Repeat Mammography Use among Women Ages 50–75[1]

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Abstract

It has been demonstrated clearly that the use of regular screening mammography reduces mortality among women ages 50 years and over. The primary objective of this study was to investigate factors associated with repeat mammography participation.

A random sample of women ages 50–75 years residing in four Washington State counties was surveyed by telephone during mid-1989. The Health Belief Model was used as a conceptual framework for the analysis. Three groups of women with different mammography experiences in the previous 5 years were compared: (*a*) nonusers; (*b*) onetime users; and (*c*) repeat users. The survey response rate was 72%, and the study sample included 1357 women.

One time users were more likely to have health insurance coverage, to visit a gynecologist or other primary care physician regularly, and to believe mammography is more effective than breast self-examination; they were less likely to think that at least 1 in 10 women are diagnosed with breast cancer or that mammography is inconvenient to obtain than were nonusers. Factors associated with repeat *versus* onetime use included routinely visiting a gynecologist, thinking the lifetime risk of breast cancer is at least 10%, and perceiving a high personal susceptibility to disease.

Women who perceive themselves as being vulnerable to breast cancer are more likely to report repeat mammograms. Visiting a gynecologist regularly is associated with repeat as well as initial mammography use. These factors could be considered as the focus of promotional efforts moves from encouraging women to obtain their first mammogram to encouraging repeat use.

Introduction

Breast cancer is a major public health problem in affluent societies (1, 2). Recent data indicate that 12% of all women will be diagnosed with breast cancer, and nearly 4% will die of the disease (1). While there is currently no proven method for the primary prevention of breast cancer, it has been demonstrated clearly that the use of regular screening mammography reduces mortality among women ages 50 years and over (1–3). As a result, the National Cancer Institute has issued cancer control objectives for the year 2000 that include the routine provision of mammography to 80% of women in the 50–70-year age group (4).

Over the last decade, the proportion of women who have ever had mammographic screening has increased (5–7). The 1987 National Health Interview Survey found that only 38% of women ages 40 years and older had received at least one mammogram (8). By 1990, 64% of women in this age group who participated in the Mammography Attitudes and Usage Survey reported ever having had the procedure (7). However, for mammography to achieve long-term public health impact, women must be screened at regular intervals (2, 9). Less encouraging are recent reports concerning the proportion of women who are having repeat mammograms (7, 10–12). Indeed, only 37% of the 1990 Mammography Attitudes and Usage Survey respondents had been screened on more than one occasion (7).

The decision to obtain mammography is a complex process influenced by sociodemographic characteristics, knowledge, beliefs, breast cancer risk, and physician-patient interactions (2, 9–13). While few studies have investigated factors associated with multiple mammograms, the emerging data suggest that the determinants of initial and habitual use may differ (10–12). We used data from a survey conducted by the Washington State site of the National Cancer Institute Breast Cancer Screening Consortium to examine factors that discriminated between women who (during the last 5 years) had not been screened, had received mammography on only one occasion, and reported two or more previous mammograms (14).

Subjects and Methods

Study Population. Women residing in four counties of Washington State were surveyed during mid-1989. All counties include a medium sized city (population of between 30,000 and 60,000) with surrounding rural areas. Approximately 97% of the target population lived in households with telephones. A modified Waksberg random digit-dialing telephone procedure was used to identify women ages 50–75 years (15). Exclusion criteria included a personal history of breast cancer and residence in the same county for less than 2 years. The survey response rate was 72%, with 1528 women completing interviews. Our survey methods have been described in detail elsewhere (16).

Ten women were excluded because they did not respond to the mammography participation question used for this analysis. A major Washington health maintenance organization, Group Health Cooperative, has an organized breast cancer-screening program. At the time of our survey, Group Health Cooperative members ages 50 years and older were invited for screening every 1–3 years, depending on their personal constellation of risk factors (17). Because screening frequency was determined by the screening program, we excluded 161 Group Health

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Cooperative enrollees. Thus, 1357 women formed the study group for this analysis.

