

Mammography Screening by Race/Ethnicity Among U.S. Servicewomen, 2009–2010

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ABSTRACT Background: Mammography screening has been shown to vary by race/ethnicity and is often thought to result from variations in access to health care. The objective of this study was to compare the prevalence of recent mammography screening among U.S. active duty servicewomen by race/ethnicity using administrative claim data from the Military Health System, which provides beneficiaries with equal access to medical care. Methods: Mammography screening use during fiscal years 2009–2010 among non-Hispanic white, non-Hispanic black, Asian/Pacific Islander, and Hispanic servicewomen was analyzed using logistic regression. Results: Overall, the prevalence of mammography screening during the study period was 61%. In comparison to non-Hispanic white servicewomen, Asian/Pacific Islander (OR [odds ratio] = 1.08; 95% CI [confidence interval] = 0.94–1.23) and Hispanic servicewomen (OR = 0.97; 95% CI = 0.85–1.11) were as likely and non-Hispanic black servicewomen were more likely to have a screening mammogram (OR = 1.09; 95% CI = 1.01–1.18). Screening mammography also increased with age, was highest in the Navy, was higher among officers than enlisted personnel, and did not differ by marital status. Conclusion: Although screening was slightly higher for non-Hispanic blacks than that for non-Hispanic whites, in general, racial/ethnic differences in mammography screening were not substantial in an equal access system.

INTRODUCTION

Breast cancer is the most common cancer among U.S. women and the second most common cause of death from cancer.¹ However, breast cancer statistics vary by race/ethnicity. Although overall age-adjusted incidence rates are higher among white women than those among black women, mortality rates are higher among black women.¹ In addition, although breast cancer incidence rates are higher among non-Hispanic white women than those among Hispanic women,² 5-year survival rates are worse among Hispanic women.³ Breast cancer incidence and mortality rates are lower among Asian/Pacific Islander (API) women than those among white women.² The reason for the racial/ethnic variations in breast cancer outcomes

is likely multifactorial and related to differences in cancer incidence, treatment, and disease presentation. For example, later-stage disease at diagnosis is more common among black and Hispanic women than among non-Hispanic white women.^{2,4}

In comparison to white women, national survey data over the past 2 decades have tended to find comparable usage of mammography, which is an effective breast cancer screening tool,⁵ among black women and lower usage among Hispanic and API women.^{6–8} However, survey data, which rely on participants' self-report, tend to overestimate true usage and the resulting misclassification has been shown to be more extreme among black and Hispanic women than that among white women.⁹ After accounting for this differential misclassification, black women have been observed to have significantly lower mammography usage than white women.^{9,10} To our knowledge, the level of misclassification among API women has not been calculated, but if it is also assumed to be greater than among white women, then it is likely that the true disparities in mammography usage in the general population between white women and Hispanic women or API women are even greater than survey data indicate.

Variation in health care access likely accounts for much of the racial/ethnic disparities in mammography use. Racial/ethnic minority groups tend to have lower health care access, which has been shown to be inversely associated with mammography usage.¹¹ National survey data have indicated that racial/ethnic disparities were attenuated or reversed after adjusting for health care coverage,⁶ which suggests that other factors may also influence mammography usage. However, as discussed above, survey data are susceptible to differential misclassification by race/ethnicity; therefore, the true association between race/ethnicity and mammography usage after controlling for health care access is uncertain.

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doi: 10.7205/MILMED-D-12-00247

The Department of Defense (DoD) Military Healthcare System (MHS) provides universal health care regardless of race/ethnicity and thus offers a unique opportunity to conduct disparities research. The MHS medical claims data can be used to assess mammography usage to avoid the self-reporting misclassification described earlier. Although a previous medical chart review among DoD beneficiaries tended to observe higher mammography usage among racial/ethnic minority groups than among white women, this study included participants from a clinical trial at five national military medical centers and did not adjust for potential confounders.¹² Therefore, it was unclear if these results could be generalized to non-volunteer DoD beneficiaries or if covariate adjustment would affect the results.

