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Lower adherence to screening mammography guidelines among ethnic minority women in America: A meta-analytic review

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Abstract

Objective—This study investigates the association between ethnic minority status and receiving a screening mammogram within the past 2 years among American women over 50.

Method—The findings from 33 studies identified from interdisciplinary research databases (1980 to 2006) were synthesized. Separate pooled analyses compared white non-Hispanics to African Americans (28 outcomes), Hispanics (18 outcomes), and Asian/Pacific Islanders (10 outcomes).

Results—Using the random effects model, results showed that African Americans were screened less than white non-Hispanics at a marginal level (OR 0.87, 95% CI 0.75, 1.00). Larger and significant discrepancies were observed for Hispanics (OR 0.65, 95% CI 0.50, 0.85) and Asian/Pacific Islanders (OR 0.63, 95% CI 0.39, 0.99) compared to white non-Hispanics. However, among studies controlling for socioeconomic status, ethnic differences in mammography screening were no longer significant for African Americans (OR 1.05, 95% CI 0.71, 1.76), Hispanics (OR 1.08, 95% CI 0.64, 1.93), or Asian/Pacific Islanders (OR 1.08, 95% CI 0.64, 1.93). Subgroup analyses further showed that geographical region, sampling method, and data collection strategy significantly impacted results.

Conclusions—This study found evidence that ethnic minority-screening mammography differences exist but were impacted by socioeconomic status. Implications for interpreting existing knowledge and future research needs are discussed.

Keywords

Mammography; Breast cancer; Prevention; Screening; Meta-analysis; Ethnic minorities; Race

Introduction

Next to skin cancer, breast cancer is the most commonly diagnosed cancer affecting women in the United States (American Cancer Society [ACS], 2005). In 2007, an estimated 240,510 new cases of breast cancer will be diagnosed in the United States, and approximately 40,460 women will die from the disease (ACS, 2007). Mortality rates from breast cancer have substantially declined in the past decade, which is attributed to improvements in treatments

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and to increases in the use of screening mammography leading to earlier detection (Berry et al., 2005).

The burden of breast cancer is not distributed equally across all women (Peek and Han, 2004; Gotzsche and Olsen, 2000; Weir et al., 2003). Data from the ACS (2005) shows that from 1998 to 2002, the average annual female breast cancer prevalence rate was highest among white non-Hispanics (141.1 cases per 100,000 females), followed by African Americans (119.4), Asian Americans (96.6), Hispanics (89.9), and Native Americans (54.8). Although ethnic minority women have a lower overall prevalence of breast cancer, research also shows that they experience later stage at diagnosis, greater prevalence for multiple cancer sites, greater mortality and morbidity than their white non-Hispanic counterparts (Ashing-Giwa et al., 2004; Heeden and White, 1999; Lannin et al., 1998; Polite and Olopade, 2005; Randolph et al., 2002; Weir et al., 2003).

Although some research suggests that screening mammography rates are similar for white non-Hispanics and African Americans (Rajaram and Rashidi, 1998), some observers maintain that ethnic minority women remain under-users (Bastani et al., 1995; Friedman et al., 1995; Pearlman et al., 1996; Peek and Han, 2004; Siegler and Costa, 1994). For example, after adjusting for age, income and education, national studies report that Hispanics are less likely than African Americans and white non-Hispanics to be screened in the past year (Meyerowitz et al., 1998). In fact, Polite and Olopade (2005) suggest that one reason ethnic minorities present at a later stage of breast cancer is that they do not receive the same level of screening as white non-Hispanics.

There are a several comprehensive reviews exploring race/ethnicity and issues related to breast cancer screening (Austin et al., 2002; Consedine et al., 2004; Katapodi et al., 2004; Raja-Jones 1999; Vernon et al., 1990; Wells and Roetzheim, 2007; Wu et al., 2004). However, these reviews do not systematically compare white non-Hispanics with different ethnic minority groups. Instead, heterogeneous ethnicities are collapsed into a single “non-white” group preventing comparisons across minority populations. Moreover, some reviews (e.g., Wells and Roetzheim, 2007; Wu et al., 2004) examine breast cancer screening patterns among a single ethnic minority group with no comparisons to white non-Hispanics. This lack of information is unfortunate given the rapidly increasing ethnic diversity within the United States and the high cancer rates within some ethnic groups (Meyerowitz et al., 1998). Furthermore, various methodological artifacts confound their conclusions, as these reviews do not take into account the methods of their primary studies. For example, research using data from insurance claims may inflate estimates of mammography use as these sources tend to combine mammography for screening and diagnostic purposes (Kagay et al., 2006).

