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## Geographic Access and the Use of Screening Mammography

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### Abstract

**Background**—Screening mammography rates vary geographically and have recently declined. Inadequate mammography resources in some areas may impair access to this technology. We assessed the relationship between availability of mammography machines and the use of screening.

**Methods**—The location and number of all mammography machines in the US were identified from US Food and Drug Administration records of certified facilities. Inadequate capacity was defined as <1.2 mammography machines per 10,000 women aged 40 or older, the threshold required to meet the *Healthy People 2010* target screening rate. The impact of capacity on utilization was evaluated in two cohorts: female respondents age 40 or older to the 2006 Behavioral Risk Factor Surveillance System survey (BRFSS) and a 5% nationwide sample of female Medicare beneficiaries age 65 or older in 2004–2005.

**Results**—About 9% of women in the BRFSS cohort and 13% of women in the Medicare cohort lived in counties with <1.2 mammography machines per 10,000 women age 40 or older. In both cohorts, residence in a county with inadequate mammography capacity was associated with lower odds of a recent mammogram (adjusted odds ratio [AOR] in BRFSS: 0.89, 95% CI 0.80 – 0.98,  $p < 0.05$ ; AOR in Medicare: 0.86, 95% CI 0.85 – 0.87,  $p < 0.05$ ), controlling for demographic and health care characteristics.

**Conclusion**—In counties with few or no mammography machines, limited availability of imaging resources may be a barrier to screening. Efforts to increase the number of machines in low-capacity areas may improve mammography rates and reduce geographic disparities in breast cancer screening.

### BACKGROUND

In multiple randomized controlled trials, screening mammography has been shown to reduce breast cancer mortality, particularly among women age 50 to 69.(1, 2) Despite the well publicized benefits of screening mammography and recommendations for population-based screening, (3, 4) about one-third of US women age 40 and older report having no recent mammogram and this proportion varies widely by state.(5) After increasing for 25 years, rates of screening mammography now appear to be declining. From 2000 to 2005, two

national surveys found a significant decrease in the percentage of women age 40 and older who reported having a mammogram in the past two years. (6, 7) In addition, about 20% of women with a history of breast cancer do not adhere with guidelines for follow-up mammography.(8–10)

Access to mammography has been a particular concern in the US since the passage of the Mammography Quality Standards Act (MQSA) which established national uniform quality standards for this imaging modality. The law requires certification of mammography facilities by the US Food and Drug Administration (FDA) which enforces the MQSA and can revoke certification from noncompliant facilities.(11) The MQSA has been credited with improvements in mammography quality, but its impact on access is uncertain.(12, 13) Federal reports suggest that overall mammography capacity is sufficient to meet existing needs,(14, 15) but it is not clear whether resources are distributed proportionally to the population. Notably, facility closures in the 1990s may have disproportionately affected areas with substantial minority or rural populations.(16, 17)

Given recent declines and geographic disparities in screening mammography, as well as financial pressures facing many facilities,(18) it is now especially critical to understand how the availability and accessibility of mammography resources affect the use of screening. Our objective was to assess whether the geographic availability of mammography machines influences the use of screening mammography.

## METHODS

This study was reviewed and approved by the Institutional Review Board at Memorial Sloan-Kettering Cancer Center.

### Mammography capacity

Information on the number, location and characteristics of mammography facilities in 2004 was obtained from the FDA. In accordance with the MQSA, the FDA has maintained administrative records on all certified mammography facilities in the US since 1994. Facilities are inspected annually, and data from inspection reports include the number of mammography machines. All facilities were georeferenced by street address using ArcGIS software (Version 9.2, ESRI, Redlands, California). Mobile mammography facilities were assigned to the county of their mailing address.

For every county in the US (n=3,140), we estimated mammography capacity as the number of mammography machines per 10,000 women age 40 years or older in 2004. Women in this age group constitute the population eligible for annual screening mammography.(4) Mammography capacity in 2004 included only machines at facilities whose FDA certification was effective for the entire calendar year. Age-specific counts of the female population in each county in 2004 were obtained from postcensal population estimates produced by the US Census Bureau.

