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Follow-Up of Abnormal Breast and Colorectal Cancer Screening by Race/Ethnicity

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Abstract

Introduction—Timely follow-up of abnormal tests is critical to the effectiveness of cancer screening, but may vary by screening test, healthcare system, and sociodemographic group.

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Methods—Timely follow-up of abnormal mammogram and fecal occult blood testing or fecal immunochemical tests (FOBT/FIT) were compared by race/ethnicity using Population-Based Research Optimizing Screening through Personalized Regimens consortium data. Participants were women with an abnormal mammogram (aged 40–75 years) or FOBT/FIT (aged 50–75 years) in 2010–2012. Analyses were performed in 2015. Timely follow-up was defined as colonoscopy ≤3 months following positive FOBT/FIT, additional imaging or biopsy ≤3 months following Breast Imaging Reporting and Data System Category 0, 4, or 5 mammograms or ≤9 months following Category 3 mammograms. Logistic regression was used to model receipt of timely follow-up adjusting for study site, age, year, insurance, and income.

Results—Among 166,602 mammograms, 10.7% were abnormal; among 566,781 FOBT/FITs, 4.3% were abnormal. Nearly 96% of patients with abnormal mammograms received timely follow-up versus 68% with abnormal FOBT/FIT. There was greater variability in receipt of follow-up across healthcare systems for positive FOBT/FIT than for abnormal mammograms. For mammography, black women were less likely than whites to receive timely follow-up (91.8% vs 96.0%, OR=0.71, 95% CI=0.51, 0.97). For FOBT/FIT, Hispanics were more likely than whites to receive timely follow-up than whites (70.0% vs 67.6%, OR=1.12, 95% CI=1.04, 1.21).

Conclusions—Timely follow-up among women was more likely for abnormal mammograms than FOBT/FITs, with small variations in follow-up rates by race/ethnicity and larger variation across healthcare systems.

Introduction

Screening reduces mortality risk for breast and colorectal cancers.[1–4] However, failure to receive appropriate follow-up after a positive result undermines the benefits of screening and may compound disparities.[5, 6] Compared with whites, black and Hispanic women have lower likelihood of receiving follow-up for abnormal mammography.[7–16] Little data exist on racial/ethnic disparities in time to follow-up of abnormal fecal occult blood testing or fecal immunochemical tests (FOBT/FIT).[17] Comparisons across cancers may suggest processes that promote timely resolution of positive screening tests. However, no previous reports have simultaneously examined follow-up of abnormal breast and colorectal cancer screening tests by race/ethnicity. This study evaluated the receipt of timely follow-up of abnormal screening mammogram or FOBT/FIT[18] and whether racial/ethnic differences in follow-up exist by screening type and healthcare system.

Methods

Data were obtained from the National Cancer Institute–funded Population-Based Research Optimizing Screening through Personalized Regiments (PROSPR) consortium (healthcaredelivery.cancer.gov/prospr/introduction.html).[19] Breast cancer screening data came from Dartmouth Hitchcock Medical Center and Brigham and Women's Hospital, University of Pennsylvania Health System, and Vermont Breast Cancer Surveillance System. FOBT/FIT data came from Kaiser Permanente, Northern (KPNC) and Southern California (KPSC), Group Health, and Parkland Hospital and Health System-University of Texas Southwestern Medical Center (PHHS-UTSW).[20] Each study site's IRB approved the study.

The study population included women with either abnormal mammograms (2011–2012) or positive FOBT/FIT (2010–2012) with race/ethnicity identified as non-Hispanic white, non-Hispanic black, Hispanic, or Asian/Pacific Islander. The mammography cohort included breast cancer–free women aged 40–75 years with mammograms classified as 0, 3, 4, or 5 on the Breast Imaging Reporting and Data System (BI-RADS)[21] with no imaging within 3 months prior. The FOBT/FIT cohort was colorectal cancer–free women aged 50–75 years with a first positive FOBT/FIT after the cohort entry date with no prior colectomy, colonoscopy within 10 years, or sigmoidoscopy within 5 years.

Patient information, including race/ethnicity, age, screening exam date, the types and results of screening and follow-up exams, and insurance coverage status were obtained from electronic databases. Median household incomes at the ZIP code of residence were obtained by linking to 2010 U.S. Census data.

The outcome was timely follow-up, based on standard definitions used by the PROSPR consortium,[18] defined as additional imaging or biopsy within 3 months of BI-RADS 0, 4, and 5 mammograms, or within 9 months for BI-RADS 3 mammograms and colonoscopy within 3 months of a positive FOBT/FIT.

