

# Breast Screening Utilization and Cost Sharing Among Employed Insured Women Following the Affordable Care Act: Impact of Race and Income

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## Abstract

**Introduction:** We assessed changes in screening mammography cost sharing and utilization before and after the Affordable Care Act (ACA) and the revised U.S. Preventive Services Task Force (USPSTF) recommendations by race and income.

**Methods:** We used Optum™ Clinformatics™ Data Mart deidentified patient-level analytic files between 2004 and 2014. We first visually inspected trends for screening mammography utilization and cost-sharing elimination over time by race and income. We then specifically calculated the slopes and compared trends before and after 2009 and 2010 to assess the impact of ACA implementation and USPSTF recommendation revisions on screening mammography cost-sharing elimination and utilization. All analyses were conducted in 2018.

**Results:** A total of 1,763,959 commercially insured women, ages 40–74, were included. Comparing trends for cost-sharing elimination before and after the 2010 ACA implementation, a statistically significant but small upward trend was found among all races and income levels with no racial or income disparities evident. However, screening utilization plateaued or showed a significant decline after the 2009 USPSTF recommendation revision in all income and racial groups except for African Americans in whom screening rates continued to increase after 2009.

**Conclusions:** Impact of ACA cost-sharing elimination did not differ among various racial and income groups. Among our population of employer-based insured women, the racial gap in screening mammography use appeared to have closed and potentially reversed among African American women. Continued monitoring of screening utilization as health care policies and recommendations evolve is required, as these changes may affect race- and income-based disparities.

**Keywords:** breast cancer screening, affordable care act, cost sharing, screening utilization

## Introduction

**B**REAST CANCER IS the most commonly diagnosed cancer and the second leading cause of cancer death among U.S. women.<sup>1</sup> Screening mammography improves early detection of breast cancer leading to better clinical outcomes and reduced morbidity and mortality.<sup>2</sup> Screening mammography

utilization, however, varies by sociodemographic characteristics, insurance status, and race/ethnicity,<sup>3</sup> and disparities in breast cancer screening persist among vulnerable populations. For example, Hispanic women continue to have lower rates of timely screening mammography than both white and African American women.<sup>4</sup> In addition, persistent differences in screening mammography utilization are seen based

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on poverty level and health insurance status.<sup>3,5,6</sup> Type of health insurance is also associated with receipt of preventive health services with screening mammography rates being higher among women with public insurance other than Medicare (such as TRICARE, Indian Health Service, or Tribal Health Service coverage) than those with private insurance or Medicare.<sup>5</sup>

One barrier to screening mammography utilization, which potentially contributes to these disparities, is the out-of-pocket costs for screening.<sup>7</sup> Trivedi et al.<sup>8</sup> found that an increase in cost sharing for mammography of \$10 or more among Medicare beneficiaries was associated with ~10% lower rates of biennial screening mammography. In a national sample of predominantly rural women, ages 40–64, the elimination of cost sharing after introduction of the National Rural Electric Cooperative Association plan correlated with increased screening mammography utilization.<sup>9</sup> As of October 2010, the Affordable Care Act (ACA) mandated elimination of cost sharing for U.S. Preventive Services Task Force (USPSTF) level A or B preventive services, including screening mammography,<sup>10</sup> with the goal to improve breast cancer screening utilization and ameliorate disparities in screening. Despite the ACA's elimination of cost sharing, overall screening mammography utilization declined after 2009<sup>11</sup> suggesting a greater effect of the USPSTF recommendation revision, with similar trends in utilization over time among 40–49- and 50–65-year-old women. In brief, before 2009, the USPSTF recommended screening mammography, with or without clinical breast examination, every 1–2 years for women ages 40 and older.<sup>12</sup> In November, 2009, the USPSTF changed its recommendation to biennial screening for women ages 50–74.<sup>13</sup> It further withdrew its previous recommendation for routine screening before age 50, noting that the decision to initiate screening should be an individual one that takes into account specific benefits and harms.

