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Mammography Utilization among Black and White Medicare Beneficiaries in High Breast Cancer Mortality US Counties

Mandeep K. Virk-Baker, PhD, MPH¹, Michelle Y. Martin, PhD^{2,3}, Robert S. Levine, MD⁴, Xin Wang, MS³, Tim R Nagy, PhD^{1,2}, and Maria Pisu, PhD^{2,3}

¹Department of Nutrition Sciences, University of Alabama at Birmingham (UAB), AL, USA

²UAB Comprehensive Cancer Center

³UAB Division of Preventive Medicine

⁴Meharry Medical College, Nashville, TN, USA

Abstract

Background—Disparities in US breast cancer mortality between older Black and White women have increased in the last twenty years. Regular mammography use is important for early detection and treatment: its utilization among older Blacks especially in counties with high Black mortality is of interest, but its extent and determinants are unknown.

Methods—We used Medicare claims for Black and White women 65–74 years old in 203 counties with the highest Black breast cancer mortality. Outcomes over six years were: screening, i.e., 1 screening mammogram, and regular screening, i.e., 3 mammograms. With logistic regressions, we examined the independent effect of race on screening controlling for individual and county-level factors.

Results—Of 406,602 beneficiaries, 17% were Black. Screening and regular screening was significantly lower among Blacks (51.6% vs. 56.9%; 32.9% vs 43.1%, respectively). Controlling for covariates, including use of cervical cancer screening, flu shots, or lipids tests, Black women were more likely to have screening (OR 1.23, CI: 1.20–1.25), but not regular screening (OR 0.95, CI: 0.93 – 0.97) than White women. County-level managed care penetration was negatively associated with screening and regular screening.

Conclusions—In Medicare enrollees from these counties, breast cancer screening was low. Black women had same or better odds of screening than White women. Some health care factors, e.g., managed care, were negatively associated with screening. Further studies on the determinants of mammography utilization in older women from these counties are warranted.

Keywords

Cancer; disparities; mammography; screening; Black women

Introduction

Over 200,000 women are newly diagnosed with breast cancer, and nearly 40,000 succumb to this disease in the US annually.¹ After Medicare started reimbursing for screening mammograms in the early 90's, increasing trends in breast cancer mortality among older

Corresponding Author: Maria Pisu, PhD, University of Alabama at Birmingham, MT 636, 1720 2nd Ave South, Birmingham, AL 35294-4410, Phone: 205-975-7366, Fax: 205-934-7959, mpisu@uab.edu.

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White and Black women were reversed, and have since decreased.² However, rates decreased less rapidly for Black women leading to persisting and increasing disparities.² Further, in most of the 203 US counties where 75% of all breast cancer deaths for older Black women occurred in 1999–2005, the county-level age adjusted mortality rates for older Black women were above those for White women.³ The temporal link between Medicare's reimbursement for screening mammography and the unequal rates of decline in breast cancer mortality which followed, make it important to further understand screening mammography utilization in counties with high breast cancer mortality.

The Centers for Disease Control and Prevention (CDC) recommends that women 50 to 74 years of age receive at least one mammogram every two years,⁴ and the American Cancer Society recommends yearly screening regardless of age for women in good health.⁵ Despite these guidelines, several studies reported differences in screening rates among older Black and White women.^{6–8} These were limited by follow-up periods of two years or less, thereby not evaluating the uptake of regular screening over longer periods.^{6–11} Given the importance of repeated screening, there is a need to understand whether older women are screened regularly as recommended, and what factors may predispose or enable them to do so. For example, having primary care visits or other preventive services are individual-level factors associated with higher likelihoods of screening.^{6,11–13} Community-level factors, for example a county's socioeconomic status or availability and type of medical resources such as managed care organizations or medical schools, also affect health care utilization as well as health outcomes.^{8,12,14–19} In a previous study, we found that counties with a higher proportion of hospitals associated with medical schools were less likely to have disparities in breast cancer mortality for Black and White older women,³ leading us to hypothesize that the presence of medical schools may be associated with better breast cancer screening and early detection.

The objective of this paper was to assess the uptake of breast cancer screening in women 65 to 74 year old from counties with most of the breast cancer deaths in Black older women. We examined screening over a period of 6 years, and the factors at the individual and county level that were associated with this screening behavior.

