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Are race/ethnic disparities in the prevalence of nocturia due to socioeconomic status? Results from the Boston Area Community Health (BACH) Survey

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Abstract

Purpose—Race/ethnic disparities in prevalence of nocturia have been reported previously. The objective of this analysis is to estimate prevalence rates of nocturia by race/ethnicity and determine the contribution of socioeconomic status (SES) to potential differences by race/ethnicity.

Methods—The Boston Area Community Health (BACH) Survey used a multistage stratified design to recruit a random sample of 5,501 adults (2301 men, 3200 women) age 30-79. Nocturia was defined as voiding more than once per night in the past week or voiding more than once per night fairly often, usually, or almost always in the past month. Self-reported race/ethnicity was defined as Black, Hispanic, and White. Socioeconomic status (SES) was defined as a combination of education and household income.

Results—Overall prevalence of nocturia was 28.4% with higher prevalence among Black (38.6%) and Hispanic (30.7%) participants compared to White participants (23.2%), a trend consistent by gender. After adjusting for SES the increased odds of nocturia among Hispanic men disappeared (adjusted odds ratio (OR)=1.04, 95% confidence interval (CI): 0.71, 1.52), while the OR for Black men was attenuated but remained statistically significant (OR= 1.57 (95%CI: 1.12, 2.21). Among women, the association between race/ethnicity and nocturia was attenuated but remained statistically significant after adjusting for SES.

Conclusions—SES accounts for part of the race/ethnic disparities in prevalence of nocturia. The effect of SES was more pronounced among men and among Hispanic participants, while differences in prevalence of nocturia remained significant for Black men and women.

Introduction

Lower urinary tract symptoms are common in both aging men and women.[1] Nocturia is one the most commonly reported urologic symptoms with previously reported prevalence rates ranging from 30 to 40% among both men and women and is associated with significant bother and decreased quality of life.[2, 3] There is also increasing evidence of the association of nocturia with chronic conditions such as obesity, heart disease, diabetes, and depression.[4-6] Additionally, nocturia has been associated with a significant increase in risk of falls in the elderly, and increased risk of hip fractures and mortality risk.[7-9] Previous research has reported higher prevalence of nocturia among minority (Black and Hispanic) participants compared to White participants, similar to race/ethnic disparities in some chronic conditions such as diabetes, hypertension, and obesity.[4, 10] However, the contribution of socioeconomic factors

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to race/ethnic disparities in nocturia have not been investigated. Race/ethnic disparities in other urologic conditions such as erectile dysfunction have disappeared after taking into account socioeconomic status.[11] Such investigations may in turn suggest modifiable risk factors for nocturia related to poverty, access to care and use of medications that in turn could be a focus of intervention.

Using data from the Boston Area Community Health (BACH) Survey, the contribution of socioeconomic status to race/ethnic disparities in the prevalence of nocturia can be investigated in a large, population-based sample of both men and women. The objectives of this analysis are to: 1) estimate the prevalence of nocturia by race/ethnicity among men and women separately, and 2) to determine whether socioeconomic status accounts for the reported race/ethnic differences in the prevalence of nocturia in men and women.

Methods

Overall Design

The BACH survey is a population-based epidemiologic survey of a broad range of urologic symptoms and risk factors in a randomly selected sample (N=5,501). Detailed methods have been described elsewhere.[12] A multi-stage stratified design was used to recruit approximately equal numbers of subjects according to age (30-39, 40-49, 50-59, 60-79 years), gender, and race and ethnic group (Black, Hispanic, and White). The BACH sample was recruited from April 2002 through June 2005. Interviews were completed with 63.3% of eligible subjects, resulting in a total sample of 5501 adults (2301 men, 3200 women). All protocols and informed consent procedures were approved by the New England Research Institutes' Institutional Review Board.

Data collection

Data were obtained during a 2-hour in-person interview, conducted by a trained (bilingual) interviewer, generally in the subject's home. Following written informed consent, height, weight, hip and waist circumference were measured and self-reported information on medical and reproductive history, major comorbidities, lifestyle and psychosocial factors, and symptoms of urogynecological conditions were collected. Medication use in the past month was collected using a combination of drug inventory and self-report with a prompt by indication.

