

UMass Chan Medical School

eScholarship@UMassChan

---

Women's Health Research Faculty Publications

Women's Faculty Committee

---

1989-11

## Breast cancer screening by mammography: utilization and associated factors

Jane G. Zapka

*University of Massachusetts Medical School*

*Et al.*

Let us know how access to this document benefits you.

Follow this and additional works at: [https://escholarship.umassmed.edu/wfc\\_pp](https://escholarship.umassmed.edu/wfc_pp)



Part of the [Life Sciences Commons](#), [Medicine and Health Sciences Commons](#), and the [Women's Studies Commons](#)

---

### Repository Citation

Zapka JG, Stoddard AM, Costanza ME, Greene HL. (1989). Breast cancer screening by mammography: utilization and associated factors. Women's Health Research Faculty Publications. Retrieved from [https://escholarship.umassmed.edu/wfc\\_pp/161](https://escholarship.umassmed.edu/wfc_pp/161)

This material is brought to you by eScholarship@UMassChan. It has been accepted for inclusion in Women's Health Research Faculty Publications by an authorized administrator of eScholarship@UMassChan. For more information, please contact [Lisa.Palmer@umassmed.edu](mailto:Lisa.Palmer@umassmed.edu).

# Breast Cancer Screening by Mammography: Utilization and Associated Factors

JANE G. ZAPKA, ScD, ANNE M. STODDARD, ScD, MARY E. COSTANZA, MD, AND HARRY L. GREENE, MD

**Abstract:** The status of mammography screening experience and factors related to utilization were examined in six towns serviced by physician staffs at five hospitals. Data were collected via random digit dial telephone interview of a probability sample of 1184 women, aged 45–75 years. The results showed that 55% of the women reported ever having had a mammogram. Of those who had ever had a mammogram, 21% reported that the mammogram in the past year was their first one. Of those women who are over 50 and had ever had a mammogram, 57% reported one in the past year. Analyses

demonstrated that a combination of demographic factors, certain beliefs and knowledge, having a regular physician, social interaction and media exposure are independently related to ever having a mammogram, and to having one in the past year. Despite anecdotal and empirical evidence that the proportion of women ever having had a mammogram has substantially increased in the past several years, increasing utilization among older and lower-income women provides a challenge for public health (*Am J Public Health* 1989; 79:1499–1502.)

## Introduction

Among women, breast cancer leads all other cancers (28% in women), and is the second leading cause of cancer death.<sup>1</sup> Reductions in mortality from breast cancer depend on successful interventions aimed at early detection and treatment,<sup>2–4</sup> but the adoption of screening technologies by physicians and women has been slow.<sup>5–7</sup> However, there are recent indications that the utilization of screening technologies, notably mammography, has been increasing.<sup>8</sup> Targeted interventions are being called for by medical and public health authorities.<sup>4,5</sup> This study was undertaken to characterize the breast cancer screening experience, knowledge, and attitudes of a probability sample of urban women so as to provide a valid base for planning community interventions aimed at increasing the appropriate use of screening technologies.

## Methods

A survey was conducted using the Waksburg random digit dial method<sup>9</sup> in two urban areas of eastern Massachusetts comprising six towns serviced by physician staffs of five community hospitals. A pretested structured 20-minute telephone interview was administered in late 1987. A woman was eligible for the study if she was between 45 and 75 years of age and had never had breast cancer. A minimum of 10 call-backs were made as needed to secure an interview, and a refusal conversion process was included. A response rate of 75.3 percent was achieved, yielding a sample of 1,184 women.

In addition to sociodemographic and health history items, the survey included items to measure knowledge (such as risk factor and incidence knowledge and knowledge that mammography is appropriate in the absence of symptoms), beliefs (such as perception of barriers to and benefits of having a mammogram, and susceptibility to breast cancer),

enabling factors (insurance coverage, having a regular physician and usual location of care) and factors which reinforce or hinder screening behavior (encouragement to have screening by family, friends, and providers, discussion about screening with social network members and exposure to media messages about breast cancer screening). Summary variables were computed for items purported to measure personal and social factors and tests of reliability yielded Cronbach's alpha coefficients in the range of .56 to .71.\*

We first looked at variables associated with ever having a mammogram in the total sample. Among women who had a previous mammogram, we subsequently looked at correlates of having a mammogram in the last year for those aged 50 and over. While recent study results suggest reduction in mortality from breast cancer with mammography in younger women,<sup>10</sup> the issue remains controversial. Therefore, women under age 50 were removed from this analysis since current guidelines do not consistently recommend annual screening for women under age 50.