Methods

Population

We obtained Medicare claims data for outpatient procedures, physician visits and inpatient stays for 1,000,000 White and Black women age 65 years old and older randomly selected from 203 US counties. These counties had 14 or more breast cancer deaths in older Black women in 1999–2005.³ Counties were mainly urban counties in the Eastern US. On average 25.7% of their population was Black females, 7.0% had less than 9 years of school, 14.6% were uninsured, and 12.4% lived below poverty, and the average median annual household income was \$42,457. The average breast cancer mortality was 117 per 100,000 in White and 137.5 in Black older women.

Our sample included women continuously enrolled in fee-for-service Medicare for 6 years from 2001–2006 (N=414,453). Because recommendations differ across organizations for women 75 and older, we limited our analyses to women 65 to 74 years of age. We included women in fee-for service plans because claims data are not available for women in managed care plans. We excluded women who had claims indicating breast cancer in the first year of follow-up, i.e., in 2001 (N=7,851). Breast cancer was identified using International Classification of Disease-version 9 (ICD-9) codes 174-174.9 and 233, ICD-9 procedure codes 40.11,40.23, 40.3, 85.2, 85.21, 85.22, 85.23, 85.4x, and Current Procedure Terminology (CPT)/Health Care Financing Administration Common Procedure Coding

System (HCPCS) codes 19120, 19125, 19126, 19160, 19162, 19180, 19182, 19184-7, 19200, 19211-6, 19220, 19224-9, 19240, 19250-5, and 38740-38745 for breast cancer related procedures.

Outcomes

Mammograms were identified using claims from outpatient and physician visits, and CPT / HCPCS codes (76090-76092, G0202, G0204, G0206) or ICD-9 codes (V76.12, 87.37) for unilateral and bilateral mammography or for screening mammography.²⁰ We included screening and diagnostic billing codes and adapted the algorithm proposed by Smith-Bindman to differentiate screening and diagnostic mammograms. We defined “**screening**” as at least one screening mammogram, and “**regular screening**” as at least three mammograms, screening and diagnostic, in the six years of follow-up. In the latter definition, we included diagnostic mammograms to account for the possibility of women skipping or delaying one or more screening mammograms because of a diagnostic procedure, and thus not meeting the definition of regular screening when they should.

In sensitivity analyses, we re-defined screening as having one or more screening or diagnostic mammograms in the six-year follow-up period. Further, we re-defined regular screening as the receipt of three screening mammograms in the follow-up period, thus not including diagnostic mammograms.

Analysis

We used logistic regressions to test the association of screening with race and selected covariates based on the Behavioral Model of Access to Care.¹⁴ The model posits that access to medical care depends on three main factors: need, predisposing, and enabling. The need factors are related to co-morbid conditions that may make a woman more likely to access care and receive advice about breast screening. We included in our analytic model comorbid conditions identified by the Elixhauser comorbidity algorithm.²¹ The predisposing factors were age and the use of other preventive tests in 2001, i.e., cervical cancer screening, lipid tests, and flu shots. These variables were used to represent the woman’s attitude toward preventive care, as it relates to other cancers, other chronic diseases, and infectious diseases. Moreover, given the limits of the claims data in providing other individual level information, we included community level predisposing factors: these served as proxy for individual predisposing characteristics and also to adjust for the direct effect of community level factors on access to care.

Community level factors were defined at the county level using data from the Area Resource File,²² which contains information on demographics and socioeconomics, physicians, hospitals, and other resources from sources like the US Census Bureau, the American Medical Association, the American Hospital Association, and the Center for Medicare and Medicaid Services.²² We considered the county because the availability of resources, particular medical resources, may be determined at this geographic level, and not at lower levels such as ZIP codes or census tracts.²³ Based on the 75th percentile value of each variable, we dichotomized these variables and defined counties where women resided to be:

- a. Older: if greater than 16.2% of the county residents were women ages 65 years and older. This variable ranged in value from 6.4% to 26.5%, with a mean of 14.7%. The mean is similar to the 14% US mean for men and women 65 and older.
- b. Low education: if the proportion of county population with 9 years of school or less was above 8.1%. This variable ranged in value from 2.4% to 20.1%, with a mean of 6.6%. This is similar to the US mean of 6% in 2012.

