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The interaction of perceived risk and benefits and its relationship to predicting mammography adherence in African-American women

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Abstract

PURPOSE/OBJECTIVES—To test the interaction of perceived risk and benefits on stage of mammography readiness and adherence.

DESIGN—Cross-sectional study

SETTING—Community gathering places and health care clinics across a Midwestern state.

SAMPLE—299 African-American women who had not had a mammogram in 18 months.

METHODS—In-person interviews were used to collect data on sociodemographics, health belief variables and stage of readiness to undertake mammography screening. Four categories were created to measure the combined magnitude of high/low levels of perceived risk and benefit with health belief variables linked to modifying mammography screening behavior.

MAIN RESEARCH VARIABLES—Perceived risks and benefits, stage of readiness, mammography adherence.

FINDINGS—The lowest rate of mammography adherence was in women with a high perceived risk and low benefit towards mammography adherence (25.6) compared to women with a high perceived benefit and low risk towards mammography adherence (46.0). Differences in mammography adherence were statistically significant between these groups $p=(0.009)$.

CONCLUSIONS—The interaction of high perceived risk and low benefits additively effected readiness to undertake screening mammography.

IMPLICATIONS FOR NURSING—Reducing disparities in breast cancer diagnosis and survival requires timely and efficient mammography adherence. Minority, medically underserved women with perceived high risk and low benefits exhibit immobilization to move forward with mammography adherence when they experience higher perceived risk. Further interventions to

increase the perception of benefit of mammography are recommended to reduce breast cancer mortality.

INTRODUCTION

Breast cancer is the second most lethal form of cancer among women in the United States. Studies show that African-American women experience higher breast cancer mortality rates compared with white women (33.0 of 100,000 vs. 22.0 of 100,000, respectively) (Ries et al., 2009). African-American women continue to have lower-five year survival (77.3%) compared to white women (88.3%) leading to their increased mortality from breast cancer (American Cancer Society, 2010). Screening mammography has been associated with a 44% reduction in risk of late-stage disease (Harris et al., 2003). Although one-time use of mammography has increased, some women do not adhere to mammography screening recommendations that would reduce breast cancer mortality (Menon, Champion, Monahan, Daggy, Hui, & Skinner, 2007). Research has described relationships between theoretical variables included in the Health Belief Model and mammography screening outcomes, however, there is little research that addresses the interaction of theoretical variables to predict mammography adherence.

Health Belief Model (HBM) constructs, including perceived barriers to and self-efficacy for mammography have been shown to predict mammography use (Ronis, 1992; Champion et al., 2005). Cultural beliefs among African-American women have also been related to mammography screening including fear of cancer discovery and treatment (Mayne & Earp, 2003; Adams, Becker, & Colbert, 2001; Allen, Sorensen, Stoddard, Colditz, & Peterson, 1998; Champion et al., 2004; Karliner, Patricia, Juarbe, Pasick & Perez-Stable, 2005) and a fatalistic view about the inevitability of death once diagnosed (Mayo, Ureda, & Parker, 2001; Powe, 1995; Powe, 1994; Powe, Hamilton, & Brooks, 2006). Two folk beliefs have been identified as causes of cancer: 1) injury spreads cancer, (Lannin et al., 1998) and 2) cancer may be caused by squeezing and touching the breasts (Russell, Monahan, Waggle, & Champion, 2007). Religious beliefs have also been associated with theoretically specified variables and mammography utilization (Russell, Monahan, Waggle, & Champion, 2007).

The two theoretical variables that have demonstrated the most conflicting results in predicting mammography adherence are perceived risk of breast cancer and perceived benefits of mammography. These variables are essential constructs of the Health Belief Model and seem intuitively necessary for action such as mammography to occur. If a woman does not perceive that she will get breast cancer or does not believe there is benefit to mammography screening, she would not be motivated to act. Researchers, however, have not considered the possibility that the interaction of these variables is key to predicting mammography adherence. There are potentially four categories of the two constructs; 1) Low risk and low benefits, 2) High risk and low benefits, 3) Low risk and high benefits, and 4) High risk and high benefits. Therefore, the purpose of this paper is to identify the relationship of different combinations of the risk/benefit construct on both the outcome of mammography adherence and on the other theoretically specified predictors of mammography adherence.

