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Mammography use among women aged 18–39 years in the United States

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Abstract

Purpose—Recommendations for breast cancer screening using mammography target asymptomatic women aged ≥ 40 years who are not at increased risk for breast cancer. Evidence is not available to demonstrate benefits of screening with mammography at younger ages, and little is known about mammography use among younger women. This study described mammography use among women aged 18–39 years.

Methods—We analyzed data from the 2011–2015 National Survey of Family Growth, an in-person survey of a nationally representative sample of the U.S. household population. We estimated the prevalence of ever receiving a mammogram and examined reasons for the first mammograms among women aged 18–39 years without personal cancer history (n = 8324). We classified the first mammogram as a screening examination if it was performed either as part of a routine exam or because of family history of cancer.

Results—Among women aged 18–39 years, 14.3% (95% CI 13.2–15.4) reported ever having a mammogram. Prevalence of mammography use was highest among women aged 35–39 years (31.0%, 95% CI 27.8–34.5), and was higher among non-Hispanic black women than in other race/ethnicity groups. Women with a family history of breast cancer reported a higher prevalence of mammography use than women without this family history. For both women with and without a family history of breast cancer, about half of all first mammograms were performed for screening reasons.

Conclusions—Among U.S. women aged 18–39 years with no personal cancer history, one in seven reported having received a mammogram. Women with no family history of breast cancer were as likely as those with a family history to initiate breast cancer screening with mammography before age 40. Our findings provide evidence that supports further research to examine factors that prompt young women to receive screening mammograms.

Compliance with ethical standards

Conflict of interest The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. The authors have no conflict of interest to declare.

Keywords

Mammography; Screening; Young women

Introduction

Routine breast cancer screening using mammography is recommended by multiple organizations, with varying recommended starting ages ranging between 40 and 50 years for asymptomatic women who are not at increased risk for breast cancer [1–5]. For women aged < 40 years in the United States, the annual incidence of breast cancer is substantially lower than for older women (24/100,000 for women aged 20–39 years compared to 260/100,000 for women aged 40–74 years) [6]. The American Cancer Society (ACS) recommends breast cancer screening starting at age 30 years for women with a high risk for breast cancer, such as women with a known BRCA mutation or a first-degree relative with a known BRCA mutation, or women with an estimated life-time risk of breast cancer greater than 20% (based on risk models that are largely dependent on family history) [7]. For these women, the ACS advises that the age to start screening should be based on shared decision-making between women and their health care providers, taking into account personal circumstances and preferences [7].

For women aged < 40 years who are not at increased risk for breast cancer, breast cancer screening by mammography is not recommended because the incidence rate of breast cancer is low and mammography has lower sensitivity, higher false-positive rates, and a lower positive predictive value for younger women compared with older women [8]. In addition, mammography may cause harms due to overdiagnosis, anxiety, and radiation exposure [9]. Studies of the potential overuse of screening mammography have focused on women aged > 65 years [10–12]. Few studies have examined the prevalence of mammography use and possible overuse among women aged < 40 years. The objective of this study was to provide nationally representative estimates of mammography use among women aged < 40 years. We sought to answer the following questions: What percentage of women aged < 40 years have ever received a mammogram? Which groups are more likely to have received one? Among those who have ever had a mammogram, at what age did they start and what was the reason for their first mammogram?

Methods

Data source and study population

Data for this analysis are from the National Survey of Family Growth (NSFG), a multistage, probability-based, nationally representative sample of men and women aged 15–44 years in the U.S. household population [13]. NSFG is conducted by the National Center for Health Statistics (NCHS) and supported by co-sponsoring agencies. NSFG gathers information on family life, marriage and divorce, pregnancy, infertility, use of contraception, and general and reproductive health. The survey is done in person in the homes of respondents by trained female interviewers using the computer- assisted self-interviewing system on laptop computers. The sample design and methodologies have been described elsewhere [14–16].

Informed consents are obtained, and the survey procedures are approved by the NCHS Research Ethics Review Board.