The individual-level enabling factor included in our model was a variable indicating high emergency room (ER) utilization. This variable was chosen to represent the availability and access, or lack of, to good quality care. In the sample, the mean percent of claims from ER departments was 3.5%. We defined high ER utilizers women whose percent of claims from ER visits was greater or equal to the value of the 75th percentile for the sample, that is 4.1%.

Further, we used community level data to adjust for economic status. Based on the 75th percentile value of each variable, we defined counties as “Poor” if the proportion of county population that lived below the poverty level was more than 13.6%. This variable ranged in value from 4.1% to 27.5%, with a mean of 11.2%. In comparison, the mean proportion of US population living below poverty was 14.3% in 2007–2011.

Among the enabling factors, we also considered the type of medical care available to women in our sample. Because the presence of managed care organizations and the availability of primary care doctors have been found to be associated with the uptake of breast cancer screening, we defined “High managed care penetration” those counties where the managed care penetration was above 24.4% (range 0–47.3%, mean 15.6%), and counties “With abundant primary care resources” as those with a number of primary care physicians per 100,000 persons 65 and older of 220.7 or more (range 25.3–435.9, mean 180.5). Moreover, since the presence of medical schools may also be associated with higher levels of screening, we defined counties “With high medical school presence” as those counties where the proportion of hospitals associated with medical schools was above 57.1% (range 0–100%, mean 42.3%).

Results

Of the 406,602 women identified, approximately 17% of women were Black (Table 1). Blacks were younger than Whites, less likely to have used preventive services, and more likely to have comorbid conditions, greater ER utilization, and to come from poorer and less educated counties or from counties with fewer primary care resources, lower managed care penetration, and higher proportions of hospitals associated with medical schools (Table 1).

Overall, 56% of women had screening (1 screening mammogram) over the six years of follow-up, 51.6% of Black and 56.9% of White women (unadjusted OR 0.81, CI: 0.80–0.82) (Table 2). Controlling for age, number of comorbidities, other preventive measures (cervical cancer screening, lipids tests or flu shot), high ER utilization, and county level variables, odds of screening were statistically greater for Black than for White women (OR 1.23 CI: 1.20–1.25) (Table 2). Moreover, screening was positively associated with having comorbid conditions or other preventive services at the beginning of the follow-up period, and having high ER utilization. Of county level variables, only managed care penetration had a significant association with screening: 40.7% of women in counties with high penetration had screening compared to 61.0% in counties with low penetration (adjusted OR 0.69, CI 0.67–0.70). Moreover, although differences were modest, women from counties with greater presence of medical schools were less likely to have screening than women in counterpart counties (53.2% vs 56.8%); however, in adjusted analyses, odds of screening were higher for women in counties with greater presence of medical schools (adjusted OR 1.11 CI 1.09–1.13).

Approximately 41% of women had regular screening (3 mammograms, screening or diagnostic) in the follow-up period, 32.9% of Black and 43.1% of White women (unadjusted OR 0.59 CI: 0.58–0.61). This association was only marginally significant in adjusted analyses (OR 0.95, CI: 0.93 – 0.97) (Table 3). Regular screening was significantly and positively associated with having comorbid conditions and receiving preventive services, but

not associated with high ER utilization. Of community factors, regular screening was negatively and significantly associated with living in a county with high managed care penetration.

We further examined screening for women with and without other preventive services (Figures 1A and 1B). Among women who received other preventive services in 2001, screening (1 screening mammogram) was similar for White and Black women and, in some cases, slightly higher for Whites. Among women who did not receive other preventive services, screening was slightly higher for Black women, especially among women who did not receive a flu shot. Similarly, regular screening (3 mammograms, screening or diagnostic) was higher for White women among women with preventive services, but not among women without preventive services in 2001. All differences in proportions were significant at $P < 0.0001$.

In sensitivity analyses, we found that screening rates were slightly higher when we re-defined screening as having at least one screening or diagnostic mammogram: in this case, 59.6% of women had screening, 55.3% of Black and 60.5% of White women. When we re-defined regular screening considering only screening mammograms, we found that 26.6% of women had regular screening, 18.9% of Blacks and 28.2% of Whites.

Discussion

In US counties where most of the breast cancer deaths for older Black women occur, only about 56% of women 65–74 years old received at least one screening mammogram in a 6 year follow-up period starting in 2001, and about 41% had three or more mammograms. This latter proportion would be even lower, 26.6%, if only screening mammograms were considered. Thus, recommendations of obtaining one mammogram every two years are not followed by the majority of older women in these counties.

