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# Reported breast symptoms in the National Breast and Cervical Cancer Early Detection Program

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## Abstract

**Purpose—**The frequency and types of breast symptoms reported by women in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) have never been characterized. This study aims to establish the frequency of reported symptoms and the diagnostic outcomes associated with reported symptoms.

**Methods—**We examined the frequency of symptoms reported prior to mammography using medical record abstraction data from women in the NBCCEDP. We also calculated adjusted odds ratios (aOR) of having an abnormal mammogram, an abnormal clinical breast examination (CBE), or a final diagnosis of breast cancer by symptoms, compared to asymptomatic women.

**Results—**In our sample of women, 10.3% reported at least one symptom. Women with symptoms were younger and more likely to be non-Hispanic white. Among those reporting symptoms, breast lump (31.7%) and pain or tenderness (49.3%) was most common. A relatively low proportion of women with symptoms were diagnosed with in situ (0.9%) or invasive breast cancer (4.3%). However, a self-reported breast lump (aOR: 13.7; 95% confidence interval [CI]: 7.8 – 24.1), inflammation or changes to the skin/nipple (aOR: 27.8; 95% CI: 8.7 – 88.8) and other or unspecified symptoms (aOR: 3.4; 95% CI: 2.1 – 7.5) were associated with an increased risk of invasive breast cancer.

**Conclusions—**Although the prevalence of breast cancer among women reporting symptoms is relatively low, knowing which symptoms carry the highest breast cancer risk is important to assist in appropriate diagnostic workup.

### Keywords

breast cancer; breast symptoms; screening; mammography

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**CONFLICT OF INTEREST:**

The authors declare that they have no conflict of interest.

## INTRODUCTION

In 2010, nearly 207,000 incident cases and 41,000 deaths resulted from breast cancer in the United States (1). This common cancer is a heterogeneous disease with no single characterized cause or presentation. Breast symptoms are commonly reported in primary care practice and approximately 75% of diagnostic mammographic examinations are among women who present with a breast problem (2–4). Over a 10-year period, 16% of women age 40–69 will have breast problems (5). Common breast complaints include inflammation, lump, pain, and nipple discharge (5, 6). Knowing which breast symptoms carry the highest risk for cancer is important in the clinical work-up of symptoms and in communicating to patients about their risk (7). Diagnostic mammography is performed in women with self-reported symptoms, an abnormal clinical breast examination, or an abnormal screening mammogram. These radiographic exams are more complex and time-consuming than routine screening mammograms and may include additional radiographic views or spot compressions.

The National Breast and Cervical Cancer Early Detection Program (NBCCEDP) is a nationwide, comprehensive public health program that provides breast and cervical cancer screening and diagnostic services to low-income, uninsured, and under-insured women 21 to 64 years of age (8). The NBCCEDP also serves a few women over age 64 that do not have Medicare coverage. Since its inception, the NBCCEDP has provided services to 4.3 million women and provided more than 10.7 million breast and cervical cancer examinations (9). In recent years, the NBCCEDP has provided over 300,000 mammograms annually (9). Among the women receiving breast exams, 48% are non-Hispanic white, 16% are non-Hispanic black, 12% are non-Hispanic other and 25% are Hispanic (9). Though often referred to as a screening program, the NBCCEDP enrolls both asymptomatic women for cancer screening and symptomatic women for diagnostic services.

Because the NBCCEDP regularly accepts symptomatic women for breast services, and because diagnostic mammograms are more involved than screening exams, understanding the proportion of symptomatic women entering the NBCCEDP is paramount for its administrators (10, 11). Additionally, understanding the types of symptoms reported in women enrolled in the NBCCEDP and their clinical outcomes can provide valuable information to clinicians responsible for their follow-up and care (12). However, the frequency and diagnostic outcomes of self-reported breast symptoms in the NBCCEDP have never been fully characterized. Our study aims to estimate the frequency of reported breast symptoms in the NBCCEDP, characterize the types of breast symptoms reported, and describe diagnostic outcomes by symptom type.

## METHODS

### Sampling and data collection

The Centers for Disease Control and Prevention (CDC) implements the NBCCEDP through cooperative agreements with all 50 states, the District of Columbia, 5 US territories, and 11 American Indian/Alaska Native tribes and tribal organizations. Each grantee reports to CDC a subset of standardized program surveillance and evaluation data known as the minimum

data elements (MDEs). CDC uses these data to monitor client demographic and clinical outcomes, establish NBCCEDP policies and best practices, assess screening outcomes, and respond to informational needs of CDC stakeholders and partners.

