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## **Abstract**

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**Methods:** African American and white women (1451) aged 40–79 years who obtained an index screening mammogram at one of five urban hospitals in Connecticut between October 1996 and January 1998 were enrolled in this study. This logistic regression analysis includes the 1229 women who completed telephone interviews at baseline and follow-up (average 29.4 months later) and for whom the study outcome, nonadherence to age-specific mammography screening guidelines, was determined. Gender discrimination was measured as lifetime experience in seven possible situations.

**Results:** Gender discrimination, reported by nearly 38% of the study population, was significantly associated with non-adherence to mammography guidelines in women with annual family incomes of \$50,000 or greater (or 1.99, 95% CI 1.33, 2.98) and did not differ across racial/ethnic groups.

**Conclusions:** Our findings suggest that gender discrimination can adversely influence regular mammography screening in some women. With nearly half of women nonadherent to screening mammography guidelines in this study and with decreasing mammography rates nationwide, it is important to address the complexity of nonadherence across subgroups of women. Life stressors, such as experiences of gender discrimination, may have considerable consequences, potentially influencing health prevention prioritization in women.

## **Disciplines**

Other Medicine and Health Sciences | Public Health | Public Health Education and Promotion | Women's Health

# Does Gender Discrimination Impact Regular Mammography Screening? Findings from the Race Differences in Screening Mammography Study

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## ABSTRACT

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**Conclusions:** Our findings suggest that gender discrimination can adversely influence regular mammography screening in some women. With nearly half of women nonadherent to screening mammography guidelines in this study and with decreasing mammography rates nationwide, it is important to address the complexity of nonadherence across subgroups of women. Life stressors, such as experiences of gender discrimination, may have considerable consequences, potentially influencing health prevention prioritization in women.

## INTRODUCTION

**D**ESPITE A SUBSTANTIAL LITERATURE addressing the psychological consequences of gender discrimination, the number of published studies investigating the influence of gender discrimina-

tion on physical health outcomes or health behaviors is limited. It is clear that gender discrimination remains prevalent in our society; the U.S. Equal Employment Opportunity Commission received over 23,000 charges of sex-based discrimination in 2006 alone.<sup>1</sup> To date, experiences of

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gender discrimination have been shown to be associated with job dissatisfaction,<sup>2</sup> premenstrual symptoms,<sup>3</sup> and suboptimal mental health, such as psychological distress, anxiety, and depression.<sup>2-5</sup>

Although terminology and definitions vary across studies, gender (or sexist) discrimination can be considered an umbrella term for unfair treatment due to one's gender/sex. For example, Klonoff and Landrine<sup>6</sup> used the term "sexist discrimination" to include such experiences as sexual harassment; unfair interpersonal treatment; being called sexist names; unfair treatment by such institutions as banks, schools, and lending institutions; and discrimination at work resulting in lower salaries, not receiving promotions or tenure, or unfair treatment by colleagues or co-workers. Notwithstanding the differences in terminology (e.g., sexual/gender harassment or sex/gender discrimination), both researchers and respondents have tended to conceptualize sexual harassment and gender discrimination collectively.<sup>7</sup> Although gender discrimination can occur in the context of many situations, many of the published studies refer specifically to gender discrimination in the workplace environment, a strategy that may not fully capture the influence of sexism on health outcomes or health behaviors or both.

There is a growing epidemiological and public health literature on discrimination and health outcomes, but much of the work has focused on experiences of racial discrimination. As reviewed by Williams et al.,<sup>8</sup> racial discrimination has been shown to influence numerous mental health and physical health outcomes, including self-rated health, days spent unwell in bed, blood pressure, cardiovascular outcomes, and low birthweight. A few studies have investigated the role of additional domains of discrimination, including gender-based discrimination, in physical and mental health outcomes. For example, Kessler et al.<sup>9</sup> found that the four most commonly reported reasons for discrimination reported in their data were race/ethnicity, gender, appearance (predominantly characterized by weight), and age.

The underlying pathways by which discrimination may influence health have largely focused on the conceptualization of discrimination as a stressor.<sup>5,6,10-13</sup> Klonoff and Landrine<sup>6</sup> have suggested that sexist events are gender-specific negative life events or stressors that can have a negative impact on physical and mental health.

