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Breast Cancer Risk and Provider Recommendation for Mammography Among Recently Unscreened Women in the United States

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BACKGROUND AND OBJECTIVE: Many women with increased breast cancer risk have not been screened recently. Provider recommendation for mammography is an important reason many women undergo screening. We examined the association between breast cancer risk and reported provider recommendation for mammography in recently unscreened women.

DESIGN: Cross-sectional study using 2000 National Health Interview Survey.

PARTICIPANTS: In all, 1673 women ages 40 to 75 years without cancer who saw a health care provider in the prior year and had no mammogram within 2 years.

MEASUREMENTS AND ANALYSIS: We assessed breast cancer risk by Gail score and risk factors. We used multivariable logistic regression models in SUDAAN adjusted for age, race and illness burden, to examine the association between risk and reported recommendation for mammography within 1 year for all women and women ages 50 to 75 years.

RESULTS: Of 1673 recently unscreened women, 29% reported a recommendation. Twelve percent of women had increased Gail risk and of these recently unscreened, high-risk women, 25% reported a recommendation. After adjustment, high-risk women were not more likely to report a recommendation than average-risk women. Results were similar for women 50 to 75 years old. No individual breast cancer factors other than age were associated with reporting a recommendation.

CONCLUSIONS: Approximately 70% of recently unscreened women seen by a health care provider in the prior year reported no recommendation for mammography, regardless of breast cancer risk. This did not include women who received a recommendation and were screened. Increasing reported recommendation rates may represent an opportunity to increase screening participation among recently unscreened women, particularly for women with increased breast cancer risk.

KEY WORDS: breast cancer risk; provider recommendation; mammography.
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Mammography screening reduces breast cancer mortality for women 50 to 69 years old,[1] yet many women remain unscreened.[2] Moreover, up to 16% of women over age 40 years have increased breast cancer risk[3] and, although high-risk women have higher screening rates than average-risk women,[4] approximately one-third of high-risk women have not been screened recently.[4,5]

Possible contributors to the failure of some high-risk women to be screened include lower educational attainment and less access to care.[4] Provider recommendation is an important reason many women receive screening.[6–11] Similarly, lack of recommendation is associated with failure to be screened,[12–13] and evidence suggests that 25% to 45% of women report not receiving a recent recommendation for mammography.[11,12,14,15]

Few studies examine the influence of breast cancer risk on provider recommendation, and most assess individual risk factors rather than overall risk. Studies evaluating family history, prior breast problems or abnormal mammograms show inconsistent results.[6,11,15–19] However, in a survey of physicians using vignettes, providers more often indicated they would recommend mammography for women with increased risk.[17] Whether this reflects actual practices is uncertain. In this context, we examined the association between breast cancer risk and provider recommendation for mammography, using a sample of recently unscreened women seen by a health care provider in the prior year. We hypothesized that among these recently unscreened women, high-risk women would more likely report a recommendation than lower risk women, because providers may more likely recommend high-risk women have annual vs. biennial screening or initiate screening in their forties.

METHODS

We used data from the 2000 National Health Interview Survey (NHIS),[20] a nationally representative sample of the civilian, noninstitutionalized U.S. population. NHIS is an annual survey administered by the National Center for Health Statistics through in-person interviews. One adult per household was randomly selected to provide self-reported information about health status, access to care and sociodemographics for the Sample Adult Core, and about cancer, screening, and risk in

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the Cancer Control Module. This included factors required to calculate Gail scores.[21] The overall response rate was 72%.

Sample

We identified 3064 women ages 40 to 75 years who reported no mammogram within two years. Consistent with other studies of mammography counseling,[8] we chose 40 years because many organizations recommend screening initiation at this age,[22–25] and therefore many women may receive screening recommendations in their 39th or 40th years. We chose 75 years because screening recommendations are less clear for women over age 75 years. We excluded 159 women with cancer history or missing this information, 498 women missing information about recommendations, and 734 with no provider visits within the prior year or missing this information. Our final sample included 1673 recently unscreened women seen by a health care provider in the prior year.

