



Nina Mikhailenko. *Faces of Bali*. Oil on canvas, 24" × 30".

*A multicomponent, culturally based intervention may improve knowledge, reduce perceived barriers, and increase mammography use among low-income African American women.*

## A Culturally Targeted Intervention to Promote Breast Cancer Screening Among Low-Income Women in East Baltimore, Maryland

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*In Maryland, outreach initiatives have been unsuccessful in engaging low-income African American women in mammography screening. This study aimed to identify factors influencing screening rates for low-income African American women. Based on the Health Belief Model, a modified time series design was used to implement a culturally targeted intervention to promote a no-cost mammography-screening program. Data were collected from women 40 years of age and older on their history of mammography use and their knowledge and beliefs about breast cancer. A 50% screening rate was achieved among 119 eligible participants. Significant predictors of screening behaviors were perceived barriers, lack of insurance, and limited knowledge. This culturally targeted intervention resulted in an unprecedented screening rate among low-income African American women in Baltimore, Maryland.*

### Introduction

Despite the knowledge that screening for breast cancer can prevent premature deaths, screening rates among low-income African American women remain low.<sup>1-5</sup>

Although funding for federal and state outreach initiatives has resulted in increased percentages of women participating in breast cancer screening,<sup>1,6-8</sup> African American women continue to have the worst breast cancer indices among all women, including advanced stage at

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*Abbreviations used in this paper:* CHW = community health worker.

diagnosis, higher mortality rates, and lower 5-year survival rates.<sup>2,9</sup> The relatively low screening rates for African American women may contribute to these disturbing statistics.<sup>10-12</sup> However, while lack of access to useful and affordable health care services is a key determinant of breast cancer health disparities, other factors, including cultural differences, racial bias,<sup>13</sup> and biological factors,<sup>14</sup> may play a role.

Programs to reduce barriers to breast cancer screening in African American women have achieved some success.<sup>15-20</sup> However, outreach initiatives directed to women who reside in very poor neighborhoods have shown only modest results.<sup>1,3,21</sup> The 2000 National Health Interview Survey reported a 64% screening rate for women 40 to 49 years of age; however, low-income women, those without health insurance, and those with no usual source of health care had screening rates of 44%, 34% and 28%, respectively. They also were least likely to have had a mammogram within the previous 2 years.<sup>1</sup> Education and income are more powerful predictors of screening behavior than race or ethnicity,<sup>10,14,22</sup> and women 40 years of age and older who are below the poverty level have the lowest rates of mammography screening, regardless of race or ethnicity.<sup>1,10</sup> The persistent failure to increase the rates of mammography use among low-income African American women underscores the urgent need for culturally targeted intervention strategies.

The most effective community-based cancer screening interventions have utilized multiple culturally targeted strategies, such as an outreach component with lay health advisors, community-based education, health care provider assistance, and mass media. These interventions increased screening rates by 13% to 29% compared to baseline. However, some of these interventions were not as effective with African Americans or individuals with less knowledge and more perceived barriers.<sup>17</sup>

The Health Belief Model is a useful framework to predict a woman's intention to obtain mammograms. It postulates that a woman is more likely to be screened for breast cancer if she feels susceptible to breast cancer and if she perceives that the behavior — obtaining a mammogram — is beneficial and the existing barriers are surmountable.<sup>23</sup> Previous studies have shown that perceived barriers and benefits have the highest correlation to behavior change.<sup>24</sup> While perceived susceptibility is associated with increased knowledge of breast cancer,<sup>21</sup> African American women may not consider themselves so susceptible to breast cancer as Caucasian women.<sup>24</sup> We used the Health Belief Model to develop a culturally targeted educational intervention to promote the use of a no-cost mammography screening program in low-income census tracts in East Baltimore, Maryland. A pilot study was conducted to assess the effect of this program on level of knowledge and strength of beliefs regarding breast cancer and mammography use and also to identify predictors of mammography use.