Stressful experiences, such as gender discrimination, may lead to a decrease in health-sustaining behaviors and an increase in health-damaging behaviors.<sup>3,14</sup> Although we did not observe a relationship between reported racial discrimination and nonadherence to mammography screening guidelines in a previous analysis using these same data,<sup>15</sup> we conceptualized gender discrimination as a distinct stressor that may influence health prevention behavior in women. Specifically, we hypothesized that women who experience the stress of gender discrimination are less adherent to mammography screening guidelines. One mechanism by which gender discrimination may influence poor health behavior is through overperformance demand, defined as the need to overperform to gain acceptance and recognition within the workplace, resulting in excessive effort,<sup>4</sup> which may lead to lower prioritization of personal health. Furthermore, some research has shown that perceptions of discrimination vary by socioeconomic status (SES), with persons of higher income and education levels more likely to report experiences of discrimination.<sup>9,16,17</sup> Thus, we further hypothesized that the relationship between reported gender discrimination and mammography screening may differ based on reported annual household income or education level. Specifically, we hypothesized that better educated women and those with a higher household income, who also reported experiences of gender discrimination, would be less adherent to mammography screening guidelines.

Mammography is widely accepted as an effective method for early detection of breast cancer and is currently recommended annually<sup>18</sup> or (at minimum) biennially<sup>19,20</sup> for women aged  $\geq 40$ . Less than half (46%) of all women receive mammograms regularly, however, as reported in a systematic review of repeat mammography.<sup>21</sup> New reported data from the Centers for Disease Control and Prevention (CDC) have shown that although mammography rates increased steadily in the 1990s, its use is now on the decline.<sup>22</sup> Furthermore, the percentage of African American women who receive regular mammograms may be even lower than other racial/ethnic groups.<sup>23</sup> In addition to sociodemographic and access to care variables,<sup>24</sup> a number of social and psychological influences on mammography screening behavior have been reported,<sup>25,26</sup> including our own studies of psychosocial factors associated with adherence to screening mammography

guidelines<sup>27,28</sup> and other mammography outcomes using the same source data as the present study.<sup>29,30</sup> The Race Differences in the Screening Mammography Process Study was designed to examine factors in the mammography screening process that may help explain why African American women die of breast cancer more often than white women. As part of that larger prospective study, the goal of this investigation is to describe the role of gender discrimination in nonadherence to screening mammography guidelines in a cohort of 1451 African American and white women living in Connecticut.

## MATERIALS AND METHODS

### *Study population, procedures, and participation*

As previously reported,<sup>27-29</sup> women who sought a screening mammogram (hereafter referred to as the "index" mammogram) between October 1996 and January 1998 were recruited for enrollment. As African Americans comprise only 9.1% of the Connecticut population,<sup>31</sup> we used 1990 U.S. Census data<sup>32</sup> and our own 1994 survey of mammography facilities in Connecticut<sup>33</sup> to identify the mammography facilities that were most likely to provide screening mammograms to African American women. The African American population in Connecticut is largely urban. Thus, study subjects were recruited from hospital-based facilities in the five Connecticut cities with the largest African American populations (ranging from 16% to 38% of total population), and four of these five cities were among the five most populous cities in Connecticut. The statewide survey of all facilities in Connecticut demonstrated that, with one exception, only hospital-based facilities met our enrollment criteria of reporting a high monthly volume of screening mammograms and  $\geq 20\%$  African American patient population. The race-specific sociodemographic profiles in the final study population are similar to those of the general population in Connecticut.

All eligible African American women who obtained index mammograms at these five facilities during the study period were invited to participate. White women were selected by a computer-generated random selection process, and frequency matched to the African American women on facility and date of mammogram. Asymptomatic

women age 40-79 who self-identified as African American or white, with no previous history of breast malignancy, cyst aspiration, or biopsy were eligible for participation. In accordance with age recommendations for regular mammography screening in the general population,<sup>34,35</sup> women <40 years were not included. Women >79 years also were excluded because of a lack of consensus with regard to screening recommendations for older women.<sup>36,37</sup> Approvals of the Institutional Review Boards of Yale University School of Medicine and each participating hospital were maintained throughout the study period.

