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Predicting the use of Individualized Risk Assessment for Breast Cancer

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Abstract

Purpose—The purpose of this study was to investigate the decision to obtain individualized risk assessment after a breast cancer education session.

Methods—A sample of both African American and Caucasian women was used to determine if there were differences by race/ethnicity in uptake of the assessment and differences in the variables that were most predictive of uptake. The sample included 166 women between the ages of 18 and 80. Sixty-two percent of the sample were African American women.

Key Findings—The results suggested that African American women and Caucasian women used different factors and used other factors differently to decide whether or not to obtain an individualized risk assessment.

Conclusions and Implications—These results are discussed within the context of health disparities among ethnic minority and Caucasian women with implications for breast cancer control programs. The results of this study would suggest that knowledge alone does not lead to opting for a personalized risk assessment, and that African American and Caucasian women use different pieces of information, or information differently to make decision about getting more personalized information about risk.

According to longitudinal tracking data from the first 10 years of the National Breast and Cervical Cancer Early Detection Program (Centers for Disease Control and Prevention, 2006), African American women of lower SES aged 50 years and older obtained mammography screening at significantly lower rates than non-Hispanic Caucasian women of similar age and SES (17.2% versus 52.4%, respectively). There are obviously disparities in regular mammography usage within the population. Although there are structural barriers to mammography usage (i.e. access to care, availability and affordability of services, lack of transportation, poor physician-patient communication, etc.), there are also behavioral barriers which include attitudes, beliefs, misperceptions about cancer, and fear (Young, Waller, & Smitherman, 2002). Young et al. (2002) found that these behavioral barriers were more predictive of underutilization of mammography screening than structural barriers. The most predictive of this underutilization were lack of knowledge and misperceptions about breast cancer.

Thus, it seems clear that accurate information about breast cancer and risk factors need to be disseminated in some form so that underutilizers of breast cancer screening (typically poor,

ethnic minority populations, and the elderly) can make more educated decisions about the use of screening. A potentially promising educational technique to increase screening is individualized risk assessment (IRA). Evidence suggests that this approach may significantly increase adherence to screening for women at high-risk (Schwartz, Rimer, Daly, Sands & Lerman, 1999). The purpose of this study was to investigate the decision to obtain IRA after a breast cancer education session in a sample of both African American and Caucasian women to determine if there were differences by race/ethnicity in uptake of the assessment and differences in the variables that were most predictive of uptake.

Personalized risk assessment for skin cancer has been shown to reduce tanning bed use and increase perceived susceptibility to skin cancer (Greene & Brinn, 2003). However, providing information alone, may not lead to action. It is likely that personality characteristics such as differentiation of self and monitoring style may, at least in part, dictate the extent to which women will be able to effectively respond to information concerning health risks. Miller and colleagues (Miller, 1995; Miller, Fang, Diefenback, & Bales, 2001) have demonstrated that individuals differ greatly “not just in what they see and define as stressful, but also in how attentively and pervasively they look for threat, how readily they find it, how tenaciously they maintain and relive it, and how they ultimately deal with it” (Miller et al., 2001; p 344). Vahabi and Gastalbo (2003) suggest that an individual’s ability to process new information, transform it into knowledge, and behave in a consistent rational manner is limited by a number of factors such as cognitive processes, past experience, and socio-demographic contexts. Until we better understand how women at all levels of risk receive and process information related to risk assessment, it is unlikely that we will be able to capitalize upon approaches to increase women’s compliance with recommended screening guidelines to monitor breast cancer risk.

Perceived Risk

Individual decision making about risk assessment appears to be based less on factual information and actual risk than it is on perceived risk and personality factors (Lerman, Croyle, Tercyak, & Hamann, 2002). Women overestimate their risk of developing breast cancer and studies have shown that overestimation of risk impedes compliance with traditional screening (Alexander, Ross, Sumner, Nease, & Littenberg, 1996; Warner et al., 1999). However, other studies provide conflicting evidence about the relationship between breast cancer worry and self-protective behavior (Shaw & Bassi, 2001). Some studies show no relationship, some show a positive relationship and others show a negative relationship (McCaul, Schroeder & Reid, 1996). Most studies, however, are cross-sectional, so it is difficult to determine a cause-effect relationship. It may be that cancer specific worry motivates testing (Lerman et al., 2002) or that testing promotes worry. McCaul, Shroeder, and Reid (1996), in a prospective study, found that those at the extremes of worry were the most likely and least likely to engage in self-protective behavior. That is, those who were the most worried about breast cancer were the most likely to engage in screening and those who were the least worried were the least likely to engage in screening. Again, this worry may not have been related to actual risk but to perceived risk.

Alexander, et al. (1996) suggest that overestimation of risk causes women to make poorly informed decisions about preventive measures and creates misplaced anxiety. These researchers established a program in which women who had enrolled in the Tamoxifen Breast Cancer Treatment Trial estimated their risk of developing breast cancer and provided information that allowed the researchers to calculate their objective risk using the Gail formula (Gail et al., 1989). Then, the participants met with a general internist who instructed them on their objective risk with the Gail model using both visual and verbal information and discussed the general risk factors involved in the Gail formula. Using a pre and post-test design, they found that women’s estimated risk dropped to within 1% of their actual risk after the education

session, while their pretest perceived risk was on average 39% above their actual risk. This change in risk perception remained stable at a five month follow-up session. Alexander, et al. (1996) and colleagues compared these results to other studies of educational interventions that demonstrate a decrease in perceived risk, but still an overestimation. They concluded that numbers can be more informative than words in some settings and that using numbers to educate women about their risk of developing breast cancer showed promise.