We hypothesized that women who resided in counties with inadequate mammography capacity would be less likely than other women to have received a recent mammogram. To examine this hypothesis, we defined inadequate capacity as the estimated number of machines needed to reach the *Healthy People 2010* goal of a 70% screening rate,(19) a level similar to the current ambient screening rate in the US. We derived this threshold using information from the U.S. Government Accountability Office (GAO), which estimated that an average mammography machine can perform a total of 6,000 mammograms per year, assuming that a single machine can perform 3 mammograms per hour, 8 hours per day, 5 days per week for 50 weeks per year.(14) This implies that a capacity of about 1.7 machines

per 10,000 women age 40 or older would be sufficient to screen all eligible women in a county (i.e., 100% screening rate), ignoring the use of resources for diagnostic mammography. Multiplying 1.7 by 70% yielded a threshold of 1.2 machines per 10,000 women age 40 or older required to achieve a 70% screening rate. In sensitivity analysis we examined alternate definitions of inadequate capacity.

### Mammography Utilization

We examined mammography utilization in two cohorts: 1) adult female respondents to the 2006 Behavioral Risk Factor Surveillance System (BRFSS) survey, and 2) a 5% random sample of female Medicare beneficiaries. These two data sources have been used extensively to examine cancer screening behaviors, including mammography, and both include geographic identifiers at the county level.

**BRFSS**—The BRFSS, administered and supported by the Behavioral Surveillance Branch of the Centers for Disease Control and Prevention (CDC), is a state-based, random-digit-dialed telephone survey of the civilian, noninstitutionalized US adult population 18 years of age and older. The BRFSS is conducted annually to collect uniform, state-specific data on preventive health practices and risk behaviors that are linked to injury and disease in the adult population, and BRFSS data are publicly accessible (<http://www.cdc.gov/brfss>).

In 2006, the core BRFSS module was administered in all 50 states and the District of Columbia. Each respondent's county of residence was identified, unless there were fewer than 50 respondents in a county. The BRFSS uses a multistage cluster sampling design to obtain a state-stratified nationally representative sample. Within each state, the BRFSS selects a probability sample of households with telephones and interviews one adult per household. In 2006 the number of completed interviews per state varied from fewer than 2,000 to more than 20,000 with a total of 330,075. The cooperation rate – the proportion of respondents interviewed of all eligible units in which a respondent was selected and actually contacted – varied by state from 57% to 89%, and the response rate varied from 35% to 66%.<sup>(20)</sup>

In the BRFSS cohort recent use of mammography was defined as a report of a mammogram within the past two years, based on responses to the following questions: “A mammogram is an x-ray of each breast to look for breast cancer. Have you ever had a mammogram?” and “How long has it been since your last mammogram?” Of the 165,311 female survey respondents age 40 years or older, 160,465 (97%) answered both of these questions, and 128,802 (80%) of those respondents also had a county identifier. Compared with respondents whose county was identified, those lacking a county identifier (n=31,663) were similar with respect to age, race, marital status, and having health insurance, a regular source of health care and receiving a check-up in the past year, but they reported somewhat lower levels of educational attainment and household income.

**Medicare**—Medicare enrollment data and claims for a 5% random sample of beneficiaries were obtained from the Center for Medicare and Medicaid's (CMS's) Chronic Condition Warehouse (CCW). Medicare is the primary health insurer for nearly all adults age 65 and older. All beneficiaries in the traditional fee-for-service (FFS) program receive inpatient hospital, skilled nursing facility, and home health benefits under Medicare Part A. Ninety-five percent of beneficiaries subscribe to Medicare Part B which covers physician services, outpatient care, and durable medical equipment. The study cohort was restricted to women age 65 and older, enrolled in Medicare by January 1, 2004, who had traditional FFS coverage, including Part B, because claims were not available for beneficiaries enrolled in Medicare managed care plans.

We identified receipt of a mammogram in 2004–2005 based on the presence of a mammography claim in either the Outpatient Standard Analytic File (OutSAF) or the National Claims History (NCH) file. This time interval was similar to the period implicitly covered by the BRFSS mammography endpoint. Screening mammography has been covered by Medicare on a biennial basis since 1991 and annually since 1998, in addition to diagnostic mammography. Although specific billing codes distinguish screening from diagnostic mammography, inferences regarding mammogram indication based on claims are subject to some misclassification. We included codes for both diagnostic and screening mammograms, consistent with prior studies.(21–23) Mammograms preceded by a breast cancer diagnosis were excluded from the primary endpoint. Women with evidence of a breast cancer diagnosis prior to 2004 were excluded from the analysis, based on Medicare claims from 1999 through 2003. County of residence reflected the most recent mailing address, by the end of 2005, in Medicare enrollment records. Of the 892,147 female beneficiaries who met inclusion criteria, 218 (<0.5%) lacked a valid county identifier, leaving 891,929 in the study cohort.