In reported research, risk and perceived benefits have been linked to mammography behavior, finding significant relationships, (Miller & Champion, 1997; Menon, Champion, Monahan, Daggy, Hui, & Skinner, 2007; Champion & Skinner, 2003; Farmer, Reddick, D'Agostino, & Jackson, 2007). However, other studies have reported conflicting results finding no association between perceived risk and benefits and mammography behavior (Zollinger, Champion, Monahan, Steele-Moses, & Zhao, 2010; Russell, Perkins, Zollinger, & Champion, 2006). One explanation for the difference in reported results is the lack of

attention to interactions identified above. This relationship may be especially important in the case where the risk and benefits constructs are different such as low risk and high benefits or high risk and low benefits. For the purpose of testing the relationship of combinations of perceived risk and benefits on mammography adherence, these constructs were combined into four distinct groups. The purpose of this paper is to investigate the combined magnitude of high/low perceived risks and benefits, on mammography screening adoption in low-income African-American women.

Our measurement of mammography behavior was based on stages of change described in the transtheoretical model (TTM)(Prochaska & Velicer, 1997). This model defines stage of behavioral change for mammography adoption ranging from lacking intention to get a mammogram, to thinking about a mammogram, to actual screening. *Precontemplation*(- no mammogram within the last 18 months and not planning to have one within the next 6 months) (Prochaska, Redding, & Evers, 2002). *Contemplation* (no mammogram within the last 18 months but planning on having one within the next 6 months) (Prochaska, Redding, & Evers, 2002) and *Action* (had a mammogram within the last year or plans to have one as recommended by their health care provider) (Rakowski et al., 1992; Rakowski, Fulton, & Feldman, 1993). In a study of predominately minority women where precontemplators had the lowest perceived benefits and highest barrier scores, precontemplators perceived relatively fewer benefits of mammography screening than did women in contemplation or action (Champion & Springston, 1999; Skinner, Arfken, & Sykes, 1998).

The conceptual model framing this study included a combination of the seminal work of the Health Belief Model (HBM)(Janz & Becker, 1984; Rosenstock, 1966) and the Transtheoretical Model (TTM)(Prochaska & Velicer, 1997). Fear and cancer fatalism were added to the framework to assess this affective dimension. Cancer fatalism was defined as the predetermination, pessimism, and inevitability of death due to cancer.(Powe, Hamilton, & Brooks, 2006) Additionally, cultural variables of preventive health orientation, mammography environment, and religious behaviors were identified and important constructs that had been demonstrated in previous work to have significant relationships with mammography adherence were included. In conclusion, the model demonstrated in Figure 1 was used as the underlying framework for predicting mammography adherence including stages of change. With this assumption we sought to understand how the combination of perceived risk and benefits related demographic variables, theoretical predictors of mammography adherence, and actual mammography adherence.

Research questions

Our research questions were the following:

Research Question 1: Are sociodemographic variables related to risk/benefit categories?

Research Question 2: What is the relationship of fear, fatalism, knowledge, self-efficacy, mammography environment, barriers, religious behavior, and preventive health orientation to the risk/benefit categories?

Research Question 3: Are the perceived risk/perceived benefit categories related to stage of mammography adherence or compliance with mammography adherence?

METHODS

Design/Procedures

This is a cross-sectional study using secondary data from a previously conducted prospective study (Champion et al., 2006). African-American women were accrued into the

study in three ways, differing only by initial contact. Recruitment occurred through multi-service centers, an African-American convention, and a general medicine clinic serving low-income clients. In all locations, research assistants approached women and gauged if they met the project's eligibility criteria, which included not having a mammogram within the last 18 months, being 41 to 75 years of age, and being at 175% of poverty level or lower. Women were also recruited from a low-income health center referral system. After screening for initial eligibility, the health center forwarded the names of eligible women to the project manager who sent invitation letters on health center letterhead. Research assistants then called women to reconfirm eligibility and explain the study. If a woman verbally agreed to participate, an appointment was made for her to meet the research assistant to sign the informed consent, complete a baseline interview and enroll on study. Third, women were recruited through churches and public housing. Staff at the church or housing tenant council identified eligible women and arranged times when research assistants were available to meet with them. At this visit, eligibility was established, the consent form was signed, the baseline interview was completed, and the women were enrolled on study. The study was approved by the University of Indiana's Institutional Review Board.