To ensure the integrity of the NBCCEDP data, in 2004 CDC initiated an extensive evaluation project, the MDE Validation Project (13). MDE data were compared with data in medical records from a sample of six states. At the time, the participating states were the largest screening volume programs and together contributed to over 32% of the national MDE data. Within each state, we used a complex sampling design consisting of a two-stage, stratified, random sample to select providers and patient records meant to be representative of the national MDE data. The detailed sampling design has been described previously (13). Trained medical record abstractors collected data from 5,603 breast and cervical cancer screening records. Of these, 2,961 were for women who received a federally funded mammogram through the NBCCEDP (representing a weighted sample of 311,582 women in the national MDE data). From any record with a mammogram, we captured detailed information on the breast symptoms reported by the patient and recorded in the medical chart, mammography and clinical breast exam (CBE) results, and final diagnostic outcomes.

## Variable definitions

Medical record abstractors trained specifically for this study reviewed the files and recorded whether any breast symptoms self-reported by the patient were noted in the medical chart. If the presence of symptoms was noted, we grouped them as follows: lump (lump, mass, or single nodule); pain or tenderness; thickening or fibrocystic changes (thickening, fibrocystic changes or nodules); inflammation or changes to the skin/nipple (redness/inflammation of the skin, changes in breast size/shape or skin dimpling or skin/nipple retraction); nipple discharge (bloody or other nipple discharge); and other or unspecified (e.g., rash, cysts, induration).

Women reported demographic characteristics including age, race and ethnicity, and prior screening history at the time of enrollment in the NBCCEDP. Providers reported dates and results of CBEs, mammograms, diagnostic procedures, and outcomes. CBE results were categorized as normal, abnormal, or unknown. Mammogram results were reported according to the Breast Imaging Reporting and Data System (BI-RADS) (14). For modeling the odds of abnormal mammogram results, we considered those categorized as a suspicious abnormality (BI-RADS 4) or suggestive of malignancy (BI-RADS 5) as abnormal results. We also modeled the odds of a final diagnosis of in situ and invasive breast cancers, separately as well as a diagnosis of either.

## Analysis

All analyses were performed using SAS software version 9.3 (SAS Institute, Inc., Cary, North Carolina) (15). We applied appropriate sampling weights and used SAS-callable SUDAAN version 11.0.0 (RTI International: Research Triangle Park, North Carolina) to correct for the complex sampling design.

We used the Pearson's Chi-square test of independence to explore differences in the prevalence of any self-reported breast symptoms by various patient characteristics and

clinical findings. We used logistic regression to estimate the adjusted odds ratios (aORs) and 95% confidence intervals (CIs) of the following outcomes for women with specific breast symptoms compared with those with no breast symptoms: an abnormal CBE; an abnormal mammogram; either an abnormal CBE or mammogram; a final diagnosis of in situ breast cancer; a final diagnosis of invasive breast cancer; and a final diagnosis of either in situ or invasive breast cancer. We adjusted all models for age, race and ethnicity, and all other symptoms.

## RESULTS

We abstracted the medical records of 2,961 women (*n*) receiving a mammogram in the NBCCEDP, representing 311,582 women (*N*) in the national MDE data after the appropriate sampling weights were applied. Table 1 shows the characteristics of the study population by whether or not they reported any breast symptoms. The majority of our sample was 50 to 59years of age at the time of their breast cancer examination, and the majority (43.2%) was white. Women reporting at least 1breast symptom tended to be younger ($p < 0.0001$), were more likely to be white, non-Hispanic (54.2% vs 41.9%, $p < 0.0001$), and were more likely to report having had a previous mammogram (87.5% vs 85.2%, $p < 0.0001$) than those with no breast symptoms. Table 2 shows the breast exam results and final cancer diagnosis by self-report of breast symptoms. Women with symptoms were more likely to have received a CBE (93.0% vs 84.5%, $p < 0.0001$). Among all women receiving a CBE, women reporting symptoms were more likely to have an abnormal finding (30.4% vs 4.0%, $p- < 0.0001$) than those who did not report breast symptoms. Women with breast symptoms were also more likely to have a mammogram finding with a higher BI-RADS code than those without symptoms and slightly more likely to receive a final diagnosis of invasive cancer (4.3% vs 2.4%) than those not reporting symptoms. Table 3 shows the distribution of patient characteristics by self-reported breast symptoms and clinical outcomes. Women with symptoms and significant clinical findings (either an abnormal exam results or a final diagnosis of cancer) were younger than women without symptoms and clinical findings. They were also more likely to be non-Hispanic white. Women with self-reported symptoms and an abnormal CBE or mammogram were less likely to have had a previous mammogram when compared to women without symptoms and a positive exam; however, women with symptoms and a final diagnosis of cancer did not appear more or less likely to have had a previous mammogram.

