

Breast Cancer Screening Use by African Americans and Whites in an HMO

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OBJECTIVE: To examine racial differences in breast cancer screening in an HMO that provides screening at no cost.

DESIGN: Retrospective cohort study of breast cancer screening among African-American and white women. Breast cancer screening information was extracted from computerized medical records.

SETTING: A large HMO in New England.

PATIENTS/PARTICIPANTS: White and African-American women ($N = 2,072$) enrolled for at least 10 years in the HMO.

MAIN RESULTS: Primary care clinicians documented recommending a screening mammogram significantly more often for African Americans than whites (70% vs 64%; $P < .001$). During the 10-year period, on average, white women obtained more mammograms (4.49 vs 3.93; $P < .0001$) and clinical breast examinations (5.35 vs 4.92; $P < .01$) than African-American women. However, a woman's race was no longer a statistically significant predictor of breast cancer screening after adjustment for differences in age, estimated household income, estrogen use, and body mass index (adjusted number of mammograms, 4.47 vs 4.25, $P = .17$; and adjusted number of clinical breast examinations, 5.35 vs 5.31, $P = .87$).

CONCLUSIONS: In this HMO, African-American and white women obtained breast cancer screening at similar rates. Comparisons with national data showed much higher screening rates in this HMO for both white and African-American women.

KEY WORDS: breast cancer screening; race; ethnicity; socioeconomic status.

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African-American women are more likely to have advanced breast cancer at the time of diagnosis, and they experience worse outcomes, stage for stage, than white women.^{1,2} Several explanations have been suggested for this disparity in survival, including differences in the access to or utilization of screening, differences in

treatment, and possible biologic differences.³⁻¹⁵ In addition, some research has shown only marginal race differences in breast cancer survival rates after adjustment for such variables as missed appointments and stage at cancer diagnosis.¹⁶ National surveys have shown that African-American women obtain less breast cancer screening than white women.¹⁷ The degree to which financial and other barriers and lack of physician recommendations for screening contribute to racial differences in screening rates remains unclear.

Prepaid health plans offer settings in which financial barriers to preventive care and screening are minimized, and screening is encouraged among all members. Health maintenance organization enrollees are significantly more likely than fee-for-service patients to have received screening tests.^{18,19} However, in a search of MEDLINE, we could find no published study specifically examining breast cancer screening utilization by race in an HMO. We therefore examined whether racial differences existed in the utilization of breast cancer screening in a large HMO, and compared these utilization rates with those reported for the U.S. population at large.

METHODS

Study Population

The study population included 2,400 women whose medical records were reviewed for a 10-year retrospective study of breast cancer screening and diagnostic evaluations. All 14,382 women who were members of the HMO and between 40 and 69 years of age on July 1, 1983, were potentially eligible for the study. Women were excluded for the following reasons: a lapse in enrollment in the HMO between July 1, 1983, and June 30, 1995 (8,816 women); health coverage from a source other than Harvard Pilgrim Health Care or from a noncomputerized HMO center during the study period (1,093 women); and a history of breast cancer or a prophylactic mastectomy or breast implants before July 1, 1983 (146 women); or a prophylactic mastectomy or breast implants during the study period (8 women). From the cohort of 4,319 remaining eligible subjects, a random sample was chosen, consisting of 1,200 women 40 to 49 years of age, 600 women 50 to 59 years of age, and 600 women 60 to 69 years of age, for a total sample of 2,400 women.²⁰

Setting

This retrospective cohort study was conducted at 11 staff-model health centers of Harvard Pilgrim Health Care,

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a large HMO in New England. Breast cancer screening for members is encouraged by internal guidelines and a computerized reminder system that prompts health care providers to perform clinical breast examinations and order mammograms for screening. Mammograms are provided at this HMO with no copayment required, nor does a deductible need to be met for these mammograms to be free of charge. Beginning in 1984, the HMO recommended screening every 2 years for women in their 40s and annually for women aged 50 years or older. These guidelines mimicked the American Cancer Society's guidelines, which were initially formulated in the late 1970s.²¹ All women in the study were continuously enrolled for the study period from July 1, 1983, to June 30, 1995.

Trained abstractors reviewed the medical records, and 27% of the patient's charts were independently reviewed. Data variables were abstracted onto standardized forms from an automated record system that was used at all sites. A complete description of the methodology and study population has been published elsewhere.²⁰

Variable Definitions

Race was documented in the demographic information section of the medical chart by clinicians and, in some cases, also mentioned in the clinical notes. Race was not available for 11% of study participants. Other demographic and clinical information was obtained from the medical record. Household income was estimated by matching the patient's address as of December 1, 1995, with U.S. Census tract data. Census data were available for 96% of the women in the sample. We used the median income of each woman's census tract as an estimate of her household income. Estrogen use was dichotomized into the categories "ever" versus "never," referring to estrogen used for hormone replacement therapy. Family history of breast cancer was classified into the categories "yes" (including both first-degree and second-degree relatives) versus "no." We evaluated racial differences in mammography recommendations by primary care clinicians among women that had not had a screening mammogram in more than 1 year. Compliance with screening mammograms was defined as obtaining a screening mammogram within 6 months of a primary care clinician's recommendation to do so.