### Statistical Analysis

Characteristics of each cohort were summarized, and the frequency of mammography use was estimated. The adjusted impact of inadequate county mammography capacity on the likelihood of having a recent mammogram was estimated using multivariable logistic regression. Covariates included in the BRFSS analysis included age group, race, marital status, educational attainment, annual household income, health insurance status, regular source of health care, and receipt of a check-up in the past two years. These characteristics were self-reported by respondents. In the analysis of Medicare beneficiaries, available covariates included age, race, visit with a primary care physician identified in claims during 2004–2005, and comorbidity based on the Romano modification of the Charlson Comorbidity Index.(24)

In sensitivity analysis we included a proxy for spatial accessibility, identifying counties as urban or rural based on the 2003 Urban Influence Codes (UIC) from the US Department of Agriculture. These designations have been found to reflect regional economic systems and health care utilization patterns.(25) We dichotomized counties as urban (UIC 1–5) or rural (UIC 6–12); comparison with population density estimates suggested that this grouping separated counties that were either densely populated or near metropolitan areas from counties that were sparsely populated and far from metropolitan areas.

All analyses were performed in SAS, version 9.2, using SAS Survey procedures (SAS Institute Inc., Cary, NC). All estimates from the BRFSS cohort were weighted to account for the probability of sample selection and post-stratification adjustment for non-response and non-coverage of households without telephones.

## RESULTS

### Mammography Capacity

In 2004 there were 8,653 mammography facilities in the US with a total of 13,239 machines. Median county mammography capacity was 1.7 machines per 10,000 women age 40 or older (interquartile range 0 – 2.6 machines per 10,000 women). Inadequate-capacity counties were located throughout the country (Figure 1), although the greatest concentration was in the South, where 41% of 1,423 counties had fewer than 1.2 machines per 10,000 women. Rates of inadequate capacity in other regions were 12% in the Northeast (27 of 217 counties), 33% in the Midwest (347 of 1055 counties) and 35% in the West (158 of 445 counties). Of the 853 counties with no mammography machines and at least one adjacent

county, 84% had at least one adjacent neighbor that also had no machines, but nearly all (97%) had at least one adjacent neighbor with mammography capacity greater than zero. Twenty-two counties with no machines were completely surrounded by other zero-capacity counties.

### **Mammography Utilization: BRFSS**

Recent use of mammography was reported by 77.4% of women in the BRFSS, including 74.5% of women who lived in counties with inadequate capacity and 77.7% of women in counties with adequate capacity (Table 1). Report of a mammogram in the past two years was more common in women were age 50–79 rather than 40–49 or older than 80; those who were married; had greater educational attainment and annual household income; had health insurance, a regular source of health care or a check-up in the past two years. Black and white women reported similar rates of recent mammography use, which were slightly higher than the rates reported by Hispanic and Asian women.

In multivariable analysis women who lived in counties with inadequate capacity had 11% lower odds of having had a mammogram in the prior two years (adjusted odds ratio [AOR] 0.89, 95% CI 0.80 – 0.98,  $p < 0.05$ ), compared with women in counties with adequate capacity, controlling for demographic, socio-economic and health care characteristics. The relationships observed in unadjusted analysis, between these characteristics and recent mammography use, persisted in the multivariable analysis. Having a regular source of health care and having had a check-up in the past year had the greatest influence on the odds of a recent mammogram, with AORs of 2.15 (95% CI 1.91 – 2.42) and 5.94 (95% CI 5.44 – 6.49) respectively.

### **Mammography Utilization: Medicare**

Receipt of a mammogram in 2004–2005 was identified in Medicare claims for 40.2% of women in this cohort, including 38.0% of women in counties with inadequate capacity, compared with 40.5% of women in counties with adequate capacity (Table 2). Mammography use was most likely among Medicare beneficiaries in younger age groups, those with less comorbidity and those with a primary care visit during the study period. Black, Hispanic and Asian Medicare beneficiaries were less likely to have a claim for mammography than their white peers.

