

Breast cancer screening health disparities: A comparison of factors associated with mammography use



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Introduction

- Breast cancer is currently the second leading cause of cancer deaths in women.
- Early detection of breast cancer by mammography has been shown to reduce the mortality and increase the treatment options.
- Studies have shown that women who are uninsured, those with lower income, lower education level, and members of minority groups have consistently reported lower mammography use.
- Lower prevalence of mammography use leads to a more advanced stage of disease at diagnosis which results in higher breast cancer mortality rates.
- According to the American Cancer Society, white women had a higher incidence rate of breast cancer (130.8 per 100,000) compared to black women (126.7 per 100,000). However, black women had a higher mortality rate (28.4 deaths per 100,000) compared to white women (20.3 deaths per 100,000).
- According to the American Cancer Society, only 30% of uninsured women were up to date with breast cancer screening compared with 64% of insured women in 2018.
- This study was conducted using the data from the 2019 National Health Institute Survey (NHIS). We focused on 8 factors associated with mammography use: age, race, education level, health insurance, access to healthcare, family poverty ratio, smoking status, and marital status.
- The primary outcome for this study is mammography use status: binary (never vs. ever use) and 3-group status (never, >1 year, and past year).
- Associations between variables of interest and mammography use status were tested using Chi-square tests and logistic regression models via R Studio.
- This study aims to understand which factors contributed to mammography use for women aged 40-54.
- Our study population included 3,651 women aged 40 to 54 with valid information for the two mammogram questions: "Ever had a mammogram?" and "Most recent mammogram?".
- According to breast cancer screening guidelines, women in this age group should be screened with mammography annually.

Mammography

- Mammography is a breast cancer screening method consisting of a low-dose X-ray image of breast tissue.
- Recent results from organized mammography programs in Europe and Canada indicate that the risk of breast cancer death was reduced by more than 40% for women who were screened.
- The Affordable Care Act states that Medicare and all private health insurance plans fully cover mammograms without any out-of-pocket expense.



Figure 1 Mammography machine.

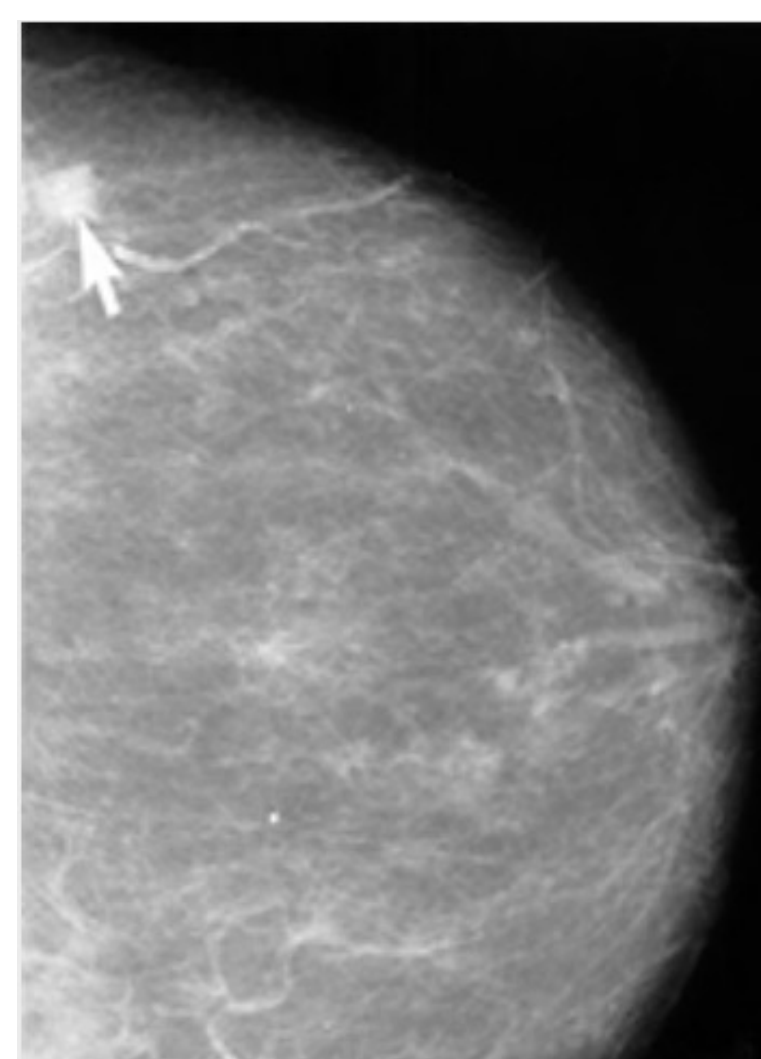


Figure 2 Mammogram showing a small cancerous lesion.