Initially, 2359 women were identified for participation, with a final number interviewed of 1451 after excluding ineligible women ( $n = 171$ ), those who could not be contacted or were deceased or ill ( $n = 206$ ), and women who declined participation ( $n = 531$ ). Participation differed across race group (African American, 69%; white, 77%;  $p < 0.001$ ) as well as by age (age 40-49, 76%; age  $\geq 50$ , 72%;  $p = 0.052$ ). Two interviews were conducted in this study: (1) a 45-minute baseline telephone interview conducted approximately 1 month after the index screening mammogram to allow time for receipt of mammography results (mean time to baseline interview, 1.5 months, standard deviation (SD)  $\pm 0.85$  month) and (2) a follow-up interview arranged at a minimum of 26 months after the index screening. The time interval between baseline and follow-up interview averaged 29.4 months (SD  $\pm 1.42$  months), with a range of 27-41 months. Of the 1451 women who participated in the baseline interviews, 1249 (86%) completed follow-up interviews, 20 of whom were excluded because of a cancer diagnosis associated with the examination ( $n = 11$ ) or inadequate information to determine adherence to mammography screening guidelines ( $n = 9$ ). Thus, 1229 women (484 African American, 39%; 745 white, 61%) were included in this analysis. Women included differed significantly from those excluded or lost to follow-up by race (participation: African American, 78%; white, 93%;  $p < 0.001$ ) but not by age.

### *Measures*

*Gender discrimination.* Measurement of gender discrimination, assessed during the follow-up interview, was adapted from the discrimination measure developed by Krieger and Sidney and

used in the Coronary Artery Risk Development in Young Adults Study (CARDIA).<sup>38,39</sup> The participants were asked whether they had ever experienced discrimination because of their gender in any of the following seven situations: (1) at school, (2) getting a job, (3) at work, (4) at home, (5) getting medical care, (6) on the street or in a public setting, and (7) from the police or in the courts. Additionally, participants were asked if they ever decided not to do something, for example, apply for a job, go to school, seek help from a medical or financial institution, the police or courts, because of anticipated or assumed gender discrimination. A dichotomous variable was created (no reported experiences of gender discrimination vs. answering yes to one or more of the seven situations).

*Nonadherence to mammography screening guidelines.* The American Cancer Society (ACS) screening guidelines in effect at the onset of this study's data collection period (1996) were used to determine the outcome for this study, nonadherence to screening mammography guidelines.<sup>37</sup> Women aged 40–49 were considered nonadherent if they did not obtain at least one mammogram within 2 years (+ 2 months) of the index examination. Women aged  $\geq 50$  were considered nonadherent if they did not obtain at least two screening examinations within 2 years (+ 2 months) of the index examination. The + 2 months allowed for reasonable delays in scheduling appointments.

For 1126 respondents (92%), the outcome was determined by self-report. The remaining 103 women (8%) did not provide sufficient self-reported information to ascertain the outcome (i.e., could not recall the month or year of at least one mammogram) but did consent to a review of their mammography records. For these women, we relied on radiology records to determine outcome status. These 103 women did not differ from women with self-reported data by recruitment site or family breast cancer history, but they were more likely to be African American than white (55% vs. 38%, respectively,  $p < 0.001$ ) and to be aged  $\geq 50$  (78% vs. 63%  $< 50$  years,  $p < 0.003$ ).

A wide range of known predictors of mammography screening and potential confounders were also examined in this analysis. Many of the variables examined in this study were drawn from models and theories that have received considerable attention in studies of mammography screening behavior, including (1) the Health Belief Model,<sup>40,41</sup> (2) social learning theory,<sup>42</sup> (3) lo-

cus of control theories,<sup>43</sup> and (4) the Theory of Reasoned Action.<sup>44</sup> Additional variables examined included sociodemographic factors, variables that were specific to the experience of undergoing mammography screening, psychosocial factors, health status and behaviors, logistic barriers, interaction with provider, provider characteristics, and known breast cancer risk factors.

### *Statistical analyses*

Bivariate associations were examined between the outcome (nonadherence to screening mammography guidelines) and the main predictor, gender discrimination, as well as all potential covariates. Statistical significance was determined by the chi-square test ( $p < 0.05$ ). Stepwise multivariate logistic regression was used to determine the adjusted association between reported gender discrimination and nonadherence to screening mammography guidelines; adjusted odds ratios (OR) with 95% confidence intervals (CI) are reported. Variables that contributed significantly to the fit of the model by likelihood ratio tests<sup>45</sup> were retained. A criterion of a 10% change in the OR for gender discrimination was used to identify potential confounders. As a first step in identifying potential effect modifiers, the associations between gender discrimination and nonadherence to mammography screening were evaluated within strata of each of the sociodemographic variables. All potential two-way interactions were tested in the multivariate logistic regression model. All analyses were performed with SAS software, version 9.1 (SAS Institute, Cary, NC).