Controlling for demographic and health care characteristics, residence in a county with inadequate capacity was associated with 14% lower of odds a mammogram (AOR 0.86, 95% CI 0.85 – 0.87,  $p < 0.05$ ). As observed in unadjusted analysis, non-white race, older age and greater comorbidity were inversely associated with mammography use. The strongest predictor of mammography use was a primary care visit during the study period, with an AOR of 5.05 (95% CI 4.94 – 5.16).

### **Sensitivity Analysis**

In the Medicare cohort, results were not very sensitive to the definition of inadequate capacity. As shown in Figure 2, at all threshold values between 0 and 3.0 machines per 10,000 women, inadequate capacity was significantly associated with lower odds of having a mammogram, controlling for demographic and health care characteristics. In the BRFSS cohort, the relationship between inadequate capacity and mammography use was statistically significant for thresholds less than 1.5 machines per 10,000, but not for most values above 1.5. Regardless of the threshold for defining inadequate capacity, controlling for county urban influence did not alter the estimated impact of inadequate capacity in either cohort.



## DISCUSSION

In the early 1990s, analysts predicted an excess supply of mammography machines in the US.(26) However, the number of mammography facilities decreased in the decade following implementation of the MQSA.(12–15) Our analyses of Medicare beneficiaries and respondents to a large national survey support an inverse relationship between mammography availability and utilization. Despite recent reports that mammography resources are adequate overall,(14) our results suggest that maldistribution of these resources may impair access to breast cancer screening in some areas.

While our results address the relationship between the availability of mammography machines and their utilization, human resources – mammographic technologists, medical physicists and interpreting radiologists – are important components of mammography capacity. A shortage of breast imagers has been reported in both community-based and academic practices.(18, 27) Several factors may be contributing to the reported shortage of qualified breast imagers, including fear of malpractice litigation, declining reimbursement, burdensome volume and education requirements stipulated by the MQSA, and greater interest in more sophisticated imaging modalities.(18, 28, 29) A shortage of mammographic technologists may also be limiting access to breast cancer screening.(30)

Our metric of mammography capacity quantifies the availability of machines, but not their spatial accessibility, both of which may independently influence utilization. For example, women in areas with limited capacity may face longer waiting times for an appointment, and women who live far from the nearest mammography facility may face a substantial travel burden. Resource capacity and proximity have been associated with health care utilization in a variety of other settings, including primary care,(31) prenatal care (32) and cancer treatment.(33, 34) Ongoing research regarding travel burden and appointment wait times should further elucidate the role of these factors in access to screening mammography.

Our estimate of the impact of inadequate capacity on mammography use was similar in the two cohorts evaluated, with AORs of 0.89 in the BRFSS cohort and 0.85 in the Medicare cohort. This similarity is remarkable given the differences between the two data sources and the populations they represent. BRFSS data are self-reported and may therefore be influenced by recall problems and social desirability bias. Recent evidence suggests that self-report surveys are likely to overestimate mammography utilization.(35, 36) Medicare claims, while not subject to these biases, only capture services reimbursed by Medicare. Free or subsidized mammograms will not be identified in claims if providers did not bill Medicare. Claims may therefore underestimate mammography utilization. These differences between the two data sources likely explain the greater estimate of recent mammography use among BRFSS respondents age 70–79, compared with the claims-based estimate among women of the same age in the Medicare analysis. In both cohorts, mammography use was inversely associated with age. This finding is not a surprise, as screening mammography benefits and guidelines are less clear for women age 70 and older than for women 40–69 years of age.(4, 37–39)

While mammography capacity had a similar impact on utilization in the two cohorts, results related to race diverged. In the Medicare cohort black, Hispanic and Asian women were all less likely than white women to receive a mammogram, while black and Hispanic BRSS respondents were more likely than their white peers to report a recent mammogram. Although this may be attributable to true differences between the cohorts, it may also be a function of race-specific variation in the accuracy of each data source for identifying breast cancer screening. Self-report of mammography use may be less sensitive and less specific among black women than white women.(36)

Numerous patient, physician and health insurance characteristics have been shown to facilitate or impede timely screening mammography.(21, 22, 40–47) In both cohorts we examined, the strongest predictors of a recent mammogram were factors related to interaction with the health care system, specifically having a regular source of care and having a check-up or a primary care visit. However, we also found that mammography capacity in a woman's county of residence was significantly associated with mammogram use, controlling for these factors and for other important characteristics. We were not able to adjust for psycho-social factors or knowledge, attitudes and beliefs about breast cancer screening.

