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Are risk factors for breast cancer associated with follow-up procedures in diverse women with abnormal mammography?

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Abstract

Objective—We evaluated the association of risk factors for breast cancer with reported follow-up procedures after abnormal mammography among diverse women.

Methods—Women ages 40–80 years were recruited from four clinical sites after receiving a screening mammography result that was classified as abnormal but probably benign, suspicious or highly suspicious, or indeterminate using standard criteria. A telephone-administered survey asked about breast cancer risk factors (family history, estrogen use, physical inactivity, age of menarche, age at birth of first child, parity, alcohol use), and self-reported use of diagnostic tests (follow-up mammogram, breast ultrasound, or biopsy).

Results—Nine hundred and seventy women completed the interview, mean age was 56, 42% were White, 19% Latina, 25% African American, and 15% Asian. White women were more likely to have a positive family history (20%), use estrogen (32%), be nulliparous (17%) and drink alcohol (62%). Latinas were more likely to be physically inactive (93%), African Americans to have early onset of menarche (53%) and Asians first child after age 30 (21%). White women were more likely to have suspicious mammograms (40%) and to undergo biopsy (45%). In multivariate models, Latinas were more likely to report breast ultrasound, physical inactive women reported fewer follow-up mammograms, and care outside the academic health center was associated with fewer biopsies. Indeterminate and suspicious mammography interpretations were significantly associated with more biopsy procedures (OR = 8.4; 95% CI = 3.8–18.5 and OR = 59; 95% CI = 35–100, respectively).

Conclusions—Demographic profile and breast cancer risk factors have little effect on self-reported use of diagnostic procedures following an abnormal mammography examination. Level of mammography abnormality determines diagnostic evaluation but variance by site of care was observed.

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Keywords

ethnicity; abnormal mammography; follow-up procedures; breast cancer

Introduction

Breast cancer is a leading cause of death among women in the United States and the most common type of cancer in women worldwide [1–3]. About 200,000 women are diagnosed and approximately 40,000 deaths are attributed to breast cancer each year [3,4]. The decline in breast cancer mortality has been attributed to improved treatment and earlier detection, in particular, increased use of screening mammography [3]. There remain multiple controversies concerning mammography recommendations [5–8]. nevertheless, screening mammography continues to be the most effective method for the early detection of non-palpable breast abnormalities [2].

Ethnic disparities in breast cancer outcomes may be a result of less regular and timely screening mammography and subsequent higher mortality and worse survival outcomes compared with White women [3,9–12]. Ethnic differentials in survival may be attributed to late stage diagnosis, suggesting that management recommendations, social, and cultural factors during screening and follow-up procedures affect outcomes [13–19]. Mammography is most effective when practiced regularly, according to screening guidelines and when abnormal test results are followed up with timely diagnostic procedures [19]. Consequently, as the number of women who have a screening mammography has increased, so have the challenges associated with false positive tests and the resulting additional follow-up evaluations [2,19].

It has been well established that certain personal and lifestyle factors contribute to a woman’s risk of developing breast cancer [21–28]. It is known that clinical history of breast symptoms and family history of breast cancer provided to a radiologist interpreting an abnormal mammogram affects the number of tests recommended for follow up [17]. However, little is known on whether the presentation of these and other clinical and personal breast cancer risk factors such as reproductive health and lifestyle history may raise suspicion and influence recommendations for follow-up of abnormal mammography in diverse ethnic groups. It is plausible to consider that clinicians may be more aggressive about diagnostic tests in women perceived to be at higher risk. Understanding the association between breast cancer risk factors presentation, socioeconomic factors, and abnormal mammography follow-up procedures may help explain ethnic differences in breast cancer morbidity and mortality.

The aim of this analysis was to assess whether breast cancer risk factors at presentation are associated with follow-up care in African American, Asian/Pacific Islander, Latina and White women with an abnormal screening mammogram. We hypothesized that compared to Whites ethnic women will report fewer follow-up procedures recommendations after adjusting for insurance and other demographic factors, even in the presence of a comparable breast abnormality index and similar risk factors.