## RESULTS

### *Characteristics of study population*

As shown in Table 1, nearly 40% of the women in the study population were African American, and approximately 60% were white. Over one third of the participants were between the ages 40 and 49, and over half were married or living as married. The distributions of many of the following population characteristics are reflective of the oversampling of African American women (study characteristics by race not shown). The majority of participants had at least a high school education, and less than half of the women reported annual family incomes of  $\geq \$50,000$ . Most women had full, annual mammography insurance and re-

TABLE 1. CHARACTERISTICS OF THE STUDY POPULATION ( $n = 1229$ ), CONNECTICUT, 1996–2000

Variable	No. <sup>a</sup>	%
Race		
African American	484	39.4
White	745	60.6
Age, years		
40–49	443	36.1
50+	786	63.9
Marital status		
Married/living as married	697	57.0
Other	525	43.0
Education		
More than 12 years	682	55.8
12 years	360	29.5
Less 12 years	180	14.7
Annual family income		
\$50,000+	489	42.7
\$15,000–\$49,999	389	33.9
Less \$15,000	268	23.4
Mammography insurance (full, annual coverage)		
Yes	838	68.5
No	386	31.5
Usual healthcare provider		
Yes	1,100	90.2
No	120	9.8
Adherence to mammography screening guidelines in 2 years subsequent to index screening		
Adherent	642	52.2
Non-adherent	587	47.8
History of adherence to mammography screening guidelines		
Adherent	986	80.7
Non-adherent	236	19.3

<sup>a</sup>May not sum to 1229 due to missing values for some variables.

ported having a usual care provider. Most women (80.7%) reported a history of regular mammography screening, but only 52.2% were adherent to screening mammography guidelines in the 2 years subsequent to the index screening. Compared with white women, African Americans were significantly more likely to be single, to have lower SES (education, income, and occupational status), to be less knowledgeable about mammography screening guidelines as well as less likely to have adhered to guidelines before the index mammogram, and finally, to be less likely to report a family history of breast cancer.

#### Gender discrimination

As reported in Table 2, nearly 38% of the women in this study reported ever having experi-

enced gender discrimination in at least one situation in their lifetime. Gender discrimination experienced at work or on the street or in a public setting was reported most often (19.7% and 18.6%, respectively). Nearly 13% of the women reported gender discrimination when trying to get a job, 10.2% at school, and 8.1% at home. Notably, only 7.8% of the women reported experiencing gender discrimination in the healthcare setting. With respect to the number of situations, over one fourth of participants reported gender discrimination in one or two situations, and nearly 12% reported three or more situations in which they experienced gender discrimination.

#### Bivariable results

As shown in Table 3, participants who reported gender discrimination were more likely to be <50 years of age, white, better educated, have higher incomes, be in the higher occupation status quartiles of the Duncan Socioeconomic Index (adapted to include a combined spouse-pair score),<sup>46,47</sup> and to have worked full time (vs. not having worked) over the course of the lifetime. Gender discrimination was not associated with either mammography insurance or having a usual care provider. Women who reported gender discrimination were more likely to have reported a history of adherence to mammography

TABLE 2. EXPERIENCES OF GENDER DISCRIMINATION REPORTED BY SITUATION ( $n = 1229$ ), CONNECTICUT, 1996–2000

	No.	%
Situation <sup>a</sup>		
At school	124	10.2
Getting a job	156	12.9
At work	238	19.7
At home	99	8.1
Getting medical care	94	7.8
On street/in public	226	18.6
Police/courts	58	5.1
Decided not to do something because of gender discrimination <sup>b</sup>	111	9.2
Number of different situations reported		
None	754	61.8
1 or 2	321	26.3
3 or more	145	11.9

<sup>a</sup>Categories are not mutually exclusive.

<sup>b</sup>Decided not to do something, for example, apply for a job, go to school, seek help from a medical or financial institution, the police and/or courts, because of anticipated or assumed gender discrimination.