It is unclear whether the impact of the ACA cost-sharing elimination and USPSTF recommendation revisions on screening behaviors varies among women of different races or income levels. The primary objective of this study was to identify disparities in screening mammography utilization before and after cost-sharing elimination under the ACA. Disparities by race/ethnicity and poverty status were assessed to identify unique populations that may be more sensitive to cost-sharing elimination.

## Methods

This study was deemed exempt by the University of Michigan Medical School Institutional Review Board.

### Data and sample

We used deidentified patient-level analytic files between January 2000 and December 2014 from the Optum™ Clinformatics™ Data Mart (OptumInsight, Eden Prairie, Minnesota, U.S.). The Optum Clinformatics Data Mart includes member enrollment data such as demographic variables and individual-level insurance claims. The advantages of this data source include its large size (75 million unique members as of the time of the study), its inclusion of race, income, and household size, and the ability to follow individuals longitudinally as individuals are reported by employers not health plans. It also contains complete patient

payment and charge information, including patient copayment, deductible, and coinsurance amounts, and standardized costs.

Our sample included women ages 40–74 enrolled in employer-based health plans between 2004 and 2014 (1) without a history of breast cancer or prior mastectomy, (2) with at least 12 months of continuous enrollment in a given plan for the plan year, and (3) enrollment in one plan for a given calendar year.

### Measures and outcomes

The primary outcomes were screening mammography utilization and cost-sharing elimination over time stratified by the independent variables of race/ethnicity and poverty status. Screening mammography utilization was calculated as the proportion of all women with at least one claim for that service among all women enrolled for each year. For women with more than one screening mammogram claim in a calendar year, only the first service claim was included in the analyses. Patient cost sharing (total out-of-pocket costs) at each calendar year was calculated for each patient who underwent screening mammography as the sum of patient copayments, coinsurance, and deductible payments. Cost-sharing elimination of screening mammography was defined as zero patient cost sharing for the service. The proportion of women without cost sharing for screening mammography each year was calculated as a proportion of those with first dollar coverage divided by all screening mammography users. We characterized poverty status as a dichotomous variable: “income ≤400% of federal poverty level” and “income >400% of federal poverty level” based on 2014 Census Bureau poverty guidelines by household size.<sup>14</sup>

### Analysis

Demographic characteristics, screening mammography utilization, and cost-sharing elimination were summarized by descriptive statistics. Trends for screening mammography utilization and cost-sharing elimination over time were first visually inspected. For cost-sharing elimination, we then specifically calculated the slopes and compared trends before and after 2010 to assess the impact of ACA implementation on cost-sharing elimination. For screening mammography utilization, we specifically calculated the slopes and compared trends before and after 2009 to examine the impact of USPSTF recommendations on screening utilization, as visual inspection of patterns for screening mammography utilization showed change in 2009. All analyses were performed and presented for each year of service stratified by race/ethnicity and poverty status.

All analyses were conducted in 2018 using Stata (StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP) and SAS 9.4 (SAS Institute, Cary, NC).

We conducted a subanalysis of annual screening utilization and cost-sharing elimination by race and income among women 50 and older, the population for whom the 2009 USPSTF recommendations specifically recommend screening.