## Methods

### *Recruitment of Study Population*

Between August and November 2003, we recruited a convenience sample of women 40 to 65 years of age who had never had a mammogram or had not had a mammogram within the previous 5 years. Participants were residents of four census tracts in East Baltimore identified as having a median income below the federal poverty line. Trained community health workers (CHWs) went door-to-door to apartments and housing complexes in the targeted census tracts. They obtained written informed consent from all participants, and they provided information about the no-cost mammography-screening program at Johns Hopkins Hospital to those who did not want to participate in the research. The study was approved by the Committee on Human Research at Johns Hopkins Bloomberg School of Public Health.

### *Study Design*

The Health Belief Model guided the development of this targeted intervention. We used three constructs of this model — perceived barriers, benefits, and susceptibility.<sup>23,24</sup> We implemented a modified time series design with a problem-solving approach that incorporated spiritual and cultural components. This design allowed us to observe changes over time in knowledge and beliefs about breast cancer and mammography and also to follow study participants over the course of the intervention.

## Procedures

The modified time series design involved four stages. During the first stage, the recruitment stage, the CHWs, who were trained interviewers, administered a standardized questionnaire to each participant while visiting their home. This baseline questionnaire elicited sociodemographic characteristics, as well as information about knowledge and beliefs regarding mammography and breast health. The CHWs gave each participant two culturally based brochures, and they scheduled a second visit to the participant's home for the following week. The first brochure, developed by the National Cancer Institute, provided basic information about mammograms in a low-literacy and easy-to-read format that included photographs of women of color, including African American women. The brochure addressed five questions about mammograms: What it is? Why you should get one? How often? How it is done? Where to get more information? The second brochure was designed specifically for the study. It featured the battle of a revered local community activist, Councilwoman Bea Gaddy, with breast cancer, and her passionate promotion of breast cancer screening. The brochure encourages women to obtain mammograms in support of her goal of saving lives through early detection.

The brochure also describes the research study and the eligibility criteria. Both brochures were a component of the intervention, and the study participants were instructed to read the brochures before the second visit.

During the second stage, the CHW conducted home visits and re-administered the questionnaire to assess knowledge changes. The questions were reordered to minimize test-retest bias. During this visit, the CHWs also questioned the women regarding their concerns about breast cancer and mammography. The CHWs then invited each participant to an educational session at a local church.

The educational intervention (third stage) included four components that addressed the three constructs of the Health Belief Model — perceptions of susceptibility, benefits, and barriers (Fig 1). A team consisting of a recognized community leader (pastor), a medical provider, and health educators conducted the 2-hour educational session at the pastor's church. The members of the team were African Americans from the community in which the target population resided. We modeled the educational intervention, in part, after the Witness Project,<sup>16,25,26</sup> which utilized breast cancer survivors to provide personal accounts of their experiences. Two of the CHWs who are breast cancer survivors shared their stories and personally demonstrated the outcome of their breast cancer surgery. The medical provider addressed myths and misperceptions regarding mammography, and the spiritual leader focused on encouraging and empowering the women to care for their bodies, referring to the body as a “temple” entrusted to them. The educational session used a problem-solving approach consisting of presentations and discussion, video, and interactive activities to assess breast lumps that can be detected by mammography and by breast self-examination. The video featured Councilwoman Gaddy urging black women not to delay screening

as she had, before losing her battle to breast cancer within 3 years of diagnosis. At the end of the educational intervention, the CHWs again re-administered the questionnaire to assess changes in knowledge and beliefs regarding mammography and breast health. The women also responded to questions about their experience in the program and completed a breast cancer screening form if they were interested in scheduling a mammogram.

The fourth stage of the intervention consisted of an appointment for clinical breast examination and mammogram at the Johns Hopkins Breast Center that was scheduled within 3 months of the educational intervention. The study team obtained permission to track the participants and access the results of their completed mammograms. To assist the participants with this process and to facilitate their adherence to the screening, we provided transportation (taxi service), child care, a patient advocate to assist with scheduling, and a CHW to accompany the participant to her appointment.

