A National Study of Out-of-Pocket Expenditures for Mammography Screening

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Abstract

Objectives: To identify variations in screening mammography expenditures, primarily out-of-pocket and total expenditures, of women 40–64 years of age in the United States and factors associated with variations.

Methods: Retrospective analysis of data collected from the 2007 and 2008 Medical Expenditure Panel Survey (MEPS). The sample included 2020 women 40–64 years of age who received one mammogram in 2007 or 2008. Ordinary least squares regression was used to describe relationships among out-of-pocket mammography expenditures, total mammography expenditures, and out-of-pocket mammography expenditures as a percentage of total mammography expenditures and such independent variables as insurance status and type, income, region of the United States, and type of facility where a mammogram was received.

Results: The average out-of-pocket expenditure for a mammogram in 2007 or 2008 was \$33, representing 14.1% of the total mammogram expenditure (\$266). After controlling for demographic and health factors, women who were uninsured, were from the Midwest, and had a mammogram at an office-based facility had greater out-of-pocket mammography expenditures. Women who were uninsured, lived in the South, and received their mammogram at an office-based facility had out-of-pocket mammography expenditures that represented a greater proportion of the total mammography expenditures.

Conclusions: Large variations in out-of-pocket expenditures were observed among women with and without insurance and between insurance types, geographic regions of the United States, and types of facilities where mammograms were received. A higher financial burden of mammography screening among some subgroups of women may act as a barrier to future mammography screening.

Introduction

IN THE UNITED STATES, breast cancer is the second leading cause of cancer-related deaths and the most frequently diagnosed type of cancer.¹ It was estimated that there would be 207,090 new cases and 39,840 deaths attributed to breast cancer in 2010.² Breast cancer screening, especially mammography, has been shown to be important for detecting cancer at an early stage when it is asymptomatic, thereby decreasing mortality.^{3–5} Although the *Healthy People 2010* objective of screening 70% of women eligible for mammography had been achieved as of 1999, many women still do not receive recommended mammography screening.^{6–9} In fact, mammography rates have been on the decline since 2005 and were at 67% in 2008.⁹

An important barrier to receiving a mammogram is the woman's or the family's absolute out-of-pocket expenditure for the service.^{6,10} Underuse of mammography screening because of burdensome out-of-pocket expenditures may be

most common among women who are of low income,^{6,8,11–13} are uninsured,^{6,7,12–14} are insured through health plans with increased cost sharing,^{15–19} or overestimate their copayment.^{6,10} In fact, both the perceived and actual out-of-pocket expenditures have been demonstrated to be the most important aspect of cost that acts as a barrier to receiving a mammogram.^{6,10} There is some evidence that among some groups of women, an out-of-pocket expenditure >\$10 can significantly decrease appropriate mammography use.¹⁶

Variations in out-of-pocket expenditures are known to occur between different types of insurance. Women who are uninsured or insured through private plans are more likely to pay some or all of the mammography charge compared to women insured through Medicare or Medicaid.⁷ Variations in charges for mammograms by different types of facilities can also lead to variations in out-of-pocket mammography expenditures.²⁰ For example, outpatient hospital facilities that have separate facility and provider charges may have an overall higher total charge

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for the same mammogram that can be received in an office-based facility. Previous studies have also recognized that women who live in different geographic regions of the United States or metro status experience variations in the out-of-pocket expenditure they pay for a mammogram.^{7,20,21}

Previous studies have highlighted the impact of women's out-of-pocket expenditures, or perceived out-of-pocket expenditures, on their decision to be screened and how sensitive the decision is to changes in out-of-pocket expenditures.^{6,10,15-17} Furthermore, it is not reporting having had a mammogram within a specified period that is important but rather the continuation of mammography screening that is crucial to improved breast cancer detection.^{1,22-27} However, a high out-of-pocket expenditure for a single mammogram may influence a woman's decision to seek further mammography screening and her decision to receive other recommended preventive health screenings.²⁸⁻³⁰