Methods

Study design and setting

This was an observational prospective study designed to describe abnormal mammography findings and follow-up procedures in a multiethnic cohort of women diagnosed with a breast abnormality during a screening mammogram in San Francisco and Alameda Counties. Women were recruited from clinical sites in the two counties and interviewed by telephone within six months of the abnormal examination. The clinical sites for recruitment were an academic health center, a private community hospital, four sites from a group model health plan and a public hospital. We selected the clinical sites to increase the probability of recruiting non-White women.

Eligibility criteria

The eligibility criteria for the study were as follows: (1) abnormal screening mammography requiring a follow-up examination prior to next routine screening; (2) age between 40 and 80 years at the time of the mammogram; (3) ability to speak English, Spanish, or Cantonese; and (4) self-identified ethnicity as White, Latina, African American or Asian/Pacific Islander. Women with a prior personal history of breast cancer in the breast with the abnormality on mammography were excluded. Women whose abnormal mammogram led to a diagnosis of cancer were eligible for the study.

Mammography results were obtained from the radiology facilities at each of the collaborating clinical sites. Abnormal mammography was defined according to the American College of Radiology Breast Imaging Reporting and Data System (BIRADS) classifications: (0) Indeterminate reading, more information needed; (1) normal; (2) benign or stable abnormality, standard screening follow-up recommended; (3) probably benign abnormality, short term follow-up recommended; (4) suspicious abnormality, consider biopsy; and (5) highly suggestive of malignancy. Classifications of indeterminate (0), probably benign abnormality (3), suspicious abnormality (4), and highly suggestive of malignancy (5) were eligible for the study.

Study procedures

This study was implemented between November 1999 and December 2001. The research protocol was approved by the UCSF Committee on Human Research and subsequently reviewed and approved at each of the clinical sites' Institutional Review Boards. Recruitment procedures were similar for all sites. Each site provided a list of names of women with an index abnormal mammogram and who met age inclusion criteria. After gaining permission to contact women from their primary care clinicians, initial contact letters were mailed with information about the study (in English, Spanish, or Chinese) advising women that they could decline participation by returning a self-addressed response postcard or by calling the project telephone number. Women who mailed the refusal postcard were not contacted.

Within two weeks of the initial mailing, women who replied that they wished to be contacted or did not mail a refusal postcard were called. In the initial telephone contact women were given additional information about the study, age and ethnicity were confirmed, and language preference (English, Spanish, or Cantonese) determined and verbal consent for the interview was obtained. If a woman was not informed of or aware of the results of the index mammogram, she was referred to her primary care clinician and called three weeks later. Up to ten additional calls were made on weekdays and weekends to ascertain potential interest in the study. The telephone interview lasted an average of 38 min and participants were mailed ten dollars each for their participation.

Survey questionnaire

The survey included items that were derived from standard questions developed and used in previous surveys and from formative focus groups in this study [29–30]. The questionnaire was pre-tested in three languages and with the four ethnic groups. Cultural and linguistic appropriateness and literacy issues were extensively evaluated over an 18-month period with panels of experts during the pre-test phase of the study.

The survey asked about demographic factors such as age, years of education, household income, language use (English, Cantonese, Spanish), health insurance (Medical and/or Medicare, Group Model Health Plan, Private, none), self-identified ethnicity and birthplace. The acculturation measure in Asian and Latina participants was adapted from a previously used language based scale [31].

Breast cancer risk factors were determined by asking about age at menarche (< 13 years of age considered at higher risk) age at first birth (≥ 30 years of age at higher risk), and total number of births (nulliparity at higher risk). Family history of breast cancer was ascertained by asking about the number of first degree relatives with breast cancer (yes/no). Past or current use of estrogen therapy was asked and duration of current or past use was ascertained. Estrogen use was considered a breast cancer risk factor for women who reported ever using hormones for five or more years (Yes/No). Lifestyle factors such as alcohol consumption (daily consumption of at least one drink of alcoholic beverages) and lifetime physical activity (physically active versus physically inactive) were asked and considered as risk factors. Prior history of breast biopsy, height and weight were not ascertained during the interview.

