Published in final edited form as:

J Urol. 2012 November ; 188(5): 1816–1821. doi:10.1016/j.juro.2012.07.027.

THE EPIDEMIOLOGY OF URINARY INCONTINENCE IN WOMEN WITH TYPE 2 DIABETES

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Abstract

Purpose—Little research has investigated the epidemiology of urinary incontinence (UI) in individuals with type 2 diabetes (T2D). We examined prevalence, incidence, and risk factors for UI among women with T2D in the Nurses' Health Study (NHS) and NHS II.

Materials and Methods—We obtained UI information at study baseline (2000 in NHS and 2001 in NHS II) and two follow ups (2002 and 2004 in NHS, and 2003 and 2005 in NHS II). Among women with T2D, we calculated UI prevalence for 9,994 women with baseline UI information, and UI incidence rates for 4,331 women with no UI at baseline and UI information during follow up. Multivariable-adjusted odds ratios (ORs) and relative risks (RRs) were estimated for associations between possible risk factors and UI.

Results—Prevalence of at least monthly UI was 48% and at least weekly UI was 29% among women with T2D; corresponding incidence rates were 9.1 and 3.4 per 100 person-years, respectively. White race, higher BMI, higher parity, lower physical activity, current post-menopausal hormone use, and diuretic use were risk factors for prevalent and incident UI in this study, and hysterectomy, vascular disease, and longer duration of diabetes were associated with increased odds of prevalent UI only. Increasing age and microvascular complications were associated with greater risk of developing frequent UI.

Conclusions—UI was very common in this study of women with T2D. We identified multiple risk factors for UI in these women, several of which suggest ways for women with T2D to reduce UI.

Keywords

urinary incontinence; type 2 diabetes; epidemiology; women

INTRODUCTION

UI is a prevalent and burdensome condition in women, and is increasingly recognized as a common complication of T2D. Previously, clinical studies have described bladder dysfunction in women with diabetes, attributing it to possible damage to the nerves, urothelium, or detrusor muscle. Moreover, multiple epidemiologic studies have demonstrated that T2D is consistently associated with UI in both prevalence^{1–8} and incidence^{5, 9, 10} studies. In the NHS cohorts, we have found that T2D is an independent risk

factor for UI, even after adjusting for BMI^{4,9}. However, the epidemiology of UI in individuals with T2D is not well understood; thus, we examined UI prevalence, incidence, and possible risk factors in nearly 10,000 women with T2D.

MATERIALS AND METHODS

Study population

The NHS began in 1976, when 121,700 female registered nurses, aged 30–55 years, returned a mailed questionnaire on their health and lifestyle, including T2D. NHS II started in 1989, when 116,430 female registered nurses, aged 25–42, returned a similar questionnaire. Both cohorts utilize identical methods for data collection and follow up. Follow-up questionnaires are mailed every two years, with a follow-up rate of >90% in each cohort. Questions on UI were included in 2000, 2002, and 2004 in NHS and 2001, 2003, and 2005 in NHS II. The institutional review board of Brigham and Women's Hospital approved these studies.

Information on type 2 diabetes

Women who reported a diagnosis of diabetes on any biennial questionnaire were sent a supplemental questionnaire to ascertain diabetes-related symptoms, diagnostic tests, and treatment. This information was used to confirm T2D using standard criteria, and in a validation study of NHS participants, medical records corroborated 98% of self-reported T2D cases¹¹.

Ascertainment of UI

To obtain information on UI, women were asked on the questionnaires, “During the last 12 months, how often have you leaked or lost control of your urine?” Response categories were never, <1/month, 2–3/month, 1/week, and 1/day. Of women who reported leaking, we asked: “When you lose your urine, how much usually leaks?” Women could indicate a few drops, enough to wet your underwear, enough to wet your outer clothing, and enough to wet the floor. UI cases were classified as “any UI” if women reported leaking 1/month, and as “frequent UI” if they reported leaking 1/week. Women's responses to these questions have been shown to be highly reliable⁵.

We also collected supplemental information on UI type among women with incident frequent UI in 2002 in NHS and 2003 in NHS II, as these women were most likely to accurately report circumstances precipitating UI. Subsequently, information on UI type was ascertained from the main NHS and NHS II questionnaires in 2004 and 2005, respectively. We defined “urgency UI” as primarily leaking accompanied by an urge to urinate or a sudden feeling of bladder fullness; “stress UI” as leaking primarily with coughing, sneezing, lifting things, laughing, or exercise; and “mixed UI” when urgency and stress UI were reported to be equally common.