The primary objective of this study was to estimate and examine subgroup variations in out-of-pocket mammography expenditures. We examined variations in out-of-pocket expenditures for women who reported receiving one mammogram in the year 2007 or 2008. The variations in out-of-pocket expenditures by insurance, income, region, and site of mammogram were analyzed within the health services use conceptual framework proposed by Andersen. The Andersen model posits that health services use and health outcomes of an individual are influenced by his or her environment, predisposing characteristics, and enabling, need, and health behaviors.^{31,32} Prior research has used Andersen's model to examine factors that affect out-of-pocket expenditures in multivariate analysis.³³ For the purposes of current research, we focused only on specific enabling (presence and type of insurance and income) and healthcare environment factors (facility type and geographic region) while controlling for predisposing, need, and health behaviors. Healthcare environment associations with out-of-pocket mammography expenditures were determined by the region of the United States in which a woman resided and the type of facility in which the mammogram was received. Regions are divided into Medical Expenditure Panel Survey (MEPS) as the Northeast, Midwest, South, and West.³⁴ Given that outpatient facilities apply separate charges for the physician and the facility compared to office-based facilities that apply only a physician's charge, out-of-pocket mammography expenditures were compared for two types of facilities in which a mammogram could be received. These facilities were either an office-based or a clinic setting and an outpatient department within a hospital.

Materials and Methods

Data

The data for this study are from the 2007 and 2008 MEPS.³⁵ As per the recommendation from the MEPS, we pooled 2 years of data to gain enough sample size and to derive reliable estimates.³⁶ MEPS collects data in an overlapping panel survey of United States noninstitutionalized civilians. The households selected for each panel of the MEPS were a subsample of households participating in the previous year's National Health Interview Survey (NHIS). The NHIS oversamples blacks, Hispanics, and starting in 2006, Asians. MEPS oversamples additional policy-relevant subgroups, such as low-income households.³⁴ The survey data was collected in five rounds over a 2 1/2-year calendar period from individuals, families, their

medical providers, and employers in the United States on information pertaining to the use, cost, and payment of health services as well as information on demographics, employment, health status, and satisfaction with services received.³⁷

Specific files used in this study were the Full Year Consolidated Data File from the Household Component Full Year File and the Outpatient Visits File and Office-Based Medical Provider Visits File from Household Component Event Files. Demographics and other individual-level information were derived from the Household Component File. The expenditures data were derived from both the Households and the Medical Provider Component Files. Households reported on expenditures for nonphysician visits, dental and vision services, other medical equipment and services, and home healthcare not provided by an agency, and data on expenditures for care provided by home health agencies, office-based visits to physicians, hospital-based events, and prescribed medicines were collected from medical providers. In the MEPS, expenditures refer to payments for healthcare services from about 13 sources, including (1) out-of-pocket by the patient or the patient's family, (2) Medicare, (3) Medicaid, (4) private insurance, (5) Veterans' Administration, excluding CHAMPVA (Civilian Health and Medical Program of the Department of Veterans Affairs), (6) TRICARE (a health care program offered by the Military Health System for active duty service members, National Guard and Reserve members, their families, survivors, and certain former spouses), (7) other federal sources, (8) other state and local sources, (9) Workers' Compensation, and (10) other unclassified sources. The response rate for the 2007 and 2008 MEPS was 56.9% and 59.3%, respectively.³⁸ Data pertaining to individual characteristics and healthcare expenditures were collected from the individual responder. Missing data on expenditures was imputed using a weighted sequential hot-deck procedure for most medical visits and services. In general, this procedure imputes data from events with complete information to events with missing information but similar characteristics.³⁹

Study sample

The 2007 MEPS surveyed 30,964 individuals, making up 11,615 families.³⁴ The 2008 MEPS surveyed 33,066 individuals, making up 12,316 families.⁴⁰ Our sample ($n=2,020$) of women 40-64 years of age who reported having at least, but no more than, one mammogram in the 2007 or 2008 calendar year and alive was selected based on receipt of mammograms using the Office-Based Medical Provider Visits File and the Outpatient Visits File. Our sample excluded women who received more than one mammogram during these years because their mammograms may have been for diagnostic or surveillance purposes. Additionally, women were excluded if they received no mammogram or if the response to having had a mammogram was missing. Missing responses to all other questions were grouped into the missing response category. Therefore, 298 women were excluded because they had more than one mammogram and 430 were excluded because of a missing response about receipt of mammogram.