Figure 1 illustrates the distribution of the number of symptoms reported by women. Most women (89.7%) did not report a symptom at or before the time of their mammogram. Among the 10.3% of women who reported at least one breast symptom, 80.2% reported a single symptom, 17.8% reported two symptoms, 1.8% reported three, and 0.2% reported four. Table 4 shows the frequency of each symptom among women reporting at least one. The most commonly reported symptoms were pain or tenderness (49.3%) or breast lump (31.7%). An additional 24.1% of symptoms were reported as other or unspecified in the medical chart. Less common symptoms were thickening or fibrocystic changes (9.0%), nipple discharge (4.4%), and inflammation or changes to the skin/nipple (1.8%).

Table 5 provides the modeling results for abnormal CBEs or mammograms or a final diagnosis of breast cancer by symptoms compared to women without symptoms. All symptoms, except for thickening or fibrocystic changes were significantly associated with an abnormal CBE. A reported breast lump (aOR: 3.9; 95% CI: 2.0 – 7.4) and inflammation or changes to the skin/nipple (aOR: 7.3; 95% CI: 1.7 – 30.8) were associated with an increased odds of an abnormal mammogram. Compared to women with no symptoms, women with a self-reported breast lump (aOR: 5.9; 95% CI: 2.3 – 14.8), or other or unspecified symptoms (aOR: 2.7; 95% CI: 1.1 – 6.6) had an increased odds of in situ breast cancer. For invasive breast cancer, women who reported a lump (aOR: 13.7; 95% CI: 7.8 – 24.1), inflammation or changes to the skin/nipple (aOR: 27.8; 95% CI: 8.7 – 88.8), or other or unspecified symptoms (aOR: 3.4; 95% CI: 2.1 – 7.5) had an increased odds compared to those without symptoms.

## DISCUSSION

About 10% of women in the NBCCEDP had an indication in their medical chart that they reported one or more breast symptoms at the time of receiving services. Of these, 2.0% had a final diagnosis of breast cancer, compared to only 0.4% of women without symptoms. Despite the low prevalence of cancer among women who report breast symptoms, these complaints are relatively frequent and their presence can elicit anxiety from both patient and provider (7, 16).

In our study, a final diagnosis of either in situ or invasive breast cancer was associated with self-reported breast lump, inflammation or changes in the skin/nipple, and other or unspecified breast symptoms. While it is important to know which symptoms carry the highest breast cancer risk, these symptoms can also be a result of benign processes. Breast lumps may be caused by fibroadenomas, cysts or dense breast tissue (6). Although inflammatory breast cancer may present with erythema, swelling and/or dimpling of the skin (17), breast inflammation is most often caused by infection (6). Differentials for nipple discharge include prolactin abnormalities, side effects from medications, and intraductal papilloma (6). While generalized breast pain is not associated with malignancy, pain that is unilateral, localized and intense may be associated with cancer (18). Guidelines for evaluating and treating breast disorders are available from the National Comprehensive Cancer Network (19). Additionally, a woman’s personal or family history of breast cancer and/or abnormalities may help to frame the level of suspicion when she presents with a breast symptom (20).

The associations we observed between certain breast symptoms and a final diagnosis of cancer are consistent with previous studies though the prevalence of symptoms in our study are markedly higher due to eligibility criteria for enrolling in the NBCCEDP which allows entrance simply on the basis of symptoms. In a Dutch study of family physician offices, overall breast symptoms were reported in about 3% of all visits by female patients and breast pain and breast mass were the most common breast-related complaints (16). Among the women complaining of breast symptoms, 3.2% had breast cancer diagnosed. Breast mass had a markedly elevated positive likelihood ratio for breast cancer (15.04; 95% CI, 11.74–19.28). In another large study of postmenopausal women in an integrated health system in

Western Washington, researchers found that women reporting a lump had an increased odds of breast cancer compared with asymptomatic women (diagnostic exam: 2.8 [2.3–3.4], and screening exam: 3.6, 2.6–5.0). However, in this study, no other symptoms were associated with breast cancer after controlling for a reported lump (7). A recent study of Finland's national breast cancer screening program found that breast lump or retraction reported by the woman or discovered upon clinical examination was associated with a diagnosis of cancer (OR: 6.5; 95% CI: 5.9 – 7.1 and OR: 2.2; 95% CI: 1.9 – 2.5, respectively) (21). Similarly, an examination of data collected from the National Cancer Control Programme in Ireland found that the presence of a lump (aOR: 5.6; 95% CI: 4.2 – 7.6), nipple change (aOR: 2.8; 95% CI: 1.7 – 4.6), or nipple discharge (aOR: 2.1; 95% CI: 1.1 – 4.0) among women visiting special symptomatic breast units was associated with cancer (22).

