

Impact of State-Specific Medicaid Reimbursement and Eligibility Policies on Receipt of Cancer Screening

Michael T. Halpern, MD, PhD¹; Melissa A. Romaine, PhD²; Susan G. Haber, ScD³; Florence K. Tangka, PhD⁴; Susan A. Sabatino, MD, MPH⁴; and David H. Howard, PhD⁵

BACKGROUND: Although state Medicaid programs cover cancer screening, Medicaid beneficiaries are less likely to be screened for cancer and are more likely to present with tumors of an advanced stage than are those with other insurance. The current study was performed to determine whether state Medicaid eligibility and reimbursement policies affect the receipt of breast, cervical, and colon cancer screening among Medicaid beneficiaries. **METHODS:** Cross-sectional regression analyses of 2007 Medicaid data from 46 states and the District of Columbia were performed to examine associations between state-specific Medicaid reimbursement/eligibility policies and receipt of cancer screening. The study sample included individuals aged 21 years to 64 years who were enrolled in fee-for-service Medicaid for at least 4 months. Subsamples eligible for each screening test were: Papanicolaou test among 2,136,511 patients, mammography among 792,470 patients, colonoscopy among 769,729 patients, and fecal occult blood test among 753,868 patients. State-specific Medicaid variables included median screening test reimbursement, income/financial asset eligibility requirements, physician copayments, and frequency of eligibility renewal. **RESULTS:** Increases in screening test reimbursement demonstrated mixed associations (positive and negative) with the likelihood of receiving screening tests among Medicaid beneficiaries. In contrast, increased reimbursements for office visits were found to be positively associated with the odds of receiving all screening tests examined, including colonoscopy (odds ratio [OR], 1.07; 95% confidence interval [95% CI], 1.06-1.08), fecal occult blood test (OR, 1.09; 95% CI, 1.08-1.10), Papanicolaou test (OR, 1.02; 95% CI, 1.02-1.03), and mammography (OR, 1.02; 95% CI, 1.02-1.03). Effects of other state-specific Medicaid policies varied across the screening tests examined. **CONCLUSIONS:** Increased reimbursement for office visits was consistently associated with an increased likelihood of being screened for cancer, and may be an important policy tool for increasing screening among this vulnerable population. *Cancer* 2014;000:000-000. © 2014 American Cancer Society.

KEYWORDS: Medicaid, access to health care, cancer screening, health insurance reimbursement, health care disparities, colonoscopy, mammography, Papanicolaou test.

INTRODUCTION

Medicaid, a joint state-federal government health insurance program for certain low-income individuals, pays for medical care for a substantial percentage of the US population (an estimated 67.7 million individuals in 2010).¹ Between 2009 and 2010, Medicaid enrollment grew by an estimated 6.2% and is expected to continue to increase over the next several years if states chose to expand Medicaid eligibility under the Patient Protection and Affordable Care Act.²

Medicaid programs in all states and the District of Columbia (DC) provide coverage for breast, cervical, and colorectal cancer screening.³ However, coverage does not guarantee receipt of these services. Previous studies have reported that Medicaid beneficiaries were less likely to be screened for cancer than individuals with private insurance,⁴⁻⁶ and were more likely to present with advanced-stage cancers than patients enrolled in private insurance or Medicare.⁷⁻¹¹

Within limits set by the federal government, states can establish their own Medicaid eligibility requirements and reimbursements.¹² Medicaid reimbursements differ substantially among states and are usually below Medicare reimbursement levels¹³; these low reimbursements may affect access to cancer screening services. Although findings regarding the association

Corresponding author information: Michael T. Halpern, MD, PhD, Division of Health Services and Social Policy Research, RTI International, 701 13th St NW, #750, Washington, DC 20005; Fax: (202) 974-7855; E-mail: mhalpern@rti.org