Data Analysis

To compare demographic information, clinical history, compliance, and screening rates between the two race groups, χ^2 and *t* tests were used. Regression analysis using generalized linear models (GLMs) was used to provide adjusted and unadjusted mean numbers of screens by race, while controlling for other variables. As the frequency of screening was not normally distributed, *P* values are supplied from a model entering the square root of the number

of screens per woman as the outcome variable. The results were the same when using Poisson regression to model the number of screens per woman. For clarity of presentation only the GLMs are described. All analyses were performed using SAS version 6.04 (SAS Institute, Cary, NC, 1995).

The HMO data were compared with published data from three national data sources. In order to provide rates comparable to the national data sources, we analyzed the data from our cohort in time periods matching the national data, and calculated for our data the comparable measure: the proportion of women over 40 years of age who had at least one mammogram during the time period.

RESULTS

Patient Characteristics

The women for whom race was known were 84.6% white (*n* = 1,811), 12.2% African American (*n* = 261), 1% Hispanic (*n* = 22), 1.7% Asian (*n* = 36), and 0.5% women of other racial groups (*n* = 10). Because of the small sample sizes of Hispanic, Asian, and other racial groups, the present report focuses on white and African-American women (*N* = 2,072).

Age of the participants in 1983 ranged from 40 to 69 years, with an average of 52 years. Approximately 48% of the women were in their 40s with the remaining women in their 50s (26%) and 60s (26%). African-American women were significantly younger, had a lower estimated household income, a higher body mass index, and were less likely to have ever used estrogen compared with white women (Table 1). No significant differences were found between racial groups in the proportion who had a documented family history of breast cancer.

Screening Utilization

Over the 10-year period, 8,659 screening mammograms and 10,707 screening clinical breast examinations were obtained by the study population. The number of screening mammograms per woman ranged from 0 to 9, with an average of 4.2 over the study period. Clinicians documented recommending a screening mammogram during an outpatient visit for women who had not had a screening mammogram in the previous year significantly more often for African-American women (70%) than for white women (64%, $\chi^2 = 12.4$, *P* < .001). Compliance within 6 months of the primary care clinician's recommendations to obtain a screening mammogram was slightly lower among African Americans (76%) compared with whites (82%, $\chi^2 = 13.64$, *P* < .001).

African-American women obtained an average of 3.93 screening mammograms per woman during the 10 years compared with 4.49 screening mammograms for white women over the 10 years (Table 2; *P* < .0001). Screen-

Table 1. Characteristics of HMO Study Members by Race

Characteristic	African Americans (n = 261)	Whites (n = 1,811)	P Value*
Age as of 1983, mean (range), y	50 (40–69)	52 (40–69)	<.005
Annual estimated household income, mean (range), \$	41,713 (15,830–161,710)	58,542 (14,450–161,710)	<.0001
Body mass index, [†] mean			
1983–1988	28.4	25.8	<.0001
1988–1993	29.4	26.2	<.0001
Estrogen ever used, %	21.1	29.5	<.005
Family history of breast cancer, %	17.0	17.0	NS

*NS indicates not significant.

[†]Body mass index is weight in kilograms divided by height in meters squared.

ing clinical breast examinations also were obtained less frequently by African-American women, with an average of 4.92 versus 5.35 examinations in the 10-year period ($P < .01$).

The control variables listed in Table 2 (age, estimated household income, estrogen, and body mass index) were included in the analysis because they were found to differ significantly by race (Table 1), and may theoretically play a role in breast cancer screening.¹¹ Racial differences in mammography persisted after adjustment for individual variables, while the racial differences in the clinical breast examination were no longer statistically significant after adjustment for estimated household income and body mass index. Neither screening method showed statistically significant racial differences after adjusting for a full model that included racial differences in age, estimated household income level, estrogen use, and body mass index. These models were robust, even though bias may have been present due to missing race data for 11% of the

initial cohort. To explore the impact of the missing race data, race for these missing data was imputed as either black, white, or proportional to racial breakdowns in our sample. None of the imputations changed the findings in Table 2 for the overall model for mammograms or clinical breast examinations. Findings obtained using Poisson regression techniques were similar.