This is the only project to date that examines the frequency, types, and cancer outcomes of breast symptoms reported in the NBCCEDP; however, it is subject to a number of limitations. We could only capture symptoms that were recorded in the medical chart. Although we employed highly trained medical record abstractors and a certified tumor registrar for this project, the information contained in the medical record may not have been complete or clear. Second, these data are older, coming from women who obtained NBCCEDP services between 1996 through 2004. Regardless, it is unlikely that breast symptom frequency or outcomes have changed since that time, though patterns in care or medical record documentation may have. Third, although we reviewed a large sample of records, the sample size was not sufficient to examine all potential associations of interest. Additional studies may be necessary to examine the outcome of women with some of the less frequently reported breast symptoms. Last, the results from this study are specific only to the NBCCEDP, though it provides useful information on general patterns of breast cancer diagnosis for both women undergoing screening and follow-up of symptoms. The association of breast symptoms with younger age is likely due to the patient eligibility criteria. The NBCCEDP allows women less than 40 years of age to be enrolled if they present with breast symptoms or an abnormal CBE (often found at the same time as a cervical cancer screening exam). The NBCCEDP's priority population for breast cancer screening is women 50 years of age and older; thus, it is more likely that women enrolled under 50 years presented with breast symptoms in our study. Among women presenting with symptoms, those who are low-income with little or no health insurance are often referred to the NBCCEDP specifically for diagnostic services. Therefore, our study likely has a higher proportion of women with symptoms than would be expected in a traditional screening program. Furthermore, these data are unable to discern the intent of the clinician for the initial mammogram. Our finding that over 60% of women with symptoms did not receive diagnostic follow-up may be misleading as many of these women likely received a diagnostic mammogram that would have included more views than a screening mammogram and may be the only necessary follow-up. Additionally, women with symptoms may have been more likely to have her initial mammogram coded as assessment incomplete by the radiologist to prompt additional mammographic views not routinely included in a screening exam.

In conclusion, our data show that women in the NBCCEDP who present with a lump or inflammation or changes to the skin/nipple have a substantially increased risk of an

abnormal result on diagnostic exam and a final diagnosis of breast cancer; however, women who reported pain or tenderness did not have an increased cancer risk. Our findings offer researchers, clinicians, and patients, particularly those associated with the NBCCEDP, fresh understanding of the risk of breast cancer associated with breast symptoms. The NBCCEDP may consider more evaluation of outcomes for the potential development of guidelines or best practices specific for women who report breast symptoms. For example, there is some evidence that the sensitivity and specificity of ultrasound is greater than mammography in patients with breast symptoms for the detection of cancer, especially in younger women (23). More granular NBCCEDP monitoring tools, or the development of clinical prediction rules (24) may also be possible to encourage providers to deliver appropriate and timely follow-up for certain women with breast symptoms who may be at higher risk for cancer (24). Our results, along with evidence-based guidelines, can aid clinicians in the evaluation and diagnosis of many breast concerns.

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## REFERENCES

1. United States Cancer Statistics: 1999 – 2010 Mortality, WONDER Online Database. United States Department of Health and Human Services, Centers for Disease Control and Prevention. 2013
2. Barlow WE, Lehman CD, Zheng Y, et al. Performance of diagnostic mammography for women with signs or symptoms of breast cancer. Journal of the National Cancer Institute. 2002; 94:1151–1159. [PubMed: 12165640]
3. Barton MB, Elmore JG, Fletcher SW. Breast symptoms among women enrolled in a health maintenance organization: frequency, evaluation, and outcome. Annals of internal medicine. 1999; 130:651–657. [PubMed: 10215561]
4. Geller BM, Barlow WE, Ballard-Barbash R, et al. Use of the American College of Radiology BI-RADS to report on the mammographic evaluation of women with signs and symptoms of breast disease. Radiology. 2002; 222:536–542. [PubMed: 11818625]
5. Salzman B, Fleegle S, Tully AS. Common breast problems. Am Fam Physician. 2012; 86:343–349. [PubMed: 22963023]
6. Kosir MA, Chism L, Bland K, Choi L, Gorski D, Simon MS. Common breast symptoms: when to refer to a breast surgeon. Advance for NPs & PAs. 2013; 4:12–15. quiz 6. [PubMed: 24279066]
7. Aiello EJ, Buist DS, White E, Seger D, Taplin SH. Rate of breast cancer diagnoses among postmenopausal women with self-reported breast symptoms. The Journal of the American Board of Family Practice / American Board of Family Practice. 2004; 17:408–415. [PubMed: 15575032]
8. Ryerson, AB.; Benard, VB.; Major, AC. The National Breast and Cervical Cancer Early Detection Program 1991–2001 National Report. Atlanta, Georgia: Department of Health and Human Services; 2005.
9. Miller JW, Hanson V, Johnson GD, Royalty JE, Richardson LC. From cancer screening to treatment: service delivery and referral in the National Breast and Cervical Cancer Early Detection Program. Cancer. 2014; 120:2549–2556. [PubMed: 25099897]
10. Ekwueme DU, Subramanian S, Trogdon JG, et al. Cost of services provided by the National Breast and Cervical Cancer Early Detection Program. Cancer. 2014; 120:2604–2611. [PubMed: 25099904]
11. Yancy B, Royalty JE, Marroulis S, Mattingly C, Benard VB, DeGroff A. Using data to effectively manage a national screening program. Cancer. 2014; 120:2575–2583. [PubMed: 25099900]

