

# The Acceptance and Completion of Mammography by Older Black Women

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**Abstract:** We assessed the relation of patient characteristics, knowledge and beliefs to the utilization of mammography in an inner-city setting by 187 Black women over the age of 50. Thirty per cent of those who were offered mammography initially declined the offer and 40 per cent were subsequently unable to complete the procedure. Patient interviews were used to derive 27 potential knowledge and health belief predictor scales. In multiple regression analysis, two health belief scales and two knowledge scales accounted for 15 per cent of the observed variance in the model of

acceptance. The strongest predictor of subsequent completion was initial acceptance. The presence of breast symptoms and two health belief scales together with initial acceptance accounted for 26 per cent of variance in the model of completion. These results suggest that the successful accomplishment of mammography requires coordinated efforts at the level of the provider, patient, and setting. Health beliefs may influence the patient's behavior in this process, but their effect appears to be modest. (*Am J Public Health* 1989; 79: 721-726.)

## Introduction

Breast cancer is the leading cause of cancer mortality among Black women in the United States.<sup>1,2</sup> Programs of early detection can lower this risk by up to 40 per cent,<sup>3,4</sup> and thus standard medical practice protocols recommend periodic mammography for all women over the age of 50.<sup>5,6</sup> Nonetheless, only about 15 to 20 per cent of women over age 50 in the general population report ever having had a mammogram,<sup>7-9</sup> even though over 75 per cent of US women visit a physician each year.<sup>10</sup> No more than 4 per cent to 40 per cent of those studied in various medical settings receive mammography.<sup>11-17</sup> The accomplishment of mammography within these settings requires that physicians offer the procedure to patients who accept the recommendation within a framework which facilitates completion. Potential barriers include physician behavior (offering), patient behavior (acceptance), and logistic factors (such as cost, transportation, time).

We have previously noted that in a primary care setting serving an inner-city Black population, 20 per cent of female patients who were offered mammography initially declined the offer and nearly 40 per cent failed to complete the procedure.<sup>18</sup> Observations in our own and other settings have led to inconsistent conclusions concerning the relevance of patient health beliefs to participation in programs of early cancer detection.<sup>18-23</sup> We therefore conducted a prospective assessment of the relation of patient demographic characteristics, health status indicators, cancer control knowledge, and health beliefs to acceptance and subsequent completion of mammography among a group of older Black women in a primary care setting.

## Methods

Subjects were recruited from patients visiting an Internal Medicine teaching practice during the period August through November 1985. The practice serves a population which is predominately Black, elderly, and of lower socioeconomic status. The practice was staffed by 16 resident physicians,

one clinical nurse specialist, and three faculty internists, all of whom participated in the study.

At the conclusion of each patient visit during the study period the primary provider completed an encounter form which documented the provider's recommendation (offering) of any of three index procedures (Pap smear, mammography, home occult blood testing) to female patients over the age of 50. Following their visit, potential subjects were telephoned at home by a research assistant, informed consent for participation was requested, and those agreeing were then interviewed using the instrument described below. Of 474 potential subjects, 97 (20 per cent) declined participation, five (1 per cent) terminated the interview prematurely, and 72 (15 per cent) were unavailable (primarily due to absent phone service). The 300 participants were demographically similar to those declining the interview (mean age 67.4 versus 66.6 years) but did appear somewhat more likely to initially accept the offer of mammography (69 versus 63 per cent). Among the 300 interviewees, 207 had been offered mammography, and 276 were Black. The 187 Black interviewees offered mammography constitute the subjects of this report.

In our setting, mammography is provided via individually scheduled appointments. Following each visit during which mammography was recommended, the primary provider indicated the category of the patient's initial response as follows: *acceptance* (mammography appointment scheduled); *deferral* (patient request to delay consideration); *refusal* (patient rejection of the recommendation). Subsequent analyses contrasted those initially accepting the recommendation with those initially declining (defer plus refuse). Completion of mammography was documented through a review of the medical record and a computerized billing search conducted six months following the date of offering to allow an adequate interval for procedure completion.

