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Keywords

African American men; Health surveys; Lower urinary tract symptoms; Older African Americans; Symptoms; Urinary organs – Diseases

Cover Page Footnote

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Abstract

Lack of population-based data on lower urinary tract symptoms (LUTS) among African American men represents a significant gap in understanding. This study examined LUTS among a racially oversampled, mixed urban/rural, elderly cohort of African Americans and whites in the South to discern whether racial differences exist in the prevalence, severity, and associated risk factors of LUTS. Longitudinal analyses using generalized estimating equations (GEE) were conducted on the 1994–1998 EPESE dataset for 5 North Carolina counties. In 1994, the analytic cohort included 482 African Americans and 407 whites; by 1998, 249 and 222, respectively. In 1994, 49.4% of African Americans reported LUTS compared to 56.8% of whites. By 1998, percentages increased to 60.6% and 70.3%, respectively. LUTS was associated with being African American, married, having poor health status and disability, delaying care quite often, being in a nursing home or in a rural area, and having a male physician.

Key Words: African American men, lower urinary tract symptoms

Introduction

Lower urinary tract symptoms (LUTS) are exceedingly common in aging men and have a major impact on health-related quality of life and health care costs (Wei et al. 2001; Barry 1990). Urinary symptoms that include frequency, urgency, weak urinary stream, dysuria, or hematuria are associated with aging and can be symptomatic of prostatism, prostate cancer, and most commonly, benign prostatic hyperplasia (BPH, non-malignant enlargement of the prostate) (Weinrich et al. 1998; Hales 2003; Hunter et al. 1996; Girman et al. 1995; Sagner et al. 1995; Tsukamoto et

al. 1995; Hiatt et al. 1994; Moon et al. 1994; Chute et al. 1993; Guess et al. 1990). In the US, approximately 195,000 prostatectomies, the majority of which were trans-urethral, were performed annually for BPH in 2002, making surgery for this condition the second most common major operation for Medicare-aged men (after cataract extraction) (DeFrances & Hall 2002).

Few population-based studies of LUTS reporting in men have been performed. Of these studies, most have been restricted to predominately majority populations. As such, their observations may not be generalizable to African American men (Wei et al. 2001). Further, what we know about African Americans and the reporting of LUTS is limited, as the only two prior studies with significant African American cohorts have been conducted in close-proximity, urban, northern cities. One of the first large studies detailing the reporting of LUTS in a sample of African American men (Genesee County, (Flint) Michigan) observed that 39.6 percent of participants had moderate to severe LUTS and almost 35 percent reported being significantly bothered by these symptoms (Wei et al. 2001). This rate is similar to the other African American community-based cohort in the Detroit Education and Early Detection (DEED) study in which 43 percent self-reported urinary symptoms (Weinrich et al. 1998; Powell et al.; 1997).

In contrast, the Olmsted County (Minnesota) Study of urinary symptoms among white men has provided some of the most important and fundamental information on the reporting of LUTS (Wei et al. 2001; Girman et al. 1994). The Olmsted County Study suggests that whites have lower rates of LUTS than African Americans, approximately 33 percent of their sample have moderate to severe obstructive urinary symptoms. Moreover, the study found that the solicitation of medical care for urinary symptoms among white males has been demonstrated to be a function of symptom severity (Jacobsen et al. 1999).

While the findings of the Flint and DEED studies do provide insight into the magnitude of LUTS reporting in African American men, the lack of community- and population-based symptom data on African American men presents a significant gap in our knowledge of this condition. Thus, an investigation into the prevalence and severity of this condition in African American men is required for various reasons. Additional community- and population-based studies of LUTS that include both white and African American men may provide the basis for a better understanding of potential racial differences in this condition. As a result, health care providers may be able to better interpret symptoms and improve the management of LUTS in African American men with additional knowledge.

Methods

Sample

This study uses a dataset that profiles a racially diverse sample cohort of community dwelling elders and their physicians over a 12-year period in a multi-county area of North Carolina. These data were developed from two sources: (1) the Piedmont Health Survey of the Elderly (PHSE), a series of four in-person community surveys conducted in 1986, 1990, 1994, and 1998 on a random sample of elders living in five North Carolina counties, as part of a National Institute of Aging (NIA) sponsored multi-site study, called Established Populations for the Epidemiological Study of the Elderly (EPESE), and (2) the North Carolina Health Professions Data system, yearly physician re-licensure surveys from the North Carolina Medical Board from 1986 through 1998. Physicians named by respondents in the first survey were matched to NC license numbers; corresponding information from an anonymous licensure file was appended to the survey data.

The PHSE assessed health and well-being of 5,226 eligible elderly persons to identify predictors of mortality and morbidity in a community-dwelling population of persons older than 65 years of age (Blazer et al. 1995). Baseline surveys were conducted by trained personnel who collected data on 4,162 elders (about 80 percent response) who received 90-minute, in-home interviews during 1986 and 1987. No additional persons were added to this initial cohort, but the initial cohort was followed up with three in-person surveys at approximately four-year intervals, (1990, 1994, and 1998) and contact was maintained with the sample through brief annual telephone surveys in the intermittent years. Subjects were not followed if they moved to a community sufficiently distant from the five-county study area as to preclude in-person surveys.