Table 1. Characteristics of study samples

	Total (n=3,651)	Had a mammogram in the past year?			P-value
		Yes 1819 (49.8%)	No 1142 (31.3%)	Never had a mammogram 690 (18.9%)	
Age					
40-44	1,227 (33.6)	499 (40.7)	300 (24.5)	428 (34.9)	<0.001
45-49	1,165 (31.9)	596 (51.2)	411 (35.3)	158 (13.6)	
50-54	1,259 (34.5)	724 (57.5)	431 (34.2)	104 (8.3)	
Race					0.246
White non-Hispanic	2,247 (61.5)	1127 (50.2)	716 (31.9)	404 (17.9)	
African American	472 (12.9)	235 (49.8)	152 (32.2)	85 (18.0)	
Hispanic	581 (15.9)	289 (49.7)	174 (29.9)	118 (20.3)	
Other	351 (9.6)	168 (47.9)	100 (28.5)	83 (23.6)	
Missing					
Education Level					<0.001
High School/GED or lower	1,046 (28.7)	460 (44.0)	338 (32.3)	248 (23.7)	
College or above	2,583 (70.8)	1,349 (52.2)	795 (30.8)	439 (17.0)	
Missing	22 (0.6)	10 (45.5)	9 (40.9)	3 (13.6)	
Health Insurance					<0.001
Yes	3,362 (92.1)	1,754 (52.2)	1,027 (30.6)	581 (17.3)	
No	289 (7.9)	65 (22.5)	115 (39.8)	109 (37.7)	
Access to healthcare					<0.001
Yes	3,426 (93.8)	1,773 (51.8)	1,048 (30.6)	605 (17.7)	
No	224 (6.1)	45 (20.1)	94 (42.0)	85 (37.9)	
Missing	1 (0.03)	1 (100)	0 (0.0)	0 (0.0)	
Family poverty ratio					<0.001
0.00 - 0.99	406 (11.1)	173 (42.6)	133 (32.8)	100 (24.6)	
1.00 - 2.99	1,123 (30.8)	470 (41.9)	376 (33.5)	277 (24.7)	
3.00 - 4.99	868 (23.8)	438 (50.5)	263 (30.3)	167 (19.2)	
5.00 - greater	1,254 (34.4)	738 (58.9)	370 (29.5)	146 (11.6)	
Missing					
Smoking status					<0.001
Current smoker	582 (15.9)	215 (36.9)	230 (39.5)	137 (23.5)	
Former smoker	636 (17.4)	321 (50.5)	202 (31.8)	113 (17.8)	
Never smoker	2,371 (64.9)	1,250 (52.7)	691 (29.1)	430 (18.1)	
Unknown	62 (1.7)	33 (53.2)	19 (30.7)	10 (16.1)	
Marital Status					<0.001
Married	2,055 (56.3)	1,089 (53.0)	612 (29.8)	354 (17.2)	
Separated/ Divorced/ Widowed	938 (25.7)	431 (45.9)	329 (35.1)	178 (19.0)	
Single/Never Married	580 (15.9)	258 (44.5)	177 (30.5)	145 (25.0)	
Missing	78 (2.1)	41 (54.7)	24 (28.0)	13 (17.3)	