The interview instrument employed was based upon the conceptual framework of the Health Belief Model<sup>19</sup> and included the dimensions of: knowledge, perceived severity, perceived susceptibility, perceived utility, perceived barriers, behavioral intentions, and cues to action. Items were derived from previous work by the authors and from review of previously published instruments, with particular emphasis on those assessing older and Black individuals.<sup>18,20-28</sup> The resulting final instrument contained 127 items and required no more than 45 minutes to complete.

Principal factor analysis with varimax rotation (SPSSx) was used to derive factors within each conceptual dimension (knowledge, susceptibility, etc). Internal consistency was determined using Cronbach's coefficient alpha which ranged

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from 0.45 to 0.97 with 24 of 27 factor alphas exceeding 0.60. Scales were then constructed by summing equally weighted item responses for each factor (see Appendix).

We measured the bivariate unadjusted relations of the demographic characteristics, health status indicators, interview scales, to mammography utilization via Pearson correlation and stratified analyses contrasting the effect of scale values classified as high, moderate, or low (generally employing cutpoints at the 75th and 25th percentiles, depending upon the frequency distributions). In preliminary regression analyses, we fitted models for each individual block of variables (demographics, health status indicators, knowledge and health belief domains) with acceptance or completion as the dependent variable. We then developed separate individual models of acceptance and completion, employing only those predictor variables which seemed reasonable and were independently significant at the 0.10 level in the initial analyses (Table 2). Results from linear models are presented here; logistic analyses gave similar results. Estimates of marginal and composite probability were derived from the logistic models.<sup>29</sup> The SPSSx and BMDP software packages were used for all statistical analyses and two-tailed tests of significance are reported.

### Results

The average age of the 187 interviewees was 67.1 years (S.D. = 10.6). Seventeen per cent were currently married and half lived alone. Nearly 70 per cent reported household incomes less than \$5000, 11 per cent were currently employed, the mean education level was 9.0 years (S.D. = 3.1), and all had some form of third party payment. The prevalence of chronic illness was high: over three-fourths had hypertension, nearly one-half manifest heart disease, one-third had diabetes mellitus, and 40 per cent had osteoarthritis. All were ambulatory and residing in the community.

Of the 187 subjects offered mammography, 131 (70 per cent) initially accepted, 42 (22 per cent) deferred, and 14 (7 per cent) refused the offer. Overall, 109 (60 per cent) of patients offered mammography were able to complete the procedure during the six-month period of follow-up. Completion was more likely among those initially accepting the offer, but some who initially accepted did not complete mammography and vice versa. Overall, 75 per cent of those initially accepting the offer completed mammography, as contrasted with 29 per cent of those initially deferring, and 8 per cent of those initially refusing.

Results from the patient interviews are presented in the Appendix. Overall, knowledge of cancer control was limited although 90 per cent believed that early detection in general was useful. Only one-third identified breast cancer as curable if detected early. Thirty per cent mentioned mammography as a potentially useful early detection procedure and half could accurately define mammography.

Most women perceived the lifetime risk of breast cancer in the population as two to four times the actual risk (median response 25–50 per cent), yet only 5 per cent viewed cancer as very likely in their own lifetime and only 1 per cent specifically identified cancer of the breast as a future health concern. Still, nearly 50 per cent acknowledged that they worried about getting cancer or that tests might detect cancer. Furthermore, 60 per cent felt they had no control over getting cancer and that there was “no point in worrying about cancer now” since it was unavoidable.

Perceived barriers to early detection included the expense of an office visit (40 per cent) or of mammography (23 per cent). Mammography safety, discomfort, or fear were each cited by less than 13 per cent as having any importance as potential barriers.