Measures

Prior to data collection, two focus groups of low-income African-American women were convened and belief scales presented for feedback. The purpose of the focus groups were to adapt the original scales that had been previously developed and extensively tested on perceived benefits and barriers (Champion & Skinner, 2003) to establish acceptability for a low-income African-American group. On the basis of this feedback, items were added to the barriers scale based on the comments of focus group participants. The reliability and validity statistics of these scales is reported elsewhere (Champion et al., 2008). The predictor variables, perceived risks and benefits are reported in detail of the frequency distribution properties. The remaining scales are presented by the number of items in each scale and the standardized Cronbach α coefficient.

Perceived benefits assessed the perceived effectiveness of behavior to decrease the risk of death from breast cancer (4 items, $\alpha=.73$). Perceived risk measured the risk women perceive of getting breast cancer compared to other women (4 items, $\alpha=.79$). Other health beliefs measured were perceived barriers (19 items, $\alpha=.89$), self-efficacy, the perceived ability to obtain a mammogram (10 items, $\alpha=.88$), fear, the emotional reaction to thinking about breast cancer (8 items, $\alpha=.94$) (Champion et al., 2004) and cancer fatalism using the Powe Fatalism Inventory (PFI), which assessed the degree to which a person equates cancer with death. (15 items, $\alpha=.87$) (Powe, 1995; Powe, 1994; Powe, Hamilton, & Brooks, 2006).

Several constructs represented African-American cultural beliefs. Religiosity was measured by a scale addressing the degree to which religious beliefs (19 items, $\alpha=.94$) and behaviors (4 items, $\alpha=.72$) played a role in the lives of individuals. The knowledge scale included items about breast cancer, treatment options, and mammography (8 items, $\alpha=.31$) (Kreuter, Oswald, Bull, & Clark, 2000). The mammography environment scale measured the discomfort individuals have or think they would experience in their immediate environment during a mammography screening procedure (16 items, $\alpha=.91$) (Russell, Monahan, Wagle, & Champion, 2007). The preventive health orientation scale consisted of two subscales. The first subscale, Active Preventive Health Orientation, measured beliefs about the importance of actively engaging in early detection of health problems and doing things to stay healthy (8 items, $\alpha=.81$). The second subscale, Passive Preventive Health Orientation, measured the belief that one should seek health care only when ill and the belief that looking for health problems can cause them (4 items, $\alpha=.63$) (Russell, Monahan, Wagle, & Champion, 2007).

All women were in pre-contemplation or contemplation when enrolled on study. Time 3 data was used for this analysis and occurred 6 months after the study enrollment, therefore a number of women who were non-adherent at baseline had a mammogram following study enrollment. Three items were used to create algorithms identifying women as being in the precontemplation, contemplation, or action stage of readiness to obtain a mammogram (Rakowski et al., 1992; Rakowski, Fulton, & Feldman, 1993). The participants' past mammogram history, their intent to be screened in the next 6 months and the date of their most recent mammogram. Mammography adherence was obtained via self-report.

Statistical Analysis

Four categories of risk/benefit were created based on the frequency distribution of each of the risk and benefit scale scores assessed at the Time 3 survey assessment (see Results) to make clinically intuitive inferences about four important combinations of risk and benefit (low/low, low/high, high/low, and high/high, respectively). The risk/benefit categories were compared on (1) categorical variables using the Pearson chi-square test, and the Cochran-Mantel-Haenszel chi-square test when controlling for other categorical covariates, and (2) continuous variables using ANOVA with the Tukey-Kramer test for post-hoc pair-wise comparisons.

RESULTS

Participant characteristics are shown in Table 1. A total of 299 women agreed to participate at both baseline and Time 3 assessments out of 492 who were eligible resulting in a response rate of 60.8 %. Reasons for not participating included lack of interest (n=38; 7.7%) or time (n=43; 8.7%). The sample consisted of women who had completed survey data for Time 3, with the majority between the ages of 41-50 (61.4%); living alone (67.9%); high school educated (74.1%); obese (53.5%) and in the contemplation stage of obtaining a mammogram (47.4%).

The frequency distribution of the perceived benefits and the risk scales were inspected for natural cut-points. Both scales contained 7-point item responses and therefore had a possible, and also observed, score range of 4 through 28. Most participants displayed high benefits and low perceived risk; scores became skewed below the natural cut point. Specifically, the benefits scale was dichotomized into low benefits (4 to 24) and high benefits (25 to 28). The perceived risk scale was dichotomized into low perceived risk (4 to 9) and high perceived risk (10 to 27). These dichotomized (low/high) variables were crossed to form four categories of risk and benefit. *Category 1* was labeled as low perceived risk and low perceived benefits. *Category 2* was labeled as low perceived risk and high perceived benefits. *Category 3* was labeled as high perceived risk and low perceived benefits and *Category 4* was labeled as high perceived risk and high benefits.

