Declining Mammography Screening in a State Medicaid Fee-for-Service Program: 1999–2008

Abhijeet Bhanegaonkar, M.P.H.,¹ S. Suresh Madhavan, M.B.A., Ph.D.,¹
Rahul Khanna, M.B.A., Ph.D.,² and Scot C. Remick, M.D.³

Abstract

Objective: To evaluate and compare annual and biennial mammography screening rates across age, race, and geographic location (rural-urban) and to determine mammography screening persistence over 10 years among women enrolled in the West Virginia (WV) Medicaid Fee-for-Service (FFS) program.

Methods: The WV Medicaid FFS administrative claims data for women recipients aged 40–64 from 1999 to 2008 were used for study purposes. Annual and biennial screening rates and persistence with screening were determined for women who were continuously enrolled in the WV Medicaid FFS program for respective calendar years.

Results: A steady decline in the annual and biennial screening rates over a 10-year period (1999–2008) was observed among women recipients aged 40–64 years in the WV Medicaid FFS program, and screening persistence was also lower. Both annual and biennial screening rates and persistence varied by different demographic characteristics.

Conclusions: Although mammography screening services are covered under Medicaid programs, underuse persists as a major concern. The results of this study emphasize the need to identify and address barriers to mammography screening in low-income rural populations.

Introduction

BREAST CANCER IS THE SECOND MOST COMMON cause of cancer-related mortality among women in the United States, after lung cancer.¹ In 2009, approximately 40,170 women in the United States were expected to die of breast cancer, and 254,650 women were expected to be diagnosed with breast cancer.² Although breast cancer is associated with substantial morbidity and mortality, it is one of the most treatable cancers when detected early.³ Mammography screening is considered the gold standard in diagnosing breast cancer at an early stage before tumors turn symptomatic.^{4,5} Whereas there is a lack of consensus regarding the age of breast cancer screening initiation, the effectiveness of mammography is well established.^{3,6,7} Studies have shown that mammography screening is associated with detection of smaller cancerous tumors, improved survival, avoidance of chemotherapy, breast conservation, mortality reduction, and improved treatment options.^{8–13} A recent Cochrane Review reported screening to be associated with a 15% relative risk reduction in mortality and an absolute risk reduction of 0.05%.¹⁴

Various public health organizations, such as the American Cancer Society (ACS), National Cancer Institute (NCI), and United States Preventive Services Task Force (USPSTF), have issued recommendations for screening among asymptomatic women with average risk of breast cancer. The current ACS guidelines recommend annual mammography screening beginning at 40 years of age,¹⁵ whereas the NCI guidelines recommend that women ≥ 40 years have mammograms every 1–2 years.¹⁶ The USPSTF breast cancer screening guidelines recommend biennial screening for women aged 50–74 years and that women in their 40s consult with their doctors to make an informed decision based on family history and the patient's values regarding specific benefits and risks associated with screening.⁷ Screening is generally considered to be effective among women 50–69 years of age, but a screening benefit among women 40–49 years of age is often debated because of unclear evidence of mortality reduction in this age group.^{6,17–19} Hence, screening recommendations vary with respect to the age at which routine screening should be initiated and the frequency of screening. In the Breast and Cervical Cancer Prevention and Treatment Act of 2000, the U.S.

¹Department of Pharmaceutical Systems and Policy, West Virginia University, Morgantown, West Virginia.

²Department of Pharmacy Administration, The University of Mississippi, University, Mississippi.

³Mary Babb Randolph Cancer Center, West Virginia University, Morgantown, West Virginia.

Department of Health and Human Services (DHHS) placed a substantial value on breast cancer screening among women ≥ 40 years of age in the United States. This act provides uninsured, underinsured, and low-income women in the 50 states and 6 U.S. territories access to free breast cancer screening for early breast cancer detection, along with follow-up diagnostic services through the National Breast and Cervical Cancer Early Detection Program (NBCCEDP).²⁰ Objective 3–13 of *Healthy People 2010* was aimed at achieving a biennial screening rate of 70% among American women ≥ 40 years.²¹

Annual mammography screening rates in the United States increased significantly between 1987 and 2000.^{22,23} Screening rates became stable after 2000, however, and showed a slight decrease through 2005.²⁴ Studies conducted over the years have identified factors associated with mammography screening, including age, race, income, education, insurance status, cost, rural residence, transportation to screening facilities, disability status, physician access, physician specialty, physician recommendation for screening, history of self-reported abnormal mammograms, family history of breast cancer, routine source of care, knowledge about breast cancer screening, cultural beliefs, acculturation, and fear of finding cancer.^{23,25–45}

Income level, health insurance status, and type of health insurance are significant predictors of screening disparities in the United States.^{45–47} Low income and lack of health insurance have significant negative impact on screening use.^{40,48} Programs, such as the NBCCEDP guided by the Centers for Disease Control and Prevention (CDC), are in place that provide breast and cervical cancer screening and diagnostic services accessible to low-income, uninsured, and underserved American women. Although low-cost or free screening services are available to uninsured or low-income women, underuse of screening is most prevalent in such populations.⁴³

The type of health insurance is an important determinant in the use of cancer screening services.⁴⁷ In their analysis of the 2005 National Health Interview Survey (NHIS) data, Breen et al.²⁴ found wide variation in breast cancer screening rates among women 40–65 years of age by insurance status. Only 38% of women without insurance and 57.9% of women enrolled in publicly funded insurance programs (Medicaid/Medicare) had undergone breast cancer screening in the past 2 years compared to 75.1% of women who had private health maintenance organization (HMO) and 73.6% of women who had private non-HMO health insurance.²⁴ Low use of screening may be one of the reasons that women with no insurance or with Medicaid coverage have a higher probability of being diagnosed with advanced stages of breast cancer compared to women with private insurance coverage.^{28,49}