Research examining mammography use among various ethnic groups has increased over the past two decades and the availability of such data offers the opportunity to examine whether ethnic minority women undergo screening mammography at a similar rate as white non-Hispanics or whether ethnic disparities in screening persist. Therefore, this review empirically investigates the relationship between screening mammography and ethnicity by integrating the findings of existing studies using meta-analytic techniques. The following specific research questions were developed:

> Research question 1: Are ethnic minority women at risk for receiving fewer mammograms than white non-Hispanic women?

> Research question 2: Are there significant socioeconomic status factors that impact reports of screening mammography?

We also plan to explore if any other significant demographic and methodological factors impact reports of screening mammography.

Method

Literature search

In February 2007, the following peer-reviewed research literature databases were searched: ERIC, PsychINFO, Medline, Social Services Abstracts, and Sociological Abstracts (1975 to 2006). The search strategy included the keywords: (ethnic*, minorit*, race) and (‘breast cancer’, ‘breast neoplasm’, ‘breast carcinoma’) and (screen*, preventi*, mammogra*). This search was augmented by bibliographic reviews of retrieved manuscripts and previous published reviews.

Inclusion criteria

As the focus of the review was the use of screening mammography among white non-Hispanic and ethnic minority women, studies had to meet the following criteria: (a) include a white non-Hispanic comparison group; (b) be conducted in the United States or Canada; (c) focus on women aged 50 years and older; (d) include women without a history of breast cancer; and (e) present their findings with sufficient detail so that effect sizes were calculable. Nonempirical manuscripts (i.e., theoretical, reviews, and qualitative studies) were excluded. Studies that focused on mammography for diagnostic purposes or combined screening and diagnostic mammograms were excluded because these studies could inflate mammography rates. Ethnic minority status was defined as African American, Hispanic, Asian/Pacific Islander, or Native American/Alaskan Native. A global definition of the dependent variable, namely having a screening mammography within the past 2 years allowed inclusion of a greater number of studies and encompassed the screening mammography guidelines outlined by several government and healthcare organizations (e.g., ACS, 2003; Canadian Cancer Institute [CCI], 2007; National Cancer Institute [NCI], 2007; United States Preventive Services Task Force [USPSTF], 2002).

Statistical analysis

Data gathered from the primary studies were classified into comparisons between white non-Hispanic women and African American women (meta-analysis 1), between white non-Hispanic women and Hispanic women (meta-analysis 2), and between white non-Hispanic women and Asian/Pacific Islander women (meta-analysis 3). Only one study that examined Native American/Alaskan Natives with white non-Hispanics met our inclusion criteria, therefore this comparison was excluded.

The odds ratio (OR), which is an estimate of the relative odds of an ethnic minority woman having a mammography versus white non-Hispanic woman having a mammography, was selected as this study's central meta-analytic statistic (Cooper, 1998; Greenland, 1987). When interpreting an OR, it is helpful to look at how much it deviates from 1. In this study, for example, an OR of 0.75 would be interpreted as the ethnic minority group being 25% less likely to receive a screening mammogram compared to the non-Hispanic white group, whereas an OR of 1.33 would be interpreted as the ethnic minority group being 33% more likely. Effect size estimates were adjusted for sample size and the 95% confidence intervals were calculated to assess the statistical significance of average effect sizes. As research suggests that the random effects model is preferable to the fixed effects model (Hunter and Schmidt, 2000), the DerSimonian–Laird random effects model is reported. The random effects model takes into account sampling variation of the estimates and variation in the underlying parameter over the studies, and has the effect of widening the confidence limits around the pooled effect. A one-tailed Fail-safe N at p<.05 was calculated for each significant overall meta-analysis as a control for publication bias (Rosenthal, 1979). Although there are no firm guidelines about the appropriate size of N, if the Fail-safe N is relatively large in comparison to the number of studies in the meta-analysis, researchers can be more confident in the stability of their results (Carson et al., 1990).

A test of heterogeneity was computed for each research outcome using Cochran's Q statistic (Fleiss, 1981). This test evaluates dispersion between studies and average effect sizes to determine if this is more than what would be expected by chance (Hedges and Orkin, 1985). If significant heterogeneity was observed (p<.05), possible sources heterogeneity was explored through subgroup analysis.

Subgroup analysis

Grouping variables were introduced to both describe the studies included in the meta-analysis and to evaluate the potential impact on the research outcomes. As subgroup analysis can potentially generate spurious findings (Higgins et al., 2003), only a small number of subgroup analyses were undertaken and were determined a priori, with the alpha criteria set at p<.05. Grouping variables were generated from a review of the literature and were pragmatically dependent upon available information within the studies. Each study was coded for:

- **a.** socioeconomic status
- **b.** year data were collected
- **c.** geographic region where data were collected and
- **d.** residence.