Ascertainment of risk factors

Information on demographics, health, and lifestyle was reported on biennial questionnaires. Diabetes-related information was obtained as follows: duration of diabetes was calculated using a participant's diagnosis date, which was ascertained on the supplemental questionnaire used to confirm T2D; diagnosis of myocardial infarction or stroke, and diabetes medication use, were reported on biennial questionnaires; and diagnosis of diabetes-related retinopathy, neuropathy, or nephropathy was reported on an additional questionnaire sent to NHS participants only.

Population for analysis

In this study, ‘baseline’ is the initial inclusion of UI questions, or 2000 in NHS and 2001 in NHS II. To examine UI prevalence, we considered 9,994 women with T2D and UI data at baseline (n=7,749 in NHS, n=2,245 in NHS II). To study UI incidence, we considered 4,331 women who reported T2D at baseline or during follow up, did not have UI at baseline, and provided UI information for at least one follow period (n=3,445 in NHS, n=886 in NHS II).

Statistical analysis

For our analyses, we examined “any UI” and “frequent UI” as primary outcomes of interest. To calculate UI prevalence, we divided the number of cases reported at baseline by the total number of women in the analytic sample. Prevalence was determined overall and by racial group (white, black, Asian) as the distribution of T2D differs across racial groups¹², and important differences in UI distribution have been demonstrated across racial groups in NHS and NHS II^{4, 13, 14}. For UI incidence, we calculated incidence rates by dividing the number of cases reported at the first and second follow ups by the total number of person-years contributed during follow up.

To evaluate the association of possible risk factors and prevalent UI, we used multivariable-adjusted logistic regression to estimate odds ratios (ORs) for any UI and frequent UI across categories of: age, race, BMI, parity, smoking, physical activity, hysterectomy, post-menopausal hormone use, diuretic use, history of vascular disease, duration of diabetes, diabetes medication use, and diabetes-related microvascular complications. The status of risk factors was determined based on a participant’s report at baseline, except that physical activity was averaged over multiple reports through baseline to represent long-term activity. We used multivariable-adjusted Cox proportional hazard models to estimate relative risks (RRs) of incident UI over four years across categories of potential risk factors. In addition, we examined incidence rates and possible risk factors for UI type (urgency, stress, mixed); as previously described, UI type information was not available for prevalent cases at study baseline. All data analysis used SAS® 9.1.

RESULTS

Baseline characteristics of the analytic sample for UI prevalence analyses are shown in Table 1. These women had an average age of 63.5 years, were largely white, and had a median duration of diabetes that was 7 years. At baseline, we observed 4,800 prevalent cases of UI 1/month for an overall prevalence of 48% in these women with T2D (Table 2). Among these, 2,947 women reported UI 1/week, which resulted in 29% prevalence of frequent UI (Table 2). When we examined prevalence by racial group, black and Asian women had a lower UI prevalence compared to white women (e.g., for any UI, age-adjusted prevalence=33%, 37%, and 49% in black, Asian, and white women, respectively; $p<0.0001$ comparing black vs. white women, $p=0.003$ for Asian vs. white women). Among 4,331 women without UI at baseline, we found 1,163 cases of UI had developed in women with T2D over follow up; thus, the four-year incidence rate was 9.1 per 100 person-years (Table 3). There were 435 incident cases of frequent UI, leading to an incidence rate of 3.4 per 100 person-years over four years (Table 3). Black women had a lower incidence rate compared to women who were white, and Asian women had a similar incidence compared to white women (i.e., for any UI, age-adjusted incidence rates=5.1, 9.3, and 9.3 per 100 person-years for black, Asian, and white women, respectively; $p=0.0007$ comparing black vs. white women, $p=0.9$ comparing Asian vs. white women).

We examined several potential risk factors and prevalent UI (Table 4). After controlling for confounding factors, the odds of UI were reduced by half among black vs. white women