Additional limitations must be noted. We assumed that with respect to non-spatial factors, mammography facilities were equally accessible by all patients. In fact, some facilities may serve only patients participating in specific health insurance plans or physician practices. We defined mammography capacity at the county level, although women may seek health care services outside their county of residence. Also, if mammography capacity is associated with other county-level or even state-level attributes, our analysis would not be able to isolate the role of those factors. Finally, because we excluded women lacking a county identifier in the BRFSS our findings in that cohort likely underrepresent women in the most sparsely populated US counties, where access to health care resources in general is of particular concern.

Among all US counties, the estimated median female population aged 40 years or older was 6,334 in 2007, and only 36% of counties had at least 10,000 women in this age group. Of the 1,164 counties with mammography capacity <1.2 machines per 10,000 in 2007, the median county population of women in this age group was 3,044, the maximum was 574,665, and only 246 counties (21% of those with inadequate capacity) had at least 10,000 adult women potentially eligible for annual screening mammography. It may be unrealistic to expect every low-capacity county to enhance resource capacity alone if it does not have a population large enough to support the service. Rather, more successful strategies to increase mammography capacity might be regional efforts that serve a larger, multi-county population, perhaps with mobile mammography facilities. Areas where multiple adjacent counties have inadequate capacity would be priority targets for such initiatives.

Prior efforts to increase screening mammography have been multi-faceted and have typically focused on patient and physician behavior. Evaluations of interventions directed at patients (such as behavioral and educational programs) and interventions directed at primary care physicians (such as automated mammography reminder notifications) have found varying degrees of effectiveness.(48–50) Our findings suggest a third strategy for improving breast cancer screening rates, namely interventions directed at the local health care infrastructure. Further research on the influence of both technical and human resources will inform the development of specific initiatives, such as subsidies for the purchase of mammography equipment at community health centers or public hospitals in low-capacity areas, increased mammography reimbursement, and incentives for radiologists and technologists to practice in underserved areas. As we have shown here, geographic analysis can identify the communities in greatest need. Targeted enhancement of mammography capacity may boost breast cancer screening rates while optimizing limited health care resources.

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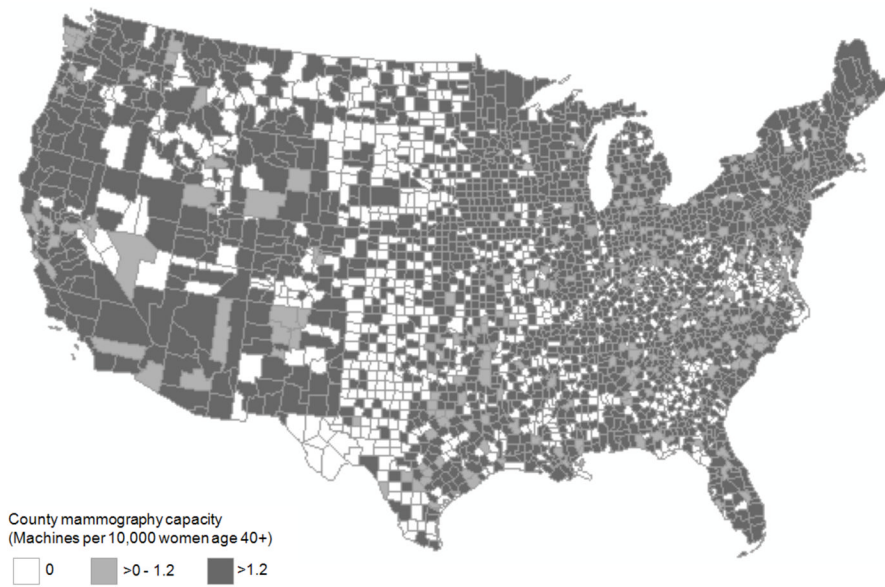
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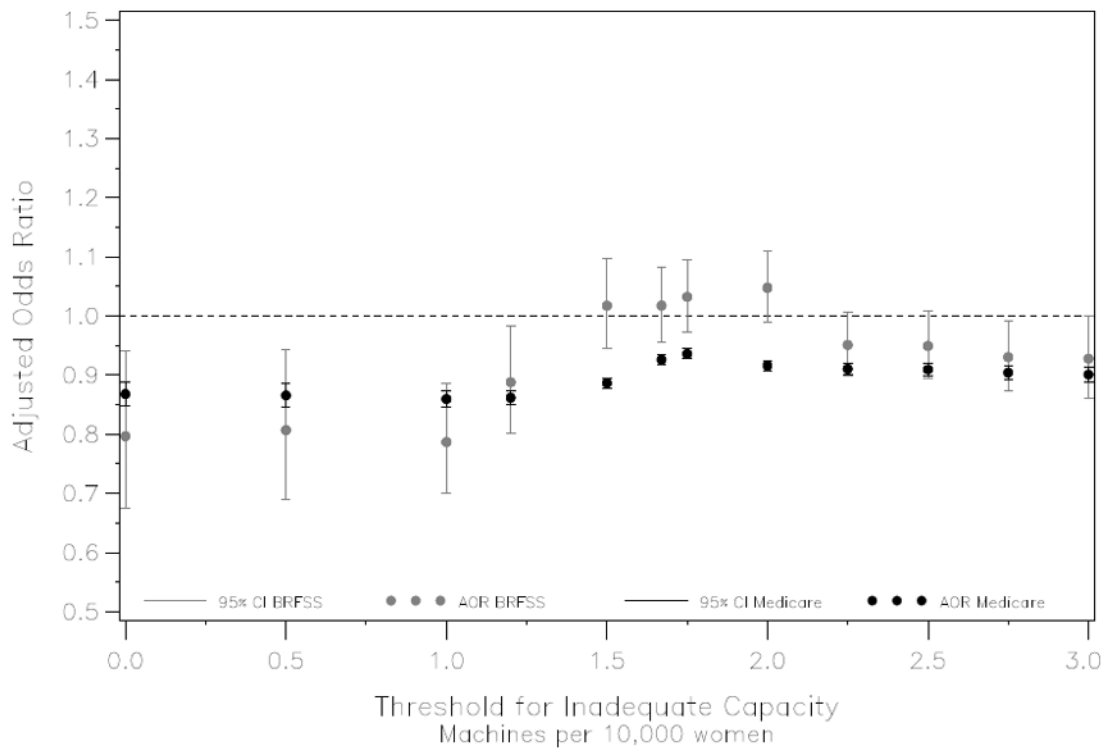