In addition to contextual variables, methodological variables that could potentially impact the outcomes were coded:

- **a.** research design
- **b.** sampling method and
- **c.** data collection strategy.

Grouping studies by research design (i.e., non-experimental descriptive versus control group in an experimental design) and residence (i.e., urban versus rural regions) revealed single studies or large numbers of mixed samples, therefore preventing subgroup analyses of these variables.

Results

Search results

The electronic literature search yielded 112 conceptually relevant studies, and another 11 studies were found from hand searching. After applying our inclusion criteria, 47 studies remained. Among studies that met the inclusion criteria but were missing information, we attempted to contact the primary authors via email. Authors of four studies responded and provided the necessary information. Fourteen studies were excluded for the following three reasons: (a) sample sizes for ethnic/racial groups were not reported (Caplan et al., 1992; Casey et al., 2001; Friedman et al., 1995; Goel et al., 2003; Lane et al., 2000; O'Malley et al., 1997; Regan et al., 1999; Stoddard et al., 1998; Yood et al., 1999); (b) data on the white non-Hispanic comparison group were not reported (Wampler et al., 2006); and (c) combined screening and diagnostic mammograms (Henderson and Schenck, 2001; Parker et al., 1998; Preston et al., 1997; Sabogal et al., 2001).

The 33 studies identified compared white non-Hispanic women to African American women, Hispanic women, and Asian/Pacific Islander women. A number of studies reported multiple outcomes, such as assessments of more than one ethnic minority group compared to white non-Hispanics. Separate pooled analyses were conducted for each ethnic group comparison for screening mammography within the past 2 years: African American (meta-analysis 1: 28 outcomes), Hispanic (meta-analysis 2: 18 outcomes), and Asian/Pacific Islander (meta-analysis 3: 10 outcomes).

The studies were published between 1991 and 2006, and the majority (84.8%) used a non-experimental research design. Among the studies that reported it, five studies collected data between 1980 and 1989, 18 between 1990 and 1996, and six between 1997 and 2005. All studies were conducted in the United States; no studies from Canada met our inclusion criteria. Based on the census regions and divisions of the United States (U. S. Census Bureau 2005), 12 studies were conducted in the West (mostly in California), eight in the South (mostly in North Carolina), four in the Northeast (mostly in New York), and one study in the Midwest (Indiana). There were nine population-based studies of which six were nationwide (five National Health Interview Surveys, one Behavioral Risk Factor Surveillance Survey) and three were statewide. Most studies collected data from urban/metropolitan regions (62.5%). Over half of the studies (66.7%) used random sampling. Data were generally collected through self-report methods, with eight studies using self-administered/mail surveys, 12 using telephone interviews, and 10 using in-person interviews. The remaining three studies used archival data (e.g., medical files).

Meta-analysis

African American versus white non-Hispanics (meta-analysis 1)—Using the random effects model, the pooled OR was 0.87 (95% CI 0.75, 1.00) based on an aggregate sample of 76,338 women, including 14,298 African Americans (Table 1). Although African Americans appear to have been screened at a lower rate than white non-Hispanics, the difference was only marginally significant ($p = .06$). However, individual effect sizes revealed that 20 of the 28 OR point-estimates were in the expected direction of higher mammography use among white non-Hispanics, and six of them were statistically significant in the expected direction ($p<.05$). Furthermore, the fixed effects model indicated that the difference was significant (OR 0.77, 95% CI 0.74, 0.81) and the heterogeneity statistic was significant, $Q(27, N = 76{,}338) = 192.62$, $p<.01$. This discrepancy justified examining moderators to account for this variation.

Effect of socioeconomic factors

Seven studies reported ORs adjusted for socioeconomic status, typically by income, education and/or insurance status. According to the aggregate mean of these adjusted ORs, the difference in having a mammography in the past 2 years was no longer significant (OR 1.05, 95% CI 0.71, 1.76). For only meta-analysis 1, five of these seven studies provided enough data on education level and three of these seven studies provided enough data on insurance status to examine how each of these factors impact mammography screening. Income level was inconsistently reported preventing us from creating meaningful income categories, hence it was not examined. For *education*, the pooled meta-analytic data showed no significant difference in mammography screening for African Americans compared to white non-Hispanics. However, we explored within-group differences for each ethnic group and found that African Americans with high school education or less were less likely to have a screening mammography than those with education beyond high school (pooled 42.7% versus 56.3%), $\chi^2(1, N = 2411) = 30.69$, $p<.0001$. Likewise, white non-Hispanics with high school education or less were less likely to receive a screening mammogram than those with education beyond high school (pooled 45.4% versus 58.7%), $\chi^2(1, N = 21{,}574) = 285.09$, $p<.0001$. For *insurance status*, the pooled data showed no significant difference in mammography screening for African Americans compared to white non-Hispanics. However, within-group differences showed that African Americans without insurance were less likely to receive a mammogram than those with some form of insurance (pooled 44.4% versus 63.5%), $\chi^2(1, N = 432) = 15.43$, $p<.0001$. Similarly, white non-Hispanics without insurance were less likely to receive a mammogram (pooled 43.8% versus 54.9%), $\chi^2(1, N = 1{,}435) = 17.72$, $p<.0001$.