TABLE 3. UNADJUSTED ASSOCIATIONS BETWEEN REPORTED GENDER DISCRIMINATION AND SELECT COVARIATES (n = 1229), CONNECTICUT, 1996–2000

Domain	Variable	Reported gender discrimination				OR <sup>a</sup>	95% CI
		Yes	%	No	%		
Sociodemographic variables	<i>Age</i>						
	40–49	204	46.2	238	53.8	1.56	1.23, 1.98
	≥50	276	35.5	502	64.5	1.00	
	<i>Race</i>						
	African American	170	35.4	310	64.6	0.77	0.61, 0.98
	White	308	41.6	432	58.4	1.00	
	<i>Marital status</i>						
	Not married	202	38.9	317	61.1	0.96	0.76, 1.21
	Married/living as married	277	39.9	417	60.1	1.00	
	<i>Education</i>						
	<High school	52	29.5	124	70.5	0.43	0.30, 0.62
	High school graduate	91	25.4	267	74.6	0.35	0.26, 0.47
	>High school	335	49.3	344	50.7	1.00	
	<i>Income</i>						
	<\$15,000	86	32.7	177	67.3	0.51	0.37, 0.70
	\$15,000–\$49,999	133	34.3	255	65.7	0.55	0.41, 0.73
	≥ \$50,000	238	48.9	249	51.1	1.00	
	<i>Duncan Socioeconomic Index by job title</i>						
	1st quartile (lowest)	69	27.4	183	72.6	0.33	0.23, 0.49
2nd quartile	109	34.5	207	65.5	0.47	0.33, 0.66	
3rd quartile	119	45.6	142	54.4	0.74	0.52, 1.06	
4th quartile (highest)	149	53.0	132	47.0	1.00		
<i>Work status (lifetime)</i>							
Did not work	173	35.5	314	64.5	0.76	0.59, 0.99	
Part-time	74	42.8	99	57.2	1.04	0.72, 1.49	
Full-time	227	41.9	315	58.1	1.00		
Access to medical care	<i>Mammography insurance</i>						
	Not full coverage	156	40.6	228	59.4	1.08	0.85, 1.38
	Full coverage	322	38.7	509	61.3	1.00	
	<i>Has a usual care provider</i>						
No	45	37.8	74	62.2	0.93	0.63, 1.37	
Yes	432	39.6	660	60.4	1.00		
Mammography related factors	<i>Adherence to mammography screening guidelines</i>						
	Nonadherent	223	38.5	356	61.5	0.94	0.74, 1.18
	Adherent	257	40.1	384	59.9	1.00	
	<i>History of adherence to mammography screening guidelines</i>						
Nonadherent	72	31.0	160	69.0	0.64	0.47, 0.87	
Adherent	405	41.3	576	58.7	1.00		
Logistical barriers to screening	<i>Traveled to appointment independently</i>						
	No <sup>b</sup>	81	29.0	198	71.0	0.55	0.41, 0.75
	Yes <sup>c</sup>	399	42.4	541	57.6	1.00	
	<i>Travel time to appointment</i>						
	>15 minutes	189	43.9	242	56.1	1.33	1.05, 1.69
0–15 minutes	290	36.9	495	63.1	1.00		
Health status and behaviors	<i>Made special arrangements, such as child care</i>						
	Yes	49	54.4	41	45.6	1.93	1.25, 2.97
	No	430	38.3	694	61.7	1.00	
	<i>Body mass index</i>						
	30+	124	35.6	224	64.4	0.67	0.50, 0.90
25–29.9	143	36.2	252	63.8	0.68	0.51, 0.91	
17.5–24.9	208	45.3	251	54.7	1.00		

(continued)



TABLE 3. UNADJUSTED ASSOCIATIONS BETWEEN REPORTED GENDER DISCRIMINATION AND SELECT COVARIATES (n = 1229), CONNECTICUT, 1996–2000 (CONT'D)