Only the male respondents from the 1994 (n=889) and 1998 (n=471) waves of the PHSE/EPESE data will be used as these waves contain the relevant variables pertaining to LUTS. In 1994, the analytic cohort included 482 African Americans and 407 whites; by 1998, 249 African Americans and 222 whites.

Measures

Independent Variables

Physician Characteristics. A usual physician identified by elders at the time of the interview was matched to data obtained from the North Carolina Health Professions Data System files and rosters of physicians employed in local settings. Socio-demographic data (age and gender)

and professional characteristics (self-reported primary care specialty—i.e., family practice, general practice, internal medicine, or geriatrics, board certification status, years since medical school graduation, type of practice setting, and practice site) were coded for physicians.

Elder Characteristics. Socio-demographic characteristics obtained on interview included race, age, gender, education, marital status, employment status, annual income, Medicaid and Medi-gap insurance, rural or urban residence, nursing home status, whether seen in a public or private facility, proximity to the care facility, and whether or not the elder had a named physician. Indicators of health behavior included whether the elder used alcohol, smoked, or delayed seeking health care.

Distinct measures captured subjective and objective aspects of health and functioning. Self-reported health status, measured by the question "Overall, how would you rate your health," was coded (1 = excellent/good, 2 = fair, 3 = poor). The presence of chronic illnesses including hypertension, diabetes, heart disease, stroke, cancer, activities of daily living (ADL) and body mass index (BMI) were measured.

Dependent Variables

This study uses a modified AUA Symptom Index, which indicates problems with urination and urinary blockage (Madsen & Bruskewitz 1995; Barry et al. 1992) to determine LUTS (Figure 1). AUA Symptom Index was modified because our dataset did not include all components of the scale (excluded nocturia and incomplete emptying). Our index included: (a) "urinated again shortly after finished urinating" (frequency), and (b) "difficulty holding urine" (urgency), which denote irritative symptoms; and (c) "push or strain to urinate" (straining), (d) "stopped and started again several times when urinating" (intermittency), and (e) "dribbled urine after initial urination period" (weak stream), which denote obstructive symptoms. Severity level is based on a 5-point Likert Scale where 1 = "not at all," 2 = "a few times," 3 = "fairly often," 4 = "usually," and 5 = "always," for each of the symptoms. A severity index score was calculated as the sum of the severity levels of the 5 symptoms. The symptom levels were then categorized as mild symptoms (1–7), moderate (8–13), and severe (14–25). An additional measure for urinary symptoms was also used. This measure identified whether the elder had urinary symptoms (yes/no) based on having a severity score greater than 5.

Analysis

The most important analyses conducted aimed to identify whether there are racial differences in the reporting of LUTS, its severity, and

Figure 1. AUA Symptom Score[a] vs. Modified AUA symptom score

Category	Original Question	EPESE Survey Question
Incomplete Emptying[b]	Over the past month, how often have you had a sensation of not emptying your bladder completely after you finished urinating?	Not Measured
Frequency[b]	Over the past month, how often have you had to urinate again less than 2 hours after you finished urinating?	Over the past month, how often have you had to urinate again shortly after you finish urinating?
Intermittency[b]	Over the past month, how often have you found that you stopped and started again several times when you urinated?	Over the past month, how often have you found you stopped and started again several times when you urinated?
Urgency[d]	Over the past month, how often have you found it difficult to postpone urination?	How often do you have difficulty holding your urine until you can get to a toilet?
Weak-stream[b]	Over the past month, how often have you had a weak stream?	Over the past month how often have you dribbled urine after you thought you were finished urinating?
Straining[b]	Over the past month, how often have you had to push or strain to begin urination?	Over the past month how often have you had to push or strain to begin urination?
Nocturia[c]	Over the past month or so, how many times did you get up to urinate from the time you went to bed until the time you got up in the morning?	Not Measured
Symptom Scoring Scale	Mild symptoms (0-7), Moderate (8-19), and Severe (20-35).	Mild symptoms (1-7), Moderate (8-13), and Severe (14-25).

[a] Madsen FA, Bruskewitz RC. 1995. Clinical Manifestations of Benign Prostatic Hyperplasia. *Urol Clin North Am* 22:291–298.

[b] Choices: Not at all (0); Less than 1 time in 5 (1); Less than half the time (2); About half the time (3); More than half the time (4); almost always (5)

[c] Choices: Not at all (1) ;A few times (2); Fairly Often (3); Usually (4); Always (5)

[d] Choices: Never (1); Hardly Ever (2); Some of the time (3); Most of the time (4); All the time (5)

associated risk factors among a racially over-sampled urban and rural cohort of elderly African Americans and whites. Fisher's exact tests and generalized estimating equations (GEE) were used to determine effects over time, and t-tests were used for comparisons between African American and white elders. For each repeated binary outcome, a multivariable linear model was fit using generalized estimating equations (GEE), allowing assessment of the impact of race across time for each analysis (Diggle, Liang, and Zegler 1994).