Effect of contextual variables and methodological factors

The only marginally significant moderator was geographical region (Table 2). Because there was only one study conducted in the Midwest and the Northeast, subgroup analysis focused on studies from the West and South. The difference between women in the West was not significant ($p = .26$). The difference between women in the South was marginally significant ($p = .09$), and this difference was significant for the fixed effects model (OR 0.72, 95% CI

0.62, 0.84, p <.01), suggesting that African Americans were screened less than white non-Hispanics.

Hispanic versus white non-Hispanics (meta-analysis 2)—Sixteen of the 18 OR point-estimates were in the expected direction of higher mammography use among white non-Hispanics, and eight of them were statistically significant (Table 3). The pooled OR of 0.65 (95% CI 0.50, 0.85) based on an aggregate sample of 63,247 women including 8522 Hispanics confidently infers that Hispanics were less likely to have received a mammography within the past 2 years compared to white non-Hispanics. The pooled summary statistic seems resistant to publication bias, as the Fail-safe N was 244. As the heterogeneity statistic was significant, $Q(17, N = 63{,}247) = 261.97$, $p < .01$, we explored possible moderators.

Influence of socioeconomic factors

Seven studies adjusted for socioeconomic status, mostly by income and/or education (Table 3). According to the aggregate mean of these adjusted ORs, the difference for having a mammography in the past 2 years was no longer significant (OR 1.08, 95% CI 0.64, 1.93).

Effect of contextual and methodological factors

For the time period in which the data were collected, the pooled OR estimate was only significant for Time 2 and was in the expected direction ($p<.05$), revealing that Hispanics were screened less often than white non-Hispanics in 1991 to 1996 (Table 2). For geographical region, data were grouped into the following categories: Northeast, South and West. The results showed significant differences between Hispanics and white non-Hispanics in the South and West, such that Hispanics in the South and West were significantly screened less than white non-Hispanics ($p<.05$).

Eleven studies used random sampling and showed a significant difference between Hispanics and white non-Hispanics ($p <.01$), with Hispanics reporting to be screened less. For data collection method, subgroup analysis focused on three groupings: self-administered surveys, telephone interviews, and archival data. The results showed that mammography screening rates was significant for archival data, whereby Hispanics were less likely to have had a screening mammography compared to white non-Hispanics ($p<.01$). As some research suggest that data obtained through archival data sources may be more accurate than self-report methods (Fiscella et al., 2006), we removed the two studies that used archival data sources and re-ran all analyses. The overall pooled OR remained statistically significant (OR 0.66, 95% CI 0.49, 0.88), and the subgroup analyses showed one difference, such that data collected in the West was now only marginally significant, OR of 0.54 (95% CI 0.28, 1.06), $p = .07$, based on a sample of 7900 women.

Asian/Pacific Islander versus white non-Hispanics (meta-analysis 3)—Eight of the 10 OR point-estimates were in the expected direction of higher mammography use among white non-Hispanics (pooled 66.4% versus 45.2%), and 3 of them were statistically significant (Table 4). The pooled OR of 0.63 (95% CI 0.39, 0.99), based on an aggregate sample of 13,094 women including 2963 Asian/Pacific Islanders, was significant and suggests that Asian/Pacific Islanders were less likely to have received a mammography compared to white non-Hispanics. The pooled summary statistic seems resistant to publication bias, as the fail safe N was 34. The heterogeneity statistic was significant, Q (10, N = 13,094) = 146.24, p<.01, so possible moderators were examined.

Effect of socioeconomic factors

Four studies adjusted for socioeconomic status, mostly by income and/or education (Table 4). Based on the aggregate means of these adjusted ORs, the difference for having had a mammogram in the past 2 years was no longer significant (OR 0.57, 95% CI 0.31, 1.27).