Starting in 2011, the NSFG added questions about cancer history and mammography use. NSFG public use files for 2011–2013 and 2013–2015 from female respondents were combined for our analysis (n = 11,300 females aged 15–44 years). The overall response rate for NSFG 2011–2015 was 72.3% for females. Our analysis sample was restricted to women aged 18–39 years because only a few (n = 12) respondents aged < 18 years reported having had a mammogram, and mammography screening is not recommended for most women aged < 40 years. In addition, we excluded women in this age range who reported any personal history of cancer (n = 360) because they may be receiving mammograms for surveillance of cancer recurrence or new cancers. Participants were asked "Have you ever been told by a doctor or other health care provider that you had cancer?" The final analytic sample comprises 8324 (weighted sample size = 44,010,208) women aged 18–39 years without personal history of cancer.

Mammography use

Mammography use among female respondents was assessed by the question similar to that used in the National Health Interview Survey [17]: "A mammogram is an x-ray taken only of the breast by a machine that presses against the breast. Have you ever had a mammogram?"

First mammogram

For women who reported ever having had a mammogram, these questions were asked: "How old were you when you had your first mammogram?" and "What was the main reason you had this first mammogram?" For the latter question, respondents could choose: "because of a problem or lump," "part of a routine exam," "because of family history or personal history of cancer," or "other reason" (no other information available). Women with a personal history of cancer were excluded from the analysis of this study, and thus the third option measures only a family history of cancer (of any type). From these responses, we classified the first mammogram as a screening examination if it was performed as part of a routine exam or because of a family history of cancer. We classified the first mammogram as a diagnostic examination if it was because of a problem or lump. We defined these categories for this analysis, and these categories are not those of the NSFG.

Respondent characteristics

We estimated prevalence of mammography use by the following variables, all defined at the time of interview: family history of breast cancer, age, race/ethnicity, body mass index (BMI) category, educational attainment, income as a percentage of federal poverty threshold (poverty level income), usual source of health care, health insurance coverage, and metropolitan residence.

All female respondents in the NSFG were asked about their family history of breast cancer using the question: "Thinking of your blood relatives, dead or alive, had your mother, sister, aunt or grandmother been diagnosed with breast cancer on either side of the family?" This is

separate from the question about reasons for the first mammogram where family history of cancer (not specifically breast cancer) is one of the listed responses. Race/ethnicity was combined into four categories as Hispanic, non-Hispanic White, non-Hispanic Black, and non-Hispanic other. Usual source of health care was assessed by asking respondents "Is there a place that you usually go to when you are sick or need advice about health?", and those who answered "yes" were asked a subsequent question "What kind of place is it?" Health insurance coverage was classified into three categories: private, public, and uninsured. Respondents covered by private health insurance or Medi-Gap at the time of the survey were categorized as having private health insurance. Respondents covered by Medicaid, Children's Health Insurance Program, state-sponsored health plans, Medicare, military health care, or other government health care were categorized as having public health insurance. Uninsured women and women with only a single-service plan or only the Indian Health Service coverage were considered uninsured, to be consistent with NCHS and U.S. Census Bureau definition [18, 19]. Metropolitan residence was described using the U.S. Office of Management and Budget delineated Metropolitan Statistical Areas (MSAs) and classified as "metropolitan, central city," "metropolitan, suburban," and "non-metropolitan" [20]. We used NCHS-recoded variables for health insurance coverage and MSAs.

Statistical analysis

Using SAS version 9.3 Survey procedures (SAS Institute, Cary, NC), we estimated the prevalence of mammography use with 95% confidence intervals (CI) overall and stratified by selected population characteristics. We examined the main reason for the first mammogram by age at the first mammogram and family history of breast cancer. Sampling weights and design variables provided by NCHS were used to account for the complex, multistage sampling design, and differential response rates [14, 15], and all percentages reported in this study are weighted.

BMI was computed based on reported weight and height for women aged 20–39 years and not pregnant at the time of the survey (BMI is not calculated for adolescents aged < 20 years given the need to use growth charts to determine their age- and sex-dependent BMI). Poverty level income and health insurance coverage were analyzed for respondents aged 20–39 years because reporting of these variables is less reliable for teen survey respondents. Analysis of education was restricted to women aged 22–39 years because a large proportion of respondents aged < 22 years may still be in school. Statistical testing for differences in weighted percentages was conducted using two-tailed Z-statistic. A reference category was selected and each of the other categories was compared with the reference group. In addition, we compared the percentage of women who had their first mammogram for screening reasons by family history of breast cancer using χ^2 tests. All statistical tests were performed at $\alpha = 0.05$ level. To examine potential reporting errors, we conducted a sensitivity analysis excluding 163 women who reported receiving their first mammogram at ages < 18 years. The results of the sensitivity analysis did not change the conclusions of this study and thus are not presented.

