

34. Wing, R. R.: Behavioral strategies for weight reduction in obese type II diabetic patients. *Diabetes Care* 12: 139-144 (1989).
35. Sanderson, P. M.: Verbalizable knowledge and skilled task performance: association, dissociation and mental models. *J Exp Psychol [Learn Mem Cogn]* 15: 729-747 (1989).
36. Anderson, R. M., Lockwood, D., Dedrick, R. F., and Hiss, R. G.: The diabetes care and education provided by nurses working in physicians' offices. *Diabetes Educ* 14: 532-536 (1988).
37. Davidson, J. K., Alogna, M., Goldsmith, M., and Borden, J.: Assessment of program effectiveness at Grady Memorial Hospital. *In Educating diabetic patients*, edited by G. Steiner and P. A. Lawrence. Springer Publishing Co., New York, 1981, pp. 329-348.
38. Runyan, J. W., Phillips, W. E., Herring, O., and Campbell, L.: A program for the care of patients with chronic diseases. *JAMA* 211: 476-479, Jan. 19, 1970.
39. Satterfield, D. W., and Davidson, J. K.: The team approach to evaluation, education and treatment. *In Clinical diabetes mellitus. A problem-oriented approach*. Ed. 2, edited by John K. Davidson. Thieme Inc., New York, 1991, pp. 170-185.
40. Anderson, R. M.: The challenge of translating scientific knowledge into improved diabetes care in the 1990s. *Diabetes Care* 14: 418-421 (1991).

Integrating Behavior and Intention Regarding Mammography by Respondents in the 1990 National Health Interview Survey of Health Promotion and Disease Prevention

WILLIAM RAKOWSKI, PhD
 BARBARA K. RIMER, DrPH
 SHARON A. BRYANT, PhD

Dr. Rakowski is Assistant Professor of Medical Science, Department of Community Health, and Senior Investigator, Center for Gerontology and Health Care Research, Brown University; Dr. Rimer is Director, Cancer Control Research, Duke Comprehensive Cancer Center, Duke University Medical Center in Durham, NC; and Dr. Bryant is Minority Affairs Coordinator at the Rhode Island Department of Health, Providence. She was a Post-Doctoral Fellow in the Center for Gerontology and Health Care Research, Brown University, when work on this paper began.

The preparation of this paper was supported in part by AHCPR grant No. T32HS0011.

Tearsheet requests Dr. Rakowski, Box G-A405, Brown University, Providence, RI 02912, telephone 401-863-3263.

Synopsis

Achieving and maintaining high rates of screening mammography are major public health priorities. This report examines data from the 1990 National Health Interview Survey of Health Promotion and Disease Prevention on the utilization of mammography among women ages 40-75.

Results show that progress is being made in some areas—57.7 percent of women “ever had” a mammogram; 50.3 percent, in previous 2 years. However, those not having repeated regular screening appear to be a sizable proportion. Only 28.6 percent of women ages 40-75 had been both screened on the recommended age-specific schedule and expressed an intention to continue screening; another 29.2 percent indicated no intention to have a mammogram in the near future.

Income, clinical breast examination, and Pap (Papanicolaou's) test, having no regular source of care, region of the country and residential variables, smoking status, not exercising, not knowing how to do breast self-examination, and race were among the variables having the strongest associations with mammography status. Several groups in the population therefore remain at risk of not receiving regular screening.

The combination of mammography status to date and future intention to have the examination provides an important perspective on efforts to reach public health screening objectives and appears to provide a strategy for targeting interventions.

ACHIEVING AND MAINTAINING high rates of regular screening mammography are among the many public health challenges currently being pursued by researchers and by virtually all health agencies.

Eleven major medical organizations, including the American Cancer Society (ACS) and the National Cancer Institute (NCI), recommend that women ages 40-49 get mammograms every 1 to 2 years,

depending upon family history, and annually after age 50 (1,2). The United States Preventive Services Task Force, however, concluded that there is not sufficient information to recommend mammography to women younger than age 50; they recommend mammography every 1–2 years for women between ages 50–75 (3).

The Year 2000 Healthy People report has set an ambitious goal for the 1990s—to have at least 60 percent of women ages 50 and older receive a screening mammogram and a clinical breast examination during a 2-year period (4). The NCI Cancer Control Objectives (5) cites a year 2000 goal: from an estimated baseline mammography rate of 15 percent in 1985, 80 percent of women ages 50–70 will have an annual clinical breast examination coupled with mammography.

Some States have instituted programs and legislation to mandate screening mammograms on a low-cost and even no-cost basis (6,7). Survey data are being used to identify the barriers and facilitators to regular screening (8–12), and intervention research is testing strategies that can increase rates of screening and sustain those rates over time (13–17).

Some progress is being made. Data from 1974–76 in the Health Insurance Experiment (18) indicated an annual rate between 2 percent (screening) and 8 percent (including diagnostic), with no observed repeated annual mammography. A 1977 sample showed only 15 percent ever having had a mammogram (19). In a 1979 survey, 20 percent of women said they ever had a mammogram, but in a 1983 survey, 41 percent had been screened (20). A 1986 national sample (21) found 39 percent of women ages 50 and older having ever had a mammogram, with 19.7 percent reporting one in the preceding year (either screening or diagnostic).

The 1987 Centers for Disease Control's Behavioral Risk Factor Survey done in 33 States found a median prevalence of 44.2 percent of women 40 and older ever having had a mammogram (22), with 29 percent of women 50 and older who had seen a physician (and 22 percent of all women 50 and older in the BRFS) having had a mammogram in the previous year (23). The 1987 Cancer Control Supplement to the National Health Interview Survey (NHIS) reported an ever-had rate of 38 percent among women ages 40 and older (about 30 percent screening, 8 percent diagnostic); 15 percent of the screening mammograms had occurred within the year (8).

Recent surveys suggest continued improvement since 1987. The NCI Mammography Consortium

found ever had rates from 51 percent to 74 percent in their six surveys conducted between late 1987 and mid-1989, with rates of 25 percent to 41 percent in the preceding year (13). More than 60 percent of women 40 and older in the 1990 Mammography Attitude and Usage Survey reported ever having a mammogram, a figure comparable to the percentage in the 1989–90 National Knowledge, Attitudes, and Behavior Survey (24). However, in the Mammography Attitudes and Usage Survey only about 31 percent of women 40 and older were on a regular schedule of mammography (24).

Zapka and coworkers (25) found in 1989 that 48 percent of women 50 and older had a mammogram in the past year, but only 20 percent were screened at yearly intervals. These data indicate that the increases in screening rates are still strongly influenced by women having their first mammograms, and low percentages of women are regularly screened (13,24–26).

There are, therefore, several diffusion-adoption curves occurring in the population. As would be expected, rates of women reporting having “ever had” a mammogram (at any time) are highest. Time-dependent rates of mammography, such as mammogram “in the past year” and mammograms on the NCI-ACS recommended schedule have been lower. Initial screening is a major step, but still only the first objective. Higher rates of having ever had a mammogram (the most basic adoption curve) are accompanied by the need to maintain regular screening and guard against the possibility of lapsing from a schedule.

Our investigation uses the 1990 National Health Interview Survey of Health Promotion and Disease Prevention (NHIS-HPDP) to examine the status of mammography among women ages 40 to 75. The NHIS-HPDP is of special interest for this purpose because it contained questions not only about mammography history, but also about intention to have a mammogram in the future. Recently, Mayer and coworkers (27) reported on intention to have mammography in a southern California sample and found that intention was a salient dimension for the participants' decision-making. Harris and colleagues (28) also included intention in their survey of women ages 30 to 74. Between 55 and 57 percent of the women ages 40–69 expressed an intent to have the examination in the next year, falling to 40 percent among women ages 70–74.

In addition, two reports by W.R. (29,30) have integrated mammography behavior and future intention in two separate samples in order to examine the relationship between a woman's “stage of

adoption" of mammography and decision-making variables. Women with different degrees of commitment to mammography, as defined by a combination of past behavior and future intention, were found to have correspondingly different favorable versus unfavorable judgments about mammography.

These two studies were grounded in the Trans-theoretical Model of behavior change, proposed by Prochaska and DiClemente (31,32). A key feature of the model is the integration of behavioral status with future intention to create a sequence of stages that range from not doing and not intending to do the target behavior (*precontemplation*), to considering adoption of the target behavior (*contemplation*), to initially starting the behavior and intending to continue (*action*), through sustaining the behavior over time and intending to continue (*maintenance*). The model also allows for "recycling" from a state of doing the target behavior to lapsing to nonperformance (*relapse*).

Mayer and coworkers (27) found that 21 percent of their sample 50 and older did not intend to have a future mammogram. In a sample of 2,900 women ages 40-75 from a random digit dial survey in Rhode Island, analysis by W.R. revealed 13.2 percent have never had a mammogram and stated no intention to have one in the coming year (unpublished data). Another of the authors, B. K.R., has observed that, although only 11 percent of her total Avoidable Mortality Study sample had not had a mammogram and did not plan to have one, 55 percent of the subgroup of women who had not had a mammogram were not planning to have one (unpublished data).

Using intention to have a mammogram in the future therefore seems to have the potential to refine the picture of the screening status of the population. Our investigation had three primary objectives: (a) to determine the screening status at the time of the survey; (b) to examine the association between mammography history and intention to have a future mammogram in order to identify the potential both for continuity and for lapsing from having the examination; and (c) to identify characteristics of women who have ever had versus those who never had a mammogram, of those who have been screened in the preceding 2 years, and of those who are being screened and intend to continue.

Methods

Sample. The data for this study were drawn from the public release tape of the 1990 NHIS-HPDP

(33); the total sample size for the NHIS-HPDP was 40,104. The NHIS-HPDP is a household interview conducted across the entire year. It utilizes a complex sample design and allows deriving national-level estimates. This report is restricted to women ages 40-75, and it is based upon current screening guidelines and reviews of the data regarding an upper age limit for universal screening recommendations (34-36). The total sample of women ages 40-75 was 10,950, before the exclusions discussed subsequently.

The far-right column in table 1, "No exclusion, adjusted percent," provides weighted and design-adjusted estimates of mammography status for this total sample of 10,950. Some restrictions on the sample are reflected in the other two percentage columns of table 1, along with analyses in tables 2 through 6. First, women who reported that their most recent mammogram was for any reason other than "routine screening" were excluded. This step reduced the sample to 9,396 for the population estimates on mammography status that are shown in the two other columns of table 1, and in the bivariate data of table 2. Next, attrition due to missing data on the independent variables produced a final sample of 9,107 for the bivariate and adjusted multivariate logistic regression analyses in tables 3 through 6.

Mammography history and intentions. Four pieces of information from the NHIS-HPDP were used to define and examine mammography status for this study. Response distributions are shown in table 1. The four elements of data follow:

1. Ever had a mammogram versus never had or did not know (DK) if they had, which was coded as a dichotomy: yes versus no or DK;
2. Number of prior mammograms if one had ever been obtained, which was coded as never had versus one versus two versus three or more;
3. Most recent mammogram, if ever had, which was coded as never had versus 1 year or less versus between 1 and 2 years versus between 2 and 3 years versus more than 3 years;
4. Intention to have a mammogram in the future, coded a priori in the survey as "No intention, DK, 3 or more years" versus when the physician recommends versus between 1 and 3 years versus within 1 year.