For this exploratory study, forward stepwise logistic regression analysis<sup>11</sup> was used to select from among those bivariately associated with screening, a set of variables representing independent correlates of screening behavior. After main effect variables were entered into the model, selected two-way and higher order interactions were considered. The entry criterion was a chi-square p value of 0.05. Some interactions could not be tested due to sparse cells in the relevant multiway cross classifications.

## Results

Selected characteristics of the sample are presented in Table 1. Fifty-five percent of the 1184 women surveyed reported ever having a mammogram. Among the 45 percent who had never had a mammogram, 10 percent had never heard of mammography. Twenty-five percent of the total sample reported previous medical problems with their breasts and these women were significantly more likely to have had multiple mammograms than those who reported never having had a problem. However, the majority of women (82 percent) reported having had their mammogram as a "check-up, for no particular problem." Women who had less than a high school education, or were Catholic or

Address reprint requests to Jane G. Zapka, ScD, Associate Professor, Health Policy and Management, School of Public Health, University of Massachusetts, Amherst, MA 01003. Dr. Stoddard is with Biostatistics at the U-MA SPH, Amherst; Dr. Costanza is with the Division of Oncology, Department of Medicine, U-MA Medical Center, Worcester; Dr. Greene is with the Division of General Medicine/Primary Care, U-MA Medical Center, Worcester. This paper, submitted to the *Journal* November 14, 1988, was revised and accepted for publication June 2, 1989.

\*Details on the survey items, factor analyses, and development of summary variables are available from the authors.

**TABLE 1—Percent (and frequency) of Reported Breast Cancer Screening Behaviors by Selected Characteristics<sup>a</sup>**

Characteristics	Total Sample n = 1184	Ever Had a Mammogram n = 650	Mammogram in Past Year <sup>b</sup> n = 290
<b>Age (years)</b>			
45–49	222	56.8 (126)	—
50–54	224	60.7 (136)	32.7 (73)
55–59	200	61.0 (122)	30.0 (60)
60–64	197	55.3 (109)	33.5 (66)
65–69	165	45.0 (75)	27.9 (46)
70–75	152	46.7 (71)	29.6 (45)
<b>Education</b>			
Less than high school	215	38.6 (83)	21.5 (41)
High school graduate	513	55.8 (286)	29.3 (125)
Some college	255	59.2 (151)	35.8 (72)
College graduate	192	65.1 (125)	43.7 (52)
<b>Employment</b>			
Currently employed	598	57.3 (343)	31.0 (130)
Full-time homemaker	192	56.3 (108)	30.8 (49)
Retired	286	51.1 (146)	33.3 (93)
Other	100	48.0 (48)	22.0 (18)
<b>Income</b>			
Less than \$15,000	333	40.5 (135)	22.9 (69)
\$15,001–25,000	201	57.2 (115)	28.6 (48)
\$25,001–35,000	163	58.3 (95)	32.0 (40)
More than \$35,000	320	66.3 (212)	42.9 (90)
<b>Religion</b>			
Catholic	754	51.7 (390)	27.8 (167)
Protestant	283	56.9 (161)	31.4 (74)
Jewish	83	84.3 (70)	63.3 (38)
<b>Marital status</b>			
Married/living with	791	57.7 (457)	32.9 (203)
Separated/divorced	130	51.5 (67)	25.0 (22)
Widowed	211	46.9 (99)	25.8 (51)
Never married	43	48.8 (21)	42.4 (14)
<b>Ever had medical problem with breast</b>			
Yes	292	83.6 (244)	43.6 (98)
No	892	45.5 (406)	27.0 (192)

<sup>a</sup>Frequencies may not sum to total sample due to missing data in respective cross-tabulations.  
<sup>b</sup>For women over 50 years of age.

Protestant (as compared to Jewish), were significantly less likely to have ever had a mammogram or had one in the past year. Income was directly related to ever having a mammogram; education and employment were highly correlated with income for the 86 percent of subjects who responded to the income question.

Given that getting a mammogram requires interaction with the medical care system, we were particularly interested in several variables related to sources and perceptions of medical care as well as insurance variables. Eighty-five percent of women reported that they had a regular physician. A majority (74 percent) of those who had a mammogram had had a clinical breast examination in the last year vs 44 percent of those who had never had a mammogram. Seven percent of the sample did not have any level of health insurance or entitlements. Seventy-one percent of those who ever had a mammogram said their insurance paid for it, 10 percent paid for it themselves, and 16 percent reported some combination.