Results

We estimated that 14.3% (95% CI 13.2–15.4) of women aged 18–39 years in 2011–2015 had ever had a mammogram (Table 1). Women who had a family history of breast cancer were more likely to have had a mammogram than those without this family history. The prevalence of young women who ever had a mammogram was higher among women aged 25–39 years compared with women aged 18–24 years, and higher among non-Hispanic black women compared with women in other race/ethnicity groups. The prevalence of mammography use was also significantly higher among women with obesity compared with underweight or normal weight women, and among women reporting private doctor offices or HMOs compared with women reporting community health clinics or other clinics as their usual source or those reporting no source of usual care. Mammography use prevalence was lower among women reporting no health insurance compared to women reporting public or private insurance, and among women living in central metropolitan areas compared with those living in suburban metropolitan or non-metropolitan areas.

Among women aged 18–39 years in 2011–2015 who ever had a mammogram (n = 1224), the reason for their first mammogram varied by age at mammogram (Table 2). The most common reason for the first mammogram was “because of a problem or lump” among women aged ≤ 34 years. For women who had their first mammogram between ages 35–39 years, the most common reason was “part of a routine exam.” The percentage of women reporting having had the first mammogram because of family history of cancer ranged between 11.8 and 17.9% for different age groups. Overall, nearly half of women (48.6%, 95% CI 44.0–53.1) who ever had a mammogram reported having received their first one as part of a routine exam (33.8%, 95% CI 29.9–37.9) or because of family history of cancer (14.9%, 95% CI 12.0–18.3).

The percentage of first mammograms performed as part of a routine exam or because of family history of cancer (screening reasons) was similar for women with no family history of breast cancer (47.5%, 95% CI 42.4–52.7), and for women with a family history of breast cancer (53.2%, 95% CI 45.7–60.5) (Table 3). Women with no family history of breast cancer received screening mammograms mainly as part of a routine exam, whereas women with a family history of breast cancer received screening mammograms mainly because of a family history of cancer.

Discussion

Among U.S. women aged 18–39 years in 2011–2015 with no personal cancer history, one in seven (14.3%) reported ever having had a mammogram. The prevalence of mammography use varied by age, family history of breast cancer, race/ethnicity, obesity status, usual source of health care, health insurance coverage, and metropolitan residence.

Mammography screening recommendations for the general population often recommend beginning screening at ages 40 or older [1–5]. Recommendations to start screening at younger ages exist for women with possible hereditary risk of breast cancer [2, 7, 21]. Therefore, most women without a family history of breast cancer would not be expected to

initiate screening before age 40. We estimated that in our study population, 13% of those without a family history of breast cancer reported ever having received a mammogram. Among women who had ever received a mammogram, we found similar percentages of women who reported receiving their first mammogram for screening reasons between those with and without a family history of breast cancer.

We found about half of women who received a mammogram before age 40 years reported having their first mammogram for screening reasons. Mammography screening for breast cancer, combined with effective treatment, reduces breast cancer mortality among women aged ≥ 40 years [4]. Among 117,738 women aged 18–39 years in six U.S. mammography registries, an evaluation of first mammography exams showed poor sensitivity, specificity, and positive predictive value of screening mammography, very low breast cancer rates, high recall rates (i.e., the proportion of screening assessments that led to a recommendation for further workup), and high rates of additional imaging [22]. In addition, beginning screening at younger ages may increase risk for overdiagnosis (i.e., non-invasive and invasive breast cancer detected by screening mammography that would otherwise not cause death or symptoms) and subsequent over-treatment [4]. Other concerns include negative psychological and economic impact of false-positive results and exposure to radiation.