Stage of mammography adoption. Response to these four questions are shown individually in tables 1 through 4. In addition, the data are com-

Table 1. Status on individual mammography questions and the summary stage-of-adoption variable: adjusted percentages shown with and without the exclusion of reason for most recent mammogram

| Question or variable | Number | With exclusion | | No exclusion, adjusted percent |
|---|--------------------|--------------------|------------------|--------------------------------|
| | | Unadjusted percent | Adjusted percent | |
| Ever had a mammogram: | | | | |
| Yes | 5,351 | 56.9 | 57.7 | 63.3 |
| No or don't know.... | 4,045 | 43.1 | 42.3 | 36.7 |
| Most recent mammogram: | | | | |
| 1 year or less | ¹ 3,568 | 38.4 | 39.1 | 41.8 |
| Between 1 and 2 years | 1,024 | 11.0 | 11.2 | 11.8 |
| Between 2 and 3 years | 282 | 3.0 | 3.1 | 3.5 |
| More than 3 years... | 371 | 4.0 | 4.0 | 5.8 |
| Never had or don't know..... | 4,045 | 43.5 | 42.7 | 37.1 |
| Number of mammograms: | | | | |
| 1 | ² 1,910 | 20.5 | 20.6 | 22.7 |
| 2 | 1,218 | 13.1 | 13.2 | 14.0 |
| 3 or more | 2,159 | 23.1 | 23.8 | 26.5 |
| Never had | 4,045 | 43.3 | 42.5 | 36.9 |
| Future intention for next examination: | | | | |
| None, don't know, 3 years or more..... | ³ 3,236 | 34.8 | 33.6 | 31.9 |
| When physician recommends | 1,908 | 20.5 | 20.1 | 19.9 |
| Between 1 and 3 years | 1,184 | 12.7 | 13.2 | 13.4 |
| Less than 1 year | 2,959 | 31.9 | 33.1 | 34.8 |
| Stage of mammography adoption: | | | | |
| No intention | ⁴ 2,768 | 30.3 | 29.2 | 27.1 |
| Relapse risk | 1,713 | 18.8 | 18.5 | 19.4 |
| Contemplating | 2,172 | 23.8 | 23.7 | 22.6 |
| Screened, plans to continue | 2,481 | 27.2 | 28.6 | 31.0 |

¹ Excludes 106 women who could not provide a time since last mammogram.
² Excludes 64 women who could not provide the number of mammograms.
³ Excludes 109 women who did not provide a statement of future intention.
⁴ Excludes 262 women who could not be staged due to incomplete data on 1 or more of the questions used to define the stages (timing, number, future intention).

bined for the analyses in tables 5 and 6 to determine women's extent of adopting regular screening mammography as a regular health habit. As in prior studies (29,30), the stages-of-adoption approach of the Transtheoretical Model was used as a guide. The stages indicate progressively greater commitment to adopting a target health habit. They are derived by integrating behavioral status to date with a report of future intention.

When defining the stages for mammography, an allowance was made for the difference between the every-other-year guideline proposed by some groups for women ages 40-49 (34,36) and the

Table 2. Association in weighted percentages between mammography history and future intention within age groups 40-50 and 51-75 years

| Variable | Future intention | | | |
|---|--|---------------------------|-----------------------|---------------|
| | No intent, don't know, 3 years or more | When physician recommends | Between 1 and 3 years | Within 1 year |
| | Ages 40-50 years | | | |
| Ever had a mammogram:¹ | | | | |
| Yes | 12.7 | 18.0 | 26.1 | 43.2 |
| No | 48.9 | 23.4 | 4.5 | 23.2 |
| Most recent mammogram:² | | | | |
| 1 year or less | 9.0 | 16.6 | 35.1 | 39.3 |
| Between 1-2 years .. | 13.4 | 19.8 | 10.7 | 56.0 |
| Between 2-3 years .. | 28.4 | 17.5 | 6.1 | 48.0 |
| More than 3 years... | 30.1 | 21.9 | 8.1 | 39.9 |
| Never had | 48.9 | 23.4 | 4.5 | 23.2 |
| | Ages 51-75 years | | | |
| Ever had a mammogram:¹ | | | | |
| Yes | 15.9 | 19.6 | 17.7 | 46.8 |
| No | 66.8 | 20.6 | 1.2 | 11.4 |
| Most recent mammogram:² | | | | |
| Less than 1 year | 9.2 | 16.9 | 22.5 | 51.4 |
| Between 1-2 years .. | 19.4 | 24.6 | 9.2 | 46.8 |
| Between 2-3 years .. | 33.8 | 24.1 | 3.8 | 38.3 |
| More than 3 years... | 47.0 | 28.3 | 6.1 | 18.6 |
| Never had | 66.8 | 20.6 | 1.2 | 11.4 |

¹ Based on a weighted sample of 9,287; 109 women excluded for missing data for the 2 age groups in total.
² Based on a weighted sample of 9,181; 215 women excluded for missing data for the 2 age groups in total.

every-year guideline for women 50 and older. Also, to allow for women who might have had a mammogram at age 49 and were told not to have another for 2 years (according to the every-other-year guideline), the stages of mammography adoption were based on age 51 as the point at which the every-year screening recommendation would definitely apply to all women. Other investigators have also used the strategy of starting at age 51 when examining rates of regular screening (25).

The following four stages of adopting mammography were derived, using the sample of 9,396 as the base (unadjusted numbers are given in parentheses).

No intention to have a mammogram (N=2,768, 29.5 percent). This group comprised 2,400 women who had never had a mammogram and had no clear intention to have one in the future (that is, No intention, DK, 3 or more years), and 368 women who had a mammogram longer ago than their age-specific schedule recommended and did

Table 3. Bivariate and multivariate adjusted odds ratios and 95 percent confidence intervals (CIs) between covariates and ever had a mammogram

| Covariates | Number in sample ¹ | Percent ever had | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
|---|-------------------------------|------------------|----------------------|------------------|----------------------------------|------------------|
| <i>Demographic and health</i> | | | | | | |
| Age: | | | | | | |
| 40–50 years | 3,248 | 57.9 | (^a) | (^a) | (^a) | (^a) |
| 51–64 years | 3,175 | 60.9 | 1.13 | 1.00,1.28 | 1.46 | 1.25,1.71 |
| 65–75 years | 2,684 | 53.8 | .85 | .75,.96 | 1.34 | 1.10,1.62 |
| Ethnicity: | | | | | | |
| Non-Hispanic white | 7,143 | 59.9 | (^a) | (^a) | (^a) | (^a) |
| Black | 1,351 | 51.4 | .71 | .60,.83 | .83 | .68,1.01 |
| Hispanic | 451 | 46.7 | .58 | .46,.75 | .76 | .56,1.02 |
| All other | 162 | 45.6 | .56 | .39,.80 | .53 | .34,.81 |
| Acute and chronic conditions: | | | | | | |
| None | 3,831 | 54.8 | (^a) | (^a) | (^a) | (^a) |
| One | 2,332 | 60.1 | 1.24 | 1.11,1.40 | 1.18 | 1.02,1.37 |
| Two or three | 1,980 | 62.2 | 1.36 | 1.20,1.53 | 1.49 | 1.25,1.78 |
| Four or more | 964 | 57.6 | 1.12 | .95,1.33 | 1.84 | 1.42,2.38 |
| Limitation to major activity: | | | | | | |
| Not limited | 6,875 | 58.9 | (^a) | (^a) | (^a) | (^a) |
| Limited (other) | 799 | 56.4 | .90 | .77,1.07 | .85 | .67,1.08 |
| Limited (major) | 842 | 55.5 | .87 | .74,1.02 | .79 | .64,.98 |
| Unable (major) | 591 | 50.4 | .71 | .58,.86 | .76 | .58,1.01 |
| Stress in past year: | | | | | | |
| Almost none | 1,167 | 48.0 | (^a) | (^a) | (^a) | (^a) |
| Only a little | 1,969 | 54.9 | 1.32 | 1.11,1.56 | 1.01 | .82,1.24 |
| Moderate | 3,099 | 60.9 | 1.68 | 1.44,1.97 | 1.18 | .98,1.44 |
| A lot | 2,757 | 62.2 | 1.78 | 1.52,2.09 | 1.32 | 1.08,1.61 |
| Don't know, unknown | 115 | 23.8 | .34 | .21,.54 | .66 | .39,1.13 |
| <i>Resources</i> | | | | | | |
| Education: | | | | | | |
| College graduate, postgraduate | 1,476 | 71.7 | (^a) | (^a) | (^a) | (^a) |
| Some college | 1,553 | 66.9 | .79 | .66,.95 | 1.06 | .87,1.29 |
| High school graduate | 3,736 | 58.2 | .55 | .47,.65 | .94 | .79,1.12 |
| 9–11 years | 1,249 | 45.5 | .33 | .27,.40 | .80 | .64,1.00 |
| 0–8 years | 1,093 | 37.5 | .24 | .19,.29 | .76 | .58,1.00 |
| Income: | | | | | | |
| Less than \$10,000 | 1,397 | 36.6 | (^a) | (^a) | (^a) | (^a) |
| \$10,000–\$19,999 | 1,838 | 47.6 | 1.57 | 1.33,1.86 | 1.45 | 1.16,1.81 |
| \$20,000–\$29,999 | 1,322 | 56.8 | 2.28 | 1.92,2.71 | 1.90 | 1.50,2.40 |
| \$30,000–\$49,999 | 1,575 | 66.1 | 3.39 | 2.81,4.08 | 2.56 | 1.99,3.29 |
| \$50,000 or more | 1,409 | 74.0 | 4.93 | 4.06,5.99 | 3.49 | 2.66,4.57 |
| Missing or declined | 1,566 | 54.4 | 2.07 | 1.73,2.48 | 1.95 | 1.55,2.46 |
| Telephone: | | | | | | |
| Yes | 8,795 | 58.7 | (^a) | (^a) | (^a) | (^a) |
| No | 312 | 32.7 | .34 | .26,.45 | .83 | .56,1.22 |
| Health care site: | | | | | | |
| Physician's office | 7,363 | 61.9 | (^a) | (^a) | (^a) | (^a) |
| Hospital or worksite | 367 | 64.2 | 1.11 | .86,1.43 | 1.57 | 1.16,2.13 |
| Emergency room, health center | 216 | 50.6 | .63 | .46,.86 | .83 | .55,1.23 |
| None or unknown | 1,161 | 32.7 | .30 | .26,.35 | .58 | .48,.69 |
| <i>Service use and behavioral factors</i> | | | | | | |
| Smokes: | | | | | | |
| No | 7,016 | 60.9 | (^a) | (^a) | (^a) | (^a) |
| Yes | 2,091 | 47.3 | .58 | .51,.65 | .62 | .53,.71 |
| Exercises: | | | | | | |
| Yes | 3,141 | 67.8 | (^a) | (^a) | (^a) | (^a) |
| No | 5,966 | 52.8 | .53 | .48,.59 | .80 | .71,.91 |
| Drinks: | | | | | | |
| Abstains | 2,234 | 47.9 | (^a) | (^a) | (^a) | (^a) |
| Infrequent | 1,806 | 57.3 | 1.46 | 1.26,1.70 | 1.23 | 1.04,1.47 |
| Former | 944 | 50.9 | 1.13 | .95,1.35 | .89 | .72,1.12 |
| Current | 4,123 | 65.0 | 2.02 | 1.77,2.30 | 1.39 | 1.18,1.64 |

continued

Table 3. Bivariate and multivariate adjusted odds ratios and 95 percent confidence intervals (CIs) between covariates and ever had a mammogram—*continued*