¹RTI International, Washington, DC; ²RTI International, Research Triangle Park, North Carolina; ³RTI International, Waltham, Massachusetts; ⁴Division of Cancer Prevention and Control, US Centers for Disease Control and Prevention, Atlanta, Georgia; ⁵Department of Health Policy and Management, Rollins School of Public Health, Emory University, Atlanta, Georgia

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between physician reimbursement and the provision of medical care services in general are mixed,¹⁴⁻¹⁸ low Medicaid reimbursement rates and required office visit copayments may decrease access to needed medical care services.^{7,19-22} Increased Medicaid reimbursements are associated with increased access to a usual source of care and the receipt of services for both children^{23,24} and adults.²⁵

State-level variations in Medicaid eligibility policies may also affect health service use, including cancer screenings. For example, several Medicaid policies (eg, frequency of Medicaid renewal) may affect how long beneficiaries remain enrolled in Medicaid or remain with established providers, both of which have been positively correlated with receipt of breast and colorectal cancer screening.^{26,27}

It is important to understand how terms of coverage (ie, eligibility requirements) and payments offered to providers affect receipt of preventive care services. The current study examined the association between Medicaid reimbursements for cancer screening tests and office visits and financial eligibility requirements and the receipt of breast, cervical, and colorectal cancer screening.

MATERIALS AND METHODS

Data and Study Population

The current study is a cross-sectional analysis of the 2007 Medicaid Analytic eXtract (MAX) claims and enrollment data, which was the most recent year of data available at the initiation of this study. The Centers for Medicare and Medicaid Services maintains MAX data for all 50 states and DC.²⁸ The study sample included individuals from 46 states and DC who were aged 21 years to 64 years, not dually eligible for Medicare, and enrolled in fee-for-service Medicaid for at least 4 months. Dual Medicare-Medicaid enrollees and enrollees in capitated managed care plans were excluded because their complete service use may not be reported in MAX.²⁹ Because beneficiaries with limited Medicaid enrollment during the study year would have fewer opportunities to use services, beneficiaries with < 4 months of enrollment were excluded. However, because many individuals are enrolled in Medicaid for relatively short periods of time,³⁰ beneficiaries were not required to have a full year of enrollment. Beneficiaries who were pregnant, had ≥ 1 claims with a cancer diagnosis, or resided in a long-term care facility were excluded. The Indian Health Service provides comprehensive health services to approximately 2 million of the estimated 3.4 million American Indians/Alaska Natives in the United States.³¹ Whether the Indian Health Service consistently bills Medicaid for cancer screenings is

unknown. Therefore, all American Indian/Alaska Native Medicaid enrollees were excluded given the likelihood of underascertaining receipt of cancer screenings. Because most fee-for-service enrollees in Arizona, New Mexico, and Nevada were American Indian and the populations remaining in these states after applying this exclusion criterion were atypical compared with the study populations of other states, these 3 states were excluded. Maine was also excluded because the state did not report physician and outpatient claims in 2007.

From the sample meeting these inclusion criteria, subsamples for each screening test were defined based on age and sex. Very few claims for flexible sigmoidoscopy or barium enema were included in the Medicaid data, and therefore these procedures were not examined. A list of the Current Procedural Terminology (CPT) and International Classification of Diseases, Ninth Revision (ICD-9) codes used to identify screening-related claims is shown in the online supporting information. For all screening tests except mammography, the same codes are used for screening and diagnostic tests, which prevents differentiation between cancer screenings and diagnostic procedures.

Independent Variables: State-Specific Reimbursement Rates and Medicaid Policies

For each state, the reimbursement rate for each screening test was defined as the median amount paid on outpatient and inpatient claims. Because multiple CPT and ICD-9 codes were used for the majority of screening tests examined, the state-specific reimbursement for a test was calculated as the median amount paid in each state for all the identified CPT and ICD-9 procedure codes associated with that test. Codes used to determine state-specific screening rates and reimbursements are presented in the online supporting information. Because there were very few claims that provided separate reimbursements for professional and technical components of screening tests, reimbursements included in the current study were for the global reimbursement (ie, combined technical and professional component reimbursements) for the included screening test.