TABLE 1. PATTERNS OF SCREENING UTILIZATION AND COST SHARING BY RACE/ETHNICITY AMONG WOMEN AGES 40-74

	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014			
<i>Total eligible women</i>	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
<i>Screening utilization</i>																								
Race/Ethnicity																								
Screening utilization among Asian race	11,936	32.1	14,574	35.3	16,654	37.5	19,061	38.9	21,486	39.4	23,222	39.4	23,222	40.5	22,773	39.2	23,370	38.8	23,477	37.1	24,534	36.9	21,711	35.5
Screening utilization among African American race	38,806	32.5	46,141	34.0	53,928	36.1	69,789	37.8	76,517	37.4	83,930	37.4	83,930	38.5	77,838	38.3	78,371	38.6	75,001	38.6	74,136	39.1	51,656	35.9
Screening utilization among Hispanic ethnicity	31,298	30.5	38,421	32.8	45,118	35.0	49,480	35.8	53,524	36.6	56,430	36.6	56,430	38.0	50,705	36.3	55,073	37.3	52,956	36.2	54,533	36.6	52,952	35.7
Screening utilization among Unknown race	28,210	36.3	30,399	38.7	30,651	40.5	30,365	41.9	30,324	42.1	30,778	42.1	30,778	43.3	28,873	41.9	29,481	41.7	28,871	40.8	29,522	41.7	26,046	40.4
Screening utilization among Caucasian race	423,085	37.5	493,729	39.7	530,995	41.5	570,569	42.7	588,346	43.0	603,527	43.0	603,527	43.9	565,162	42.7	569,604	42.3	552,740	41.6	549,520	42.4	461,410	41.2
<i>Zero cost share</i>																								
Race/Ethnicity																								
Proportion of Asian race with zero cost share	9,834	82.4	12,309	84.5	14,409	86.5	16,820	88.3	18,372	85.5	21,000	85.5	21,000	90.4	20,943	92.0	22,712	97.2	22,908	97.6	24,038	98.0	21,358	98.4
Proportion of African American race with zero cost share	31,557	81.3	38,035	82.4	47,619	88.3	63,307	90.7	68,784	89.9	77,933	89.9	77,933	92.9	73,912	95.0	76,783	98.0	73,464	98.8	72,940	98.4	50,728	98.2
Proportion of Hispanic ethnicity with zero cost share	26,706	85.3	33,487	87.2	40,204	89.1	44,491	89.9	47,975	89.6	52,131	89.6	52,131	92.4	46,971	92.6	53,798	97.7	51,632	97.5	53,199	97.6	52,075	98.3
Proportion of unknown race with zero cost share	23,183	82.2	25,440	83.7	26,933	87.9	27,046	89.1	26,812	88.4	28,167	88.4	28,167	91.5	26,683	92.4	28,432	96.4	27,984	96.9	28,741	97.4	25,574	98.2
Proportion of Caucasian race with zero cost share	344,876	81.5	410,125	83.1	466,196	87.8	508,992	89.2	522,570	88.8	555,332	88.8	555,332	92.0	525,401	93.0	550,934	96.7	536,346	97.0	536,164	97.6	453,212	98.2

TABLE 2. PATTERNS OF SCREENING UTILIZATION AND COST SHARING BY POVERTY STATUS AMONG WOMEN AGES 40–74

Characteristic	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total eligible women	1,541,293	1,682,880	1,717,175	1,812,643	1,877,042	1,899,439	1,822,460	1,859,587	1,834,060	1,806,802	1,550,172
Screening utilization	N	%	N	%	N	%	N	%	N	%	N
Poverty status											
Screening utilization among ≤400% FPL	56,374	33.9	77,401	35.7	97,288	37.0	132,845	37.8	164,661	37.0	183,251
Screening utilization among >400% FPL	194,839	39.7	252,683	41.9	306,938	43.6	395,018	44.7	490,927	44.4	548,867
Zero cost share	N	%	N	%	N	%	N	%	N	%	N
Proportion ≤400% FPL with zero cost share	45,033	79.9	63,260	81.7	83,418	85.7	117,222	88.2	146,757	89.1	168,524
Proportion >400% FPL with zero cost share	159,302	81.8	211,458	83.7	269,267	87.7	351,900	89.1	434,371	88.5	505,466

Results

Sample characteristics

We identified an average of 1,763,959 commercially insured women in a given plan per year meeting our inclusion criteria. Characteristics of members and their health plans have previously been described.<sup>15</sup> Screening mammography utilization and cost-sharing elimination for each year of service and by race/ethnicity and poverty status are summarized in Tables 1 and 2, respectively.