The interrelations among the potential predictor variables were relatively weak for the most part, thus limiting the potential effect of multicollinearity. Age, education, and knowledge scores did demonstrate relationships with selected health beliefs in the expected direction. Overall, of the 406 interscale bivariate correlation coefficients only 31 exceeded 0.3 and, of these, three exceeded 0.6, i.e., *utility of tests* (likelihood of behavior change); *emotional arousal* (level of concern); *futility of cancer treatment* (knowledge of prognosis).

The unadjusted relation of selected demographic and interview scale variables to the acceptance and completion of offered mammography is presented in Table 1. Older, asymptomatic women with more frequent medical conditions were less likely to accept and complete mammography. Acceptance and completion were also associated with: knowledge of the procedure; belief that testing, early detection, and treatment were useful; and belief that cancer was avoidable. Women who discounted the importance of expense, fear of detection, embarrassment, and procedure discomfort as barriers were more likely to accept and complete mammography.

The results of the multiple regression analyses are presented in Table 2. The previously described bivariate intercorrelations noted between predictor variables and the relatively skewed distribution of some of the belief scores (Table 1, particularly barriers 2–5) accounted for the exclusion of the variables in Table 1 that were not in the final multivariate models. We observed no independent relation between any of the demographic or health status indicators with initial acceptance of mammography. Women who knew more about the detection procedures and recognized the increased risk of cancer with age were more likely to accept, other factors being equal. Health beliefs independently associated with acceptance included the belief that early treatment of cancer was useful, and a discounting of the importance of procedure expense as a potential barrier to mammography accomplishment. Overall, these four scales accounted for 14.5 per cent of the observed variance in mammography acceptance (95% CI = 7.7, 34.4).

Initial acceptance strongly predicted mammography completion, as expected. One health status indicator and two health belief scales also contributed independently to the final model. The presence of breast symptoms, discounting of expense as a barrier, and higher assigned utility of cancer detection tests, together with initial acceptance, accounted for 26 per cent of the observed variance in the final model of mammography completion (95% CI = 18.8, 55.3).

As shown in Table 3, the magnitude of the independent effects (marginal probabilities) of each of the four predictor variables in the acceptance model varied between 5 per cent and 9 per cent. For example, a one-point increase in the health beliefs scale for utility of treatment was linked to an increase of 8 percentage points (95% CI = 2.9, 13.1) in acceptance. The presence of symptoms was linked to an increase in completion of 15.5 percentage points (90% CI = .6, 30.4). Table 3 presents estimates of the probability of acceptance and completion, based upon the logistic models, for various combinations of predictor variables. The estimated probability of mammography acceptance among those with higher belief scores rose from 66 per cent among those with low scores on the knowledge scales to 92 per cent for

**TABLE 1—Percentage of Women Accepting and Completing Recommended Mammography, According to Selected\* Interview Scores and Other Factors**

Factors	Mammography Offered (n)	Mammography Accepted (%)	Mammography Completed (%)
All subjects	187	70.1	59.6
Age (years)			
50–59	55	79.2	58.2
60–69	60	66.7	70.7
70–79	44	72.7	59.5
≥80	28	57.1	39.3
Income			
≤\$5000	130	76.2	62.2
>\$5000	51	58.8	56.0
Serious Illnesses (n)			
0	100	73.8	59.0
1	69	71.0	65.2
≥2	14	40.0	35.7
Breast Symptoms			
Present	28	82.1	78.6
Absent	159	67.9	56.1
Knowledge 2—Procedure			
Low (3.0–4.0)	60	50.0	68.2
Moderate (4.1–6.2)	70	57.1	62.5
High (6.3–7.2)	48	72.9	77.9
Knowledge 5—Age Risk			
Low (2.0–2.9)	85	60.0	55.4
Moderate (3.0–3.9)	23	87.0	73.9
High (≥4.0)	79	75.9	59.7
Susceptibility 3—Unavoidable			
Low (4.0–6.9)	46	71.7	66.7
Moderate (7.0–10.9)	81	77.8	66.3
High (≥11.0)	54	57.4	42.3
Barriers 1—Expense			
Low (3.0–5.9)	135	75.6	67.7
Moderate (6.0–8.9)	21	66.7	42.9
High (≥9)	23	43.5	39.1
Barriers 2—Fear			
Low (≥9)	155	73.5	62.7
High (3.0–8.9)	25	52.0	52.0
Barriers 3—Embarrassment			
Low (≥9)	141	66.0	73.2
High (3.0–8.9)	37	43.2	56.7
Barriers 5—Discomfort			
Low (≥9)	146	76.0	64.6
High (3.0–8.9)	29	44.8	44.8
Utility 1—Tests			
Low (4.0–11.9)	22	40.9	22.7
High (≥12)	164	74.4	64.6
Utility 2—Early Treatment			
Low (4.0–10.9)	23	56.5	47.8
Moderate (11.0–11.9)	31	58.1	53.3
High (≥12)	127	76.4	63.7
Utility 3—Futility Treatment			
Low (4.0–6.9)	40	87.5	75.0
Moderate (7.0–10.9)	94	70.2	58.9
High (11.0–12.9)	42	47.6	45.2
Utility 4—Futility Detection			
Low (4.0–8.9)	68	80.9	67.2
Moderate (9.0–11.9)	65	64.6	58.1
High (≥12)	47	59.6	48.9