Because of the significant difference in reimbursement for film versus digital mammography, separate reimbursement rates for each type of mammogram were calculated as well as for film and digital mammograms billed by facilities (eg, hospitals) and nonfacilities (eg, physician's offices). Because screening tests are generally either provided or ordered during an office visit, reimbursement for office visits was also considered using the state-specific median reimbursement for office visits of moderate severity (CPT code 99213). State variation in

fecal occult blood test (FOBT) reimbursement was minimal (range, \$1-\$7), and therefore state-specific FOBT reimbursement was not included in the FOBT regression model.

Medicare's methodology of accounting for regional differences in the costs of medical services was used by adjusting reimbursement for mammography and office visits by the 2007 Medicare Geographic Adjustment Factor and reimbursement for colonoscopy by the 2007 Hospital Wage Index.

State-specific Medicaid eligibility requirements hypothesized to influence cancer screening included income and financial asset thresholds, physician copayments for preventive services (required or not required), and frequency of eligibility renewal (12 months or < 12 months from the initial enrollment date) (see online supporting information). Policy information was derived from the Henry J. Kaiser Family Foundation.³²⁻³⁴ Because income and financial asset requirements vary by Medicaid eligibility group (parents, blind/disabled, or medically needy) within a state, these variables were determined using beneficiaries' eligibility categories. "Less restrictive" income eligibility requirements were defined as allowing a maximum income of > 100% of the federal poverty level (FPL) for parents, 75% of the FPL for the blind/disabled, and 54% of the FPL for the medically needy. Parents were assigned as experiencing a "less restrictive" financial asset policy if they did not have to meet an asset test. Because blind/disabled and medically needy populations are subject to asset tests in all states, a state's policy was considered "less restrictive" if these populations were allowed assets > \$2000.

Dependent Variable: Cancer Screening Test Receipt

The outcome of interest was receipt of a colonoscopy, film or digital mammogram, FOBT, or Papanicolaou (Pap) test. Select CPT codes and ICD-9 procedure codes were used to identify claims for these cancer screening tests (see online supporting information). State-specific rates for receipt of each screening test are presented in the online supporting information. Analyses examine receipt of cancer screenings in 2007 and do not reflect adherence to testing intervals recommended in current cancer screening guidelines. Furthermore, because screening test rates were based only on 2007 Medicaid claims data (which, for many beneficiaries, involved Medicaid enrollment for less than the full calendar year), the screening rates presented in the current study are likely to be lower than those from individual surveys or

analyses of claims data for individuals enrolled for an entire year.

Statistical Analyses

Multivariable logistic regression was used to measure associations between state-specific Medicaid reimbursement and policy variables with receipt of cancer screening tests. To account for the clustering of beneficiaries within a state, generalized estimating equations assuming an exchangeable working correlation and robust standard errors were used to fit logistic regression models. All regressions controlled for age, age squared, sex, race/ethnicity, urban residence, Medicaid eligibility category, number of inpatient stays, number of chronic conditions (conditions and codes listed in the online supporting information), and statewide screening rates for the corresponding type of cancer as a partial control for unmeasured state-level factors (from the 2008 Behavior Risk Factor Surveillance System; 2007 estimates were not available).³⁵ To facilitate interpretation, odds ratios were scaled by a dollar amount equal to 20% of the national median reimbursement for that screening test or office visit.

For mammography, 2 additional covariates were included (the ratio of film to digital mammogram claims among Medicare enrollees in the state and the ratio of facility to nonfacility mammogram claims in the state's Medicaid claims) to control for state variations in the availability of digital versus film mammography and the rates at which different types of providers billed for mammograms. An additional 9 states (Delaware, Massachusetts, Missouri, Nebraska, New York, Ohio, Utah, West Virginia, and Wyoming) were excluded from mammography analyses because these states had no claims for digital mammography or lacked both facility and nonfacility claims, thus preventing the creation of these independent variables. Maryland was excluded from this analysis because the median reimbursement was more than twice that of the next highest state and 6 times the national Medicaid reimbursement.