12. Williams RS, Brook D, Monypenny IJ, Gower-Thomas K. The relevance of reported symptoms in a breast screening programme. Clin Radiol. 2002; 57:725–729. [PubMed: 12169283]
13. Eheman CR, Leadbetter S, Benard VB, et al. National Breast and Cervical Cancer Early Detection Program data validation project. Cancer. 2014; 120:2597–2603. [PubMed: 25099903]
14. D'Orsi, CJ.; Mendelson, EB.; Ikeda, DM. Breast Imaging Reporting and Data System: ACR BI-RADS - Breast Imaging Atlas. Reston, VA: American College of Radiology; 2003.
15. Inc. SI. Base SAS 9.3 Utilities: Reference. Cary, NC: SAS Institute Inc.; 2011.
16. Eberl MM, Phillips RL Jr, Lamberts H, Okkes I, Mahoney MC. Characterizing breast symptoms in family practice. Annals of family medicine. 2008; 6:528–533. [PubMed: 19001305]
17. Dushkin H, Cristofanilli M. Inflammatory breast cancer. Journal of the National Comprehensive Cancer Network : JNCCN. 2011; 9:233–240. quiz 41. [PubMed: 21310844]
18. Foulkes RE, Heard G, Boyce T, Skyrme R, Holland PA, Gateley CA. Duct Excision is Still Necessary to Rule out Breast Cancer in Patients Presenting with Spontaneous Bloodstained Nipple Discharge. International journal of breast cancer. 2011; 2011:495315. [PubMed: 22295227]
19. Network NCC. Breast Cancer (Version 2.2014).
20. Gail MH, Brinton LA, Byar DP, et al. Projecting individualized probabilities of developing breast cancer for white females who are being examined annually. Journal of the National Cancer Institute. 1989; 81:1879–1886. [PubMed: 2593165]
21. Singh D, Malila N, Pokhrel A, Anttila A. Association of symptoms and breast cancer in population-based mammography screening in Finland. Int J Cancer. 2015; 136:E630–E637. Epub 2014 Sep 4. [PubMed: 25160029]
22. Galvin R, Joyce D, Downey E, Boland F, Fahey T, Hill AK. Development and validation of a clinical prediction rule to identify suspected breast cancer: a prospective cohort study. BMC Cancer. 2014; 14:743. [PubMed: 25277332]
23. Devolli-Disha E, Manxhuka-Kerliu S, Ymeri H, Kutllovci A. Comparative accuracy of mammography and ultrasound in women with breast symptoms according to age and breast density. Bosn J Basic Med Sci. 2009; 9:131–136. [PubMed: 19485945]
24. McCowan C, Donnan PT, Dewar J, Thompson A, Fahey T. Identifying suspected breast cancer: development and validation of a clinical prediction rule. Br J Gen Pract. 2011; 61:e205–e214. [PubMed: 21619744]

