

Relationship Between Earlier and Later Mammography Screening—California Medicare, 1992 Through 1994

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Regular screening mammography is recommended to reduce breast cancer mortality. Although predictors of mammography have been studied, factors that influence adherence to guidelines are less understood. We examined the relationship between an index mammogram and subsequent mammograms among California Medicare beneficiaries. Medicare billing data for 1992, 1993, and 1994 were used to estimate the association between screening mammography in 1992 and subsequent screening in 1993 or 1994. We found that women with a 1992 mammogram were more than twice as likely to have a mammogram in 1993 or 1994 than women without a 1992 mammogram (relative risk = 2.58; 95% confidence interval, 2.57–2.59). This relationship was somewhat stronger for black women compared with white women and increased with age. Although further study of regular screening patterns is needed, these findings provide some evidence that encouraging a single mammogram may lead to continued adherence.

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Screening mammography significantly reduces breast cancer mortality in women 50 to 74 years of age.^{1,2} As a result, routine mammography screening for women older than 40 years is widely recommended.^{2,3}

Despite Medicare coverage for biennial screening mammography between 1991 and 1997 (as of January 1998, Medicare covers annual screening mammograms), fewer than 40% of eligible beneficiaries had at least one mammogram in a two-year period.⁴ Several studies have documented predictors of screening mammography in the Medicare population,^{5–8} but less is known about subsequent screening among these women.^{9–11} A recent study of low-income women found that 45% had subsequent screening mammography during the 15-month follow-up.⁹ A different study of women older than 40 years found a single screening mammogram was the strongest predictor of screening two years later.¹¹

We examined the relationship between mammography in a single year and mammography in a subsequent two-year period among a large group of California Medicare beneficiaries. Knowledge about the relationship between a single mammogram and subsequent screenings at recommended intervals provides insight into the possible long-term effects of outreach efforts and an indication of how useful an index of mammography screening during a single year is for inferences about future screening.

Methods

We used billing data from the Health Care Financing Administration for 1992, 1993, and 1994 to identify mammograms among Medicare beneficiaries in California. Our study population began with 1,360,448 female beneficiaries aged 65 years or older in January 1992 and alive through December 1994. We excluded women enrolled in a health maintenance organization at any time during the three years (37%) because the Health Care Financing Administration does not receive bills for services provided under managed care contracts. We also excluded women who had more than one mammogram during any six-month period between 1992 and 1994. This exclusion was made to reduce potential bias of including women with clinical indications that require screening mammography at closer intervals (about 1%). Our final study group comprised 845,442 California women.

Our main predictor, earlier screening mammography, was defined as at least one mammogram in 1992. Our outcome measure, later screening mammography, was defined as at least one mammogram in 1993 or 1994. All mammograms were combined for this analysis because screening and diagnostic mammography claims are difficult to distinguish in Medicare files.⁴ Although race is available from the Medicare file, coding for groups other

TABLE 1.—Percentage of Distribution and Percentage of Mammography Screening in 1992 (Annual) and 1993 or 1994 (Biennial)

Race and Age	Distribution, %	Mammography, %	
	n = 845,442	1992	1993 or 1994
All*	100.0	28.8	39.9
Race			
Black	4.8	19.2	29.7
White	88.0	30.1	41.3
Age, y*			
65 to 69	29.3	35.4	50.3
70 to 74	26.4	33.5	46.9
75 to 79	20.3	28.3	38.8
80 to 84	13.5	20.4	27.2
≥85	10.5	9.8	11.8

*Includes races other than black or white.

than black or white is considered unreliable.¹² In addition to reporting the mean age of these women, we categorized age into five-year intervals to ease some presentations.

We used Mantel-Haenszel methods¹³ to estimate the association between later and earlier screening mammography, adjusted for age and race.

Results

Within this study group, about 29% had a mammogram in 1992 (Table 1). There were statistically significant differences, however, in screening within age and race categories. For example, fewer black women than white women had mammograms, and fewer older women than younger women had mammograms.

Although the mean age of these women was 74.6 years in 1992, women who had a mammogram in 1992 were younger (72.6 years) than women who did not have a

mammogram (75.4 years). Despite racial differences in mammography use, the mean age of black women (74.5 years) was similar to that of white women (74.7 years). Furthermore, although black women and white women who had a mammogram in 1992 were close in age (72.8 and 72.6 years, respectively), black women who did not have a mammogram in 1992 were younger (74.9 years) than their white counterparts (75.6 years).