Nocturia

Two questions were used to determine nocturia. Question 1 was "During last month how often have you had to get up to urinate more than once during the night?" Question 2 was "In the last 7 days on average how many times have you had to go to the bathroom to empty your bladder during the night after falling asleep?" If the answer to question 1 was fairly often, usually or almost always or the answer to question 2 was 2 or greater, the respondent was considered to have nocturia.[4, 5] A total of 1,785 individuals indicated that they voided more than once nightly during the last week (question 2) of whom 789 also indicated that they voided more than once nightly fairly often or more frequently during the last month, while 84 individuals reported voiding more than once nightly fairly often or more during the past month (question 1) but did not report voiding more than once nightly in the last week (question 2). Thus a total of 1869 individuals were classified as having nocturia.

Race/ethnicity and socioeconomic status (SES)

Self-reported race/ethnicity was defined as Black, Hispanic and White according to the Office of Management and Budget classification.[13] Socioeconomic status (SES) index was calculated

using the method by Green,[14] incorporating both education (number of years of school completed) and household income normalized to income in the Northeast United States (US Census 2000). The SES index is a weighted sum of education and household income with more weight given to education. The advantage of this method, as opposed to including separate variables for education and income in a multivariate model, is that it gives a measure of the combined effects of education and income in a single variable. The SES index has been shown to predict preventive health behavior nearly as well as a 3-factor index including occupation.[14] SES was categorized as low (lower 25% of the distribution of the SES index), middle (middle 50% of the distribution), and high (upper 25% of the distribution).

Covariates

Body mass index (BMI) was categorized as <25.0, 25.0-29.9, and ≥30.0 kg/m^2. Physical activity was measured using the Physical Activity Scale for the Elderly (PASE) and was categorized as low (<100), medium (100-250), and high (>250).[15] Alcohol consumption was defined as alcoholic drinks including beer, wine and hard liquor consumed per day: 0, <1, 1-2.9, ≥3 drinks per day. Smoking was defined as never smokers (smoked <100 cigarettes lifetime and not currently smoking), former smokers (smoked ≥100 cigarettes lifetime and currently nonsmoker), and current smoker (smoked ≥100 cigarettes and currently a smoker). Comorbid conditions included in the analysis were heart disease, type 1 or type 2 diabetes, hypertension. The presence of comorbidities was defined as a yes response to "Have you ever been told by a health care provider that you have or had...."? Heart disease was defined by self-report of myocardial infarction, angina, congestive heart failure, coronary artery bypass, or angioplasty stent. Participants reporting five or more depressive symptoms (out of 8) using the abbreviated Center for Epidemiological Studies – Depression (CES-D) scale were considered to have clinically significant depression.[16] Medication use included in the analysis include use of prescription medications for LUTS and diuretics use (Table 1).

Statistical analysis

Analyses were conducted separately for men and women. Prevalence of nocturia was estimated by race/ethnicity and age trends were assessed by decades of age. Odds ratios (OR) and 95% confidence intervals (95% CI), estimated using multiple logistic regression, were used to assess the association of race/ethnicity and nocturia and adjust for SES and other covariates of interest. In multivariate analyses of the association of nocturia with race/ethnicity and SES, age was always included in the model. Other covariates were included in the model if the overall significance of the variable was $p<0.1$ or if they were confounders of the race/ethnicity and nocturia association. A multiple imputation technique was used to obtain plausible values for missing data.[17] The proportion of participants with missing data was 0.4% (22 participants) for nocturia, 0.9% (47 participants) for comorbid conditions and depressive symptoms, and 0.9% (49 participants) for lifestyle variables (physical activity, alcohol consumption, cigarette smoking). The SES index was missing for 6.1% of participants (333 participants) primarily due to missing data on household income (6.1%, 333 participants) rather than years of education (0.3%, 16 participants). Overall, 7.7% of BACH participants had missing data on at least one of these variables. To be representative of the city of Boston, observations were weighted inversely proportional to their probability of selection.[18] Weights were post-stratified to the Boston population according to the 2000 census. Analyses were conducted in version 9.1 of SAS (SAS Institutes, Cary, NC, USA) and version 9.01 of SUDAAN (Research Triangle Institutes, Research Triangle Park, NC, USA).