From a policy perspective, understanding why screening rates among older women are low is fundamental. Low breast cancer screening rates among Medicare beneficiaries have been reported previously. In a five year period following Medicare coverage for screening mammograms (1993 to 1997), only 57% of Medicare beneficiaries in one state had one or more screening mammograms.²⁴ Further, in two year periods from 2000 to 2005, screening was found in fewer than 50% of women.^{6–8} Similarly, among older women with breast cancer between 1993 and 2005, only 49% had screening mammograms before diagnosis.¹³ While these rates are worrisome, our finding that 41% or fewer women received regular screening is of particular concern as it is the repeat mammography that is extremely beneficial for detecting small tumor masses that could undergo early medical treatment. Recently, the results from a 30 year follow-up study revealed a highly significant reduction in breast cancer mortality among women with regular mammography as compared to women without regular mammography (RR 0.69; 95% CI 0.56 – 0.84).²⁵ Furthermore, it is especially important to understand screening uptake among older American women in the counties selected for this study. As mentioned above, most of the breast cancer deaths for older Black women occur in these counties, and in most, mortality rates are higher for Black than for White women.³ Therefore, improving breast cancer screening rates in these targeted areas is bound to improve the outcomes of older Black American women.

Having access to medical care remains an important predictor of screening as illustrated by greater screening rates for women who receive care for other comorbid conditions.^{12,13} However, access to breast cancer screening also depends on the organization of medical care and resources available.^{8,12,16–19} We found that women in counties with high managed care penetration were less likely to receive one or more mammograms in six years than women in

counties with lower managed care penetration. Although women in our sample were not in managed care plans, their care may have been affected by managed care companies.¹⁶ Managed care companies may encourage physician practices for their enrollees that spill over to fee-for-service patients receiving care from the same physicians.¹⁶ Alternatively, managed care–induced physician practices may lead to changes in the availability of breast cancer screening facilities or personnel that affect patients in managed and non-managed care plans.¹⁶ An in-depth qualitative investigation may be needed to determine whether and why managed care companies in these counties examined here have practices that discourage breast cancer screening in older women. However, it is to be noted that in these same, managed care penetration was not associated with county-level breast cancer mortality rates or with having disparities in mortality.³ In addition, our findings are contrary to studies that have found no effect or positive effects on breast cancer screening of being managed care enrollees or living in areas with high managed care penetration.^{16,26,27} For example, Baker et al. found a positive effect among women ages 40–75 years old.¹⁶

Furthermore, while having a usual source of care and a recommendation from a physician are found to be crucial factors for breast cancer screening.^{12,19,28} we found that availability of primary care physicians had only minimal effects on screening in these counties. Similarly negligible was the effect of the presence of medical schools. Previously, we found that the presence of medical schools was associated with counties having lower breast cancer mortality and no disparities for older women.³ We, thus, had hypothesized that medical schools may be better positioned to promote and provide screening; however, we did not find that to be the case. Further studies to understand how the health care system in these areas of the US may hinder breast cancer screening are necessary.

It is concerning that in the selected counties, screening rates were lower for older Black women. This is not a surprising finding since previous studies have also reported similar differences.^{6–8} However, our multivariable adjusted analyses indicated no differences in screening between Black and White women, and even higher odds for Black women of having at least one screening mammogram in six years. Others had similar findings when adjusting for socio-economic status.^{29,30} In our study, higher odds of screening for Black women became apparent when we included utilization of other preventive services in the model. In particular, among women who had not received other preventive services, such as flu shots, Black women were more likely than Whites to have breast cancer screening. This may signify that for older Black women, mammograms are accessible even if women do not access care for other preventive services, or that the breast cancer screening behavior differs from other preventive health care seeking behaviors. It may be that programs to increase uptake of, and reduce barriers to, breast cancer screening in this population successfully improved screening.

It is clear that much remains to be understood about breast cancer screening among older women residing in these counties. There are various factors we cannot investigate in this study. For example, the attitude, access, and support for preventive services, and in particular breast cancer screening, in the White and Black communities of these counties.^{28,31} While the number of physicians per capita did not seem to affect screening in this population, understanding physicians' attitude toward breast cancer and screening, and the relation with older patients, and if indeed these are impacted by the managed care or medical school presence, may also shed light on why screening rates are low.^{28,31,32} Additionally, we do not know what breast cancer screening programs are available. Evidence-based programs have been implemented in these counties, including those that aim at reducing barriers to screening for Black and low income women.³³ However, the reach to the county population and in particular to older women is not known.

