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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 healthcare. 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 (API) 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, API (OR=1.08; 95% CI=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 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 black

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women, mortality rates are higher among black women [1]. Additionally, although breast cancer incidence rates are higher among non-Hispanic white women than Hispanic women [2], five-year survival rates are worse among Hispanic women [3]. Breast cancer incidence and mortality rates are lower among Asian Pacific Islander (API) women than 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 last two 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 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 assumed to also be greater than among white women, than 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 healthcare access likely accounts for much of the racial/ethnic disparities in mammography use. Racial/ethnic minority groups tend to have lower healthcare 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 healthcare 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 healthcare assess is uncertain.

The Department of Defense (DoD) Military Healthcare System (MHS) provides universal healthcare 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 above. 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 healthcare 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 in-patient and out-patient care at Military Treatment Facilities (MTFs; direct care) or at non-MTFs 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 (CPT) and Healthcare Common Procedure Coding System (HCPCS) codes.

Study Subjects

All active duty servicewomen ages 40-62 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 two 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 mammography screening, younger servicewomen were not included because no guidelines recommend routine screening prior to age 40 years. The American Cancer Society recommends annual screenings beginning at age 40 years [13]; 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 due to small sample sizes. Servicewomen were excluded from the analyses if records indicated that they had a recorded history of breast cancer during the two 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=2041) because mammography usage may be affected by service branch, which was adjusted for and assessed as a potential effect modifier.

Assessment of Screening Mammography

In order to allow for adherence to the least restrictive biennial guidelines, for this study a servicewomen was considered to have had a screening mammography during fiscal years 2009-2010 if there was a recorded mammography procedure code (CPT: 76091, 76092, 77056, 77057, 76083, 76085, 77052; HCPCS: 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) prior to the date of mammography [15]. Additionally, the identified mammogram had to be conducted more than 11 months after a previous mammogram [15], 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 Chi square 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 1). 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 2). 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-interaction>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 3) and Hispanic servicewomen (OR=0.97; 95% CI=0.85-1.11). However, mammography screening was higher among non-Hispanic black servicewomen than 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 healthcare system, mammography screening was under-utilized. 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 over-estimate 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 data [10] among whites and 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 the current study. Similarly, although the overall prevalence of screening mammography (61%) in the current study was lower than a previous estimate [12] 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.

While experts continue to debate the merits of mammography screening among women ages 40-49 years, guidelines are more consistent for women age 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 due to differences in medical examination policies. During this study period all three service branches recommended mammography screening beginning at age 40 but the recommended screening frequency varied; the Navy recommended annual screenings [19,20], the Army recommended screenings every 1-2 years [18] and the Air Force left frequency decisions to the primary care provider and patient [17]. Additionally, 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 healthcare 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 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. Additionally, 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 healthcare 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 healthcare 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 healthcare access can minimize health disparities observed in the general population. The current findings also indicated that even though mammography is an effective breast cancer screening tool and a covered healthcare benefit, there is uniform under usage. Studies that identify the driving factors behind this underutilization are warranted.

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Table 1

Comparison of basic characteristics by race/ethnicity among U.S. servicewomen who were active duty in fiscal years 2007-2010.

		non-Hispanic white N= 8102 (52%)		non-Hispanic black N=5457 (35%)		Asian/Pacific Islander N=1085 (7%)		Hispanic N=1023 (7%)		
Characteristic[1]		**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**p**[2]
Age	40-44	4678	58%	3590	66%	670	62%	656	64%	<0.01
	45-49	2312	29%	1414	26%	292	27%	272	27%	
	50-62	1112	14%	453	8%	123	11%	95	9%	
Service branch	Army	2950	36%	3501	64%	616	57%	557	54%	<0.01
	Air Force	3395	42%	1224	22%	244	22%	262	26%	
	Navy	1757	22%	732	13%	225	21%	204	20%	
Military rank	Enlisted	3531	44%	3799	70%	551	51%	670	65%	<0.01
	Officer	4571	56%	1558	29%	534	49%	353	35%	
Marital status	Married	5052	62%	2692	49%	704	65%	610	60%	<0.01
	Single	3050	38%	2765	51%	381	35%	413	40%	

[1] At the beginning of fiscal year 2009.

[2] Chi-square test.

Table 2

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[1]		N	%	p[2]
All		9622	61%	--
Race/ethnicity	non-Hispanic white	4990	62%	0.46
	non-Hispanic black	3349	61%	
	Asian/Pacific Islander	677	62%	
	Hispanic	606	59%	
Age	40-44	5545	58%	<0.01
	45-49	2827	66%	
	50-62	1250	70%	
Service branch	Army	4607	60%	<0.01
	Air Force	3114	61%	
	Navy	1901	65%	
Military rank	Enlisted	5082	59%	<0.01
	Officer	4540	64%	
Marital status	Married	5535	61%	0.35
	Single	4087	62%	

[1] At the beginning of fiscal year 2009.

[2] Chi-Square test.

Table 3

Adjusted odds of screening mammography during fiscal years 2009-2010 among U.S. servicewomen who were active duty during fiscal years 2007-2010.

Characteristic[1]		OR[2]	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	Married	1.00	reference		
	Single	1.03	0.96	1.10	0.42

[1] At the beginning of fiscal year 2009.

[2] Odds ratio and 95% confidence interval from logistic regression model that controlled for the effects of all listed variables.