| Covariates | Number in sample ¹ | Percent ever had | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
|---|-------------------------------|------------------|----------------------|------------------|----------------------------------|------------------|
| <i>Service use and behavioral factors—continued</i> | | | | | | |
| Knows breast self-examination: | | | | | | |
| Yes | 8,112 | 60.6 | (²) | (²) | (²) | (²) |
| No or unknown | 995 | 35.7 | .36 | .31,.43 | .64 | .52,.80 |
| Pap test and clinical breast examination: | | | | | | |
| Both 1 year or less | 4,882 | 76.1 | (²) | (²) | (²) | (²) |
| 1 year or less and 1–2 years | 383 | 71.6 | .79 | .61,1.02 | .81 | .61,1.07 |
| Both 1–2 years | 837 | 49.7 | .31 | .26,.37 | .34 | .32,.37 |
| 1 year or less and 3 years or more | 784 | 53.0 | .35 | .30,.42 | .37 | .34,.41 |
| Both 2–3 years | 279 | 41.1 | .22 | .17,.29 | .26 | .24,.29 |
| Both 3 years or more | 1,942 | 17.1 | .06 | .05,.08 | .08 | .07,.09 |
| <i>Structural and contextual</i> | | | | | | |
| Residence: | | | | | | |
| Single home | 7,093 | 59.7 | (²) | (²) | (²) | (²) |
| Apartment, condominium (low) | 1,085 | 52.2 | .74 | .63,.86 | .90 | .74,1.10 |
| Apartment, condominium (high) | 434 | 54.6 | .81 | .63,1.05 | .96 | .70,1.29 |
| Mobile home, other | 495 | 43.7 | .52 | .43,.64 | .74 | .70,.78 |
| Region: | | | | | | |
| West | 1,745 | 63.8 | (²) | (²) | (²) | (²) |
| Northeast | 1,986 | 58.6 | .80 | .68,.95 | .73 | .60,.90 |
| Midwest | 2,278 | 57.7 | .77 | .66,.91 | .73 | .62,.85 |
| South | 3,098 | 54.3 | .67 | .57,.79 | .70 | .58,.85 |
| People in household: | | | | | | |
| One | 2,973 | 55.3 | (²) | (²) | (²) | (²) |
| Two | 3,541 | 61.4 | 1.28 | 1.15,1.43 | .89 | .77,1.02 |
| Three | 1,277 | 59.5 | 1.18 | 1.02,1.38 | .79 | .63,.98 |
| Four or more | 1,316 | 52.0 | .87 | .76,1.01 | .54 | .44,.67 |
| SMSA characteristics: | | | | | | |
| 1 million or more | 3,808 | 62.4 | (²) | (²) | (²) | (²) |
| 250,000 to 999,999 | 2,372 | 58.4 | .85 | .73,.97 | .88 | .75,1.03 |
| 100,000 to 249,999 | 544 | 50.8 | .62 | .50,.78 | .62 | .48,.80 |
| Under 100,000 | 170 | 61.8 | .98 | .75,1.27 | .93 | .69,1.26 |
| Not in an SMSA | 2,213 | 50.7 | .62 | .54,.71 | .73 | .62,.87 |
| <i>Bivariate only: not in logistic analysis</i> | | | | | | |
| Marital status: | | | | | | |
| Married | 4,812 | 61.5 | (²) | (²) | NA | NA |
| Widowed | 1,978 | 48.7 | .59 | .53,.67 | ... | ... |
| Divorced, separated | 1,741 | 54.9 | .76 | .67,.86 | ... | ... |
| Never married | 576 | 46.6 | .55 | .44,.67 | ... | ... |
| Poverty status: | | | | | | |
| Above | 7,341 | 61.2 | (²) | (²) | NA | NA |
| Below | 850 | 31.8 | .30 | .25,.36 | ... | ... |
| Unknown | 916 | 48.6 | .60 | .51,.70 | ... | ... |
| Employment: | | | | | | |
| Employed | 4,527 | 61.5 | (²) | (²) | NA | NA |
| Not employed | 4,580 | 54.2 | .74 | .68,.81 | ... | ... |
| Clinical breast examination: | | | | | | |
| 1 year or less | 5,779 | 73.7 | (²) | (²) | NA | NA |
| Between 1 and 2 years | 1,167 | 52.5 | .39 | .34,.46 | ... | ... |
| 3 years or more, never, don't know | 2,161 | 18.3 | .08 | .07,.09 | ... | ... |
| Pap test: | | | | | | |
| 1 year or less | 5,152 | 75.0 | (²) | (²) | NA | NA |
| Between 1 and 2 years | 1,169 | 51.8 | .36 | .31,.42 | ... | ... |
| 3 years or more, never, don't know | 2,786 | 28.5 | .13 | .12,.15 | ... | ... |

¹ The sample sizes are based on the unadjusted N=9,107 which excludes women with missing data on any of the intended covariates. However, entries in all the other columns of the table are based on weighted and design-adjusted data.

² Reference group.
NOTE: SMSA = standard metropolitan statistical area; NA = not applicable.

not intend to have another, so that they were already in a period of having lapsed from having the procedure. Based on earlier work (29,30), the precontemplator and relapse stages were found not to differ on decisional balance, so that they were combined for this report.

Risk of lapsing (N=1,713, 18.2 percent). Of the women in this second group, 402 were on schedule but expressed no intention of having a mammogram in the future, and 1,311 had one in the preceding year or 2 but said they would wait for 1-3 years or until their physician recommended it. In a sense, then, this group of women were viewed as being at risk for moving into the No intention group. This group has not been explicitly examined to date in work with the Transtheoretical Model. Creation of this second group was possible due to the wording of the question on intention, which provided a variety of response options that was more diverse than those used in other investigations.

Contemplating having a mammogram (N=2,172, 23.1 percent). This third group consisted of women who had either never had a mammogram or were now off-schedule after an earlier mammogram but were considering having one. Two subgroups of women contemplating a mammogram could be distinguished. One group, 1,240 women, seemed more passive, stating that they would wait for a physician's recommendation or would wait for 1-3 or more years. A second group, 932 women, seemed more actively contemplating in the sense of stating a readiness to have the procedure in the coming year. This third general group represented the contemplation stage used in other investigations.

Screened and intends to continue (N=2,481, 26.4 percent). Women in this fourth group had been screened in their appropriate age-specific interval and expressed an intention to continue having the procedure in the next appropriate interval. This last group combined the action and maintenance stages, since earlier work had shown these two groups not to differ appreciably on decisional balance indices (29,30).

Some 262 women (2.8 percent) did not provide sufficient information for complete staging (for example, could not recall the time of last mammogram or number of prior mammograms). It should be noted that these stages were derived after-the-fact from the interview data. Women were not told

either what the recommended age-specific screening intervals were or where their mammography self-report history placed them relative to the next recommended time for screening. Also, the NHIS-HPDP asked only for the timing of the most recent mammogram, not the timing of any earlier procedures. There is, therefore, some limitation to how precisely women's histories could be assessed.

Mammography variables for analysis. Five comparisons were of primary interest for this report, in bivariate odds ratio calculations and for multiple logistic analysis. The first of these was the basic comparison of ever had versus never had a mammogram (table 3). The second was mammography within the preceding 2 years versus more than 2 years or never (table 4). The third was examining the screened and intends to continue stage versus all other stages combined (table 5). These three comparisons involved the entire sample with complete data (N=9,107).

The fourth analysis (table 6) was a comparison specifically between women in the screened and intends to continue group versus those in the no intention group (N=5,070). This comparison was of interest because it emphasized the extremes of commitment along the four stages of adopting mammography. The fifth (table 6) was a comparison specifically between women in the screened and intends to continue group versus the risk of lapsing group (N=4,089). This last comparison was of interest because both groups were women with a history of recent screening who differed primarily in their interest to continue.

Covariates. Several variables were used as covariates for the research questions. They were organized into four broad categories, and included

1. Demographic and health status: age, marital status, ethnicity, limitation to activity, acute and chronic medical conditions at the time of interview, and stress in the preceding year;
2. Resources: income, poverty status, education, working status, has a telephone, and site of health care;
3. Service use and other behavioral factors: most recent clinical breast examination (CBE), most recent Pap test, a composite CBE-Pap test index that considered the timing of both examinations jointly, smoking status, drinking status, exercise status, and knowing breast self-examination;
4. Structural and contextual aspects of one's

living arrangements: type of residence, region of the country, size of standard metropolitan statistical area (SMSA), and number of persons in the household.

The categories used for these covariates are based on the public tape documentation, and are shown in tables 3 through 6. In some cases (income, stress in the past year, Pap test, CBE, knowing breast self-examination), declining to answer and "don't know" responses (for example, for time of last Pap test) were retained to avoid losing cases, and because we considered such answers meaningful. The CBE and Pap test questions were combined in order to examine their joint association with mammography screening status. The apartment-condominium residence variable distinguished persons living on the third floor or higher (that is, Apartment, condominium [high]) from those living nearer to ground level (Apartment, condominium [low]), on the possibility that women on lower floors might feel that they had easier access to the outside. Finally, because the NHIS is an inperson interview, it was possible to include having a telephone as an independent variable.

Results

Descriptive, bivariate, and multivariate statistics were applied to the data. Analyses were conducted taking into consideration the population weights and the survey design. The SUDAAN software package was used for this purpose (37).

Mammography status and future intention

Individual mammography status indicators. Table 1 presents three columns of data for the four individual elements of mammography information, along with the derived stages of adoption. The "No exclusion, adjusted percent" column gives the weighted and design-adjusted data based on the full sample of 10,950 women, without excluding those whose most recent mammogram was health-related. The left-most column shows the unadjusted data for the sample of 9,396 women (see "With exclusion, Unadjusted percent"). The "With exclusion, Adjusted percent" column shows the weighted and design-adjusted data also based on the sample of 9,396.

In this sample of women ages 40-75, the column "With exclusion, Adjusted percent" shows that the ever had rate of mammography was 57.7 percent. Receipt of a mammogram within the preceding 1 or

2 years was reported by an estimated 50.3 percent of the women. Importantly, about 20 percent of the women indicated that a physician's recommendation would serve as the trigger for a next mammogram, and slightly more than 33 percent gave no indication of an intent to have a mammogram in the coming 3 years, if at all.

The summary stage-of-adoption variable indicated that 29.2 percent of the sample was in the No intention group, being currently off-schedule and stating that they had no intention to have a mammogram in the future (that is, before 3 years at least, if at all). Another 18.5 percent were in the Relapse risk group, having been screened recently but expressing no clear intention to have another examination in their age-specific time interval. Women considering having a mammogram (contemplation) accounted for 23.7 percent of the sample. Finally, 28.6 percent of the women were in the Screened, plans to continue group, reporting a mammogram on the age-appropriate schedule along with an intention to have another. Therefore, these stage of adoption groups suggest that the 50.3 percent estimate of mammography in the prior year or 2 was tempered substantially when the intention variable was added to create the Screened, plans to continue group.

The "No exclusion, adjusted percent" column shows mammography status regardless of the reason for the most recent mammogram. Exclusion of recent health-related mammograms acts to reduce the ever had estimate by subtracting equally from the numerator and denominator. Without this exclusion, 63.3 percent of the women said that they had ever had a mammogram. Receipt of a mammogram within the preceding 2 years was reported by 53.6 percent of the sample. The Screened, plans to continue group was slightly higher, although it was still only slightly more than 30 percent.

Mammography history and future intention. Table 2 presents the adjusted data for mammography history and future intention in another format. The ever had and recency of mammogram questions are each presented in cross-tabulation with intention to have a future mammogram. These cross-tabulations are further broken down for women ages 40-50 and women ages 51-75.