Conceptual Framework. We used the Health Belief Model as a conceptual framework for the reported study. It has been used widely to consider predictors of preventive health actions and is believed to be particularly useful in relation to screening procedures (18, 19). Rimer *et al.* (12) have suggested, in an application of the model, that a woman would be more likely to obtain mammography if she believes that she is personally vulnerable to breast cancer, that she can have breast cancer without symptoms, that the procedure is effective in early detection, and that the benefits outweigh any barriers or costs involved. Other constructs potentially influencing use of mammograms by women include modifying factors such as sociodemographic and health care characteristics (19). Survey questions addressing components of the model are described below.

Study Variables. The Breast Cancer Screening Consortium survey instrument included several indicators of use of breast cancer-screening modalities by women (14). For this study, we used the number of reported mammograms during the previous 5 years as our indicator of participation. We defined three groups of women: (*a*) nonusers (no mammograms in the previous 5 years); (*b*) onetime users (one mammogram only); and (*c*) repeat users (two or more mammograms).

Women were queried about their age, race, household income, educational level, marital status, health insurance coverage, and physicians they visited regularly (*e.g.*, family and general practitioners, general internists, and gynecologists). Recent studies suggest specialty differences in the use of breast cancer-screening modalities by physicians; gynecologists reported higher mammography ordering rates than did other primary care specialists (20, 21). Therefore, regularly visiting a gynecologist and routinely seeing any other type of primary care provider were considered separately. Women who reported visiting both a gynecologist and another physician regularly were included in the gynecologist grouping.

Two questions were used to assess perceived breast cancer risk. The first of these asked "What proportion of women do you think will get breast cancer at some time during their lives?" Since we aimed to identify women who were aware that the lifetime risk of breast cancer is relatively high, we grouped respondents into those who answered 10% or more and those who answered less than 10% or "don't know." The other perceived risk question was phrased "How would you rate your own risk of getting breast cancer compared to other women (higher, the same, or lower)?" A question about family history of breast cancer in first- or second-degree blood relatives (mother, sister, daughter, grandmother, or aunt) was used as a measure of actual risk.

Several questions examined whether women were concerned about potentially negative aspects of mammography (cost, radiation exposure level, and the possibility of cancer being found). Respondents were also asked whether they agreed or disagreed with four statements designed to explore perceived benefits of and barriers to the test, which began "Having a mammogram this year" and included the following rejoinders: "would allow detecting a cancer that you cannot find yourself using breast self-examination," "would allow detecting cancer that your doctor cannot detect in a physical exam," "involves looking for breast cancer even if you do not have symptoms," and "would be inconvenient." Women who responded "don't know" to these questions were classified as having disagreed with the statements.

Table 1 Sociodemographic and health care characteristics by mammography participation

Characteristic	No. of mammograms in previous 5 years		
	0 (No. = 425) *n* (%)	1 (No. = 373) *n* (%)	≥2 (No. = 559) *n* (%)
Age (yr)			
50–64	231 (54)	227 (61)	352 (63)
≥65	194 (46)	146 (39)	207 (37)
Race			
White	403 (95)	360 (97)	545 (98)
Other	19 (5)	12 (3)	11 (2)
Household income ($)			
<15,000	175 (50)[a]	83 (27)	112 (23)
≥15,000	176 (50)	224 (73)	368 (77)
Educational level			
<High school	97 (23)[b]	60 (16)	58 (10)[c]
≥High school	326 (77)	311 (84)	500 (90)
Marital status			
Married	262 (62)[b]	260 (70)	415 (75)
Other	163 (38)	111 (30)	142 (25)
Health insurance			
Yes	373 (88)[b]	348 (93)	540 (97)[c]
No	51 (12)	25 (7)	18 (3)
Regularly visits physician			
Yes, gynecologist	20 (5)[a]	53 (14)	126 (23)[c]
Yes, other	310 (73)	291 (78)	413 (74)
No	95 (22)	29 (8)	20 (4)

[a] Statistically significant difference between 0 and 1; $P < 0.001$.
[b] Statistically significant difference between 0 and 1; $P < 0.05$.
[c] Statistically significant difference between 1 and ≥2; $P < 0.05$.

