Attitudes, Age, And Participation In Mammographic Screening: A Prospective Analysis

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Abstract: ***Background:*** **To address the needs of older women, we investigated age-specific attitudes toward mammography that might be influenced by written or verbal communications.**

Methods: **Attitudinal scores for women aged 40 through 64 years and 65 years and older were calculated prospectively from responses to a mailed questionnaire based on the theory of reasoned action. Age-group mean scores were compared using t-tests for eight components of the attitude measure. Score correlations with participation were compared between age groups using multivariate analysis.**

Results: **Of the 919 eligible women, 666 (72 percent) completed the study questionnaire, and 433 (65 percent) of the 666 women obtained mammograms. A woman aged 65 years or older was less likely to believe that mammography could find a cancer that she ($P < 0.01$) or her physician ($P < 0.05$) could not find, and she valued this characteristic less than a younger woman in each instance ($P < 0.01$). The belief that mammography involved asymptomatic detection was more highly correlated with participation in older women ($P < 0.05$), as was the attitude that mammography was unfamiliar, but acceptable ($P < 0.05$).**

Conclusions: **Older women are less likely to understand that mammography can find cancers that might be missed by other screening methods. Communications to encourage mammography among older women should explain its strengths and familiarize them with the procedure. Communications to younger women need to consider other factors. (J Am Board Fam Pract 1993; 6:13-23.)**

The problem in breast cancer screening is no longer whether mammography is effective, but how to encourage its use.[1-4] There is a clear consensus that screening mammography in women older than 50 years will reduce breast cancer mortality, and a national goal has been established that 80 percent of women should be screened at least once by the year 2000.[4-6] Recent national estimates show that less than 35 percent of women have had more than one mammogram and that women aged 65 years and older appear least likely to have had any.[4,7] Women who are candidates for mammography and physicians who have the opportunity to make referrals both contribute to the low compliance with national recommendations for its regular use.[1,4,8,9]

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Previous studies to evaluate factors associated with adherence to recommendations have defined demographic, behavioral, and attitudinal differences between women who obtained a mammogram (participants) and those who did not (nonparticipants).[3,4,10-25] Women who participate are more likely to be (1) from a higher sociodemographic level, (2) younger, and (3) married, though older women will participate when given an invitation from their health care organization.[11,15,16,18,20-22,25] Women who participate in mammography also are more likely to use other preventive measures, such as cervical cancer screening, dental checkups, and seat belts.[15,19,20]

Attitudinal associations have been more ambiguous but offer the best hope for developing educational interventions. Heightened fear of cancer being found has been reported among both participants and nonparticipants in screening.[17,19] Other attitudes, such as "faith in screening," "perceived vulnerability" to cancer, and "increased concern about cancer" have been found among participants.[14,15,17,19,22] Age-specific differences have not been evaluated for these measures.

These studies have been instrumental in characterizing the participant and nonparticipant in

mammography screening but have been primarily retrospective and without a clear link between a recommendation and the observed behavior. The prospective study presented here focuses on factors associated with women's participation subsequent to a mailed recommendation to schedule a mammogram. Prospective studies that link the recommendation and behavior offer a chance to learn what affects women. Retrospective cross-sectional studies among participants and nonparticipants in a population reflect not only the woman's behavior but also her physician's.[3,4,16] Two prospective studies exist, but they may not be generalizable to screening mammography in the United States. One study included symptomatic women referred from a physician's office, and the other was performed in the United Kingdom.[12,20] These studies had participation rates of 60 percent and 69 percent, respectively. Other studies that used direct mail invitations had participation rates between 27 percent and 84 percent, but they did not measure attitudes in a detailed manner.[26-28]