This study has some limitations. First, we detected mammograms only if they were paid by Medicare, and thus screening rates may be lower than those found in studies that used self-report of mammography use.^{9,10} It may be that women in our sample received mammograms for which Medicare was not billed, or self-reported rates are an overestimation of the true screening rates.^{34,35} Second, we used an algorithm to identify screening mammograms. However, the use of claims has been found to be reliable to examine mammography screening.³⁶ Third, we did not have data at the individual level that may be important to explain utilization of mammograms, e.g., economic status, education, social support, perceived breast cancer risk, or fatalistic attitudes.^{10,16,37–48} Fourth, we did not use information on adjacent counties, which may be those with richer resources where women travel to receive medical care. And lastly, we used limited information on health care utilization and utilization of other preventive services.

In summary, in 203 counties where most of breast cancer deaths in Black older women occur, more than half of women Medicare beneficiaries did not receive regular screening in a six-year period. For Black women, mammography utilization was less tied to a predisposition for, or availability of, other prevention services, than for White women. This may indicate that access to mammography screening may be separate from access to other preventive services through the health care system, and/or that women may have been more receptive to interventions that focused on improving the uptake of this particular cancer screening. Moreover, characteristics of the local health care system may affect breast cancer screening, in particular the penetration of managed care companies or the presence of medical schools. Therefore, the breast cancer screening utilization of older women in these US counties and the factors contributing to it warrant further investigation.

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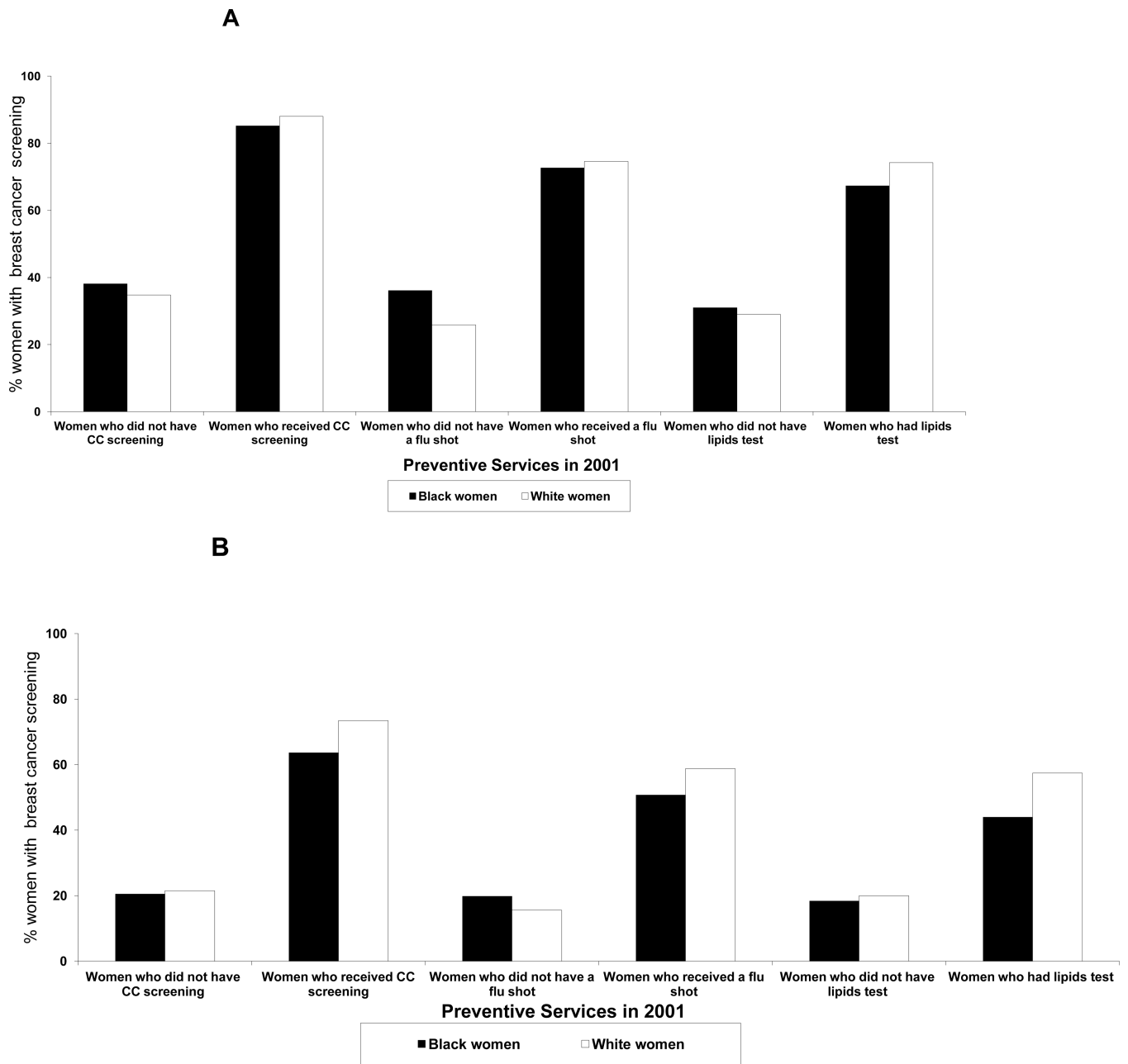