All analyses were weighted by the fee-for-service months an individual was enrolled in Medicaid during 2007 and were performed using SAS statistical software (SAS Institute Inc, Cary, NC). Study procedures were approved by RTI's Institutional Review Board.

RESULTS

Beneficiary characteristics are summarized in Table 1. The percentage of Medicaid enrollees residing in states with less restrictive income requirements ranged from

TABLE 1. Select Sociodemographic Characteristics and Cancer Screening Rates Within the Study Sample That Is Age-/Sex-Eligible for the Screening Test

Characteristic, Column Mean and Percentage ^a	Females Aged 21-64 Years N=2,136,511	Females Aged 40-64 Years N=792,470	Males and Females Aged 50-64 Years N=769,729
Type of Screening	Cervical Cancer	Breast Cancer	Colorectal Cancer
Mean age, y	40	50	56
Female, %	100.0	100.0	59.5
Race/ethnicity, %			
White	51.7	48.6	49.9
Black	27.6	27.7	25.5
Hispanic	10.5	9.9	9.8
Other race	10.2	13.9	14.8
No. of chronic conditions, %			
1	22.9	26.7	26.1
≥2	24.1	40.4	46.2
Residence, %			
Large metropolitan area	36.3	36.7	43.7
Small metropolitan area	35.0	34.2	30.4
Nonmetropolitan area adjacent to metropolitan area	17.7	18.3	15.8
Nonmetropolitan area not adjacent to metropolitan area	11.1	10.8	10.1
Medicaid eligibility category, %			
Parent	43.7	21.7	9.3
Blind/disabled	47.3	71.2	86.5
Medically needy	9.0	7.1	4.2
Less restrictive income eligibility requirement, %	41.9	45.0	56.8
Less restrictive financial asset requirements, %	27.0	18.3	23.1
Frequency of Medicaid renewal <12 mo, %	20.7	21.4	19.2
Physician copayment in the state of residence, %	59.6	66.9	57.9
Receipt of cancer screening test, %			
Colonoscopy	—	—	5.7
FOBT ^b	—	—	4.4
Digital or film mammography	—	20.3	—
Pap test	25.8	—	—

Abbreviations: FOBT, fecal occult blood test; Pap, Papanicolaou.

^a Percentages were weighted by the number of months an individual was enrolled in fee-for-service Medicaid.

^b The numbers of Medicaid enrollees eligible for FOBT and for colonoscopy differ because the colonoscopy population (769,729 individuals) excluded enrollees who received an FOBT earlier in the observation period and the FOBT population (753,868) excluded enrollees who underwent a colonoscopy earlier in the observation period.

42% to 57%, and the percentage in states with less restrictive asset requirements ranged from 18% to 27%. Approximately 80% of beneficiaries resided in states requiring Medicaid renewal every 12 months and approximately 60% resided in states requiring physician copayments for preventive care services. Within the age-appropriate and sex-appropriate samples, 26% of patients received a Pap test, 20% received a film or digital mammogram, 6% received a colonoscopy, and 4% received a FOBT during the study year.

Table 2 summarizes screening test and office visit reimbursements (state-specific rates are presented in the online supporting information). National median screening test reimbursements ranged from \$24 for a Pap test to

\$271 for colonoscopy; the median office visit reimbursement was \$37.