Women who had never had a mammogram were asked why. Forty-five percent responded that they did not feel it was necessary and/or that they felt healthy, and 24 percent said their doctor had never recommended it. All women were asked if they would have a mammogram in the next year if their doctor recommended it, and 83 percent said they were very certain they would.

*Factors Associated with Mammogram Experience*

Table 2 presents the results of the main effects logistic regression analysis on ever having had a mammogram. There were significant negative interactions (data not shown) between being encouraged by a friend to have a mammogram and disagreeing with the statement that symptoms should precede a mammogram, and between being encouraged by a friend and discussing mammography with a friend. These interactions indicate that once one event has occurred there is no additional association with the other event. Variables which showed bivariate associations with ever having had a mammogram but which did not enter the model include knowledge of breast cancer risk factors, perceptions of susceptibility to breast cancer, perception of barriers to mammography, a belief that other health problems have priority, and education attainment. Women whose regular physician was an internist or gynecologist were more likely to report ever having a mammogram than women whose physician was a general or family practitioner (68 percent vs 41 percent); the latter women were no more likely to have had a mammogram than women with no regular doctor.

The women age 50 and over who had ever had a mammogram were divided into those who had one within the past year and those who had not. The main effects logistic regression model for this comparison is given in Table 3. Although having a mother or sister with breast cancer was positively associated with ever having a mammogram, having another relative (e.g., aunt) with breast cancer was negatively associated with having one in the last year. Variables which showed bivariate associations with mammography in the last year but which did not enter the model include a belief that mammography can detect cancer, history of breast problems, and employment status.

We were interested in the impact of insurance coverage on mammogram experience. Reliable and valid information on coverage was limited. A substantial number of subjects reported having more than one type of coverage. Since it was not possible to determine which plan provided coverage,

**TABLE 2—Factors Associated with Ever Having a Mammogram: Main Effects Logistic Model (n = 840)**

Variables	B	Odds Ratio	(95% CI)
<i>Sociodemographic</i>			
<i>Income</i>			
\$15001–25000	.54	1.72	(1.08, 2.75)
\$25001–35000	.03	1.03	(0.62, 1.70)
\$35001+	.43	1.53	(1.00, 2.35)
<i>Religion</i>			
Catholic	-.09	0.91	(0.63, 1.33)
Jewish	1.14	3.14	(1.30, 7.60)
<i>Health History</i>			
History of breast problems (yes)	1.69	5.40	(3.47, 8.41)
Mother/sister with breast cancer (yes)	.95	2.59	(1.43, 4.68)
<i>Knowledge</i>			
Need symptom (disagree)	.76	2.15	(1.75, 2.63)
<i>Attitude/Belief</i>			
Benefits of mammography (agree)	.16	1.17	(1.08, 1.28)
<i>Enabling</i>			
Have a regular MD (yes)	.75	2.13	(1.30, 3.48)
<i>Reinforcing</i>			
Mammogram encouraged by a friend (yes)	.62	1.85	(1.20, 2.87)
Discuss mammography with friends (yes)	.71	2.04	(1.43, 2.89)
Constant	-2.38		

Hosmer-Lemeshow Goodness of fit: Chi-square = 5.78, df = 8, p = .67.

**TABLE 3—Factors Associated with Having Had a Mammogram within the Past Year for Women Over Age 50: Main Effects Logistic Model (n = 346)**

Variables	B	Odds Ratio	(95% CI)
<i>Sociodemographic</i>			
Income			
\$15001–25000	-.67	0.51	(0.25, 1.06)
\$25001–35000	-.34	0.71	(0.32, 1.61)
\$35001+	.56	1.75	(0.78, 3.95)
Marital			
Separated/divorced	.41	1.50	(0.60, 3.79)
Widowed	-.70	0.50	(0.23, 1.08)
Never married	2.14	8.46	(1.25, 57.28)
Age (years)			
60–69	.99	2.69	(1.48, 4.86)
70–75	1.65	5.22	(1.88, 14.45)
<i>Health History</i>			
Mother/sister with breast cancer (yes)	.88	2.40	(1.06, 5.44)
Other blood relatives had breast cancer (yes)	-1.01	0.36	(0.17, 0.78)
Reason for mammogram (routine)	.84	2.31	(1.22, 4.38)
<i>Knowledge</i>			
Need symptom (disagree)	.37	1.45	(1.03, 2.04)
Know cost (yes)	.84	2.31	(1.09, 4.91)
<i>Attitude/Belief</i>			
Most women over 50 get a mammogram (agree)	.37	1.45	(1.09, 1.91)
<i>Enabling</i>			
Have regular MD (yes)	1.10	3.02	(1.09, 8.39)
Mammogram satisfaction (high)	.16	1.17	(1.01, 1.36)
<i>Reinforcing</i>			
Media exposure (greater)	.92	2.51	(1.11, 5.72)
Constant	-2.32		