For each GEE analysis exploring the relationship between elder and health status, lifestyle, and healthcare characteristics and race over time (Tables 1, 2, and 3) or the relationship of selected dependent variables and race over time (Table 4), an initial model tested associations between each dependent variable and race, time, and time by race interaction. A significant interaction term was interpreted as possibly supporting a differential effect of race across time. If the interaction was non-significant, then the interaction was removed and a reduced model was fit with the aim of assessing the main effect of race across time.

Multivariate models using GEE were constructed using backward elimination to identify the significant risk factors and best predictors of urinary symptoms and severity score at an inclusion level of $p = 0.20$ (Table 5). Reducing the model allows one to obtain a parsimonious set of explanatory variables for assessing the relationship between risk factors and the outcome. Only results from final reduced models are reported here. SAS Version 9.1 software (SAS Institute, Cary, NC) was employed for all analyses.

Results

Table 1 displays the distribution of elder characteristics by race and year. Overall, the cohort declined from 889 in 1994 to 471 in 1998. There were 482 African American and 407 white elders in the 1994 cohort, while 249 and 222 remained in the 1998 cohort, respectively. In 1994, African American elders in comparison to white elders, on average, were older ($p=0.004$), less educated ($p<0.001$), less likely to be married ($p<0.001$), had less income ($p<0.001$), and were more likely to live in a rural area ($p<0.001$).

In the 1994 cohort, the health status and lifestyle behavior of the elders indicates that African American elders in comparison to white elders were more likely to have one or more ADL limitation ($p=0.018$), as well as Stage 2 hypertension ($p=0.032$) and to smoke ($p=0.003$), but were less likely to have cancer ($p<0.001$), and heart conditions ($p=0.017$) (Table 2).

Moreover, African American elders in comparison to white elders were less likely to have male physicians ($p<0.001$), and more likely to utilize Medicaid insurance ($p<0.001$) rather than Medi-gap insurance ($p<0.001$), to have physicians 65 years old and older ($p<0.001$), to receive care in a public clinic/hospital or ER ($p<0.001$) and to not have a physician at all ($p=0.014$) (Table 3).

Table 1. Distribution of Elder Characteristics by Race and Year

CHARACTERISTICS	1994 (N=889) AFRICAN AMERICAN ELDER	1994 (N=889) WHITE ELDER	1998 (N=471) AFRICAN AMERICAN ELDER	1998 (N=471) WHITE ELDER	PVALUE[a]	PVALUE[b]	PVALUE[c]
N	482	407	249	222			
Age, mean(SD)	78.0(5.8)	76.9(5.3)	80.7(4.5)	80.0(4.1)	0.004	0.103	0.005
Age Categories:							
65-74	165(34.2)	179(44.0)	0(0.0)	0(0.0)	0.004	0.147	[d]
75-84	241(50.0)	185(45.5)	199(79.9)	189(85.1)			
85+	76(15.8)	43(10.6)	50(20.1)	33(14.9)			
Mean Years of Education	7.0(4.5)	10.1(4.0)	7.4(4.5)	10.2(4.0)	<0.001	<0.001	<0.001
Married	243(50.4)	263(64.6)	141(56.6)	155(69.8)	<0.001	0.005	<0.001
Currently Working	61(12.7)	50(12.3)	31(12.4)	25(11.3)	0.758	0.671	0.714
Income:							
$0-$3,999	23(4.8)	5(1.2)	7(2.8)	4(1.8)	<0.001	<0.001	<0.001
$5,000-$6,999	97(20.1)	28(6.9)	49(19.7)	15(6.8)			
$7,000-$14,999	166(34.4)	99(24.3)	102(41.0)	43(19.4)			
≥ $15,000	69(14.3)	184(45.2)	52(20.9)	126(56.8)			
Ever in a Nursing Home	41(8.5)	33(8.1)	23(9.2)	19(8.6)	0.903	0.872	0.963
Respondent Lives in Rural Area	291(60.4)	198(48.6)	163(65.5)	114(51.4)	<0.001	0.002	<0.001

[a] P-values from difference between African American and white elder characteristics in 1994 and are obtained from Fisher's exact tests and t-tests (for means).

[b] P-values from difference between African American and white elder characteristics in 1998 and are obtained from Fisher's exact tests and t-tests (for means).

[c] P-values from difference between African American and white elder characteristics over time and are obtained from generalized estimating equations.