Personality Factors

There are several theories available that provide hypotheses about which types of people would engage in health protective behavior (c.f. Ajzen & Fishbein, 1980; Becker, 1974; Miller, 1995; Rogers, 1975). These theories have been researched, producing varying levels of support (Ogden, 2003). There are also theories in the social sciences that may provide ways of explaining behavior. One such theory is Bowen's (1978) Family Systems Theory. The cornerstone construct for Bowen's theory is differentiation of self. Differentiation of self is a multidimensional construct that consists of "an intrapsychic ability to distinguish between the feeling process and intellectual thinking process, and an interpersonal ability to maintain connections with others while achieving an autonomous self" (Skowron & Schmitt, 2003; p 209). Differentiation, according to Kerr and Bowen (1988), in essence, is the antidote to anxiety. The lower the level of differentiation, the less able the individual is to tolerate anxiety and the quicker the individual will do something to relieve the anxiety. Kerr and Bowen (1988) refer to this rapid response as emotional reactivity. Thus, with increased anxiety from potentially life threatening information (i.e. risk of breast cancer) the less differentiated person will become more anxious and do something to relieve the anxiety fairly quickly. One way would be to avoid the information, another would be to get as much information as possible to determine risk immediately and then do something about that. This emotional reactivity leads to becoming overwhelmed and allowing emotions to cloud thinking. With emotional reactivity, decision making is often based on "all or nothing" thinking in order to reduce anxiety and perspective taking becomes narrow to the point of self centeredness (Papero, 1990). Bowen (1978) further suggested that emotional reactivity comes in at least two forms, one, becoming overwhelmed and reducing the anxiety by connecting, and another becoming overwhelmed and reducing the anxiety by cutting off from relationships or the situation that creates the anxiety.

Alternatively, the Cognitive-social health information-processing (C-SHIP) model proposed by Miller, Shoda and Hurley (1996) includes several psychological factors involved in the processing and responding to cancer prevention and control messages. One factor is cancer-relevant affects and emotions. Miller, et al. (2001) suggest that there is variation in affective and emotional responses to cancer-relevant threats. They suggest that affect or worry may trigger thoughts about mammography or other screening, which then may produce more worry. This becomes a vicious cycle and may occur so rapidly that affects and cognitions appear to arise simultaneously. This process sounds quite similar to the process that Bowen (1978) termed as emotional reactivity. Miller and colleagues (Miller, 1995; Miller & Champion, 1997; Miller et al., 1999; Miller et al., 2001) have developed a typology of information processing styles and demonstrated that people have different ways of processing threatening health information. High monitors tend to scan for, and amplify, threatening cues, while low monitors or blunters find ways to distract themselves from threatening cues. These styles of monitoring then may be the reactions to the anxiety created by threatening health information, and thus differentiation may be related to these monitoring styles.

Lerman et al. (1996), using this monitoring versus blunting style typology, demonstrated that high monitors experienced more distress after breast cancer risk counseling (IRA) than blunters. Shoda et al. (1998) suggest that these coping styles create somewhat of a paradox.

High monitors may be especially likely to opt for screening including genetic testing (Lerman, 1997), but with more risk information they become distressed to the point that avoidant defense reactions are triggered and adherence to screening is undermined. Shoda et al. (1998) conclude that the women who may be most eager for screening may be the least likely to be able to cope with its consequences. Fang, Miller, Daly, and Hurley (2002) found that, of women at increased risk for ovarian cancer, high monitors were more likely to opt for preventive surgery, regardless of their actual risk. This and other studies show that perceived risk of developing a disease, along with personality factors, motivate an individual's interest in undergoing health behaviors such as mammography and further suggest that personality factors will also be likely to significantly impact the individual's ability to cope with the result of the screening and to further adhere to screening recommendations.

It seems plausible that the more accurate a woman's risk perception coupled with personality characteristics that allow her to understand and process that information would allow for more follow-through on breast cancer screening. However, since there is evidence of less mammography usage among ethnic minorities and this lack of compliance with screening guidelines may be related more to "behavioral" barriers than more structural barriers (i.e. access) (Young et al., 2002), then also including ethnic minority status in our understanding of these processes seems imperative. Thus, understanding how differentiation of self and monitoring style impact the decision to have IRA among African American and Caucasian women was the focus of this project. We hypothesized that women with higher levels of differentiation would be moderate monitors of threatening health information and be able to use information about breast cancer and its risks to make the decision to obtain an individualized risk assessment. We did not make a directional hypothesis for the relationship between race/ethnicity and choosing to obtain IRA, but included race/ethnicity in our models to explore differences if they emerged.