The study presented here, therefore, uses a prospective design with a clear invitation to screening as a starting point. The study also uses the theory of reasoned action as the conceptual basis for the questionnaire that gathered attitudinal measures soon after the invitation was given.[29] The theory of reasoned action assumes that individuals make rational choices based on available information when deciding whether to engage in a behavior.[29,30] According to the theory, persons' actions can be predicted in a mathematical model using measures of both their attitude (attitude) about a behavior and their perception of what persons around them think they should do (subjective norm). The theory has been expanded to include (1) consideration of factors that facilitate behavior once a decision is made; (2) a measure of habit, which reflects the past tendency of an individual; and (3) a measure of the emotion surrounding the behavior (affect).[31] The theory has successfully predicted influenza vaccination and cancer screening.[32-34]

The attitude measure used in the theory of reasoned action provides a basis for educational messages, because it evaluates women's beliefs. The theory posits that these beliefs, rather than demographic characteristics, are the immediate predictors of behavior. We tested this hypothesis in a separate analysis of mammography use.[35] As predicted by the theory, factors such as income and marital status either did not contribute to explaining behavior or did so in a clinically insignificant way once the main components were placed in the mathematical model.[35]

The analysis reported here provides a detailed evaluation of the components of the attitude measure (i.e., beliefs and values). Knowing what women think about mammograms, how those thoughts correlate with their behavior, and how they differ by age categories offers an opportunity to develop appropriate educational messages. Unlike demographic characteristics, attitudes can be influenced by direct communications from physicians and by community-wide campaigns. Whether these attitudes differ between women aged 65 years and older and younger women is of particular interest. Because Medicare coverage of mammography has reduced the economic barrier to women older than 65 years of age, it is important to determine whether messages to these women should differ from those to younger women. The purpose of this research was to find the key beliefs that might lead to successful promotional efforts to all women eligible for mammography.

Methods

The Setting

The study occurred in the context of an ongoing risk-based breast cancer screening program in a 400,000-member closed-panel health maintenance organization (Group Health Cooperative of Puget Sound, GHC).[36,37] Eighty-five percent of women aged 40 years and older completed a two-page questionnaire that elicited information concerning breast cancer risk factors and screening history.[37] Within 2 months, each questionnaire respondent was sent a single letter that indicated her risk category and a recommendation to (1) perform monthly breast self-examination, (2) obtain a breast physical examination annually, and (3) be seen in the Breast Cancer Screening Center at an interval determined by her risk level.[36,38] At the time of this study the risk categories (high, moderate, borderline, no increased risk) accounted for 16 percent, 28 percent, 12 percent, and 44 percent of the population, respectively. Women in the upper three categories were invited into the screening centers every 1, 3, and 5 years, but the system has subsequently changed.[38]

Questionnaire

The study questionnaire measured basic demographic characteristics and items relevant to the five components of the theory of reasoned action (attitude, subjective norm, facilitating conditions, habit, and affect). Open-ended interviews with a sample of individuals from the target population revealed characteristics (outcomes) and influential individuals (referents) to include in the measurement of attitude and subjective norm.[35] The analysis presented in this paper focuses on the details of the attitude and subjective norm measures, which are described in more detail below. A full description of the questionnaire development and theory testing has been presented elsewhere.[35]

Attitude (Aact)

The attitude measure is the sum of the products of a numeric rating of beliefs (b_i) and values (v_i) regarding each of several potential characteristics (outcomes, i = 1 to n) of the behavior (Aact = $\Sigma b_i \cdot v_i$).[35] Eight characteristics of mammography singled out during open-ended interviews were included in the final attitude measure. The characteristics included the ability of mammography to lead to early detection, find cancers the woman or her physician could not find, or result in unnecessary radiation and discomfort (Appendix). Endpoints on the belief scale are labeled "strongly agree" and "strongly disagree." Endpoints on the value scale are labeled "extremely good" and "extremely bad" or "extremely acceptable" and "extremely unacceptable" (Appendix). Scores on the belief items could range from 1 to 7. Value item scores could range from -3 to +3. Product scores ($b_i \cdot v_i$) could range from -21 to +21. Internal consistency analysis showed that the product scores ($b_i \cdot v_i$) of the set of questions resulted in a Cronbach's alpha of 0.79 for the eight items included in the attitude score computation.[35]