System of care—HMO vs. fee-for-service (FFS)—is also said to influence breast cancer screening use. Women who are FFS enrollees are half as likely to undergo screening compared to HMO enrollees.⁴⁰ A study of receipt of cancer screening in a Medicaid population reported a breast cancer screening rate of 31.8% in women aged ≥ 50 enrolled in the Medicaid FFS program, which is substantially lower than the average screening rate for women in the United States.⁵⁰ Evidence also suggests that breast cancer is diagnosed at a later stage among FFS enrollees than in HMO enrollees.⁵¹ Given the nationally changing trends in screening and incidence of breast cancer, screening trends among low-income women represented in the FFS Medicaid program are important to ongoing breast

cancer screening initiatives for improving screening behavior among underprivileged women in the United States.

This study had the following two objectives: (1) to determine annual and biennial screening rates for women recipients aged 40–64 years enrolled in the West Virginia (WV) Medicaid FFS program from 1999 to 2008 and (2) to determine the level of screening persistence, defined as the total number of screenings undertaken during the 10-year period from 1999 to 2008, among women recipients aged 40–64 years and continuously enrolled in the WV Medicaid FFS program.

Materials and Methods

Study design and data source

A retrospective, cross-sectional (Objective 1) and longitudinal (Objective 2) research design was used in this study. This study used the WV Medicaid FFS administrative claims data. Medicaid is a medical assistance program for individuals and families with low income and disability and is jointly funded by state and federal governments. For the purpose of this study, medical services (hospitalizations, emergency department [ED], and office services) claims data from 1999 to 2008 for women recipients enrolled in the WV Medicaid FFS program were analyzed. Enrollment and demographic files were used to determine eligibility dates for each recipient during the study period and relevant demographic information, respectively. All data were available to study researchers in a de-identified format. Study files were linked using a unique recipient identifier. The study was acknowledged by the West Virginia University Institutional Review Board under the exempt status.

Study sample

Objective 1. The target population used to determine annual screening rates comprised women with continuous enrollment during each calendar year (1999–2008) who were ≥ 40 years on January 1 and ≤ 64 years on December 31 of the respective calendar years. Claims for screening were identified using Current Procedure Terminology (CPT) codes (Appendix 1, supplemental material available online at www.liebertonline.com). To determine biennial screening rates, the target population comprised women with continuous enrollment during 2 consecutive calendar years (1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008) who were ≥ 40 years on January 1 of the starting calendar year and ≤ 64 years on December 31 of the following calendar year. Annual and biennial screening rates for women aged 50–64 years were calculated in a similar way. Annual and biennial screening rates for women 40–64 and 50–64 years of age were then compared to see if rates change based on different screening recommendations.

Objective 2. To determine screening persistence, the source population comprised women who were ≥ 40 years on January 1, 1999, and ≤ 64 years on December 31, 2008, who were continuously enrolled during the 10-year period from January 1, 1999, to December 31, 2008.

Women enrollees in West Virginia Medicaid managed care programs were not included in the study, as the data for these women were not available. Women with the following *International Classification of Disease*, 9th revision, Clinical Modification (ICD9-CM) diagnosis codes were excluded from

study analysis: 174.xx (breast cancer), 233.0x (carcinoma *in situ* of breast), 238.3x (neoplasm of uncertain behavior related to breast), and 239.3x (neoplasm of unspecified nature associated with breast). Data for women recipient ≥ 65 years of age were incomplete because these recipients are covered by Medicare as their primary insurance payer. Therefore, they were excluded from this study. Description of data extraction performed to identify the sample for each objective is provided in Appendix 2. (supplemental material available online at www.liebertonline.com).

Screening rates

Annual screening rates from 1999 to 2008 were calculated by dividing the number of continuously enrolled women (40–64 years of age) who had at least one claim for a screening mammography (based on the CPT code provided in Appendix 1, supplemental material available online at www.liebertonline.com) during the respective year by the total number of women (40–64 years of age) continuously enrolled in the FFS program during that year. Biennial screening rates were calculated from 1999 to 2008 by dividing the number of continuously enrolled women (40–64 years of age) who had at least one claim for a screening (based on CPT code) during the 2 calendar years (e.g., 1999 and 2000) by the total number of women (40–64 years of age) continuously enrolled in the FFS program during the same 2 calendar years. Because guidelines for age of screening initiation vary among different health organizations, overall screening rates were estimated for two age groups, 40–64 years of age and 50–64 years of age.

Annual and biennial screening rates were stratified by the recipients' age, race, and location of residence (county of residence). Age was categorized into three groups: 40–49 years, 50–59 years, and 60–64 years. Because West Virginia's population is >95% white, race was categorized into two categories: white and other (which included black, Hispanic, Asian, others/unknown). Location of residence was categorized into three groups: metro-urban, nonmetro-urban, and nonmetro-rural based on rural-urban continuum codes developed by the U.S. Department of Agriculture.⁵²

Unadjusted odds ratios (ORs) were calculated using logistic regression to determine the extent of differences in the screening rates for each demographic variable subcategory across the time periods.