\*Significant at the 0.10 level in bivariate analyses.

those with high scores. Table 3 also includes the observed rates of acceptance and completion for comparison with the model estimates. It should be noted that the small number of individuals manifesting concurrently low values on each of the relevant health belief scales precludes calculation of rates for those groups.

### Discussion

Successful cancer control in the primary care setting requires that detection procedures be offered by physicians to

patients who then accept and are able to complete the procedure. We have observed that even among women offered the procedure, personal and logistic factors are important determinants of subsequent acceptance and completion of mammography. While provision of mammographic services to a substantial number of the patients we studied is encouraging, those remaining at risk for nonparticipation constitute an important focus for study.

The role of health beliefs in this process is complex. Our data suggest that patient beliefs only weakly influence initial acceptance and subsequent procedure completion. After controlling for the interdependence of the multiple potential predictors, only two knowledge variables (detection procedures, age risk) and two belief scales (utility of early treatment, importance of expense as a barrier) remained as independent predictors of mammography acceptance and together accounted for 15 per cent of the observed variance. After controlling for initial acceptance, subsequent completion appeared more likely among women who presented with a sign or symptom of breast disease, who believed in the utility of early detection tests and who discounted expense as a barrier. The inverse relation noted for external prompts may suggest that intrapersonal factors are the more relevant but this must be interpreted with caution. While this model explained 26 per cent of the variance in completion, initial acceptance accounted for the largest component. Previous studies of patient participation in early detection programs for breast as well as colon cancer have also reported only modest effects for health beliefs.<sup>22,23</sup> These observations lead us to conclude that factors other than patient beliefs must be considered if mammography utilization is to improve our setting.

Mammography appears substantially underutilized as a cancer control tool in most reported settings.<sup>11–17</sup> Our findings emphasize that the process of mammography utilization begins with a physician decision to recommend the procedure but then depends upon the successful interaction of patient, physician, and setting. McCusker and Celantano have suggested that physicians may operate as potent reinforcers of patient decisions regarding early cancer detection, perhaps consistent with our observation of subsequent examination completion among women initially deferring or refusing the procedure.<sup>21,30</sup> We have not, however, assessed the interactional dynamics of the offers, nor those factors associated with the physician's decision to recommend mammography to an individual patient.

This study and previous observations have also emphasized the importance of logistic factors such as procedure cost as potential barriers.<sup>31</sup> Although all of our subjects had health care insurance, coverage for preventive services is variable and we do not have information on individual out-of-pocket expense. Nor have we directly ascertained the extent to which other logistic factors inhibited patient intention to complete mammography. Retrospective interviews may be useful to assess experienced barriers and would complement prospective ascertainment of predictive characteristics.