[d] P-value indicates that there is a differential effect over time (significant interaction between race and time) for age categories (p=0.026)

By 1998, many of the racial differences in elder characteristics within the 1994 cohort remained, except for elder age, having heart conditions and hypertension, smoking, and having a male physician, which were no longer significantly different by race. New racial differences in other characteristics within the 1994 cohort emerged in 1998. African American elders were more likely to give a poorer self-report of health status (p=0.024), have diabetes (p=0.006), and not live in the same county as the doctor practices (p=0.029). Using GEE analysis (last column of Table 3), most of the differences in elder characteristics persisted over time between African Americans and whites, except for diabetes, stroke, smoking status, whether the elder lived in the same county as the doctor practiced, physician age, and physician board certification. A significant interaction between race and time existed for elder income, hypertension, and physician medical experience—i.e., the effect of race was different in 1994 and 1998 for elder age, hypertension, and physician medical experience.

Table 2. Distribution of Health Status and Lifestyle Behavior by Race and Year

CHARACTERISTICS	1994 (N=889) AFRICAN AMERICAN ELDER	1994 (N=889) WHITE ELDER	1998 (N=417) AFRICAN AMERICAN ELDER	1998 (N=417) WHITE ELDER	PVALUE[a]	PVALUE[b]	PVALUE[c]
N	482	407	249	222			
SELF-REPORTED HEALTH STATUS:							
Excellent or Good	208(43.2)	216(53.1)	121(48.6)	140(63.1)	0.051	0.024	0.003
Fair	126(26.1)	92(22.6)	70(28.1)	59(26.6)			
Poor	30(6.2)	19(4.7)	23(9.2)	10(4.5)			
HEALTH CONDITIONS:							
Stroke	54(11.2)	60(14.7)	39(15.7)	31(14.0)	0.131	0.697	0.227
Cancer	42(8.7)	105(25.8)	42(16.9)	73(32.9)	<0.001	<0.001	<0.001
Diabetes	106(22.0)	84(20.6)	76(30.5)	43(19.4)	0.681	0.006	0.290
Heart Condition	87(18.0)	101(24.8)	46(18.5)	46(20.7)	0.017	0.562	0.023
Hypertension							
Normal Blood Pressure	61(12.7)	52(12.8)	46(18.5)	32(14.4)	0.032	0.248	[d]
Pre-Hypertension	148(30.7)	122(30.0)	90(36.1)	67(30.2)			
Stage 1 Hypertension	96(19.9)	110(27.0)	69(27.7)	76(34.2)			
Stage 2 Hypertension	97(20.1)	59(14.5)	39(15.7)	38(17.1)			
One or More ADL Limitation[e]	80(16.6)	44(10.8)	72(28.9)	37(16.7)	0.018	0.002	0.001
Body Mass Index (BMI), mean(SD)	26.4(4.4)	25.7(4.2)	26.4(4.7)	25.8(4.7)	0.057	0.220	0.065
LIFESTYLE CHARACTERISTICS:							
Puts Off Care Quite Often	27(5.6)	19(4.7)	13(5.2)	10(4.5)	0.448	0.669	0.370
Alcohol							
Non-Drinker	277(57.5)	226(55.5)	175(70.3)	152(68.5)	0.103	0.076	0.016
Moderate Drinker (1-28 Drinks/ Month)	84(17.4)	92(22.6)	32(12.9)	48(21.6)			
Heavy Drinker (29 or More Drinks/Month)	5(1.0)	9(2.2)	7(2.8)	9(4.1)			
Smoking Status							
Non-Smoker	342(71.0)	297(73.0)	217(87.1)	198(89.2)	0.003	0.185	0.197
Moderate Smoker (1-9 Cigarettes/ Day)	33(6.8)	8(2.0)	15(6.0)	6(2.7)			
Heavy Smoker (10 Or More Cigarettes/Day)	50(10.4)	42(10.3)	16(6.4)	18(8.1)			

[a] P-values from difference between African American and white elder characteristics in 1994 and are obtained from Fisher's exact tests and t-tests(for means).
[b] P-values from difference between African American and white elder characteristics in 1998 and are obtained from Fisher's exact tests and t-tests(for means).
[c] P-values from difference between African American and white elder characteristics over time and are obtained from generalized estimating equations.
[d] P-value indicates that there is a differential effect over time (significant interaction between race and time) for Blood Hypertension level (p=0.038)
[e] ADL, Activities of Daily Living.

Table 3. Distribution of Healthcare and Quality of Care Characteristics by Race and Year