Cost-sharing elimination over time

Overall, an upward trend was seen in the proportion of women with zero cost sharing over time among all races/ethnicities (Fig. 1) and income levels (Fig. 2). The trend lines for different races and income levels appeared to have greater slopes from 2004 to 2010 while converging and reaching a plateau in 2010–2011. No racial or income disparities were evident after 2011. Comparing trends for cost-sharing elimination before and after 2010, a statistically significant upward but small trend was found among all races (Fig. 1) and income levels (Fig. 2).

The trends for cost-sharing elimination by race (Fig. 3) and income (Fig. 4) among those 50 and older mirrored the population at large.

Screening mammography utilization over time

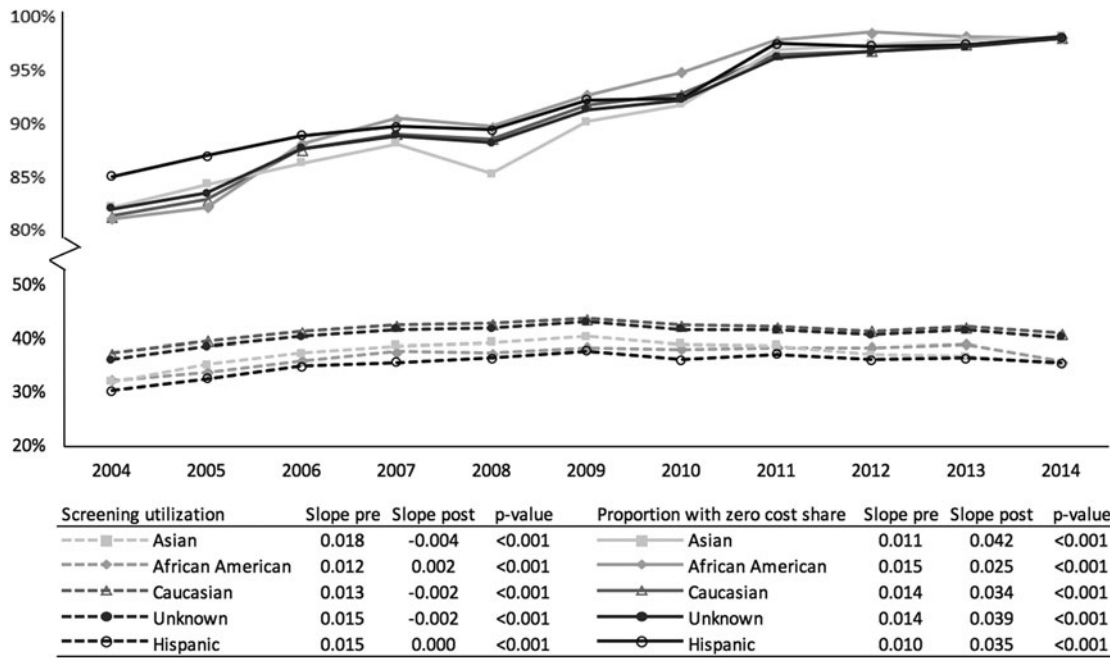
Screening mammography utilization showed a small upward trend from 2004 to 2009 among all races, while reaching a plateau or trending downward after 2009 in all races except for African Americans (Fig. 1). Comparing slopes for screening mammography utilization before and after 2009 by race/ethnicity, Caucasians and Asians showed a statistically significant decline in screening utilization after 2009, while African Americans were the only racial group who demonstrated a statistically significant increase in screening utilization after 2009 (Fig. 1).

Screening mammography utilization showed a small upward trend from 2004 to 2009 among women with both income levels ≤400% FPL and >400% FPL, while demonstrating a comparable downward trend in both groups after 2009 (Fig. 2). Comparing slopes for screening mammography utilization before and after 2009 by poverty status, both women with income levels ≤400% FPL and >400% FPL showed a significant downward trend after 2009 (Fig. 2).

Regarding the subanalyses of screening utilization by race and income among those 50 and older, we demonstrated that African American women in this age group experienced a plateau in screening utilization after 2009 rather than a decline in other groups (Table 3 and Fig. 3). The trends in screening utilization by income in this older population mirrored the population at large (Table 4 and Fig. 4).