Women excluded because they had no visit within the prior year were more likely than women in our study to be nonwhite (35% vs 26%), lack health insurance (34% vs 17%) or usual source of care (40% vs 10%), report better than fair health status (91% vs 80%) or no comorbid illnesses (93% vs 76%), and were slightly less likely to have increased Gail risk (10% vs 12%).

Provider Recommendation

Our outcome was respondent-reported provider recommendation for mammography within the prior year, and was determined from two questions. Women not screened in 2 years (recently unscreened) were asked the main reason they were not screened. Response options are shown in Table 4. Women giving responses other than lack of physician order or lack of physician were subsequently asked if a provider recommended mammography in the previous year. We considered women to have received no recommendation within the prior year if they indicated the main reason they were recently unscreened was lack of physician order or lack of physician, or if they responded to the second question that they did not receive a recommendation. In NHIS, information about provider recommendation is available only for recently unscreened women. Therefore our study did not include women who received a recommendation and were subsequently screened.

Using the same question, we also explored reasons high-risk women were not screened.

Breast Cancer Risk

For overall breast cancer risk, we calculated 5-year Gail scores using the modified Gail model.[21,26] These scores estimate risk of developing breast cancer within 5 years, based on age, age at menarche, age at first birth, number of benign breast biopsies, and number of first-degree relatives with breast cancer. Biopsies included reported needle biopsies or tumor/lump excisions. We classified 793 women who never had a mammogram (and were not asked about biopsies) as having no biopsy because it is unlikely a woman would have a biopsy without prior mammography. Women missing age at menarche ($n=123$) were assigned to the modal group (12 to 13 years). We dichotomized Gail scores into increased risk ($>1.66\%$) and average risk ($<1.66\%$).[27] Individual breast cancer risk factors considered included age, age at menarche, age at first birth, prior biopsy, and breast cancer in a first-degree relative.

Other Covariates

We considered age, race/ethnicity, education, income, region, urban residence, body mass index (BMI), prior mammography, abnormal mammography, cancer risk perception, illness burden, and access to care. Cancer risk perception was determined from "Would you say your risk of getting cancer in the future is low, medium, or high?" Illness burden included hospitalizations within 1 year, health status, and comorbid illnesses, including coronary artery disease, other heart disease, stroke, emphysema, weak/failing kidneys and diabetes.

For access to care, we examined health insurance, usual source of care, number of health care visits and types of providers contacted in the prior year. We defined five categories of provider type including primary care provider (PCP) for adults only, PCP for adults and children, gynecologist, PCP and gynecologist, and neither PCP nor gynecologist. PCP type (adult vs adult/child) was determined from "In the past 12 months, have you seen or talked to a general doctor who treats a variety of illnesses (a doctor in general practice, family medicine or internal medicine)?" and "Does that doctor treat children and adults?" Among women reporting contact with neither a PCP nor gynecologist, 36% reported contact with a specialist and 11% with a nurse practitioner, physician's assistant or midwife.

Analysis

We performed bivariable analyses using χ^2 tests and used multivariable logistic regression models to evaluate the association of breast cancer risk with reported recommendation after adjusting for age, race and illness burden. We created three separate models. The first evaluated the association between recommendation and risk by Gail score for all women. The second evaluated the association between reported recommendation and risk by individual breast cancer factors (considered in a separate model because multiple factors are incorporated in calculating Gail scores). The third model evaluated the association between reported recommendation and Gail risk for women ages 50 to 75 years ($n=839$), because there is more controversy regarding screening women in their forties. Finally, because provider recommendation in NHIS was ascertained for women not screened within 2 years, we repeated our analysis for women 42 to 75 years old ($n=1403$). Other covariates with $P<.20$ in unadjusted analyses were initially included in the models. We used backward elimination to identify significant factors after adjustment. Confounders ($\Delta\beta$ for Gail score $>10\%$) were included in the model.[28] We also evaluated a potential interaction between Gail risk and previous mammography. Because information on income, provider type, risk perception and BMI was missing for $>5\%$ of women, we created an indicator for missing data for these covariates. Reference categories were selected according to the largest category. We used SUDAAN (version 8.1 RTI International, Research Triangle Park, NC) for all analyses to account for the complex sampling design and weight results to reflect national estimates.