Measures

Dependent variable: Mammography expenditures. Total mammography expenditures were measured as the total of payments received by the insurance provider and out-of-

pocket expenditures by self or family. Insurance provider payments consisted of private insurance, Medicaid, Medicare, other public insurance, and any other third-party source of payment. The out-of-pocket mammography expenditures may be in the form of either copayment for individuals with insurance or direct payment for the uninsured. Mammography expenditures were derived from both the Office-Based Medical Provider Visits File and the Outpatient Visits File based on the recorded type of services. We calculated mammography expenditures, using the indicator, whether or not the patient had a mammogram during the visit. Office-based includes expenses for visits to both physician and nonphysician medical providers seen in the office setting. Hospital outpatient includes expenses for visits to both physicians and other medical providers seen in hospital outpatient departments, including payments for services covered under the basic facility charge and those for separately billed physician services. (www.meps.ahrq.gov/mepsweb/data_files/publications/st203/stat203.pdf).⁴¹

The primary dependent variables of interest in this study were the woman's and family's out-of-pocket expenditures for a mammogram and out-of-pocket mammography expenditures as a percent of the total mammography expenditures. Also of interest were the total mammography expenditures by all payers. Because of changes in medical care costs from year to year, we expressed all expenditures in 2008 dollars using the consumer price index for medical care services (www.bls.gov/cpi/cpid08av.pdf).⁴²

Based on our conceptual framework, variables in the predisposing group were age, race (white, African American, and other), and ethnicity (Latina). The enabling group examined the effects of marital status (married or not married), education (less than high school and high school and above), poverty (poor and not poor), employment status (employed or not employed), insurance status (insured or uninsured), type of insurance (Medicare, Medicaid, private, and other), and having a usual source of care (yes or no) on out-of-pocket mammography expenditures. The association between need and out-of-pocket mammography expenditures was determined by analyzing variation between states of perceived mental and physical health (excellent/very good, good, fair/poor) and by the presence or absence of common disease states, including arthritis, diabetes, heart disease, hypertension, and stroke. A report of receiving a general and dental checkup, Papanicolaou test, and influenza immunization within the past year, along with body mass index (BMI), cigarette smoking status (yes or no), and physical activity (yes or no), were included as measures of personal health practices. Clinical preventive services were combined into two groups by count: (1) received one or two services and (2) received three or four services. We also used year of observation (2007 vs. 2008) to control for changes in medical care over time.

Statistical techniques

Analysis was performed for women 40–64 years of age. Group differences were tested for statistical difference using *t* tests and *F* tests. Ordinary least squares regression was used to estimate the relationship between independent variables and mammography expenditures. Parameter estimates were considered significant if their *p* values were <0.001. Reference groups were set at being white, aged 60–64, not married,

completing high school or above high school, not poor, having private insurance, having fair/poor perceived mental or physical health, nonmetro status, living in the West region, and receiving a mammogram in an office-based facility. Chronic conditions were compared by presence or absence, and clinical preventive services were compared according to their count. Log transformation was performed on regression estimates because many women had zero out-of-pocket mammography expenditures. Results from logged expenditures models generally were consistent and are not reported in this article. All statistical calculations were performed using survey procedures in SAS version 9.2 software (SAS Institute Inc., Cary, NC), which accounted for the complex sample design.

Results

Table 1 provides a description of the women aged between 40 and 64 from the 2007 and 2008 MEPS who received one mammogram in 2007 or 2008. Among this group, 1331 of the 2020 women were white. After weighting, 80% of the women with one mammogram in 2007 and 2008 were white. The majority of the sample were not poor (85.1%), had private insurance (86.8%), and were distributed throughout the different geographic regions of the United States (Northeast 20.2%, Midwest 25.9%, South 34.4%, and West 19.5%), and about two thirds (65.1%) of women received their mammogram at an office-based facility.