Method

Sample

The sample for this project comes from a larger NCI funded study to understand the impact of individualized risk assessment for breast cancer on decisions about screening behavior. The larger study includes a longitudinal follow-up component, which was not used for this project. The data come from 166 women between the ages of 18 and 80 with an average age of 48.5. Sixty-two percent of the sample were African American, with 34.7% Caucasian. Twenty-one percent of the sample had a high school education or less, 31% reported having had some college, and 27% had a bachelors degree. The average income was between \$20,000 and \$30,000 annually, with 40% making less than \$20,000, and about 26% of the sample making more than \$50,000 annually.

Procedures

Breast cancer education sessions were advertised in churches who elected to participate in the program, in community agencies (i.e. an urban league, YWCA for formerly homeless women, and a homeless family shelter) and at a university wellness program. African American and Caucasian women entered the project from each venue. Participants were informed about the voluntary nature of the research component of the project. If they elected to participate in the research (nearly 100% did so), they completed a pretest before the education session, a post test following the education session, and then could elect to have an individualized risk assessment via the Gail model, and could also participate in follow-up telephone calls every three months over the following year. Participants received \$5 for completing the pretest and post-test.

Instruments

Differentiation of Self Inventory (DSI; Skowron & Schmitt, 2003), a 46 item instrument was used to assess four characteristics of differentiation of self or the lack thereof based on Bowen's (1978) definition of differentiation of self: Fusion with Others, Emotional Reactivity, Emotional Cutoff, and "I" Position. Sample items include, "I tend to distance myself when people get too close to me," (cut-off), "At times my feelings get the best of me and I have trouble thinking clearly," (emotional reactivity), and "I usually do not change my behavior simply to please another person" (I position). Internal consistency reliabilities ranged from .81 to .89 for the subscales and .92 for the full scale. Skowron and Schmitt (2003) report significant correlations between the DSI subscales and the Personal Authority in the Family System Questionnaire (Bray, Williamson & Malone, 1984). The DSI was elected because it is shorter and more closely aligns with Bowen's (1978) definition of differentiation of self than other assessments available. The subscales are scored so that higher scores indicate higher differentiation. The converse being that lower scores indicate that the respondent is more likely to endorse the behaviors (cut-off or emotional reactivity) that indicate a lack of differentiation.

The Miller Behavioral Style Scale (MBSS; Miller, 1987) was used to assess monitoring styles (information seekers or blunters). The short form of the MBSS presents 2 scenarios and asks the respondent to endorse the behavioral response that they would most likely choose if they were in the same situation. The two scenarios include going to the dentist, and learning that someone will be fired at one's place of employment.

It should be noted that the MBSS two subscales monitoring and blunting had poor internal consistency reliabilities. The blunting scale could not be modified to become more reliable and could not be used in the project. The monitoring subscale had two items that had no variability (asking the dentist to tell me exactly what he would be doing, and making sure that I had performed all the duties related to my job). Once these were removed, the reliability of the scale improved to .74 (Cronbach alpha).

Breast Cancer and Hereditary Knowledge Scale (Ondrusek, Warner, & Goel, 1999) was used to assess knowledge of breast cancer and heredity specifically for women with low to moderate risk for hereditary breast cancer. It assesses knowledge in four areas: incidence and etiology, screening, disease presentation, and genetics. Ondrusek et al. (1999) report a test-retest reliability of .76.

Breast Cancer Worry was measured with the 3 items from McCaul, Shroeder, and Reid (1996): 1) How often do you worry about getting breast cancer? Answered on a scale from never (1) to always (5); 2) On a scale from 1-5, how would you rate how worried you are about getting breast cancer? Answered on a scale from not at all (1) to extremely (5); and 3) Thinking about breast cancer makes me feel upset and frightened. Answered on a scale from strongly disagree (1) to strongly agree (5).

Perceived Risk was assessed with the item "what do you think your chances are for getting breast cancer in your lifetime?" This was answered on a scale from 0 to 100%.

Actual risk was calculated using the Gail formula with questions included in the pre-test questionnaire.

Data on participants' age, gender, SES, ethnicity, and religious background, mammography and other breast cancer screening history and insurance coverage were also collected from the participants themselves.

Data Analysis

The goal of the larger study was to include African American women at equal rates with Caucasian women given the health disparities between African American and Caucasian women. We were able to include more African American women than Caucasian women in the sample. Disparities in health, however, are not just about race/ethnicity but also about socioeconomic factors. Since we would be including race in the models used to test the hypothesis, we also wanted to determine any differences in socioeconomic characteristics and other demographics between the African American and Caucasian participants. A series of t-tests for continuous variables and chi-square analyses for categorical variables were performed to test for differences between the two groups of participants. The results of the t-tests can be found in Table 1.

In order to test the full hypothesis, a structural equation model was estimated using LISREL 8.8 (Joreskog & Sorbom, 2006) with a group comparison procedure to test for any significant differences in the path estimates between the African American participants and the Caucasian participants (Bollen, 1989). This model can be seen in Figure 1. The model suggests that the demographic characteristics (age and income) along with differentiation (reactivity and I position) are predictive of monitoring, and initial levels of worry, perceived to actual risk, and knowledge as well as change in these, and finally would be related to choosing to obtain an individualized risk assessment. The model also allows monitoring, risk, worry, and knowledge as well as change in risk, worry and knowledge to predict choosing to obtain an individualized risk assessment. In order to account for change in perceived to actual risk, worry and knowledge after the education session, we allowed pretest scores to lead to post test scores for all three of these, so if any variable explained worry, perceived to actual risk, or knowledge at post-test, it was controlling for worry, perceived to actual risk and knowledge at pre-test, thus any remaining variance was the variance due to change in scores.