Figure 1.
A: Percentage of White and Black Older Women with Breast Cancer Screening in 2001–2006 by receipt of other preventive services in 2001 (Cervical Cancer Screening, Flu Shot, Lipid Tests), (Medicare Claims Data 2001–2006). Screening is defined as at least one screening mammogram in the six year follow-up period. CC = Cervical Cancer.
B: Percentage of White and Black Older Women with Regular Breast Cancer Screening in 2001–2006 by receipt of other preventive services in 2001 (Cervical Cancer Screening, Flu Shot, Lipid Tests), (Medicare Claims Data 2001–2006). Regular Screening is defined as at least three mammograms in the six year follow-up period. CC = Cervical Cancer.

Table 1

Descriptive statistics for women 65 to 74 years old enrolled in Medicare in 2001–2006, from 203 selected US counties

	All women	Black	White	pa
N	406,602	70,941	335,661	
Percentage	100.0	17.4	82.6	
Women's characteristics (%)				
Age 70–74	48.2	44.4	49.0	<0.0001
Any comorbidity	66.3	73.3	64.9	<0.0001
Breast cancer during follow-up	6.1	5.4	6.3	<0.0001
Preventive services received in 2001 (%)				
Cervical cancer screening	39.3	28.7	41.5	<0.0001
Flu shot	59.9	42.4	63.6	<0.0001
Lipids Test	60.8	56.7	61.6	<0.0001
High ER utilization^b (%)				
	25.2	36.9	22.7	<0.0001
County characteristics (%)				
Older ^c	25.4	17.5	27.1	<0.0001
Low education ^d	24.9	33.8	23.1	<0.0001
Poor ^e	24.8	40.8	21.5	<0.0001
High managed care penetration^f				
	24.9	19.0	26.2	<0.0001
With high medical school presence^g				
	23.0	26.7	22.3	<0.0001
With abundant primary care resources^h				
	24.1	17.7	25.5	<0.0001

^a P value for bivariate association of race with listed variables

^b High ER utilization = Person with >4.1% of claims from ER

^c Older = county with > 16.2% of the county residents being women age 65 years old and older

^d Low education = county with > 8.1% of the population having < 9 years of school

^e Poor = county with > 13.6% of county population living below the poverty level

^f High managed care penetration = county with > 24.4% managed care penetration

^g County with high medical school presence = county where >57.1% of hospitals being associated with medical schools

^h County with abundant primary care resources = county with >220.7 primary care physicians per 100,000 persons 65 and older.

Table 2

Women with screening, i.e., at least one screening mammogram in the six year follow-up period: unadjusted and adjusted odds ratios (OR) and 95% Confidence Intervals (CI)