Subjective Norm (SN)

Subjective norm is measured by summing the products of two separate seven-point bipolar measurements as well (Appendix). One measurement rates whether the respondent feels someone (referent, j = 1 to n) would want them to perform the behavior (normative belief, NB_j), and the other measures whether the person is motivated to comply (MC_j) with the referent's opinion ($SN = \Sigma NB_j \cdot MC_j$). Regular physician, husband, women friends, daughter(s), sister(s), regular nurse, prominent women, and Group Health Cooperative were all included as potential sources of influence. A score was computed for each referent by multiplying each normative belief by its respective motivation to comply. Scores for normative belief (NB_j) and motivation to comply (MC_j) could range from 1 to 7. Product scores ($NB_j \cdot MC_j$) could range from 1 to 49.

Other Measures

Measures of additional theory of reasoned action model components, including facilitating conditions, past mammography behavior (habit), and affect, were also included in the questionnaire, and prediction of behavior used this expanded model.[35] The questionnaire also included items addressing basic demographic characteristics, such as race, marital status, education, religion, income, and other such health-related behaviors as physical activity, seat belt use, number of visits to a health care provider in the past year, and number of Papanicolaou smears in the past 4 years.

Sample and Data Collection

During July, August, and September 1986, a sample of 946 women, aged 40 years and older, was selected during the course of inviting women for their initial visit to the screening centers. Women were eligible for a visit if they had not had a screening mammogram within their recommended interval. The sample was stratified by risk category to allow risk-level-specific analyses. The demographic characteristics of GHC women in this region are comparable with those of Washington State, though women in the highest and lowest income levels are somewhat underrepresented. Demographic characteristics of the sample were compared with a random sample of women surveyed in an independent study in 1984.[39]

The study questionnaire was sent to each of the 946 women within 2 weeks of the date they were mailed their letter of invitation. After 2 weeks, nonrespondents to the study questionnaire were contacted by telephone and offered another opportunity to complete the questionnaire.

Women receiving a mammogram within 6 months of the mailed recommendation to schedule an appointment in the screening center were

defined as participants. All data from the original risk factor survey, plus the women's participation in the program, were collected on an automated database that was merged with questionnaire data for the analyses presented here.

Analysis

In this analysis we wanted to find beliefs that could be influenced by community-wide educational campaigns or direct communication at the time of a recommendation to seek mammography. The overall model developed in an earlier analysis is shown in Table 1 and was the starting point for this analysis.[35] Facilitating conditions, attitude, and affect all contributed significantly ($P < 0.01$ for beta weights) to explaining the variance in participation. The final model in the earlier analysis did not include the subjective norm component of the theoretical framework, suggesting that the other components of the model were the determinants of screening behavior once the recommendation was made.[35] Adding age as a dummy variable improved the model in a statistically significant way, but the difference in the variance explained was minimal.

The analysis proceeded in three stages. First, because of the growing interest in the mammography behavior of Medicare-eligible women, the model's explanatory power was tested in women aged more than 65 years and the findings were compared with those of younger women. Next, the model components were examined for their correlation with behavior, and a test for an interaction between age and the main effect of the component was performed. Finally, the analysis focused on the attitude measure after briefly exam ining who might be the important people to reinforce the recommendation to seek mammography.

To test whether the influence of each model component differed by age, hierarchical multiple regression was used to test for an interaction. Each model component was first multiplied by age to compute an interaction term. The analysis then proceeded by regressing participation on the model component and age in the first step and by entering the interaction term on the second step.

To examine the items making up attitude, mean product scores ($b_i \cdot v_i$) for each of the eight components of the measure were compared between participants and nonparticipants using t-tests. Similarly, the mean product scores for individual referents ($NB_j \cdot MC_j$) were compared between participants and nonparticipants. Mean scores for beliefs (b_i), values (v_i), and their product scores ($b_i \cdot v_i$) were then calculated for the eight individual items in the attitude measure for two age categories: women aged 40 through 64 years and women aged 65 years and older. These scores were compared across age categories using t-tests.