The objective of this study was to investigate if mammography screening among active duty servicewomen varied by race/ethnicity after adjustment for covariates using DoD-wide medical claims data. It was hypothesized that race/ethnicity would not be associated with mammography usage in this equal access health care system.

METHODS

Data Source

This study assessed screening mammography usage by race/ethnicity during fiscal years 2009–2010 based on data from the DoD's MHS Management Analysis and Reporting Tool (M2). M2 encompasses multiple databases that include detailed demographics and medical claims information (diagnoses and medical procedures) on inpatient and outpatient care at military treatment facilities (direct care) or at non-military treatment facilities paid for by the DoD (indirect care). Clinical diagnoses of all medical conditions were coded using the International Classification of Diseases–Ninth Revision (ICD-9), and procedures were coded using ICD-9, Current Procedural Terminology, and Healthcare Common Procedure Coding System codes.

Study Subjects

All active duty servicewomen ages 40 to 62 years, who were non-Hispanic white, non-Hispanic black, API, or Hispanic (not exclusive of race), and did not have a history of breast cancer, were eligible for this study. The classification of a mammogram as screening (see below) required knowledge of prior medical diagnoses and procedures in the preceding 2 years; therefore, servicewomen were eligible only if they were continuously enrolled as active duty during fiscal years 2007–2010. Demographic information is automatically collected on active duty service members and was available in the Defense Enrollment Eligibility Reporting System, which is included in M2.

Servicewomen between ages 40 and 62 years at the beginning of fiscal year 2009 were selected for the study. Although there is some debate on the optimal age to start mammog-

raphy screening, younger servicewomen were not included because no guidelines recommend routine screening before age 40 years. The American Cancer Society recommends annual screenings beginning at age 40 years¹³, whereas the U.S. Preventive Services Task Force recommends biennial screening beginning at age 50 years.¹⁴ Servicewomen 63 years or older at the beginning of fiscal year 2009 were not included because they would have become eligible for Medicare during the assessment period (2009–2010); therefore, their medical data in M2 may have been incomplete. There are also very few active duty servicewomen in this age range.

Exclusions were also made for race/ethnicity, history of breast cancer, and military branch. Racial/ethnic groups other than non-Hispanic white, non-Hispanic black, API, or Hispanic (not exclusive of race) were not included because of small sample sizes. Servicewomen were excluded from the analyses if records indicated that they had a recorded history of breast cancer during the 2 preceding years ($n = 120$) because subsequent mammograms are considered surveillance mammograms rather than screening mammograms. Finally, servicewomen were excluded if their branch of service was listed as other (i.e., Coast Guard or Commissioned Corps of the Public Health Service; $n = 2,041$) because mammography usage may be affected by service branch, which was adjusted for and assessed as a potential effect modifier.

Assessment of Screening Mammography

To allow for adherence to the least restrictive biennial guidelines, for this study a servicewoman was considered to have had a screening mammography during fiscal years 2009–2010, if there was a recorded mammography procedure code (Current Procedural Terminology : 76091, 76092, 77056, 77057, 76083, 76085, 77052; Healthcare Common Procedure Coding System: G0202, G0203, G0204; ICD-9: V76.11, V72.12) and if there were no new diagnoses of breast cancer (ICD-9: V103, 174.xx, 233.0), breast masses (ICD-9: 611.72), or breast surgeries (mastectomy or breast conserving surgery) before the date of mammography.¹⁵ In addition, the identified mammogram had to be conducted more than 11 months after a previous mammogram¹⁵ to further decrease the likelihood of including diagnostic mammograms.