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**Figure 1. Geographic Distribution of Mammography Capacity in US Counties, 2004**  
The number of mammography machines in each county was determined from mammography facility certification records and inspection reports from the US Food and Drug Administration.



**Figure 2. Adjusted Odds Ratio for Impact of Inadequate Mammography Capacity on Receipt of Recent Mammogram, BRFSS and Medicare**

BRFSS: Behavioral Risk Factor Surveillance System Survey

Recent use of mammography defined by self-report receipt of a mammogram within the past two years (BRFSS, 2006) or health insurance claim for mammography in two-year period (Medicare, 2004–2005).

In BRFSS analysis, odds ratios were adjusted for age, race, marital status, educational attainment, household income, health insurance, regular source of health care and check-up in the past 2 years. In Medicare analysis, odds ratios were adjusted for age, race, comorbidity and primary care visit during the two-year study period.

All BRFSS estimates were weighted to account for the probability of sample selection and for post-stratification adjustment for non-response and non-coverage of households without telephones.

Table 1

Characteristics of Cohort and Recent Use of Mammography, BRFSS 2006\*

	N	Percent of Cohort	Percent with Mammogram	Adjusted OR	(95% CI)
County mammography capacity					
Inadequate	14,205	8.8	74.5	0.89	(0.80 – 0.98)
Adequate	114,597	91.2	77.7	Reference	-
Age group					
40–49 years	32,783	32.1	69.8	Reference	-
50–59 years	35,688	27.9	81.5	1.94	(1.79 – 2.11)
60–69 years	27,480	18.1	83.5	2.15	(1.97 – 2.35)
70–79 years	20,763	13.9	82.9	1.88	(1.69 – 2.09)
80+ years	12,088	8.0	70.3	0.96	(0.86 – 1.07)
Race					
White	105,129	74.3	77.9	Reference	-
Black	10,580	10.0	78.3	1.20	(1.07 – 1.34)
Hispanic	6,001	9.8	75.5	1.51	(1.28 – 1.79)
Asian	1,959	2.3	75.2	0.80	(0.60 – 1.07)
Other/Unknown	5,133	3.6	71.5	0.84	(0.73 – 0.97)
Marital status					
Married	63,960	39.8	73.6	Reference	-
Not married	64,401	59.9	80.0	1.27	(1.18 – 1.36)
Unknown	441	0.3	73.0	0.86	(0.58 – 1.27)
Educational attainment					
Less than HS graduate	12,756	10.8	68.7	Reference	-
HS graduate	75,738	56.3	76.7	1.25	(1.11 – 1.40)
College graduate+	40,084	32.8	81.5	1.48	(1.31 – 1.69)
Unknown	224	0.1	70.7	0.94	(0.53 – 1.66)
Annual household income					
<\$25,000	35,497	23.7	69.6	Reference	-
\$25,000–49,999	31,382	22.9	77.1	1.22	(1.12 – 1.34)