Domain	Variable	Reported gender discrimination				OR <sup>a</sup>	95% CI
		Yes	%	No	%		
Health status and behaviors	<i>Pack-years of smoking</i>						
	>10	120	42.0	166	58.0	1.27	0.95, 1.70
	1–10	106	45.9	125	54.1	1.49	1.09, 2.04
	<1	249	36.3	437	63.7	1.00	
	<i>Alcohol use in past year</i>						
	Yes	320	42.9	426	57.1	1.46	1.14, 1.85
	No	159	34.0	308	66.0	1.00	
	<i>Regular exercise (at least once a week)</i>						
	No	204	35.6	369	64.4	0.73	0.58, 0.92
Yes	274	43.0	363	57.0	1.00		
Psychosocial factors	<i>Control over recovering from cancer if diagnosed</i>						
	None	130	43.0	172	57.0	1.93	1.06, 3.53
	A little	251	40.2	373	59.8	1.72	0.97, 3.06
	Some	66	39.1	103	60.9	1.63	0.86, 3.12
	A lot	20	28.2	51	71.8	1.00	
	<i>Perceived usefulness of mammography</i>						
	Not useful	109	49.3	112	50.7	1.65	1.23, 2.21
	Useful	370	37.1	626	62.9	1.00	
	<i>Perceived susceptibility of getting breast cancer</i>						
	Very likely	20	33.9	39	66.1	0.99	0.52, 1.84
	Somewhat likely	170	44.7	210	55.3	1.56	1.13, 2.15
	A little likely	162	41.0	233	59.0	1.34	0.97, 1.85
	Not likely	104	34.2	200	65.8	1.00	
<i>Experienced a stressful life event since index screening</i>							
Yes	431	41.6	606	58.4	1.95	1.37, 2.76	
No	49	26.8	134	73.2	1.00		
<i>Treated with respect by radiology technologist</i>							
Some/little/none	44	50.0	44	50.0	1.59	1.03, 2.45	
A lot	436	38.7	692	61.3	1.00		
Gender	<i>Usual healthcare provider</i>						
	Concordance with usual healthcare provider						
	same sex						
Different	209	36.3	366	63.7	0.77	0.61, 0.97	
Same	247	42.7	332	57.3	1.00		

<sup>a</sup>OR, odds ratio; 95% confidence interval.

<sup>b</sup>Study participants depended on another person for travel or took public transportation or taxi.

<sup>c</sup>Study participants traveled independently by walking or driving themselves.

guidelines, although there was no association (unadjusted) between gender discrimination and adherence to mammography guidelines as measured in this prospective study. Considering logistical barriers to mammography screening, women who reported gender discrimination were significantly more likely to have traveled independently to the appointment, reported longer travel times to the appointment, and needed to make special arrangements, such as child care.

There were also some notable differences with respect to health status and behaviors. For example, women who reported gender discrimination were significantly more likely to have a lower body mass index (BMI), to have smoked or used alcohol, and to have exercised regularly, compared with women who did not report gender discrimination. With regard to psychosocial factors, participants who reported gender discrimination were significantly less likely to have re-

ported high perceived control over recovering from cancer (if diagnosed), less likely to believe that mammography screening was very useful in detecting breast cancer, and more likely to report they were somewhat likely to develop breast cancer. Additionally, women who experienced gender discrimination were also nearly twice as likely to have reported a stressful life event since the index screening examination and more likely to have reported that they were not treated with respect by the radiology technologist (all female) and were more likely to have a female usual care provider.

### Multivariate results

Although the initial bivariate association between gender discrimination and nonadherence to mammography screening guidelines was nonsignificant (Table 3), this relationship was examined in multivariate logistic regression models using a stepwise approach, testing the variables reported in Table 3 (but not limited to these variables). When included in a multivariate model, adjusted for sociodemographic factors, access to care variables, and history of adherence to guide-

lines, the association between gender discrimination and nonadherence remained nonsignificant (Table 4, Model 1). Because we hypothesized that sociodemographic variables (i.e., SES) may modify the effect of gender discrimination on nonadherence, we also conducted stratified analyses. Significant heterogeneity of the ORs revealed possible effect modification by annual household income (Breslow Day test for heterogeneity,  $p = 0.02$ ). We proceeded to formally test this effect modification in multivariate logistic regression models using an interaction term. This interaction between gender discrimination and income is shown in multivariate Model 2 (Table 4), adjusted for sociodemographic factors, access to care variables, and history of adherence to guidelines (high income: OR 1.81, 95% CI 1.23, 2.66; middle income: OR 1.06, 95% CI 0.68, 1.65; low income: OR 0.69, 95% CI 0.39, 1.20). As presented in Model 3 (Table 4), with further adjustment for variables with known associations with mammography screening behavior from the literature or from the analyses of these data (BMI, perceived susceptibility to breast cancer, perceived usefulness of mammography, pain experienced compared with expectations, provider recommendation, and re-