Discussion

Among our sample of employer-based insured women, we found an upward trend in the proportion of women with zero cost sharing for screening mammography both before and after 2010 among all races/ethnicities and income levels. By 2010, when ACA mandated cost-sharing elimination for screening mammography, >90% of women in our sample



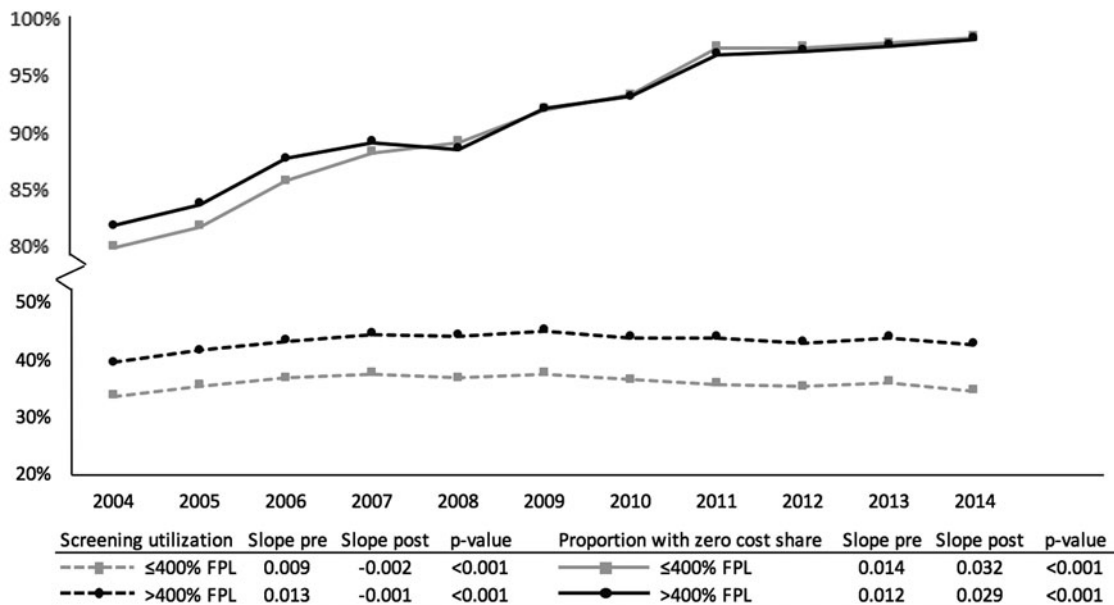
**FIG. 1.** Elimination of cost sharing for screening mammography before and after the 2010 ACA implementation and mammography screening utilization before and after the USPSTF breast screening recommendation revision, by race and among women ages 40–74. ACA, Affordable Care Act; USPSTF, U.S. Preventive Services Task Force.

already had zero cost share for screening mammography, independent of their race/ethnicity or poverty status. After 2010, a small increase in cost-sharing elimination was seen among all races and income levels with no evident racial or income disparities with respect to the impact of ACA provision on screening mammography cost-sharing elimination.