The proportions of abnormal screening exams were compared by race/ethnicity and PROSPR sites, separately for breast and colorectal cancer screening. Multivariable logistic regression models were used to estimate the relative odds of timely follow-up by race/ethnicity, adjusted for age, test year, and study site. Expanded models also adjusted for insurance and ZIP code income. The Vermont site lacked insurance data so it was excluded from the expanded models.

Results

Among 166,602 screening mammograms, 17,746 (10.7%) were abnormal, with a similar fraction abnormal across racial/ethnic groups (p=0.84) (Table 1). Among 566,781 screening FOBT/FITs, 24,424 (4.3%) were positive, with a range from 3.9% for Asian/Pacific Islanders to 4.8% for blacks (p<0.001).

Receipt of timely follow-up was higher and less variable across study sites for abnormal mammograms (Table 2, 92.9%–96.7%) than for positive FOBT/FITs (39.8%–71.3%). In general, the proportion with timely follow-up was fairly similar by race; however, small differences were statistically significant. Blacks were less likely than whites to receive timely follow-up of mammography at all study sites (p<0.001). Timely follow-up by race/ethnicity was more variable across healthcare systems for FOBT/FIT.

Overall, black women were less likely than white women to receive timely follow-up of abnormal mammograms (Table 3), though differences were attenuated after adjusting for insurance and income (OR=0.71, 95% CI=0.51, 0.97). For FOBT/FIT, compared with whites, blacks had similar a rate of timely follow-up whereas Hispanics were more likely to have timely follow-up (AOR=1.12, 95% CI=1.04, 1.21) after adjusting for study site, age, year of test, insurance, and income. Analyses stratified by study site are displayed in Appendix Table 1. There were no significant interactions between study site and race/

ethnicity. Sensitivity analyses using 6 months instead of 3 months as the definition of timely follow-up produced similar results (Appendix Table 2).

Discussion

There were different patterns of timely follow-up of positive screening test by race/ethnicity for mammography and FIT/FOBT. Mammography follow-up rates were high for all racial/ethnic groups. Black women were less likely than whites to receive timely follow-up of abnormal mammograms but the absolute percentage difference in follow-up between whites and blacks was relatively small. By contrast, timely follow-up of positive FOBT/FIT was lower than abnormal mammography and racial/ethnic differences were not significant. Positive FOBT/FIT follow-up rates were more variable across healthcare systems, consistent with prior reports that 40%–85% of positive FOBT/FIT results receive follow-up within 1 year.[22–28] These patterns may be the result of differences in policies, the screening process, and practices and procedures across the cancers and healthcare systems as well as differences in the populations served.

The Mammography Quality Standards Act requires providers to notify patients with abnormal results in a timely manner, which likely explains the consistent and high observed follow-up rates.[29] No such mandates are in place for positive FOBT/FIT results. Higher rates of timely follow-up of abnormal FOBT/FIT were observed at KPNC/KPSC, which have more aggressive follow-up procedures than other systems.[20] KPNC, KPSC, and Group Health all have systemwide procedures to track adherence to follow-up of positive FOBT/FIT, but PHHS-UTSW does not have a system-level program in place. At PHHS-UTSW, physicians are notified of positive results and patients' failure to attend scheduled colonoscopy. The lack of a system-level follow-up program likely explains the observed greater variation in follow-up across racial/ethnic groups at PHHS-UTSW than at the other healthcare systems in this study.

Differential access to care and income may explain differences in mammography follow-up, because racial differences in follow-up were attenuated after adjustment for insurance and income. Although the Affordable Care Act mandates coverage without co-payments for U.S. Preventive Services Task Force–recommended screening tests, coverage and out-of-pocket costs for follow-up testing can vary widely across health insurance plans.[30] The majority of the FOBT/FIT cohort was from insured populations of KPNC, KPSC, and Group Health, which may account for the minimal overall racial/ethnic differences. By contrast, there is more diversity in insurance coverage among the mammography screening sites, with a greater proportion of Medicaid recipients.

Limitations

A limitation of this study is the potential for incomplete capture of received care and prior screening at outside institutions, although some sites included data from claims. The authors were unable to disentangle the contributions of geographic differences in characteristics from other factors, which may require pragmatic trials of the mandates and organized process of care for diverse populations.