TABLE 4. MULTIVARIATE LOGISTIC REGRESSION MODELING OF ASSOCIATION BETWEEN REPORTED GENDER DISCRIMINATION AND NON-ADHERENCE TO SCREENING MAMMOGRAPHY GUIDELINES

Model and independent variables included	Income category	Reported gender discrimination	Odds ratio	95% confidence interval
Model 1: Association between gender discrimination and nonadherence adjusted for sociodemographic variables, access to care, and history of adherence (no gender discrimination and income interaction) <sup>a</sup> ( $n = 1121$ )		Yes	1.24	0.95, 1.61
		No	1.00	
Model 2: Model with gender discrimination and income interaction (adjusted for same variables as in Model 1) <sup>a</sup> ( $n = 1121$ )	≥\$50,000	Yes	1.81	1.23, 2.66
		No	1.00	
	\$15,000–\$49,999	Yes	1.06	0.68, 1.65
		No	1.00	
	<\$15,000	Yes	0.69	0.39, 1.20
		No	1.00	
Model 3: Model plus adjustment for additional mammography-related covariates <sup>b</sup> ( $n = 1102$ )	≥\$50,000	Yes	1.99	1.33, 2.98
		No	1.00	
	\$15,000–\$49,999	Yes	1.15	0.72, 1.84
		No	1.00	
	<\$15,000	Yes	0.69	0.38, 1.23
		No	1.00	

<sup>a</sup>Models 1 and 2 are adjusted for race, marital status, age, education, annual household income, family size, mammography insurance, usual care provider, body mass index, and history of adherence to mammography guidelines.

<sup>b</sup>Model 3 is adjusted for covariates in Model 2 plus perceived susceptibility to breast cancer, perceived usefulness of mammography, embarrassment experienced during the index mammogram, provider recommendation within the past 2 years, and receipt of a reminder notice for a mammogram.

ceipt of a reminder notice), the magnitude of the association for high income women further increased and remained statistically significant (OR 1.99, 95% CI 1.33, 2.98). Results from race-specific models (data not shown) were consistent for both white and African American women. Additional adjustment for race discrimination in the multivariate models did not attenuate the results, and interaction between gender discrimination and race discrimination was not detected.

## DISCUSSION

Although our hypothesis that gender discrimination is associated with nonadherence to mammography screening guidelines was not upheld for all women, our analysis suggests that having experienced gender discrimination is a deterrent to adherence to screening mammography guidelines among women whose total family income was  $\geq$ \$50,000. Notably, neither education nor occupational status modified this relationship. Even with adjustment for psychosocial factors, logistical barriers, and additional potential confounders, having ever experienced gender discrimination resulted in lower adherence to mammography screening guidelines in this group of women.

We initially looked to variables, such as occupational status or working full-time, as potential explanations for our findings, considering our proposed mechanism of gender discrimination as a stressor. However, even with adjustment for occupational rank (measured using a modified Duncan Socioeconomic Index<sup>46,47</sup> both for spouse pair and for women alone), full-time/part-time employment, family size, and logistical barriers, such as child care, the relationship was not attenuated. Despite our inclusion of detailed information on occupation and other work-related variables, it is possible that some unmeasured aspect of work or the work environment could have explained the observed relationship between reported gender discrimination and nonadherence to screening mammography guidelines in these comparatively high income women.

Consistent with conceptualizing gender discrimination as a stressor, much of the available gender discrimination literature addresses discrimination in the workplace. Although we collected information on numerous situations in which women may experience gender discrimi-

nation, workplace discrimination was the most prevalent, with nearly 20% of the women in this study reporting gender discrimination in this setting. One mechanism by which workplace gender discrimination may influence poor health behavior is through overperformance demand, defined as the need to overperform to gain acceptance and recognition within the workplace, resulting in excessive effort.<sup>4</sup> Parker and Griffin<sup>4</sup> found that overperformance demand was more common in women who had experienced gender harassment and, in turn, mediated the relationship between gender harassment and psychological distress within the context of women working in male-dominated occupations. Despite our attempts to control for many work-related factors, it is possible that the higher income women who experience gender discrimination in this study are at higher risk of overperformance demand; subsequently, these women may have neglected other aspects of their lives, such as maintaining a regular screening mammography schedule.