The observed higher prevalence of mammography use among young non-Hispanic black women compared with other race/ethnicity groups is consistent with findings in earlier studies using other large national surveys [23, 24]. Among U.S. women aged 30–39 years, non-Hispanic black women were more likely to report ever having a mammogram and receiving multiple mammograms compared with white women [23]. In another analysis of U.S. women aged 18–33 years, black women also reported higher mammography utilization rates than white women [24]. In contrast, no difference in mammography use in 2015 was observed between white and black women aged 50–74 years [25], the age group for whom routine mammography screening is recommended [4]. A cross-over effect of race on breast cancer risk at around age 40 years has been documented [26, 27]. Non-Hispanic black young women experience a higher burden of breast cancer than non-Hispanic white women in terms of incidence, tumor characteristics, and mortality [28, 29]. The incidence rate among black women aged < 40 years was about 22% higher and the mortality rate twice that of white women in the same age group during 1999–2013 [6]. In addition, young black women were reported to have higher incidence of fibroadenomas than women in other race/ethnicity groups [30, 31], possibly prompting more mammography use [24].

This study is subject to several limitations. First, we do not have information about the total number and frequency of mammograms, or about reasons for any mammograms after the first one. Having one's first mammogram for screening reasons does not necessarily indicate that they received repeated mammograms, and women whose first mammogram was diagnostic may have had subsequent mammograms for screening reasons or continued medical monitoring. Second, family history of breast cancer was assessed by a single question of any breast cancer in first-or second-degree female family members. Further details about family history, such as the age of breast cancer diagnosis in affected family members, number of family members affected, first- versus second-degree relative, and history of ovarian cancer, may help better discriminate breast cancer risk. More accurate

assessment of breast cancer risk could improve our understanding on whether young women are getting screening mammograms based on their risk. Third, mammography use questions had not been used previously on women aged < 30 years. Information was collected through self-report and reporting errors and misclassification cannot be ruled out [32]. Fourth, women with a personal history of cancer were excluded from the analysis, and thus the percentage of young women who received mammograms for diagnostic or screening reasons would have been underestimated if such mammograms led to a breast cancer diagnosis. Lastly, respondent characteristics such as health insurance, income, and BMI at the time of survey may not represent the status at the time of the first mammogram.

In conclusion, one in seven U.S. women aged 18–39 years without personal history of cancer self-reported ever having had a mammogram. Among women aged < 40 years who had ever received a mammogram, about half received their first mammogram for screening reasons, and this percentage was similar for women with and without a family history of breast cancer. Our findings suggest that many women below the recommended age for breast cancer screening are receiving screening mammograms. Although early detection of breast cancer is desirable for women of all ages, who should be screened, when to start, and how to improve screening accuracy remain important questions for young women. Our findings provide evidence that supports further research to examine factors that prompt young women to receive screening mammograms.

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Table 1

Prevalence of mammography use by selected characteristics for U.S. females aged 18–39 years, National Survey of Family Growth, 2011–2015

Characteristics	Sample *n*	%	95% CI	*p*[d]
Overall	8324	14.3	13.2–15.4	
Family history of breast cancer				
Yes	2305	17.6	15.6–19.9	<0.001
No	5916	13.0	11.9–14.3	Ref
Age at survey (year)				
18–24	2714	6.4	5.4–7.6	Ref
25–29	2056	11.3	9.3–13.7	<0.001
30–34	1957	13.0	11.2–15.0	<0.001
35–39	1597	31.0	27.8–34.5	<0.001
Race/ethnicity				
Hispanic	2113	12.5	10.5–14.8	<0.001
White, non-Hispanic	3810	13.9	12.3–15.6	0.002
Black, non-Hispanic	1833	19.3	16.6–22.4	Ref
other, non-Hispanic	568	12.0	9.3–15.5	<0.001
Body Mass Index category[a]				
Under/normal weight	2740	13.9	12.3–15.8	Ref
Overweight	1796	14.0	11.8–16.6	n.s.
Obese	2415	19.3	16.8–22.2	0.001
Education[b]				
Less than high school	1121	16.6	13.9–19.7	n.s.
High school	1545	20.0	16.7–23.7	0.008
Some college	2111	16.5	14.2–19.0	n.s.
College or higher	2001	14.6	12.7–16.6	Ref
Usual source of health care				
No place	1910	10.6	9.0–12.4	<0.001
Private doctors office or HMO	4761	16.1	14.5–17.7	Ref
Community health clinics	1057	12.3	9.6–15.7	0.031
Hospitals	278	16.3	12.0–21.8	n.s.
Other clinics	316	10.0	6.0–16.2	0.025
Poverty level income (%)[c]				
<139%	3266	15.7	14.0–17.6	Ref
139–400%	2893	14.2	12.6–16.0	n.s.
>400%	1328	16.9	14.3–20.0	n.s.
Health insurance[c]				
Private	3719	16.2	14.5–18.0	0.008
Public	2128	16.3	14.4–18.3	0.009
None	1640	12.1	9.9–14.8	Ref