Results

Overall prevalence of nocturia was 28.4% (Table 1) and was higher in women (31.3%) compared to men (31.3% vs. 25.3%, χ^2 p-value = 0.003). Prevalence was higher among Black

(38.6%) and Hispanic (30.7%) participants compared to White participants (23.2%) (χ^2 p-value <0.001), a trend consistent by gender and in every age decade. Prevalence of nocturia was 21.5% in White men, 34.8% in Black men, and 25.1% in Hispanic men (χ^2 p-value <0.001). A similar trend was observed among women with prevalence rates of 24.9% in White women, 41.5% in Black women, and 35.7% in Hispanic women (χ^2 p-value <0.001). A trend of increased prevalence of nocturia with age was consistent by gender and race/ethnicity (Figure 1) Higher prevalence of nocturia in the low SES group compared to the middle and high SES groups was consistent among both men (prevalence rate of 39.3%, 22.6%, 17.5% for the low, middle, and high SES groups, χ^2 p-value <0.001) and women (prevalence rate of 43.5%, 28.0%, 21.7% for the low, middle, and high SES groups, χ^2 p-value <0.001). Among men, the largest difference in age-adjusted prevalence of nocturia by race/ethnicity was observed in the low SES category between Black and White men (Figure 2). This difference disappeared in the middle SES category. The number of Black and especially Hispanic men in the high SES category was too small to estimate reliable prevalence rates. In contrast, among women, no difference was observed in the prevalence of nocturia in the low SES category while the differences were more pronounced in the middle and high SES categories primarily because of a larger decline in the prevalence of nocturia in White women between the low and middle SES categories.

While the same proportion of Black and White participants (about 50%) are classified as middle SES, only 10% of Black participants fall in the high SES category compared to over 35% of White participants (Figure 3). About 60% of Hispanic participants were in the low SES category and only about 10% (11% of Hispanic men, 6% of Hispanic women) were in the high SES category. These patterns were consistent by gender.

Overall, comorbid conditions are associated with increased odds of nocturia in both men and women while increased physical activity is associated with decreased odds of nocturia (Table 2). A robust association between higher BMI and increased odds of nocturia was observed in women while the association between BMI and nocturia in men was U-shaped.

The association of race/ethnicity with nocturia before and after accounting for SES differences is presented in Table 3. Among men, increased odds of nocturia are observed among both Black (age-adjusted OR=2.09, 95%CI: 1.50, 2.91) and Hispanic men (age-adjusted OR=1.48, 95% CI:1.03, 2.13) compared to White men. After adjusting for SES, the association was attenuated for Black men (age- and SES-adjusted OR=1.65, 95%CI:1.17, 2.33) and disappeared for Hispanic men (age- and SES-adjusted OR=0.99, 95%CI:0.66, 1.49). Results were similar in the final multivariate model. In addition to SES, hypertension, depressive symptoms, and BMI were statistically significant in the final multivariate model form. The association between race/ethnicity and nocturia was more robust among women. Increased odds of nocturia were observed for both Black (OR=1.96, 95%CI:1.45, 2.65) and Hispanic women (OR=1.50, 95% CI:1.03, 2.18) after adjusting for age and SES. In multivariate analyses, increased odds of nocturia were observed for Black women (adjusted OR=1.72, 95%CI:1.27, 2.34) but not for Hispanic women (adjusted OR=1.35, 95%CI:0.93, 1.95). The association of SES and nocturia was not statistically significant in women after adjusting for BMI, diabetes, depression, and LUTS medications and diuretics use. The effect of SES on the race/ethnicity and nocturia association is illustrated in Figure 4, where attenuation in the association between race/ethnicity and nocturia is observed among men, especially in Hispanic men. The effect of SES is less pronounced among women, especially among Black women, where the association remains significant in multivariate analyses.

Discussion

Results from the BACH study show higher prevalence of nocturia among Black and Hispanic participants in both men and women. Socioeconomic status (SES) accounts for part of the race/ethnic disparities in the prevalence of nocturia. Compared to White men, the increased odds of nocturia was attenuated in Black men and disappeared in Hispanic men after accounting for differences in SES. The increased odds of nocturia remained significant for men of low SES. The association between race/ethnicity and nocturia was more robust in women. Increased odds of nocturia were observed among Black women compared to White women after adjusting for SES differences and comorbid conditions such as diabetes, depression, and obesity. Increased odds of nocturia were attenuated in Hispanic after adjusting for comorbid conditions.