CHARACTERISTICS	1994 (N=889) AFRICAN AMERICAN ELDER	1994 (N=889) WHITE ELDER	1998 (N=471) AFRICAN AMERICAN ELDER	1998 (N=471) WHITE ELDER	PVALUE[a]	PVALUE[b]	PVALUE[c]
N	482	407	249	222			
HEALTH STATUS CHARACTERISTICS							
Medicaid Insurance	88(18.3)	20(4.9)	60(24.1)	12(5.4)	<0.001	<0.001	<0.001
Medi-gap Insurance	140(29.0)	263(64.6)	80(32.1)	174(78.4)	<0.001	<0.001	<0.001
PHYSICIAN CHARACTERISTICS							
Male	250(51.9)	283(69.5)	161(64.7)	173(77.9)	<0.001	0.146	<0.001
MD Age, mean(SD)	51.8(12.0)	50.8(11.0)	53.5(11.5)	50.5(9.7)	0.293	0.007	0.059
Physician Age Categories							
65+	70(14.5)	37(9.1)	43(17.3)	18(8.1)	<0.001	<0.001	<0.001
36-64	230(47.7)	257(63.1)	137(55.0)	170(76.6)	0.002	<0.001	<0.001
35 Or Less	17(3.5)	16(3.9)	4(1.6)	2(0.9)	1.000	0.443	0.653
Years Since Medical School Graduation, mean(SD)	24.2(11.8)	24.4(11.8)	26.2(11.6)	24.1(10.5)	0.845	0.061	[d]
Primary Specialty: FP, GP, IM, Geriatrics[e]	275(57.1)	251(61.7)	154(61.8)	149(67.1)	0.363	0.366	0.324
Board Certified in FP, GP, IM, Geriatrics[e]	183(38.0)	177(43.5)	100(40.2)	90(40.5)	0.306	0.446	0.428
Board Certified in Other Specialty	29(6.0)	40(9.8)	19(7.6)	21(9.5)			
QUALITY OF CARE							
Lives in Same County As MD Practices	240(49.8)	241(59.2)	125(50.2)	147(66.2)	0.207	0.029	0.067
No Named Physician in 1994 or 1998 or Both Years	141(29.3)	89(21.9)	44(17.7)	23(10.4)	0.014	0.025	0.004
Receives Care in Private Clinic/Hospital	247(51.2)	303(74.4)	182(73.1)	200(90.1)	<0.001	<0.001	<0.001
Receives Care in Public Clinic/Hospital or ER	152(31.5)	36(8.8)	60(24.1)	17(7.7)	<0.001	<0.001	<0.001

[a] P-values from differences between African American elder and white elder characteristics in 1994 and are obtained from Fisher's exact tests and t-tests (for means).

[b] P-values from differences between African American elder and white elder characteristics in 1998 and are obtained from Fisher's exact tests and t-tests (for means).

[c] P-values from differences between African American elder and white elder characteristics over time and are obtained from generalized estimating equations.

[d] P-values indicate that there is a differential effect over time (significant interaction between race and time) for Years Since Medical School Graduation (p=0.049)

[e] FP=Family Practice; GP= General Practice; IM=Internal Medicine.

Table 4 summarizes the dependent variables by race and year. In 1994, there was a significant racial difference in the percentage of elders who had urinary symptoms with African Americans having less than whites (49.4 percent vs. 56.8 percent, p=0.003). African American elders also had a lesser mean severity score than white elders (6.7 vs. 7.5, respectively, p<0.001). African American elders specifically indicated a greater urinary problem of "urgency" (p=0.002), while white elders specifically indicated that they had trouble with "intermittency" (p=0.015).

Table 4. Distribution of Dependent Variables by Race and Year

	1994 (N=889)		1998 (N=371)				
CHARACTERISTICS	AFRICAN AMERICAN ELDER	WHITE ELDER	AFRICAN AMERICAN ELDER	WHITE ELDER	PVALUE[a]	PVALUE[b]	PVALUE[c]
N	482	407	249	222			
ELDERS WITH URINARY SYMPTOMS	238(49.4)	231(56.8)	151(60.6)	156(70.3)	0.003	0.032	<0.001
SEVERITY SCORE, MEAN (SD)	6.7(3.2)	7.5(3.3)	7.0(3.1)	7.6(3.1)	<0.001	0.024	<0.001
Mildly Symptomatic (1-7)	292(60.6)	212(52.1)	164(65.9)	135(60.8)	0.046	0.445	0.024
Moderately Symptomatic (8-13)	117(24.3)	114(28.0)	73(29.3)	77(34.7)			
Severely Symptomatic(14-25)	14(2.9)	20(4.9)	11(4.4)	9(4.1)			
TYPE OF SYMPTOM	60(12.4)	61(15.0)	1(0.4)	1(0.5)			
Urgency	165(34.2)	98(24.1)	115(46.2)	85(38.3)	0.002	0.093	0.002
Straining	73(15.1)	80(19.7)	35(14.1)	40(18.0)	0.199	0.525	0.125
Frequency	109(22.6)	115(28.3)	68(27.3)	80(36.0)	0.166	0.186	0.083
Intermittency	80(16.6)	99(24.3)	46(18.5)	63(28.4)	0.015	0.058	0.004
Weak Stream	93(19.3)	104(25.6)	56(22.5)	67(30.2)	0.091	0.238	0.044

[a] P-values from differences between African American elder and white elder characteristics in 1994 and are obtained from Fisher's exact Tests and t-tests (for means).

[b] P-values from differences between African American elder and white elder characteristics in 1998 and are obtained from Fisher's exact Tests and t-tests (for means).

[c] P-values from differences between African American elder and white elder characteristics over time and are obtained from generalized estimating equations.