Statistical Analyses

The distributions of age, service branch, rank, and marital status were compared across the four racial/ethnic groups using the χ^2 test. To determine whether mammography usage varied by race/ethnicity, odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using multivariate logistic regression, adjusting for age, service branch, military rank, and marital status. Effect modification between indicator variables that represented race/ethnicity and the covariates was assessed by including two-way interaction terms in the regression models. All statistical analyses were performed using SAS

(version 9.3; SAS Institute Inc, Cary, NC) and the two-sided significance level was set at $p < 0.05$.

RESULTS

A total of 15,667 eligible active duty servicewomen were included in this study. The distributions of basic demographics were observed to vary by race/ethnicity ($p < 0.01$; Table I). Non-Hispanic white servicewomen tended to be older and were more likely to be officers than were servicewomen in the other racial/ethnic groups. The Army was the most common service branch, except among non-Hispanic white servicewomen who were more likely to be Air Force personnel. Non-Hispanic black servicewomen were more likely to be single than married, in contrast to servicewomen in the other racial/ethnic groups.

Overall, 61% of the study population had a screening mammogram during fiscal years 2009–2010 (Table II). Univariate analyses indicated that the percentage of servicewomen who had a screening mammogram did not vary significantly by race/ethnicity (range: 59–62%, $p = 0.46$). Marital status also did not appear to be related to screening mammography ($p = 0.35$). However, the percentage of servicewomen with a screening mammography did vary significantly by age, service branch, and military rank ($p < 0.01$).

In multivariate logistic regression analysis, there was no indication of effect modification between race/ethnicity and any of the covariates ($p > 0.05$). Compared to non-Hispanic white servicewomen, mammography screening was not significantly different among API servicewomen (OR = 1.08; 95% CI = 0.94–1.23; Table III) and Hispanic servicewomen (OR = 0.97; 95% CI = 0.85–1.11). However, mammography screening was higher among non-Hispanic black servicewomen than that among non-Hispanic white servicewomen (OR = 1.09; 95% CI = 1.01–1.18). There were indications

that screening mammography use increased with age and varied by service branch and military rank. In comparison to the usage among Army servicewomen, screening mammography use was similar among Air Force servicewomen (OR = 1.05; 95% CI = 0.98–1.14) and higher among Navy servicewomen (OR = 1.23; 95% CI = 1.13–1.35). Screening mammography use was also more likely among officers than enlisted personnel (OR = 1.15; 95% CI = 1.07–1.23). There was no indication that screening mammography usage varied by marital status (OR = 1.03; 95% CI = 0.96–1.10).

DISCUSSION

In this equal access health care system, mammography screening was underutilized. In comparison to non-Hispanic white servicewomen, mammography screening usage was similar among API and Hispanic servicewomen and slightly higher among non-Hispanic black servicewomen. In addition, mammography screening was shown to increase with age and vary by service branch and military rank.

In agreement with our findings, after adjusting for type of insurance and other covariates, the 2008 National Health Interview Survey (NHIS) results indicated that use of mammography screening, in comparison to non-Hispanic white women, was similar among non-Hispanic Asian and Hispanic women but was more common among non-Hispanic black women.¹⁶ Comparisons of our findings to these national survey results, however, should be made cautiously because the mammography ascertainment differed. In the NHIS, recent mammography (in the past 2 years) was defined according to participants' self-report but has been shown to differentially overestimate true usage by race/ethnicity.^{9,10} It is uncertain if the same racial/ethnic variations would have been observed if the NHIS results were corrected for differential misclassification. Comparisons to other national survey data¹⁰ among whites and

TABLE I. Comparison of Basic Characteristics by Race/Ethnicity Among U.S. Servicewomen Who Were Active Duty in Fiscal Years 2007–2010