Table 2. Results of logistic model

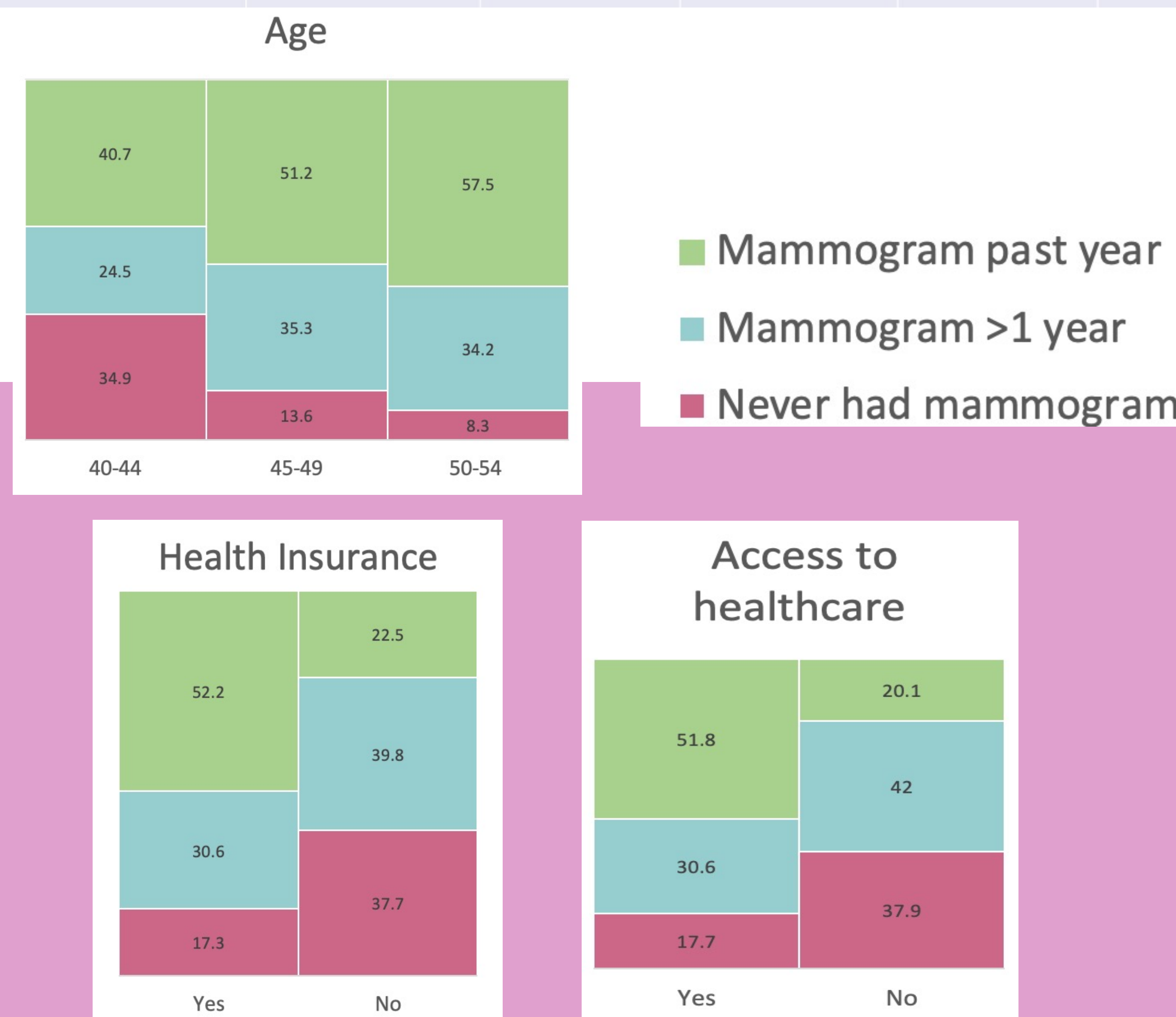
	Unadjusted OR of Never (Ref: ever) (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age				
40-44	1.305 (1.267, 1.344)	<0.001	6.281 (4.922, 8.016)	<0.001
45-49	1.054 (1.023, 1.086)	<0.001	1.746 (1.331, 2.290)	<0.001
50-54 (ref)	1	ref	1	
Race				
non-Hispanic White (ref)	1	ref	1	
African American	1.00 (0.962, 1.041)	0.988	0.694 (0.511, 0.943)	0.020
Hispanic	1.024 (0.988, 1.061)	0.201	0.810 (0.617, 1.062)	0.127
Others	1.058 (1.013, 1.106)	0.012	1.331 (0.988, 1.793)	0.060
Education Level				
High School/GED or lower	1.069 (1.040, 1.010)	<0.001	1.348 (1.092, 1.664)	0.005
College or above (ref)	1		1	
Health Insurance				
Yes (ref)	1	Ref	1	
No	1.227 (1.171, 1.285)	<0.001	2.197 (1.633, 2.956)	<0.001
Access to healthcare				
Yes (ref)	1	Ref	1	
No	1.225 (1.162, 1.291)	<0.001	2.338 (1.694, 3.226)	<0.001
Family poverty ratio				
0.00 - 0.99 (ref)	1	Ref	1	
1.00 - 2.99	1.00 (0.957, 1.045)	0.987	0.943 (0.699, 1.269)	0.694
3.00 - 4.99	0.948 (0.905, 0.992)	0.021	0.845 (0.606, 1.179)	0.322
5.00 - greater	0.878 (0.841, 0.917)	<0.001	0.508 (0.359, 0.721)	<0.001
Smoking status				
Never smoker (ref)	1	Ref	1	
Former smoker	0.996 (0.963, 1.031)	0.833	0.943 (0.734, 1.213)	0.651
Current smoker	1.056 (1.019, 1.094)	0.003	1.158 (0.897, 1.494)	0.261
Marital Status				
Married (ref)	1	Ref	1	
Separated/Divorced/ Widowed	1.012 (0.987, 1.049)	0.256	1.077 (0.859, 1.350)	0.520
Single/Never Married	1.081 (1.043, 1.121)	<0.001	1.321 (1.026, 1.703)	0.031