Persistence

Persistence with screening was defined as the total number of annual screenings undertaken by women recipients enrolled continuously in the FFS program during the 10-year period (1999–2008). The maximum number of screenings a woman could have had between 1999 and 2008 was 10, and the minimum was 0. Based on the level of persistence, recipients were stratified into four groups: no screening, low persistence (≤ 4 screenings), medium persistence (5–7 screenings), and high persistence (≥ 8 screenings). Recipients were also classified into two age categories: ≤ 49 years and ≥ 50 years. Location of residence was categorized into three categories: metro-urban, nonmetro-urban, and nonmetro-rural. The associations between persistence with screening and the demographic variables (age, race, location of residence) were determined using chi-square analysis. Data management and analysis was performed using SAS version 9.0.

Results

Objective 1: Annual and biennial screening rates

Annual screening rates. Table 1 shows screening rates from 1999 to 2008 among women recipients aged 40–64 in the WV Medicaid FFS program who had a claim for mammography in the past year, based on age, race, and location of residence. The total number of women recipients continuously enrolled during each calendar year from 1999 to 2008 increased from 21,441 in 1999 to 29,039 in 2008 (Table 1). Annual screening rates increased slightly for WV Medicaid FFS recipients for women aged 40–64 years, from 21.2 in 1999 to 22.4 in 2008. The changes in annual screening rates between 1999 and 2008 were significant. Between 1999 and 2000, there was a sharp increase in the annual mammography screening use across all age, race, and location of residence groups. From 2000 to 2008, however, there was a steady decline in annual screening rates across all age, race, and location of residence categories (Table 1).

Biennial screening rates. Table 2 shows biennial screening rates from 1999 to 2008 among women recipients aged 40–64 in the WV Medicaid FFS program based on a claim for mammogram in the past 2 years, by age, race, and location of residence categories. The number of women recipients continuously enrolled in the past 2 years increased from 17,683 in 2000 to 25,761 in 2008 (Table 2). Biennial screening rates dropped from 39.5 in 2000 to 36.6 in 2008 for recipients aged 40–64 years. The changes in biennial screening rates between 2000 and 2008 for women aged 40–64 years were significant. From 2000 to 2008, there was a steady decline in biennial screening use across all age, race, and location of residence subcategories except for the nonmetro-rural subcategory of location of residence (Table 2).

Among women recipients in the WV Medicaid FFS program, the annual as well as biennial screening rates were higher for those aged 50–59 years, whites, and those residing in nonmetro-rural areas compared to women 40–49 years and 60–64 years of age belonging to other racial origin including black Americans, and those residing in metro-urban and nonmetro-urban counties, respectively (Tables 1 and 2).

Annual mammography screening rates differed significantly between 1999 and 2008 in women aged 60–64 years, whites, others, and those who resided in metro-urban areas. The differences in the biennial mammography screening rates between 1999 and 2008 were statistically significant for women enrolled in the WV Medicaid FFS program across all age categories, whites, and those who resided in the metro-urban and nonmetro-urban areas. Although the proportion of women in the WV Medicaid FFS program undergoing annual and biennial mammography screening was higher in the nonmetro-rural areas compared to those living in metro-urban and nonmetro-urban areas between 1999 and 2008, screening rates did not change significantly among women residing in nonmetro-rural areas between 1999 and 2008.

Objective 2: Persistence with screening

Table 3 shows a comparison of levels of persistence with annual screening among women recipients in the WV Medicaid FFS program across different demographic characteristics. The total number of women recipients continuously

TABLE 1. MAMMOGRAPHY RATES AMONG WOMEN RECIPIENTS AGED 40–64 IN WEST VIRGINIA MEDICAID FEE-FOR-SERVICE PROGRAM WHO HAD A MAMMOGRAM IN PAST YEAR, BASED ON AGE, RACE, AND LOCATION OF RESIDENCE, 1999–2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total number of women ^a with continuous enrollment	21,441	21,297	22,812	23,678	24,528	24,888	25,469	25,846	28,643	29,039
Total number of women with claim for mammogram	4,539	5,417	5,673	5,991	5,883	5,877	6,147	6,427	6,866	6,518
<i>Demographic variables</i>										
Overall	21.2	Ref	24.9	25.3	24.0	23.6	24.1	24.9	24.0	22.4
Distribution by age group (%)	18.9	Ref	22.1	22.2	20.8	21.0	21.5	22.2	20.9	19.3
40–49 years	23.8	Ref	28.1	28.2	26.7	26.0	26.2	26.8	26.6	24.6
50–59 years	20.8	Ref	24.1	26.5	26.2	24.5	25.7	26.9	24.8	24.4
60–64 years	21.4	Ref	25.1	25.5	24.1	23.8	24.2	24.8	24.1	22.6
White	16.9	Ref	21.1	21.6	22.4	19.4	21.8	25.9	21.0	20.1
Other ^c	21.2	Ref	24.7	25.1	23.7	23.8	25.2	26.2	24.9	23.2
Distribution by location of residence (%)	20.4	Ref	24.3	24.9	23.5	22.9	22.8	23.4	22.4	21.1
Metro-urban	26.8	Ref	30.5	29.5	29.8	27.9	28.0	27.9	29.7	27.9
Nonmetro-urban										
Nonmetro-rural										

Screening rates per 100 are calculated for women who were ≥40 years on January 1 and ≤64 years on December 31 of the respective calendar years.

^aWomen were continuously enrolled during respective calendar years.

^bComparison of mammography screening rates for demographic variable categories in respective years with the screening rate for same demographic variable category of the reference year (1999).