Our focus has been the relevance of potential barriers to the utilization of mammography among older, Black women and thus our conclusions may not apply to other settings. Education, knowledge of cancer control, and resources were limited among our subjects. National surveys, however, have also demonstrated a surprising degree of misinformation regarding cancer among many groups, including but not limited to older and minority subgroups.<sup>24,28</sup>

**TABLE 2—Results of Multiple Linear Regression Analyses for the Acceptance and Completion of Mammography**

	Mammography Acceptance			Mammography Completion		
	b	(90% CI)	Marginal Probability*	b	90% CI	Marginal Probability*
Presence of Symptoms	—	—	—	.155	(.006, .304)	.120
Health Beliefs						
Utility treatment	.080	(.038, .123)	.087	—	—	—
Utility tests	—	—	—	.042	(.008, .076)	.068
Expense barrier	.044	(.016, .071)	.049	.031	(.003, .059)	.040
External prompts	—	—	—	-.072	(-.146, .002)	—
Knowledge						
Procedure	.073	(.031, .115)	.084	—	—	—
Age risk	.062	(.002, .121)	.080	—	—	—
Acceptance	—	—	—	.437	(.312, .562)	.256
Constant	-1.120	(-1.702, -.534)	—	-.562	(-1.033, -.092)	—
Multiple R	.407			.529		
Adjusted R <sup>2</sup>	.145			.257		

\*Based upon logistic regression model  
NOTE: N = 166

**TABLE 3—Estimated and Observed Probabilities of the Acceptance and Completion of Mammography**

Health Belief Scales***	Mammography Acceptance*				Mammography Completion**			
	High Knowledge		Other Knowledge		Initial Accept		Initial Decline	
	Estimate %	Observed % (n)	Estimate %	Observed % (n)	Estimate %	Observed % (n)	Estimate %	Observed % (n)
High	92	94 (34)	67	75 (56)	89	82 (79)	63	22 (23)
Other	66	69 (26)	43	53 (53)	57	41 (22)	32	28 (25)

\*Overall probability of acceptance = .71

\*\*Overall probability of completion among asymptomatic women = .58

\*\*\*Scales in acceptance model include utility of treatment and discounting expense barrier. Scales in completion include utility of tests and discounting expense barrier.

Several other limitations of this study must be acknowledged. Nearly one-third of all potential subjects were not interviewed. While the initial mammography acceptance rate among those not interviewed was similar to that observed among the participants, we have no information concerning their subsequent behavior or their beliefs. Furthermore, the response rate specifically among Black women could not be measured. Second, health beliefs are complex constructs and no reference standard for their assessment is available. In addition, incorporation in our models of unmeasured but relevant variables or study of a sample manifesting broader variability could alter our estimates. Finally, even if these results are correct for this population, we do not know how generalizable they are.

Successful cancer control in the primary care setting will likely require complementary interventions at the level of patient, provider, and institution. Structural interventions which limit cost or which otherwise facilitate completion are fundamental. Certainly, patient beliefs are not irrelevant to this process. Furthermore, while their influence may be limited, health beliefs are potentially modifiable and thus of clinical relevance particularly in a population characterized by limited knowledge of cancer control activities. However, our work and that of others reinforces the need to interpret patient beliefs in the broader context within which decisions are made and action carried out. This broader view of physician and patient behavior holds the most likely promise for cancer control in the primary care setting.

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**APPENDIX**  
**Description of the Patient Interview Scales**