## Measures

Sociodemographic measures included age, marital status, ethnicity, education level, annual household income, and insurance coverage. To assess knowledge, we used a 9-item knowledge of breast cancer scale and a 4-item knowledge of mammography scale based on the Susan G. Komen Breast Cancer Foundation guidelines.<sup>27</sup>

To measure beliefs, we used the Champion Health Belief Scale for Measuring Beliefs Related to Breast Cancer.<sup>24</sup> This scale is composed of three sections: perceived-benefits (5 items), barriers (11 items), and susceptibility (3 items) to breast cancer. We scored the items on a 5-point Likert scale ranging from *strongly agree* to *strongly dis-*

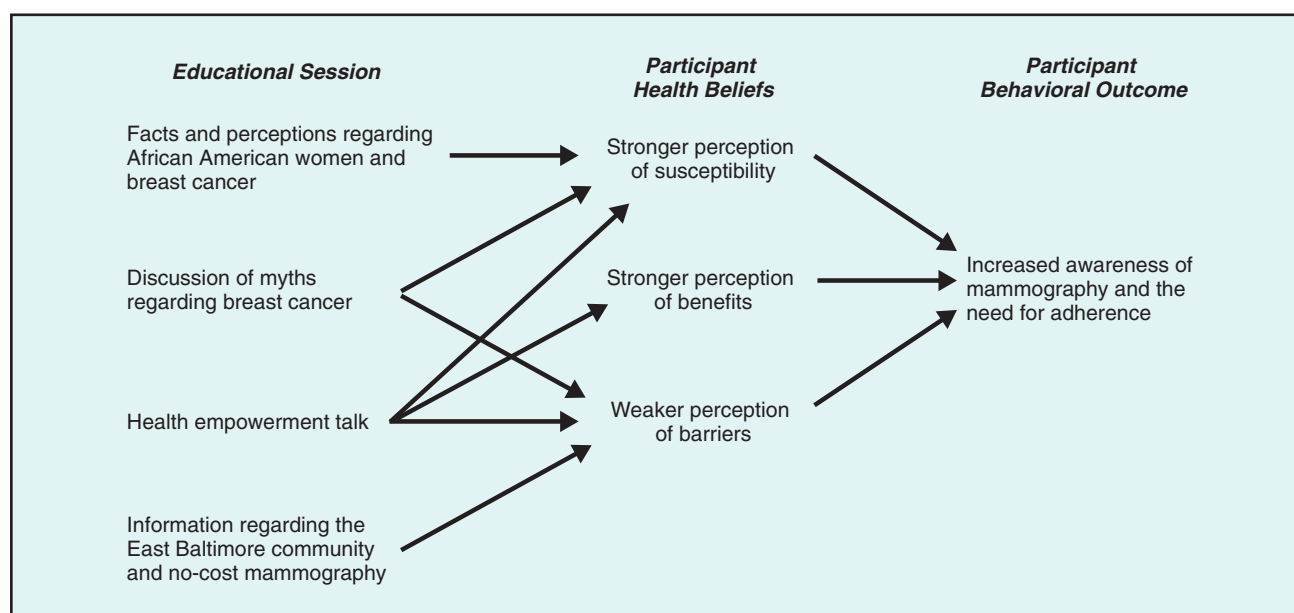


Fig 1. — Conceptual framework of the three constructs of the Health Belief Model: perceptions of susceptibility, benefits, and barriers.

agree. The reliability estimates for the three constructs are perceived susceptibility ( $\alpha = 0.84$ ), benefits ( $\alpha = 0.69$ ), and barriers ( $\alpha = 0.85$ ).<sup>28</sup>

One item assessed mammography use by a *yes* or *no* response. All participants had the option to obtain a no-cost mammogram, including those who did not complete all three stages of the educational intervention.

## Statistical Analysis

To illustrate the change in knowledge of breast cancer and mammography over time, we calculated the percent of correct answers for each participant at each stage. We performed repeated measurement analysis of variance (ANOVA) to compare the mean percentages at each stage, and we used Fisher's least significant difference (LSD) test for pairwise comparison to specify the differences among the stages when the overall F-test was significant. We conducted a similar analysis for beliefs concerning breast cancer and mammography.

First, we conducted bivariate analysis to identify factors (ANOVA for continuous variables, and Fisher's Exact Test for categorical variables) associated with the completion of a mammogram using  $\alpha = .10$  as the significance level in order to identify all the possible factors. Then, we

included possible predictors for completion of a mammogram in a multiple logistic regression model. We analyzed the data using SAS version 9.1.