Association Between Reimbursement Rates and Cancer Screening

In multivariate regression models, small but significant associations were observed between Medicaid reimbursement rates and several screening tests. However, these associations were not in a consistent direction. A 20% increase in screening test reimbursement (based on the national median reimbursement) was associated with a 1.6% increase in the odds of receiving colonoscopy and an 0.8% decrease in the odds of receiving Pap test (Table 3). Increased reimbursements for digital mammography

TABLE 2. Median State Medicaid Reimbursement Rates for Cancer Screening Tests and Office Visits^a

	National Median, \$	Reimbursement Range, \$ ^b	
		Minimum Amount (State)	Maximum Amount (State)
Colonoscopy	270.94	83.94 (NY)	598.20 (AK)
Digital mammography, facility	49.16	16.84 (FL)	136.31 (ND)
Digital mammography, nonfacility	84.95	25.03 (LA)	209.25 (VT)
Film mammography, facility	30.51	16.53 (FL)	64.34 (SC)
Film mammography, nonfacility	53.75	28.00 (NH)	79.11 (VA)
Pap test	24.00	4.00 (IL)	36.00 (NC)
Office visit	36.85	20.67 (RI)	79.62 (AK)

Abbreviation: Pap, Papanicolaou.

^aFecal occult blood test reimbursement rates were not included. Because state variations in reimbursement were minimal, reimbursement for fecal occult blood tests was not examined in regression models.

^bStates excluded from the regression analysis for a particular screening test were excluded from the determination of minimum and maximum reimbursement rates.

at facilities, digital mammography at nonfacilities, and film mammography at nonfacilities were associated with 1.2%, 4.0%, and 1.7% increases, respectively, in the odds of receiving mammography, whereas increased reimbursement for film mammography at facilities (the most frequent type of mammography claim) was associated with a 5.4% decrease in the odds of receiving mammography (Table 4).

In contrast to these mixed results, increased reimbursement for office visits was significantly and consistently found to be positively associated with the likelihood of receiving colonoscopy, FOBT, Pap test, and mammogram. A 20% increase in office visit reimbursement was associated with increases in the odds of screening ranging from 2.2% for mammography to 8.7% for FOBT.

Association Between Medicaid Policies and Cancer Screening

The effects of Medicaid policy variables were not uniform across the screening tests examined. Beneficiaries in states with less restrictive income eligibility had higher odds of receiving Pap tests ($P < .001$) but lower odds of receiving FOBT tests ($P < .001$). There was no significant relationship noted between income eligibility and receipt of colonoscopy or mammography. Less restrictive financial asset policies were found to be negatively associated with the odds of receipt of FOBT and positively associated with the odds of receipt of all other screening tests (all $P < .001$); these positive associations ranged from 7.4% to 12.2% increases in the odds of receiving these screenings. Beneficiaries in states requiring Medicaid renewal < 12 months after initial enrollment had higher odds of receiving an FOBT ($P = .03$) or mammogram ($P < .001$) and lower odds of receiving a Pap test ($P < .001$). The effect size of the association of required renewal at < 12

months on the odds of mammography, 11.8%, was substantially larger than other effects on other screening tests for this policy factor. Residing in states requiring a copayment for physician services was found to be negatively associated with the odds of receiving a colonoscopy, Pap test, or mammogram and was positively associated with the odds of receiving a FOBT (all $P < .001$).

DISCUSSION

The current study examined the effects of Medicaid reimbursement rates and eligibility requirements on receipt of cancer screening tests among Medicaid enrollees. Increased reimbursements for screening tests were associated with generally small and inconsistent changes (ie, both positive and negative) in the likelihood of receiving screening tests whereas increased office visit reimbursements were associated with a higher likelihood of receiving screening for all tests examined. Given the large number of adults enrolled in Medicaid, even small increases in screening rates can translate into large numbers of additional individuals screened. However, the larger effect sizes and consistently positive association observed between office visit reimbursement and receipt of screening tests suggest that offices visits may be a more relevant policy tool with which to increase cancer screenings compared with test reimbursements.

Less restrictive Medicaid financial asset policies were associated with an increased odds of receiving all screening tests except FOBT. However, the relationships between receipt of screening and other Medicaid policies examined, including income eligibility, frequency of eligibility renewal, and physician copayments, varied across the screening tests.