Health Belief Factors	Description	Mean	Range
<b>Knowledge</b>			
1. Recognition of symptoms (5 items, alpha = .78)	Breast and colon symptoms suggestive of cancer	8.89	5-10
2. Procedures (4 items, alpha = .72)	Identification and purpose of Pap smear, mammography, and occult blood testing	5.11	3-8
3. Routine checkup (2 items, alpha = .89)	Indication for routine examinations	2.98	2-4
4. Prognosis (3 items, alpha = .64)	Potentially curable cancers and likelihood of fatality	4.96	2-9
5. Age effect (2 items, alpha = .86)	Risk of cancer with increasing age	2.94	2-4
6. Prevalence (2 items, alpha = .66)	Population likelihood of breast and colon cancer	.21	0-2
<b>Severity</b>			
1. Limitations (3 items, alpha = .78)	Impact of cancer on social activity	6.24	3-9
2. Emotional arousal (3 items, alpha = .66)	Fear of cancer severity	6.77	3-9
<b>Susceptibility</b>			
1. Comparative risk (4 items, alpha = .90)	Likelihood of personal cancer compared to others	7.54	4-12
2. Absolute risk (2 items, alpha = .91)	Personal likelihood of cancer over time	6.22	3-9
3. Unavoidability (4 items, alpha = .67)	Potential to prevent or avoid cancer	8.22	4-12
4. Level of concern (5 items, alpha = .55)	Worry regarding personal likelihood of cancer and illness	5.73	3-11.25
<b>Utility</b>			
1. Worthwhile tests (4 items, alpha = .97)	Usefulness of tests	11.47	4-12
2. Early treatment (4 items, alpha = .72)	Potential for cure if cancer detected early	11.41	4-12
3. Futility cancer (4 items, alpha = .70)	Futility of cancer treatment	8.30	4-12
4. Futility detection (4 items, alpha = .56)	Futility of early cancer detection	9.99	4-12
<b>Barriers</b>			
1. Procedure expense (3 items, alpha = .95)	Importance of cost in deterring utilization	7.93	3-9
2. Fear (3 items, alpha = .89)	Importance of fear of detection in deterring utilization	8.63	3-9
3. Embarrassment (3 items, alpha = .84)	Importance of embarrassment in deterring utilization	8.53	3-9
4. Safety (3 items, alpha = .86)	Importance of procedure safety in deterring utilization	8.45	3-9

(continued)

## APPENDIX (continued)

Health Belief Factors	Description	Mean	Range
5. Discomfort (3 items, alpha = .74)	Importance of discomfort in deterring utilization	8.62	3-9
6. System devaluation (3 items, alpha = .67)	Discounting of physician or system	8.64	3-9
7. Resource limitations (3 items, alpha = .66)	Relevance of expense and transportation as obstacles	5.57	3-9
8. Time (3 items, alpha = .45)	Relevance of time as an obstacle	8.56	4-9
<b>Behavioral Intentions</b>			
1. Likelihood change (3 items, alpha = .81)	Probability of altering diet or habits to reduce cancer risk	8.31	3-9
2. Willingness checkup (2 items, alpha = .60)	Likelihood of engaging in regular checkups	5.66	2-6
<b>Cues to Action</b>			
1. Physician recommendation (3 items, alpha = .73)	Recollection that personal physician endorses procedure	7.50	3-9
2. Cancer experience (3 items)	Personal contact with individual with cancer	1.19	0-3
3. External prompts (3 items)	Suggestions by individuals or media regarding checkups	.71	0-3

### CDC's ACIP Updates General Recommendations on Immunization

The Immunization Practices Advisory Committee (ACIP), of the Centers for Disease Control, has updated its general recommendations on immunization. The revised version, which updates the 1983 statement, was printed in the April 7, 1989 issue of *Morbidity and Mortality Weekly Report* (MMWR) published by CDC. Changes or new sections in the revised recommendations include:

- 1) Listing of vaccines available in the United States by type and recommended routes of administration;
- 2) Updated schedules for immunizing infants and children;
- 3) Clarification of the guidelines for spacing administration of immune globulin preparations and different vaccines;
- 4) An updated table of recommendations for routing immunization of children infected with human immunodeficiency virus;
- 5) Listing of conditions that are often inappropriately considered contraindications to immunization; and
- 6) Addition of information on the National Childhood Vaccine Injury Act of 1986 and the National Vaccine Injury Compensation Program.

The *Morbidity and Mortality Weekly Report* is prepared by the Centers for Disease Control, Atlanta, Georgia, and available on a paid subscription basis from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, (202) 783-3238.