## Results

### Sociodemographic Characteristics

Table 1 summarizes the sociodemographic characteristics of the participants. We recruited 127 women for the study, including 118 (93%) who had never had a mammogram. The majority of participants ( $n = 119$ ) completed all three stages of the study protocol. Eight women did not complete the program (1 died, and 7 had incomplete data); however, they were similar to the other 119 in marital status, education level, and insurance status ( $P = .079, .61,$  and  $.10$ , respectively). Nearly all participants (99%) were African American, with an average age of 48 (SD 6.8 years). Over three quarters (77%) had a household income below \$6,000 and/or were high school or GED graduates (76%). More than half (58%) of the participants had no health insurance. Table 1 also compares demographic data for screened vs not-screened participants. These groups were similar in sociodemographic characteristics ( $P = .75, .89,$  and  $.37$  for marital status, education, and income, respectively) except insurance ( $P = .043$ , Fisher's Exact Test).

Table 1. — Sociodemographic Characteristics by Breast Cancer Screening Status (N = 127)

Variable	Demographic Characteristics n (%)	Breast Cancer Screening		P Value
		No	Yes	
		n = 67 n (% <sup>a</sup> , % <sup>b</sup> )	n = 60 n (% <sup>a</sup> , % <sup>b</sup> )	
Marital status*				
Married	8 (6)	5 (7, 63)	3 (5, 37)	0.75
Widowed	12 (10)	5 (8, 42)	7 (12, 58)	
Divorce/separated	13 (10)	6 (9, 46)	7 (12, 54)	
Never married	93 (74)	51 (76, 55)	42 (71, 45)	
Education*				
Less than high school	18 (14)	10 (15, 56)	8 (13, 44)	0.89
High School/GED	96 (76)	51 (77, 53)	45 (75, 47)	
Some college	7 (6)	3 (5, 43)	4 (7, 57)	
College	5 (4)	2 (3, 40)	3 (5, 60)	
Income**				
<\$6,000	96 (77)	51 (79, 53)	45 (75, 47)	0.37
\$6,000–\$8,000	11 (9)	5 (8, 45)	6 (10, 55)	
\$8,000–\$10,000	7 (5)	2 (3, 29)	5 (8, 71)	
\$10,000–\$17,000	5 (4)	2 (3, 40)	3 (5, 60)	
>\$17,000	6 (5)	5 (7, 83)	1 (2, 17)	
Insurance				
Private	11 (9)	10 (15, 91)	1 (2, 9)	0.043
Medicaid	36 (28)	18 (27, 50)	18 (30, 50)	
Medicare	6 (5)	2 (3, 33)	4 (6, 67)	
None	74 (58)	37 (55, 50)	37 (62, 50)	

\* 1 missing value (n = 126)  
\*\* 2 missing values (n = 125)  
<sup>a</sup> = column percentage  
<sup>b</sup> = row percentage

Further analysis showed that the unscreened group was more likely to have private insurance ( $P = .0097$ , Fisher's Exact Test).

### Effect of the Educational Intervention on Level of Knowledge

Fig 2 shows the effect of the intervention by stage on the level of knowledge of breast cancer and mammography. Knowledge of breast cancer and mammography increased significantly between stages 2 and 3, as measured by the mean percentage of correct answers ( $P < .0001$ ); however, the difference between stages 1 and 2 was not statistically significant. Using the Pearson correlation coefficient for stages 1 through 3, we found that each domain of knowledge was highly correlated with the total scale, with knowledge of breast cancer ( $r > 0.90$ ), and with knowledge of mammogram ( $r > 0.60$ ). Knowledge of breast cancer was moderately correlated with knowledge of mammogram ( $0.26 < r < 0.40$ ).