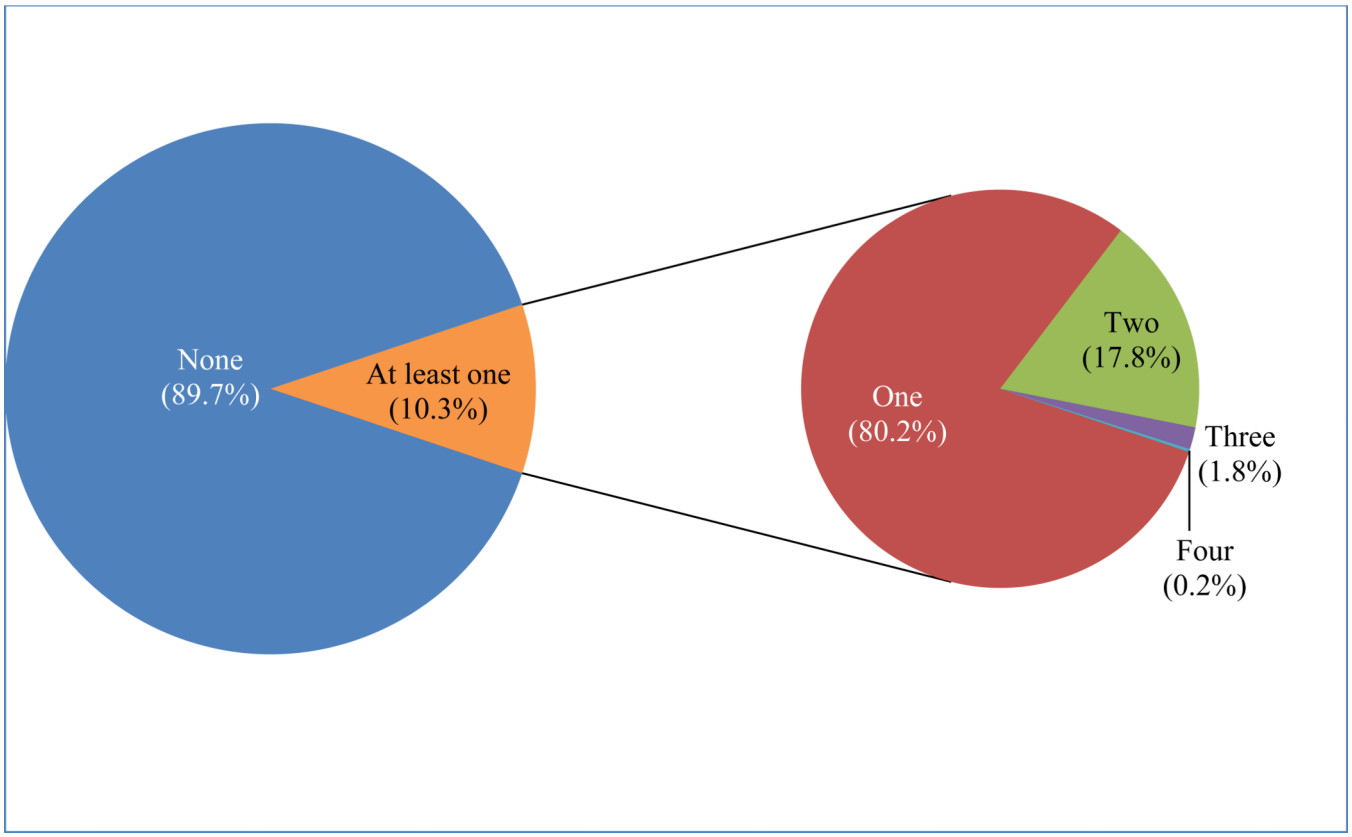


**Figure 1.**
Distribution of the number of symptoms reported by women who received a mammogram in the NBCCEDP
NBCCEDP=National Breast and Cervical Cancer Early Detection Program

## Table 1

Patient characteristics of women receiving mammography in the NBCCEDP by self-reported breast symptoms

| | | Reported breast symptoms | | |
|---|---|---|---|---|
| | **Total (*n* = 2,961) *N* (%[1])** | **No (*n* = 2,365) *N* (%[1])** | **Yes (*n* = 596) *N* (%[1])** | ***p*-value[2]** |
| Total | 311,582 (100) | 279,575 (100) | 32,007 (100) | |
| Age, years | | | | |
| 30–39 | 456 (0.2) | 274 (0.1) | 182 (0.6) | <0.0001 |
| 40–49 | 59,053 (19.0) | 47,844 (17.1) | 11,209 (35.0) | |
| 50–59 | 159,949 (51.3) | 145,603 (52.1) | 14,345 (44.8) | |
| 60–69 | 73,372 (23.6) | 67,742 (24.2) | 5,630 (17.6) | |
| 70+ | 18,752 (6.0) | 18,112 (6.5) | 641 (2.0) | |
| Race/Ethnicity | | | | |
| White, non-Hispanic | 134,593 (43.2) | 117240 (41.9) | 17353 (54.2) | <0.0001 |
| Black, non-Hispanic | 58,628 (18.8) | 53211 (19.0) | 5417 (16.9) | |
| Other, non-Hispanic | 22,921 (7.4) | 20008 (7.2) | 2912 (9.1) | |
| Hispanic | 95,440 (30.6) | 89116 (31.9) | 6325 (19.8) | |
| Previous mammogram | | | | |
| No | 45,530 (14.6) | 41521 (14.9) | 4009 (12.5) | <0.0001 |
| Yes | 266,052 (85.4) | 238054 (85.2) | 27998 (87.5) | |
| Time since last, years | | | | |
| < 1 | 1,612 (0.6) | 922 (0.4) | 691 (2.5) | <0.0001 |
| 1 to < 2 | 12,637 (4.8) | 10552 (4.4) | 2085 (7.5) | |
| 2 to <3 | 101,064 (38.0) | 92189 (38.7) | 8874 (31.7) | |
| 3 to < 5 | 65,287 (24.5) | 59148 (24.9) | 6139 (21.9) | |
| ≥ 5 | 79,742 (30.0) | 70666 (29.7) | 9076 (32.4) | |
| Unknown | 5,710 (2.2) | 4577 (1.9) | 1133 (4.1) | |

[1] Percentages may not add to 100% due to rounding

[2] Pearson chi-square test of independence

NBCCEDP=National Breast and Cervical Cancer Early Detection Program; *n* = raw sample; *N* = weighted sample