The four categories of risk/benefit are shown in Table 2. The majority of individuals (n=116) fell into Category 4; (high risk and high benefit).

Research Question 1: Are sociodemographic variables related to risk/benefit categories?

The risk/benefit categories differed significantly on level of education. The omnibus chi-square test for the 4 × 3 table was significant and pairwise differences of the risk/benefit category 2 had significantly higher education (58% had more than a high school degree) compared to those in category 3 (33%) or category 4 (31%). None of the other demographic variables differed significantly between the four risk/benefit categories.

Research question 2: What is the relationship of fear, fatalism, knowledge, self-efficacy, mammography environment, barriers, religious beliefs, religious behaviors, and preventive health orientation to the risk/benefit categories?

The summated mean scores of the other belief variables were compared for differences between the four categories of Risk/Benefit. Post-hoc pair-wise comparisons were compared on continuous belief variables using analysis of variance with the Tukey-Kramer post-hoc test. The p-value was considered significant at <0.05 .

The Risk/Benefit categories differed significantly ($p < 0.05$) on all of the health belief scales. The health belief variable questionnaire items are detailed in Table 3 for further comprehension of their relationships to the four perceived benefit/risk categories (See Table 3).

For Fear, post-hoc tests revealed women with high perceived risk regardless of perceived benefit (Categories 3, $\bar{x}=25.14$ and 4 $\bar{x}=25.14$) reported greater levels of fear than women with low risk and high benefits (Category 2, $\bar{x}=21.44$) ($F=3.12$, $p=0.026$). For Fatalism, Category 3 ($\bar{x}=42.55$) (high risk, low benefits), was significantly different than Categories 2 ($\bar{x}=36.05$) and 4 ($\bar{x}=37.85$) ($F=5.04$, $p=0.002$). Category 3 has low benefits thus is higher on the fatalism scale than Categories 2 and 4 which have high benefits.

For the knowledge construct, Category 2 ($\bar{x}=5.92$) (low risk, high benefits) was significantly different than Categories 1 ($\bar{x}=5.32$), 3 ($\bar{x}=5.16$) or 4 ($\bar{x}=5.24$) ($F=4.49$, $p=0.004$). Self-efficacy demonstrated the greatest overall difference of all belief scales and the categories of risk benefit. Categories 1 ($\bar{x}=57.71$) and 3 ($\bar{x}=54.26$) were both significantly lower than Categories 2 ($\bar{x}=63.79$) and 4 ($\bar{x}=62.46$). Women with low benefits were less likely than women with high benefits to have higher scores on self-efficacy. Women in Category 3 had the lowest amount of self-efficacy, ($F=12.32$, $p<0.0001$). Women in Category 3 ($\bar{x}=41.41$) had significantly higher scores on mammography environment than women in Categories 1 ($\bar{x}=36.09$), 2 ($\bar{x}=32.93$) and 4 ($\bar{x}=36.22$) ($F=7.55$, $p<0.0001$). For barriers Category 3 was significantly different than all other categories ($F=8.89$, $p<0.0001$). Women in Category 3 ($\bar{x}=93.49$) had significantly lower religious beliefs than women in all other categories (1, $\bar{x}=102.63$, 2, $\bar{x}=98.72$ and 4, $\bar{x}=98.28$) ($F=4.27$, $p=0.006$). In terms of engaging in religious behaviors, Categories 3 ($\bar{x}=14.16$) and 4 ($\bar{x}=13.77$) reported a lower frequency of religious activity than Category 1 ($\bar{x}=16.09$) ($F=3.65$, $p=0.013$). Active Preventive Health Orientation demonstrated women in Category 3 ($\bar{x}=31.71$) had lower scores than any of the other three categories (1, $\bar{x}=34.71$; 2, $\bar{x}=34.75$ and 4 $\bar{x}=34.31$) ($F=9.57$, $p<0.0001$), and higher scores in Category 3 ($\bar{x}=12.84$) than categories 2 ($\bar{x}=11.35$) and 4 ($\bar{x}=11.32$) for Passive Prevention Health Orientation ($F=4.01$, $p<0.008$).