By 1998, LUTS among African Americans increased at a slower rate than among whites (60.6 percent vs. 70.3 percent, p=0.032). However, the racial difference in the mean severity score remained the same (p=0.024). There was no longer a racial difference in the specific conditions of "urgency" and "intermittency." The specific condition of "weak stream" emerged as significantly more likely for white elders over time (p=0.044).

Using GEE analysis (last column of Table 4), most of the differences in the dependent variables between African Americans and whites persisted over time, except straining and frequency.

Table 5 reports the final reduced model from the multivariable analysis of the presence of urinary symptoms and the severity of urinary symptoms in elders. Elders who reported urinary symptoms were less likely to have lived in a nursing home (OR=0.404; 95% CI: (0.222, 0.734)) and to live in a rural area (OR=0.694; 95% CI: (0.509, 0.947)), but more likely to have poorer self-reported health (OR=2.153; 95% CI: (1.263, 3.673)). No other variables are significantly ($p<0.05$) associated with presentation of urinary symptoms. However, the reporting of urinary symptoms was marginally more likely ($p<0.10$) to have one or more ADL limitation.

Table 5. Odds Ratio for the Presence of Urinary Symptoms and Severity Score over a 4-Year Period, Piedmont Health Survey of the Elderly, 1994–1998

	URINARY SYMPTOMS		SEVERITY SCORE	
ELDER CHARACTERISTICS	OR[a]	95% CI[a]	OR[a]	95%CI[a]
Year	1.012	(0.949, 1.079)	1.043	(0.953, 1.140)
African American	0.828	(0.609, 1.126)	0.519[b]	(0.323, 0.834)
Married			0.553[b]	(0.308, 0.991)
Income Less than $15,000			1.349	(0.866, 2.102)
Medicaid Insurance	0.761	(0.515, 1.126)		
Poor Self-Reported Health Status	2.153[b]	(1.263, 3.673)	11.28[b]	(4.097, 31.03)
One or More ADL Limitation[a]	1.472	(0.997, 2.173)	4.699[b]	(2.274, 9.711)
Cancer			1.521	(0.890, 2.602)
Heart Condition			1.560	(0.907, 2.681)
Ever in a Nursing Home	0.404[b]	(0.222, 0.734)	0.105[b]	(0.043, 0.256)
Lives in Rural Area?	0.694[b]	(0.509, 0.947)	0.397[b]	(0.257, 0.613)
Puts Off Care Quite Often	1.592	(0.909, 2.788)	3.625[b]	(1.326, 9.906)
Male Physician	0.693	(0.409, 1.177)	0.209[b]	(0.081, 0.537)
Physician Experience: Years Since Medical School Graduation			1.013	(0.996, 1.032)

[a] OR, Odds Ratio obtained from generalized estimating equations; CI, Confidence Interval; ADL, activities of daily living

[b] P-value in final reduced model <0.05

The fourth and fifth columns of Table 5 examine the severity of urinary symptoms as a continuous score, adjusted for all other effects in the final reduced model. Elders with a higher mean severity score were

more likely to have poorer self-reported health (OR=11.28; 95% CI: (4.097, 31.03)), to have one or more ADL limitation (OR=4.699; 95% CI: (2.274, 9.711)), to delay care (OR=3.625; 95% CI: (1.326, 9.906)) and less likely to have lived in a nursing home (OR=0.105; 95% CI: (0.043, 0.256)), to live in a rural area (OR= 0.397; 95% CI: (0.257, 0.613)), to be African American (OR=0.519; 95% CI: (0.323, 0.834)), to be married (OR=0.553; 95% CI: (0.308, 0.991)) or to see a male physician (OR=0.209; 95% CI: (0.081, 0.537)) than elders with lower mean severity scores. No other variables are significantly ($p<0.05$) associated with a higher mean severity score.

Tables 6A and 6B examine the censoring events in the study. There was no significant racial difference in the proportion of censoring events (Table 6A). However, when comparing African Americans who were censored to their counterparts who were not censored, they were older ($p<0.001$), less educated ($p=0.034$), not married ($p<0.001$), had a lower income ($p=0.004$), had Medicaid Insurance ($p=0.007$), lived in a nursing home ($p=0.003$) and lived in a rural area ($p=0.020$) (Table 6B). Whites who were censored compared to whites who were not censored, were older ($p<0.001$), not married ($p=0.010$), not working ($p<0.001$), had a lower income ($p<0.001$), had Medicaid insurance ($p=0.030$), and had lived in a nursing home ($p<0.001$). These differences observed within the racial groups may be due to the larger proportion of missing data among the censored sample.

Table 6A. Censoring Events by Race

	AFRICAN AMERICAN	WHITE	PVALUE
BASELINE SAMPLE (1994)	482	407	
Remaining in 1998	249(51.7)	222(54.5)	0.418[a]
Censored	233(48.3)	185(45.5)	
Lost to follow-up	16(3.3)	14(3.4)	0.850[b]
Died 1998 or earlier	217(45.0)	171(42.0)	

[a] Fisher's exact test for difference in censoring by race.

[b] Fisher's exact test for difference in lost to follow-up (vs. death) by race.