	Women with Screening		OR of Screening		
	%	Unadjusted	95% CI	Adjusted	95% CI
All women	56.0	--	--	--	--
Women's characteristics					
White	56.9				
Black	51.6	0.81	0.80-0.82	1.23	1.20-1.25
Age 65-69	56.3				
Age 70-74	55.5	0.97	0.96-0.98	0.88	0.86-0.89
No comorbidities	30.7				
Any comorbidity	68.8	4.97	4.90-5.04	2.34	2.29-2.38
Preventive services					
Cervical cancer screening	87.6	12.88	12.67-13.11	7.59	7.45-7.74
No cervical cancer screening	35.4				
Flu shot	74.4	7.28	7.18-7.39	3.36	3.30-3.42
No flu shots	28.5				
Lipids tests	73.1	6.54	6.45-6.63	2.12	2.08-2.16
No lipid tests	29.4				
ER utilization					
High ^d	61.3	1.34	1.32-1.36	1.10	1.08-1.12
Low	54.1				
County					
Older County ^b	50.9	0.77	0.76-0.78	0.90	0.89-0.92
Younger county	57.6				
Low education ^c	51.9	0.81	0.80-0.82	0.84	0.82-0.86
Higher education	57.3				
Poor ^d	52.3	0.83	0.82-0.84	0.93	0.91-0.95
Non poor	57.1				

	Women with Screening		OR of Screening		
	%	Unadjusted	95% CI	Adjusted	95% CI
High managed care penetration ^e	40.7	0.44	0.43-0.44	0.69	0.67-0.70
Low managed care penetration	61.0				
With high medical school presence ^f	53.2	0.87	0.86-0.88	1.11	1.09-1.13
Lower medical school presence	56.8				
With abundant primary care resources ^g	54.2	0.91	0.90-0.93	1.04	1.02-1.06
Without abundant primary care resources	56.5				

^a High ER utilization = Person with >4.1% of claims from ER

^b Older = county with > 16.2% of the county residents being women age 65 years old and older

^c Low education = county with > 8.1% of the population having 9 years of school

^d Poor = county with > 13.6% of county population living below the poverty level

^e High managed care penetration = county with > 24.4% managed care penetration

^f County with high medical school presence = county where >57.1% of hospitals being associated with medical schools

^g County with abundant primary care resources = county with >220.7 primary care physicians per 100,000 persons 65 and older.

Table 3

Women with regular screening, i.e., at least 3 mammograms in the six year follow-up period: unadjusted and adjusted odds ratios (OR) and 95% Confidence Intervals (CI)

	Women with Regular Screening		OR of Regular Screening		
	%	Unadjusted	95%CI	Adj	95%CI
All Women	41.3			--	--
Women's characteristics					
White	43.1				
Black	32.9	0.65	0.64–0.66	0.95	0.93–0.97
Age 65–69	41.7				
Age 70–74	40.9	0.96	0.95–0.98	0.90	0.89–0.92
No comorbidities	21.2				
Any comorbidity	51.5	3.94	3.88–4.00	1.98	1.94–2.02
Breast cancer during follow-up	72.7	4.12	4.01–4.24	3.07	2.97–3.17
No breast cancer	39.3				
Preventive services					
Cervical cancer screening	72.2	9.57	9.43–9.71	5.94	5.85–6.04
No cervical cancer screening	21.3				
Flu shot	57.8	6.87	6.77–6.98	3.35	3.30–3.41
No flu shots	16.6				
Lipids tests	55.2	5.02	4.96–5.09	1.69	1.66–1.72
No lipid tests	19.7				
ER utilization					
High ^d	41.4	1.00	0.99–1.02	0.87	0.86–0.89
Low	41.3				
County					
Older County ^b	38.6	0.86	0.85–0.88	0.99	0.97–1.01
Younger county	42.2				
Low education ^c	36.7	0.78	0.76–0.79	0.85	0.84–0.87
Higher education	42.8				

	Women with Regular Screening		OR of Regular Screening		
	%	Unadjusted	95%CI	Adj	95%CI
Poor ^d	37.3	0.80	0.79–0.82	0.95	0.93–0.97
Non poor	42.6				
High managed care penetration ^e	29.4	0.51	0.50–0.51	0.73	0.72–0.75
Low managed care penetration	45.2				
With high medical school presence ^f	38.7	0.87	0.86–0.88	1.08	1.06–1.10
Lower medical school presence	42.1				
With abundant primary care resources ^g	40.8	0.97	0.96–0.99	1.06	1.04–1.08
Without abundant primary care resources	41.5				

^a High ER utilization = Person with >4.1% of claims from ER

^b Older = county with > 16.2% of the county residents being women age 65 years old and older

^c Low education = county with > 8.1% of the population having < 9 years of school

^d Poor = county with > 13.6% of county population living below the poverty level

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