Effect of contextual and methodological factors

Only one study collected data during Time 1, therefore subgroup analysis focused on data collected during Time 2 and Time 3 (Table 2). Though the pooled OR estimates shows that Asian/Pacific Islanders reported being screened less than white non-Hispanics, this difference was not significant at Time 2 (p = .20) and marginally significant at Time 3 (p = .054). Nine of the 10 studies collected data from the West (e.g., mostly California), therefore subgroup analysis was not undertaken. The majority of these studies aggregated the Asian subpopulations, however two studies examined mammography use separately for Asian subgroups and found some differences. Hiatt et al. (1996) reported that Chinese women were screened less than Vietnamese women, (36.2% versus 55.8%), χ^2 (1, N = 1380) = 51.17, p<.001. Similarly, Otero-Sabogal et al. (2004) reported that Chinese women were screened less than Filipino women, (38.7% versus 53.2%), χ^2 (1, N = 1250) = 184.34, p<.001.

For data collection strategy, data from the 10 studies were divided into three groupings: self-administered surveys, telephone interviews, and archival data. The only significant difference in mammography screening were observed for data collected via telephone interviews (p <.01) and showed that Asian/Pacific Islanders reported having a screening mammography at a lower rate than white non-Hispanics.

Discussion

Commonly reported estimates of mammography screening suggest that American women are highly screened (Blackman et al., 1999; Breen et al., 2001; Smith et al., 2007), and recent research suggests that substantial differences by ethnicity in screening no longer exist. However, after systematically integrating studies of mammography screening, this study found evidence to suggest ethnic minority-mammography screening differences may persist.

Our first research question asked whether ethnic minority women were at risk of receiving screening mammograms within the past 2 years at a lower rate than white non-Hispanic women. The support for this research question is neither direct nor obvious for all ethnic minority-mammography comparisons. For example, the view that screening rates would be lower for African Americans given their higher breast cancer mortality rate is not entirely supported. Systematically integrating 28 studies showed that African Americans were screened less than white non-Hispanics, although using a conservative statistical approach this difference was only marginally significant. The pattern of results involving comparisons of Hispanics and Asians/Pacific Islanders with white non-Hispanics revealed larger and significant disparities. The results showed that both Hispanics and Asian/Pacific Islanders were screened less than white non-Hispanics.

Our second research question asked whether socioeconomic status significantly impacted reports of screening mammography. Among studies that controlled for socioeconomic status, significant differences in screening mammography for each ethnic minority group compared to white non-Hispanics no longer existed. This finding seems consistent with the hypothesis that there are not direct pathways from ethnicity to mammography screening adherence behavior. According to Meyerowitz et al. (1998), ethnic minority status is related to adherence behavior through socioeconomic factors (e.g., education, income), access to care (e.g., insurance, regular healthcare provider), and health-and cancer-related cognitions (e.g., fear of radiation, efficacy of procedure). Moreover, Rajaram and Rashidi (1998) contend that the sociocultural context such as cultural beliefs and values, and personal life experiences effect breast cancer screening behavior. Few studies in our meta-analysis provided adequate demographic or social variables such as age, education, income level, or attitudinal variables required to test such relationships. However, our preliminary results suggest a possible link between socioeconomic status and screening adherence. Although based on a small proportion of studies, when we explored within-group differences, we found that African Americans and white non-Hispanics with lower levels of education and no insurance coverage were less likely to report having a screening mammography within the past 2 years compared to those women with higher levels of education and some form of insurance coverage. We acknowledge ethnic differences in immunological and endocrinological functioning, but research that compares race per se is unlikely to provide conceptually rich or clinically useful information. Future research needs to integrate measurement of socioeconomic status, health beliefs, and sociocultural context in order to identify the factors underlying screening differences.

We also explored the impact of contextual and methodological variables. Subgroup analysis showed that African Americans and Hispanics living in the South reported the lowest levels of screening mammography and were screened less than white non-Hispanics. Also, studies using random sampling reported that Hispanics – and African Americans to a marginal level – were less likely to have a mammogram compared to white non-Hispanics; studies using convenience sampling showed no significant differences. Furthermore, two studies that used archival data showed that Hispanics were screened less than white non-Hispanics, whereas data collected through self-reports showed no such difference. This finding is in contrast to what was found for Asian/Pacific Islanders. Specifically, Asian/Pacific Islanders were screened less according to data collected via telephone interviews; data collected via archival data were in the expected direction but were not significant. In trying to reconcile these differences, we cannot determine whether self-report or an archival data is a more accurate reflection of mammograms received. It is possible that Asian/Pacific Islanders underestimated the time interval since their last mammogram, and thus tended to “over-report” during telephone interviews. It should be noted, however, that the finding of Asian/Pacific Islanders being screened less according to data collected via telephone interviews is based on three outcomes from only two relatively small studies (N = 1892, including 265 Asian/Pacific Islanders). Despite this apparent contradiction, the findings are generally consistent with recent research (e.g., Fiscella et al., 2006; Kagay et al., 2006) which reports that, compared with data collected through archival sources such as medical files and insurance claims, studies using convenience sampling and self-reports may overestimate incidence of mammography screening and present an optimist view that ethnic disparities cease to exist.