The average out-of-pocket mammography expenditure for all groups in 2007 was \$32.90, and the average total mammography expenditure from all payers was \$266.49. Women's out-of-pocket mammography expenditures were on the average about 14% of the total mammography expenditures.

Out-of-pocket mammography expenditures

Statistically significant differences in out-of-pocket mammography expenditures were observed between women who were insured (\$31.32) or uninsured (\$60.03) (Table 2). Insured women with the lowest out-of-pocket mammography expenditures were those with Medicaid coverage (\$3.60). Among women with insurance, the greatest out-of-pocket mammography expenditures were for women who were privately insured (\$33.04), yet women without any insurance had the greatest out-of-pocket mammography expenditures of all groups (\$60.03). Women who were classified as not poor had higher out-of-pocket mammography expenditures (\$34.27) than women who were poor (\$25.10). White women had the highest out-of-pocket mammography expenditures (\$35.48) compared to African Americans (\$21.26), Latinas (\$28.72), and women classified as another race (\$16.61). Women residing in the Midwest region of the United States had the highest out-of-pocket mammography expenditures (\$46.76) of all regions, and those residing in the Northeast and West had the lowest (\$23.95 and \$24.61). Women who received a mammogram at an office-based facility (\$35.29) had higher out-of-pocket mammography expenditures than women who received their mammogram at an outpatient facility (\$28.45).

Findings from regression models (Table 3) showed that uninsured women had greater out-of-pocket mammography expenditures than women with private insurance. Women insured through Medicare and Medicaid paid less out-of-pocket compared to those with private insurance. When compared to women who were not poor, those who were

TABLE 1. DESCRIPTION OF WOMEN WITH MAMMOGRAM:
MEDICAL EXPENDITURE PANEL SURVEY, 2007–2008

All	n 2020 ^a	Wt % 100.0
Race/ethnicity		
White	1331	79.7
African American	262	7.9
Latina	290	7.2
Other	137	5.1
Age, years		
40–50	756	36.4
50–59	870	42.5
60–64	394	21.1
Marital status		
Married	1378	69.5
Not married	642	30.5
Education		
Less than high school	254	12.6
High school and above	1762	87.2
Poverty status		
Poor	409	14.9
Not poor	1611	85.1
Uninsured		
Yes	163	5.5
No	1857	94.5
Medicare		
Yes	93	3.9
No	1927	96.1
Medicaid		
Yes	152	5.1
No	1868	94.9
Private insurance		
Yes	1653	86.8
No	367	13.2
TRICARE		
Yes	62	3.1
No	1958	96.9
Usual source of care		
Yes	1863	92.9
No	156	7.1
Perceived health		
Excellent/very good	1164	63.0
Good	586	26.8
Fair/poor	270	10.3
Mental health		
Excellent/very good	1343	70.2
Good	534	24.0
Fair/poor	143	5.7
Exercise		
Three times a week	1149	59.3
No exercise	868	40.7
Body mass index		
Under/normal	709	38.3
Overweight	589	28.2
Obese	644	29.6
Missing	78	3.9
Current smoker		
Current smoker	258	12.3
Other	1661	83.3
missing	101	4.5
Metro status		
Metro	1708	83.9
Nonmetro	312	16.1

TABLE 1. (CONTINUED)

All	n 2020 ^a	Wt % 100.0
Region		
Northeast	347	20.2
Midwest	504	25.9
South	705	34.4
West	464	19.5
Mammogram site		
OTP	687	34.9
Office	1333	65.1
Year		
2007	993	49.2
2008	1027	50.8

Based on women aged 40–64, alive at the end of the year, who received one mammogram in 2007 or in 2008.

^aFor some variables, numbers do not add to 2020 due to missing data (e.g., education, usual source of care).