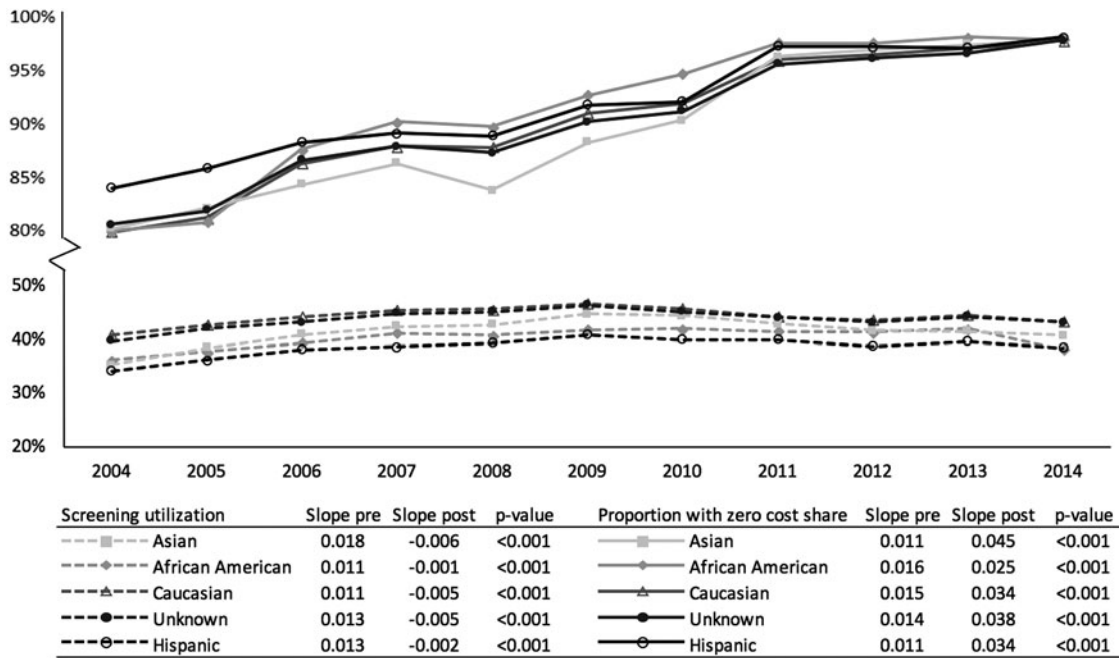
Despite the universal upward trend in cost-sharing elimination, in our sample of employer-based insured women,

screening mammography utilization plateaued or showed a significant decline after 2009 in all income and racial groups except for African Americans.

Extensive efforts to improve breast cancer screening pre-date the ACA, including the near-complete elimination of financial barriers to breast screening in the employed insured population. In a recent study, Carlos et al.<sup>15</sup> suggested that we may be experiencing a ceiling effect in further responses of



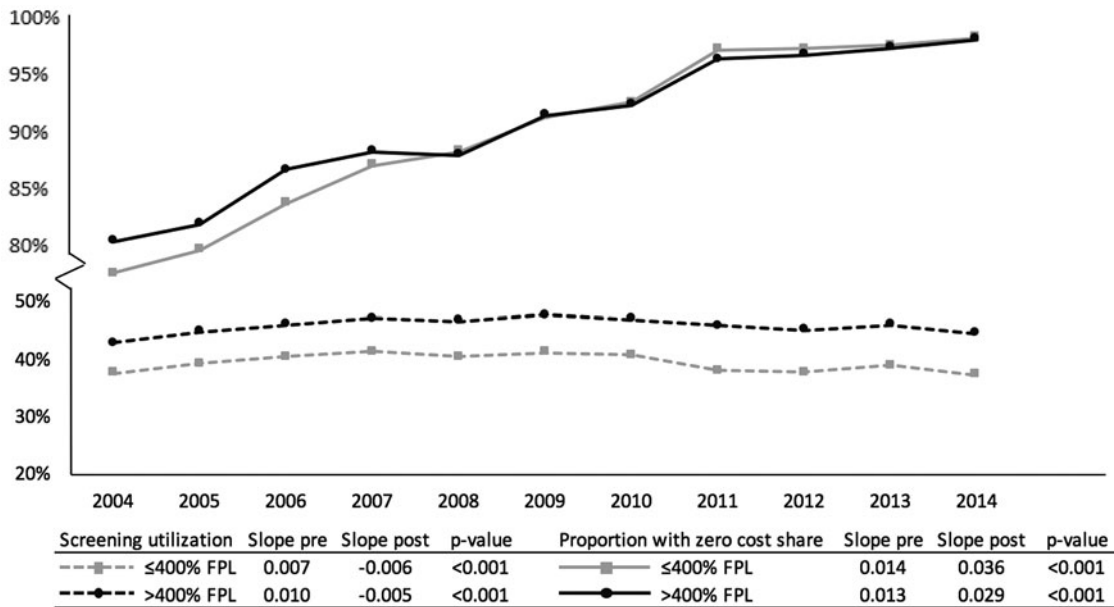
**FIG. 2.** Elimination of cost sharing for screening mammography before and after the 2010 ACA implementation and mammography screening utilization before and after the USPSTF breast screening recommendation revision, by income level and among women ages 40–74.