Analysis. We compared nonusers (no mammograms) with onetime users (one mammogram), and onetime users with repeat users (two or more mammograms). In bivariate analyses, the χ^2 test was used to assess statistical significance (22). Unconditional logistic regression was used to estimate the independent effects of variables on mammography experience (23). Since few respondents were ethnic minorities, no adjustment for race was made in the multivariate analyses. Household income was excluded from the regressions because 16% of the relevant survey responses were missing. However, educational level has been shown to be a reasonable surrogate measure for income (10). The multivariate analyses included women who responded to all the other questions.

Results

Four hundred twenty-five of the respondents (31%) reported no mammograms in the previous 5 years. Three hundred seventy-three (28%) of the respondents had been screened on 1 occasion and 559 (41%) had received 2 or more mammograms.

Table 1 presents the distribution of sociodemographic and health care variables by three groups: (*a*) nonusers (no mammograms in the previous 5 years); (*b*) onetime users (one mammogram); and (*c*) repeat users (two or more mammograms). We found significant differences between the nonusers and onetime users for household income, educational level, marital status, health insurance coverage, and the physician visit variable (regularly seeing a gynecologist or other type of physician *versus* not regularly seeing a physician). Educational level, health insurance coverage, and the physician visit variable also differentiated between onetime and repeat users.

Table 2 Health belief model variables by mammography participation

Variable	No. of mammograms in previous 5 years		
	0 (No. = 425) *n* (%)	1 (No. = 373) *n* (%)	≥2 (No. = 559) *n* (%)
Personal vulnerability			
Proportion of women affected			
≥10%	228 (54)	183 (49)	376 (67)[a]
<10%	195 (46)	189 (51)	183 (33)
Personal relative risk			
High	30 (7)	27 (8)	76 (14)[b]
Same	114 (28)	102 (29)	162 (30)
Low	257 (64)	221 (63)	296 (55)
Family history			
Yes	86 (20)	79 (21)	156 (28)[b]
No	339 (80)	294 (79)	403 (72)
Asymptomatic disease			
Involves asymptomatic detection			
Agree	343 (81)[c]	337 (92)	534 (96)[b]
Disagree	80 (19)	30 (8)	22 (4)
Effectiveness			
More effective than CBE[d]			
Agree	337 (80)[c]	339 (92)	535 (96)[b]
Disagree	84 (20)	31 (8)	23 (4)
More effective than BSE			
Agree	344 (82)[c]	344 (93)	541 (97)[b]
Disagree	76 (18)	26 (7)	15 (3)
Barriers			
Involves inconvenience			
Yes	127 (30)[c]	68 (18)	65 (12)[b]
No	294 (70)	300 (82)	490 (88)
Concern about cost			
Yes	194 (49)	153 (42)	195 (35)[b]
No	204 (51)	214 (58)	362 (65)
Concern about radiation			
Yes	180 (44)	140 (38)	186 (33)
No	230 (56)	228 (62)	370 (67)
Concern about finding cancer			
Yes	195 (49)	183 (52)	266 (49)
No	207 (51)	171 (48)	279 (51)

[a] Statistically significant difference between 1 and ≥2; $P < 0.001$.
[b] Statistically significant difference between 1 and ≥2; $P < 0.05$.
[c] Statistically significant difference between 0 and 1; $P < 0.001$.
[d] CBE, clinical breast examination; BSE, breast self-examination.

Table 3 Variables associated with having had one mammogram *versus* no mammogram (No. = 670)

Variable	OR[a]	95% CI
Sociodemographic		
Age 50–64	1.20	0.84–1.73
≥High school education	1.40	0.89–2.18
Married	1.36	0.95–1.93
Health care		
Health insurance	1.88[b]	1.02–3.45
Regularly visits gynecologist[c]	8.29[d]	3.82–17.95
Regularly visits other physician[c]	2.65[d]	1.57–4.48
Personal vulnerability		
≥10% of women affected	0.69[b]	0.49–0.97
High personal relative risk[e]	0.85	0.45–1.62
Same personal relative risk[e]	0.88	0.61–1.29
Family history	1.33	0.87–2.02
Asymptomatic disease		
Involves asymptomatic detection	1.73	0.94–3.20
Effectiveness		
More effective than CBE[f]	1.82	0.94–3.54
More effective than BSE	2.29[b]	1.15–4.57
Barriers		
Involves inconvenience	0.62[b]	0.42–0.93
Concern about cost	0.90	0.64–1.26
Concern about radiation	0.89	0.63–1.28
Concern about finding cancer	1.31	0.93–1.84