Wt %, weighted %, OTP, out-patient hospital; TRICARE, a health care program offered by the Military Health System for active duty service members, National Guard and Reserve members, their families, survivors, and certain former spouses.

poor had lower out-of-pocket mammography expenditures. Women residing in the Midwest (\$24.97) and South (\$9.45) regions of the United States had greater out-of-pocket mammography expenditures compared to women residing in the West, whereas women in the Northeast region had out-of-pocket mammography expenditures that were slightly lower (–\$0.76) compared to those in the West. Women who receive a mammogram at a hospital outpatient facility had lower out-of-pocket mammography expenditures than women who received a mammogram at an office-based facility. As compared to white women, African Americans, Latinas, and women who are of another race had lower out-of-pocket mammography expenditures.

Out-of-pocket mammography expenditures as percent of total mammography expenditures

Among uninsured women, out-of-pocket mammography expenditures represented 31.0% of the total mammography expenditures (Table 2). Out-of-pocket mammography expenditures among women insured through Medicaid were 3.6% of the total mammography expenditures, as compared to women with private insurance who paid 13.7% of the total mammography expenditures. Among race/ethnicity groups, Latina women paid the highest proportion (18.0%) of total mammography expenditures, with white women paying 14.2% out-of-pocket. Women residing in the South region of the United States paid the highest percentage of the total mammography expenditures (16.5%), whereas those residing in the Northeast only paid 10.0%. Women who received a mammogram at an office-based facility paid a higher percentage of the total mammography expenditures (16.0%) compared to woman who received a mammogram from an outpatient facility (10.4%) (Table 2).

Total mammography expenditures

Women who were uninsured had significantly lower total mammography expenditures (\$170.47) compared to those who

(continued)

TABLE 2. OUT-OF-POCKET AND MAMMOGRAM EXPENDITURES (2008 DOLLARS): WOMEN AGED 40–64 WITH ONE MAMMOGRAM: MEDICAL EXPENDITURE PANEL SURVEY, 2007–2008

	<i>Out-of-pocket expenditures</i>		<i>Mammogram expenditures</i>		<i>% OOP to mammogram expenditures</i>	
	<i>Mean</i>	<i>SE</i>	<i>Mean</i>	<i>SE</i>	<i>Mean</i>	<i>SE</i>
All	32.90	2.32	266.49	10.09	14.08	0.67
Race/ethnicity						
White	35.48	2.81	268.43	11.44	14.24	0.81
African American	21.26	5.40	236.59	19.48	11.40	2.12
Latina	28.72	4.38	228.07	27.82	17.96	1.64
Other	16.61	3.36	336.82	76.46	10.26	1.53
Age, years						
40–50	35.39	3.85	287.68	20.99	13.80	1.02
50–59	34.06	3.89	264.32	14.75	15.17	1.02
60–64	26.26	4.22	234.25	15.71	12.35	1.57
Poverty status						
Poor	25.10	3.82	209.98	12.87	13.76	1.41
Not Poor	34.27	2.68	276.40	11.67	14.13	0.72
Uninsured						
Yes	60.03	12.91	170.47	18.90	30.96	3.74
No	31.32	2.33	272.09	10.67	13.09	0.66
Medicare						
Yes	8.68	2.48	175.22	22.81	6.14	1.69
No	33.88	2.40	270.20	10.49	14.40	0.69
Medicaid						
Yes	3.60	1.53	192.42	25.08	3.55	1.28
No	34.47	2.48	270.47	10.28	14.65	0.71
Private insurance						
Yes	33.04	2.53	280.29	11.46	13.69	0.71
No	31.94	5.97	175.38	11.59	16.62	2.08
TRICARE						
Yes	21.02	3.09	222.41	36.56	8.76	1.29
No	33.28	2.39	267.89	10.12	14.25	0.69
Region						
Northeast	23.95	3.45	303.06	29.82	9.99	1.47
Midwest	46.76	7.46	295.61	17.90	14.56	1.15
South	32.44	2.75	228.72	14.14	16.52	1.27
West	24.61	4.49	256.58	24.82	13.37	1.48
Mammogram site						
Outpatient hospital	28.45	3.27	309.52	17.98	10.43	0.93
Office-based	35.29	3.04	243.39	12.49	16.04	0.86

Based on 2020 women aged group 40–64 years with one mammogram in 2007 or 2008. Significant group differences in out-of-pocket and mammogram expenditures were tested with *F* tests and *t* tests. All group differences were significant at $p < 0.001$ based on *t* tests or *F* tests. Out-of-pocket spending on mammograms to total expenditures is expressed in terms of percentages.