Results

Subsample Comparisons

The African American participants tended to be older than the Caucasian participants (AA mean age=50.75, C mean age=45.23; $t=-2.39$; $p<.05$). The African American participants gave birth to their first child at an older age (18.6 years) than the Caucasian participants (15.0 years; $t=-2.01$; $p<.05$). Caucasian participants reported having more education than African American participants, with the Caucasian participants having completed a bachelor's degree more often (43.3%) than the African American participants (16.3%; $\chi^2(7)=17.98$; $p<.05$). There were no differences in income between the two groups of participants. African American and Caucasian women reported being Protestant in roughly equal percentages, more Caucasian women reported that they were Catholic than African American women and more African American women reported their religious preference as "other" than Caucasian women ($\chi^2(2)=12.98$; $p<.01$). There were no differences among the participants in terms of who had insurance and who had had a mammogram. Ninety-eight percent of the Caucasian participants and 91.1% of the African American participants over the age of 37 had had at least one mammogram and 90% of both groups had had a mammogram within the last two years. Ninety-six percent of the Caucasian women in the sample had insurance that they believed covered annual mammograms and 84% of the African American women in the sample had insurance. Finally, more Caucasian women (73%) than African American women (51%) elected to have an individualized risk assessment ($\chi^2(1)=8.03$; $p<.01$). African American and Caucasian women perceived their risk of developing breast cancer at the same level at pre-test, but there was a significant difference in perceived risk at post test ($t=2.99$; $p<.01$), with African American women perceiving lower risk than Caucasian women. Both groups however, overestimated their risk at about 30% higher than their actual risk. The actual risk of developing breast cancer

was significantly different between the two groups of participants as would be expected using the Gail formula, which tends to underestimate the risk of breast cancer in African American women. Although this bias is present, African American women over-all are at lower risk for developing breast cancer, but at higher risk for mortality due to breast cancer. The actual risk for developing breast cancer in the Caucasian group was at 16%, while the risk for the African American group was 11% according to the Gail Formula ($t=4.84$; $p<.001$).

There were significant differences between the two groups on knowledge of breast cancer both pre and post education sessions. Caucasian women had more knowledge of breast cancer at both times ($t=2.46$ and 3.35 respectively). African American women had lower scores on the cut-off subscale of the DSI suggesting that they were more likely to endorse cutting off than Caucasian women ($t=4.47$).

Structural Equation Model Results

The group comparison results can be seen in Table 2. In this procedure an initial model is estimated that allows both groups to have the same structure but frees the estimates across groups to vary (H_{form}). Then, in a series of steps, the models are estimated with invariant or equal paths between the two groups. At each step a chi-square difference test is performed to calculate any loss of fit due to the equality constraints. If no loss of fit is detected, then the next step in invariance is estimated and another chi-square difference test is performed to assess for loss of fit and so on. Once a loss of fit is detected then further analysis is done to determine which paths are significantly different between the groups. Then a final model is reported that provides those paths that can be considered equivalent across the groups and those that can not.

Using full information maximum likelihood estimation H_{form} fit the data quite well. The chi-square with 186 degrees of freedom was 226.25 ($p=.023$) and the RMSEA was .05 (Root Mean Square Error of Approximation is a test of close fit, values of 0 to .05 are considered a close fit). There was no loss of fit in the model that allowed the loadings on the latent variables (monitoring and differentiation) to be equivalent across groups. There was also no loss of fit in the model that set the paths from age and income and the differentiation variables to all the other variables to be equivalent across the groups. There was a loss of fit when the paths between the “endogenous” variables (those on the right) were set to be equal. In further analysis, the paths from knowledge, worry and perceived to actual risk at pretest and election of IRA were all statistically different between the groups. The final model allowing these three paths to be free to vary across the groups and the other estimates to be invariant resulted in a good fit to the data ($\chi^2(228)=278.06$; $p=.013$; RMSEA=.051).

The significant paths in the model suggested that several variables were predictive of the variance in the change in perceived to actual risk after the education sessions. These paths were the same in both groups and included age, income and reactivity. Age was positively related to the variance in the change, income was negatively related to the variance and reactivity was positively related to the variance as well. These estimates suggest that being older, having less income and being more differentiated was associated with the variability in the change in perceived to actual risk after the education session. In order to understand the direction of the change and its relationship to these variables we performed a repeated measures ANCOVA using a thirds split for the reactivity variables, a mean split of income and divided the ages for those 39 and above and those 38 and under and using the other two variables as covariates (i.e when testing for differences for differentiation we used age and income as covariates). From these results it appeared that younger participants become more accurate in their perception of risk than older participants who became less accurate. Those who were in the low differentiation group became less accurate and those with less income became less accurate in their perception of risk across both African American and Caucasian women.

The stability factors or the relationships between pre- and post-test scores on knowledge, worry and perceived to actual risk were also the same between the two groups and all were significant thus, the education sessions made some difference in these scores but knowledge worry and perceived to actual risk at pretest predicted these same scores at post-test.