^cOther race category includes African American, Asian, Hispanic, Native American or Alaska Native, and Pacific Islander.

*** $p < 0.001$.

** $0.001 \leq p < 0.01$.

* $0.01 \leq p < 0.05$.

Ref, referent.

TABLE 2. MAMMOGRAPHY RATES AMONG WOMEN RECIPIENTS AGED 40–64 IN WEST VIRGINIA MEDICAID FEE-FOR-SERVICE PROGRAM WHO HAD A MAMMOGRAM IN PAST 2 YEARS, BASED ON AGE, RACE, AND LOCATION OF RESIDENCE, 1999–2008

Year		1999–2000		2001–2002		2003–2004		2005–2006		2007–2008	
Total number of women ^a with continuous enrollment		17,683		20,087		21,246		22,388		25,761	
Total number of women with a claim for mammogram		6,982		7,960		8,103		8,736		9,431	
Demographic variables		%	p ^b	%	p ^b	%	p ^b	%	p ^b	%	p ^b
Overall		39.5	Ref	39.6		38.1	**	39.0		36.6	***
Distribution by age group	40–49 years	36.8	Ref	36.4		35.1	*	35.9		33.2	***
	50–59 years	42.5	Ref	43.3		41.1		41.7		39.7	***
	60–64 years	39.0	Ref	38.0		38.8	**	40.6		37.2	***
Distribution by race	White	39.7	Ref	39.9		38.3	**	39.0		36.8	***
	Other ^c	34.1	Ref	34.0		34.0		38.4		33.2	
Distribution by location of residence (%)	Metro-urban	40.4	Ref	39.2		38.1	**	40.4		37.9	***
	Nonmetro-urban	38.0	Ref	39.1		37.2		37.2		34.4	***
	Nonmetro-rural	45.2	Ref	46.4		46.0		44.7		45.7	

Screening rates per 100 are calculated for women who were ≥40 years on January 1 of the starting calendar year and ≤64 years on December 31 of the following calendar year.

^aWomen were continuously enrolled during 2 consecutive calendar years.

^bComparison of mammography screening rates for demographic variable categories in respective years with the screening rate for same demographic variable category of the reference year (1999).

^cOther race category includes African American, Asian, Hispanic, Native American or Alaska Native, and Pacific Islander.

*** $p < 0.001$.

** $0.001 \leq p < 0.01$.

* $0.01 \leq p < 0.05$.

enrolled in the WV Medicaid FFS program during 1999–2008 was 8,243. Half of the women (approximately 50%) with continuous enrollment had low persistence with annual screening, approximately 9% of women had high screening persistence, and approximately 28% had no mammography screening at all during the 10-year period (Table 3). Persistence with screening was significantly different across different age and location of residence categories. Older women were more persistent with screening recommendations. High screening persistence was observed among white women compared to those belonging to other racial origins (including black Americans); however, the differences in screening were not significant across racial categories. Women residing in metro-urban and nonmetro-urban areas had lower persistence compared to those residing in nonmetro-rural areas.

Discussion

Incidence rates of *in situ* and invasive breast cancer among women aged ≥50 years in the United States have dropped since 1999.² Despite a decline in the incidence of breast cancer in the last decade, breast cancer remains one of the leading causes of mortality and morbidity among women in the United States.⁵³ Reduction in breast cancer incidence is mainly attributed to the reduced use of hormone replacement therapy (HRT) after publication of the results of the Women's Health Initiative (WHI) Estrogen Plus Progestin trial in 2002.^{54,55} However, the decline in breast cancer incidence may also be due to a decrease in mammography screening in the United States.⁵³

Results of this study show an overall decline in the annual and biennial screening rates over a 10-year period (1999–2008) among women recipients aged 40–64 years in the WV Medicaid FFS program. Screening rates for women aged ≥40 years significantly increased nationally from 1987 to 2000 before

showing a declining trend in the following decade.^{5,23,24} Our findings show similar trends of increase in screening use between 1999 and 2000, followed by a steady decline in the Medicaid FFS population aged 40–64 years.

Among women recipients in the WV Medicaid FFS program, the screening rates dropped consistently across all age, race, and location of residence categories, although the annual screening rates among women aged 60–64 years showed an increasing trend. The annual screening rate in women aged 60–64 years increased slightly from 27.0 in 1999 to 28.2 in 2008. Annual and biennial screening rates were higher in women aged 50–59 years compared to women in other age groups. These results are consistent with findings based on NHIS data, where screening rates were found to be higher in women >50 years compared to women aged 40–49 years.²⁴ Results of this study also indicate declining annual and biennial screening rates during 2000–2008 among women 40–49 years of age compared to women in the older age groups. These results are consistent with other reports suggesting an overall decline in the screening rates between 2000 and 2006 among American women aged 40–49 with healthcare insurance coverage.⁵⁶

Annual and biennial screening rates among women recipients in the WV Medicaid FFS program were lower than the screening rates for the overall female population in West Virginia and the United States during the 10-year period (1999–2008). Our results are consistent with previous studies, which also had demonstrated lower screening rates among women recipients enrolled in Medicaid programs.^{50,57} Studies consistently have found lower screening rates among women with public health insurance, including those with Medicaid coverage, compared to those with private health insurance.^{23,24,34,40}

Annual and biennial screening rates were higher among white women compared to their counterparts from other racial groups (including African Americans). A study involving church-based intervention to improve mammography