Simple correlations between these scores and participation were next tested. To examine whether the association between item scores and participation were significantly different between women aged 40 through 64 years and women aged 65 years and older, regression analyses were done to examine interactions of age with beliefs, values, and the attitude item product score ($b_i \cdot v_i$) after controlling for risk strata. Dummy variables were computed for each risk strata and for age dichotomized into the two age categories noted above. Interaction terms were then computed by multiplying this dichotomous age variable by each belief, value, and product score ($b_i \cdot v_i$). The regressions then proceeded by entering the main effects of risk and age for the item in the first step and testing the effect of the interaction on the second step. A separate test for interaction with age was done for the belief, the value, and the product score of each of the eight items in the attitude measure. Finally, the eight product scores were used in a discriminant analysis to test the correct classification rate, sensitivity, and specificity of a model based on the attitude items alone.

Table 1. Theory of Reasoned Action Model Prediction of Participation by Age.

Age	No.	Percent Participation	Regression Model	R^2
40–64 years	464	64	$p^* = 0.24F† + 0.13Aact‡ + 0.15AF§ - 0.08H‖$	0.16
65+ years	189	65	$p = 0.36F + 0.20Aact + 0.15AF + 0.13H$	0.32
Overall	653	65	$p = 0.28F + 0.15Aact + 0.15AF - 0.05H$	0.20

*p = participation. †F = facilitating conditions. ‡Aact = attitude. §AF = affect. ‖H = habit.

Results

Of the 946 women in the original study sample, 938 remained after excluding 8 women because of mistaken identities or incorrect addresses. Participation information could not be obtained for 2 women who did not complete the study questionnaire, leaving 936 women for whom follow-up was complete. We excluded an additional 17 women who obtained mammograms before receiving the study invitation to a screening center, leaving 919 women eligible for mammograms.

Of the 919 eligible women 481 (52 percent) obtained a mammogram by 6 months from the invitation (participants), and 666 (72 percent) returned the study questionnaire, which contained information for this analysis. Respondents to the study questionnaire were much more likely to participate than nonrespondents (65 percent versus 20 percent). Among these respondents, 13 women did not complete all relevant questionnaire items, leaving 653 women for the analysis presented here.

Table 1 presents the expanded theory of reasoned action model prediction of participation for women in the two age categories. The model prediction of participation was best in the subsample of women aged 65 years and older, as shown by the multiple correlation coefficients. Participation was nearly identical (64 percent) in each age category.

Correlations between each of the major model components and participation were statistically significant ($P < 0.01$) for facilitating conditions, attitude, and affect, but not for habit. For these three components the correlations were higher in women aged 65 years and older (0.42 to 0.49 compared with 0.28 to 0.32 for the younger participants), raising the possibility of an interaction between the components and age in the prediction of participation. Subsequent regression analysis, however, showed that only the interaction between attitude and age approached statistical significance ($P < 0.09$).

Table 2 compares some chosen characteristics of women in the study sample with those from a random sample of GHC women. Because of the characteristics of the risk algorithm used at the time of the study, older women were underrepresented relative to the total population. The study subjects also came from a more affluent region of the Cooperative. The women in the sample are therefore somewhat younger, better educated, and in households with higher incomes than the general GHC population.

Table 3 presents the mean attitude item scores ($b_i \cdot v_i$) for women who obtained mammograms compared with women who did not. There were statistically significant differences in the mean scores for all eight items, suggesting that attitudes were different between women who became participants and those who did not. Higher scores indicate a stronger belief that mammography will lead to the outcome described and a stronger value for that outcome. The highest mean score was found for detecting cancer in an early stage. The lowest mean score was found for exposure to radiation, suggesting that few women believed the radiation was excessive or unacceptable.