Discussion

This study examined the reporting of LUTS among a racially oversampled, mixed urban/rural, elderly cohort of African Americans and whites in the South. This study controlled for elder and physician characteristics as well as indicators of health status, lifestyle behavior, and quality of care over time. No study has examined, longitudinally, the

Table 6B. Baseline Demographics by Censoring Events and Race

	AFRICAN AMERICAN ELDER			WHITE ELDER		
CHARACTERISTICS	UNCENSORED	CENSORED	P-VALUE[a]	UNCENSORED	CENSORED	P-VALUE[b]
N	249	233		222	185	
Age, mean (SD)	76.5(4.5)	79.7(6.6)	<0.001	75.7(4.1)	78.4(6.1)	<0.001
65-74	105(42.2)	60(25.8)		113(50.9)	66(35.7)	
75-84	127(51.0)	114(48.9)		99(44.6)	86(46.5)	
85+	17(6.8)	59(25.3)		10(4.5)	33(17.8)	
Years of Education, mean (SD)	7.4(4.5)	6.6(4.4)	0.034	10.2(4.0)	9.9(4.0)	0.380
Married	160(64.3)	83(35.6)	<0.001	173(77.9)	90(48.6)	0.010
Missing	17(6.8)	72(30.9)		12(5.4)	56(30.3)	
Currently Working	52(20.9)	9(3.9)	<0.001	43(19.4)	7(3.8)	<0.001
Missing	10(4.0)	71(30.5)		2(0.9)	57(30.8)	
Income						
$0-$3,999	9(3.6)	14(6.0)	0.004	2(0.9)	3(1.6)	<0.001
$5,000-$6,999	57(22.9)	40(17.2)		9(4.1)	19(10.3)	
$7,000-$14,999	106(42.6)	60(25.8)		61(27.5)	38(20.5)	
≥ $15,000	54(21.7)	15(6.4)		133(59.9)	51(27.6)	
Missing	23(9.2)	104(44.6)		17(7.7)	74(40.0)	
Medicaid Insurance	41(16.5)	47(20.2)	0.007	8(3.6)	12(6.5)	0.030
Missing	5(2.0)	65(27.9)		0(0.0)	59(31.9)	
Medi-gap Insurance	88(35.3)	52(22.3)	0.248	171(77.0)	92(49.7)	0.515
Missing	2(0.8)	59(25.3)		0(0.0)	60(32.4)	
Ever in a Nursing Home	12(4.8)	29(12.4)	0.003	4(1.8)	29(15.7)	<0.001
Missing	0(0.0)	5(2.1)		0(0.0)	9(4.9)	
Respondent Lives in Rural Area	163(65.5)	128(54.9)	0.020	114(51.4)	84(45.4)	0.273

[a] P-values from difference between African American elders by censoring status and are obtained from Fisher's exact tests and t-tests (for means).

[b] P-values from difference between white elders by censoring status and are obtained from Fisher's exact tests and t-tests (for means).

reporting of urinary symptoms among African Americans in the South. As such, this study will complement the only other community-based studies of urinary symptoms and African American men—the Genesee County (Flint) Michigan Study and the Detroit Education and Early Detection Study—which were conducted in the North (Wei et al. 2001; Powell et al. 1997). Of particular interest are the racial differences in the prevalence of elders reporting LUTS, in the quality and severity of these symptoms, and in associated risk factors.

The findings of this study should be interpreted with the understanding that there are limitations in analyzing repeated measures data. The North Carolina EPESE Survey was designed to capture information about this study population at two time points over four years. This means that data between waves are not available; hence, assumptions

must be made about symptom presentation for periods when survey measurements are not collected. However, the sample size is robust enough to confidently make inferences about these data over time.

Further, there was attrition in the North Carolina EPESE Survey over the four-year period of this study. However, the end-of-study sample size nonetheless allowed for useful and important information to be extracted from the data. Attrition and missing data introduce bias in estimation and inference, particularly if they happen non-randomly. Statistical methods for addressing attrition and missing data that was not missing at random in repeated measures studies are very complex and beyond the scope of this paper. The proportion of participants lost to follow-up did not differ by race. As a result, we used all available data for analysis under the assumption that missing data was completely at random since bias in estimation was expected to be similar between races.

Our study results indicate that in 1994, 49.4 percent of African Americans reported LUTS compared to 56.8 percent of whites. By 1998, these percentages increased to 60.6 percent and 70.3 percent, respectively. These percentages are higher than what was reported in the DEED Study, in which 43 percent self-reported urinary symptoms (Weinrich et al. 1998; Powell et al. 1997). Of the LUTS reported in our study, 27.2 percent and 33.7 percent of African Americans in 1994 and 1998, respectively, presented moderate and severe LUTS compared to 32.9 percent and 38.8 percent of whites. The percentages of moderate and severe LUTS in our study are comparable to results indicated in the Flint Study, which observed that 39.6 percent had moderate to severe LUTS (Wei et al. 2001), and the Olmsted County Study of white men, which reported that approximately 33 percent had moderate to severe LUTS (Jacobsen et al. 1999).