Outcome variables were measured by asking women to recall medical procedures and tests that they received after the abnormal screening mammogram: (1) additional mammograms including magnification views or a six-month study; (2) a breast ultrasound; or (3) a biopsy of the breast abnormality.

Data analysis

Descriptive statistics were generated for all variables and summarized using frequency distributions. Breast cancer risk factors and demographics were compared for differences among ethnic groups. Comparisons were made using either the chi-squared test or the Fisher's exact test for categorical variables and analysis of variance models for continuous data. To examine the association of potential predictors of follow-up procedures we computed contingency tables between each predictor and additional mammogram, breast ultrasound, and biopsy. Potential covariates were identified on the basis of bivariate contingency tables analysis. Separate multivariate logistic regression models evaluated the association of demographic factors, personal characteristics, insurance, and breast cancer risk factors, with three categories of self-reported follow-up procedures – additional mammogram, breast ultrasound and biopsy. Insurance type was strongly related to clinical site and thus only insurance was used in the models presented. Statistical Analysis System (SAS, version 8.2) was used to analyze data. All analyses are two-sided, with a statistical significance level of $p = 0.05$ and based on 95% confidence intervals.

Results

Demographic characteristics

A comparison of demographic characteristics by ethnicity is shown in Table 1. The majority of the sample was 50 years of age or older (68%), reported a household income of $40,000 or more (52%), and had at least a college education (63%). About two-thirds of our sample was insured by a group model health plan. Over half of all women were between 50 and 69 years of age. White women were older, had a higher annual household income and completed more years of education than women from other ethnic groups. Latinas reported the lowest educational attainment of all groups. About two-thirds of all participants had some college education but this was lower for Latinas among whom less than one-third had attended college. Asian Pacific Islander women were more likely to be married or living with a partner (78%) than White (60%), Latina (59%) and African American women (36%). African American

(10%) and Latina (9%) women were more likely to have no insurance coverage compared to API and White women ($p < 0.01$).

Ethnic differences in breast cancer risk factor history

A description of breast cancer risk factor history at the time of the initial screening mammogram is presented in Table 2. Each of the risk factors was significantly different by ethnicity. White women were more likely to have a first-degree relative with breast cancer ($X^2 = 13.05$, $p = 0.004$) compared to each of the other ethnic groups. Ever use of HRT for five or more years was most common among Whites (32%), and this was significantly different than all three other groups of ethnic women ($X^2 = 50.5$, $p < 0.01$). Latinas reported the highest rate of physical inactivity, African Americans were most likely to have onset of menarche at a younger age and API women were the most likely to have birth of first child after age 30 years. Asian Pacific Islander participants reported having their first child at an older average age (27 ± 5.3) than Latina (23 ± 5.4) and African American women (20 ± 4.6; $p < 0.01$). White and API women had a similar proportion of never giving birth (16% and 17%), but higher than African American and Latina women ($p < 0.01$). Daily consumption of alcoholic beverages was most common among Whites and least prevalent among API women.

Abnormal mammogram classification

The level of abnormality is shown in Table 3. Latinas were more likely to have a ‘‘probably benign abnormality’’ (61.3%) compared to African American (53.8%), API (50.7%) and White women (50.6%). Latinas also had a lower prevalence of suspicious or highly suspicious abnormality on mammography compared to other ethnic groups and the highest proportion of ‘‘indeterminate’’ examinations. Among White women, 40% had a suspicious mammogram examination and this was significantly higher than other ethnic groups. White women had the highest proportion of suspicious or highly suspicious mammography findings ($X^2 = 45.81$, $p \leq 0.01$).

Self-reported follow-up procedures

Table 4 shows self-reported procedures obtained after the abnormal mammogram by ethnicity. The most common procedure was a follow-up mammography examination and this included a magnification view of the area of abnormality. Nearly 40% of women reported a biopsy and a similar proportion reported an ultrasound (37%). Comparison by ethnicity showed that Latina women reported the lowest proportion of biopsy (25%), but similar rates of mammography and ultrasound examinations. White women reported biopsy rates (45%) similar to API women (42%), but higher than African Americans (37%) and Latinas (25%).