Discussion

- Among US women aged 40-54, 18.9% women never had mammogram screening for breast cancer, and 49.8% had a mammogram during the past year, which followed the breast cancer screening guideline.
- Except race, all factors were statistically significantly associated with the 3-group mammography use.
- For evaluating factors associated with following breast cancer guidelines of mammogram screening, women who were older (57.5%, aged 50-54), with college or above education (52.2%), higher income (58.9% for family poverty ratio>=5), married (53.0%), with health insurance (52.2%), access to healthcare (51.8%), and never smoking (52.7%) tended to have a mammogram screening in the past year compared to their counterparts.
- After adjusting for other factors, young women aged 40 to 44 (odds ratio [OR] of never use mammogram= 6.3, p<0.001), low education (OR= 1.3, p=0.005), no health insurance (OR= 2.2, p<0.001), single or never married (OR= 1.3, p= 0.031), no access to health care (OR= 2.3, p<0.001) were the high-risk groups of never having mammogram screening compared to their counterparts.
- There was no significant difference between Whites and African Americans for never mammogram use status in the univariate model. However, after adjusting other factors, African American women had a higher rate of using a mammogram (p=0.020).

Conclusions

The study has shown that breast cancer screening health disparities are still evident. Women who are uninsured, who have no access to healthcare, have never been married, and who belong to minority groups have the lowest mammography use rates. This information is beneficial for policy making and community engagement for promoting mammography use and reduce breast cancer health disparities.



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- Studies have shown that women who are uninsured, those with lower income, lower education level, and members of minority groups have consistently reported lower mammography use.
- Lower prevalence of mammography use leads to a more advance stage of disease at diagnosis which results in higher breast cancer mortality rates.
- According to the American Cancer Society, white women had a higher incidence rate of breast cancer (130.8 per 100,000) compared to black women (126.7 per 100,000). However, black women had a higher mortality rate (28.4 deaths per 100,000) compared to white women (20.3 deaths per 100,000).
- The American Cancer Society also found that only 30% of uninsured women were up to date with breast cancer screening compared with 64% of insured women in 2018.
- A 2018 study of mammography use in the US population found that women who were older, had a higher income, and had health insurance were more likely to follow the cancer screening guidelines and have an annual mammogram.