TABLE 3. COMPARISON BETWEEN DEMOGRAPHIC CHARACTERISTICS AND PERSISTENCE WITH ANNUAL MAMMOGRAPHY SCREENING AMONG WOMEN RECIPIENTS IN THE WEST VIRGINIA MEDICAID FEE-FOR-SERVICE PROGRAM, 1999–2008

Demographic variables		Level of persistence				Total n = 8,243	p ^a
		No screening n = 2,270 (27.5%)	Low (0–4 mammograms) n = 4,080 (50.3%)	Medium (5–7 mammograms) n = 1,460 (17.7%)	High (8–10 mammograms) n = 433 (5.3%)		
Distribution by age group ^b	40–49 years	1,581 (28.2%)	2,818 (50.3%)	952 (17.0%)	256 (4.6%)	5,607 (68.0%)	***
	≥ 50 years	689 (26.1%)	1,262 (47.9%)	508 (19.3%)	177 (6.7%)	2,636 (32.0%)	
Distribution by race ^c	White	2,155 (27.3%)	3,914 (49.6%)	1,397 (17.7%)	418 (5.3%)	7,884 (95.6%)	0.222
	Other	115 (32.0%)	166 (46.2%)	63 (17.5%)	15 (4.2%)	359 (4.4%)	
Distribution by location of residence	Metro-urban	909 (26.6%)	1,698 (49.6%)	619 (18.1%)	194 (5.7%)	3,420 (41.5%)	***
	Nonmetro-urban	1,256 (29.3%)	2,120 (49.4%)	712 (16.6%)	200 (4.7%)	4,288 (52.0%)	
	Nonmetro-rural	105 (19.6%)	262 (49.0%)	129 (24.1%)	39 (7.3%)	535 (6.5%)	

Women were continuously enrolled during the 10-year period from January 1, 1999, to December 31, 2008.

^aPearson's chi-square statistics.

^bWomen who were ≥ 40 years on January 1, 1999 and ≤ 64 years on December 31, 2008. Age on January 1, 1999, was used to group women into two categories, 40–49 years and ≥ 50 years, respectively.

^cOther race category includes African American, Asian, Hispanic, Native American or Alaska Native, and Pacific Islander.

***p < 0.001.

reported that white women had higher biennial screening rates compared to their Latina counterparts, during both baseline and follow-up periods.⁵⁷ These findings are in contrast with the results of another study examining breast cancer screening in North Carolina Medicaid recipients aged ≥ 50, in which white women were less likely to have been screened than African American women.⁵⁰

In this study, screening rates among women residing in nonmetro-rural areas were higher compared to women residing in metro-urban and nonmetro-urban areas. This result is in contrast to previous studies that have found lower screening rates among women residing in rural areas compared to those in urban areas.^{23,38} Rural areas are often characterized by longer distances between facilities providing medical care, women without insurance, lower household income, and lower education attainment compared to urban regions.^{38,58} Therefore, women residing in rural areas are more likely to underuse screening compared to women residing in urban areas. There are reports suggesting improvement in screening use among uninsured, low-income women over the last decade, however, although this improvement is small in magnitude and lower than the target screening rate.⁴⁸ The reported improvement in screening use may be attributed in part to the promotion programs targeted to increase screening among underserved populations, such as the NBCCSP, a nationwide comprehensive public health initiative funded by CDC. Alternatively, West Virginia being a predominantly rural state, higher screening rates and the absolute change in screening rates from 1999 to 2008 in women residing in nonmetro-rural areas compared to those living in metro-urban and nonmetro-urban areas in West Virginia may be purely coincidental.

The efficacy of screening in early detection of cancer and subsequent reduction in the mortality rate primarily depends on adherence to screening recommendations.⁵⁹ Studies have reported increased screening rates in the last decade for the overall female population in the United States, yet screening adherence among women followed over time was found to be low.^{22,60,61} Overall persistence with screening was very low in our study, with only 8.6% of Medicaid FFS women having 8–10 screening over the 10-year period (1999–2008).

Despite widespread breast cancer awareness and screening initiatives by various health organizations, overall screening rates and persistence with screening in women aged 40–64 in the WV Medicaid FFS program was far below the *Healthy People 2010* goal of biennial screening rate of 70% and also below the state and national overall screening rates for women. In this study, screening persistence significantly differed across different age and location of residence categories. Higher screening persistence was observed in women aged ≥ 50 than in women in their 40s (11.2% vs. 7.4%). Prior studies have reported a screening persistence of 46.1% in women aged ≥ 50, whereas 44.6% women aged 43–49 were persistent with screening.^{42,62} Persistence with screening was higher among women residing in the nonmetro-rural area.

The findings of this study are subject to several limitations. Medicaid claims data are collected mainly for reimbursement purposes, and, therefore, it is difficult to determine the completeness and accuracy of the data. Coding errors are likely to occur during processing of the claims. Claims data have been reported to underestimate the use of preventive procedures.⁶³ Mammography screening done as a part of community-based

cancer screening and prevention services where Medicaid was not billed are difficult to account for and could cause underestimation of screening rates. It is possible that some screening mammograms may have been coded as diagnostic mammograms during the process of creating a claim for such visits. The WV Medicaid data were used as provided to us, and no testing was done for potential level of accuracy of claims associated with coding error.