Among women ages 40-50, the difference in intention between women who have ever had versus never had a mammogram is evident. Almost half of the women in the never had group expressed no clear intention to have a mammogram in the future (48.9 percent) versus a much smaller percentage of

Table 4. Bivariate and multivariate adjusted odds ratios and 95 percent confidence intervals (CIs) between covariates and having had a mammogram in the past year or 2

| Covariates | Number in sample ¹ | Screened in past year or 2 (percent) | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
|---|-------------------------------|--------------------------------------|----------------------|------------------|----------------------------------|------------------|
| <i>Demographic and health</i> | | | | | | |
| Age: | | | | | | |
| 40–50 years | 3,225 | 51.0 | (^a) | (^a) | (^a) | (^a) |
| 51–64 years | 3,143 | 53.2 | 1.09 | .97,1.23 | 1.46 | 1.26,1.70 |
| 65–75 years | 2,640 | 45.5 | .80 | .71,.90 | 1.34 | 1.10,1.62 |
| Ethnicity: | | | | | | |
| Non-Hispanic white | 7,069 | 52.2 | (^a) | (^a) | (^a) | (^a) |
| Black | 1,330 | 44.4 | .73 | .62,.86 | .82 | .67,1.00 |
| Hispanic | 449 | 40.3 | .62 | .48,.79 | .75 | .57,1.00 |
| All other | 160 | 41.1 | .64 | .44,.93 | .57 | .36,.89 |
| Acute and chronic conditions: | | | | | | |
| None | 3,798 | 47.8 | (^a) | (^a) | (^a) | (^a) |
| One | 2,310 | 52.9 | 1.23 | 1.09,1.38 | 1.18 | 1.02,1.38 |
| Two or three | 1,957 | 54.1 | 1.29 | 1.14,1.46 | 1.42 | 1.18,1.70 |
| Four or more | 943 | 47.6 | .99 | .83,1.18 | 1.66 | 1.28,2.17 |
| Limitation to major activity: | | | | | | |
| Not limited | 6,820 | 51.7 | (^a) | (^a) | (^a) | (^a) |
| Limited (other) | 783 | 47.0 | .83 | .69,.98 | .79 | .61,1.01 |
| Limited (major) | 827 | 46.8 | .82 | .69,.97 | .80 | .64,1.00 |
| Unable (major) | 578 | 41.9 | .67 | .55,.82 | .76 | .56,1.01 |
| Stress in past year: | | | | | | |
| Almost none | 1,156 | 40.8 | (^a) | (^a) | (^a) | (^a) |
| Only a little | 1,942 | 47.8 | 1.33 | 1.11,1.58 | 1.01 | .82,1.25 |
| Moderate | 3,064 | 53.1 | 1.64 | 1.40,1.92 | 1.16 | .95,1.41 |
| A lot | 2,734 | 54.2 | 1.72 | 1.46,2.01 | 1.31 | 1.07,1.61 |
| Don't know, unknown | 112 | 21.2 | .39 | .24,.64 | .93 | .52,1.68 |
| <i>Resources</i> | | | | | | |
| Education: | | | | | | |
| College graduate, postgraduate | 1,463 | 65.4 | (^a) | (^a) | (^a) | (^a) |
| Some college | 1,540 | 58.4 | .74 | .63,.88 | .97 | .79,1.19 |
| High school graduate | 3,697 | 50.4 | .54 | .46,.62 | .94 | .79,1.13 |
| 9–11 years | 1,236 | 37.5 | .32 | .26,.38 | .81 | .64,1.03 |
| 0–8 years | 1,072 | 30.9 | .24 | .19,.29 | .81 | .61,1.07 |
| Income: | | | | | | |
| Less than \$10,000 | 1,377 | 29.1 | (^a) | (^a) | (^a) | (^a) |
| \$10,000–\$19,999 | 1,815 | 38.9 | 1.55 | 1.30,1.85 | 1.42 | 1.13,1.79 |
| \$20,000–\$29,000 | 1,309 | 48.0 | 2.25 | 1.88,2.70 | 1.90 | 1.47,2.44 |
| \$30,000–\$49,999 | 1,565 | 58.8 | 3.49 | 2.87,4.23 | 2.61 | 2.00,3.41 |
| \$50,000 or more | 1,399 | 67.2 | 5.01 | 4.13,6.08 | 3.56 | 2.68,4.72 |
| Missing or declined | 1,543 | 47.8 | 2.24 | 1.86,2.69 | 2.16 | 1.70,2.75 |
| Telephone: | | | | | | |
| Yes | 8,704 | 51.1 | (^a) | (^a) | (^a) | (^a) |
| No | 304 | 23.9 | .30 | .22,.41 | .65 | .45,.94 |
| Health care site: | | | | | | |
| Physician's office | 7,288 | 54.4 | (^a) | (^a) | (^a) | (^a) |
| Hospital or worksite | 360 | 58.3 | 1.17 | .92,1.50 | 1.79 | 1.27,2.51 |
| Emergency room, health center | 213 | 41.6 | .60 | .43,.82 | .75 | .51,1.10 |
| None or unknown | 1,147 | 24.4 | .27 | .23,.32 | .57 | .46,.70 |
| <i>Service use and behavioral factors</i> | | | | | | |
| Smokes: | | | | | | |
| No | 6,936 | 53.6 | (^a) | (^a) | (^a) | (^a) |
| Yes | 2,072 | 39.1 | .55 | .49,.63 | .60 | .52,.69 |
| Exercises: | | | | | | |
| Yes | 3,105 | 60.4 | (^a) | (^a) | (^a) | (^a) |
| No | 5,903 | 45.2 | .54 | .49,.60 | .83 | .72,.94 |
| Drinks: | | | | | | |
| Abstains | 2,205 | 40.4 | (^a) | (^a) | (^a) | (^a) |
| Infrequent | 1,788 | 50.4 | 1.49 | 1.29,1.72 | 1.31 | 1.10,1.56 |
| Former | 929 | 42.1 | 1.07 | .89,1.29 | .82 | .65,1.03 |
| Current | 4,086 | 57.4 | 1.98 | 1.74,2.26 | 1.38 | 1.16,1.63 |

continued

Table 4. Bivariate and multivariate adjusted odds ratios and 95 percent confidence intervals (CIs) between covariates and having had a mammogram in the past year or 2—*continued*

| Covariates | Number in sample ¹ | Screened in past year or 2 (percent) | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
|---|-------------------------------|--------------------------------------|----------------------|------------------|----------------------------------|------------------|
| <i>Service use and behavioral factors—continued</i> | | | | | | |
| Knows breast self-examination: | | | | | | |
| Yes | 8,024 | 52.9 | (²) | (²) | (²) | (²) |
| No or unknown | 984 | 28.8 | .36 | .30,.43 | .65 | .51,.82 |
| Pap test and clinical breast examination: | | | | | | |
| Both 1 year or less | 4,831 | 71.8 | (²) | (²) | (²) | (²) |
| 1 year or less and 1-2 years .. | 381 | 62.8 | .66 | .52,.85 | .65 | .63,.66 |
| Both 1-2 years | 831 | 41.3 | .28 | .23,.33 | .30 | .28,.32 |
| 1 year or less and 3 years or more | 769 | 43.6 | .30 | .25,.36 | .31 | .29,.34 |
| Both 2-3 years | 278 | 26.8 | .14 | .10,.20 | .16 | .15,.18 |
| Both 3 years or more | 1,918 | 3.4 | .01 | .01,.02 | .02 | .01,.02 |
| <i>Structural and contextual</i> | | | | | | |
| Residence: | | | | | | |
| Single home | 7,026 | 52.2 | (²) | (²) | (²) | (²) |
| Apartment, condominium (low) | 1,070 | 45.3 | .76 | .65,.88 | .90 | .85,.96 |
| Apartment, condominium (high) | 425 | 46.9 | .81 | .64,1.02 | .89 | .68,1.18 |
| Mobile home, other | 487 | 35.1 | .49 | .39,.62 | .68 | .51,.89 |
| Region: | | | | | | |
| West | 1,720 | 56.3 | (²) | (²) | (²) | (²) |
| Northeast | 1,971 | 52.7 | .86 | .73,1.02 | .82 | .81,.82 |
| Midwest | 2,255 | 49.0 | .75 | .64,.87 | .68 | .55,.83 |
| South | 3,062 | 46.7 | .68 | .58,.79 | .67 | .55,.81 |
| People in household: | | | | | | |
| One | 2,934 | 47.2 | (²) | (²) | (²) | (²) |
| Two | 3,505 | 53.9 | 1.31 | 1.17,1.46 | .90 | .77,1.04 |
| Three | 1,264 | 50.9 | 1.16 | .99,1.35 | .74 | .60,.91 |
| Four or more | 1,305 | 45.8 | .95 | .82,1.10 | .55 | .44,.69 |
| SMSA characteristics: | | | | | | |
| 1 million or more | 3,760 | 55.0 | (²) | (²) | (²) | (²) |
| 250,000 to 999,999 | 2,354 | 50.4 | .83 | .73,.95 | .87 | .74,1.02 |
| 100,000 to 249,999 | 537 | 45.4 | .68 | .55,.85 | .70 | .54,.91 |
| Under 100,000 | 167 | 56.0 | 1.04 | .76,1.42 | 1.08 | .96,1.22 |
| Not in an SMSA | 2,190 | 42.7 | .61 | .53,.70 | .73 | .61,.88 |
| <i>Bivariate only: not in logistic analysis</i> | | | | | | |
| Marital status: | | | | | | |
| Married | 4,770 | 54.2 | (²) | (²) | NA | NA |
| Widowed | 1,949 | 40.4 | .57 | .51,.64 | ... | ... |
| Divorced, separated | 1,716 | 46.9 | .75 | .66,.85 | ... | ... |
| Never married | 573 | 39.6 | .55 | .45,.68 | ... | ... |
| Poverty status: | | | | | | |
| Above | 7,275 | 53.7 | (²) | (²) | NA | NA |
| Below | 834 | 23.6 | .27 | .22,.33 | ... | ... |
| Unknown | 899 | 40.5 | .59 | .50,.69 | ... | ... |
| Employment: | | | | | | |
| Employed | 4,493 | 54.5 | (²) | (²) | NA | NA |
| Not employed | 4,515 | 46.2 | .72 | .65,.78 | ... | ... |
| Clinical breast examination: | | | | | | |
| 1 year or less | 5,713 | 69.0 | (²) | (²) | NA | NA |
| Between 1 and 2 years | 1,160 | 43.2 | .34 | .29,.40 | ... | ... |
| 3 or more years, never, don't know | 2,135 | 4.0 | .02 | .01,.02 | ... | ... |
| Pap test: | | | | | | |
| 1 year or less | 5,099 | 70.1 | (²) | (²) | NA | NA |
| Between 1 and 2 years | 1,161 | 42.8 | .32 | .27,.37 | ... | ... |
| 3 or more years, never, don't know | 2,748 | 16.4 | .08 | .07,.09 | ... | ... |

¹ The sample sizes are based on the unadjusted N=9,008 which excludes women with missing data on any of the intended covariates. However, entries in all the other columns of the table are based on weighted and design-adjusted data.

² Reference group.
NOTE: SMSA = standard metropolitan statistical area; NA = not applicable.

women who had had a mammogram (12.7 percent). Similarly, notably fewer women in the never had group expressed the intent to have a mammogram in the coming year despite not having yet had one (23.2 percent versus 43.2 percent for those who ever had). The association between most recent mammography and future intention is equally apparent. Less than 15 percent of women who had been screened in the past year or the past 2 years expressed no intention to have the examination, compared with between 28 and 30 percent of women who had had a mammogram at some point, but not within the past 2 years.

Results for women ages 51–75 were at least as strong as for women ages 40–50. About two-thirds of the women in the never had group (66.8 percent) expressed no clear intention to have a mammogram in the future versus 15.9 percent of women who had had a mammogram. Similarly, few women who had never had a mammogram expressed the intent to have one in the coming year (11.4 percent versus 46.8 percent for those who had ever had). The association between most recent mammography and future intention is equally apparent. No intention to have the examination was expressed by only 9.2 percent of women who had been screened in the past year and 19.4 percent of those screened in the past 2 years, compared with 33.8 percent and 47.0 percent of women who had had a mammogram at some point, but not within the past 2 years.

Correlates of mammography. Tables 3–6 present the bivariate and multivariate adjusted odds ratio associations between the covariate variables and the five mammography status indicators. Note in each table that a smaller number of covariates were used in the multivariate logistic analyses than were used for the bivariate odds ratios. Poverty status and employment status were not used in the multivariate analyses in favor of using income, which had a more substantial association with mammography status. The individual clinical breast examination (CBE) and Pap test indicators were not used in favor of a combined index that produced a timeline continuum ranging from both tests having been obtained within the past year to neither test having been obtained in 3 or more years. Finally, marital status was not used in favor of the number of persons in the household, which was considered to reflect a potential for competing demands when several persons lived in the residence. However, these bivariate-only results are shown in the tables, since the variables are still of interest in their own right.

Ever had versus never had. Table 3 shows results for ever had versus never had a mammogram. Several covariates showed a relationship with screening status. Less recent CBE and Pap tests, having no regular source of care, being a smoker, reporting no regular exercise, not knowing breast self-examination, living in a mobile home or trailer park, living anywhere other than in the western region of the United States, having three or more people in the household, and not living in an SMSA were related to less likelihood of having ever had a mammogram in the multivariate analyses. A clear trend toward lower rates was observed for groups other than non-Hispanic whites, even though the multivariate logistic confidence intervals for blacks and Hispanics included 1.00. Similarly, persons with functional limits on major daily activities were at higher risk of not being screened, although the upper confidence interval approached 1.00.