Characteristic ^a	non-Hispanic White; N = 8,102 (52%)		non-Hispanic black; N = 5,457 (35%)		Asian/Pacific Islander; N = 1,085 (7%)		Hispanic; N = 1,023 (7%)		<i>p</i> ^b
	N	Percentage (%)	N	Percentage (%)	N	Percentage (%)	N	Percentage (%)	
Age									<0.01
40–44	4,678	58	3,590	66	670	62	656	64	
45–49	2,312	29	1,414	26	292	27	272	27	
50–62	1,112	14	453	8	123	11	95	9	
Service Branch									<0.01
Army	2,950	36	3,501	64	616	57	557	54	
Air Force	3,395	42	1,224	22	244	22	262	26	
Navy	1,757	22	732	13	225	21	204	20	
Military Rank									<0.01
Enlisted	3,531	44	3,799	70	551	51	670	65	
Officer	4,571	56	1,558	29	534	49	353	35	
Marital Status									<0.01
Married	5,052	62	2,692	49	704	65	610	60	
Single	3,050	38	2,765	51	381	35	413	40	

^aAt the beginning of fiscal year 2009. ^b χ^2 test.

TABLE II. Overall and Stratified Counts and Percentages of U.S. Servicewomen Who Were Active Duty During Fiscal Years 2007–2010 and Had a Screening Mammogram During Fiscal Years 2009–2010

Characteristic ^a	N	Percentage (%)	p ^b
All	9,622	61	—
Race/Ethnicity			0.46
Non-Hispanic White	4,990	62	
Non-Hispanic Black	3,349	61	
Asian/Pacific Islander	677	62	
Hispanic	606	59	
Age			<0.01
40–44	5,545	58	
45–49	2,827	66	
50–62	1,250	70	
Service Branch			<0.01
Army	4,607	60	
Air Force	3,114	61	
Navy	1,901	65	
Military Rank			<0.01
Enlisted	5,082	59	
Officer	4,540	64	
Marital Status			0.35
Married	5,535	61	
Single	4,087	62	

^aAt the beginning of fiscal year 2009. ^b χ^2 test.

blacks that have been corrected for differential misclassification are also difficult because calendar years included varied and because the survey data include all mammograms, whereas only screening mammography was included in this study. Similarly, although the overall prevalence of screening

TABLE III. Adjusted Odds of Screening Mammography During Fiscal Years 2009–2010 Among U.S. Servicewomen Who Were Active Duty During Fiscal Years 2007–2010

Characteristic ^a	OR ^b	95% CI	p
Race/Ethnicity			
non-Hispanic White	1.00	Reference	
non-Hispanic Black	1.09	1.01 1.18	0.03
Asian/Pacific Islander	1.08	0.94 1.23	0.27
Hispanic	0.97	0.85 1.11	0.66
Age			
40–44	1.00	Reference	
45–49	1.41	1.31 1.52	<0.01
50–62	1.68	1.50 1.87	<0.01
Service Branch			
Army	1.00	Reference	
Air Force	1.05	0.98 1.14	0.18
Navy	1.23	1.13 1.35	<0.01
Military Rank			
Enlisted	1.00	Reference	
Officer	1.15	1.07 1.23	<0.01
Marital Status	1.00		
Married	1.00	Reference	
Single	1.03	0.96 1.10	0.42

^aAt the beginning of fiscal year 2009. ^bOR and 95% CI from logistic regression model that controlled for the effects of all listed variables.

mammography (61%) in this study was lower than a previous estimate¹² among active duty women (71%), many aspects of the studies differed, including the calendar years, assessment period, and definition of an eligible mammography. Therefore, it is difficult to know the true level of agreement between our findings and previous findings, both in the general population and among active duty servicewomen.