The differences between the two groups were in the prediction of choosing to obtain an individualized risk assessment. For African American women, those with less knowledge at pretest, and those who were less accurate in their perception of risk at pretest were more likely to obtain an individualized risk assessment. For Caucasian women those who were more worried about breast cancer at pre-test and those who were more accurate about their risk were more likely to choose an individualized risk assessment. The final model explained 17% of the variance in selecting IRA for the African American group and 23% of the variance for the Caucasian group.

Discussion

There are many barriers to mammography screening both structural and behavioral (Young, et al., 2002). Young et al. (2002) found that behavioral barriers such as lack of knowledge and misperceptions about cancer played a more important role in lack of adherence to screening recommendations for breast cancer than structural barriers. There is some evidence that using individualized numerical risk estimates increases adherence to screening (Schwartz, et al., 1999). However, Schwartz et al.(1999) suggested that women with different characteristics were impacted by individualized risk assessment differently. There appeared to be no impact on the more educated group in their sample of women at varying levels of risk for breast cancer, while for the less educated sample, IRA reduced their self-reported adherence to screening. Thus, relatively threatening health information has different impacts on behavior depending on the person.

The results of this study suggest that African American and Caucasian women use different information to decide about getting IRA. For the African American women in this sample, having less knowledge about breast cancer at pretest and being less accurate about their risk for breast cancer were the best predictors of electing to have IRA. For Caucasian women, those who were more worried and who were more accurate about their risk for breast cancer were more likely to opt for IRA. Knowledge was not a predictor of IRA for Caucasian women but it was for African American women, while worry was a predictor for Caucasian women and not for African American women. The impact of risk perception in relation to actual risk was opposite for these two subsamples of women. African American women who were less accurate about their risk (i.e. over estimated their risk) were more likely to opt for IRA, while Caucasian women who were more accurate (i.e. closer to their actual risk, but still overestimating) at pre-test were more likely to opt for IRA.

African-American women who elected to have an IRA believed that they were at higher risk and also had less knowledge of the disease before the education session. Allen, Sorenson, Stoddard, Colditz,, and Petersen (1998) found that self-efficacy and strong supportive social influences were both significant in the intention to have a mammogram. This could also be true for the women in this study electing to have an IRA. It could be that social factors played a more important role than self-efficacy for African-American women electing to have an IRA. African-American women who have been exposed to breast cancer within their families or within their social networks may be less informed about the disease but more proactive about screening. African-American women in this study with less knowledge of breast cancer were also more likely to have an IRA because these women understood the importance of screening and risk assessment rather than accurate knowledge of the disease. These women may have

based their decision to have and IRA mainly on their social awareness of the disease rather than their confidence or self-efficacy about the disease.

The African-American women in this study were more educated and had a higher SES than the general population. This may have influenced the decision to have an IRA because higher education is associated with higher screening and preventative practices. Ethnic groups with low income and lower education have less awareness of preventative practices and access to health (Schreiber & Homiak, 1981). However, incomes above \$45,600 and a college degree are associated with a higher likelihood of receiving screening (Katz & Hofer, 1994). So it could also be that over all SES significantly influenced the decision to have an IRA, more so than knowledge of the disease.

In accordance with the Health Belief Model, African-American women in this study who had an increased perception of risk were more likely to elect to have and IRA. The Health Belief Model (HBM) suggests that perceived risk or vulnerability is an important construct in understanding whether or not an individual will engage in protective health behaviors. The model also suggests that preventive health behavior is a function of (a) perceived susceptibility of acquiring the disease; (b) perceived severity of the disease; (c) perceived benefits and barriers of engaging in preventative behaviors; (d) cues to action for preventative behaviors and (e) self-efficacy (Becker & Maiman, 1975; Janz & Becker, 1984). The results of this study would suggest that the actors are involved in the decision to have and IRA. It appears that knowledge of the disease is less predictive of choosing to get more information about individual risk for African American women as was perceived risk. In this instance African American women who were less knowledgeable about breast cancer at pretest, regardless of their change in knowledge after an education session, chose to have an IRA. In essence then, it appears that these women were seeking more information. This information may help them in determining their susceptibility to developing breast cancer which may lead them to adhere to screening recommendations. Using HBM, the results of the IRA may provide a cue to action for women with less knowledge of breast cancer. The IRA provides information, raises awareness and could be used as a reminder for women to get a mammogram. Again, using the HBM, those women who knew the most about breast cancer, may have reasoned that they were less susceptible to the disease if they did not have the known risk factors.

Caucasian women, however, tended to use their level of worry to help them decide whether or not to get an IRA. The women who were more worried yet more accurate about their risk of getting breast cancer were more likely to opt for IRA. Using HBM, thus, Caucasian women who were more accurate about their risk at pretest or overestimated their risk less than their counterparts, and yet still more worried about breast cancer were more likely to opt for IRA. This fits with the HBM model, the women seemed to understand their risk more accurately, and they understood or at least worried about developing the disease and its consequences, thus they elected to get more information about their own risk. It would thus be hoped that they would then use this information as cues to action to perform recommended breast cancer screening.