Research question 3: Are risk/benefit categories related to stage of mammography adherence or compliance with mammography adherence?

Stage of adherence to mammography by each of the four risk/benefit categories was compared in Table 4. Overall, 32% of the participants were adherent to mammography at 6 months (Table 4). The greatest mammography adherence was for women in Categories 1 (low risk and low benefit) and 2 (low risk and high benefit). The lowest rate of adherence was in Categories 3 and 4 both of which had high perceived risk and either low or high benefit. Results at the 0.05 level, for omnibus and pairwise tests, were the same regardless when adjusted for education.

The relationship between categories of risk/benefit by stage of mammography was examined in Table 5. The omnibus comparison was significant in both the unadjusted and adjusted analyses. For subsequent pairwise comparisons, three comparisons were possible. First,

women in **Precontemplation** were compared with women in **Contemplation**. Secondly, women in **Precontemplation** were compared with women in **Action**. Third, women in **Contemplation** were compared with women in **Action**.

Women with low benefits and either low or high risk (Categories 1&3) were more likely to be in Precontemplation as compared to women in Category 4 (high risk and high benefit) who were more likely to be in Contemplation.

Women in Category 3 (high risk and low benefit) were less likely to be in Action, and more likely to be in Precontemplation, than women in Categories 2 or Category 4. When comparing women in Contemplation to women in Action, women in Categories 1 and 2 were more likely to be in Action, and less likely to be in Contemplation, than women in Categories 3 and 4. The difference between Categories 1 and 3 was significant only after adjusting for education. For this comparison, low perceived risk seemed to be related to having obtained a mammogram.

DISCUSSION

This study examined the relationship among categories of perceived risk/benefits, mammography adherence behavior, and stage of change in low income African-American women. There is clearly a consistent pattern when categories of Risk/Benefit are compared to mammography adherence, mammography stage and beliefs that predict mammography adherence.

High perceived benefit was not associated with mammography adherence if accompanied by high risk. Adherence in Category 1 (women with low risk and low benefits) was significantly higher than in Category 3 indicating that when women perceived low benefits, higher risk further decreased mammography adherence. Similarly, low risk regardless of whether the woman perceived low or high benefits was associated with higher mammography adherence. When risk was held constant-either low or high, higher benefits was marginally associated with adherence. Category 1 showed marginally greater adherence than Category 3 after adjusting for education ($p = 0.056$). It is possible that the two risk categories were not sufficient to differentiate risk which might need to be split into three categories. Low risk may not be sufficient to encourage mammography and high risk may induce enough fear that women are not inclined to make an appointment. This scenario is supported by the relationship of risk/benefit categories to fear. Other work (Champion et al., 2004) has demonstrated that a moderate risk level is most highly associated with mammography adherence.

Secondly, we examined the relationship of fear, fatalism, knowledge, self-efficacy, mammography environment, barriers, religious beliefs, religious behaviors, and preventive health orientation to the risk/benefit categories. The theoretical relationships between the risk/benefit categories and health belief variables demonstrated significance, with the most interesting results emerging for women in Category 3. Women in Category 3 (high risk and low benefits) had higher means on fear, fatalism, mammography environment, barriers, passive preventive health orientation and lower means on knowledge, self-efficacy, religious beliefs, and active preventive health orientation. These findings are revealing as they test the as yet undefined interactions between perceived risk and benefits on health and cultural beliefs.

The combination of higher perceived risk and lower benefits is striking as it reveals personal characteristics adverse to mammography screening adherence in a population of women more susceptible to a later stage, more advanced breast cancer diagnosis. Perceived risk

obscures the perceived benefits of screening mammography as an early detection modality. An individual's sense of confidence and knowledge to pro-actively engage in breast health care is attenuated and replaced with fear and fatalism of the inevitability of breast cancer death regardless of diagnosis. These results are not surprising, lower perceived benefits and self-efficacy have been shown to work in tandem where with lower self-efficacy and benefits have higher levels of fear (Russell Perkins, Zollinger & Champion, 2006). Religious beliefs were lower in women with Category 3 and have been shown to be associated with adaptive breast cancer beliefs and mammography utilization among urban African-American women (Holt et al., 2003).

Lastly, we investigated whether the risk/benefit categories were related to stage of mammography adherence or compliance with mammography adherence. Women with higher benefits and higher risk were more likely to be considering a mammogram. Benefits regardless of risk category seemed to be the important variable for women considering a mammogram. Women with high perceived risk and high perceived benefits were more likely to be in contemplation as opposed to precontemplation than women in either Category 2 or Category 3.