Higher incomes were related to a higher likelihood of screening. Women with more illnesses were more likely to have ever had a mammogram, as was any drinking of alcohol, and women who said that their health care came through a hospital or company-based clinic rather than a private practice office. Ages 65–75 showed a reversal in direction of association when the covariates were entered, showing a greater adjusted likelihood of having been screened at some point. Not having a telephone was associated with lower ever had rates in the bivariate calculations, but its effect was attenuated in the multivariate analyses. Interestingly, as in several other analyses that follow, education also saw its bivariate relationship (less formal education, lower screening rates) attenuated notably in the multivariate model, although income retained its association to a much greater degree. The association for education was localized among women who had not graduated from high school.

Mammogram in previous 2 years versus all others. Table 4 shows results for having been screened in the past 2 years versus less recent screening or never having been screened. Results were similar to those for the ever had indicator, perhaps because such a high percentage of the women who ever had the examination said that their most recent mammogram was within the past 2 years (table 2).

Less recent CBE and Pap tests, having no regular source of care, being a smoker, reporting no regular exercise, not knowing breast self-examination, living in a mobile home or trailer

'About two-thirds of the women in the never had group (66.8 percent) expressed no clear intention to have a mammogram in the future versus 15.9 percent of women who had had a mammogram.'

park, living on the lower floors of an apartment or condominium, living anywhere other than the western region of the United States, having three or more people in the household, and not living in an SMSA were related to less likelihood of having ever had a mammogram in the multivariate analyses.

Clear trends toward lower rates were again observed for groups other than non-Hispanic whites, and for women with limitation to major activities, even though the upper confidence interval for these groups overlapped 1.00 by a small amount. In addition, women without a phone also were less likely to have been screened in the past 2 years, even after multivariate adjustments. Older age was again associated with greater likelihood of screening, after the multivariate adjustments. Higher incomes and any drinking were associated with a greater likelihood of screening in both the bivariate and multivariate analyses. However, the association for education at the bivariate level was not found in the multivariate analysis.

Screened and plans to continue versus all others. Table 5 gives the results for the Screened and plans to continue stage of adoption versus the other three stages combined. Older age now showed a consistently lower likelihood of screening, even in the multivariate analyses. In addition, having no regular source of care, having less than a high school education, being a smoker, having no exercise program, not knowing breast self-examination, not having a recent CBE or Pap test, living in the Northeast, living on the lower floors of an apartment or condominium, having four or more people in the household, and not living in an SMSA were associated with lower screening rates in the multivariate analyses. Higher incomes, having two or more illnesses, receiving care at a hospital or company clinic, and any drinking of alcohol were associated with higher rates.

Screened and intends to continue versus no intention. Table 6 (left-hand portion) shows results specifically for the Screened and will continue stage of adoption versus those women in the No inten-

tion stage. These two groups are the two extremes of the stages of mammography adoption. Older age was associated with a lower likelihood of being in the Screened and will continue group. Higher incomes and regular CBE and Pap testing again showed very strong associations with regular screening. Any current alcohol use also was related to a higher likelihood of screening. Hispanics and other (nonblack) ethnic groups, being a smoker, not exercising regularly, not knowing breast self-examination, not having a regular source of health care, living elsewhere than the western region of the United States, having four or more people in the household, and living elsewhere than an SMSA with 1 million or more persons were associated with a lower likelihood of screening in the multivariate analyses. Having less than a high school education and having some limitation to major activity were also associated with a trend toward less regular screening. As in prior analyses, the association of education with mammography was reduced notably in the multivariate analysis, although some comparisons remained significant beyond the bivariate results.

Screened and intends to continue versus risk of lapsing. Table 6 (right-hand portion) gives the results specifically for the Screened and will continue stage of adoption versus women in the Risk of lapsing group. Among these women who had all been recently screened, the likelihood of intending to continue in the multivariate analysis was lower for women who were 51 and older; who had less than a high school education, lower incomes, who abstained from drinking, and who reported not exercising regularly; who lived in the northeastern region; who had four or more persons living in the household; who had not had a Pap test or CBE in 3 or more years; who lived in a mobile home or trailer park or who lived on the lower floors of an apartment or condominium; and who either lived in an SMSA of less than 100,000 persons or did not live in an SMSA.

Discussion

The data in this report suggest that although progress has been made in increasing the numbers of women who have ever had a mammogram, the challenge of achieving regular screening has not yet been met. As tables 1 and 2 indicate, when intention to continue having mammograms is combined with mammography history to date, rates are reduced notably. An important factor for sustain-

Table 5. Bivariate and multivariate adjusted odds ratios and 95 percent confidence intervals between covariates and being screened with an intention to continue versus all other stages

| Covariates | Number in sample ¹ | Screened and plans to continue (percent) | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
|---|-------------------------------|--|----------------------|------------------|----------------------------------|------------------|
| <i>Demographic and health</i> | | | | | | |
| Age: | | | | | | |
| 40-50 years | 3,174 | 36.5 | (^a) | (^a) | (^a) | (^a) |
| 51-64 years | 3,089 | 26.9 | .64 | .56,.73 | .67 | .58,.78 |
| 65-75 years | 2,596 | 19.4 | .42 | .36,.48 | .58 | .48,.70 |
| Ethnicity: | | | | | | |
| Non-Hispanic white | 6,975 | 29.8 | (^a) | (^a) | (^a) | (^a) |
| Black | 1,296 | 24.7 | .77 | .64,.93 | .91 | .74,1.13 |
| Hispanic | 433 | 22.1 | .67 | .50,.89 | .84 | .61,1.16 |
| All other | 155 | 24.2 | .75 | .47,1.20 | .71 | .42,1.22 |
| Acute and chronic conditions: | | | | | | |
| None | 3,741 | 28.3 | (^a) | (^a) | (^a) | (^a) |
| One | 2,276 | 29.5 | 1.06 | .93,1.21 | 1.06 | .91,1.24 |
| Two or three | 1,920 | 31.0 | 1.14 | .99,1.30 | 1.36 | 1.13,1.64 |
| Four or more | 922 | 22.7 | .74 | .61,.90 | 1.39 | 1.05,1.84 |
| Limitation to major activity: | | | | | | |
| Not limited | 6,715 | 30.4 | (^a) | (^a) | (^a) | (^a) |
| Limited (other) | 770 | 22.4 | .66 | .54,.81 | .79 | .61,1.03 |
| Limited (major) | 808 | 24.1 | .73 | .59,.90 | .86 | .67,1.11 |
| Unable (major) | 566 | 20.6 | .59 | .46,.77 | .88 | .64,1.21 |
| Stress in past year: | | | | | | |
| Almost none | 1,133 | 20.2 | (^a) | (^a) | (^a) | (^a) |
| Only a little | 1,916 | 24.3 | 1.27 | 1.02,1.57 | .91 | .72,1.16 |
| Moderate | 3,026 | 32.6 | 1.91 | 1.58,2.32 | 1.20 | .96,1.50 |
| A lot | 2,682 | 31.7 | 1.84 | 1.50,2.25 | 1.13 | .89,1.43 |
| Don't know, unknown | 102 | 7.3 | .31 | .14,.67 | .70 | .31,1.57 |
| <i>Resources</i> | | | | | | |
| Education: | | | | | | |
| College graduate, postgraduate | 1,438 | 43.0 | (^a) | (^a) | (^a) | (^a) |
| Some college | 1,525 | 36.5 | .76 | .65,.90 | 1.03 | .85,1.25 |
| High school graduate | 3,652 | 28.4 | .53 | .46,.61 | .94 | .79,1.12 |
| 9-11 years | 1,207 | 16.1 | .25 | .20,.32 | .73 | .57,.94 |
| 0-8 years | 1,037 | 10.8 | .16 | .12,.21 | .64 | .46,.88 |
| Income: | | | | | | |
| Less than \$10,000 | 1,348 | 10.4 | (^a) | (^a) | (^a) | (^a) |
| \$10,000-\$19,999 | 1,770 | 17.9 | 1.87 | 1.48,2.37 | 1.54 | 1.18,1.99 |
| \$20,000-\$29,999 | 1,293 | 26.7 | 3.13 | 2.49,3.95 | 2.07 | 1.59,2.70 |
| \$30,000-\$49,999 | 1,549 | 37.9 | 5.25 | 4.19,6.56 | 2.77 | 2.13,3.62 |
| \$50,000 or more | 1,386 | 45.1 | 7.06 | 5.63,8.86 | 3.25 | 2.45,4.32 |
| Missing or declined | 1,513 | 22.5 | 2.49 | 1.95,3.17 | 1.80 | 1.38,2.40 |
| Telephone: | | | | | | |
| Yes | 8,564 | 29.1 | (^a) | (^a) | (^a) | (^a) |
| No | 295 | 12.8 | .36 | .23,.55 | .81 | .50,1.31 |
| Health care site: | | | | | | |
| Physician's office | 7,178 | 31.0 | (^a) | (^a) | (^a) | (^a) |
| Hospital or worksite | 354 | 32.5 | 1.07 | .80,1.43 | 1.40 | 1.02,1.94 |
| Emergency room, health center | 210 | 22.2 | .64 | .45,.90 | .84 | .57,1.25 |
| None or unknown | 1,117 | 14.4 | .37 | .31,.46 | .72 | .57,.90 |
| <i>Service use and behavioral factors</i> | | | | | | |
| Smokes: | | | | | | |
| No | 6,828 | 30.7 | (^a) | (^a) | (^a) | (^a) |
| Yes | 2,031 | 21.7 | .62 | .54,.72 | .68 | .58,.79 |
| Exercises: | | | | | | |
| Yes | 3,063 | 38.7 | (^a) | (^a) | (^a) | (^a) |
| No | 5,796 | 23.5 | .49 | .44,.54 | .72 | .63,.82 |
| Drinks: | | | | | | |
| Abstains | 2,166 | 18.7 | (^a) | (^a) | (^a) | (^a) |
| Infrequent | 1,755 | 28.9 | 1.76 | 1.48,2.10 | 1.51 | 1.24,1.84 |
| Former | 912 | 22.9 | 1.29 | 1.03,1.62 | 1.09 | .85,1.41 |
| Current | 4,026 | 35.1 | 2.35 | 2.02,2.73 | 1.46 | 1.22,1.74 |

continued

Table 5. Bivariate and multivariate adjusted odds ratios and 95 percent confidence intervals between covariates and being screened with an intention to continue versus all other stages—*continued*