Figure 1. Mammography Machine

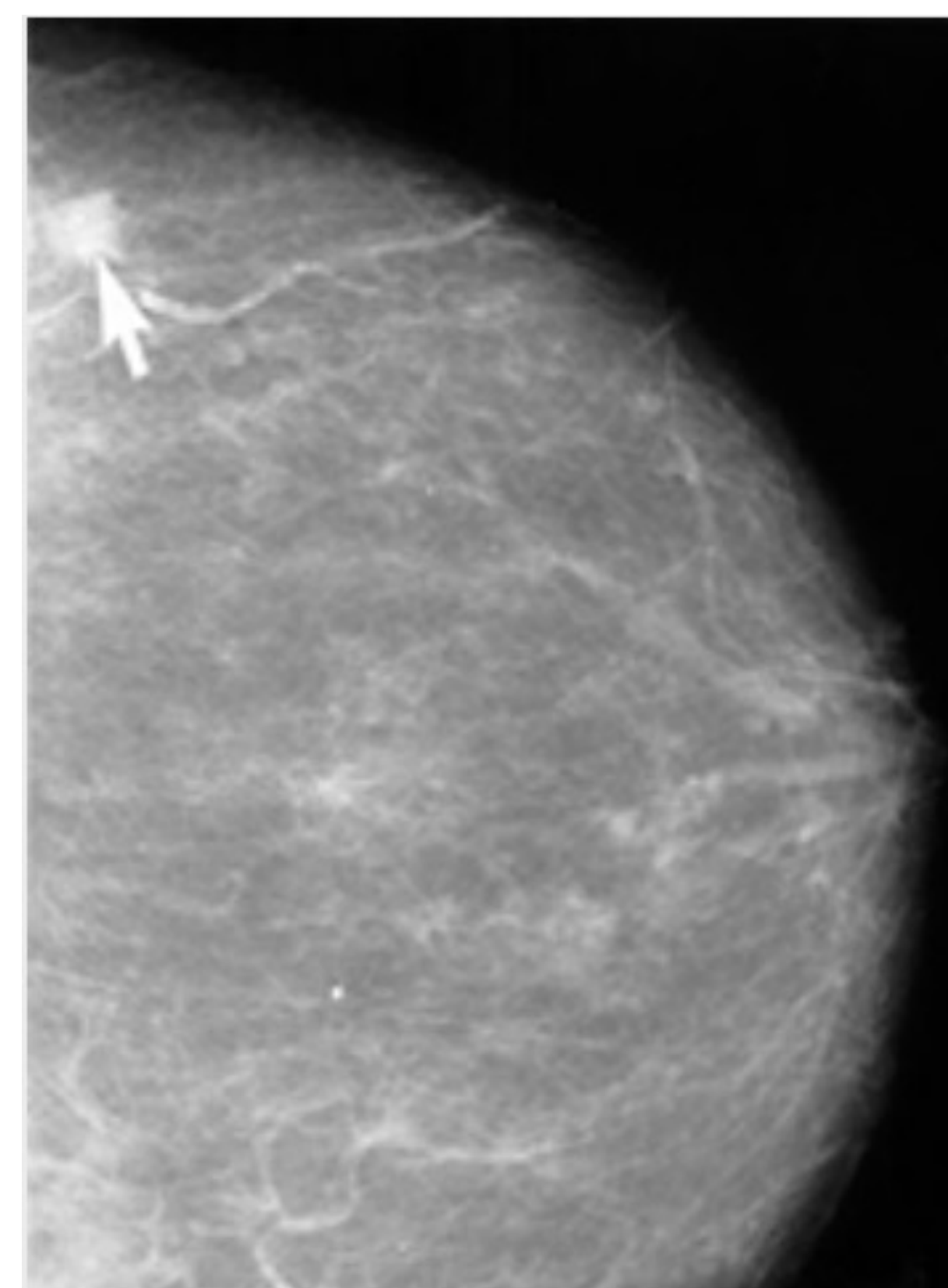


Figure 2. Mammogram showing small cancerous lesion.

- Mammography is a breast cancer screening method consisting of a low-dose X-ray image of breast tissue.
- Recent results from organized mammography programs in Europe and Canada indicate that the risk of breast cancer death was reduced by more than 40% for women who were screened.
- The Affordable Care Act states that Medicare and all private health insurance plans fully cover mammograms without any out-of-pocket expense.