Women with high benefits regardless of risk were more likely to be in Action compared to precontemplation. High risk and low benefit increased the likelihood of women only being in Precontemplation –compared to women with high perceived benefit regardless of risk.

It is also possible that after having a mammogram, women's perception of risk decreased because results were negative. For contemplators, those who had not yet had a mammogram, higher risk possibly pushed women toward considering a mammogram. For women who had completed a mammogram their perception of breast cancer risk was lower than for those with higher risk perception who were only contemplating mammography. In summary, higher perceived benefits were associated with women considering a mammogram or actually having a mammogram. Women who had a mammogram were more likely to have lower risk-probably because they had just confirmed that breast cancer was not present.

It appears a new high risk group of minority women has emerged that presents psychosocial health beliefs recalcitrant to customary educational intervention techniques. The combinations of health and cultural belief variables that predispose Category 3 women to non-adherence to need to be disentangled and examined before further interventions can be performed on the static mammography behaviors of this study population.

Study limitations

The findings from this study are limited in generalization to women who participated in this study and are not representative of all African-American women. Since other ethnic and racial groups were not included in this study, we cannot assert if study findings differ cross-culturally. Lastly, because this is a cross-sectional analysis on self-reported behaviors and beliefs, the findings are tempered by known validity limitations.

Implications for providers

Minority, medically underserved women in Category 3 with perceived high risk and low benefits may exhibit immobilization to move forward with mammography adherence when they experience higher perceived risk. The perception of high benefits possibly motivates women to progress through stages of readiness to mammography adherence. These findings suggest that future work is needed on the conceptualization, measurement and communication of perceived risk and benefits conditioned on stages of mammography behavior. Further psychometric analysis is warranted to develop an ultra-brief, reliable, valid and user-friendly assessment of the combination of the four categories of perceived risk/

perceived benefit to capture the interaction between these highly significant constructs. Reducing disparities in breast cancer diagnosis and survival requires timely and efficient mammography adherence. Minority women with apprehension to utilize screening mammography may benefit from further intervention on their health belief decisions to affect disparities in breast cancer survival.

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Figure 1.
Proposed conceptual framework

Table 1

Descriptive characteristics of the sample, n (%) unless otherwise indicated

Characteristics	Number (n=299)	Percent
Age in Years	51.0 (mean)	8.99 (S.D.)
Marital Status		
Living with Partner	93	31.1
Living Alone	206	68.9
Education		
Less than High School Degree	74	24.8
High School Degree	109	36.5
Greater than High School Degree	116	38.8
Body mass Index (kg/m ²)*		
Underweight or Normal	56	18.9
Overweight	82	27.6
Obese	159	53.5
Health Insurance		
Yes	213	71.2
No	86	28.8

* Weight status missing on two participants

Table 2

Low/High Categories of Risk/Benefits

	Low Risk (0 – 8)	High Risk (9 – 27)
Low Benefits (4 – 24)	Category 1 (n=34)	Category 3 (n=86)
High Benefits (25 – 28)	Category 2 (n=63)	Category 4 (n=116)

Table 3

Questionnaire items: Health Beliefs on Mammography Adherence

Health Belief Variable/Questionnaire items	
<u>Fear</u>	
1	When you think about breast cancer you get scared.
2	When you think about breast cancer, you feel nervous.
3	When you think about breast cancer, you get upset.
4	When you think about breast cancer, you get depressed.
5	When you think about breast cancer, you get edgy.
6	When you think about breast cancer, your heart beats faster.
7	When you think about breast cancer, you feel uneasy.
8	When you think about breast cancer, you feel anxious.
<u>Fatalism</u>	
1	I believe if someone is meant to have cancer, it doesn't matter what she eats; she will get it anyway.
2	I believe if someone has cancer, it is already too late to do anything about it.
3	I believe someone can smoke all her life, and if she is not meant to get cancer, she won't get it.
4	I believe if someone is meant to get cancer, she will get it no matter what she does.
5	I believe if someone gets cancer, it was meant to be.
6	I believe if someone gets cancer, her time to die is near.
7	I believe if someone gets cancer, that's the way she was meant to die.
8	I believe getting checked for cancer makes people think about dying.
9	I believe if someone is meant to have cancer, she will have cancer.
10	I believe some people don't want to know they have cancer because they don't want to know they are dying.
11	I believe if someone gets cancer, it doesn't matter when she finds out about it, she will still die.
12	I believe if someone gets cancer, a lot of different treatments don't make any difference.
13	I believe if someone was meant to have cancer, it doesn't matter what the doctor tells her to do, she will still get cancer anyway.
14	I believe if someone is meant to have cancer, it doesn't matter if she eats healthy foods.
15	I believe cancer kills most people who get it.
<u>Knowledge</u>	
1	Are women who have close relatives with breast cancer more likely to get it themselves?
2	Do women with breast cancer have to have their breast removed?
3	Can bumping or bruising the breasts lead to breast cancer?
4	Can touching, fondling, or squeezing the breasts lead to breast cancer?
5	Are women with large breasts more likely to get breast cancer than women with smaller breasts?
6	When breast lumps are discovered, how many of them turn out to be cancer?
7	Who is more likely to get breast cancer?
8	How often does a woman your age need a mammogram?
<u>Self- Efficacy</u>	
1	You can get a mammogram even if the doctor does not tell you to get one. How likely or unlikely is that?