Table 1. Characteristics of Recently Unscreened Women According to Breast Cancer Risk Status, 2000 National Health Interview Survey (n=1673)

	Breast Cancer Risk		
	Overall n (%*)	Increased (n=198) %*	Average (n=1442) %*
Age (y)			
40 to 49	810 (51)	11	57
50 to 59	351 (21)	14	21
60 to 75	512 (29)	75	22
Race/ethnicity			
White	1070 (74)	93	71
Black	254 (11)	2	12
Hispanic/other	349 (15)	5	16
Education			
< High school	463 (24)	25	23
High school/GED	540 (35)	37	35
Some college/AA	397 (25)	21	25
College+graduate	257 (17)	17	17
Income			
< $20,000	607 (28)	33	28
$20 to 34,999	474 (32)	40	31
$35 to 64,999	268 (19)	18	20
≥ $65,000	230 (20)	10	22
Region			
Northeast	302 (19)	29	18
Midwest	365 (23)	26	23
South	667 (40)	33	41
West	339 (18)	12	19
Urban			
Yes	1227 (72)	70	72
No	446 (28)	30	28
BMI (kg/m^2)			
<19	64 (4)	7	3
19 to 24.9	602 (39)	43	39
25 to 29.9	474 (30)	26	31
≥30	447 (27)	24	28
Age at menarche (y)			
8 to 11	321 (20)	20	20
12 to 13	930 (56)	57	55
≥14	418 (25)	24	25
Age at first birth (y)			
<20	481 (28)	9	31
20 to 24	530 (34)	25	36
25 to 29/ nulliparous	513 (30)	54	27
≥30	118 (7)	12	6
Breast biopsy			
Yes	84 (5)	22	3
No	1589 (95)	78	97
Family History			
Yes	116 (7)	38	3
No	1557 (93)	62	97
Previous Mammogram			
Yes	874 (54)	64	53
No	793 (46)	36	47
Abnormal Mammogram			
Yes	63 (4)	13	3
No	1601 (96)	87	97
Risk perception			
High	164 (10)	15	9
Low/medium	1380 (90)	85	91
Insurance			
Yes	1351 (83)	96	81
No	316 (17)	4	19
Usual source			
Yes	1491 (90)	95	89
No	172 (10)	5	11
Provider			
Adult PCP	287 (16)	20	16
Adult/child PCP	629 (41)	50	40
PCP+GYN	291 (18)	9	20
GYN only	119 (8)	6	8
Neither	243 (16)	15	16
# Visits			
1 to 3	849 (52)	49	52
4 to 7	410 (23)	28	22
>7	414 (25)	23	25
# Comorbidities			
0	1257 (76)	67	78
1	296 (17)	21	16
≥2	120 (7)	12	6
# Hospitalizations			
0	1480 (90)	87	90
1	135 (7)	7	7
≥2	58 (3)	6	3
Health status			
E/VG/G	1301 (80)	82	80
F/P	372 (20)	18	20

**All percentages weighted to reflect national estimates.*
GED, general equivalency degree; AA, associate degree; E, excellent; VG, very good; G, good; F, fair; P, poor; GYN, gynecologist; PCP, primary care provider; BMI, body mass index.

RESULTS

Our sample included 1673 recently unscreened women seen by a provider in the prior year, representing an estimated 9.4 million women nationwide. Table 1 presents the sample characteristics. Overall, 12.4% of women had increased breast cancer risk by Gail score, 20% had early age at menarche (8 to 11 years), 37% had age at first birth ≥25 years or nulliparity, 5% reported a breast biopsy, 7% had a family history of breast cancer, and 4% had an abnormal mammogram. Ten percent perceived their cancer risk as high.