Methods

- This study was conducted using the data from the 2019 National Health Institute Survey (NHIS). We focused on 8 factors associated with mammography use: age, race, education level, health insurance, access to healthcare, family poverty ratio, smoking status, and marital status.
- The primary outcome for this study is mammography use status: binary (never vs. ever use) and 3-group status (never, >1 year, and past year).
- Associations between variables of interest and mammography use status were tested using Chi-square tests and logistic regression models via R Studio.
- Our study population included 3,651 women aged 40 to 54 with valid information for the two mammogram questions: “Ever had a mammogram?” and “Most recent mammogram?”.
- According to breast cancer screening guidelines, women in this age group should be screened with mammography annually.

Purpose

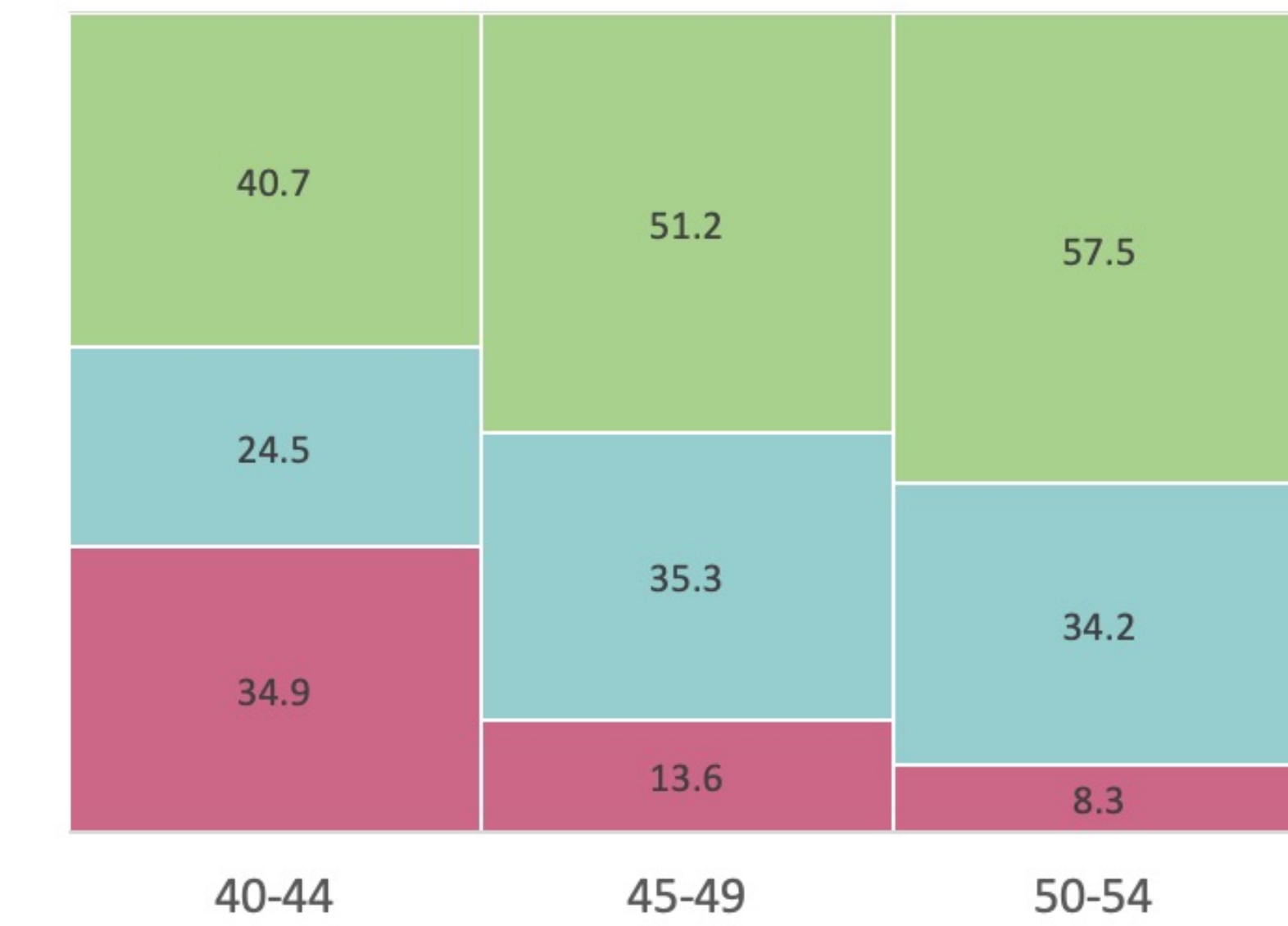
This study aims to understand which factors contributed to mammography use for women aged 40-54.