Hosmer-Lemeshow Goodness of fit: Chi-square = 6.14 df = 8, p = .63.

women with more than one type of coverage were excluded and the screening behavior of those women who reported only one type of coverage was further examined. Given the possibility that a person's insurance plan changes over the years, analysis was limited only to mammogram experience in the past year. Bivariate analysis demonstrated that 34 percent of women who had commercial insurance, health maintenance organization (HMO) or Medicare plus commercial insurance had a mammogram in the past year compared to 15 percent of women covered by Medicare only, Medicaid only, or no insurance. For this set of subjects, the insurance variable did not significantly improve the multiple logistic model.

### Discussion

The findings of this study support anecdotal and empirical evidence that the proportion of women ever having a mammogram has substantially increased in the last several years, particularly among White, middle and upper socioeconomic level, and younger women.<sup>5,8,12</sup> Further, we found that although a greater proportion of women over age 60 have never had a mammogram, among those who have ever had one, more older women than younger women did get one in the past year. A summary of data from 33 states<sup>13</sup> reported that 29 percent of US women 50 years of age or older reported having had a screening mammogram in the last year. The level of screening varies considerably by state, however, with 37 percent reported in Massachusetts.<sup>14</sup> For our sample of women ages 50–75 years, 31 percent reported a mammogram in the past year.

It is very difficult to determine the extent to which women have had mammographic examinations for screening rather than diagnostic purposes.<sup>5</sup> Our data demonstrate a positive correlation between previous breast problems and having had one mammogram or having multiple mammograms. However, 82 percent of the women reported that their most recent mammogram was for "check-up" purposes, not for a particular problem. Additionally, there is uncertainty in estimating the proportion of women who have been screened with mammography at some time in their lives as compared with the proportion who are routinely screened according to recommended age/frequency guidelines. Defining the reasons for mammography and documenting the prevalence of *regular* screening should be priority questions for prospective research on screening utilization.

The regression models reported here must be interpreted with caution. Stepwise forward selection of variables was used as a means of screening many bivariate associated variables to select those independently associated with screening behavior. Although this approach is suitable for screening it does not necessarily result in valid estimates of effect size.<sup>15</sup> The results of this analysis may be used to develop specific models which can then be explicitly estimated and tested in another data set.

Perception of barriers to mammography (exposure to radiation, pain, cost, and embarrassment) and to breast cancer screening have been suggested by theoretical models<sup>16</sup> and emphasized in previous studies.<sup>17,18</sup> Interestingly, none were significantly related to mammography behavior. Neither perception of severity, nor risk factor knowledge were associated. In contrast to the limited relationship of knowledge and belief factors, importance of having a regular physician, particularly a gynecologist and/or internist, is highlighted in this research.

Although the findings of this study cannot be generalized to minority or rural populations, they do highlight a particular challenge for public health to increase screening utilization behavior in older and lower-income women. Targets for education include their clinicians who need to initiate more effective discussion of screening requirements, motivation of public policy-makers to include coverage of screening mammograms to deal with any cost/access barrier, as well as education of women about the need to attend to breast health.