About 10% more women were screened during the subsequent two-year period, 1993 to 1994 (39.9%); however, the relationships between screening and the covariates age and race were similar for both annual and biennial screening (Table 1).

Of the women with earlier screening, more than 70% had subsequent screening (Table 2). Of women without a mammogram in 1992, however, only 27.4% had a later mammogram. When adjusted for race and age, women with a 1992 mammogram were 2.3 times more likely to have another screening mammogram in 1993 or 1994 than women without the 1992 mammogram. Adjustment led to similar estimates among stratified age groups, but not race groups. This result indicates that age, but not race, affects the relationship between earlier and later screening.

Although the overall mammography rates decrease with age, the importance of the earlier mammogram in predicting later mammograms increases. Among the younger women, those with an earlier mammogram were about twice as likely to have a later mammogram than those without the earlier mammogram; whereas among the oldest age group, women with an early mammogram were nearly six times as likely to have a later mammogram. The effects of earlier screening on later screening was slightly stronger among black women than among white women, despite their overall lower mammography use.

Discussion

This study provides recent information about subsequent screening mammography among a large number of

TABLE 2.—Relative Risks for Mammography Screening in 1993 or 1994 by Mammography Screening in 1992

Age and Race	Mammography in 1993 or 1994, %		Relative Risk (95% Confidence Interval)	
	Mammogram in 1992	No Mammogram in 1992	Unadjusted	Adjusted*
All†	70.8	27.4	2.58 (2.57–2.59)	2.27 (2.26–2.28)
Race				
Black	61.7	22.1	2.79 (2.71–2.87)	2.60 (2.52–2.67)
White	71.5	28.3	2.53 (2.51–2.54)	2.25 (2.23–2.26)
Age, y†				
65 to 69	75.3	36.7	2.05 (2.04–2.07)	2.02 (2.00–2.03)
70 to 74	73.4	33.5	2.19 (2.17–2.21)	2.16 (2.14–2.18)
75 to 79	68.1	27.3	2.50 (2.47–2.52)	2.46 (2.43–2.49)
80 to 84	60.0	18.7	3.21 (3.14–3.27)	3.78 (3.12–3.23)
≥85	46.4	8.0	5.81 (5.62–6.02)	5.75 (5.59–6.95)

*All: adjusted for age and race; race: adjusted for age; age: adjusted for race.
†Includes races other than black and white.

Medicare beneficiaries. We demonstrated that beneficiaries with an earlier mammogram are more than twice as likely to have a later mammogram as beneficiaries without an earlier mammogram. This finding is strongest among older women and black women, groups with lower overall screening rates. We found a much higher rate of subsequent screening mammography among this population of Medicare women (about 70%) than in an earlier study of low-income women (in which 45% of women had subsequent screening mammograms).⁹ Our finding, however, is consistent with results from Sherbourne and colleagues, who found mammography at the beginning of their study period to be the strongest predictor of mammography two years later.¹¹ This relationship has important implications for the long-term benefits of cancer screening programs; reducing barriers for women who have never been screened may promote long-term adherence to cancer screening guidelines.

We found the relationship between the earlier and later mammograms increased with age. Because morbidity increases with age, however, a possible explanation is that the same disabilities that prevent the index mammogram prevent subsequent mammograms.

One explanation for these results is the effects of the physician recommendation¹⁴ on screening, which could explain, in part, these results; women with physicians who recommend the first mammogram may have the same physician recommending the later mammograms. On the other hand, it could be that one physician recommendation leads to long-term adherence to screening guidelines.

One limitation of Medicare claims data is the probable underestimate of mammography; beneficiaries with mammograms paid for by other sources—out-of-pocket, subsidized or free programs, or private insurance—are not included in our mammography count.⁴ This undercount would make our finding appear stronger than the actual relationship. In addition, the effects of managed care enrollment on statewide estimates are unknown. We have no comparable information about screening mammography for women enrolled in a managed care program. Indeed, for both these reasons, it is more accurate to phrase our results in mammography bills: women with one Medicare-billed mammogram are more likely to have Medicare-billed mammograms in subsequent years than women without the first billed mammogram. As a corollary, the relatively high cost of a mammogram increases incentives to obtain Medicare coverage.

We show that efforts to increase mammography use may have long-term effects. Early screening mammography is an important predictor of later screening mammography. Further study of factors that affect this relationship would enable health educators to aim more effectively their efforts toward adherence to screening mammography. Nonetheless, this evidence fuels optimism that our short-term interventions may lead to long-term benefits for older women.

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