| Covariates | Number in sample ¹ | Screened and plans to continue (percent) | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
|---|-------------------------------|--|----------------------|------------------|----------------------------------|------------------|
| <i>Service use and behavioral factors—continued</i> | | | | | | |
| Knows breast self-examination: | | | | | | |
| Yes | 7,908 | 30.6 | (²) | (²) | (²) | (²) |
| No or unknown | 951 | 12.5 | .32 | .26,.41 | .67 | .51,.88 |
| Pap test and clinical breast examination: | | | | | | |
| Both 1 year or less | 4,769 | 43.3 | (²) | (²) | (²) | (²) |
| 1 year or less and 1–2 years .. | 374 | 33.4 | .66 | .51,.85 | .70 | .54,.91 |
| Both 1–2 years | 817 | 14.3 | .22 | .17,.28 | .24 | .21,.27 |
| 1 year or less and 3 years or more | 755 | 23.6 | .40 | .33,.50 | .52 | .41,.64 |
| Both 2–3 years | 273 | 9.3 | .13 | .08,.22 | .18 | .11,.29 |
| Both 3 years or more | 1,871 | 1.4 | .02 | .01,.03 | .03 | .02,.03 |
| <i>Structural and contextual</i> | | | | | | |
| Residence: | | | | | | |
| Single home | 6,912 | 30.3 | (²) | (²) | (²) | (²) |
| Apartment, condominium (low) | 1,049 | 23.4 | .70 | .58,.85 | .88 | .83,.92 |
| Apartment, condominium (high) | 416 | 23.8 | .72 | .54,.95 | .85 | .63,1.15 |
| Mobile home, other | 482 | 17.0 | .47 | .33,.67 | .70 | .48,1.04 |
| Region: | | | | | | |
| West | 1,680 | 33.0 | (²) | (²) | (²) | (²) |
| Northeast | 1,952 | 26.8 | .74 | .60,.92 | .77 | .61,.98 |
| Midwest | 2,216 | 28.8 | .82 | .68,1.00 | .85 | .69,1.06 |
| South | 3,011 | 27.5 | .77 | .63,.94 | .92 | .73,1.16 |
| People in household: | | | | | | |
| One | 2,884 | 22.3 | (²) | (²) | (²) | (²) |
| Two | 3,456 | 30.2 | 1.51 | 1.34,1.70 | 1.02 | .87,1.19 |
| Three | 1,245 | 32.4 | 1.67 | 1.42,1.95 | .91 | .74,1.12 |
| Four or more | 1,274 | 28.1 | 1.36 | 1.15,1.60 | .61 | .52,.72 |
| SMSA characteristics: | | | | | | |
| 1 million or more | 3,693 | 32.9 | (²) | (²) | (²) | (²) |
| 250,000 to 999,999 | 2,316 | 28.3 | .80 | .68,.94 | .82 | .78,.85 |
| 100,000 to 249,999 | 533 | 29.6 | .86 | .68,1.09 | .97 | .74,1.26 |
| Under 100,000 | 165 | 26.0 | .72 | .47,1.10 | .68 | .61,.76 |
| Not in an SMSA | 2,152 | 21.4 | .56 | .47,.66 | .70 | .57,.85 |
| <i>Bivariate only: not in logistic analysis</i> | | | | | | |
| Marital status: | | | | | | |
| Married | 4,703 | 32.1 | (²) | (²) | NA | NA |
| Widowed | 1,917 | 16.1 | .41 | .35,.47 | ... | ... |
| Divorced, separated | 1,679 | 28.4 | .84 | .73,.97 | ... | ... |
| Never married | 560 | 21.6 | .58 | .46,.74 | ... | ... |
| Poverty status: | | | | | | |
| Above | 7,171 | 31.6 | (²) | (²) | NA | NA |
| Below | 810 | 10.0 | .24 | .18,.32 | ... | ... |
| Unknown | 878 | 16.1 | .42 | .33,.52 | ... | ... |
| Employment: | | | | | | |
| Employed | 4,431 | 34.1 | (²) | (²) | NA | NA |
| Not employed | 4,428 | 23.1 | .58 | .52,.65 | ... | ... |
| Clinical breast examination: | | | | | | |
| 1 year or less | 5,634 | 41.2 | (²) | (²) | NA | NA |
| Between 1 and 2 years | 1,142 | 16.2 | .27 | .23,.34 | ... | ... |
| 3 years or more, never, don't know | 2,083 | 1.5 | .02 | .01,.03 | ... | ... |
| Pap test: | | | | | | |
| 1 year or less | 5,033 | 42.0 | (²) | (²) | NA | NA |
| Between 1 and 2 years | 1,139 | 17.4 | .29 | .23,.36 | ... | ... |
| 3 years or more, never, don't know | 2,687 | 8.2 | .12 | .10,.15 | ... | ... |

¹ The sample sizes are based on the unadjusted N=8,859 which excludes women with missing data on any of the intended covariates. However, entries in all the other columns of the table are based on weighted and design-adjusted data.

² Reference group.
NOTE: SMSA = standard metropolitan statistical area; NA = not applicable.

ing higher rates is likely to be found among the women who said that they will have their next mammogram when the physician recommends, as opposed to stating a definite, near-future time frame. This group of women accounted for 20 percent of the population (table 1). Our results therefore continue to support the longstanding observation that physician recommendation is a key ingredient to success, although certainly not the only one.

Several findings seem particularly worth noting, because they appeared across many, if not all, of the mammography status indicators and therefore define important groups of women at-risk of not having mammograms. One of these is that, although education and income both had strong bivariate associations with mammography, it was income that sustained a stronger effect in the logistic models. The multivariate associations for education were localized among the women who had less than a high school education. Perhaps as information about mammography has diffused into society, it may not be knowledge of availability but other factors that act as barriers.

The financial demands of mammography therefore need continued attention in public policy and other intervention efforts, because financial factors are a key element of access to care. The recent initiation of every-other-year, partial coverage of screening for women under Medicare will likely be of some help. However, the association of less screening among women with less than a high school education is distressing and sends a strong message for programs aimed at retaining high school students, even though they are well below screening age.

A second finding, although expected from past studies, is the association of mammography status with not having a regular source of medical care. The odds ratio estimates and absolute numbers for this group are of a magnitude to denote an important target group for outreach. This latter finding was recently supported by research conducted in Massachusetts (38).

The combined CBE and Pap test variable also showed a strong relationship with screening, except in the final analysis where it was attenuated somewhat (table 6, right-hand portion: Screened and will continue versus Risk of lapsing). As tables 3-5 show, the women who had neither examination in 3 years or more were a sizable subgroup (about 1,900). Therefore, the extremely low screening rates in this group denote a considerable population-at-risk. It was important that at least one examination

have been within the past year, and that the other be no more than 2 years earlier. Even if both examinations were between 1 and 2 years ago, the likelihood of screening decreased. The window of opportunity provided by CBE and Pap tests cannot be emphasized too strongly.

Not smoking, having regular exercise, and knowing breast self-examination were consistently associated with greater likelihood of being screened. It was only in the final analysis (table 6, right-hand portion: Screened and will continue versus Risk of lapsing) that smoking status and knowing breast self-examination lost their effects (that is, the 95 percent confidence intervals included 1.00). The results for exercise are especially important due to the large percentage of women who reported not having an exercise routine. The odds ratio estimates therefore apply to a substantial population. In addition, just as results for income and regular source of care imply access barriers to regular screening, these three health practice indicators imply that mammography screening may be part of broader lifestyle issues for certain groups of women. Moreover, the data suggest that having information about these practices may help to identify a target group of underutilizers.

The variables of living in a mobile home or trailer park and not having a telephone merit further attention. Bivariate odds ratios and 95 percent confidence intervals in tables 3-6 were less than 1.00. They were sustained in the logistic models of table 3, table 4, and the right-side of table 6 (for mobile home-trailer park), and in table 3 (for having a telephone). Mobile homes are often located in areas away from concentrations of services, so that proximity, familiarity with local radiology services, and even travel time may become factors. Women without phones lack one of the most common means of contacting, or being contacted by, health care providers. These two variables may also be surrogates for less social integration and having economic limitations. The fact that other logistic covariates tended to account for their bivariate associations should not detract from the fact that these are two groups of women who are more likely to have problems with access to care. In addition, the percentage of women without phones was a one-time assessment. It is likely that the actual numbers of persons who are without phones at some point, and the number of persons who change phone numbers due to relocation, is higher. Although the point-prevalence of not having phones was low, the implication is that telephone-based surveys, recruitment strategies, and

interventions for missed appointments will miss a segment of the population at high risk of not having mammograms.

The results for the racial-ethnic variable also deserve attention. Bivariate odds ratios were regularly less than 1.00, although the multivariate analyses tended to attenuate the associations. As with the mobile home or trailer park and the telephone variables, the bivariate data for race-ethnicity indicate groups who are at higher risk of not being screened, which should not be overshadowed by the multivariate results.

Prior to multivariate adjustment, age group showed that women ages 65–75 were less likely to have been screened. Multivariate adjustment reversed that picture for the ever had versus never had (table 3), and for screening within the past 2 years (table 4). However, when intention was incorporated into the dependent variable (tables 5–6), age 51–64 and 65–75 were related to lower likelihood of regular screening even in the multivariate models. The tendency for women in these age groups not to express a clear intention for future mammograms is noteworthy in its implication that sustained attention may be necessary in order to achieve regular mammography. Moreover, the multivariate results in tables 3 and 4 should not totally take away from the fact that absolute rates were still lower (in the bivariate analyses), and were reversed by statistical correction for colinear factors.

An intriguing and unexpected finding was the consistent association between any consumption of alcohol and a greater likelihood of screening, relative to the lifelong abstainer. However, review of the tables indicates that this discrepancy was due as much or more to the abstainer group having low screening rates as it was to the alcohol-user groups having high rates of mammography. Other analyses (not shown here) indicated that extent of drinking was not a factor in mammography rates; it was the distinction between abstaining and any drinking that was important. Data sets with better information about the reasons for abstaining will be helpful for further investigating this association.

The results in table 6 (right side) for the Screened and will continue versus the Risk of lapsing groups are of particular interest because both groups had been recently screened, and therefore differed on their intention to continue being screened. The fact that even women ages 51–64 (along with women ages 65–75) are at higher risk of not intending to be screened regularly is noteworthy, given the large amount of publicity directed at this group to

encourage having the procedure and the age-related increase in cancer risk. Other at-risk groups are women with less formal education and with lower income, women with no regular exercise, households with four or more persons, women in small SMSA's or not in an SMSA, and even women in the Northeast. Even though getting a woman into screening is a major step, certain groups appear to need extra attention to help prevent lapsing.

A finding in table 2 deserves mention. Specifically, 39.3 percent of women ages 40–50 who said that their most recent mammogram was in the past year also reported an intention to have another within the upcoming year. Nonscreening mammograms had been excluded for table 2. Harris and coworkers (28) raised a caution regarding a potential for overtargeting younger women (that is, in their 30s and 40s), and differences of professional opinion still exist on the routine screening of women ages 40–49 who are asymptomatic or not at-risk due to other factors (35,39). However, the earlier figure of 39.3 percent (for the past year mammogram subgroup only) means that 14.9 percent of the total population of women ages 40–50 expressed an every-year pattern of mammography. This is not a trivial portion of the population, and deserves further attention to identify who these women are and why they intended to be screened again within the year.

Finally, although the NHIS-HPDP provides a strong data set in many respects, it should be remembered that mammography history was based on self-report, not on a check of medical records. Although recollection of mammography is good (40,41), it is also possible that some telescoping of timeframes did occur such that prior mammograms were mistakenly recalled as having occurred in the past year (40). In addition, the NHIS-HPDP cannot provide detail on the processes of personal decision-making surrounding mammography, nor on interactions between women and their physicians.

In sum, the present data convey some measure of ambiguity. Is the cup “half full” as denoted by the current screening rates in table 1, or is it “half empty,” as other data in table 1, table 2, and the at-risk groups of tables 3–6 might denote? Perhaps we are at an important watershed in the diffusion of screening mammography into the population. After 25 years of research and public education, mammography has made many inroads. However, a recent comment by Hankey (42) suggested that screening may be stabilizing at lower levels than expected, reducing potential mortality benefits. Many barriers and challenges still exist, as these