Women with a past diagnosis of breast cancer, other breast abnormalities, mastectomy, lumpectomy, and other breast-related procedures were excluded from the study. Identification of women with a diagnosis of breast cancer and breast abnormalities using only ICD-9 codes can cause underestimation of breast cancer cases because of a lack of specific clinical definitions under ICD-9 CM. However, a medical history of such diagnoses or surgical procedures among women recipients in the WV Medicaid FFS program before the study period was not possible to determine because data before 1999 were unavailable. WV Medicaid data were not linked with cancer registry data; such a linkage may have identified women diagnosed with breast cancer who were missed because of the use of Medicaid claims data alone. Encounter data for recipients enrolled in WV Medicaid managed care programs were also not available and are not included. Dual enrollees (those <65 years old but eligible for Medicare and Medicaid) were included, but because Medicare would be their primary payer for mammography screening, these encounters may not have been captured in our analysis. Mammography screening rates by Medicaid eligibility groups were not reported because there was no grouping variable in the data. Reporting eligibility status by year for the Medicaid program as a whole is possible, but it may not necessarily reflect the proportion of individuals by eligibility category in the FFS program. Our results should be interpreted in light of these limitations.

This study is of particular importance for the state of West Virginia as well as the Appalachian region, which is characterized by its largely poor, undereducated, medically underserved, and geographically dispersed rural population with significant health disparities. West Virginia is the only state situated entirely in the Appalachian region. Breast cancer is one of the most prevalent cancers among women in West Virginia, with reported disparities in screening and mortality.⁶⁴ This study highlights the lower breast cancer screening rates among women recipients in the WV Medicaid FFS program regardless of which screening guidelines are considered. Persistence with mammography screening was also found to be low among women recipients in the WV Medicaid FFS program.

Many previous studies have found lower mammography rates among women with low socioeconomic status (SES).^{40,45-48} Although all people who qualify to receive health coverage under the Medicaid program have lower SES based on the federal poverty level, the financial barriers preventing access to screening services are removed for these women because of healthcare insurance coverage provided by Medicaid. The lower screening rates found in this study clearly indicate that factors other than lack of insurance coverage, such as poor knowledge about screening benefits, negative attitudes toward preventive practices, cultural beliefs, nonavailability of screening facilities, lack of physician's recommendations, lack of transportation, and child care is-

sues, may influence screening practices among low-income women recipients in the Medicaid FFS programs.

Medicaid FFS recipients are traditionally known to be sicker or more disabled than their managed care counterparts and are present in all state Medicaid programs. Thus, even though this study focuses on the WV Medicaid FFS population, the mammography screening differences and trends noted in this vulnerable population segment are likely to be true in Medicaid beneficiaries enrolled in the FFS programs in other states as well and may have similar policy implications. Further research is needed to determine factors associated with lower screening and persistence rates among these women.

Acknowledgments

Funding support for this project was provided by a grant from the West Virginia Affiliate of the Susan G. Komen For The Cure foundation. Some additional support was provided by a grant (R24 - HS018622) from the Agency for Healthcare Research and Quality, Washington, DC. We thank Dr. Usha Sambamoorthi, Professor, Department of Pharmaceutical Systems and Policy, West Virginia University, for her guidance with claims data analysis. We acknowledge the assistance extended by Commissioners Marsha Morris and Nancy Atkins; Peggy King, R.Ph., Pharmacy Coordinator of the West Virginia Department of Health and Human Resources; and Steve Small, M.S., R.Ph. of the West Virginia Rational Drug Therapy Program.

Disclosure Statement

No competing financial interests exist.

References

1. American Cancer Society. Breast cancer overview, 2009. Available at www.cancer.org/acs/groups/cid/documents/webcontent/003037-pdf.pdf Accessed August 23, 2010.
2. American Cancer Society. Breast cancer facts & figures 2009-2010. Atlanta: American Cancer Society, 2009.
3. Chagpar AB, McMasters KM. Trends in mammography and clinical breast examination: A population-based study. *J Surg Res* 2007;140:214-219.
4. Hansen NM, Growney A. Breast cancer: pre- and postoperative imaging for staging. *Surg Oncol Clin north Am* 2007;16:447-463.
5. American Cancer Society. Breast cancer facts & figures 2007-2008. Atlanta: American Cancer Society, 2007.
6. Fletcher SW, Elmore JG. Clinical practice. Mammographic screening for breast cancer. *N Engl J Med* 2003;348:1672-1680.
7. Nelson HD, Tyne K, Naik A, Bougatsos B, Chan BK, Humphrey L. Screening for breast cancer: An update for the U.S. Preventive Services Task Force. AHRQ Publication No. 10-05142-EF-5, 2009. Agency for Healthcare Research and Quality, Rockville, MD. Available at www.ahrq.gov/clinic/uspstf09/breastcancer/brcanup.htm Accessed December 20, 2010.
8. Garfinkel L, Boring CC, Heath CW Jr. Changing trends. An overview of breast cancer incidence and mortality. *Cancer* 1994;74(Suppl 1):222-227.
9. Barth RJ Jr, Gibson GR, Carney PA, Mott LA, Becher RD, Poplack SP. Detection of breast cancer on screening mammography allows patients to be treated with less-toxic therapy. *Am J Roentgenol* 2005;184:324-329.