## Table 2

Clinical findings of women receiving mammography in the NBCCEDP by self-reported breast symptoms

| | | Reported breast symptoms | | |
|---|---|---|---|---|
| | **Total (*n* = 2,961) *N* (%[1])** | **No (*n* = 2,365) *N* (%[1])** | **Yes (*n* = 596) *N* (%[1])** | ***p*-value[2]** |
| Total | 311,582 (100) | 279,575 (100) | 32,007 (100) | |
| Received a CBE | | | | |
| No | 45,622 (14.6) | 43,378 (15.5) | 224 (7.0) | <0.0001 |
| Yes | 265,960 (85.4) | 236,197 (84.5) | 29,736 (93.0) | |
| CBE results | | | | |
| Normal | 242,072 (91.0) | 222,785 (94.3) | 19,287 (64.8) | <0.0001 |
| Abnormal | 18,453 (6.9) | 9,408 (4.0) | 9,045 (30.4) | |
| Unknown | 5,435 (2.0) | 4,004 (1.7) | 1,431 (4.8) | |
| Mammogram results | | | | |
| Negative | 178,325 (57.2) | 160,878 (57.5) | 17,447 (54.5) | |
| Benign | 88,384 (28.4) | 80,458 (28.8) | 7,925 (24.8) | |
| Probably benign | 12,837 (4.1) | 10,652 (3.8) | 2,186 (6.8) | <0.0001 |
| Suspicious abnormality | 3,178 (1.0) | 2,615 (0.9) | 563 (1.8) | |
| Suggestive of malignancy | 883 (0.3) | 627 (0.2) | 256 (0.8) | |
| Assessment incomplete | 27,975 (9.0) | 24,345 (8.7) | 3,630 (11.3) | |
| Received diagnostic follow-up | | | | |
| No | 261,116 (83.8) | 241,660 (86.4) | 19,456 (60.8) | <0.0001 |
| Yes | 50,466 (16.2) | 37,915 (13.6) | 12,551 (39.2) | |
| Final diagnosis | | | | |
| No cancer | 43,866 (86.9) | 33,293 (87.8) | 10,572 (84.2) | |
| In situ | 429 (0.9) | 317 (0.8) | 112 (0.9) | <0.0001 |
| Invasive | 1,438 (2.9) | 903 (2.4) | 535 (4.3) | |
| Unknown | 4,733 (9.4) | 3,402 (9.0) | 1,332 (10.6) | |

[1] Percentages may not add to 100% due to rounding

[2] Pearson chi-square test of independence

NBCCEDP=National Breast and Cervical Cancer Early Detection Program; CBE=clinical breast exam; *n* = raw sample; *N* = weighted sample

**Table 3**

Distribution of patient characteristics by clinical outcomes and self-reported breast symptoms

| | CBE & Mammogram Results | | | | | | Final Breast Cancer Diagnosis | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Abnormal CBE (*N* = 9,045) %[1] | | Abnormal Mammogram (*N* = 819) %[1] | | Either (*N* = 9,260) %[1] | | In situ (*N* = 112) %[1] | | Invasive (*N* = 535) %[1] | | Either (*N* = 647) %[1] | |
| **Breast Symptoms:** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** |
| **Age, years** | | | | | | | | | | | | |
| 30–39 | 0.3 | 2.0 | 0.0 | 0.0 | 0.2 | 2.0 | 0.0 | 0.0 | 0.1 | 0.6 | 0.1 | 0.5 |
| 40–49 | 21.9 | 40.4 | 22.3 | 39.8 | 21.2 | 40.0 | 17.9 | 23.5 | 12.2 | 27.0 | 13.6 | 26.4 |
| 50–59 | 50.9 | 40.0 | 32.6 | 42.6 | 47.0 | 40.7 | 49.5 | 54.9 | 54.2 | 41.6 | 53.0 | 43.9 |
| 60–69 | 24.7 | 17.6 | 39.5 | 16.2 | 28.4 | 17.2 | 25.6 | 20.7 | 28.9 | 27.6 | 28.1 | 26.4 |
| 70+ | 2.3 | 0.1 | 5.6 | 1.4 | 3.2 | 0.2 | 7.1 | 0.9 | 4.6 | 3.3 | 5.2 | 2.8 |
| *p*-value[2] | <0.0001 | | <0.0001 | | <0.0001 | | 0.0379 | | <0.0001 | | <0.0001 | |
| **Race/Ethnicity** | | | | | | | | | | | | |
| White, non-Hispanic | 26.2 | 57.5 | 63.6 | 66.9 | 34.8 | 57.2 | 51.5 | 62.7 | 49.2 | 66.2 | 49.8 | 65.6 |
| Black, non-Hispanic | 29.1 | 21.3 | 10.4 | 11.0 | 25.0 | 21.4 | 21.2 | 8.8 | 15.1 | 13.3 | 16.7 | 12.5 |
| Other, non-Hispanic | 4.1 | 4.7 | 10.9 | 3.4 | 5.9 | 4.6 | 10.6 | 12.6 | 8.8 | 6.7 | 9.3 | 7.7 |
| Hispanic | 40.7 | 16.5 | 15.0 | 18.9 | 34.3 | 16.8 | 16.7 | 15.9 | 26.9 | 13.8 | 24.3 | 14.2 |
| *p*-value[2] | <0.0001 | | <0.0001 | | <0.0001 | | 0.0252 | | <0.0001 | | <0.0001 | |
| **Previous mammogram** | | | | | | | | | | | | |
| No | 11.1 | 15.5 | 19.5 | 27.7 | 12.7 | 15.6 | 32.0 | 31.0 | 34.6 | 30.7 | 33.9 | 30.7 |
| Yes | 88.9 | 84.5 | 80.5 | 72.4 | 87.3 | 84.4 | 68.0 | 69.0 | 65.4 | 69.3 | 66.1 | 69.3 |
| *p*-value[2] | <0.0001 | | <0.0001 | | <0.0001 | | 0.8456 | | 0.1287 | | 0.1647 | |