Conclusions

This study showed high rates of follow-up of abnormal mammograms irrespective of race/ethnicity and small racial differences across healthcare systems. By contrast, follow-up rates of positive FOBT/FIT were lower and more variable across healthcare systems with minimal differences by race/ethnicity. Legal mandates targeted at national patient safety goals, or in their absence, coordinated organized programs with multilevel interventions, may improve follow-up of abnormal tests.[31, 32] Future studies could assess how specific patient-, provider-, and system-level follow-up methods affect variation in timely follow-up by race/ethnicity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Characteristics of Women With Preventive Screening in the PROSPR Consortium

	Breast			Colorectal		
	Total screened population	**Abnormal screening result**	**Percent abnormal within category**	**Total screened population**	**Abnormal screening result**	**Percent abnormal within category**
	N (Column %)	**N (Column %)**	**Row %**	**N (Column %)**	**N (Column %)**	**Row %**
Total	166,602 (100)	17,746 (100)	10.7	566,781 (100)	24,424 (100)	4.3
Age, year						
40–44	20,018 (12.0)	3,279 (18.5)	16.4			
45–49	24,948 (15.0)	3,435 (19.4)	13.8			
50–54	29,754 (17.9)	3,229 (18.2)	10.9	187,367 (33.1)	6,843 (28.0)	3.7
55–59	29,296 (17.6)	2,589 (14.6)	8.8	129,209 (22.8)	4,998 (20.5)	3.9
60–64	26,966 (16.2)	2,246 (12.7)	8.3	112,615 (19.9)	4,905 (20.1)	4.4
65–69	20,487 (12.3)	1,732 (9.8)	8.5	78,244(13.8)	4,013 (16.4)	5.1
70–75	15,133 (9.1)	1,236 (7.0)	8.2	59,346 (10.5)	3,665 (15.0)	6.2
Race/ethnicity						
N.H. white	146,503 (87.9)	15,568 (87.7)	10.6	305,758 (53.9)	13,360 (54.7)	4.4
N.H. black	9,841 (5.9)	1,069 (6.0)	10.9	51,230 (9.0)	2,452 (10.0)	4.8
Hispanic	7,502 (4.5)	811 (4.6)	10.8	126,545 (22.3)	5,338 (21.9)	4.2
Asian/PI	2,756 (1.7)	298 (1.7)	10.8	83,248 (14.7)	3,274 (13.4)	3.9
Study site						
D-BWH	50,225 (30.2)	4,917 (27.7)	9.8			
UPenn	16,233 (9.7)	1,649 (9.3)	10.2			
VT	100,144 (60.1)	11,180 (63.0)	11.2			
GH				22,343 (3.9)	956 (3.9)	4.3
KPNC				272,133 (48.0)	11,080 (45.4)	4.1
KPSC				260,667 (46.0)	11,942 (48.9)	4.6
PHHS-UTSW				11,638 (2.1)	446 (1.8)	3.8
Year of positive test						
2010				295,355 (52.1)	11,474 (47.0)	3.9

	Breast			Colorectal		
	Total screened population	**Abnormal screening result**	**Percent abnormal within category**	**Total screened population**	**Abnormal screening result**	**Percent abnormal within category**
	N (Column %)	**N (Column %)**	**Row %**	**N (Column %)**	**N (Column %)**	**Row %**
2011	72,754 (43.7)	7,937 (44.7)	10.9	161,894 (28.6)	7,609 (31.2)	4.7
2012	93,848 (56.3)	9,809 (55.3)	10.5	109,532 (19.3)	5,341 (21.9)	4.9
Insurance type						
Medicare	14,432 (21.9)	1,175 (18.0)	8.1	154,706 (27.3)	8,645 (35.4)	5.6
Medicaid	4,101 (6.2)	480 (7.4)	11.7	14,421 (2.5)	977 (4.0)	6.8
Commercial/private	39,890 (60.6)	4,038 (62.0)	10.1	387,339 (68.3)	14,422 (59.0)	3.7
Other	6,505 (9.9)	691 (10.6)	10.6	1,171 (0.2)	46 (0.2)	3.9
Uninsured	1,011 (1.5)	124 (1.9)	12.3	8,962 (1.6)	329 (1.3)	3.7
Unknown	519 (0.8)	58 (0.9)	11.2	182 (0.0)	5 (0.0)	2.7
Not collected	100,144	11,180	11.2			
ZIP code median income						
Q1	39,070 (23.5)	4,188 (23.6)	10.7	130,887 (23.1)	6,053 (24.8)	4.6
Q2	39,261 (23.6)	4,497 (25.3)	11.5	142,283 (25.1)	6,558 (27.0)	4.6
Q3	39,882 (23.9)	4,225 (23.8)	10.6	143,835 (25.4)	6,063 (24.8)	4.2
Q4	38,049 (22.8)	3,785 (21.3)	10.0	144,580 (25.5)	5,485 (22.5)	3.8
Unknown	10,340 (6.2)	1,051 (5.9)	10.2	5,196 (0.9)	235 (1.0)	4.5