[a] Controlling for county of residence and all other variables. OR, odds ratio; CI, confidence interval.
[b] $P < 0.05$.
[c] *Versus* no regular physician.
[d] $P < 0.001$.
[e] *Versus* low personal risk.
[f] CBE, clinical breast examination; BSE, breast self-examination.

As shown in Table 2, which classifies variables according to the Health Belief Model, we found that 67% of repeat users but only 49% of onetime users thought that the lifetime risk of breast cancer is at least 10% ($P < 0.001$). Fourteen % of the women with 2 or more mammograms perceived their personal risk of breast cancer as being high relative to other women, compared to 8% of those women reporting only 1 mammogram ($P < 0.05$). The proportions of women in the repeat and onetime user groups reporting a family history of breast cancer were 28 and 21%, respectively ($P < 0.05$). These measures of risk did not distinguish between onetime users and nonusers.

The percentages of women who agreed that mammography involves asymptomatic detection, is more effective than clinical breast examination or breast self-examination, and is inconvenient were significantly greater in the onetime user group than in the nonuser group. Similarly, repeat users were significantly more likely to agree with these statements than onetime users. Concern about cost differentiated between repeat and onetime users but not between onetime users and nonusers.

Our multivariate analyses included 353 nonusers, 317 onetime users, and 516 repeat users with complete data. In a logistic regression model, we found onetime users were significantly more likely than nonusers to have health insurance coverage, visit a gynecologist or other primary care physician regularly, and believe mammography is more effective than breast self-examination; they were less likely to think at least 1 in 10 women are diagnosed with breast cancer or that mammography is inconvenient to obtain (Table 3). Factors independently associated with repeat *versus* onetime use included routinely visiting a gynecologist, thinking the lifetime risk of breast cancer is at least 10%, and perceiving a high personal susceptibility to disease (Table 4).

Discussion

We found that women who perceive themselves as being vulnerable to breast cancer were more likely to report repeat mammograms. Results from a Pennsylvania study conducted by Lerman *et al.* (11) also suggested a positive relationship between repeat mammography and perceived susceptibility to breast cancer. These investigators found that women who reported two or more mammograms thought the lifetime risk of breast cancer was higher than those with one prior mammogram. It is of note that a recent randomized trial designed to assess the impact of risk assessment and feedback on mam-

Table 4 Variables associated with having had two or more mammograms *versus* one mammogram (No. = 833)

Variable	OR[a]	95% CI
Sociodemographic		
Age 50–64	0.95	0.69–1.31
≥ High school education	1.39	0.89–2.18
Married	1.21	0.87–1.69
Health care		
Health insurance	1.83	0.92–3.64
Regularly visits gynecologist[b]	2.41[c]	1.15–5.04
Regularly visits other physician[b]	1.71	0.88–3.33
Personal vulnerability		
≥10% of women affected	1.99[d]	1.47–2.71
High personal relative risk[e]	1.89[c]	1.11–3.21
Same personal relative risk[e]	1.13	0.81–1.57
Family history	1.12	0.78–1.61
Asymptomatic disease		
Involves asymptomatic detection	1.44	0.69–2.98
Effectiveness		
More effective than CBE[f]	0.65	0.29–1.46
More effective than BSE	2.39	0.95–6.04
Barriers		
Involves inconvenience	0.69	0.45–1.05
Concern about cost	0.80	0.59–1.09
Concern about radiation	0.91	0.65–1.26
Concern about finding cancer	1.00	0.74–1.36

[a] Controlling for county of residence and all other variables. OR, odds ratio; CI, confidence interval.
[b] *Versus* no regular physician.
[c] $P < 0.05$.
[d] $P < 0.001$.
[e] *Versus* low personal risk.
[f] CBE, clinical breast examination; BSE, breast self-examination.

mography participation showed that women with a positive family history were more likely to obtain the test when screening invitations emphasized this risk factor (24).