Table 2. Characteristics of Study Women and a Random Sample of Group Health Cooperative (GHC) Women.

	GHC*	Questionnaire Sample
Mean age (years)	65.3	57.14
Range	40-95	37-87
Marital status (%)		
Never married	2.9	4.2
Married	57.9	63.7
Divorced/separated	9.6	13.4
Widowed	29.6	15.8
Race (%)		
White	95.1	94.8
African American, Native American, Other	4.9	5.2
Education (%)		
< High-school graduate	24.3	10.4
High-school graduate	28.8	24.4
< College graduate	28.0	27.9
College graduate	8.6	14.6
Graduate school	10.2	22.7
Household income (%)		
< $15,000	42.8	23.9
≥ $15,000–< $25,000	24.2	24.1
≥ $25,000–< $35,000	14.2	18.6
≥ $35,000–< $50,000	11.2	17.0
≥ $50,000	7.7	14.5
Health-related characteristics (%)		
Health status		
Excellent	30.1	33.5
Good	51.7	49.8
Fair	15.3	15.5
Poor	2.9	1.2
Cigarette smoker		
Current smoker	15.6	15.7
Ex-smoker	22.8	36.6
Never smoked	61.6	47.6

*Based on data collected by Pearson, et al.[39]

Table 3. Mean Product Scores (Belief × Value) for Eight Components of the Attitude Measure among Participants and Nonparticipants.

Attitude Component	Women Obtaining Mammogram	Women Not Obtaining Mammogram	t-Test
1. Tests for breast cancer when no symptoms exist	14.33	8.96	7.61*
2. Detects breast cancer I cannot find myself	18.61	14.54	6.18*
3. Is inconvenient	5.86	3.55	3.50*
4. Is unfamiliar	7.27	4.81	3.65*
5. Detects breast cancer my doctor cannot find	18.04	14.25	5.67*
6. Exposes me to excessive radiation	2.69	0.15	4.44*
7. Involves physical discomfort	6.0	3.48	4.59*
8. Detects breast cancer in early stage	18.96	16.63	4.47*

*Difference in scores is significant $P < 0.01$.

The means of the subjective norm scores were also different between participants and nonparticipants ($P < 0.01$) across all eight referents. The mean scores among participants were highest for Group Health (42) and regular doctors (40) but lowest for women friends (31) and prominent women (30). The relative scores were the same for nonparticipants, though the absolute scores were lower (Group Health [37], regular doctors [36], women friends [27], and prominent women [24]).

Table 4 shows the differences by age categories in mean scores for the belief, value, and their product scores ($b_i \cdot v_i$) for each item in the attitude measure. In general, younger women had stronger beliefs that mammography had the stated attributes with two notable exceptions. The mean score for whether mammography was unfamiliar was identical in each age group. The mean score for whether mammography involved excessive radiation was higher among women aged 65 years and older ($P < 0.05$). The mean scores were significantly higher among younger women for the beliefs that mammography could find cancer the woman ($P < 0.01$) or her physician ($P < 0.05$) could not find and that mammography involved looking for cancer when the woman did not have symptoms ($P < 0.05$). Mean value scores were significantly higher ($P < 0.01$) among younger women for these items, suggesting that younger women placed higher value on examinations in the absence of symptoms and finding a cancer she or her physician could not find. The inconvenience of

Table 4. Mean Scores by Age Categories for Individual Attitude Components.