### Effect of Educational Intervention on Strength of Beliefs

Table 2 shows the effect of the intervention on the strength of beliefs. The mean score for beliefs about perceived barriers to having a mammogram was reduced from 2.24 to 2.06 (overall F-test  $P < .0001$ ), indicating a reduction in perceived barriers over time. The pairwise comparison showed no difference between stage 1 and stage 2 ( $P = .41$ ) but a lower score for stage 3 than for stage 1 ( $P = .0006$ ) and stage 2 ( $P < .0001$ ). Beliefs about perceived susceptibility ( $P = .79$ ) and perceived benefits of breast cancer and mammography did not change ( $P =$

**Table 2. — Effect of the Intervention on Strength of Beliefs: Repeated Measures ANOVA (N = 119)\***

Questions	P Value	Means			Pairwise Comparison
		Stage 1	Stage 2	Stage 3	
Perceived susceptibility	0.79	2.88	2.86	2.91	
Perceived benefits	0.32	3.58	3.62	3.68	
Perceived barriers	0.00	2.24	2.28	2.06	Stage 1>Stage 3 ( $P = .0006$ )  Stage 2>Stage 3 ( $P < .0001$ )

\* 5-point Likert scale ranging from strongly agree = 5 to strongly disagree = 1

.32). In our sample, the Cronbach's alpha for internal consistency ranged from 0.61 to 0.87.

### Tracking and Follow-Up

Following the initial telephone contact to schedule the mammogram, 13 women had moved and 10 women had disconnected their telephones. Although repeated attempts were made to contact these women via registered letters and contacting family members and/or friends, we were unable to reach them. Six of the remaining women ( $n = 37$ ) moved and/or had their telephones disconnected during the course of the study. Thus, 29 women (24% of the study sample) were lost to follow-up. A total of 31 women were labeled as "no shows" because three or more scheduled appointments were missed.

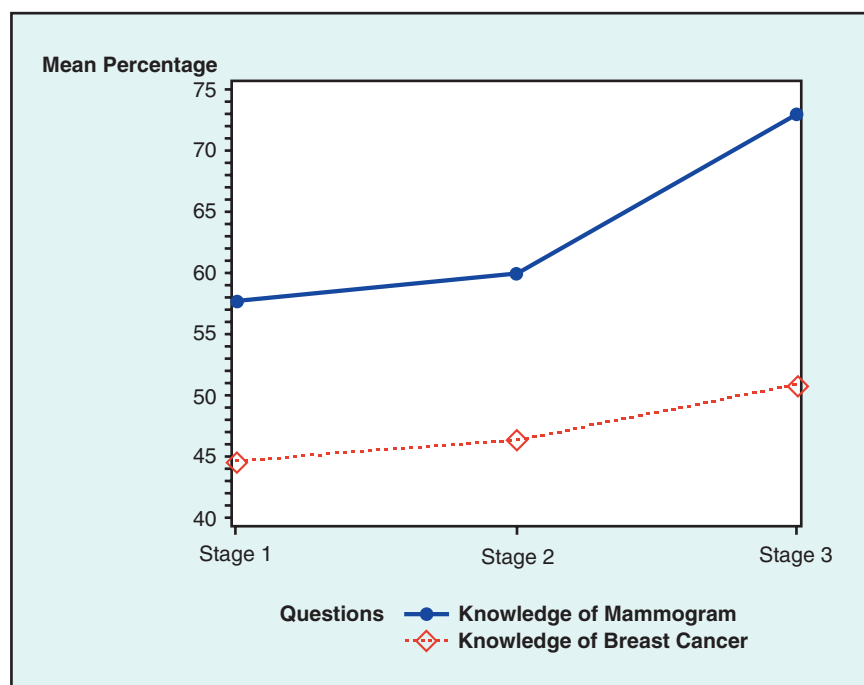


Fig 2. — Effect of the intervention on knowledge scores for breast cancer and mammography according to stage.

### Predictors of Completion of No-Cost Breast Cancer Screening

Of the 119 participants who attended stages 1 through 3 of the program, 118 (99%) had never had a mammogram. Fifty-nine women, 49.6% of those who attended all stages of the intervention, completed no-cost breast cancer screening. We excluded from further analysis one participant who did not complete all three stages but received breast cancer screening. Participants who completed mammograms were more knowledgeable of breast cancer and mammography ( $P = .047$ ) than those who did not. A greater proportion disagreed with the statement "mammogram is too painful" ( $P = .035$ ) compared with participants who did not have a mammogram. More than half (53.2%) of the participants who did not have private insurance com-

pleted the no-cost screening compared with only 10% of the participants who had private insurance ( $P = .0089$ ).