Previous reports from the BACH study have reported race/ethnic disparities in prevalence of nocturia,[4] and the association of nocturia with chronic illnesses such as diabetes, hypertension, and heart disease.[4, 5] The results from the present study suggest that factors that may account for race/ethnic disparities may be different for men and women. Among men, differences were attenuated primarily by adjusting for SES, especially for Hispanic men, while the effect of comorbidities on the race/ethnicity and nocturia association was less pronounced, especially in Hispanic men (Figure 4). Among women, attenuation of the race/ethnicity and nocturia association was observed primarily after adjusting for comorbid conditions (diabetes, depression), BMI, and medication use, while the effect of SES was not as evident as in men. Differences in obesity, physical activity, and diuretics use may explain part of the observed gender difference. Overall, rates of obesity were higher in women (38.1%) compared to men (32.7%) while physical activity levels were higher in men (25.8% reporting high activity) compared to women (18.5% reporting high activity levels). Additionally, reported use of diuretics was higher in women (13.8%) compared to men (8.1%). These results are consistent with previous studies of risk factors associated with nocturia. Obesity has been associated with nocturia in both men and women in a large, population-based study conducted in Finland.[6] Similar to results presented in this study, the association of obesity and nocturia was stronger among women. Data from the National Overactive Bladder Evaluation survey has shown an association of nocturia with diabetes, congestive heart failure.[3] In a survey of older adults (60 yeas and older), hypertension and diuretic use were associated with nocturia while diabetes was not.[19]

Strengths of the BACH study include a community-based random sample across a wide age range (30-79), inclusion of large numbers of minority participants representative of Black and Hispanic populations, and a wide range of covariates including sociodemographic, medication use, lifestyle, and health variables, which can be adjusted for in the analysis. Although history of comorbid conditions was assessed by self-report with the potential for reporting and/or recall bias, previous research has demonstrated the reliability and validity of self-report for heart disease, diabetes, and hypertension.[20] The BACH study was limited geographically to the Boston area. However, comparison of sociodemographic and health-related variables from BACH with other large regional (Boston Behavioral Risk Factor Surveillance System) and national (National Health Interview Survey) surveys have shown that the BACH estimates are comparable to national trends on key health related variables.

In summary, socioeconomic status accounts for part of the race/ethnic disparities in prevalence of nocturia. Overall, the effect of SES was more pronounced among men and among Hispanic participants, while differences in prevalence of nocturia remained significant for Black men and women. These results motivate investigation of SES related factors, such as access to health care, medication use, and environmental or occupational health, as determinants of nocturia, especially among Hispanic men and women.