DBWH, Geisel School of Medicine at Dartmouth and Brigham and Women's Hospital; GH, Group Health Research Institute; KPNC, Kaiser Permanente Northern California; KPSC, Kaiser Permanente Southern California; N.H., Non-Hispanic; PHHS-UTSW, Parkland Health and Hospital System - University of Texas Southwestern; PI, Pacific Islander; PROSPR, Population-based Research Optimizing Screening through Personalized Regimens; UPenn, University of Pennsylvania; VT, University of Vermont

Table 2

Timely Follow-up of Abnormal Screening Tests by Screening Type and Race/Ethnicity[a]

	Breast				Colorectal				
Race/Ethnicity	**Total N(%)**	**D-BWH N(%)**	**UPenn N(%)**	**VT N(%)**	**Total N(%)**	**GH N(%)**	**KPNC N(%)**	**KPSC N(%)**	**PHHS-UTSW N(%)**
All races	16,953 (95.6)	4,567 (92.9)	1,575 (95.5)	10,811 (96.7)	15,447 (67.9)	463 (55.7)	6,919 (66.2)	7,942 (71.3)	153 (39.8)
N.H. white	14,931 (96.0)	3,574 (93.2)	927 (97.5)	10,430 (96.8)	8,483 (67.6)	343 (56.0)	4,275 (66.4)	3,840 (70.7)	25 (44.6)
N.H. black	981 (91.8)	370 (90.9)	564 (92.5)	47 (90.4)	1,478 (64.5)	24 (53.3)	557 (65.1)	831 (68.5)	66 (37.5)
Hispanic	762 (94.0)	510 (92.9)	31 (93.9)	221 (96.5)	3,457 (70.0)	25 (56.8)	984 (66.0)	2,391 (73.1)	57 (43.2)
Asian/PI	279 (93.6)	113 (89.7)	53 (96.4)	113 (96.6)	2,059 (67.9)	71 (55.0)	1,103 (66.6)	880 (71.8)	5 (25.0)

[a]Percentages are derived from the number completing timely follow-up (shown) divided by the number of women with abnormal screening test results among women with sufficient follow-up time within each study site and racial/ethnic group (not shown).

D-BWH, Geisel School of Medicine at Dartmouth and Brigham and Women's Hospital; GH, Group Health Research Institute; KPNC, Kaiser Permanente Northern California; KPSC, Kaiser Permanente Southern California; N.H., Non-Hispanic; PHHS-UTSW, Parkland Health and Hospital System - University of Texas Southwestern; PI, Pacific Islander; UPenn, University of Pennsylvania; VT, University of Vermont

Table 3

Logistic Regression of Timely Follow-up of Abnormal Screening Tests by Screening Type and Race/Ethnicity

Race/Ethnicity	OR (95% CI)				
	Breast [a]	Breast [b]	Breast [c]	Colorectal [a]	Colorectal [c]
N total	**N=17,739**	**N=6,564**	**N=6,447**	**n=22,805**	**n=22,598**
N.H. white	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
N.H. black	0.53 (0.41–0.69)	0.55 (0.42–0.72)	0.71 (0.51–0.97)	0.90 (0.82,0.99)	1.00 (0.90,1.10)
Hispanic	0.90 (0.66–1.22)	0.90 (0.64–1.27)	1.26 (0.87–1.84)	1.05 (0.98,1.14)	1.12 (1.04,1.21)
Asian/PI	0.71 (0.44–1.15)	0.66 (0.38–1.14)	0.67 (0.38–1.15)	1.00 (0.92,1.09)	0.98 (0.90,1.07)

[a] Logistic regression model adjusted for study site, age, year of test. (All sites)

[b] Logistic regression model adjusted for study site, age, year of test. (VT excluded).

[c] Logistic regression model adjusted for study site, age, year of test, income (ZIP code median), and insurance (VT excluded from mammography analysis)

N.H., Non-Hispanic; PI, Pacific Islander