Health Belief Variable/Questionnaire items

- 2 You can get transportation to have a mammogram. How likely or unlikely is that?
- 3 You can arrange other things in your day to have a mammogram. How likely or unlikely is that?
- 4 You can talk to people at the mammogram center if you have a problem. How likely or unlikely is that?
- 5 You will get a mammogram even if you are worried. How likely or unlikely is that?
- 6 You will get a mammogram even if you don't know what to expect. How likely or unlikely is that?
- 7 You can find a way to pay for a mammogram. How likely or unlikely is that?
- 8 You can make an appointment for a mammogram. How likely or unlikely is that?
- 9 You can find a place to get a mammogram (or know where to go to get a mammogram). How likely or unlikely is that?
- 10 You can get a mammogram. How likely or unlikely is that?

Mammography Environment

- 1 I don't like the mammography machine touching me.
- 2 The appearance of a x-ray room concerns me.
- 3 It bothers me when the x-ray staff is always busy.
- 4 The temperature of the x-ray machine against my breasts concerns me.
- 5 It bothers me when the x-ray staff touches my breasts.
- 6 Mammography waiting rooms that don't have decorations for my culture concerns me.
- 7 Not having a privacy screen around my body during the mammography screening concerns me.
- 8 The lighting in the x-ray room is uncomfortable to me.
- 9 It bothers me when the x-ray staff is unfriendly.
- 10 The temperature in the x-ray room is uncomfortable to me.
- 11 Lack of privacy during the x-ray bothers me.
- 12 Health care reading materials that aren't specific to my race bothers me.
- 13 Exposing my breasts during the mammography screening bothers me.
- 14 Mammography rooms that lack decorations showing my culture concern me.
- 15 The x-ray staff has to get too close to me during the mammography screening.
- 16 The x-ray staff does not tell me enough about what to expect.

Barriers

- 1 Getting a mammogram would be inconvenient for you. How likely or unlikely is that?
- 2 Getting a mammogram could cause breast cancer. How likely or unlikely is that?
- 3 The treatment you would get for breast cancer would be worse than the cancer itself. How likely or unlikely is that?
- 4 Being treated for breast cancer would cause you a lot of problems. How likely or unlikely is that?
- 5 Other health problems would keep you from having a mammogram. How likely or unlikely is that?
- 6 Your age would keep you from having a mammogram. How likely or unlikely is that?
- 7 You would not get a mammogram because your doctor already examines your breasts or you examine them yourself. How likely or unlikely is that?
- 8 Being afraid of finding a breast problem would keep you from having a mammogram. How likely or unlikely is that?
- 9 The trouble of having a mammogram would keep you from getting one. How likely or unlikely is that?
- 10 Concern about pain with having a mammogram would keep you from having one. How likely or unlikely is that?
- 11 Being embarrassed about your body would keep you from having a mammogram. How likely or unlikely is that?
- 12 You will not have time to have a mammogram. How likely or unlikely is that?