	Beliefs (B) (Range 1 to 7)		Values (V) (Range −3 to 3)		BV (Range −21 to +21)	
	Age (years)		Age (years)		Age (years)	
	40–64	65+	40–64	65+	40–64	65+
Item	Mean (SD)*	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	(Mean (SD)
1. Tests for cancer when no symptoms exist	5.9 (1.79)*	5.5† (1.79)	2.2 (1.22)	1.8‡ (1.41)	13.1 (8.44)	11.0‡ (8.69)
2. Detects breast cancer I cannot find myself	6.6 (0.99)	6.3‡ (1.25)	2.7 (0.89)	2.3‡ (1.25)	17.9 (6.37)	15.7‡ (8.61)
3. Is inconvenient	3.5 (2.11)	3.2 (2.16)	2.6 (0.96)	2.4‡ (1.38)	5.1 (7.22)	4.9 (7.29)
4. Is unfamiliar	4.1 (2.51)	4.1 (2.36)	−0.85 (1.67)	−0.88 (1.8)	6.0 (8.03)	7.2 (8.01)
5. Detects breast cancer my doctor cannot find	6.4 (1.08)	6.2† (1.45)	2.8 (0.77)	2.6‡ (1.03)	17.2 (6.78)	15.5 (9.12)
6. Exposes me to excessive radiation	3.1 (1.87)	3.4† (1.98)	1.8 (1.53)	1.8 (1.53)	1.7 (6.19)	2.0 (7.18)
7. Involves physical discomfort	4.0 (1.86)	3.6 (1.98)	1.7 (1.44)	1.8 (1.37)	5.2 (6.96)	5.0 (6.63)
8. Detects breast cancer in early stage	6.6 (1.01)	6.4 (1.17)	1.4 (1.47)	1.6 (1.52)	18.6 (5.50)	17.2‡ (7.23)

*Numbers in parentheses are the standard deviations of the mean scores.
†$P < 0.05$ for difference between scores (t-test).
‡$P < 0.01$ for difference between scores (t-test).

mammography was more acceptable to younger women ($P < 0.01$). Examining the product score ($b_i \cdot v_i$) for each item reveals that the mean scores were higher among younger women ($P < 0.01$) for four items related to early detection and asymptomatic detection. The differences in beliefs regarding excessive radiation did not result in differences in the product score for this item because, on average, women across the two age groups found it equally acceptable.

In the analysis of whether beliefs, values, and their product scores were more highly correlated with participation in older women, a general pattern appeared. For all the items, the correlations were higher among women aged 65 years and older. This finding suggests that the attitude component explained more of the behavior among older women than it did among younger women and is consistent with the general test of interactions between age and the model components.

Four of the eight attitude items showed age-specific differences that could influence communications. Accepting the discomfort of mammography appeared more strongly correlated with behavior in older women, but the difference did not reach statistical significance ($P < 0.06$). Table 5 shows the belief, value, and product score correlations with participation for the three items that showed statistically significant differences between age categories. The belief that mammography involved an examination in the absence of symptoms, the values that excessive radiation and an unfamiliar test were acceptable, and the attitude ($b_i \cdot v_i$) that mammography involved an acceptably unfamiliar procedure were all more strongly associated with participation among older women.

Age-category-specific results of the discriminant analyses using the attitude component alone showed that a high proportion of women were classified correctly in the overall sample (66 percent). The attitude measures correctly classified the highest proportion of individuals in the oldest age category (72 percent). The use of attitude measures in the discriminant function was more sensitive than it was specific. Seventy-two percent of the participants could be classified correctly, but only 55 percent of the nonparticipants were properly classified. Among older women the specificity improved to 62 percent, indicating that the attitude measures better classified women aged 65 years and older who did not participate.

Discussion

A growing body of literature suggests that one of the major reasons for the underutilization of mammography is the failure of physicians to recommend that it be done.[3,4,21] This prospective study of 919 women shows that a clear recommendation is helpful, but it may not be sufficient to accomplish the national goals for the year 2000 that 80 percent of women should have had at least one mammogram. Forty-eight percent of the women given a clear written recommendation did not follow through to obtain the mammogram.

Something more must be done to encourage women to participate. Influencing women's values

Table 5. Correlation of Items with Participation by Age Categories.