### REFERENCES

1. Cancer Statistics: CA 1988; 38:5–22.
2. Tabar L, *et al*: Reduction in mortality from breast cancer after mass screening with mammography. Randomized trial from the Breast Cancer Screening Working Group of the Swedish National Board of Health and Welfare. *Lancet* 1985; 1:829–832.
3. Verbeek ALM, *et al*: Reduction of breast cancer mortality through mass screening with modern mammography. First results of the Nijmegen project, 1975–1981. *Lancet* 1984; 1:1222–1224.
4. Wertheimer MD, *et al*: Increasing the effort toward breast cancer detection. *JAMA* 1986; 255:1311–1315.
5. Howard J: Using mammography for cancer control: An unrealized potential. *CA* 1987; 37:33–48.
6. A basic study of public attitudes toward cancer and cancer tests. Vol 1: Major Results. New York: Lieberman Research, Inc. 1979.
7. Williams PA, Williams M: Barriers and incentives for primary care physicians in cancer prevention and detection. *Cancer* 1987; 1970–1978.
8. National Cancer Institute: *Annual Cancer Statistics Review*. Bethesda, MD: DHHS, NIH, NCI, 1989.
9. Waksberg J: Sampling methods for random digit dialing. *J Am Stat Assoc* 1978; 73:40–46.
10. Chu KC, *et al*: Analysis of breast cancer mortality and stage distribution by age for the health insurance plan clinical trial. *JNCI* 1988; 80:1125–1132.
11. Breslow NE, Day NE: *Statistical Methods in Cancer Research Volume I—The analysis of case control studies*. Lyon: International Agency for

- Research on Cancer, 1980.
12. Volicer BJ, Williamson E. Breast cancer early detection practices. *Massachusetts J Community Health* 1986-87; Fall/Winter:4-13.
  13. Centers for Disease Control: Trends in screening mammograms for women 50 years of age and older—Behavioral risk factor surveillance system, 1987. *MMWR* 1989; 38:137-140.
  14. Centers for Disease Control: State to state variation in screening mammograms for women 50 years of age and older—Behavioral risk factors surveillance system, 1987. *MMWR* 1989; 38:157-160.
  15. Greenlaud S: Modeling and variable selection in epidemiologic analysis. *Am J Public Health* 1989; 79:340-349.
  16. Janz NK, Becker MH: The Health Belief Model: A decade later. *Health Educ Q* 1984; 11:1-47.
  17. Rutledge DN, *et al*: Exploration of factors affecting mammography behaviors. *Prev Med* 1988; 17:412-422.
  18. MacLean V, *et al*: Women who decline breast screening. *J Epidemiol Community Health* 1984; 38:278-283.
  19. Howard J: In-reach: An approach to the secondary prevention of cancer. *In: Parron DL, et al (eds): Behavior, Health Risks and Social Disadvantage.* Washington, DC: National Academy Press, 1982; 51-61.

#### ACKNOWLEDGMENTS

We gratefully acknowledge the assistance of Diane Spotts, MS, Lee Maul, BS, and Mary Ellen Colten, PhD, (UMass/Boston, Center for Survey Research) in survey design and data collection, management, and analysis. We also thank Harris Pastides, PhD, and Stephen Gehlbach, MD, for their helpful review of the manuscript. This study was supported by the Division of Cancer Control National Cancer Institute (RO1-CA 44990-02).

### Editor Search Committee Seeks New Editor for American Journal of Public Health

An Editor Search Committee is actively recruiting a replacement for Dr. Alfred Yankauer who has announced his retirement as Editor of this *Journal*, effective July 1, 1990. The six-member search committee welcomes and solicits nominations and recommendations from the APHA membership and leadership to assist them in identifying the best available individual for this important salaried position. Nominations should be submitted as soon as possible, as the committee will meet several times to consider suggestions, applications, and support materials of potential candidates.

Names of potential candidates, along with letters of endorsement and other support materials, should be sent to: Editor Search Committee, American Public Health Association, 1015 15th St., NW, Washington, DC 20005.

The following criteria will be considered by the search committee in selecting the Journal editor:

- Comprehensive knowledge and broad perspective of the field of public health, with an appreciative understanding of its many disciplines and solid grounding in the basic sciences of epidemiology and statistics;
- Professional accomplishment and identity with the public health field, including respected standing among peers, combined with an extensive network of professional contacts who will provide expertise in soliciting and evaluating materials for publication;
- Demonstrated research skills, with evidence (such as credited publication in peer review journals) of firm grounding in a field of scientific inquiry within public health;
- Demonstrated writing, reviewing, and editing skills, enabling authoritative advice to authors on the suitability of prepared manuscripts, facilitating informed consideration of reviewer assessments, and equipping the preparation of appropriate editorials as needed;
- Freedom to devote substantial time to editor duties—as much as needed, presumably at least half time;
- Working knowledge of APHA and sympathy to its advocacy goals;
- Easy access to Washington, DC;
- An academic base is deemed highly desirable, preferably in a school of public health or a university health sciences center.

APHA is an affirmative action/equal opportunity employer.