Physician encouragement has been shown consistently to have a major impact on breast cancer-screening behavior (11, 12, 25). One Los Angeles study showed that women were between 4 and 12 times as likely, depending on their age group, to have a mammogram if their physician discussed it with them (25). Our results (as well as others) indicate that women who routinely visit gynecologists are more likely to report repeat mammograms, as well as onetime use (10, 16, 26). However, patients who choose to see gynecologists differ from other women and may be inherently more likely to participate in screening than those who seek care from other primary care providers. Also, performance of clinical breast examinations and obtaining Papanicolaou smears (rather than specialty) have been shown to be the salient factors that distinguish between physicians who do and do not order screening mammography (27).

The reported study has certain limitations. Because of the strong secular increase in mammography participation over the last few years, the presented data do not reflect current levels of use by women (2). Also, although our response rates were relatively good compared to similar surveys, it is possible that nonrespondents had a different mammography experience than did respondents (14). We made no attempt to distinguish between diagnostic and screening mammograms because this distinction is often not recognized by women (28). In addition, validation of mammography use reported by women was not undertaken. However, it has been shown that breast cancer-screening self-reports can usually be validated by medical records (29). Our study population included women residing in medium sized towns and rural areas; the majority of the respondents were white, high school graduates, and insured. Therefore, results are not necessarily generalizable to urban, minority, or socially disadvantaged populations.

This research has the problems inherent in any study using cross-sectional survey methodology. A higher proportion of women in the onetime user group had their first mammogram during the late 1980s than did those who reported multiple mammograms. Therefore, repeat mammography was probably an indicator of early adoption, as well as regular use. Also, it was not possible to ascertain the extent to which beliefs had been influenced by having a mammogram and, therefore, the degree to which they might influence future mammography behavior.

In summary, our multivariate results indicate that "access" factors such as insurance and regular physician visits are more important in distinguishing between onetime mammography users and nonusers, but perceived vulnerability to breast cancer is more important in distinguishing repeat users from onetime users. They also reinforce the findings of previous studies, which indicate that efforts to promote regular mammography use should include interventions directed at both women and primary care physicians (9). Because the focus of promotional efforts moves from encouraging women to get their first mammogram to encouraging repeat use, those implementing educational programs might consider trying to increase perceptions of vulnerability to disease. Future research could investigate ways of enhancing perceived susceptibility to breast cancer without causing undue anxiety (30). Prospective studies are needed to examine factors that are associated with routine interval mammography. Such studies can examine causal effects rather than associations and distinguish between the outcomes of early adoption and regular use.

References

1. Harris, J. R., Lippman, M. E., Veronesi, U., and Willett, W. Breast cancer. N. Engl. J. Med., *327:* 319–328, 1992.

2. White, E., Urban, N., and Taylor, V. Mammography utilization, public health impact, and cost-effectiveness in the United States. Annu. Rev. Public Health, *14:* 605–633, 1993.

3. Council on Scientific Affairs. Mammographic screening in asymptomatic women aged 40 years and older. JAMA, *261:* 2535–2542, 1989.

4. National Cancer Institute. Cancer control objectives for the nation: 1985–2000. Natl. Cancer Inst. Monogr., *2:* 27–32, 1986.

5. Coleman, E. A., Fever, E. J., and NCI Breast Cancer Screening Consortium. Breast cancer screening among women from 65 to 74 years of age in 1987–88 and 1991. Ann. Int. Med., *117:* 961–966, 1992.

6. Breen, N., and Kessler, L. Changes in the use of screening mammography: evidence from the 1987 and 1990 National Health Interview Surveys. Am. J. Public Health, *84:* 62–67, 1994.

7. Centers for Disease Control. Use of mammography: United States. Morb. Mort. Wkly. Rep., *39:* 621–630, 1990.

8. Dawson, D. A., and Thompson, G. B. Breast cancer risk factors and screening: United States, 1987. Hyattsville, MD: United States Department of Health and Human Services, 1990.