Item	Beliefs (B) Age (years)			Values (V) Age (years)			BV Age (years)		
"My having a mammogram this year. . ."	40–64	65+	*P* Value	40–64	65+	*P* Value	40–64	65	*P* Value
1. Involves testing for breast cancer	0.10*	0.28*	0.05‡	0.30†	0.35†		0.27†	0.37†	
2. Involves a test that is unfamiliar	−0.05	−0.005		−0.06	0.10*	0.05‡	0.09	0.26†	0.01§
3. Exposes me to excessive radiation	−0.09*	−0.15*		0.30†	0.40†	0.05‡	0.13†	0.29†	

*$P < 0.05$ for Pearson correlation with participation.

†$P < 0.01$ for Pearson correlation with participation.

‡For difference between correlations using a multivariate test of the interaction between the item's main effect and age in a model that predicts participation.

§For difference between correlations using a multivariate test of the interaction between the item's main effect and age in a model that predicts participation.

and beliefs regarding mammography could be part of the solution. General educational efforts currently emphasize the ability of mammography to detect cancer early. These communications have been based upon a variety of primarily cross-sectional retrospective surveys showing that women who value asymptomatic early detection are more likely to have had a mammogram.[4,23]

Despite national attention to promote mammography, its use remains lower than national goals, especially among older women, which suggests that either the early detection message has not been received or it is not relevant to this age group. Both interpretations are plausible, as most of the studies to date have been retrospective. It is therefore unclear whether women's opinions about the value of early detection are a cause or result of obtaining mammograms. Given the limited success of the message in some age groups, it is reasonable to question whether this message is the correct one to be making.

This prospective study shows that the early detection message is important to older women. The study also adds information that could clarify additional ideas to convey to older women. Older women who obtained mammograms appeared to recognize and value three particularly strong attributes of mammography that are related to early detection (Table 3): (1) its ability to detect cancer their physician could not find, (2) its ability to detect cancer the woman herself could not find, and (3) the need to look for breast cancer in the absence of symptoms. The correlation between these item attitudes ($b_i \cdot v_i$) and participation is high in both age groups but is significantly higher in older women for the belief that mammography involves asymptomatic evaluation (Table 5).

This finding not only confirms those of others but also shows that the beliefs and values are associated prospectively with behavior. Women who appreciate the additional contribution of mammography to early detection are more likely to participate once they receive the recommendation. This finding opens the possibility that attitudes regarding mammography could be influenced during the decision-making process. The importance of screening in the absence of symptoms can be particularly influential in older women. Our findings show that older women who appreciate breast cancer detection in the absence of symptoms are more likely to participate. Younger women seem to have gotten this message as it is more commonly believed (Table 4) and significantly less strongly associated with participation in women aged 40 through 64 years (Table 5). Among younger women other messages need to be developed, and other factors assessed.

The advent of Medicare coverage for mammography means that more women aged 65 years and older will be facing decisions regarding screening; consequently, communications need to address specifically their appreciation of mammography. In addition to discussing the importance of asymptomatic detection, the findings of this study suggest that campaigns targeting the 65-year-old and older age group might also address the unfamiliarity and discomfort of mammography. Older women who could accept having an unfamiliar procedure were much more likely to participate. Educational messages targeted at older women might need to explain the procedure more clearly so that it becomes familiar to everyone. It might also be worthwhile to acknowledge that the procedure can involve some discomfort but emphasize that the breast compression reduces the necessary radiation and improves the quality of the image. The latter type of message might be particularly appropriate in a physician's office, where he or she can discuss the procedure in detail.

Discussions with physicians can clearly influence women's behavior regarding mammography.[4] Authors have emphasized the importance of the physician in reinforcing screening behavior.[40,41] The results from women themselves in the study presented here confirm, with a prospective association, the importance of physician opinion. The results also show that once the recommendation is made, other factors, such as beliefs about mammography, become more important. Further work needs to be done using prospective designs to assess whether the content of messages from physicians leads to increases in participation, especially among older women.