**FIG. 3.** Elimination of cost sharing for screening mammography before and after the 2010 ACA implementation and mammography screening utilization before and after the USPSTF breast screening recommendation revision, by race and among women ages 50–74.

screening rates to financial incentives that reduce screening cost. Our findings build on prior works to show that this ceiling effect is likely similar among all races/ethnicities and income levels. Screening mammography utilization among our sample of insured women appeared, however, to be more influenced by the 2009 USPSTF revised recommendations. We have previously shown a general decline in screening

mammography utilization in the years following the implementation of the 2009 USPSTF recommendations.<sup>11</sup> In this study, examining race-specific rates and trends enabled us to show that screening mammography utilization has continued to increase among African American women even after the implementation of the USPSTF recommendations in 2009. In African American women 50 and older, the screening



**FIG. 4.** Elimination of cost sharing for screening mammography before and after the 2010 ACA implementation and mammography screening utilization before and after the USPSTF breast screening recommendation revision, by income level and among women ages 50–74.

TABLE 3. PATTERNS OF SCREENING UTILIZATION AND COST SHARING BY RACE/ETHNICITY AMONG WOMEN AGES 50–74

	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014	
<i>Total eligible women</i>	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
<i>Screening utilization</i>	792,555		901,679		940,845		1,030,424		1,084,522		1,106,122		1,065,851		1,105,982		1,098,146		1,092,012		939,417	
<i>Race/Ethnicity</i>																						
Screening utilization among Asian race	5,633	35.3	7,075	38.5	8,249	38.5	9,647	41.0	10,895	42.5	11,795	42.8	11,738	44.5	11,906	44.5	12,011	43.0	12,596	41.8	11,379	40.8
Screening utilization among African American race	22,288	36.2	27,107	37.7	31,811	37.7	44,060	39.4	48,553	41.3	53,453	40.8	49,619	42.1	49,274	42.1	47,090	41.6	46,998	41.4	31,871	38.3
Screening utilization among Hispanic ethnicity	15,586	34.2	19,556	36.3	23,103	36.3	25,634	38.2	28,054	38.7	29,874	39.4	27,272	40.1	29,423	40.1	28,537	40.1	30,129	38.9	29,432	38.6
Screening utilization among unknown race	15,317	39.8	17,030	42.2	17,169	42.2	17,564	43.2	17,960	44.9	18,423	45.2	17,636	45.3	18,018	44.1	17,849	44.1	18,646	43.2	16,565	43.2
Screening utilization among Caucasian race	242,065	40.9	292,922	42.8	318,732	42.8	355,320	44.3	371,852	45.6	384,554	45.7	367,409	45.9	368,536	44.4	360,214	44.4	363,748	43.7	306,682	43.4
<i>Zero cost share</i>																						
<i>Race/Ethnicity</i>																						
Proportion of Asian race with zero cost share	4,528	80.4	5,824	82.3	6,971	82.3	8,347	84.5	9,149	86.5	10,439	84.0	10,628	90.5	11,494	96.5	11,676	97.2	12,294	97.6	11,161	98.1
Proportion of African American race with zero cost share	17,881	80.2	21,966	81.0	27,916	81.0	39,843	87.8	43,661	90.4	49,654	89.9	47,065	94.9	48,200	97.8	46,065	97.8	46,199	98.3	31,271	98.1
Proportion of Hispanic ethnicity with zero cost share	13,127	84.2	16,809	86.0	20,447	86.0	22,885	88.5	25,001	89.3	27,485	89.1	25,159	92.3	28,686	97.5	27,781	97.4	29,327	97.3	28,937	98.3
Proportion of unknown race with zero cost share	12,375	80.8	13,977	82.1	14,903	82.1	15,476	86.8	15,721	88.1	16,660	87.5	16,120	91.4	17,268	95.8	17,189	96.3	18,054	96.8	16,233	98.0
Proportion of Caucasian race with zero cost share	193,979	80.1	238,434	81.4	275,826	81.4	313,105	86.5	327,122	88.1	350,535	88.0	338,343	92.1	354,646	96.2	348,193	96.7	353,753	97.3	300,639	98.0