Increasing reimbursement levels for screening tests may expand the supply of facilities (eg, laboratories,

TABLE 3. Adjusted ORs (95% CI) for Receipt of Colonoscopy, FOBT, and Pap Test

	Colonoscopy N=769,729	P	FOBT N=753,868	P	Pap Test N=2,136,511	P
Reimbursement variables ^a						
State median reimbursement for cancer screening test	1.016 (1.011-1.027)	<.001	NA		0.992 (0.989-0.995)	<.001
State median reimbursement for an office visit	1.069 (1.060-1.078)	<.001	1.087 (1.077-1.097)	<.001	1.023 (1.020-1.026)	<.001
Sociodemographic and other variables						
Age ^b	1.053 (0.975-1.137)	.19	1.177 (1.077-1.287)	<.001	0.982 (0.980-0.984)	<.001
Sex						
Female	Reference		Reference		Reference	
Male	0.829 (0.812-0.847)	<.001	0.666 (0.649-0.683)	<.001	NA	
Race/ethnicity						
White	Reference		Reference		Reference	
Black	0.867 (0.846-0.890)	<.001	0.834 (0.809-0.859)	<.001	1.078 (1.070-1.087)	<.001
Hispanic	1.043 (1.006-1.081)	.02	1.226 (1.178-1.276)	<.001	1.163 (1.149-1.176)	<.001
Other	0.957 (0.928-0.986)	.01	1.256 (1.216-1.296)	<.001	1.039 (1.027-1.051)	<.001
No. of chronic conditions						
0	Reference		Reference		Reference	
1	2.193 (2.120-2.268)	<.001	2.049 (1.972-2.128)	<.001	1.554 (1.541-1.567)	<.001
≥2	2.956 (2.864-3.051)	<.001	2.537 (2.449-2.628)	<.001	1.731 (1.714-1.748)	<.001
Residence						
Large metropolitan area	Reference		Reference		Reference	
Small metropolitan area	1.092 (1.064-1.121)	<.001	1.066 (1.035-1.097)	<.001	1.123 (1.114-1.133)	<.001
Non metropolitan area adjacent to metropolitan area	1.074 (1.040-1.109)	<.001	0.997 (0.962-1.034)	.88	1.172 (1.160-1.184)	<.001
Nonmetropolitan area not adjacent to metropolitan area	1.021 (0.983-1.061)	.28	0.878 (0.839-0.918)	<.001	1.181 (1.167-1.196)	<.001
No. of inpatient stays	1.084 (1.074-1.093)	<.001	1.069 (1.060-1.079)	<.001	0.905 (0.900-0.910)	<.001
Medicaid eligibility category						
Parents	Reference		Reference		Reference	
Blind/disabled	0.984 (0.947-1.022)	.39	1.191 (1.138-1.246)	<.001	0.745 (0.738-0.751)	<.001
Medically needy	1.073 (1.009-1.142)	.03	0.965 (0.892-1.044)	.37	0.930 (0.918-0.943)	<.001
State BRFSS cancer screening rate	1.021 (1.018-1.024)	<.001	1.043 (1.040-1.046)	<.001	1.055 (1.053-1.057)	<.001
State Medicaid variables						
Income eligibility						
More restrictive	Reference		Reference		Reference	
Less restrictive	0.995 (0.971-1.019)	.66	0.857 (0.835-0.880)	<.001	1.056 (1.047-1.066)	<.001
Financial assets						
More restrictive	Reference		Reference		Reference	
Less restrictive	1.074 (1.045-1.103)	<.001	0.914 (0.885-0.943)	<.001	1.122 (1.114-1.131)	<.001
Frequency of Medicaid renewal						
12 mo	Reference		Reference		Reference	
<12 mo	1.016 (0.988-1.044)	.27	1.034 (1.003-1.067)	.03	0.981 (0.972-0.990)	<.001
Requires physician copayment						
No	Reference		Reference		Reference	
Yes	0.939 (0.918-0.959)	<.001	1.142 (1.114-1.170)	<.001	0.944 (0.937-0.951)	<.001

Abbreviations: 95% CI, 95% confidence interval; BRFSS, Behavioral Risk Factor Surveillance System; FOBT, fecal occult blood test; NA, not applicable; OR, odds ratio; Pap, Papanicolaou.