OOP, Out-of-pocket expenditures; SE, standard error.

had insurance (\$272.09). Women insured by Medicare (\$175.22) and Medicaid (\$192.42) had lower total mammography expenditures compared to women with private insurance (\$280.29). Women who were poor had lower total mammography expenditures (\$209.98) compared to those who are not poor (\$276.40). Women classified as another race had the highest total mammography expenditures (\$336.82) compared to whites (\$268.43), African Americans (\$236.59), and Latinas (\$228.07). Between office-based and outpatient facilities, women who received a mammogram at an outpatient facility had a total mammography expenditures >\$70 more than women who received a mammogram at an office-based facility (Table 2).

Findings from our regression on mammography expenditures summarized in Table 3 suggest that women who were insured by Medicare, Medicaid, and other insurances had lower total mammography expenditures compared to women with private insurance. Women who were uninsured had total

mammography expenditures that were lower than those of women with private insurance. When compared to women who were not poor, those who were poor had lower total mammography expenditures. Women residing in the Northeast and Midwest had total mammography expenditures that were higher than those in the West, and those in the South were lower. Furthermore, women who received their mammogram at an outpatient hospital facility had greater total mammography expenditures than those from an office-based facility. Women of another race and Latinas had greater total mammography expenditures than white women, whereas African Americans had lower total mammography expenditures (Table 3.).

Discussion

To our knowledge, this is the first study using a nationally representative survey sample to estimate women's average

TABLE 3. ORDINARY LEAST SQUARES REGRESSION ON OUT-OF-POCKET AND MAMMOGRAM EXPENDITURES (2008 DOLLARS): WOMEN AGED 40–64 YEARS WITH ONE MAMMOGRAM: MEDICAL EXPENDITURE PANEL SURVEY, 2007–2008

	<i>Out-of-pocket expenditures</i>		<i>Mammogram expenditures</i>		<i>% OOP to mammogram expenditures^a</i>	
	<i>Beta</i>	<i>SE</i>	<i>Beta</i>	<i>SE</i>	<i>Beta</i>	<i>SE</i>
Race/ethnicity						
African American	–16.534	0.129***	–12.677	0.661***	–3.710	0.065***
Latina	–4.976	0.126***	0.143	1.575	3.180	0.061***
Other	–14.217	0.526***	74.414	3.863***	–2.913	0.261***
White (ref)	0.000	0.000	0.000	0.000	0.000	0.000
Age, years						
40–50	13.947	0.200***	49.246	3.953***	1.482	0.084***
50–59	11.427	0.360***	24.600	1.387***	3.336	0.204***
60–64 (ref)	0.000	0.000	0.000	0.000	0.000	0.000
Poverty status						
Poor	–4.413	0.364***	–26.722	2.274***	0.175	0.075*
Not poor (ref)	0.000	0.000	0.000	0.000	0.000	0.000
Insurance						
Medicare	–20.157	1.070***	–65.879	2.041***	–8.715	0.232***
Medicaid	–22.517	0.402***	–97.583	3.419***	–7.858	0.085***
Other	–3.039	0.233***	–93.671	2.378***	–3.626	0.092***
Uninsured	29.976	0.716***	–89.481	2.821***	16.327	0.310***
Private (ref)	0.000	0.000	0.000	0.000	0.000	0.000
Region						
Northeast	–0.760	0.180***	35.027	4.986***	–2.035	0.107***
Midwest	24.966	0.485***	26.265	2.896***	3.170	0.224***
South	9.445	0.170***	–30.213	1.916***	4.490	0.124***
West (ref)	0.000	0.000	0.000	0.000	0.000	0.000
Mammogram site						
Outpatient hospital	–10.571	0.396***	75.035	3.442***	–6.112	0.212***
Office-based (ref)	0.000	0.000	0.000	0.000	0.000	0.000

Based on women aged 40–64, alive at the end of the year, received one mammogram in 2007 or in 2008. The regressions include intercept terms and are also controlled for other variables (the parameter estimates are not presented in this table): marital status, metropolitan status, education, employment, mental health, physical health, body mass index, smoking, clinical preventive care, number of chronic conditions, and calendar year of observation.