Nearly 21% of women were unaware of or unable to recall any follow-up procedures. Women who were uninsured compared to privately insured (37% versus 4%, $p = 0.004$), had a probably benign compared to highly suggestive result on the index mammogram (34% versus 4%, $p < 0.0001$), and cared for at the public hospital compared to the academic health center (43% versus 11%, $p < 0.0001$) were more likely to not recall any follow-up tests. On the other hand, nearly 40% of women reported two or three follow-up tests with a higher proportion of White and API women compared to Latinas and African Americans. However, the mean number of tests did not vary significantly by ethnicity.

Association of breast cancer risk factors with follow-up procedures

The multivariate logistic regression models focused on risk factors associated with follow-up procedures for women with an abnormal screening mammogram (Table 5). Women who reported less physical activity during their lifetime were less likely to have a follow-up diagnostic mammogram (OR = 0.56, CI: 0.36–0.87; $p = 0.009$).Women with a family history of breast cancer were two times more likely to have a biopsy (OR = 2.05, CI: 1.19–3.51; $p = 0.009$), but not the non-invasive procedures. Taking hormone replacement therapy for five or more years was borderline significant in increasing the odds of having a biopsy. These three risk factors alone explained a significant amount of variance in the biopsy follow-up model ($R^2 = 0.43$, $p < 0.01$).

After controlling for demographic factors, Latinas compared to White women, were nearly two times more likely to have a breast ultrasound (OR = 1.83, CI: 1.15–2.93; $p = 0.011$), but there were no other effects of ethnicity on follow-up tests. Women with any insurance compared to group health plan were less likely to have a follow-up mammogram, but no other effect of health insurance was observed. Because insurance type and clinical site were strongly related, we also examined models with both variables and clinical site only and these did not affect the limited association with ethnicity. Age, education and income were not associated with obtaining the follow-up tests in any of the models.

Women with an ‘‘indeterminate’’ mammogram were more likely to have an additional mammogram when compared to women with probably benign finding. Receipt of a breast ultrasound was significantly associated with having a screening mammogram with an indeterminate and with a ‘‘suspicious/highly suspicious’’ interpretation. Women with a ‘‘suspicious’’ or ‘‘highly suspicious’’ breast assessment were more than 50 times more likely to have a biopsy as part of the follow-up evaluation.

Discussion

Most of the literature on breast cancer disparities has focused on race/ethnic variations in prevalence, mortality and barriers to the practice of screening. Less research has explored ethnic differences in types of follow-up of abnormal mammograms. One aspect of this issue that has not been addressed is the impact of risk factors on follow-up and how this might differ by race/ethnicity. In this study, we analyzed the association between patient characteristics, including race/ethnicity and breast cancer risk factors, and self-reported follow-up procedures after an initial abnormal screening mammogram in a multiethnic sample of women. The largest proportion of women were between the ages of 50 and 69 years, the age range for which there is the best evidence for the efficacy of regular screening mammography [33–35].

We found ethnic differences in breast cancer risk factor history and as expected White women had a higher rate of breast cancer risk factors. African American and Latina women had a lower rate of risk factors for breast cancer in this study. These findings may explain the lower prevalence of suspicious or highly suspicious abnormality among this sample of Latina women. Although White women had a higher rate of biopsies, this finding was not significant after adjusting for mammography result and other variables.

Our results on procedures by self-report must be interpreted with caution. First, the level of accuracy and confidence on women’s self-report of screening procedures for breast cancer has been questioned and thought to bias group comparisons among ethnically diverse women, in particular with longer procedure to recall intervals [35–37]. The validation of self-reported cancer screening rates may need to be adjusted downward for ethnically diverse populations since Whites (89.3%) had higher rate of validation than African American (72%), Chinese (75.9%), and Latinas (66.7%) in a study of self-reported screening tests [36]. However, comparisons to validation of self-report of cancer screening examinations should be done with caution, since it is likely that recall of tests done for evaluation of an abnormal test would be higher. Regardless, this is an empirical question that can be addressed with medical record reviews.