We built a logistic regression model based on the above analyses, with completion of mammogram as the dependent variable and level of knowledge, attitude towards pain of a mammogram, and private insurance as the independent variables. While controlling for other factors in the model (knowledge of breast cancer and mammography, “mammogram is too painful”), the only statistically significant predictor was whether or not a woman had private insurance (odds ratio = 0.12, comparing those with private insurance vs those without;  $P = .0486$ ; 95% confidence interval 0.014–0.987).

## Discussion

### Breast Cancer Screening

We achieved a 50% screening rate with a very low-income African American study population by providing a culturally targeted intervention with a spiritual component and by removing three specific barriers to screening (lack of patient advocate, child care, and transportation). This screening rate is lower than both the current screening rate in the State of Maryland and the rates reported by previous studies.<sup>1,6,29</sup> Also, it remains well below the Healthy People 2010 objectives for mammography (70% within the last 2 years).<sup>2</sup> Although the women were highly motivated at the time of the educational sessions and all agreed to follow-up with breast cancer screening, only half of them completed screening. The women’s level of motivation was assessed by their completion of the breast cancer screening form for a mammogram at the end of the educational session. While there were many verbal comments of satisfaction, gratitude, and motivation to get screened, plus additional written feedback received on the questionnaires, the motivation to get screened may have dissipated for some women after returning to the realities of their home life situations.

Consistent with previous reports, the study participants’ reasons for not following through with screening included fear of pain, a preference to not know the outcome, and forgetfulness.<sup>21,22,29,31</sup> In addition, the study participants presented with many unmet needs that they considered more important than routine screening, suggesting the need to look beyond commonly recognized barriers. This provides further insight into a complex issue that confronts women who live in extreme poverty. The stressors of daily living create competing priorities that make it difficult for them to think beyond their current circumstances<sup>31,32</sup> and leave little room for self-care.<sup>21</sup> Women’s concern for everyone else, including children, partners, and family members, often takes precedence over their own well-being. A breast cancer study conducted in Baltimore reported that over one third of the women were not very concerned or not at all concerned about their health.<sup>21</sup>

This suggests that while women value their health, their priorities may lie in their immediate circumstances. Competing priorities may make it difficult for extremely poor women to think about committing to preventive action when a benefit is to be reaped years into the future.

Overall, the women were willing to get screened immediately after the educational session. The spiritual leader’s comments about taking care of the body encouraged and empowered them to want to seek immediate care. However, for some women, this urgency was short-lived after they returned to their home environment. This raises the question whether the availability of breast cancer screening immediately after an educational session would be effective in minimizing interference stemming from competing priorities.

Only one of 10 women with private insurance followed through with no-cost breast cancer screening. This may be due in part to their preference for obtaining mammograms without taking advantage of a program targeting uninsured women. Insurance status was not an eligibility criterion; we were more concerned about finding women who had never had a mammogram. We did not collect information about whether the need for co-payment constituted a barrier for those with insurance. It is possible that some of these participants obtained mammograms but did not report the mammograms to the study team. Moreover, it is possible that in the study population, the failure to obtain mammography screening for at least 5 years, even when insured, indicates unresolved fears about screening, or resistance to screening. Further investigation is needed on the reasons why some low-income women may fail to utilize these preventive services, even while insured.

### Beliefs of Breast Cancer and Mammography

Although the health beliefs model is a useful theory for understanding and explaining belief variables that influence breast cancer screening, it did not prove useful in our study. We had expected that perceived benefits, perceived barriers, and perceived susceptibility would be important predictors of participation in breast cancer screening. However, our results showed only perceived barriers changed significantly over time. In addition, after controlling for other variables, it was no longer a statistically significant predictor. These findings are consistent with those reported by McDonald and colleagues,<sup>32</sup> who demonstrated in 1999 that these constructs were not predictive of screening behavior. Although perceived susceptibility is closely related to knowledge of breast cancer, it also did not change over time, confirming the results of Bastini and coworkers in 1994.<sup>29</sup> This suggests that there may be other salient factors operating to influence perceived benefits, barriers, and susceptibility that may not be detected by the health beliefs model.