Vahabi and Gastalbo (2003), suggest that women use various “models” to interpret risk, which may not be what clinicians use. They suggest that in the domain of health care, a realist perspective is used to define risks in disease prevention initiatives such as breast cancer screening. A major precursor in adopting this approach into clinical practice is that human beings are rational and have as a priority maximizing their health. So once women are provided with the knowledge of breast cancer and the benefits of early detection they would opt for screening at recommended intervals. If women are not following these recommended guidelines, we assume they must not have enough knowledge or be able to use the knowledge they have. However, Vahabi and Gastalbo (2003) and others (i.e. Davey et al. 2003), suggest

that women may use other perspectives to define risk and want different sorts of information in order to make decisions. In a qualitative investigation, Vahabi and Gastalbo (2003) found that giving voice to women's understandings of risk showed that there are many perspectives on risk that co-exist and compete. A behavior that is labeled as irrational under the realist framework can be quite rational and intelligible when other perspectives are used. In this way it becomes important to take into account other factors when considering people's health-related decisions. These are not only based on their desire to maximize their health but also on multiple factors such as their socio-cultural context, power relations, and cognitive capacities (Vahabi & Gastalbo, 2003). The results of this study would suggest that knowledge alone does not lead to opting for a personalized risk assessment, and that African American and Caucasian women use different pieces of information, or information differently to make decision about getting more personalized information about risk.

Glanz, Croyle, Chollette, & Pinn (2003) suggest that ethnic minority women may use traditional belief sets which include a strong sense that an individual's health is just one part of the whole of a person's life. In this study African American women who had less knowledge about breast cancer were more likely to opt for IRA, while those with more knowledge at pretest were less likely to opt for IRA. The question is what did these women understand about their own risk given their level of knowledge, did they believe they were at higher risk and weren't willing to find out more? Or did they believe that their risk wasn't really an issue for them, in other words knowing more about their personal risk wouldn't have made a difference in their sense of health? Until we have a better sense of how all women use the knowledge they have and how women understand their risk, we will be unable to provide more effective cancer control programs.

It should be noted that most women in the sample had had at least one mammogram in their life time and most had had a mammogram within the last two years. This leads to a discussion of the limitations of this sample. It was our goal to recruit African American women in equal or larger numbers than Caucasian women for this project given the disparities in mammography use between the two groups. It appears, however, that those who elect to attend a breast cancer education session are also much more likely to adhere to screening recommendations (at least mammography) than the general population. The results from this sample can not be generalized to the larger population. It is interesting to note, however, that even though these women complied with screening recommendations in general, they had varying levels of knowledge, worry and perceived risk about the disease. This again points to there being more to health decision making than perceived susceptibility or risk, and concern about developing the disease.

The two constructs that were tested in this project were Monitoring Attentional Style from Miller, et al.'s (1996) C-SHIP model, and differentiation of self from Bowen's (1978) Family Systems Theory. Neither monitoring attentional style nor differentiation of self were directly predictive of choosing to have an IRA. Monitoring attentional style was unrelated to any of the other variables in the model. Differentiation of self in the form of emotional reactivity was related to change in the perception of risk. To better understand this relationship, a repeated measure ANOVA showed that those in the lowest differentiation group showed the greatest change in their perception of risk in relation to their actual risk becoming more accurate at post-test ($F(2,96)=3.23; p<.05$). Those with higher levels of differentiation did not change their perception of risk as much as the low group. This was the same for both African American and Caucasian women. Thus, differentiation of self is related in some way to how women use information to make estimations of their risk.

The analysis of the follow-up data from this sample will provide a prospective analysis of how differentiation of self, monitoring, individualized risk information, knowledge, worry and

perceived risk play a role in decisions about screening for breast cancer. Although most of the women in this sample had had at least one mammogram, fewer had had a clinical breast exam within the past year, and many were not performing monthly breast self exam. These three screening mechanisms are believed to provide the best avenue for early detection of breast cancer. With information about certain “personality” characteristics, along with factors within the Health Beliefs Model, we hope to be able to better predict the impact of individualized risk assessment on health decision making about breast cancer screening.