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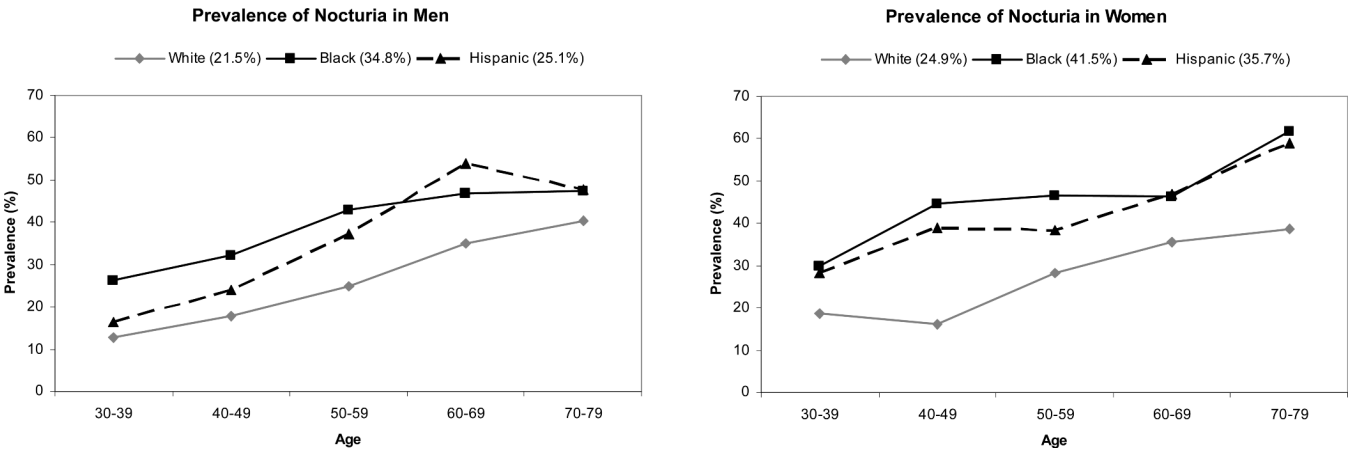
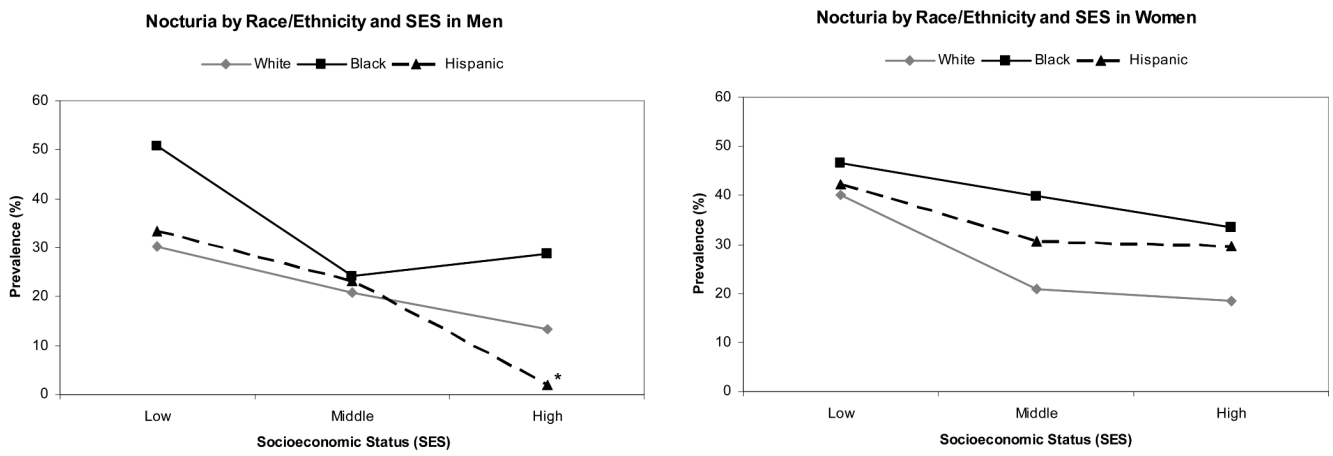


Figure 1.
Age trends in nocturia prevalence by race/ethnicity and gender



*Small observed numbers in the High SES category for Hispanic men:
3 cases of nocturia among 41 Hispanic men of high SES

Figure 2.
Age-adjusted prevalence of nocturia by socioeconomic status (SES) and race/ethnicity.