10. Feig SA, D'Orsi CJ, Hendrick RE, et al. American College of Radiology guidelines for breast cancer screening. *Am J Roentgenol* 1998;171:29–33.
11. Humphrey LL, Helfand M, Chan BK, Woolf SH. Breast cancer screening: A summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2002;137:347–360.
12. Tabár L, Vitak B, Chen HH, Yen MF, Duffy SW, Smith RA. Beyond randomized controlled trials: Organized mammographic screening substantially reduces breast carcinoma mortality. *Cancer* 2001;91:1724–1731.
13. Tabar L, Yen MF, Vitak B, Chen HH, Smith RA, Duffy SW. Mammography service screening and mortality in breast cancer patients: 20-year follow-up before and after introduction of screening. *Lancet* 2003;361:1405–1410.
14. Gøtzsche PC, Nielsen M. Screening for breast cancer with mammography. *Cochrane Database Syst Rev* 2009;4:CD001877.
15. Smith RA, Cokkinides V, Brawley OW. Cancer screening in the United States, 2009: A review of current American Cancer Society guidelines and issues in cancer screening. *CA Cancer J Clin* 2009;59:27–41.
16. National Cancer Institute. Breast cancer (PDQ): Mammograms. U.S. National Institutes of Health. Available at www.cancer.gov/cancertopics/factsheet/Detection/mammograms Accessed December 27, 2009.
17. National Institutes of Health Consensus Development Panel. National Institutes of Health Consensus Development Conference Statement: Breast cancer screening for women ages 40–49, January 21–23, 1997. *J Natl Cancer Inst* 1997;89:1015–1026.
18. Qaseem A, Snow V, Sherif K, Aronson M, Weiss KB, Owens DK. Screening mammography in women 40 to 49 years of age: A clinical practice guideline from the American College of Physicians. *Ann Intern Med* 2007;146:511–515.
19. Brewer NT, Reiter PL. Assessing and increasing breast cancer screening. *Prev Med* 2008;47:483–484.
20. Centers for Disease Control and Prevention, 2009. Breast and Cervical Cancer Prevention and Treatment Act of 2000. Available at www.cdc.gov/cancer/nbccedp/legislation/law106-354.htm Accessed July 7, 2010.
21. U.S. Department of Health and Human Services. Healthy people 2010. Volume II: Objectives for improving health (Part B), 2nd ed. Washington, DC: U.S. Government Printing Office, 2000.
22. Blackman DK, Bennett EM, Miller DS. Trends in self reported use of mammograms (1989–1997) and Papanicolaou tests (1991–1997)—Behavioral Risk Factor Surveillance System. *MMWR CDC Surveillance Communication* 1999;48:1–22.
23. Swan J, Breen N, Coates RJ, Rimer BK, Lee NC. Progress in cancer screening practices in the United States: Results from the 2000 National Health Interview Survey. *Cancer* 2003;97:1528–1540.
24. Breen N, Cronin K, Meissner HI. Reported drop in mammography: Is this cause for concern? *Cancer* 2007;109:2405–2409.
25. Davis TC, Arnold C, Berkel HJ, Nandy I, Jackson RH, Glass J. Knowledge and attitude on screening mammography among low-literate, low-income women. *Cancer* 1996;78:1912–1920.
26. Centers for Disease Control and Prevention. Use of mammography services by women aged >or =65 years in Medicare—United States, 1991–1993. *MMWR* 1995;44:777–781.
27. Pearlman DN, Rakowski W, Ehlich B, Clark MA. Breast cancer screening practices among black, Hispanic, and white women: Reassessing differences. *Am J Prev Med* 1996;12:327–337.
28. Halpern MT, Bian J, Ward EM, Schrag NM, Chen AY. Insurance status and stage of cancer at diagnosis among women with breast cancer. *Cancer* 2007;110:403–411.
29. Halliday T, Taira DA, Davis J, Chan H. Socioeconomic disparities in breast cancer screening in Hawaii. *Prev Chronic Dis* 2007;4:A91.
30. Ives DG, Lave JR, Traven ND, Schulz R, Kuller LH. Mammography and Pap smear test use among older rural women. *Public Health Rep* 1996;111:244–250.
31. Rimer BK, Trock B, Engstrom PF, Lerman C, King E. Why do some women get regular mammograms? *Am J Prev Med* 1991;7:69–74.
32. Bjurstam N, Björnelid L, Duffy SW, et al. The Gothenburg Breast Cancer Screening Trial: Preliminary results on breast cancer mortality for women aged 39–49. *J Natl Cancer Inst Monogr* 1997;22:53–55.
33. Chu KC, Smart CR, Tarone RE. Analysis of breast cancer mortality and stage distribution by age for the Health Insurance Plan clinical trial. *J Natl Cancer Inst* 1988;80:1125–1132.
34. Adams EK, Breen N, Joski PJ. Impact of the National Breast and Cervical Cancer Early Detection Program on mammography and Pap test utilization among white, Hispanic, and African American women: 1996–2000. *Cancer* 2007;109(Suppl 2):348–358.
35. Khanna R, Bhanegaonkar A, Colsher P, Madhavan SS, Halverson J. Breast cancer screening, incidence, and mortality in West Virginia. *WV Med J* 2009;105:24–32.
36. McAlearney AS, Reeves KW, Tatum C, Paskett ED. Perceptions of insurance coverage for screening mammography among women in need of screening. *Cancer* 2005;103:2473–2480.
37. Lyttle NL, Stadelman K. Assessing awareness and knowledge of breast and cervical cancer among Appalachian women. *Prev Chronic Dis* 2006;3:A125.
38. Coughlin SS, Thompson TD, Hall HI, Logan P, Uhler RJ. Breast and cervical carcinoma screening practices among women in rural and nonrural areas of the United States, 1998–1999. *Cancer* 2002;94:2801–2812.
39. Mobley LR, Kuo TM, Clayton LJ, Evans WD. Mammography facilities are accessible, so why is utilization so low? *Cancer Causes Control* 2009;20:1017–1028.
40. Schueler KM, Chu PW, Smith-Bindman R. Factors associated with mammography utilization: A systematic quantitative review of the literature. *J Womens Health*. 2008;17:1477–1498.
41. O'Malley AS, Forrest CB, Mandelblatt J. Adherence of low-income women to cancer screening recommendations. *J Gen Intern Med* 2002;17:144–154.
42. Gierisch JM, O'Neill SC, Rimer BK, DeFrank JT, Bowling JM, Skinner CS. Factors associated with annual-interval mammography for women in their 40s. *Cancer Epidemiol* 2009;33:72–78.
43. Peek ME, Han JH. Disparities in screening mammography. Current status, interventions and implications. *J Gen Intern Med* 2004;19:184–194.
44. Borrayo EA, Jenkins SR. Feeling frugal: Socioeconomic status, acculturation, and cultural health beliefs among women of Mexican descent. *Cultur Divers Ethnic Minor Psychol* 2003;9:197–206.