Study limitations and strengths

In addition to subgroup analyses, there are other possible reasons for the lack of clear and direct findings. First, research in this area is often confounded by methodological problems, many of which are common in multicultural research in general. For example, no culturally sensitive translations exist for widely used assessments despite evidence that language can impact the results (Angel and Guarnaccia, 1989). Although one of the strengths of the present study was examining various ethnic groups, identifying discrete and meaningful ethnic groups proved difficult as few authors provided information about how race or ethnicity was defined. For instance, Asian/Pacific Islanders are not a homogenous group and include subgroups such as Filipino, Chinese, and Vietnamese women. Even the definition of white non-Hispanic is debatable and varied across studies. The development of adequate tools for defining ethnicity is needed to advance our understanding of the reasons underlying ethnic disparities in cancer screening.

Heterogeneity was evident from the onset, both in the context (e.g., year data collected) and methodology (e.g., data collection strategy). Creating subgroups was one attempt to shed light on the factors influencing the relationship between ethnic minority status and mammography. Furthermore, we carefully developed our inclusion criteria to include only studies that reported screening mammography. As approximately 10% of all mammograms are done for diagnostic purposes (Breen et al., 2001), including studies that combined mammography for screening and diagnostic purposes would have likely inflated rates of mammography use. But perhaps more importantly, the four studies that combined mammography for screening and diagnostic purposes compared mammography use for African Americans with non-Hispanic whites only, and including them would have potentially led to invalid comparisons across other ethnic groups. In addition, this meta-analysis used only US data, thus the results may not generalize to other parts of the world. As the ethnic diversity in Canada increases, future research needs to examine ethnic minority status and mammography screening. Therefore, the results from this study should be considered tentative and exploratory until confirmed by additional research studies.

Conclusion

This meta-analysis found mammography screening rates among ethnic minority women over 50 years to be lower than their white non-Hispanic counterparts, and these relationships were significantly and consistently affected by socioeconomic status. As ethnic diversity within the United States continues to increase and the high cancer rates among some ethnic groups persist, research that examines the link between ethnicity and screening mammography as well as the possible factors that impact this relationship is required.

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Table 1

Primary study and aggregate study outcomes by race: Non-Hispanic White (W) versus African American (AA) on obtaining a mammogram in the past 2 years

Citation	Sample size		Year data were collected	Location	Sampling method	Data collection	Effect size		
	W	AA					OR	95%	CI
Auguston et al. (2003)	144	718	2000	West	Random	TI	1.33	0.89	1.96
Burack et al. (1998)	1521	221	1992	Nationwide	Random	IPI	0.80	0.60	1.08
Caplan et al. (1992)	19,646	3896	1987–1988	Nationwide	Random	SAS	0.44[a]	0.39	0.49
Cummings et al. (2002)	438	405	1997	South	Random	IPI	0.82	0.62	1.08
Fox and Stein (1991)	344	77	1988	West	Random	TI	1.11	0.64	1.91
Fox et al. (1998)	650	469	1995–1996	West	Convenience	TI	0.88	0.68	1.13
Frazier et al. (1996)	14,315	1424	1990	Nationwide	Random	TI	0.88[a]	0.78	0.98
Glanz et al. (1996)	531	111	1989–1992	Northeast	Convenience	TI	1.38	0.87	2.23
Goldberg and Lessard (2002)	363	1278	1996	West	Convenience	SAS	1.27	0.98	1.67
Haas et al. (2002)	4577	844	1996	Nationwide	Random	SAS	0.87	0.73	1.03
Hiatt et al. (1996)	605	602	1993–1996	West	Random	SAS	0.90	0.69	1.17
Johnson and Murata (1988)	316	210	1984–1985	West	Convenience	Arch	0.64	0.38	1.06
Lee and Vogel (1995)	5646	213	1986–1991	South	Convenience	SAS	0.25[a]	0.11	0.48
Magai et al. (2004)	154	295	nr	nr	Random	IPI	0.96	0.63	1.46
Makuc et al. (1999)	3022	529	1993–1994	Nationwide	Random	IPI	1.27	1.04	1.56
Mayne and Earp (2003)	419	411	1993–1994	South	Random	IPI	0.62[a]	0.46	0.82
Mayo et al. (2001)	81	130	nr	South	Convenience	IPI	1.26	0.65	2.43
Miller and Champion (1997)	807	242	nr	Midwest	Convenience	SAS	0.74	0.50	1.09
Otero-Sabogal et al. (2004)	273	54	1999	West	Random	TI	0.83	0.44	1.57
Raucher et al. (2005) (group 1)	80	136	1993–1994	South	Random	SAS	0.43[a]	0.20	0.89
Raucher et al. (2005) (group 2)	139	124	1993–1994	South	Random	SAS	1.29	0.75	2.23
Rimer et al. (1996)	91	378	nr	South	Random	TI	1.10	0.68	1.78
Sambamoorthi and McAlpine (2001)	1065	200	1996	Nationwide	Random	IPI	0.97	0.68	1.41
Song and Fletcher (1998)	1137	337	1994	West	Convenience	Arch	0.97	0.73	1.28
Taylor et al. (1998)	159	122	1995	West	Convenience	SAS	0.91	0.52	1.58
Taylor et al. (1999)	40	35	1995–1996	West	Random	Arch	0.86	0.24	3.01