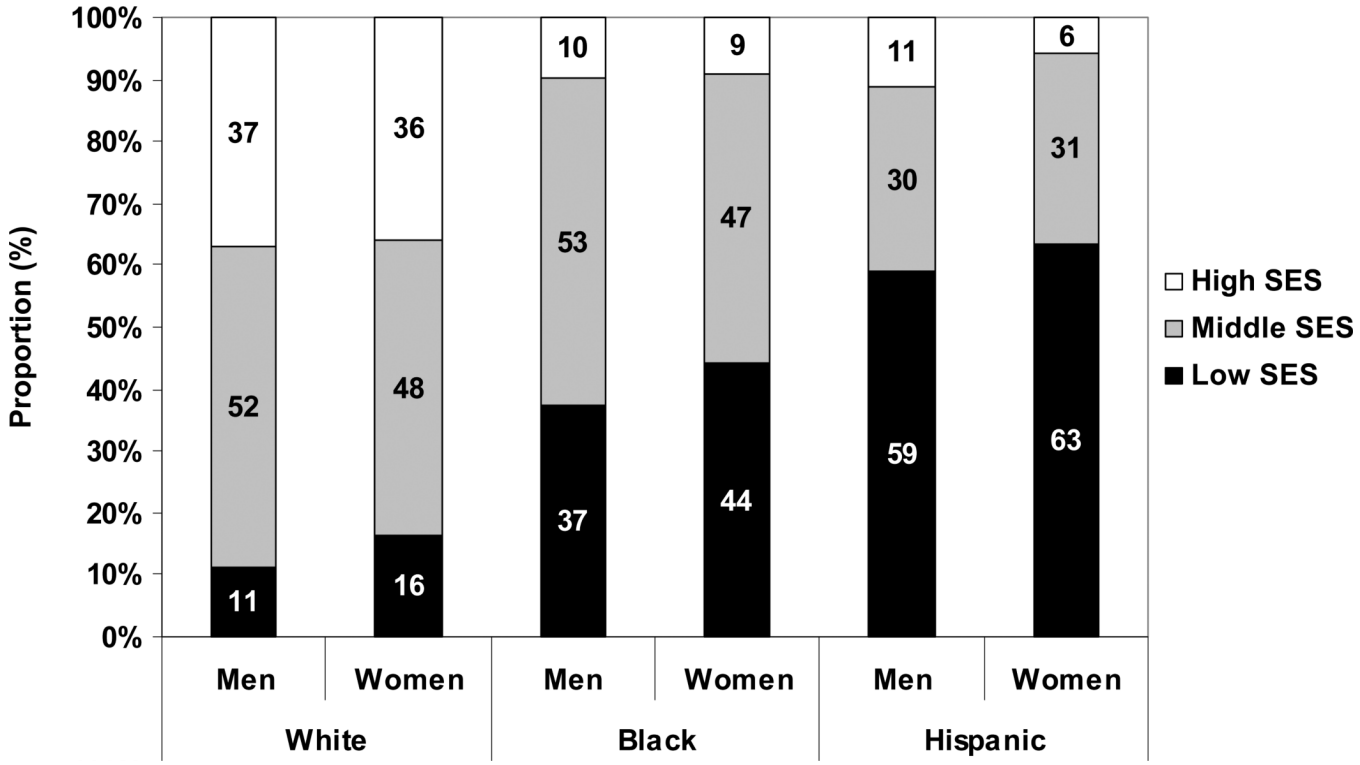


Figure 3.
Race/ethnicity and socioeconomic status (SES).