45. Fiscella K, Franks P, Doescher MP, Saver BG. Disparities in health care by race, ethnicity, and language among the insured. *Med Care* 2002;40:52–59.
46. DeVoe JE, Fryer GE, Phillips R, Green L. Receipt of preventive care among adults: Insurance status and usual source of care. *Am J Public Health* 2003;93:786–791.
47. Hedegaard HB, Davidson AJ, Wright RA. Factors associated with screening mammography in low-income women. *Am J Prev Med* 1996;12:51–56.
48. Sabatino SA, Coates RJ, Uhler RJ, Breen N, Tangka F, Shaw KM. Disparities in mammography use among US women aged 40–64 years, by race, ethnicity, income, and health insurance status, 1993 and 2005. *Med Care* 2008;46:692–700.
49. Roetzheim RG, Pal N, Tennant C, et al. Effects of health insurance and race on early detection of cancer. *J Natl Cancer Inst* 1999;91:1409–1415.
50. DuBard CA, Schmid D, Yow A, Rogers AB, Lawrence WW. Recommendation for and receipt of cancer screenings among Medicaid recipients 50 years and older. *Arch Intern Med* 2008;168:2014–2021.
51. Riley G, Potosky A, Lubitz J, Brown M. Stage of cancer at diagnosis for Medicare HMO and fee-for-service enrollees. *Am J Public Health* 1994;84:1598–1604.
52. United States Department of Agriculture (USDA), Economic Research Service (ERS). Measuring rurality: Rural-urban continuum codes (2004). Available at www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/ Accessed December 20, 2009.
53. American Cancer Society. Cancer facts & figures 2008. Atlanta: American Cancer Society, 2008. Available at www.cancer.org/acs/groups/content/@nho/documents/document/2008caffinalsecuredpdf.pdf Accessed August 23, 2010.
54. Glass AG, Lacey JV Jr, Carreon JD, Hoover RN. Breast cancer incidence, 1980–2006: Combined roles of menopausal hormone therapy, screening mammography, and estrogen receptor status. *J Natl Cancer Inst* 2007;99:1152–1161.
55. Katalinic A, Rawal R. Decline in breast cancer incidence after decrease in utilisation of hormone replacement therapy. *Breast Cancer Res Treat* 2008;107:427–430.
56. Ryerson AB, Miller JW, Ehemann CR, Leadbetter S, White MC. Recent trends in U.S. mammography use from 2000–2006: A population-based analysis. *Prev Med* 2008;47: 477–482.
57. Welsh AL, Sauaia A, Jacobellis J, Min SJ, Byers T. The effect of two church-based interventions on breast cancer screening rates among Medicaid-insured Latinas. *Prev Chronic Dis* 2005;2:A07.
58. Kreher NE, Hickner JM, Ruffin MT 4th, Lin CS. Effect of distance and travel time on rural women's compliance with screening mammography: An UPRNet study. Upper Peninsula Research Network. *J Fam Pract* 1995;40:143–147.
59. Breast Screening Frequency Trial Group (BSFTG). The frequency of breast cancer screening: Results from the UKCCCR randomized trial. United Kingdom Coordinating Committee on Cancer Research. *Eur J Cancer* 2002;38:1458–1464.
60. Tang TS, Patterson SK, Roubidoux MA, Duan L. Women's mammography experience and its impact on screening adherence. *Psychooncology* 2009;18:727–734.
61. Breen N, Wagener DK, Brown ML, Davis WW, Ballard-Barbash R. Progress in cancer screening over a decade: Results of cancer screening from the 1987, 1992, and 1998 National Health Interview Surveys. *J Natl Cancer Inst* 2001; 93:1704–1713.
62. Clark MA, Rakowski W, Bonacore LB. Repeat mammography: Prevalence estimates and considerations for assessment. *Ann Behav Med* 2003;26:201–211.
63. Freeman JL, Klabunde CN, Schussler N, Warren JL, Virnig BA, Cooper GS. Measuring breast, colorectal, and prostate cancer screening with Medicare claims data. *Med Care* 2002; 40(Suppl 8):IV-36–42.
64. West Virginia Department of Health and Human Resources. The West Virginia 2010 Objectives. Available at www.wvdhhr.com/bph/hp2010/objective/3.htm Accessed December 12, 2009.

Address correspondence to:
 Abhijeet Bhanegaonkar, M.P.H.
 Department of Pharmaceutical Systems and Policy
 School of Pharmacy
 West Virginia University
 PO Box 9510
 Morgantown, WV 26506
 E-mail: contact.abhijeet@gmail.com