^aORs for the reimbursement variables were scaled by the dollar amount equal to 20% of the national median reimbursement for that screening test/office visit.

^bAge-squared (ie, age times age) was also included in all regression models (results not shown).

imaging facilities) providing services for Medicaid beneficiaries, but increasing payments for office visits may increase access to and/or the supply of providers ordering the tests. There are substantial barriers for Medicaid enrollees to receive outpatient physician care³⁶⁻³⁸; the results of the current study are consistent with previous studies indicating that higher Medicaid reimbursements for office visits are associated with increased receipt of health care services, including preventive services.²³⁻²⁵

Medicaid reimbursement rates are also associated with physician participation in Medicaid and acceptance of new Medicaid patients.^{20,39-42} The Patient Protection and Affordable Care Act includes provisions intended to increase Medicaid provider capacity and improve accessibility for Medicaid populations, including the requirement that states increase Medicaid reimbursements for certain services provided by primary care providers to Medicare rates in 2013 and 2014. The findings of the

TABLE 4. Adjusted ORs (95% CI) for Receipt of Mammography^a

	Film and Digital Mammography N=792,470	P
Reimbursement variables ^b		
State median reimbursement for digital mammography, facility	1.012 (1.007-1.016)	<.001
State median reimbursement for digital mammography, nonfacility	1.040 (1.035-1.045)	<.001
State median reimbursement for film mammography, facility	0.946 (0.942-0.951)	<.001
State median reimbursement for film mammography, nonfacility	1.017 (1.011-1.023)	<.001
State median reimbursement for an office visit	1.022 (1.016-1.028)	<.001
Sociodemographic and other variables		
Age ^c	1.196 (1.179-1.213)	<.001
Race/ethnicity		
White	Reference	
Black	0.964 (0.950-0.978)	<.001
Hispanic	1.306 (1.280-1.333)	<.001
Other race	1.084 (1.065-1.103)	<.001
No. of chronic conditions		
0	Reference	
1	1.901 (1.870-1.932)	<.001
≥2	2.377 (2.339-2.415)	<.001
Residence		
Large metropolitan area	Reference	
Small metropolitan area	1.234 (1.216-1.253)	<.001
Nonmetropolitan area adjacent to metropolitan area	1.272 (1.249-1.296)	<.001
Nonmetropolitan area not adjacent to metropolitan area	1.276 (1.247-1.305)	<.001
No. of inpatient stays	0.807 (0.799-0.814)	<.001
Medicaid eligibility category		
Adult		
Blind/disabled	0.932 (0.915-0.949)	<.001
Medically needy	0.864 (0.839-0.891)	<.001
State BRFSS mammogram screening rate	1.033 (1.030-1.036)	<.001
State-level ratio of film to digital mammography claims in Medicare	0.855 (0.827-0.883)	<.001
State-level ratio of facility to nonfacility mammogram claims	1.004 (1.003-1.004)	<.001
State Medicaid variables		
Income eligibility		
More restrictive	Reference	
Less restrictive	1.013 (0.996-1.031)	.14
Asset test		
More restrictive	Reference	
Less restrictive	1.074 (1.055-1.093)	<.001
Medicaid redetermination		
12 mo	Reference	
<12 mo	1.118 (1.098-1.139)	<.001
Requires physician copayment		
No	Reference	
Yes	0.909 (0.893-0.925)	<.001

Abbreviations: 95% CI, 95% confidence interval; BRFSS, Behavioral Risk Factor Surveillance System; OR, odds ratio.