Citation	Sample size		Year data were collected	Location	Sampling method	Data collection	Effect size		
	W	AA					OR	95%	CI
Valdini and Cargill (1997)	1597	119	1999	Northeast	Convenience	IPI	0.44[a]	0.39	0.49
Wee et al. (2004)	3880	718	1998	Nationwide	Random	IPI	0.96	0.65	1.42
Meta-statistics									
All study outcomes	62,040	14,298					0.87	0.75	1.00
SES-adjusted outcomes	25,170	4541					1.05	0.71	1.76

TI = telephone interview; IPI = in-person interview, SAS = self-administered survey; Arch = archival data; OR = odds ratio; CI = confidence intervals; and nr = data not reported.

[a] $p<.05$.

Table 2

Subgroup analysis for African American, Hispanic, and Asian/Pacific Islander women compared to white non-Hispanic women

Socioeconomic and contextual variables						Methodological variables					
Subgroup	**Race**	**No. of studies**	**OR**	**95% CI**	***N* total**	**Subgroup**	**Race**	**No. of studies**	**OR**	**95% CI**	***N* total**
Geographical region						Data collection method					
Northeast	AA	2	1.28	0.79, 1.16	2358	Self-administered survey	AA	8	0.81	0.63, 1.05	15,937
	His	4	0.92	0.77, 1.09	4102		His	5	0.74	0.46, 1.18	17,152
	As/PI	0	–	–	–		As/PI	5	0.62	0.23, 1.36	8881
Midwest	AA	1	0.74	0.51, 1.08	1049	Telephone interview	AA	7	0.99	0.85, 1.15	19,579
	His	0	–	–	–		His	8	0.63	0.38, 1.03	19,807
	As/PI	0	–	–	–		As/PI	3	0.61	0.42, 0.87	1892
South	AA	7	0.74	0.52, 1.05	8691	In-person interview	AA	10	0.84	0.63, 1.11	38,748
	His	2	0.53[a]	0.40, 0.70	6518		His	3	0.61	0.31, 1.21	24,453
	As/PI	1	1.45	0.99, 2.05	1099		As/PI	0	–	–	–
West	AA	10	0.98	0.86, 1.12	7933	Archival data	AA	3	0.87	0.67, 1.12	2075
	His	8	0.56[a]	0.33, 0.95	9735		His	2	0.61[a]	0.46, 0.81	1836
	As/PI	8	0.51[a]	0.32,.083	7264		As/PI	2	0.89	0.74, 1.09	2321
Year data collected						Sampling method					
1980–1990	AA	5	0.65	0.38, 1.12	30,991	Random	AA	18	0.86	0.72, 1.04	61,821
	His	5	0.86	0.68, 1.08	22,821		His	11	0.70[a]	0.54, 0.90	49,165
	As/PI	1	0.54	0.19, 1.51	350		As/PI	7	0.62	0.34, 1.11	10,352
1991–1996	AA	14	0.92	0.82, 1.03	34,824	Convenience	AA	10	0.89	0.72, 1.11	14,518
	His	11	0.60[a]	0.42, 0.87	52,578		His	7	0.58	0.30, 1.11	14,083
	As/PI	4	0.90	0.73, 1.11	6630		As/PI	3	0.82	0.61, 1.09	2742
1997–2006	AA	14	0.92	0.82, 1.03	34,824						
	His	2	0.66	0.39, 1.08	2621						
	As/PI	4	0.90	0.73, 1.11	6630						

AA = African American; His = Hispanic; As/PI = Asian/Pacific Islander; OR = Odds ratio; and CI = Confidence intervals.

[a] $p<.05$.