	N	Percent of Cohort	Percent with Mammogram	Adjusted OR	(95% CI)
\$50,000-74,999	16,871	13.6	80.4	1.30	(1.16 – 1.46)
\$75,000+	24,422	24.3	82.5	1.51	(1.35 – 1.69)
Unknown	20,630	15.5	79.2	1.32	(1.19 – 1.46)
Health insurance					
Yes	118,046	90.9	79.9	1.79	(1.59 – 2.01)
No	10,593	9.0	52.5	Reference	-
Unknown	163	0.1	62.5	1.43	(0.50 – 4.07)
Regular source of health care					
Yes	117,821	90.7	80.4	2.15	(1.91 – 2.42)
No	10,756	9.2	47.9	Reference	-
Unknown	225	0.2	62.6	1.09	(0.62 – 1.92)
Check-up in past 2 years					
Yes	112,482	87.4	82.8	5.94	(5.44 – 6.49)
No	14,882	11.7	38.3	Reference	-
Unknown	1,438	0.9	64.9	2.89	(2.23 – 3.74)

#### BRFSS: Behavioral Risk Factor Surveillance System Survey

Recent use of mammography was defined by self-report receipt of a mammogram within the past two years.

Percent of Cohort gives the distribution of each characteristic within the cohort. Percent with Mammogram gives the percent of women in each row who reported a recent mammogram.

Adjusted OR: Odds ratio for impact of characteristic on odds of recent mammogram, adjusted for other characteristics in table.

Inadequate county mammography capacity was defined as <1.2 mammography machines per 10,000 women age 40+ in the county of residence.

All estimates, other than actual sample size (N), were weighted to account for the probability of sample selection and for post-stratification adjustment for non-response and non-coverage of households without telephones.

Table 2

Characteristics of Cohort and Use of Mammography, Medicare 2004–2005

	N	Percent of Cohort	Percent With Mammogram	Adjusted OR	(95% CI)
County mammography capacity					
Inadequate	112,676	12.6	38.0	0.86	(0.85 – 0.87)
Adequate	779,253	87.4	40.5	Reference	-
Age group					
65–69 years	164,037	18.4	56.0	Reference	-
70–74 years	201,853	22.6	52.2	0.83	(0.82 – 0.85)
75–79 years	197,917	22.2	44.3	0.59	(0.59 – 0.60)
80–84 years	164,747	18.5	31.7	0.34	(0.34 – 0.35)
80+ years	163,375	18.3	12.9	0.11	(0.11 – 0.11)
Race					
White	789,372	88.5	41.0	Reference	-
Black	69,629	7.8	34.8	0.74	(0.73 – 0.75)
Hispanic	11,716	1.3	32.1	0.66	(0.64 – 0.69)
Asian	10,033	1.1	31.0	0.54	(0.52 – 0.57)
Other/Unknown	11,539	1.3	34.3	0.67	(0.65 – 0.70)
Charlson comorbidity score					
0	797,780	89.4	41.8	Reference	-
1	46,351	5.2	31.1	0.69	(0.68 – 0.71)
2	47,798	5.4	21.2	0.39	(0.38 – 0.40)
Primary care visit in past 2 years					
Yes	815,393	91.4	42.5	5.05	(4.94 – 5.16)
No	76,536	8.6	15.1	Reference	-

Percent of Cohort gives the distribution of each characteristic within the cohort. Percent with Mammogram gives the percent of women in each row with a claim for a mammogram during the study period.

Adjusted OR: Odds ratio for impact of characteristic on odds of recent mammogram, adjusted for other characteristics in table.

Inadequate county mammography capacity was defined as <1.2 mammography machines per 10,000 women age 40+ in the county of residence.