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References

- Ajzen, I.; Fishbein, M. Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice Hall; 1980.
- Alexander N, Ross J, Sumner W, Nease R, Littenberg B. The effect of an educational intervention on the perceived risk of breast cancer. *Journal of General Internal Medicine* 1996;11:92–97. [PubMed: 8833016]
- Allen J, Sorenson G, Stoddard A, Colditz G, Petersen K. Intentions to have a mammography in the future among women who have underused mammography in the past. *Health Education & Behaviors* 1998;25(4):474–488.
- Becker M. The health beliefs model and personal health behavior. *Health Education Monographs* 1974;2:324–508.
- Becker MH, Maiman LA. Sociobehavioral determinants of compliance with health and medical care recommendations. *Medical Care* 1975;13:1–24.
- Bollen, K. Structural Equations with Latent Variable. New York: Wiley and Sons; 1989.
- Bowen, M. Family Therapy in Clinical Practice. New York: Jason Aaronson; 1978.
- Bray JH, Williamson DS, Malone PE. Personal authority in the family system: Development of a questionnaire to measure personal authority in intergenerational family processes. *Journal of Marital and Family Therapy* 1984;10:167–178.
- Centers for Disease Control and Prevention. The National Breast and Cervical Cancer Early Detection Program: NBCCEDP screening program summaries. 2006. From <http://www.cdc.gov/cancer/nbccedp/sps/index.htm>
- Davey HM, Lim J, Butow PN, Barratt AL, Houssami L, Higginson R. Consumer information materials for diagnostic breast tests: Women’s views on information and their understanding of test results. *Health Expectations* 2003;6:298–311. [PubMed: 15040792]
- Fang C, Miller S, Daly M, Hurley K. The influence of attentional style and risk perceptions on intentions to undergo prophylactic oophorectomy among first-degree relatives. *Psychology and Health* 2002;17:365–376.
- Gail M, Brinton L, Byar D, Corle D, Green S, Schairer C, Mulvihill J. Projecting individualized probabilities of developing breast cancer for white females who are being examined annually. *Journal of the National Cancer Institute* 1989;81:1879–1886. [PubMed: 2593165]
- Glanz K, Croyle RT, Chollette CY, Pinn VW. Cancer-related health disparities in women. *American Journal of Public Health* 2003;93:292–298. [PubMed: 12554589]
- Greene K, Brinn LS. Messages influencing college women’s tanning bed use: Statistical versus narrative evidence format and a self-assessment to increase perceived susceptibility. *Journal of Health Communication* 2003;8:443–461. [PubMed: 14530147]
- Janz NK, Becker MH. The health belief model: A decade later. *Health Education Quarterly* 1984;11:1–47. [PubMed: 6392204]
- Joreskog, K.; Sorbom, D. LISREL 8.72. Lincolnwood, IL: Scientific Software International; 2005.
- Katz S, Hofer T. Socioeconomic disparities in preventive care persist despite universal coverage. Breast and cervical cancer screening in Ontario and the United States. *JAMA* 1994;272(7):530–534. [PubMed: 8046807]

- Kerr, ME.; Bowen, M. Family Evaluation. New York: Norton and Company; 1988.
- Lerman, C. Psychological aspects of genetic testing for cancer susceptibility. In: Krantz, D., editor. Perspectives in Behavioral Medicine. Hillsdale, NJ: Erlbaum; 1997.
- Lerman C, Schwartz M, Miller S, Daly M, Sands C, Rimer B. A randomized trial of breast cancer risk counseling: Interacting effects of counseling, educational level, and coping style. *Health Psychology* 1996;15:75–83. [PubMed: 8681923]
- Lerman C, Croyle R, Tercyak K, Hamann H. Genetic testing: Psychological aspects and implications. *Journal of Consulting and Clinical Psychology* 2002;70(3):784–797. [PubMed: 12090383]
- McCaul K, Shroeder D, Reid P. Breast cancer worry and screening: Some prospective data. *Health Psychology* 1996;15(6):430–433. [PubMed: 8973922]
- Miller S. Monitoring and blunting: Validation of a questionnaire to assess styles of information seeking under stress. *Journal of Personality and Social Psychology* 1987;52:345–353. [PubMed: 3559895]
- Miller S. Monitoring versus blunting styles of coping with cancer influence the information patients want and need about their disease: Implications for cancer screening and management. *Cancer* 1995;76:167–177. [PubMed: 8625088]
- Miller S, Buzaglo J, Simms S, Green V, Bales C, Mangan C, Sedlacek T. Monitoring styles in women at risk for cervical cancer: Implications for the framing of health-relevant messages. *Annals of Behavioral Medicine* 1999;21:27–34.
- Miller S, Champion V. Attitudes about breast cancer and mammography: Racial, income, and educational differences. *Women and Health* 1997;26:41–63.
- Miller, S.; Fang, C.; Diefenbach, M.; Bales, C. Tailoring psychosocial interventions to the individual's health information-processing style: The influence of monitoring versus blunting in cancer risk and disease. In: Baum, A.; Anderson, BL., editors. Psychosocial interventions for cancer. Washington, D.C.: American Psychological Association; 2001. p. 343-362.
- Miller S, Shoda Y, Hurley K. Applying cognitive-social theory to health-protective behavior: Breast self-examination in cancer screening. *Psychological Bulletin* 1996;119:70–94. [PubMed: 8559860]
- Ogden J. Some problems with social cognition models: A pragmatic and conceptual analysis. *Health Psychology* 2003;22:424–428. [PubMed: 12940399]
- Ondrusek N, Warner E, Goel V. Development of a knowledge scale about breast cancer and heredity (BCHK). *Breast Cancer Research and Treatment* 1999;53:69–75. [PubMed: 10206074]
- Papero, D. Bowen Family Systems Theory. Boston, MA: Allyn and Bacon; 1990.
- Rogers R. A protection motivation theory of fear appeals and attitude change. *Journal of Psychology* 1975;91:93–114.
- Schreiber, J.; Homiak, J. Mexican Americans. In: Harwood, A., editor. Ethnicity and medical care. Cambridge:MA: Harvard University Press; 1981. p. 264-336.
- Schwartz M, Rimer B, Daly M, Sands C, Lerman C. A randomized trial of breast cancer risk counseling: The impact on self-reported mammography use. *American Journal of Public Health* 1999;89:924–926. [PubMed: 10358689]
- Shaw J, Bassi K. Lay attitudes toward genetic testing for susceptibility to inherited diseases. *Journal of Health Psychology* 2001;6(4):405–423.
- Shoda Y, Mischel W, Miller S, Diefenbach M, Daly M, Engstrom P. Psychological interventions and genetic testing: Facilitating informed decisions about BRCA1/2 cancer susceptibility. *Journal of Clinical Psychology in Medical Settings* 1998;5:3–17.
- Skowron E, Schmitt T. Assessing interpersonal fusion: Reliability and validity of a new DSI Fusion with others scale. *Journal of Marital and Family Therapy* 2003;29:209–222. [PubMed: 12728779]
- Vahabi M, Gastalbo D. Rational choice(s)? Rethinking decision-making on breast cancer risk and screening mammography. *Nursing Inquiry* 2003;10:245–256. [PubMed: 14622371]
- Warner E, Goel V, Ondrusek N, Thiel EC, Lickley LA, Chart PL, Meschino WS, et al. Pilot study of an information aid for women with a family history of breast cancer. *Health Expectations* 1999;2:118–128. [PubMed: 11281885]
- Young R, Waller J, Smitherman H. A breast cancer education and on-site screening intervention for unscreened African American women. *Journal of Cancer Education* 2002;17:231–236. [PubMed: 12556062]