^aNine states (Delaware, Massachusetts, Missouri, Nebraska, New York, Ohio, Utah, West Virginia, and Wyoming) were excluded from the regression analysis because a reimbursement variable could not be created because the state had no claims for digital mammography or no claims associated with a facility or a nonfacility. Maryland was also excluded because mammogram reimbursement was very high.

^bORs for the reimbursement variables were scaled by the dollar amount equal to 20% of the national median reimbursement for facility and nonfacility film/digital mammograms and office visits.

^cAge-squared (ie, age times age) was also included in all regression models (results not shown).

current study indicate that this requirement may increase the receipt of cancer screening tests.

Increased cancer screening among Medicaid enrollees may result in the increased detection of cancers at earlier stages.⁴³ Sommers et al recently reported that expanded Medicaid eligibility was associated with significantly decreased all-cause mortality.² As states expand Medicaid eligibility, it will be important to track state-specific changes in Medicaid enrollment, reimbursement

rates, and eligibility requirements, and their impact on cancer screening, diagnosis at an early stage, and survival among individuals diagnosed with cancer.

The current study includes several limitations. The analyses reflect only the receipt of screening tests billed to Medicaid; services rendered without billing or those billed to other insurers (eg, Veterans Affairs) were not captured in the data. Because screening test rates were based only on 2007 Medicaid claims data (which, for many

beneficiaries, involved Medicaid enrollment for less than the full calendar year), the screening rates presented in the current study are likely to be lower than those from individual surveys or analyses of claims data for individuals enrolled for an entire year. In addition, because the same CPT codes are used for all screening and diagnostic tests except for mammography, no differentiation could be made between cancer screenings versus diagnostic procedures as a follow-up to symptoms or previous abnormal screening results. However, it is likely that a majority of the tests were for screening results rather than diagnosis because many more individuals undergo screening and because individuals diagnosed with cancer were excluded from the current study. Furthermore, although physicians may not submit codes for screening tests performed for all patients, and in particular FOBT may not be submitted due to low reimbursement, physicians in fee-for-service environments need to submit procedure codes to get paid for services provided; therefore, we anticipate that physicians will submit claims for screening tests for the majority of patients screened. Because the vast majority of screening test claims provided only the global reimbursement for each screening test (ie, there were very few claims providing separate reimbursements for professional and technical components), we were unable to examine the association between professional and technical component reimbursements and rates of screening tests. The current study did not include patients in capitated managed care plans; state-level differences in policies regarding Medicaid managed care may result in differences between state populations included in the study sample.

A recently published study reported that breast, cervical, and colorectal cancer screenings are not covered in all states for Medicaid beneficiaries.⁴⁴ However, a report for the Kaiser Family Foundation and other information have indicated that these cancer screenings are covered in all states and DC.^{3,45,46} Furthermore, substantial numbers of claims and reimbursements were identified for all these screening tests in all states included in the current study (see online supporting information). Therefore, we believe that these cancer screenings were covered for Medicaid beneficiaries in all included states during the study period. The current study is a cross-sectional analysis, and unmeasured state-level factors may affect results. State-wide screening rates for the corresponding type of cancer were included as a partial control for unmeasured state-level factors. Because previous work has indicated limited changes in Medicaid cancer screening reimbursements across years,⁴⁷ this cross-sectional comparison is likely to demonstrate more policy variation than a longitudinal

study of state reimbursement rates over time. Multiple previous studies have examined the impact of a variety of disparities on cancer screening using cross-sectional comparisons.⁴⁸⁻⁵¹ Finally, adherence to 2007 recommendations for cancer screenings with multiyear intervals could not be examined.

As Medicaid programs continue to evolve, these findings may assist policy makers in examining ways in which reimbursements for cancer screening tests and office visits and eligibility policies could be used to address barriers to access to care and improve the uptake of cancer screening services.

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CONFLICT OF INTEREST DISCLOSURES

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