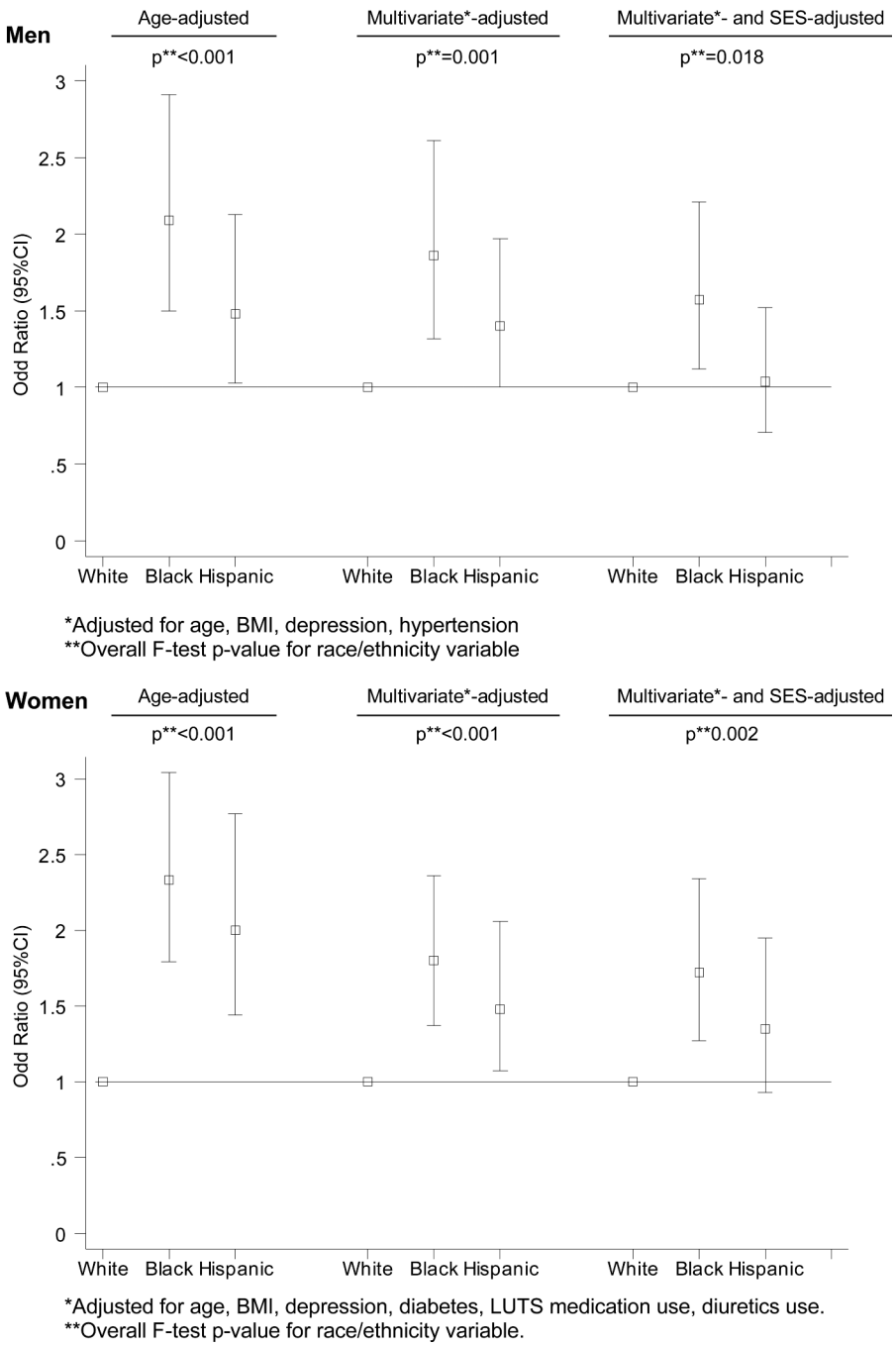


Figure 4.

Association of race/ethnicity and nocturia before and after adjusting for socioeconomic status (SES).

Table1

Characteristics of the analysis sample overall and by gender. N (weighted percentages)

		Overall	Men	Women	p-value*
Nocturia		1870 (28.4)	683 (25.3)	1187 (31.3)	0.003
Age	30-39	1407 (35.2)	615 (37.2)	792 (33.5)	0.041
	40-49	1496 (25.1)	659 (25.8)	837 (24.4)	
	50-59	1287 (18.1)	510 (17.8)	777 (18.4)	
	60-69	845 (13.3)	329 (11.3)	516 (15.1)	
	70-79	466 (8.2)	188 (7.8)	278 (8.6)	
Race/ethnicity	White	1859 (59.2)	835 (61.9)	1024 (56.8)	0.024
	Black	1765 (27.6)	700 (25.1)	1065 (29.9)	
	Hispanic	1877 (13.2)	766 (13.0)	1111 (13.3)	
Socioeconomic Status (SES)	Low	2563 (27.7)	970 (24.3)	1593 (30.8)	<0.001
	Middle	2153 (47.1)	954 (49.0)	1199 (45.3)	
	High	785 (25.2)	377 (26.7)	408 (23.9)	
Body Mass Index (kg/m^2)	<25.0	1349 (30.1)	596 (26.6)	753 (33.3)	<0.001
	25.0-29.0	1876 (34.4)	905 (40.7)	972 (28.6)	
	≥30.0	2276 (35.5)	801 (32.7)	1476 (38.1)	
Physical Activity (PASE)	Low <100)	1885 (27.3)	694 (26.8)	1191 (27.8)	<0.001
	Moderate (200-250)	2643 (50.7)	1069 (47.4)	1575 (53.6)	
	High(>250)	972 (22.0)	537 (25.8)	434 (18.5)	
Smoking	Never	2665 (47.8)	964 (45.1)	1702 (50.2)	0.088
	Former	1438 (27.9)	662 (28.7)	776 (27.2)	
	Current	1398 (24.3)	675 (26.2)	722 (22.6)	
Alcohol Consumption (drinks per day)	None	2459 (34.9)	800 (27.5)	1660 (41.7)	<0.001
	<1/day	2024 (41.2)	815 (38.9)	1208 (43.2)	
	1-2.9/day	702 (18.2)	434 (24.0)	268 (12.9)	
	≥3/day	316 (5.7)	252 (9.6)	64 (2.2)	
Heart disease		552 (9.0)	248 (10.2)	303 (7.9)	0.051
Type 1 or 2 Diabetes		747 (9.5)	298 (9.3)	449 (9.6)	0.818
Hypertension		1860 (27.3)	735 (26.2)	1125 (28.3)	0.221
Depression		1220 (17.2)	391 (14.0)	829 (20.1)	<0.001
Medication use	LUTS**	209 (3.1)	60 (2.1)	149 (3.9)	0.005
	Diuretics***	819 (11.1)	256 (8.1)	563 (13.8)	<0.001

*X^2 p-value for comparisons by gender

**Lower Urinary Tract Symptoms (LUTS) medications: Oxybutinin, Tolterodine Tartrate, Detrol, Propantheline, Hyoscyamine Sulfate, Doxasozin, Terazosin, Prazosin, Alfuzosin, Tamsulosin, Finasteride (no reported use of darifenacin, trospium, solifenacin, or dutasteride in BACH).