Overall, 29% of recently unscreened women studied ages 40 to 75 years reported a provider recommendation for mammography, which was essentially unchanged among and women ages 42 years or older (30%) and women ages 50 to 75 years (30%). The unadjusted associations of risk and reported recommendation are shown in Tables 2 and 3. Before adjustment, we found no significant difference in reported recommendation between women with increased Gail risk and average-risk women, with few women in either group reporting a recommendation. We also observed no significant differences in reported recommendation according to any individual breast cancer factors.

After adjustment (Table 3), high-risk women were not more likely to report a recommendation. Age, income, provider type and region were significant. No interaction was observed between previous mammography and Gail risk. In our model evaluating individual breast cancer factors, no individual factors were associated with reported recommendation (data not shown). The association between risk and recommendation was similar among women ages 42 to 75 years but the effect of age was attenuated and no longer significant (data not shown). Among women at least 50 years old, the association between Gail risk and reported recommendation was essentially unchanged (adjusted odds ratio (AOR) 0.65, 95%

Table 2. Provider Recommendation for Mammography Among Recently Unscreened Women According to Breast Cancer Factors, 2000 National Health Interview Survey (n=1673)

	Provider Recommendation Reported		
	n	%*	*P*†
Age at menarche (y)			.22
8 to 11	97	33	
12 to 13	248	27	
≥14	123	30	
Age at first birth (y)			.61
<20	142	30	
20 to 24	138	28	
25 to 29	151	30	
≥30	33	25	
Breast biopsy			.22
Yes	25‡	37	
No	443	29	
Family history			.63
Yes	29‡	27	
No	439	29	

*All percentages weighted to reflect national estimates.
†χ^2 test.
‡Estimate based on an a sample size with <30 respondents and should be interpreted with caution, as may not meet the standard of reliability or precision.

confidence interval (CI) (0.40 to 1.07)). Income, region and provider type remained significant, although the association with income was stronger (AOR 1.64, 95% CI (0.99 to 2.71) for income $20,000 to 34,999, 2.13 (1.20 to 3.76) for income $35,000 to $64,999, and 2.75 (1.43 to 5.29) for income ≥$65,000).

We further explored possible reasons some high-risk women were not screened (Table 4). The most common reason was "never thought about it/no reason" (34%). Furthermore, 24% of high-risk women reported the main reason was either lack of physician recommendation or "didn't need/know I needed it." Of women with prior biopsy, family history, abnormal mammograms or age ≥60 years, 20% to 23% cited these two reasons (data not shown).

DISCUSSION

In this nationally representative sample, 71% of recently unscreened women who saw a provider in the prior year did not report receiving a recommendation for mammography. Overall, 12% of recently unscreened women had increased breast cancer risk by Gail score (an estimated 1.15 million women nationally) and 25% of high-risk women reported a screening recommendation.

Our findings indicate that an estimated 9.4 million women nationwide in this age group who saw a provider in the prior year have not been recently screened (of an estimated 45.6 million U.S. women without cancer in this age range). This is a conservative estimate because we did not include women with cancer or missing information about provider recommendation. Less than one-third of recently unscreened women studied recalled a screening recommendation, despite a recent provider visit. Among women 50 years or older, the result was similar. In a 1991 study, 52% of women over age 50 years with no mammogram in the previous year reported ever receiving a physician recommendation.[7] In another study, screening recommendations were given during 48% of visits

Table 3. Associations of Breast Cancer Risk With Provider Recommendation for Screening Mammography Among Recently Unscreened Women, 2000 National Health Interview Survey (n=1673)