Despite the prospective design of the study presented here, there are some limitations. First, the overall theory of reasoned action model explained only 20 percent of the variance in mammography behavior. It has been acknowledged elsewhere that the facilitating factors that might influence behavior need to be explored more fully.[12,35] It is of interest, however, that the model explained a

greater proportion of the variance in behavior (32 percent) among older women. Correlations between model components and behavior were higher for older women, though the interaction between the main effect of the component and age approached statistical significance only in the case of the attitude measure. It is reasonable to suggest that the study findings regarding attitudes could be a stronger foundation for educational campaigns among older women.

The proportion of the variance explained by the model also points out another problem in questionnaire research. The women who were least likely to participate did not complete the study questionnaire. Overall the mammography participation rate was 52 percent, but it differed markedly among study questionnaire respondents and nonrespondents (65 percent versus 20 percent, respectively). It cannot be determined whether information from the study questionnaire nonrespondents would strengthen the conclusions presented here or introduce new considerations. Further research should try to reach the women who are least likely to participate.

Another potential limitation in the study is that it was performed several years ago in a health maintenance organization (HMO) where the women did not have to pay the direct costs of the procedure, and the invitation letter was signed by the program director. Whether participation among HMO enrollees could be improved by having the woman's physician sign the invitation needs further exploration. The women in the study were also a relatively well educated group with a high level of employment and income. They appeared to be somewhat different from the HMO population as a whole in this regard as well. The results are probably best generalized to other HMO populations. Recent focus-group discussions, conducted by Schechter, et al.[10] among a random sample of women, have suggested that the attitudes of the women in our sample are relevant to the national population. The value of early detection and the importance of asymptomatic detection were salient issues detected in the Schechter, et al. study as well. That cost was not an issue in our study also might not be a major limitation, as the results from several studies have found that cost is not currently a prominent concern.[4] In addition, the recent passage of legislation to include mammography coverage in Medicare benefits makes the direct costs less of a concern to individuals aged 65 years and older.

Conclusion

This prospective study demonstrates that several components of women's attitudes toward mammography are more strongly associated with participation in older women. Women aged 65 years and older who believe that screening mammography involves looking for cancer even though no symptoms exist and who value the ability of a mammogram to reveal cancers that women and their physicians cannot find are more likely to participate in screening. In addition, this study shows that older women's lack of familiarity with mammography might need to be addressed to encourage their participation. Physicians and other health care providers are particularly suited to explain mammography to older women, but community and national campaigns should address these issues as well.

The initiative to encourage physicians to recommend mammography is a necessary component of reaching the "Healthy People 2000" goal that 80 percent of women aged 40 and older will have had a mammogram. This study suggests messages that should accompany that recommendation, because the recommendation alone is not enough.

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APPENDIX

Attitudes

Component measures of attitude (Aact)

"My having a mammogram this year . . . "

1. Involves testing for breast cancer when I do not have symptoms
2. Would allow detecting a cancer I cannot find myself using breast self-examination
3. Would be inconvenient
4. Would involve a test that is unfamiliar to me
5. Would allow detecting breast cancer that my doctor or nurse cannot detect in a physical examination
6. Would expose me to excessive radiation
7. Would involve physical discomfort
8. Would involve thinking about the possibility that I may have breast cancer
9. Would allow the detection of breast cancer in an early stage if it is present

An example of the expectancy rating scale

My having a mammogram this year would be inconvenient for me:

Disagree								Agree
	strongly	somewhat	slightly	neither/ don't know	slightly	somewhat	strongly	

An example of the value rating scale

The inconvenience associated with obtaining a mammogram would be:

Unacceptable								Acceptable
	extremely	quite	slightly	neither/ don't know	slightly	quite	extremely	

Subjective Norm

An example of the subjective norm expectancy measure

I think my regular doctor feels:

I should not								I should
				neither				

have a mammogram done at the Breast Cancer Screening Clinic this year.

An example of the measure of motivation to comply

Generally speaking, I try to do what my regular doctor thinks I should do:

Agree								Disagree
				neither				