^aOut-of-pocket spending divided by total expenditures for mammogram and expressed in terms of percentages.

Asterisks represent significant differences compared to the reference group. *** $p < 0.0001$; ** $p < 0.001$; * $p < 0.01$. ref, referent.

out-of-pocket mammography expenditures and total mammography expenditures and how these expenditures vary by insurance status and type, poverty status, facility where mammogram was received, and region of the United States where a woman resided at the time of the mammogram. Our study findings suggest that women without available resources that enable access to care, such as health insurance, had higher out-of-pocket mammography expenditures, which may pose a high financial burden. Such a financial burden is a potential barrier for receipt of mammograms in the future. Previous research by Trivedi et al.¹⁶ showed that a copayment as much as \$10 may deter eligible women from receiving a mammogram, and our study suggests that nationwide average out-of-pocket mammography expenditures are at least twice as high. Our findings also have implications for future screening decisions.¹⁶ High out-of-pocket mammography expenditures may negatively influence a woman's decision to receive future mammography screening. Study findings by McAlearney et al.^{6,10} highlighted how perceived cost or overestimation of cost of a mammogram can act as a barrier to receiving a mammogram.

Our study findings also confirm that even among women who received mammograms, the out-of-pocket mammography expenditures as a proportion of the total mammography

expenditures varied by presence of insurance. These findings are consistent with those of another study, in which the authors reported that uninsured women were more likely to report paying some or all of the cost of their most recent mammogram compared to women who were insured.⁷ Further efforts are needed to identify available resources for these women in order to deflect their out-of-pocket mammography expenditures.

Additional variations in mammography expenditures were observed among women residing in different regions of the United States. Women in the Midwest bear nearly twice the out-of-pocket mammography expenditures as those who reside in the West. Women who reside in the Northeast have the lowest out-of-pocket mammography expenditures yet the highest total mammography expenditures of all regions. This may be explained by different reimbursement rates that are calculated based on the area's various labor market factors.

Other variations in mammography expenditures were observed between the types of facility where a mammogram was received. Compared to women who received mammograms at an office-based facility, women who received mammograms at a hospital outpatient facility had lower out-of-pocket mammography expenditures but greater total mammography expenditures. Because of a shortage of

specialists, many rural areas may not have an office-based facility that provides mammography services. Therefore, women may receive their mammogram at a hospital outpatient facility in either their area or some distance away.

Although adherence to recommended mammography screening guidelines was not the purpose of the present study, our sample (largely white, of high income, with private insurance) suggests that women for whom cost is not a barrier and out-of-pocket mammography expenditures do not present a high financial burden may be more likely to receive a mammogram. A descriptive comparison of women who did and who did not receive a mammogram in 2007 or 2008 is shown in the Appendix.

Major strengths of our study include large nationally representative data, comprehensive information on many variables that can be controlled for, and the availability of payments rather than charges for mammograms. However, some limitations need to be noted. A major limitation is that the study did not examine mammography expenditures associated with guideline-consistent mammography screening; the purpose of this study, however, was not to determine guideline-consistent mammography screening but how much the women were paying. Another limitation may arise from recall bias. To limit recall bias, the survey was conducted in five panels that occur in shorter intervals than if it was administered at one time. In addition, our sample may suffer from selection bias; for example, women classified as poor represented almost 15% of our sample, whereas they represented almost 36% of women 40–64 years of age who did not receive a mammogram during the calendar year. Furthermore, almost four times as many women (20.8%) who were uninsured did not receive a mammogram during the calendar year compared to those who did (5.5%). Finally, although this study only examined possible financial barriers to receiving a mammogram, nonfinancial barriers have been demonstrated to be equally effective at discouraging women from receiving a mammogram. Study findings from Schueler et al.⁴³ found that women who did not have a usual source of care, did not see an obstetrician/gynecologist, and did not have a physician recommend a mammogram were less likely to receive a mammogram. In addition, a lack of screening knowledge and particular mammography beliefs, as well as concerns about safety and pain, prevented receipt of mammography.⁴³