[1] Percentages may not add to 100% due to rounding

[2] Pearson chi-square test of independence

NBCCEDP=National Breast and Cervical Cancer Early Detection Program; CBE=clinical breast exam; *N* = weighted sample

## Table 4

Frequency of reported breast symptoms among women reporting at least one symptom

| Symptom | *N* (%[1]) |
|---|---|
| At least one symptom | 32,007 (100) |
| Lump | 10,137 (31.7) |
| Pain or tenderness | 15,766 (49.3) |
| Pain | 7,318 (22.9) |
| Tenderness | 9,017 (28.2) |
| Thickening or fibrocystic changes | 2,877 (9.0) |
| Thickening | 505 (1.6) |
| Fibrocystic changes | 1,722 (5.4) |
| Nodules | 650 (2.0) |
| Inflammation or changes to the skin/nipple | 581 (1.8) |
| Change in size or shape | 193 (0.6) |
| Skin dimpling or skin/nipple retraction | 208 (0.7) |
| Redness or inflammation of the skin | 186 (0.6) |
| Nipple discharge | 1,419 (4.4) |
| Other or unspecified | 7,707 (24.1) |
| Other | 2,422 (7.6) |
| Unspecified | 5,284 (16.5) |

[1] Percentages do not add to 100% because women could report more than one symptom.

*N* = weighted sample

**Table 5**

Adjusted1 odds ratio (OR) and 95% confidence interval (CI) for having an abnormal CBE or mammogram result2 or a final diagnosis of breast cancer by symptoms

| | CBE & Mammogram Results | | | Final Breast Cancer Diagnosis | | |
|---|---|---|---|---|---|---|
| | **Abnormal CBE OR (95% CI)** | **Abnormal Mammogram[2] OR (95% CI)** | **Either[2] OR (95% CI)** | **In situ OR (95% CI)** | **Invasive OR (95% CI)** | **Either OR (95% CI)** |
| **No symptom** | **Ref** | **Ref** | **Ref** | **Ref** | **Ref** | **Ref** |
| Lump | 16.7 (7.4–38.0) | 3.9 (2.0–7.4) | 13.7 (6.3–29.9) | 5.9 (2.3–14.8) | 13.7 (7.8–24.1) | 11.6 (6.8–19.9) |
| Pain or tenderness | 2.5 (1.3–4.8) | 1.2 (0.6–2.4) | 2.4 (1.3–4.3) | 1.1 (0.4–2.6) | 0.6 (0.3–1.2) | 0.7 (0.4–1.3) |
| Thickening or fibrocystic changes | 2.2 (0.5–9.0) | 0.8 (0.1–5.7) | 2.1 (0.5–8.3) | 0.2 (0.1–2.2) | 1.2 (0.4–3.7) | 0.9 (0.3–2.7) |
| Inflammation or changes to the skin/nipple | 16.8 (3.3–85.8) | 7.3 (1.7–30.8) | 12.6 (2.5–63.6) | 0.8 (0.1–7.0) | 27.8 (8.7–88.8) | 21.3 (6.7–67.4) |
| Nipple discharge | 6.3 (2.2–18.6) | 0.9 (0.3–3.0) | 5.6 (2.0–15.6) | 3.2 (0.7–14.1) | 1.3 (0.3–7.0) | 1.7 (0.4–7.4) |
| Other or unspecified | 7.5 (2.6–21.5) | 1.7 (0.7–4.2) | 6.1 (2.3–16.0) | 2.7 (1.1–6.6) | 3.4 (2.1–7.5) | 3.7 (3.0–6.5) |

[1] Adjusted for age, race and ethnicity, and all other symptoms

[2] Includes suspicious abnormality or suggestive of malignancy

OR=odds ratio; CI=confidence interval; CBE = clinical breast examination