Table 6. Bivariate and adjusted multivariate odds ratios and 95 percent confidence intervals (CI) showing their associations with having been screened and intending to continue versus expressing no intention to have a mammogram and versus risk of lapsing after prior screening

| Covariates | No intention versus screened and will continue ¹ | | | | | Risk of lapsing versus screened and will continue ² | | | | |
|------------------------------------|---|----------------------|------------------|----------------------------------|------------------|--|----------------------|------------------|----------------------------------|------------------|
| | Percent screened and will continue | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI | Percent screened and will continue | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
| <i>Demographic and health</i> | | | | | | | | | | |
| Age: | | | | | | | | | | |
| 40-50 years | 62.5 | (^a) | (^a) | (^a) | (^a) | 71.9 | (^a) | (^a) | (^a) | (^a) |
| 51-64 years | 47.4 | .54 | .46,.64 | .72 | .57,.90 | 55.6 | .49 | .41,.59 | .48 | .39,.59 |
| 65-75 years | 33.7 | .31 | .26,.36 | .51 | .39,.67 | 48.0 | .36 | .30,.44 | .42 | .33,.54 |
| Ethnicity: | | | | | | | | | | |
| Non-hispanic | | | | | | | | | | |
| white..... | 51.3 | (^a) | (^a) | (^a) | (^a) | 61.2 | (^a) | (^a) | (^a) | (^a) |
| Black | 45.2 | .78 | .63,.97 | .87 | .63,1.21 | 58.9 | .91 | .71,1.15 | 1.06 | .82,1.37 |
| Hispanic..... | 39.2 | .61 | .43,.86 | .64 | .42,.96 | 56.4 | .82 | .55,1.23 | .96 | .62,1.48 |
| All other | 41.5 | .67 | .41,1.10 | .47 | .24,.92 | 59.4 | .93 | .52,1.66 | .83 | .41,1.70 |
| Acute and chronic conditions: | | | | | | | | | | |
| None..... | 48.8 | (^a) | (^a) | (^a) | (^a) | 62.9 | (^a) | (^a) | (^a) | (^a) |
| One..... | 52.1 | 1.14 | .97,1.34 | 1.22 | .97,1.54 | 59.6 | .87 | .73,1.04 | .96 | .79,1.17 |
| Two or three..... | 53.9 | 1.22 | 1.04,1.44 | 1.75 | 1.36,2.26 | 61.8 | .95 | .78,1.16 | 1.21 | .95,1.53 |
| Four or more | 39.1 | .67 | .54,.84 | 1.91 | 1.28,2.86 | 50.7 | .61 | .47,.78 | 1.04 | .74,1.46 |
| Limitation to major activity: | | | | | | | | | | |
| Not limited..... | 52.7 | (^a) | (^a) | (^a) | (^a) | 62.5 | (^a) | (^a) | (^a) | (^a) |
| Limited (other) ... | 40.3 | .61 | .48,.76 | .69 | .48,.99 | 51.0 | .62 | .48,.82 | .79 | .58,1.09 |
| Limited (major) ... | 41.1 | .62 | .49,.79 | .70 | .49,.99 | 55.8 | .76 | .58,.98 | .90 | .66,1.24 |
| Unable (major) ... | 35.2 | .49 | .37,.65 | .80 | .51,1.26 | 52.1 | .65 | .47,.89 | .92 | .63,1.36 |
| Stress in past year: | | | | | | | | | | |
| Almost none | 34.1 | (^a) | (^a) | (^a) | (^a) | 52.8 | (^a) | (^a) | (^a) | (^a) |
| Only a little | 43.4 | 1.48 | 1.16,1.88 | .94 | .68,1.30 | 55.2 | 1.10 | .84,1.44 | .90 | .67,1.21 |
| Moderate | 56.2 | 2.48 | 1.99,3.09 | 1.25 | .91,1.71 | 64.5 | 1.63 | 1.27,2.08 | 1.17 | .89,1.55 |
| A lot | 55.1 | 2.37 | 1.89,2.97 | 1.30 | .94,1.79 | 62.5 | 1.49 | 1.15,1.93 | 1.03 | .77,1.38 |
| Don't know, unknown | 10.6 | .23 | .10,.51 | .64 | .26,1.59 | 35.4 | .49 | .18,1.31 | .66 | .24,1.80 |
| <i>Resources</i> | | | | | | | | | | |
| Education: | | | | | | | | | | |
| College graduate, postgraduate ... | 74.1 | (^a) | (^a) | (^a) | (^a) | 67.9 | (^a) | (^a) | (^a) | (^a) |
| Some college | 62.1 | .57 | .45,.72 | .81 | .60,1.12 | 66.0 | .91 | .74,1.13 | 1.04 | .83,1.30 |
| High school graduate..... | 49.8 | .35 | .28,.43 | .80 | .60,1.06 | 60.6 | .73 | .60,.88 | .95 | .78,1.17 |
| 9-11 years | 29.3 | .14 | .11,.19 | .53 | .37,.77 | 48.1 | .44 | .33,.57 | .75 | .55,1.01 |
| 0-8 years..... | 18.0 | .08 | .06,.10 | .51 | .33,.78 | 38.6 | .30 | .21,.42 | .60 | .41,.88 |
| Income: | | | | | | | | | | |
| Less than \$10,000 | 17.6 | (^a) | (^a) | (^a) | (^a) | 40.5 | (^a) | (^a) | (^a) | (^a) |
| \$10,000-\$19,999. | 31.5 | 2.16 | 1.68,2.77 | 1.82 | 1.30,2.55 | 50.5 | 1.50 | 1.12,2.00 | 1.25 | .91,1.70 |
| \$20,000-\$29,999. | 49.3 | 4.56 | 3.53,5.88 | 3.10 | 2.14,4.48 | 60.5 | 2.25 | 1.68,3.01 | 1.57 | 1.12,2.19 |
| \$30,000-\$49,999. | 66.7 | 9.40 | 7.24,12.21 | 4.62 | 3.17,6.72 | 68.3 | 3.17 | 2.38,4.23 | 1.84 | 1.32,2.57 |
| \$50,000 or more . | 74.6 | 13.77 | 10.42,18.19 | 6.05 | 4.02,9.09 | 69.0 | 3.27 | 2.45,4.36 | 1.73 | 1.21,2.49 |
| Missing or declined..... | 38.8 | 2.98 | 2.29,3.88 | 2.25 | 1.58,3.21 | 50.7 | 1.51 | 1.12,2.04 | 1.06 | .76,1.48 |
| Telephone: | | | | | | | | | | |
| Yes..... | 50.6 | (^a) | (^a) | (^a) | (^a) | 60.8 | (^a) | (^a) | (^a) | (^a) |
| No..... | 22.1 | .28 | .17,.44 | .58 | .30,1.10 | 53.7 | .75 | .42,1.31 | 1.18 | .63,2.23 |
| Health care site: | | | | | | | | | | |
| Physician's office. | 54.7 | (^a) | (^a) | (^a) | (^a) | 60.8 | (^a) | (^a) | (^a) | (^a) |
| Hospital or work-site | 61.3 | 1.31 | .92,1.87 | 1.99 | 1.12,3.55 | 58.0 | .89 | .62,1.28 | 1.04 | .71,1.52 |
| Emergency room, health center ... | 43.1 | .62 | .41,.95 | .74 | .41,1.35 | 54.3 | .76 | .46,1.27 | 1.00 | .58,1.73 |
| None or unknown | 21.7 | .23 | .18,.28 | .49 | .37,.65 | 62.7 | 1.08 | .80,1.46 | .97 | .70,1.34 |

continued

Table 6. Bivariate and adjusted multivariate odds ratios and 95 percent confidence intervals (CI) showing their associations with having been screened and intending to continue versus expressing no intention to have a mammogram and versus risk of lapsing after prior screening—*continued*

| Covariates | No intention versus screened and will continue ¹ | | | | | Risk of lapsing versus screened and will continue ² | | | | |
|---|---|----------------------|------------------|----------------------------------|------------------|--|----------------------|------------------|----------------------------------|------------------|
| | Percent screened and will continue | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI | Percent screened and will continue | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
| <i>Service use and behavioral</i> | | | | | | | | | | |
| Smokes: | | | | | | | | | | |
| No | 53.1 | (³) | (³) | (³) | (³) | 61.0 | (³) | (³) | (³) | (³) |
| Yes | 38.1 | .54 | .46,.64 | .52 | .42,.65 | 59.2 | .93 | .76,1.12 | .87 | .70,1.08 |
| Exercises: | | | | | | | | | | |
| Yes | 66.7 | (³) | (³) | (³) | (³) | 66.8 | (³) | (³) | (³) | (³) |
| No | 41.0 | .35 | .31,.40 | .57 | .46,.69 | 56.3 | .64 | .55,.74 | .74 | .63,.87 |
| Drinks: | | | | | | | | | | |
| Abstains | 32.6 | (³) | (³) | (³) | (³) | 50.3 | (³) | (³) | (³) | (³) |
| Infrequent | 50.3 | 2.09 | 1.71,2.57 | 1.72 | 1.29,2.28 | 61.4 | 1.57 | 1.25,1.97 | 1.46 | 1.14,1.87 |
| Former | 40.3 | 1.40 | 1.08,1.81 | .96 | .67,1.37 | 59.2 | 1.43 | 1.09,1.89 | 1.40 | 1.04,1.89 |
| Current | 60.5 | 3.18 | 2.67,3.78 | 1.79 | 1.37,2.32 | 64.4 | 1.79 | 1.47,2.17 | 1.36 | 1.10,1.69 |
| Knows breast self-examination: | | | | | | | | | | |
| Yes | 53.6 | (³) | (³) | (³) | (³) | 61.5 | (³) | (³) | (³) | (³) |
| No or unknown | 20.0 | .22 | .17,.28 | .51 | .48,.54 | 47.2 | .56 | .41,.75 | .81 | .60,1.10 |
| Pap test and clinical breast examination: | | | | | | | | | | |
| Both 1 year or less | 76.7 | (³) | (³) | (³) | (³) | 62.1 | (³) | (³) | (³) | (³) |
| 1–2 yrs | 65.5 | .58 | .41,.81 | .54 | .52,.56 | 62.1 | 1.00 | .71,1.42 | 1.12 | 1.07,1.16 |
| Both 1–2 yrs and 1 year or less and 3 years or more | 29.6 | .13 | .10,.17 | .14 | .12,.16 | 51.2 | .64 | .47,.88 | .63 | .55,.72 |
| Both 2–3 years and 3 years or more | 42.2 | .22 | .17,.28 | .29 | .26,.34 | 55.5 | .76 | .58,.99 | .96 | .86,1.07 |
| Both 3 years or more | 16.5 | .07 | .04,.10 | .08 | .05,.15 | 53.1 | .69 | .36,1.33 | .76 | .37,1.55 |
| Both 3 years or more | 2.0 | .01 | .004,.01 | .01 | .008,.01 | 48.6 | .58 | .31,1.08 | .74 | .57,.97 |
| <i>Structural and contextual</i> | | | | | | | | | | |
| Type of residence: | | | | | | | | | | |
| Single home | 52.0 | (³) | (³) | (³) | (³) | 62.0 | (³) | (³) | (³) | (³) |
| Apartment, condominium (low) | 42.2 | .67 | .54,.84 | .88 | .79,.98 | 54.5 | .73 | .57,.95 | .90 | .87,.92 |
| Apartment, condominium (high) | 46.8 | .81 | .58,1.13 | .84 | .52,1.38 | 53.2 | .69 | .48,1.01 | .90 | .61,1.34 |
| Mobile home, other | 30.6 | .41 | .28,.59 | .81 | .54,1.23 | 51.9 | .66 | .42,1.05 | .80 | .71,.91 |
| Region: | | | | | | | | | | |
| West | 55.1 | (³) | (³) | (³) | (³) | 62.4 | (³) | (³) | (³) | (³) |
| Northeast | 51.3 | .86 | .67,1.10 | .74 | .73,.75 | 53.1 | .68 | .51,.91 | .72 | .53,.98 |
| Midwest | 50.1 | .82 | .65,1.03 | .67 | .50,.91 | 63.6 | 1.05 | .82,1.35 | 1.05 | .81,1.37 |
| South | 45.9 | .69 | .55,.88 | .66 | .49,.89 | 63.1 | 1.03 | .81,1.31 | 1.16 | .89,1.52 |
| People in household: | | | | | | | | | | |
| One | 38.9 | (³) | (³) | (³) | (³) | 52.9 | (³) | (³) | (³) | (³) |
| Two | 51.5 | 1.66 | 1.45,1.91 | .96 | .90,1.02 | 60.3 | 1.35 | 1.15,1.58 | 1.05 | .87,1.26 |
| Three | 55.4 | 1.95 | 1.60,2.37 | .84 | .70,1.02 | 66.4 | 1.76 | 1.41,2.19 | 1.04 | .80,1.35 |
| Four or more | 51.0 | 1.63 | 1.33,2.00 | .59 | .48,.74 | 62.6 | 1.49 | 1.18,1.88 | .74 | .55,1.00 |
| SMSA characteristics: | | | | | | | | | | |
| 1 million or more | 57.7 | (³) | (³) | (³) | (³) | 62.8 | (³) | (³) | (³) | (³) |
| 250,000 to 999,999 | 49.3 | .71 | .59,.86 | .73 | .57,.94 | 59.5 | .87 | .70,1.08 | .85 | .68,1.06 |
| 100,000 to 249,999 | 45.7 | .62 | .46,.82 | .65 | .55,.77 | 69.1 | 1.32 | .94,1.86 | 1.26 | .89,1.78 |
| Under 100,000 | 43.9 | .57 | .36,.92 | .55 | .46,.67 | 53.3 | .68 | .42,1.10 | .58 | .50,.67 |
| Not in an SMSA | 37.6 | .44 | .36,.54 | .59 | .45,.78 | 55.5 | .74 | .59,.92 | .78 | .62,.98 |