Understanding management of specific breast abnormalities in the context of breast cancer risk factors history is a vital step to improve follow-up procedures after an abnormal mammogram. In a study that assessed the impact of clinical history on mammography interpretations, radiologists who were alerted of a clinical history of breast cancer risk factors, in particular first degree blood relative history of breast cancer, were more likely to make interpretation towards suspicious abnormalities and to recommend follow-up testing [37]. A non-alerting clinical history led to a significant index bias that altered the management recommendations, and could alter the path to diagnosis of breast cancer. Our study is limited to computerized reports of index classifications and we are unaware of any potential bias effect on the recommendation of follow-up procedures based on clinical history of breast cancer risk factors. However, our findings indicate that after controlling for other factors, family history and HRT use was associated with more procedures in follow-up of abnormal mammography. This implies that clinicians may lower their threshold to follow-up breast abnormalities when women use HRT or have a family history of breast cancer.

In multivariate analysis, after adjustment for personal and social factors, and mammography index classification, we found that being seen at any site other than the academic health center was associated with having fewer biopsies. The effect of clinical site appeared to have been stronger than health insurance although women insured by private insurance was associated with having more biopsies. Whether having more breast biopsies represents better quality of care is unclear since the standard for biopsy may vary.

Because 95% of the women in the study were insured, our findings may not accurately reflect the challenges of having no insurance in evaluation of abnormal mammography. Although factors such as access to health care and having a regular primary care clinician are associated with increase use of screening mammography [38–39], it is unclear how much these factors matter in type of follow-up tests after an abnormal screening mammogram. Although it is possible that even in the presence of insurance-enabled access disparities may continue to exist, our findings identified limited ethnic differences and no socioeconomic differences in evaluation of women with abnormal mammography after accounting for clinical site and level of abnormality. It is also possible, that our findings are a reflection of standard protocols that have been implemented at the main clinical sites that we recruited patients from.

The findings on the association between physical activity and additional mammography examination are not easily explained and may have been a chance observation. We relied on only one item to ascertain physical activity history, which may have limited validity and may have been subject to response and recall bias. It is therefore unlikely, that a personal history of physical activity alone influenced radiologist recommendations in this group of women. It is possible that women reporting higher levels of physical activity were more likely to engage in health promotion and take a more active role to participate in decision-making that led to an additional mammogram.

Our findings also showed that Latina ethnicity was associated with having a breast ultrasound as a follow-up procedure. Breast ultrasound has been found to have additional diagnostic value in the evaluation of abnormal screening mammography for women who are found to have inconclusive mammography results and who present with a palpable mass or with breast symptoms [41]. Latinas were more likely to report a breast ultrasound as a follow-up procedure and this may reflect a higher proportion with breast abnormalities on physical examination. This finding, therefore, may be reflective of ethnic differences on the chief presentation to the initial screening mammogram.

Finally, our findings on the factors associated with biopsy as a follow-up procedure are consistent with the current recommendations for the evaluation of abnormal mammography results [42]. The presence of a family history of breast cancer and a history of HRT use may have alerted radiologists and managing clinicians to be more concerned about the risk for breast cancer and led to biopsy as the next level of management. These factors appeared to have affected the evaluation even after considering the presence of suspicious or highly suggestive of cancer mammography abnormalities.

Our study has several important limitations. First, we used self-reported procedures in evaluation of abnormal mammography and were unable to validate with a medical record review. Second, we conducted our study in one geographical area with a high rate of coverage for evaluation of breast abnormalities and thus limited our ability to evaluate the potential effects of disparities in access. Finally, we did not fully assess breast cancer risk factor history and thus we were unable to estimate an absolute risk value for each woman.

The progress to reduce the burden of breast cancer remains a challenge and depends on our ability to institute the most effective approaches in prevention, early detection, follow-up and treatment. Our findings indicate that when a breast abnormality is detected multiple factors may influence management decisions. Further research is needed to understand how breast cancer risk factors presentation, provider and patient characteristics influence the decision-making process for follow-up procedures.