Descriptive Analysis

Table 1: Characteristics of study sample

	Total (n=3,651)	Had a mammogram in the past year?			P-value
		Yes 1819 (49.8%)	No 1142 (31.3%)	Never had a mammogram 690 (18.9%)	
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40-44	1,227 (33.6)	499 (40.7)	300 (24.5)	428 (34.9)	<0.001
45-49	1,165 (31.9)	596 (51.2)	411 (35.3)	158 (13.6)	
50-54	1,259 (34.5)	724 (57.5)	431 (34.2)	104 (8.3)	
Race					
White non-Hispanic	2,247 (61.5)	1127 (50.2)	716 (31.9)	404 (17.9)	0.246
African American	472 (12.9)	235 (49.8)	152 (32.2)	85 (18.0)	
Hispanic	581 (15.9)	289 (49.7)	174 (29.9)	118 (20.3)	
Other	351 (9.6)	168 (47.9)	100 (28.5)	83 (23.6)	
Education Level					
High School/GED or lower	1,046 (28.7)	460 (44.0)	338 (32.3)	248 (23.7)	<0.001
College or above	2,583 (70.8)	1349 (52.2)	795 (30.8)	439 (17.0)	
Missing	22 (0.6)	10 (45.5)	9 (40.9)	3 (13.6)	
Health Insurance					
Yes	3,362 (92.1)	1754 (52.2)	1027 (30.6)	581 (17.3)	<0.001
No	289 (7.9)	65 (22.5)	115 (39.8)	109 (37.7)	
Access to healthcare					
Yes	3,426 (93.8)	1773 (51.8)	1,048 (30.6)	605 (17.7)	<0.001
No	224 (6.1)	45 (20.1)	94 (42.0)	85 (37.9)	
Missing	1 (0.03)	1 (100)	0 (0.0)	0 (0.0)	
Family poverty ratio					
0.00 – 0.99	406 (11.1)	173 (42.6)	133 (32.8)	100 (24.6)	<0.001
1.00 – 2.99	1,123 (30.8)	470 (41.9)	376 (33.5)	277 (24.7)	
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5.00 – greater	1,254 (34.4)	738 (58.9)	370 (29.5)	146 (11.6)	
Smoking status					
Current smoker	582 (15.9)	215 (36.9)	230 (39.5)	137 (23.5)	<0.001
Former smoker	636 (17.4)	321 (50.5)	202 (31.8)	113 (17.8)	
Never smoker	2,371 (64.9)	1250 (52.7)	691 (29.1)	430 (18.1)	