Table 3

Primary study and aggregate study outcomes by race: Non-Hispanic White (W) versus Hispanic (H) on obtaining a mammogram in the past 2 years

Citation	Sample size		Year data were collected	Location	Sampling method	Data collection	Effect size		
	W	H					OR	95%	CI
Bush and Langer (1998)	1996	457	1993–1994	West	Convenience	SAS	0.44[a]	0.33	0.60
Caplan et al. (1992)	19,646	1708	1987–1988	Nationwide	Random	SAS	0.34[a]	0.28	0.40
Fox and Stein (1991)	344	50	1988	West	Random	TI	0.73	0.35	1.46
Fox et al. (1998)	650	318	1995–1996	West	Convenience	TI	0.15[a]	0.11	0.20
Frazier et al. (1996)	14,315	457	1990	Nationwide	Random	TI	0.94	0.78	1.14
Fredman et al. (1999)	764	182	1995	Northeast	Random	TI	0.79	0.54	1.18
Goldberg and Lessard (2002)	363	702	1996	West	Convenience	SAS	1.96	1.48	2.61
Haas et al. (2002)	4577	898	1996	Nationwide	Random	SAS	0.85	0.72	1.00
Hiatt et al. (1996)	605	1601	1993–1996	West	Random	SAS	0.53[a]	0.43	0.66
Johnson and Murata (1988)	316	37	1984–1985	West	Convenience	Arch	0.63	0.18	1.72
Lee and Vogel (1995)	5646	307	1986–1991	South	Convenience	SAS	0.54[a]	0.35	0.81
Otero-Sabogal et al. (2004)	273	540	1999	West	Random	TI	0.51[a]	0.37	0.69
Polednak et al. (1993) (group 1)	568	121	1988	Northeast	Random	TI	1.23	0.78	1.90
Polednak et al. (1993) (group 2)	531	128	1989	Northeast	Random	TI	0.97	0.64	1.46
Sambamoorthi and McAlpine (2001)	1065	226	1996	Nationwide	Random	IPI	0.82	0.59	1.15
Song and Fletcher (1998)	1137	346	1994	West	Convenience	Arch	0.61[a]	0.45	0.82
Tortolero-Luna et al. (1995)	332	233	1992	South	Random	TI	0.52[a]	0.35	0.77
Valdini and Cargill (1997)	1597	211	1999	Northeast	Convenience	IPI	0.85	0.63	1.14
Meta-statistics									
All study outcomes	54,725	8522					0.65[a]	0.50	0.85
SES-adjusted outcomes	23,090	3708					1.08	0.64	1.93

TI = telephone interview; IPI = in-person interview, SAS = self-administered survey; Arch = archival data; OR = odds ratio; CI = confidence intervals; and nr = data not reported.

[a] $p<.05$.

Table 4

Primary study and aggregate study outcomes by race: Non-Hispanic White (W) versus Asian/Pacific Islander (AS/PI) on obtaining a mammogram in the past 2 years

Citation	Sample size		Year data were collected	Location	Sampling method	Data collection	Effect size		
	W	AS/PI					OR	95% CI	
Chen et al. (2004)	1081	108	1999–2000	West	Random	TI	0.70	0.44	1.16
Goldberg and Lessard (2002)	363	58	1996	West	Convenience	SAS	0.56	0.24	1.19
Haas et al. (2002)	4577	154	1996	Nationwide	Random	SAS	1.35	0.89	2.10
Hiatt et al. (1996) (Chinese)	605	775	1993–1996	West	Random	SAS	0.43[a]	0.34	0.55
Hiatt et al. (1996) (Vietnamese)	605	645	1993–1996	West	Random	SAS	0.19[a]	0.15	0.25
Johnson and Murata (1988)	316	34	1984–1985	West	Convenience	Arch	0.54	0.13	1.60
Lipkus et al. (2000)	901	198	1995	South	Random	SAS	1.43	0.98	2.11
Otero-Sabogal et al. (2004) (Chinese)	273	76	1999	West	Random	TI	0.41[a]	0.23	0.71
Otero-Sabogal et al. (2004) (Filipino)	273	81	1999	West	Random	TI	0.75	0.44	1.28
Song and Fletcher (1998)	1137	834	1994	West	Convenience	Arch	0.91	0.74	1.12
Meta-statistics									
All study outcomes	10,131	2963					0.63[a]	0.40	0.99
SES-adjusted outcomes	2654	1586					0.57	0.31	1.27

TI = telephone interview; IPI = in-person interview, SAS = self-administered survey; Arch = archival data; OR = odds ratio; CI = confidence intervals; and nr = data not reported.

[a] $p<.05$.