The utilization of breast cancer screening is shown by race, age groups, and for different time periods in Table 3, with age determined by a patient's age at the last mammogram in each time period. Mammogram and clinical breast examination utilization increased during the 10-year period for both racial groups. The largest increases were in mammography utilization among women under 50 years of age, increasing from 47% in 1983–1986 to 85% in 1990–1993 among African Americans and from 56% in 1983–1986 to 90% in 1990–1993 among white women. Whites had slightly higher rates of screening compared with African Americans for each age group and each

Table 2. Comparison of Breast Cancer Screening Use by Race over 10 Years

Breast Cancer Screening	African Americans	Whites	Absolute Difference	P Value*
Mammograms, mean				
Unadjusted	3.93	4.49	0.56	<.0001
Adjusted for age	3.97	4.48	0.51	<.0002
Adjusted for estrogen	3.98	4.48	0.50	<.0003
Adjusted for estimated household income	4.07	4.46	0.39	<.008
Adjusted for body mass index	4.02	4.51	0.49	<.0006
Adjusted for age, estimated household income, estrogen and body mass index [†]	4.25	4.47	0.22	.17
Clinical breast examinations, mean				
Unadjusted	4.92	5.35	0.43	<.01
Adjusted for age	4.93	5.35	0.42	<.01
Adjusted for estrogen	4.99	5.34	0.35	<.04
Adjusted for estimated household income	5.08	5.32	0.24	.18
Adjusted for body mass index	5.11	5.38	0.27	.11
Adjusted for age, estimated household income, estrogen and body mass index [†]	5.31	5.35	0.04	.87

*Tests for differences were based on a model using a square-root transformation of the frequency of screening, which was selected to stabilize the variance; therefore, the P values do not represent the significance of the absolute difference.

[†]Findings were double-checked using Poisson regression analysis, and similar results were noted for full model.

Table 3. Breast Cancer Screening Use by Race and Age Group for Different Time Periods*

Screening by Time Period	African Americans, n (%) (n = 261)		Whites, n (%) (n = 1,811)	
	<50 Years (n = 144)	≥50 Years (n = 117)	<50 years (n = 861)	≥50 years (n = 950)
Mammogram				
1983–1986	68 (47)	59 (50)	482 (56)	600 (63)
1986–1990	115 (80)	91 (78)	729 (85)	814 (86)
1990–1993	123 (85)	99 (85)	777 (90)	845 (89)
Total 1983–1993	132 (92)	106 (91)	826 (96)	895 (94)
Clinical breast examination				
1983–1986	100 (69)	87 (74)	664 (77)	738 (78)
1986–1990	122 (85)	97 (83)	742 (86)	823 (87)
1990–1993	118 (82)	102 (87)	772 (90)	858 (90)
Total 1983–1993	136 (94)	115 (98)	834 (97)	936 (99)

*Ten-year period split into 3 equal periods: July 1, 1983 to October 31, 1986; November 1, 1986 to February 28, 1990; and March 1, 1990 to June 30, 1993. Age is defined as age at last mammogram in each time period. Values given are number of women in specified time period with at least one screen (percentage of women screened).

time period. From 1983 to 1993, considering women of all ages, slightly more white women than African-American women obtained at least one screening mammogram (95% vs 91%, $\chi^2 = 6.53$, $P < .01$), and obtained at least one screening clinical breast examination (98% vs 96%, $\chi^2 = 2.34$, $P = .13$).

Table 4 shows that screening rates among women enrolled in the HMO were higher than rates described by national surveys.¹⁷ Through 1987, the HMO rates exceeded screening rates published in the National Health Interview Survey (NHIS) for both African Americans (HMO 69% vs NHIS 30%) and whites (HMO 78% vs NHIS 39%). The absolute difference between white and African-American women in both studies was 9%. Through 1990, HMO rates also exceeded those described in the National Knowledge, Attitudes, and Behavior Survey (NKAB) and the Mammography Attitudes and Usage Survey (MAUS) for both African Americans (HMO 84% vs NKAB 59% and MAUS 58%) and whites (HMO 90% vs NKAB 69% and MAUS 65%). The absolute difference in utilization rates during this time period between African-American and white women was lower in our study sample (6%) than among women in the NKAB (10%) or MAUS (7%).

DISCUSSION

This study examined racial differences in breast cancer screening utilization in an HMO that encouraged breast cancer screening and included it as a covered benefit for all female members. African Americans were slightly less likely to comply with screening mammograms recommended by their physicians (76%) than whites (82%). The mean number of mammograms and clinical breast examinations over the 10 years was slightly lower for African Americans than for whites; these differences disappeared when adjusted for differences in age, estrogen use, estimated household income, and body mass index. The screening rates for both races in this HMO were markedly higher than those in published national samples. Over a 30-year lifetime period of breast cancer screening, our data suggest African-American members of this HMO would have an average of 1 fewer mammogram than white women. This difference is small and may have marginal, if any, clinical effects at an individual level.