continued

Table 6. Bivariate and adjusted multivariate odds ratios and 95 percent confidence intervals (CI) showing their associations with having been screened and intending to continue versus expressing no intention to have a mammogram and versus risk of lapsing after prior screening—*continued*

| Covariates | No intention versus screened and will continue ¹ | | | | | Risk of lapsing versus screened and will continue ² | | | | |
|---|---|----------------------|------------------|----------------------------------|---------------|--|----------------------|------------------|----------------------------------|---------------|
| | Percent screened and will continue | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI | Percent screened and will continue | Bivariate odds ratio | 95 percent CI | Multivariate adjusted odds ratio | 95 percent CI |
| <i>Bivariate only: not in logistic analysis</i> | | | | | | | | | | |
| Marital status: | | | | | | | | | | |
| Married..... | 56.0 | (³) | (³) | NA | NA | 62.5 | (³) | (³) | NA | NA |
| Widowed..... | 28.6 | .31 | .27,.37 | ... | ... | 45.9 | .51 | .42,.62 | ... | ... |
| Divorced, separated..... | 46.4 | .68 | .57,.80 | ... | ... | 63.9 | 1.06 | .87,1.29 | ... | ... |
| Never married ... | 38.7 | .49 | .37,.65 | ... | ... | 58.6 | .85 | .60,1.18 | ... | ... |
| Poverty status: | | | | | | | | | | |
| Above..... | 55.0 | (³) | (³) | NA | NA | 62.6 | (³) | (³) | NA | NA |
| Below..... | 16.6 | .16 | .12,.22 | ... | ... | 45.3 | .49 | .35,.71 | ... | ... |
| Unknown..... | 28.2 | .32 | .25,.41 | ... | ... | 43.5 | .46 | .35,.60 | ... | ... |
| Employment: | | | | | | | | | | |
| Employed..... | 59.9 | (³) | (³) | NA | NA | 65.7 | (³) | (³) | NA | NA |
| Not employed.... | 39.6 | .44 | .39,.50 | ... | ... | 54.4 | .62 | .54,.72 | ... | ... |
| Clinical breast examination: | | | | | | | | | | |
| 1 year or less | 73.2 | (³) | (³) | NA | NA | 61.5 | (³) | (³) | NA | NA |
| Between 1 and 2 years..... | 32.7 | .18 | .14,.22 | ... | ... | 54.9 | .76 | .59,.99 | ... | ... |
| 3 years or more, never, don't know | 2.3 | .01 | .006,.01 | ... | ... | 46.2 | .54 | .32,.91 | ... | ... |
| Pap test: | | | | | | | | | | |
| 1 year or less | 74.9 | (³) | (³) | NA | NA | 62.1 | (³) | (³) | NA | NA |
| Between 1 and 2 years..... | 34.8 | .18 | .14,.23 | ... | ... | 53.9 | .71 | .54,.93 | ... | ... |
| 3 years or more, never, don't know..... | 12.9 | .05 | .04,.06 | ... | ... | 55.0 | .75 | .59,.95 | ... | ... |

¹The data on the left hand-side of this table represent the weighted and design-adjusted estimates. Actual sample size was 2,420 for "screened and will continue" versus N = 2,650 for "no intention."

²The data on the right hand-side of this table represent the weighted and

design-adjusted estimates. Actual sample size was 2,420 for "screened and will continue" versus N = 1,669 for "risk of lapsing."

³Reference group.

NOTE: SMSA = standard metropolitan statistical area; NA = not applicable.

data and reports such as that by Costanza and coworkers (43) demonstrate. As Zapka and coworkers (38) showed, predisposing, need, and enabling health system factors all affect screening. In their population, income was particularly related to repeat mammography, with lower income women less likely to report use. Future reports should consider using stages-of-adoption such as those used by Zapka (38) and this study.

Whether or not adoption can become even more widespread to achieve the year 2000 goals will depend upon our ability to work successfully with groups of women who have not yet been reached in substantial numbers, and upon guarding against lapsing among the women who have already been screened. Integrating mammography behavior with future intention may help to target interventions by identifying groups of women who are at-risk of either not starting to have mammograms or not continuing to be screened once they have begun.

Our data therefore support the findings on the salience of intention by Mayer and coworkers (27) and Harris and coworkers (28). Women's statements of intention or doubt about the procedure should be taken seriously and addressed by health care providers. It is important to remember, however, that socioeconomic resources and access to care may be factors influencing intention. Without the window of opportunity that accompanies access and economic resources, focusing on intention as a variable will result in placing responsibility for screening solely and inappropriately on the woman.

References.....

1. Levin, B., and Murphy, G.: Revision in American Cancer Society recommendations. *CA Cancer J Clin* 42: 296-299 (1992).
2. Vanchieri, C.: Medical groups' message to women. *J Natl Cancer Inst* 81: 1126-1128 (1989).

3. U.S. Preventive Services Task Force: Guide to clinical preventive services. Williams and Wilkins, Baltimore, 1989.
4. Public Health Service: Healthy people 2000: national health promotion and disease prevention objectives. DHHS Publication No. (PHS) 91-50212, U.S. Government Printing Office, Washington, DC, 1990.
5. Greenwald, P., and Sondik, E.J.: Cancer control objectives for the nation. NCI Monographs 2: 1-105 (1986).
6. Boss L. P., and Guckes, F. H.: Medicaid coverage of screening tests for breast and cervical cancer. *Am J Public Health* 82: 252-253 (1992).
7. Reynolds, T.: States begin CDC-sponsored breast and cervical cancer screening. *J Natl Cancer Inst* 84: 7-9, Jan. 1, 1992.
8. Dawson, D. A., and Thompson, G. B.: Breast cancer risk factors and screening: United States, 1987. *Vital Health Stat* [10], No. 172. DHHS Publication No. (PHS) 90-1500, National Center for Health Statistics, Hyattsville, MD, January 1990.
9. Fulton, J. P., et al.: A study guided by the Health Belief Model of the predictors of breast cancer screening of women ages 40 and older. *Public Health Rep* 106: 410-420, July-August 1991.
10. Lerman, C., et al.: Factors associated with repeat adherence to breast cancer screening. *Prev Med* 19: 279-290 (1990).
11. Stein, J. A., Fox, S. A., and Murata, P. J.: The influence of ethnicity, socioeconomic status, and psychological barriers on use of mammography. *J Health Soc Behav* 32: 101-113 (1991).
12. Lane, D. S., Polednak, A. P., and Burg, M. A.: Breast cancer screening practices among users of county-funded health centers vs women in the entire community. *Am J Public Health* 82: 199-203 (1992).
13. The NCI Breast Cancer Screening Consortium: Screening mammography—a missed clinical opportunity? Results of the NCI Breast Cancer Screening Consortium and National Health Interview Survey Studies. *JAMA* 264: 54-58, July 4, 1990.
14. Burack, R. C., and Liang, J.: The early detection of cancer in the primary care setting: factors associated with the acceptance and completion of recommended procedures. *Prev Med* 16: 739-751 (1987).
15. Harris, R. P., et al.: Prompting physicians for preventive procedures: a five year study of manual and computer reminders. *Prev Med* 6: 145-152 (1990).
16. Nattinger, A. B., Panzer, R. J., and Janus, J.: Improving the utilization of screening mammography in primary care practices. *Arch Intern Med* 149: 2087-2092 (1989).
17. Chambers, C. V., et al.: Microcomputer-generated reminders: improving the compliance of primary care physicians with mammography screening guidelines. *J Family Pract* 29: 273-280 (1989).
18. Lurie, N., et al.: Preventive care: do we practice what we preach? *Am J Public Health* 77: 801-804 (1987).
19. Reeder, S., Berkanovic, E., and Marcus, A. C.: Breast cancer detection behavior among urban women. *Public Health Rep* 95: 276-281, May-June 1980.
20. Howard, J.: Using mammography for cancer control: an unrealized potential. *CA Cancer J Clin* 37: 33-48 (1987).
21. Hayward, A. A., Shapiro, M. F., Freeman, H. E., and Corey, C. R.: Who gets screened for cervical and breast cancer? Results from a new national survey. *Arch Intern Med* 148: 1177-1181 (1988).
22. Behavioral risk factor surveillance - selected states, 1987. *MMWR Morb Mortal Wkly Rep* 38: 469-473, July 14, 1989.
23. Anda, R. F., et al.: Screening mammography for women 50 years of age and older: practices and trends, 1987. *Prev Med* 6: 123-129 (1990).
24. Use of mammography - United States, 1990. *MMWR Morb Mortal Wkly Rep* 39: 621-630, Sept. 14, 1990.
25. Zapka, J. G., Stoddard, L., and Costanza, M. E.: Interval adherence to mammography screening guidelines. *Med Care* 29: 697-708 (1991).
26. Zapka, J. G., Stoddard, A. M., Costanza, M. E., and Greene, H. L.: Breast cancer screening by mammography: utilization and associated factors. *Am J Public Health* 79: 1499-1502 (1989).
27. Mayer, J. A., et al.: Mammography knowledge and intentions among insured women. *Prev Med* 21: 8-17 (1992).
28. Harris, R. P., et al.: Mammography and age: are we targeting the wrong women? A community survey of women and physicians. *Cancer* 67: 2010-2014 (1991).
29. Rakowski, W., et al.: Assessing elements of women's decision-making about mammography. *Health Psychol* 11: 111-118 (1992).
30. Rakowski, W., Fulton, J. P., and Feldman, J. P.: Stages-of-adoption and women's decision-making about mammography. *Health Psychol* 12: 209-214 (1993).
31. Prochaska, J. O., and DiClemente, C. C.: Transtheoretical therapy: toward a more integrative model of change. *Psychother Theory, Res, Pract* 20: 161-173 (1982).
32. Prochaska, J. O., and DiClemente, C. C.: The transtheoretical approach: crossing the traditional boundaries of therapy. Dow Jones/Irwin, Chicago, 1984.
33. Schoenborn, C.: 1990 National Health Interview Survey of Health Promotion and Disease Prevention: sample person file. (Public data tape documentation.) National Center for Health Statistics, Hyattsville, MD, September 1991.
34. Gordillo, C.: Breast cancer screening guidelines agreed on by AMA, other medically related organizations. *JAMA* 262: 1155, Sept. 1, 1989.
35. Rutqvist, L. E., et al.: Chapter IV: reduced breast-cancer mortality with mammography screening—an assessment of currently available data. *Int J Cancer (suppl.)* 5: 76-84 (1990).
36. Dodd, G. D.: American Cancer Society guidelines on screening for breast cancer: an overview. *CA Cancer J Clin* 42: 177-180 (1992).
37. Shah, B.: SUDAAN: Professional software for survey data analysis. Research Triangle Institute, Research Triangle Park, NC, 1989.
38. Zapka, J., et al.: Changes in mammography use: economic, need and service factors. *Am J Public Health* 82: 1345-1351 (1992).
39. Hayward, R. S., et al.: Preventive care guidelines: 1991. *Ann Intern Med* 114: 758-783 (1991).
40. Degnan, D., et al.: Measuring the use of mammography: two methods compared. *Am J Public Health* 82: 1386-1388 (1992).
41. King, E. S., et al.: How valid are mammography self-reports? *Am J Public Health* 80: 1386-1388 (1990).
42. Hankey, B.: Breast cancer incidence, 1973-1989. *J Natl Cancer Inst* 84: 1467 (1992).
43. Costanza, M. E., et al.: Feasibility of universal screening mammography. *Arch Intern Med* 151: 1851-1856 (1991).