Despite these limitations, our study estimated women's average out-of-pocket mammography expenditures. The average out-of-pocket mammography expenditure was found to be \$33. Although public insurance coverage reduced the average out-of-pocket mammography expenditures, the proportions of out-of-pocket mammography expenditures to total mammography expenditures were larger among some subgroups of women, suggesting that higher financial burden and higher cost sharing may influence women's decision to seek health services, especially those that are preventive, such as a mammogram. Further disparities in out-of-pocket mammography expenditures were seen among women who were uninsured and living in different geographic regions of United States and also in the type of facility where the mammogram was received.

Considering that the largest variations in out-of-pocket mammography expenditures were observed among uninsured women, the recently passed healthcare reform bill that includes provisions of the Patient Protection and Affordable

Care Act may be a step in the right direction to eliminate these disparities. (www.healthcare.gov/center/regulations/prevention/regs.html).⁴⁴ This law prohibits the imposition of cost-sharing requirements with respect to evidence-based recommendations with a rating of A or B by the United States Preventive Services Task Force. Strict enforcement of this provision across regions and type of facilities that offer mammography screening will go a long way toward eliminating financial barriers to mammography screening.

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(Appendix follows →)

Appendix

COMPARISON OF WOMEN WHO RECEIVED ONE MAMMOGRAM
AND THOSE WITHOUT ANY MAMMOGRAM:
MEDICAL EXPENDITURE PANEL SURVEY, 2007–2008

	<i>Mammogram</i>		<i>No Mammogram</i>	
	n 2020	Wt % 23.7	n 7644	Wt % 76.3
<i>All</i>				
Race/ethnicity***				
White	1331	26.8	3751	73.2
African American	262	15.7	1536	84.3
Latina	290	15.6	1743	84.4
Other	137	18.7	614	81.3
Age***				
40–50	756	19.9	3606	80.1
50–59	870	25.2	2967	74.8
60–64	394	30.2	1071	69.8
Poverty status***				
Poor	409	13.0	1196	87.0
Not poor	1611	24.7	1536	75.3
Uninsured***				
Yes	163	9.4	1590	90.6
No	1857	26.0	6054	74.0
Medicare				
Yes	93	19.7	440	80.3
No	1927	23.9	7204	76.1
Medicaid***				
Yes	152	14.6	1003	85.4
No	1868	24.5	6641	75.5
Private insurance***				
Yes	1653	27.2	4876	72.8
No	367	12.8	2768	87.2
TRICARE**				
Yes	62	35.2	132	64.8
No	1958	23.5	7512	76.5
Perceived health***				
Excellent/very good	1164	27.5	3604	72.5
Good	586	20.9	2526	79.1
Fair/poor	270	15.9	1,514	84.1
Mental health***				
Excellent/very good	1343	25.8	4596	74.2
Good	534	21.3	2259	78.7
Fair/poor	143	15.8	789	84.2
Metro status				
Metro	1708	23.9	6424	76.1
Nonmetro	312	22.8	1220	77.2
Region***				
Northeast	347	25.1	1202	74.9
Midwest	504	28.1	1392	71.9
South	705	22.3	3021	77.7
West	464	20.5	2029	79.5
Year				
2007	993	23.5	3767	76.5
2008	1027	23.9	3877	76.1

Based on women aged 40–64 years of age, alive at the end of the year who received one mammogram in 2007 or in 2008. Figures for women without mammogram need to be interpreted with caution because these do not represent women who did not receive guideline-consistent mammography screening.

Asterisks represent significant group differences based on chi-square tests.

TRICARE, a health care program offered by the Military Health System for active duty service members, National Guard and Reserve members, their families, survivors, and certain former spouses; Wt %, weighted %.