Our study indicated that whites reported moderate and severe LUTS more often than African Americans. These results are in contradistinction to those of Sarma et al. (2003), who combined data from the Flint and Olmsted Studies and found that African Americans reported moderate and severe LUTS significantly more than whites. There may be a few reasons for this. First, our study reported on racial differences in LUTS among African American and white elders in a population-based study rather than from racial groups separated by time, geography, source of care, and survey methodology. Second, our modified AUA severity score may not provide a comparable indication of moderate and severe as the AUA severity score used in other studies. Differences in the indexes may make it difficult to discern degrees of severity in LUTS across studies. Last, according to O'Leary (2000), patients with urinary symptoms who

present to urologists and who are enrolled in studies tend to have moderate to severe LUTS, whereas individuals who are not bothered by the condition or whose quality of life is not impacted, do not present. The lower percentages of moderate and severe LUTS among African Americans in our study may be reflective of our study data not being expressly collected for the purpose of a urology study.

Factors associated with having urinary symptoms and a higher severity of LUTS in our study included having poor health status, poor health behavior (delaying care quite often), and having some disability. These results coincided with a multivariable analysis of the Flint Study data by Joseph et al. (2003) which found greater LUTS risks in African Americans who had a history of heart disease, diabetes, or hypertension as well as smoked or drank alcohol heavily—indicators of poor health and poor health behavior. LUTS, as well as urinary incontinence, increase with age and is often associated with impaired mobility, cognitive decline and certain chronic diseases (Durrant & Snape 2003; Smith 2003).

Having urinary symptoms and severe LUTS in our study was negatively related to living in a rural area, having a male physician, and ever residing in a nursing home. A study of continuity of care over time by Howard et al. (in press) that used the same PHSE EPESE data as this current study found that urban locality was related to elders having discontinuity of care because of the lack of access to a physician. The study concluded that racial disparities in continuity of care may have been due to limited alternatives for access to care among African Americans within urban areas. As such, in the current study, being in an urban area may mean having limited access to quality physician care and could consequently impact the reporting of LUTS.

Sommer et al. (2000) conducted a survey on voiding patterns and found that one of the reasons men do not present symptoms to their doctors is a reluctance to discuss symptoms with a female family practitioner. Male physicians may be more sensitive to the disposition of and bother from this condition, which may impact prognosis and treatment.

Ever having been in a nursing home may be a proxy for quality of care received. Urinary incontinence is common in nursing homes as over half of the three million elderly who receive care in nursing homes are reported to suffer from this condition (Biles, Nicholas, and Burke 2003). As such, LUTS may be reported more frequently among nursing home residents.

A final result of our study indicates that racial differences exist in the type of urinary symptoms reported. Our study found that African

American elders were more likely to indicate that they had LUTS that were irritative, while white elders indicated that they had trouble with LUTS that were obstructive in nature. More research is required to determine whether this distinction in the type of symptom reported is clinically relevant. It remains to be determined whether this distinction represents a racial difference in the expression of a medical condition or a racial difference in the etiology and prognosis of a urinary problem.

There are a few mitigating factors involved in the presentation of urinary symptoms among African Americans. One is the existence of diabetes. This should be expected, as African Americans have diabetes at a rate twice that observed in whites (Michel et al. 2000; Boon et al. 2001; World Health Organization 1985; National Center for Health Statistics 1994). Our study found that African Americans and whites had similar rates of reported diabetes in 1994, but African Americans had higher prevalence of diabetes than did whites in 1998. Inexplicably, having diabetes did not remain as a significant variable in our multivariable analyses of having urinary symptoms or symptom severity.

Some of the signs of poorly controlled adult-onset diabetes mellitus are frequent urination and difficulty holding urine (Hales 2003). More chronic diabetic symptoms include bladder paralysis and incontinence (Hales 2003). Michel et al. (2000) found the severity of LUTS and the likelihood of having Type II diabetes to be significantly associated. Moreover, men with Type II diabetes and concomitant LUTS suggestive of BPH have the highest prostate annual growth rate when compared to those with other metabolic diseases (World Health Organization 1985). The relationship among race, diabetic condition, and LUTS requires more research and is beyond the scope of this paper.

Another mitigating factor may be the impact of medications for conflicting and competing conditions. Our study found higher levels of hypertension and diabetes among African Americans, but higher levels of heart disease among whites. Results from our data, as well as results from previous LUTS studies (Detroit, Flint, and Olmsted), may have been confounded by medications for hypertension (HTN), diabetes, and heart conditions. Hypertension medications and combination medications for heart disease include over 120 thiazides (diuretics) and thiazide-beta blockers/alpha blockers (Physicians' Desk Reference 2004). Some of these medications may mask or exacerbate LUTS as only alpha blocking agents relieve LUTS. The relationship among race, conflicting and competing conditions, medication, and LUTS requires more research and is beyond the scope of this paper.

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