It was also unclear why differences in mammography screening were observed between non-Hispanic white and non-Hispanic black active duty servicewomen. Mammography compliance is not strictly enforced but periodic physical examinations are, and mammograms are provided free of charge to all servicewomen older than 40 years.^{12,17–20} Therefore, although possible, it seems unlikely that servicewomen would seek mammography screening outside of the DoD MHS (paid for either entirely out of pocket or through other health insurance). Therefore, mammography screening outside the MHS is unlikely to account for the observed racial/ethnic differences. Adjustment for continuous age provided similar results (data not shown); therefore, residual confounding by age also does not appear to be a valid explanation for the results. Other factors, such as marital status, education, and income that have previously been shown to be independently associated with mammography screening,¹⁶ were adjusted for either directly or indirectly during the multivariate analysis. Military rank was used as a proxy for education and income. Therefore, there is the possibility of residual confounding to the extent that rank may not adequately represent education and/or income, but this may only be a concern if the resulting misclassification was differential by race/ethnicity.

Although experts continue to debate the merits of mammography screening among women aged 40 to 49 years, guidelines are more consistent for women aged 50 years or older. It is, therefore, understandable that mammography screening was highest among servicewomen older than 49 years. Variation by service branch is likely because of differences in medical examination policies. During this study period, all three service branches recommended mammography screening beginning at age 40 years, but the recommended screening frequency varied; the Navy recommended annual screenings,^{19,20} the Army recommended screenings every 1 to 2 years,¹⁸ and the Air Force left frequency decisions to the primary care provider and patient.¹⁷ In addition, although we are unaware of official differences in enforcement of the mammography screening, in practice, enforcement may vary by service. In contrast to covariate-adjusted national survey results where single women were less likely to have mammograms,¹⁶ our results indicated that marital status was not associated with mammography among servicewomen. However, in agreement with national survey data that indicate a positive association between education/income and mammography screening use,¹⁶ officers were observed to have higher mammography screening use than enlisted women.

The main strength of this study was the use of data from a health care system based on equal access, which provided a

unique opportunity to investigate racial/ethnic disparities in mammography screening that was not dependent on participant recall. It is not clear why mammography screening was higher among non-Hispanic black servicewomen than that among their non-Hispanic white counterparts. Although the clinical relevance of the difference (OR = 1.09) is unclear, the finding was, nonetheless, statistically significant and thus indicates that factors other than medical care access might have influenced mammography screening utilization. In addition, conducting multivariate analyses provided the ability to simultaneously adjust for multiple potential confounders (i.e., military service branch and rank) to better assess the association between race/ethnicity and screening mammography usage in the DoD MHS. Study limitations include those inherent to using medical administrative databases, such as the possibility of incomplete data, coding inaccuracies, and errors. However, the possibility of incomplete data should have been minimized because the analyses were restricted to active duty servicewomen who are unlikely to seek health care that is not provided by the DoD. It is also unlikely that any incompleteness or inaccuracy in the data would be either differential by race/ethnicity or substantial enough to account for the findings; thus, these factors are not likely explanations for the observed variations. However, because there was no information in the administrative data, we were unable to account for other possible confounders such as family history of breast cancer, which may be related to both race/ethnicity and mammography screening. Finally, these findings should not be generalized to all similar-aged, non-active duty female DoD beneficiaries. Although it may have been more informative to include these latter beneficiaries who also benefit from equal health care access and are likely to be more comparable to the general population, we did not include them in the study because of a high proportion of missing information on race/ethnicity.

In conclusion, Hispanic and API servicewomen were as likely and non-Hispanic black servicewomen were more likely than non-Hispanic white servicewomen to have mammography screening, thus indicating that equal health care access can minimize health disparities observed in the general population. These findings also indicated that even though mammography is an effective breast cancer screening tool and a covered health care benefit, there is uniform underusage. Studies that identify the driving factors behind this underutilization are warranted.

ACKNOWLEDGMENTS

This project was supported by the United States Military Cancer Institute (USMCI) via the Uniformed Services University of the Health Sciences under the auspices of the Henry M. Jackson Foundation for the Advancement of Military Medicine; by the Clinical Breast Care Project, Walter Reed National Military Medical Center; and by the Intramural Research Program of the National Institutes of Health (NIH), National Cancer Institute, Division of Cancer Epidemiology and Genetics (DCEG).

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