A possible explanation is that it is more difficult to change beliefs than knowledge, and consistent messaging

over a longer time period may be necessary to process information in a way that influences behavior change. The items measuring the three constructs may not effectively address health beliefs for women with incomes below \$6,000 because of deep-seated fears of mammography, residual myths about breast cancer, remoteness of potential benefits, etc. In contrast to this study, earlier studies had assigned poverty status to households based on income levels between \$15,000 and \$20,000.<sup>33</sup> Over 70% of our sample reported incomes below \$6,000. The question remains whether and how varying degrees of poverty may affect adherence to breast cancer screening. Women who live in extreme poverty may behave differently than those who live in less extreme poverty. They may not subscribe to a model whose outcome aims to increase adherence to preventive behaviors.

### **Knowledge of Breast Cancer and Mammography**

We also found that our customized educational intervention had a positive effect on level of knowledge regarding breast cancer and mammography use. Compared with participants who did not complete mammograms, those who did were more knowledgeable about breast cancer and mammography. This finding is consistent with previous observations that knowledge of both breast cancer and mammography increases over time.<sup>21,29,32</sup>

### **Limitations**

Our study has some limitations. Our sample size was small, and because we used a convenience sampling strategy to recruit participants into the study, our results cannot be generalized to the wider population of women living in extreme poverty. In addition, we were not able to collect information on nonparticipants. However, our study population was comparable to those of other studies of low-income women residing in East Baltimore in regard to age, race, income, and insurance status.<sup>21,31</sup> Because our study design used multiple testing of the participants, which has the potential to introduce test-retest bias, the questions were reordered to minimize the potential for such bias. Although the study design did not include a comparison group, the participants served as their own comparison group by being assessed three times over the course of the intervention. The sequential, nonrandom design of the stages of the intervention raises the possibility that carryover effects contributed to the scores ascertained following the educational interventions in stages 2 and 3. However, as the participant progressed from stage to stage, the interventions were increasingly more powerful, and it is unlikely that carryover effects could explain the changes in knowledge and perceived barriers, as ascertained at the end of stages 2 and 3. Moreover, in the absence of an extended follow-up time period to assess knowledge and beliefs, the sustainability of intervention effects is uncertain. However, this question was beyond the scope of this pilot study.

Although we achieved a 50% screening rate in the study population, it does not establish effectiveness of the intervention in the absence of a control group. The lack of a control group leaves open the possibility that regression to the mean contributed to the observed screening rate; however, it is unlikely to completely account for this result, as only 7% of the study participants had ever had a mammogram before participation in the study. Finally, we did not determine stage of readiness to accept screening; for that reason, there is uncertainty regarding the proportion of the study population who would have been screened regardless of the intervention.

## **Conclusions**

We have successfully recruited and retained the majority of study participants in this culturally targeted intervention, and we achieved a 50% screening rate. While lower rates have been reported in other studies,<sup>1,6</sup> this screening rate suggests that the intervention may be effective among low-income African American women. Considering the modest results of interventions directed to women who reside in very poor neighborhoods, the efficacy of this intervention should be determined. More research is needed to characterize the barriers to adherence, including daily stressors, to breast cancer screening among low-income African American women, especially those from very poor neighborhoods. The knowledge gained from such research would improve understanding of how different levels of poverty may affect adherence to breast cancer screening. The factors that motivate women of low socioeconomic status to engage in preventive behaviors need to be explored in depth. Because many women were motivated but failed to be screened, interventions that facilitate screening services immediately following an educational intervention should be evaluated in this study population.

We have shown that a multicomponent, culturally based intervention can improve knowledge, reduce perceived barriers, and increase mammography use among African American women from a very low-income group. Future investigations are needed to evaluate the relative effectiveness of different components of the intervention and to assess the cost-effectiveness of the minimal intervention needed to improve adherence to mammography screening in this population. Such studies should also estimate the effect of the interventions on follow-up screening mammography and, if feasible, the duration of the effect.

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