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Table 1

Demographic and health-related characteristics of African American, Asian/Pacific Islander, Latina and White women with an abnormal mammography examination, San Francisco and Alameda Counties, 1999–2001

	Ethnicity					
	African American (*N* = 240)	**Asian/Pacific Islander (*N* = 142)**	**Latina (*N* = 181)**	**White (*N* = 407)**	**Total (*N* = 970)**	***p*** [*]
Percent						
Age (years)						
40–49	37	39	40	23	32	<0.0001
50–69	52	52	47	59	54	
≥ 70	11	9	13	18	14	
Mean ± SD	55 ± 9.9	54 ± 10.0	55 ± 10	58 ± 10	56 ± 10.2	
Annual household income[a]						
≤ $20,000	32	21	37	11	22	<0.001
$20,001 to $39,999	22	25	31	27	26	
$40,000 to $49,999	11	7	9	12	11	
≥ $50,000	35	47	23	50	41	
Years of completed education						
Less than 12 years	9	13	44	4	14	<0.0001
High School	25	20	25	23	23	
College	54	51	25	46	45	
More than college	12	16	6	27	18	
Mean ± SD	14 ± 2.4	14 ± 3.7	11 ± 4.3	15 ± 2.8	14 ± 3.6	
Marital status						
Married or living with a partner	36	78	59	60	57	<0.001
Health Insurance						
Medicare/Medicaid	11	8	11	4	8	<0.001
Group model plan	64	66	63	73	68	
Private insurance	15	23	17	22	19	
No insurance	10	3	9	1	5	

[*] *p* values are for chi-square comparisons of proportions within each variable by ethnicity.

[a] $N = 876$ due to missing values.

Table 2

Breast cancer risk factor history among African American, Asian/Pacific Islander, Latina and White women with an abnormal mammography examination, San Francisco and Alameda Counties, 1999–2001

Risk Factors	**Ethnicity**				
	African American (N = 240)	**Asian/Pacific Islander (N = 142)**	**Latinas (N = 181)**	**White (N = 407)**	p^*
Percent					
Have a first degree relative with breast cancer	15	11	10	20	0.004
Ever use of hormonal replacement therapy for 5 years or more	15	15	11	32	<0.001
Physically inactive in adulthood	84	86	93	84	0.042
Age at time of menarche (≥13 years of age)	47	68	56	53	0.001
Age at birth of first child (≥30 years of age)	3	21	11	13	<0.0001
Nulliparous	9	16	9	17	0.006
Average of more than one drink of alcohol per day	41	20	30	62	<0.001

[*] p values are for chi-square comparisons of proportions within each variable by ethnicity.

Table 3

Classification of abnormal screening mammography[*] examination among African American, Asian/Pacific Islander, Latina and White women aged 40–79, San Francisco and Alameda Counties, 1999–2001

Screening mammogram index classification	**Ethnicity**				
	African American (*N* = 240)	**Asian and Pacific Islander (*N* = 142)**	**Latina (*N* = 181)**	**White (*N* = 407)**	**Total Sample (*N* = 970)**
Percent					
Indeterminate	16.7	20.4	22.7	9.3	15.2
Probably benign abnormality	53.8	50.7	61.3	50.6	53.4
Suspicious abnormality/highly suspicious	29.6	28.9	16.0	40.0[†]	31.3

[*] Classification of screening mammography is defined in the text.

[†] Comparison of White to other ethnic categories: $X^2 = 45.46$, df = 6, $p < 0.0001$.

Table 4

Self-reported follow-up tests after an abnormal mammography examination among African American, Asian/Pacific Islander, Latina and White women aged 40–79 years, San Francisco and Alameda Counties, 1999–2001[*]

Self-reported follow-up procedures	**Ethnicity**				
	African American (*N* = 240)	**Asian and Pacific Islander (*N* = 142**	**Latina (*N* = 181)**	**White (*N* = 407)**	**Total sample (970)**
Percent					
Diagnostic mammogram	49	59	51	57	54
Breast ultrasound	35	41	40	35	37
Biopsy	37	42	25	45[**]	39
Number of follow-up procedures					
0	26	20	23	18	21
1	29	32	45	39	39
2	24	35	24	31	28
3	11	13	8	12	11
Mean (SD)	1.4 (0.9)	1.2 (0.9)	1.2 (0.9)	1.2 (0.9)	1.3 (0.9)

[*] Percentages add up to more than 100% because multiple tests in one woman were counted independently by each of the categories shown.