Unknown	62 (1.7)	33 (53.2)	19 (30.7)	10 (16.1)	
Marital Status					
Married	2,055 (56.3)	1089 (53.0)	612 (29.8)	354 (17.2)	<0.001
Separated/ Divorced/ Widowed	938 (25.7)	431 (45.9)	329 (35.1)	178 (19.0)	
Single/Never Married	580 (15.9)	258 (44.5)	177 (30.5)	145 (25.0)	
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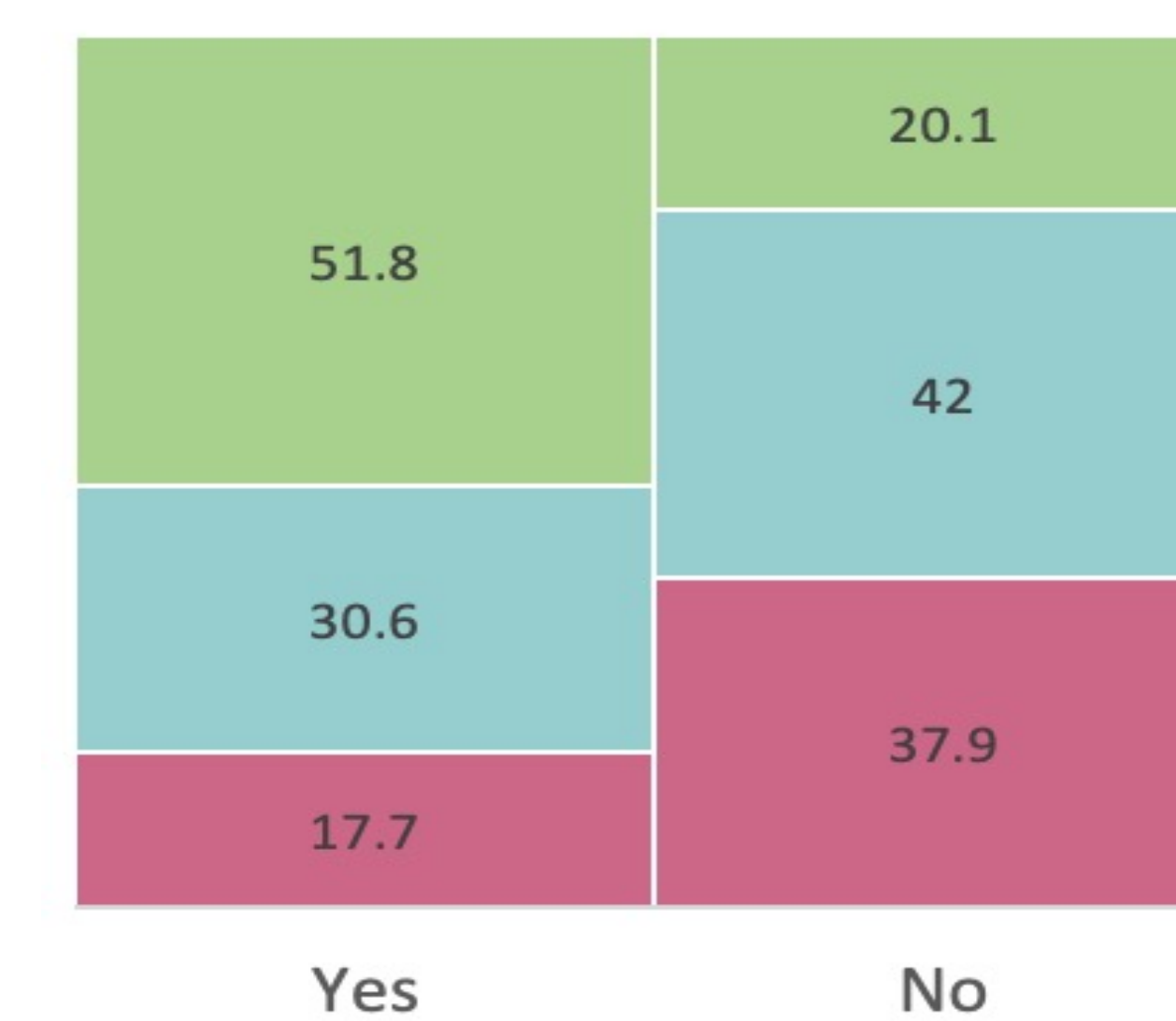
Age



Health Insurance



Access to healthcare



- Mammogram past year
- Mammogram >1 year
- Never had mammogram

Results

Table 2. Univariate and Multivariate logistic models

	Unadjusted OR of Never (Ref: ever) (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age				
40-44	1.305 (1.267, 1.344)	<0.001	6.281 (4.922, 8.016)	<0.001
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Marital Status				
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Separated/Divorced/ Widowed	1.012 (0.987, 1.049)	0.256	1.077 (0.859, 1.350)	0.520
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- After adjusting for other factors, young women aged 40 to 44 (odds ratio [OR] of never use mammogram= 6.3, $p<0.001$), low education (OR= 1.3, $p=0.005$), no health insurance (OR= 2.2, $p<0.001$), single or never married (OR= 1.3, $p= 0.031$), no access to health care (OR= 2.3, $p<0.001$) were the high-risk groups of never having mammogram screening compared to their counterparts.
- There was no significant difference between Whites and African Americans for never mammogram use status in the univariate model. However, after adjusting other factors, African American women had a higher rate of using a mammogram ($p=0.020$).

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