Figure 1. Model to predict the election of Individualized Risk Assessment which was compared for African American and Caucasian participants in a breast cancer education in session.

Table 1

Mean differences for the African American and Caucasian participants in the study.

	African American Mean (sd)	Caucasian Mean (sd)	t-value
Age	50.75 (15.35)	45.23 (12.80)	-2.40 *
Age First Live Birth	18.63 (9.19)	15.01 (11.71)	-2.12 *
Income	3.90 (3.06)	5.10 (3.50)	2.22 *
Worry Pre	8.26 (2.28)	7.98 (1.88)	-.80
Worry Post	8.35 (1.54)	7.01 (1.75)	.041
Knowledge Pre	6.13 (1.98)	6.88 (1.85)	2.46 *
Knowledge Post	7.96 (1.83)	7.01 (1.75)	3.35 **
Emotional Reactivity	37.8 (12.87)	38.81 (9.97)	.49
I-Position	33.07 (6.65)	34.90 (5.80)	1.80
Cut-off	37.35 (16.05)	48.53 (13.36)	4.47 ***
Monitoring	2.62 (1.92)	3.19 (1.91)	1.83
Perceived Risk Pre	4.11 (2.87)	4.39 (2.92)	.573
Perceived Risk Post	3.61 (2.61)	4.91 (2.69)	2.99 **
Actual Risk (Gail Model)	1.12 (.42)	1.60 (.63)	4.84 ***
Perceived to Actual Risk pre	2.83 (2.90)	2.37 (2.45)	.88
Perceived to Actual Risk post	2.15 (2.52)	3.06 (2.50)	1.84

*
p<.05;**
p<.01;***
p<.001

Table 2

Chi-Square Difference Tests for each step for invariance in the models between African American and Caucasian participants to predict use of Individual Risk Assessment.

Model	χ^2 (df)	p-value	RMSEA	χ^2 difference (df)
H _{form}	226.25 (186)	.023	.05	--
H _{$\lambda y \lambda x$}	233.85 (192)	.021	.05	7.60 (6)
H _{$\lambda y \lambda xy$}	272.12 (224)	.015	.05	38.27 (32)
H _{$\lambda y \lambda xy$} Post to IRA	277.95 (227)	.012	.051	5.83 (3)
H _{$\lambda y \lambda xy$} Post, Knowledge1, And Worry1	285.15 (229)	.0068	.054	7.20 (2)*
Post and Knowledge1,	283.62 (228)	.0072	.053	5.67 (1)*
Post and Risk1	287.17 (228)	.0048	.055	9.32 (1)**
Post and Monitoring	278.06 (228)	.013	.051	.11 (1)

*
p<.05;

**
p<.01;

p<.001

Table 3

Standardized LISREL Estimates of Paths of the Final Structural Model for the African American and Caucasian Participants.

To IRA	African American Estimate	Caucasian Estimate
Post Knowledge	.03	.03
Worry	-.15	-.15
Risk	-.05	-.05
Pre Knowledge	-.30*	.05
Worry	.11	.36*
Risk	.31*	-.40*
Monitoring	.06	.06
Age	.01	.01
Income	.08	.08
Reactivity	.10	.10
I-Position	.00	.00
Knowledge Pre to Post	.33*	.33*
Worry Pre to Post	.77*	.77*
Risk Pre to Post	.43*	.43*
Monitoring to Knowledge Post	.11	.11
Monitoring to Worry Post	.17	.17
Monitoring to Risk Post	-.09	-.09
Pre Worry to Pre Risk	.29*	.29*
Age to Knowledge Post	.00	.00
Age to Worry Post	.01	.01
Age to Risk Post	.05*	.05*
Income to Knowledge Post	.01	.01
Income to Worry Post	-.04	-.04
Income to Risk Post	-.37*	-.37*
Reactivity to Knowledge Post	.04	.04
Reactivity to Worry Post	.00	.00
Reactivity to Risk Post	.15*	.15*
I-Position to Knowledge Post	-.03	-.03
I-Position to Worry Post	.04	.04
I-Position to Risk Post	-.04	-.04
Percent of Variance Accounted For IRA	17	23
Post Knowledge	18	20
Worry	60	39
Risk	43	29