Health Belief Variable/Questionnaire items

- 13 Not being able to afford a mammogram would keep you from having one. How likely or unlikely is that?
- 14 Worrying about breast cancer would keep you from having a mammogram. How likely or unlikely is that?
- 15 Concern about being exposed to the x-ray would keep you from having a mammogram. How likely or unlikely is that?
- 16 You would find it difficult to remember to make an appointment for a mammogram. How likely or unlikely is that?
- 17 Forgetting your appointment would keep you from getting a mammogram. How likely or unlikely is that?
- 18 Being treated rudely at the mammography centers would keep you from having a mammogram. How likely or unlikely is that?
- 19 "Not wanting to know" would keep you from having a mammogram. How likely or unlikely is that?

Passive Preventive Health Orientation

- 1 I believe that looking for health problems can cause health problems.
- 2 I don't need to look for health problems when I am feeling well.
- 3 When I feel well, I do not worry about my health.
- 4 I only do something about my health when I feel sick.

Religious Belief

- 1 My belief in God influences my decisions about my health.
- 2 I believe that God wants me to be concerned about the health of my family and friends.
- 3 I believe that God wants me to take care of my body so that I can enjoy life.
- 4 Because of my religious beliefs, I feel guilty when I don't take care of my body.
- 5 If I take care of my body, I am better able to do God's will.
- 6 I believe that God will be with me if something happens to my health.
- 7 I believe God has given me some control of my health.
- 8 My religious community shares my beliefs about taking care of my body.
- 9 I believe that God expects me to take care of my body.
- 10 I believe that God wants me to be concerned about my health.
- 11 I believe that God has complete control of my health.
- 12 I believe that God has given us doctors to help us take care of our bodies.
- 13 I believe that God will take care of my body.
- 14 I believe that God wants me to take care of my body to help me enjoy my life.
- 15 Because of my religious beliefs, I feel anxious when I don't take care of my body.
- 16 Taking care of my body is necessary to do God's work.
- 17 I believe that God will provide others to help me if something happens to my health.
- 18 I believe I should put my health completely in God's hands, not in man's.
- 19 The women in my religious community encourage me to take care of my body.

Religious Behavior

- 1 How often do you read religious books, magazines, or pamphlets?
- 2 How often do you pray?
- 3 How often do you attend worship services other than for occasions like weddings or funerals?
- 4 Besides attending services, how often do you take part in other religious activities such as scripture studies, choir practice, or committee meetings?

Health Belief Variable/Questionnaire items**Active Preventive Health Orientation**

- 1 When I have a health problem, I take care of it right away.
- 2 My health now will affect my future.
- 3 It is important to me to do things now to prevent health problems.
- 4 It makes sense to take care of myself now so I can be healthy in the future.
- 5 I try to do things to stay in good health
- 6 Finding health problems early is important for me.
- 7 I do things now for a healthy future.
- 8 It is important to me to have regular health screenings.

Table 4

Relationship Between Categories of Risk/Benefit by Stage of Mammography

	Low Benefit Low Risk (Category 1)	High Benefit Low Risk (Category 2)	Low Benefit High Risk (Category 3)	High Benefit High Risk (Category 4)	p-value
Precontemplation	8(23.5)	8(12.7)	19(22.1)	9(7.8)	0.0012^a (0.0019)^b
Contemplation	12(35.3)	26(41.3)	45(52.3)	75(64.7)	
Action	14(41.2)	29(46.0)	22(25.6)	32(27.6)	
Post-hoc Pair-wise Comparisons ^c					
Precontemplation vs. Contemplation	VS.				
		p-value			
Category 1 vs Category 4		0.0015(0.0048)		S^d	
Category 3 vs Category 4		0.0035(0.0038)		S	
Precontemplation vs. Action					
Category 2 vs Category 3		0.0219 (0.0167)		S	
Category 3 vs Category 4		0.0199 (0.0214)		S	
Contemplation vs. Action					
Category 1 vs. Category 3		0.0619 (0.0384)		S	
Category 1 vs. Category 4		0.0213 (0.0313)		S	
Category 2 vs. Category 3		0.0267 (0.0207)		S	
Category 2 vs. Category 4		0.0045 (0.0229)		S	

^aThe first p-value is from a 3 × 4 omnibus Pearson chi-square test.

^bThe p-value within the parentheses is from a 3 × 4 × 2 Cochran-Mantel-Haenszel chi-square test controlling for education.

^cDue to significant omnibus tests, post-hoc pair-wise comparisons were performed. Post hoc tests for each pair of two groups were performed with a 2 × 2 Pearson chi-square test and a 2 × 2 × 2 Cochran-Mantel-Haenszel chi-square test(in parentheses) controlling for education.

^dSignificant difference between categories at p< 0.05.