	Women Reporting Provider Recommendation (%*) (n=1673)		Adjusted Odds Ratio (AOR) for Reported Recommendation (n=1640)†
		P‡	AOR§ (95% CI)
Gail score			
Average	423 (30)	.22	1.00
Increased	42 (25)		0.70 (0.45, 1.09)
Age (y)			
40 to 49	225 (28)	.39	1.00
50 to 59	113 (33)		1.53 (1.07, 2.17)
60 to 75	130 (28)		1.32 (0.93, 1.88)
Race/ethnicity			
White	309 (30)	.46	1.00
Black	80 (31)		1.13 (0.79, 1.62)
Hispanic/Other	79 (26)		0.80 (0.54, 1.18)
Income			
<$20,000	140 (24)	.005	1.00
$20 to 34,999	123 (26)		1.19 (0.81, 1.73)
$35 to 64,999	93 (34)		1.81 (1.17, 2.79)
≥$65,000	84 (36)		1.88 (1.22, 2.90)
Region			
South	167 (25)	.06	1.00
Northeast	108 (36)		1.76 (1.20, 2.60)
Midwest	100 (29)		1.25 (0.89, 1.77)
West	93 (30)		1.36 (0.93, 2.00)
Provider			
Adult/child PCP	169 (28)	<.001	1.00
Adult PCP	80 (31)		1.21 (0.80, 1.83)
PCP+GYN	113 (41)		1.77 (1.26, 2.49)
GYN only	39 (31)		1.32 (0.78, 2.21)
Neither	36 (17)		0.52 (0.32, 0.86)
# Comorbidity			
0	340 (28)	.22	1.00
1	89 (32)		1.31 (0.92, 1.87)
≥2	39 (35)		1.37 (0.79, 2.37)
Health status			
E/VG/G	361 (29)	.40	1.00
F/P	107 (31)		1.17 (0.80, 1.72)
Hospitalizations			
0	413 (29)	.43	1.00
1	43 (36)		1.28 (0.78, 2.12)
≥2	12 (28)		0.86 (0.38, 1.94)

*All percentages weighted to reflect national estimates.
†Thirty-three women missing information on Gail risk.
‡χ^2 tests.
§Adjusted for variables shown.
E, excellent; VG, very good; G, good; F, fair; P, poor.

by never screened women presenting for nonacute care.[15] Differences among studies may reflect differences in samples, interval since recommendation, temporal change or other factors. However, our findings and others' suggest that many unscreened women report no mammography recommendation, even when in contact with providers.

Our findings also suggest that there are many recently unscreened, high-risk women (12%), and most did not report a provider recommendation for screening. Furthermore, risk was not associated with reported recommendation in this population. We found this to be so whether risk was assessed by Gail score or individual factors, except age, that might be more recognizable. One possible explanation is that women may fail to recognize personal risk and therefore not discuss risk with providers. Evidence suggests that women are more likely to receive a recommendation during visits where they request a

Table 4. Most Important Reasons Recently Unscreened Women Reported Not Receiving Screening According to Breast Cancer Risk, 2000 National Health Interview Survey (n=1631*)

	Breast Cancer Risk by Gail Score	
	Increased (n=197) %†	Average (n=1434) %†
No reason/never thought about it	34	38
Didn't need/know I needed	10	6
Doctor didn't order/say I needed it	14	14
Haven't had any problems	12	7
Put it off/didn't get around to it	10	14
Too expensive/no insurance/cost	7	9
Too painful/unpleasant/embarrassing	3	5
I'm too young	0	2
Don't have doctor	<1	<1
Other reason	10	4

*33 missing information about Gail risk, 9 missing information about the main reason they were not screened.
†Percentages weighted to reflect national estimates.

mammogram.[15] Although high-risk women in our study more often perceived high risk for developing cancer than average-risk women, only 15% of high-risk women perceived high risk, while 54% perceived low risk. Inaccuracy in risk perception among high-risk women is consistent with other studies.[4,29] Despite this, risk perception was not associated with reported recommendation among recently unscreened women, and in another study differences in screening between risk groups were not explained by cancer risk perception.[4] However, more than 40% of high-risk women reported the main reason they were not screened was "no reason/never thought about it" or "didn't need/know I needed it," suggesting many recently unscreened, high-risk women may be unaware of their risk and the potential role for mammography.