***Thiazide diuretics, loop diuretics, and other diuretics.

Table 2

Association of potential confounders with nocturia. Age-adjusted odds ratios and 95% confidence intervals.

		Men	Women
Body Mass Index (kg/m^2)	<25.0	1.00	1.00
	25.0-29.0	1.16 (0.81, 1.65)	1.47 (1.05, 2.07)
	≥30.0	1.41 (0.99, 2.01)	2.73 (2.02, 3.69)
Physical Activity (PASE)	Low <100)	1.00	1.00
	Moderate (200-250)	0.61 (0.42, 0.91)	0.74 (0.56, 0.91)
	High(>250)	0.54 (0.33, 0.89)	0.52 (0.34, 0.79)
Smoking	Never	1.00	1.00
	Former	0.83 (0.59, 1.17)	1.08 (0.80, 1.46)
	Current	1.13 (0.96, 1.67)	1.24 (0.92, 0.79)
Alcohol (drinks per day)	None	1.00	1.00
	<1/day	0.86 (0.56, 1.28)	0.72 (0.54, 094)
	1-2.9/day	0.63 (0.43, 0.91)	0.49 (0.31, 0.76)
	≥3/day	0.74 (0.47, 1.18)	0.77 (0.32, 1.85)
Heart disease		1.93 (1.25, 2.96)	1.50 (1.00, 2.77)
Diabetes		1.71 (1.12, 2.60)	2.73 (1.87, 3.98)
Hypertension		1.82 (1.33, 2.50)	1.66 (1.30, 2.11)
Depression		3.40 (2.17, 5.33)	2.45 (1.76, 3.40)
Medication use	LUTS*	2.15 (0.97, 4.78)	3.11 (1.81. 5.40)
	Diuretics**	2.11 (1.43, 3.82)	1.94 (1.44, 2.80)

* Lower Urinary Tract Symptoms (LUTS) medications: Oxybutinin, Tolterodine Tartrate, Detrol, Propantheline, Hyoscyamine Sulfate, Doxasozin, Terazosin, Prazosin, Alfuzosin, Tamsulosin, Finasteride (no reported use of darifenacin, trospium, solifenacin, or dutasteride in BACH).

** Thiazides diuretics, loop diuretics, and other diuretics.

Table 3

Associations of race/ethnicity and SES with nocturia. Adjusted odds ratios and 95% confidence intervals.

Men		Adjusted for		
		Age	**Age and Race/ethnicity or SES***	**Age, BMI, HBP, Depression****
Race/ethnicity	White	1.00	1.00	1.00
	Black	2.09 (1.50, 2.91)	1.65 (1.17, 2.33)	1.57 (1.12, 2.21)
	Hispanic	1.48 (1.03, 2.13)	0.99 (0.66, 1.49)	1.04 (0.71, 1.52)
SES	Low	2.02 (1.43, 2.85)	1.91 (1.36, 2.68)	1.69 (1.20, 2.38)
	Middle	1.00	1.00	1.00
	High	0.71 (0.49, 1.04)	0.78 (0.52, 1.17)	0.89 (0.60, 1.32)

Women		**Age**	**Age and Race/ethnicity or SES**	**Age, BMI, Diabetes, Depression, LUTS medications, Diuretics****
Race/ethnicity	White	1.00	1.00	1.00
	Black	2.33 (1.79, 3.04)	1.96 (1.45, 2.65)	1.72 (1.27, 2.34)
	Hispanic	2.00 (1.44, 2.77)	1.50 (1.03, 2.18)	1.35 (0.93, 1.95)
SES	Low	1.91 (1.45, 2.53)	1.65 (1.21. 2.25)	1.33 (0.98, 1.81)
	Middle	1.00	1.00	1.00
	High	0.76, 0.52, 1.09)	0.90 (0.61, 1.32)	1.11 (0.75, 1.67)

* OR for race/ethnicity adjusted for age and SES OR for SES adjusted for age and race/ethnicity

** Model for men includes race/ethnicity, SES, age, BMI, hypertension, depression Model for women includes race/ethnicity, SES, age, BMI, diabetes, depression, LUTS medications use, Diuretics use.