[**] $X^2 = 21.2$, df = 3, $p \leq 0.05$.

Table 5

Multivariate logistic regression model of breast cancer risk factors with abnormal mammogram follow-up procedures among African American, Asian/Pacific Islander, Latina and White women aged 40–79 years, San Francisco and Alameda Counties, 1999–2001

Variable	**Abnormal mammogram follow up procedures**					
	Mammogram OR (95% CI)	***p***	**Breast ultrasound**	***p***	**Breast biopsy**	***p***
Family history of breast cancer	1.22 (0.81, 1.85)	0.331	1.18 (0.73, 1.69)	0.599	2.05 (1.19,3.51)	0.009
HRT for ≥ 5 years	1.28 (0.87, 1.87)	0.208	1.30 (0.87, 1.92)	0.196	1.71 (1.02, 2.87)	0.040
Physical inactivity in adulthood	0.56 (0.36, 0.87)	0.009	0.99 (0.63, 1.55)	0.971	1.16 (0.65, 2.08)	0.618
Daily alcohol consumption ≥ More than one alcoholic beverage per day	0.96 (0.71, 1.31)	0.813	1.16 (0.84, 1.60)	0.360	1.09 (0.71, 1.68)	0.689
Age at time of menarche ≥ 13 years old	1.14 (0.85, 1.53)	0.368	0.95 (0.70, 1.28)	0.730	0.94 (0.63, 1.41)	0.759
Age at birth of first child ≥ 30 years old	1.46 (0.98, 2.17)	0.063	1.23 (0.82, 1.85)	0.309	1.06 (0.62, 1.83)	0.809
Nulliparity	0.74 (0.44, 1.24)	0.256	1.04 (0.62, 1.76)	0.873	1.62 (0.81, 3.24)	0.172
Mammography result						
Probably benign	Reference		Reference		Reference	
Indeterminate	4.6 (2.6, 8.02)	<0.001	3.89 (2.27, 6.69)	<0.001	5.29 (2.62, 10.69)	<0.001
Suspicious/highly suspicious	0.83 (0.60, 1.16)	0.278	3.17 (2.26, 4.46)	<0.001	56.4 (34.2, 0.93)	<0.001
Ethnicity						
White	Reference		Reference		Reference	
African American	0.85 (0.58, 1.25)	0.378	1.35 (0.90, 2.02)	0.151	1.17 (0.68, 2.01)	0.563
Asian	1.19 (0.74, 1.91)	0.019	1.56 (0.96, 2.54)	0.072	1.64 (0.87, 3.07)	0.124
Latina	0.92 (0.59, 1.44)	0.883	1.83 (1.15, 2.93)	0.011	1.08 (0.58, 2.04)	0.802
Education ≤ High school	0.77 (0.55, 1.08)	0.133	1.11 (0.78, 1.58)	0.559	0.96 (0.60, 1.54)	0.867
Income < $50,000	0.97 (0.67, 1.31)	0.705	1.12 (0.72, 1.45)	0.917	0.78 (0.49, 1.25)	0.310
Age (5 year increments)	0.99 (0.91, 1.07)	0.766	0.99 (0.91, 1.08)	0.814	1.10 (0.98, 1.23)	0.120
Insurance						
Group Model Health Plan	Reference		Reference		Reference	
Medicare/Medical	0.43 (0.23, 0.81)	0.009	0.71 (0.30, 1.69)	0.438	0.62 (0.27, 1.43)	0.262
Private	0.49 (0.31, 0.76)	0.001	0.98 (0.53, 1.83)	0.960	1.04 (0.55, 1.95)	0.903
None	0.32 (0.14, 0.68)	0.003	0.32 (0.10, 1.00)	0.051	0.35 (0.11, 1.09)	0.070