Another possibility is that providers may not recognize risk. This may be consistent with studies of breast cancer risk assessment suggesting providers may inaccurately assess risk, inconsistently ascertain or consider some risk factors,[30–34] and may not feel confident counseling about cancer risk.[35] As above, the main reasons many high-risk women in our study were not screened were lack of doctor's order, not thinking about it or knowing they needed it. This could reflect lack of awareness of risk or poor risk communication by providers. We are unaware of other studies evaluating risk and recommendation among recently unscreened women, although studies including screened women showing no association between risk and recommendation[6,11,18] also raise this possibility. However, others note a relationship between risk and recommendation,[15,16,17] and in one study high-risk women were more likely to undergo screening than average-risk women,[4] suggesting providers may consider risk when counseling about screening. Possible explanations for these discrepancies include variation among physicians in identifying and counseling high-risk women, or variation among women in recalling counseling.

The lack of association between risk and recommendation could reflect similar recommendations to women despite awareness of risk. This also could be consistent with the lack of association between risk and recommendation found in some studies of screened and unscreened women,[6,11,18] although not in others.[15,16,17] Moreover, many guidelines advise screening for all women starting at age 40 years.[22–25] Therefore, providers may not tailor screening based on a woman's known risk status. However, several organizations suggest that clinical judgment and consideration of risk may influence some screening decisions.[22–25]

Similarity in reported recommendations between risk groups might also reflect differences in compliance. High-risk women may more likely adhere to a recommendation when they receive one. Since our study included only recently unscreened women, those reporting a recommendation, by definition, did not adhere to it. Although not significant, one study found that women with prior biopsy were more likely to adhere to recommendations.[14] Because questions about provider recommendations in NHIS were only asked of unscreened women, we were unable to explore this possibility. This is a potential area for future research.

As in studies including screened women,[6,8,11,18] lower income was related to lower rates of recommendation or discussion, possibly because providers may be less likely to order mammography if they perceive cost will be a problem.[35] Consistent with others,[18] our findings concerning provider type may reflect the number of providers seen, and therefore the number of opportunities to receive a recommendation, rather than specialty. We observed no differences across specialties unlike some studies,[11,17,18] although whether this reflects differences in samples is unknown.

We also detected increased reported recommendations among northeastern women compared with southern women. Other studies suggest that geographic variation exists in breast cancer screening[36] and provider counseling about colorectal cancer screening.[37,38] Nonsignificant increases in provider recommendation for cervical cancer screening among recently unscreened women in the northeast compared with the south have been reported as well.[39] Regional differences might represent variations in practice structure or systems, provider behavior or patient populations. Northeastern women remained more likely to report recommendations when we restricted our analysis to women 50 years or older, suggesting this difference unlikely reflects varying approaches to screening women in their forties.

Our findings should be interpreted in light of several limitations. We used self-reported data to identify eligible women, and therefore some misclassification may have occurred. However, evidence suggests that recall is a reliable measure of cancer screening.[40,41] Furthermore, we have no information about whether recommendations were actually given, although screening behavior may more likely reflect women's perceptions of counseling than the actual content of discussions. Additionally, we have no information about reasons for visits. Women presenting for annual visits may be more likely to receive screening recommendations than other women.[15,42] Also, NHIS questions about provider recommendation were only asked of women not screened within 2 years, which limits generalizability. Finally, the Gail model has only been validated for white women, and may overestimate risk for some younger women not regularly screened. The modified Gail model however has been suggested to be less susceptible to inaccuracy in risk estimation resulting from differences in screening, and may be more appropriate for populations not screened regularly.[43] Given our sample however, some risk misclassification may have occurred.

In summary, findings from a nationally representative dataset conservatively suggest an estimated 9.4 million women ages 40 to 75 years recently seen by a health care provider have not had a mammogram within 2 years. Twelve percent of these women had increased breast cancer risk, and more than 70%, regardless of risk, reported no screening recommendation. Further research is needed to examine whether reported recommendation reflects actual recommendation, why some women do not adhere to recommendations, and if the similarity in reported recommendations rates between risk groups reflects unrecognized risk by women or providers, or other reasons. To the extent that it reflects unrecognized risk, efforts to educate providers and/or women about risk and risk assessment may improve screening recommendation rates and facilitate informed decision-making about screening. In general, increasing reported recommendation rates, either by increasing provider recommendation or by improving women's understanding and recall of counseling, may represent an opportunity to increase screening participation among recently unscreened women, particularly for women with increased risk.

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