The question remains why screening rates for African Americans would be lower at all in a health care setting that encourages and covers screening. Psychosocial vari-

Table 4. Comparison of HMO Statistics with Published National Survey Statistics on Percentage of Women Aged ≥ 40 Years Who Had At Least One Mammogram

Source*	Time Period	Type of Data	Women with Mammography Screening, %		
			White	Absolute Difference Between Races	
HMO study cohort (n = 2,072)	1983–1987	Utilization	69	78	9
NHIS* (n = 6,858)	Through Dec. 1987	Self-report	30	39	9
HMO study cohort (n = 2,072)	1983–1990	Utilization	84	90	6
NKAB† (n = 836)	Through Feb. 1990	Self-report	59	69	10
MAUS‡ (n = 980)	Through Feb. 1990	Self-report	58	65	7

*National Health Interview Survey (NHIS), 1987.

†National Knowledge, Attitudes and Behavior Survey, April 1989 to February 1990.

‡Mammography Attitudes and Usage Study, February 1990.

ables, lack of knowledge about mammograms, specific health beliefs, cultural beliefs such as distrust of doctors and procedures, lack of transportation, and the need to obtain time off work to attend appointments may explain the racial difference in screening. The difference may also be due to differential recommendations by providers, as found by previous research in which physicians with minority patients were significantly less likely to recommend screening mammography compared with physicians with predominantly white patients.²² However, our data did not support this hypothesis. We searched for racial differences in mammogram recommendations following a clinical breast examination among women that had not had a screening mammogram in more than 1 year and found that clinicians documented recommending a screening mammogram significantly more often to African-American women (70%) than to white women (64%).

The screening rates in our study were much higher than those in several national published studies. Direct comparisons with national data are difficult, as most national samples use self-reported data, and our data are based on medical record documentation of actual breast cancer screening utilization. Two previous studies found that survey data overestimated mammogram utilization when compared with medical records,^{23,24} whereas another study reported no difference in accuracy between self-reported data and medical records.²⁵ However, the surveys provide a general comparison between breast cancer screening in the U.S. population and that in this HMO. Our HMO estimates are conservative given that women in this HMO may have had a mammogram prior to 1983 that we did not capture.

The results of this study suggest that enrollment in an HMO that emphasizes preventive services may positively affect breast cancer screening utilization among both African-American and white women. Other factors, such as education or income levels of the HMO members, may also be responsible for the high utilization rates. Our sample consists of women who were enrolled in an HMO continuously for 10 years (1983–1993) in a part of the country where HMO enrollment has been consistently higher than in other parts of the country. Women with continuous medical care from a single source may be more likely to receive preventive services. Conversely, mammography utilization in the 1980s was generally lower than in the 1990s, so the effect we found may be conservative. We cannot determine how generalizable our results are to other clinical settings or other HMOs, some of which may not emphasize prevention to their members to the degree of the HMO under study.

With the data on racial minorities restricted to African-American women, the findings may not be generalizable to more ethnically diverse community settings. In addition, race was abstracted from charts based on clinician identification of the patient's race. The patients' own perceptions of their race would be a more accurate indicator for research purposes. Finally, we do not have mortality

or morbidity outcome data for these women to determine whether or not the small racial differences in screening led to significantly different outcomes. As previously mentioned, recent research studies have cited a strong link between race and breast cancer morbidity and mortality. We also did not have available other indicators of socioeconomic status or of comorbidity, which would have enhanced the analysis.

Racial differences in breast cancer screening are a complex area of research. Two recent articles failed to find mammography screening a potential protective mechanism for breast cancer stage at diagnosis among African-American women.^{10,11} Jones and her colleagues found that a history of mammography screening was not an important explanatory variable in the association between race and cancer stage at diagnosis.¹¹ Their patients were not HMO members, and African Americans received significantly less mammography screening, recent screening, and recommendations for follow-up by their physicians compared with whites. Hunter and colleagues, who found more advanced cancer stages at diagnosis in African Americans than in whites, also found that patients enrolled in an HMO presented with earlier-stage cancers, regardless of race.¹⁰

Our study suggests that African-American women enrolled in an HMO can obtain breast cancer screening at higher rates than the general population. In the HMO, we found screening rates for African-American women continued to be slightly lower than for white women, but the racial difference did not reach statistical significance in a multivariate model and is unlikely to have clinical significance. An HMO practice setting that removes financial barriers and encourages regular breast cancer screening for all patients, regardless of race, may result in increased rates of screening utilization.

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