9. Rimer, B. K. Understanding the acceptance of mammography by women. Ann. Behav. Med., *14:* 197–203, 1992.

10. Zapka, J. G., Stoddard, A., Muhl, L., and Costanza, M. E. Interval adherence to mammography screening guidelines. Med. Care, *29:* 697–707, 1991.

11. Lerman, C., Rimer, B., Trock, B., Balshem, A., and Engstom, P. F. Factors associated with repeat adherence to breast cancer screening. Prev. Med., *19:* 279–290, 1990.

12. Rimer, B. K., Lerman, C., Trock, B., King, E., and Engstrom, P. F. Why do some women get regular mammograms? Am. J. Prev. Med., *7:* 69–74, 1991.

13. Vernon, S. W., Laville, E. A., and Jackson, G. Participation in breast screening programs: a review. Soc. Sci. Med., *30:* 1107–1118, 1990.

14. The NCI Breast Cancer Screening Consortium. Screening mammography: a missed clinical opportunity. JAMA, *264:* 54–58, 1990.

15. Larrakas, P. J. Telephone Survey Methods: Sampling, Selection, and Supervision, pp. 28–52. Newbury Park, CA: Sage Publications, 1987.

16. Urban, N., Anderson, G. L., and Peacock, S. Mammography screening: how important is cost as a barrier to use? Am. J. Public Health, *84:* 50–55, 1994.

17. Taplin, S. H., Thompson, R. S., Schnitzer, F., Anderman, C., and Immanuel, V. Revisions in the risk-based breast cancer screening program at Group Health Cooperative. Cancer (Phila.), *66:* 812–818, 1990.

18. Levine, S., and Sorenson, J. F. Social and cultural factors in health promotion. *In:* J. D. Matarazzo (ed.), A Handbook of Health Enhancement and Disease Prevention, pp. 222–229. New York: John Wiley & Sons, Inc., 1984.

19. Fulton, J. P., Buechner, J. S., Scott, H. D., *et al.* A study guided by the health belief model of the predictors of breast cancer screening in women ages 40 and older. Public Health Rep., *106:* 410–420, 1991.

20. Albanes, D., Weinberg, G. B., Boss, L., and Taylor, P. R. A survey of physicians' breast cancer early detection practices. Prev. Med., *17:* 643–652, 1988.

21. Slenker, S. E., and Wright, J. M. A survey of physician beliefs and practices concerning routine mammography. Ohio State Med. J., *84:* 476–480, 1988.

22. Rosner, B. Fundamentals of Biostatistics, pp. 302–368. Boston: Duxbury Press, 1986.

23. Breslow, N. E., and Day, N. E. Statistical Methods in Cancer Research. Vol. 1, pp. 192–246. Lyon, France: International Agency for Research on Cancer, 1980.

24. Curry, S. J., Taplin, S. H., Anderman, C., Barlow, W. E., and McBride, C. A randomized trial of the impact of risk assessment and feedback on participation in mammography screening. Prev. Med., *22:* 350–360, 1993.

25. Fox, S. A., Murata, P. J., and Stein, J. A. The impact of physician compliance on screening mammography for older women. Arch. Int. Med., *151:* 50–56, 1991.

26. Burg, M. A., Lane, D. S., and Polednak, A. P. Age group differences in the use of breast cancer screening. J. Aging Health, *2:* 514–530, 1992.

27. Taplin, S. H., Taylor, V., Montano, D., Chinn, R., and Urban, N. Specialty differences and the ordering of screening mammography by primary care physicians. J. Am. Board Fam. Pract., *7:* 375–386, 1994.

28. Howard, J. Using mammography for cancer control: an unrealized potential. CA Cancer J. Clin., *37:* 33–48, 1987.

29. King, E. S., Rimer, B. K., Trock, B., Balshem, A., and Engstrom, P. How valid are mammography self-reports? Am. J. Public Health, *80:* 1386–1388, 1990.

30. Thirlaway, K., and Fallowfield, L. The psychological consequences of being at risk of developing breast cancer. Eur. J. Cancer Prev., *2:* 467–471, 1993.