Characteristics	Sample *n*	%	95% CI	*p*[d]
Metropolitan residence				
Metropolitan, central city	3407	12.3	10.9–13.8	Ref
Metropolitan, suburban	3642	14.8	13.4–16.4	0.019
Non-metropolitan	1275	17.2	14.6–20.0	0.002

Women with a personal history of cancer were excluded from this analysis. Sample *n* for some characteristics is less than 8324 due to missing values

n.s. not statistically significant; *Ref* reference group

[a]Estimates limited to women ≥ 20 years old and not pregnant at the time of interview. *Under/normal weight* BMI < 25 kg/m^2; *overweight* 25 ≤ BMI < 30 kg/m^2; *obesity* BMI ≥ 30 kg/m^2

[b]Estimates limited to women ≥ 22 years old at the time of interview

[c]Estimates limited to women ≥ 20 years old at the time of interview

[d]*p* values of two-tailed *Z* test

Table 2

Reason for the first mammogram by age at mammogram for U.S. females aged 18–39 years who reported ever having had a mammogram, National Survey of Family Growth, 2011–2015

Age at first mammogram (year)	%	95% CI		%	95% CI
All (n = 1224)					
Part of a routine exam	33.8	29.9–37.9	Screening[a]	48.6	44.0–53.1
Family history of cancer	14.9	12.0–18.3			
Because of a problem or lump	39.7	35.6–43.9			
Other reason	11.6	8.8–15.3			
≤ 24 (n = 579)					
Part of a routine exam	36.9	30.8–43.5	Screening[a]	48.6	42.3–54.9
Family history of cancer	11.8	8.7–15.8			
Because of a problem or lump	38.6	32.4–45.0			
Other reason	12.7	9.4–17.1			
25–29 (n = 199)					
Part of a routine exam	31.1	23.1–40.5	Screening[a]	48.9	38.8–59.1
Family history of cancer	17.8	11.1–27.2			
Because of a problem or lump	42.1	33.4–51.2			
Other reason	9.0	3.7–20.4			
30–34 (n = 223)					
Part of a routine exam	14.1	10.1–19.3	Screening[a]	32.0	24.4–40.7
Family history of cancer	17.9	11.6–26.6			
Because of a problem or lump	54.3	45.2–63.2			
Other reason	13.6	6.8–25.6			
35–39 (n = 223)					
Part of a routine exam	46.5	36.9–56.4	Screening[a]	62.3	52.5–71.1
Family history of cancer	15.9	10.7–23.1			
Because of a problem or lump	27.8	19.5–37.9			
Other reason	9.8	4.6–19.4			

Women with a personal history of cancer were excluded from this analysis

[a]Defined if the first mammogram was performed as part of a routine exam or because of a family history of cancer

Table 3

Reason for the first mammogram by family history of breast cancer among U.S. females aged 18–39 years who reported ever having had a mammogram, National Survey of Family Growth, 2011–2015

	Family history of breast cancer				p^b
	No		Yes		
	%	95% CI	%	95% CI	
First mammogram for screening[a]	47.5	42.4–52.7	53.2	45.7–60.5	n.s.
First mammogram for specific screening reasons					< 0.001
Part of a routine exam	43.1	37.9–48.4	18.6	13.6–25.1	
Family history of cancer	4.5	3.0–6.8	34.8	28.1–42.4	

Women with a personal history of cancer were excluded from this analysis

[a]Defined if the first mammogram was performed as part of a routine exam or because of a family history of cancer

[b]p values of χ^2 tests for difference in percentages by family history of breast cancer

n.s. not statistically significant