Much of the gender discrimination literature to date focuses on workplace discrimination, but the measure used in this study included additional situations in which women may experience gender discrimination: at school, at home, in the healthcare setting, on the street/in public, or by police/in court system. This multidimensionality of the measure is a strength and has been shown to be important in validity and reliability compared with other measures that use single item responses in a study of racial discrimination.<sup>48</sup> Although we collected information on specific situations in which gender discrimination was experienced, this measure was designed to be analyzed as a global measure of discrimination and was not appropriate for analysis of situation-specific discrimination.<sup>48</sup> In future studies, additional aspects of discrimination, such as duration or number of experiences, when in the life course events occurred, chronic vs. acute episodes, overt vs. subtle occurrences, cumulative effects, or physical or emotional responses to discrimination, could further elucidate the relationship between discrimination and health prevention behaviors.<sup>8</sup>

An alternative explanation for observing a positive association in high-income women only may be masking of an association in lower-income women as a result of underreporting. The possibility of underreporting has often been a concern in

studies of racial discrimination, particularly among lower-income individuals.<sup>16,17</sup> While it is not entirely clear why persons of low SES are less likely to report experiences of racial discrimination, Krieger<sup>16,39</sup> has suggested that persons of lower social position, especially those subject to multiple forms of subordination or deprivation, may internalize oppression, resulting in underreporting of racial discrimination by individuals of lower SES. Reasons for underreporting may also be linked to the sensitive nature of the topic, social desirability, or discomfort in reporting discrimination to a person of a different racial/ethnic background. Additional reasons for underreporting may include denial,<sup>49</sup> keeping quiet about unfair treatment,<sup>38</sup> or the endorsement of racial ideology (the acceptance of beliefs about race and racial inequality), low levels of racial identification, or the internalization of racial prejudice (expression of negative feelings toward members of your racial group).<sup>50–52</sup>

The association that was observed in more affluent women was not modified by race and was independent of experiences of racial discrimination. Although there could be some concern that women who report one type of discrimination are more likely to report other types of discrimination because of some underlying (and unmeasured) psychological characteristic, our finding that the gender discrimination effect is independent of race discrimination is reassuring.

We cannot rule out the possibility that our significant finding between reported gender discrimination and nonadherence to screening mammography guidelines in high-income women is a result of the cross-sectional nature of the analysis. It is conceivable that women who were not screened regularly at follow-up may have been more likely to report discrimination as a means of explaining their nonadherence. However, this is unlikely, as many of the bivariate associations between factors measured at baseline are consistent with a history of gender discrimination (e.g., women who reported more gender discrimination were more likely at baseline to have a female primary care provider). Still, prospective studies of experiences of gender discrimination and adherence to screening mammography guidelines are needed to fully understand the temporal relationship between these factors.

The sampling strategy used in this study was designed to reflect the general population of African American and white women in Con-

necticut who were of mammography screening age. Based on our own statewide survey of mammography facilities in which we collected information on volume of screening mammography and racial composition of the population served in each facility,<sup>33</sup> we were able to identify the facilities that African Americans were most likely to use. As expected, these were all large hospital-based facilities in large urban centers. Although it is not clear if these results are generalizable to other parts of the United States, we observed the usual racial/ethnic differences in SES variables generally seen in the United States and Connecticut populations.<sup>53,54</sup>

## CONCLUSIONS

To our knowledge, this investigation represents a first look at the association between gender discrimination and a health prevention behavior. Although exploratory, our findings suggest that gender discrimination can adversely influence regular mammography screening in some women. Specifically, among higher-income women, those who experienced gender discrimination were less likely to adhere to screening mammography guidelines than women who did not report experiences of gender discrimination. With nearly half of women nonadherent to screening mammography guidelines in this study and with decreasing mammography rates nationwide,<sup>22</sup> it is important to address the complexity of nonadherence across subgroups of women. Finetuning our understanding of factors that contribute to nonadherence will be critical as we move toward increasingly tailored health prevention interventions. Life stressors, such as experiences of gender discrimination, may have considerable consequences, potentially influencing health prevention prioritization in women. Ways to decrease the occurrence of discriminatory practices and increasing cultural competency should be explored as a means to address this issue. Finally, with approximately 38% of women in this culturally diverse population reporting a history of gender discrimination, even relatively small health and behavioral effects in individuals may have a large impact on health prevention efforts on a population level. The potential health and behavioral consequences of gender discrimination warrant further study to ensure that all patients receive the full benefit of state-of-the-art healthcare.

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