TABLE 4. PATTERNS OF SCREENING UTILIZATION AND COST SHARING BY POVERTY STATUS AMONG WOMEN AGES 50–74

Characteristic	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total eligible women	792,555	901,679	940,845	1,030,424	1,084,522	1,106,122	1,065,851	1,105,982	1,098,146	1,092,012	939,417
Screening utilization	N	%	N	%	N	%	N	%	N	%	N
Poverty status											
Screening utilization among ≤400% FPL	35,792	37.8	50,029	39.5	61,152	40.6	84,481	41.5	101,605	40.7	111,240
Screening utilization among >400% FPL	113,227	43.1	151,901	45.0	186,120	46.2	248,036	47.3	311,036	46.8	350,832
Cost share											
Zero cost share	N	%	N	%	N	%	N	%	N	%	N
Poverty status											
Proportion ≤400% FPL with zero cost share	27,789	77.6	39,806	79.6	51,191	83.7	73,494	87.0	89,664	88.2	101,429
Proportion >400% FPL with zero cost share	91,040	80.4	124,432	81.9	161,219	86.6	218,714	88.2	273,269	87.9	320,497

utilization appeared to plateau rather than frankly decline as in the other races and ethnicities. This finding suggests that the increase in utilization among African American women is concentrated in younger women, 40–49-year olds.

Lee et al.<sup>16</sup> showed that the release of the revised 2009 USPSTF recommendations for screening mammography was associated with a decline in screening mammography utilization among white, but not African American, women. As breast cancer mortality rate remains higher among African American women, it has been suggested that African American women may better perceive the benefits of screening mammography.<sup>17</sup> Similarly, we can speculate that physician recommendations for screening mammography may vary across different racial groups based on prognosis and mortality rates.

Future research is needed to clarify why impact of USPSTF recommendation revisions on screening behaviors varies among women with different races. Nevertheless, these findings suggest that the racial gap in screening mammography has closed and potentially reversed among African American women with employer-based health insurance plans. It is important to continue monitoring screening utilization as health care policies and guidelines change, as these changes may affect disparities in screening between different racial and income groups.

A strength of this study is the use of large patient-level data set, including patient demographics (e.g., race and income) and payment (e.g., copayment and deductible) information, which allowed us to describe and assess patterns of screening mammography utilization and cost-sharing elimination over time by race and income level. However, there are a number of limitations to our study. First, our descriptive cross-sectional design limited our ability to determine causal associations between cost-sharing elimination and screening mammography utilization. In addition, we cannot assess whether individual women experienced reductions in their cost sharing or changed their use of screening mammography in response. Furthermore, our sample of employed insured women has potentially resulted in underestimation of racial and income disparities in screening mammography utilization. Lastly, while using administrative data offers the opportunity to examine changes in large populations, there are inherent weaknesses such as variation in coding and billing.

**Acknowledgments**

This study was coordinated by the ECOG-ACRIN Cancer Research Group (Peter O’Dwyer, MD, and Mitchell D. Schnall, MD, PhD, Group Co-Chairs) and supported by the National Cancer Institute of the National Institutes of Health under the following award numbers: CA189828, CA180801. SFD is supported by NIH T32 EB005970-09. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. government.

**Author Disclosure Statement**

No competing financial interests exist.



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