(e.g., for any UI, OR=0.47, 95% CI=0.35–0.63). Increasing BMI was strongly associated with greater odds of UI (e.g., p-trend<0.0001 for any UI; OR=2.28, 95% CI=1.89–2.75 comparing women with BMI ≥ 30 vs. <22 kg/m²). In contrast, higher levels of long-term physical activity were strongly associated with lower odds of UI (e.g., p-trend for any UI<0.0001; OR=0.71, 95% CI=0.63–0.79 comparing highest vs. lowest tertiles of physical activity measured in metabolic-equivalent hours/week, which is the amount of energy expended sitting quietly for one hour). In addition, greater odds of UI were associated with a greater number of child births (e.g., for any UI, OR=1.36, 95% CI=1.16–1.59 comparing women with ≥ 3 births to nulliparous women), having had a hysterectomy (OR=1.22, 95% CI=1.11–1.34), post-menopausal hormone use (OR=1.67, 95% CI=1.47–1.90 comparing current vs. never users), and diuretic use (OR=1.20, 95% CI=1.09–1.33). Finally, both history of vascular disease (defined as myocardial infarction or stroke) and longer duration of diabetes were associated with increased odds of UI (e.g., for vascular disease and any UI: OR=1.16, 95% CI=1.02–1.32; for duration of diabetes and any UI: OR=1.15, 95% CI=1.03–1.28 comparing >10 vs. <5 years).

For analyses of incident UI, a number of risk factors were similar compared to those for prevalent UI (Table 5). Increasing age was modestly associated with higher UI risk among women with T2D, although the trend was statistically significant for frequent incontinence only (p-trend=0.02; RR=1.88, 95% CI=1.07–3.32 comparing women ≥ 70 vs. <50 years of age). Black women had a lower UI risk compared to white women (e.g., for any UI, RR=0.42, 95% CI=0.24–0.72), and higher BMI was strongly related to greater risk of incident UI in women with T2D (e.g., p-trend<0.0001 for any UI; RR=1.51, 95% CI=1.12–2.03 comparing women with BMI ≥ 30 vs. <22 kg/m²). Higher levels of physical activity were associated with lower UI risk (e.g., p-trend=0.007 for any UI; RR=0.78, 95% CI=0.65–0.93 comparing extreme tertiles), whereas parity, current post-menopausal hormone use, and diuretic use were associated with an increased UI risk (for parity and any UI: RR=1.39, 95% CI=1.04–1.85 comparing women with ≥ 3 births to nulliparous women; for post-menopausal hormone use and any UI: RR=1.26, 95% CI=1.01–1.56 comparing current vs. never users; for diuretic use and any UI: RR=1.20, 95% CI=1.02–1.40). Finally, microvascular complications of diabetes were associated with higher risk of frequent UI (RR=1.70, 95% CI=1.08–2.66 comparing women with neuropathy, retinopathy, or nephropathy to those without these conditions).

In additional analyses where we analyzed UI incidence by type (results not shown in tables), there were 123 cases of stress UI, 97 cases of urgency UI, and 86 cases of mixed UI in our sample; the four-year incidence rates for these UI types were 0.9, 0.7, and 0.6 per 100 person-years, respectively, in women with T2D. Statistical power was limited in risk factor analyses, but we observed that BMI was associated with a slightly greater risk of all three types of UI.

DISCUSSION

In our study, we found that prevalence of UI at least monthly was 48% at baseline, with an incidence rate of 9.1 per 100 person-years among women with T2D, ages 36–81 years. Prevalence of UI at least weekly was 29% at baseline and the incidence rate was 3.4 per 100 person-years. Although T2D is more common in black than white women (including in the NHS cohorts), we observed a consistently lower UI burden in black women in terms of prevalence and incidence – similar to findings in the full NHS and NHS II cohorts of women who largely had no diabetes mellitus^{4, 13, 14}. We also identified several risk factors for prevalent and incident UI in women with T2D, including diabetes-related factors.

Importantly, the estimates of UI prevalence and incidence in this sample of women with T2D appeared higher than in the broader population of women who mostly had no T2D in the NHS cohorts^{4, 13} and in other cohorts^{15–17}, reflecting the excess of UI in women with T2D. Moreover, although stress UI remained the most common type in these women, the rate of urgency UI was much closer to the rate of stress UI compared to findings in these cohorts among women who mostly had no T2D¹⁸. Still, in general, most risk factors for UI were similar for these women with T2D compared to the full cohorts, thus overall UI prevention would not be substantially different in women with T2D compared to those without T2D^{4, 5, 13, 19–22}.

A particular strength of our study is the large number of women with T2D. However, this study has several limitations. First, all UI information was self reported; however, we established high reliability of self-reported incontinence symptoms among these women⁵. Several studies also have demonstrated the high validity of self-reported incontinence compared to clinical assessment^{15, 23}. Second, information on potential risk factors for UI was determined using self-reported information from our questionnaires. Yet, our participants are health professionals with substantial knowledge about health-related issues, which suggests that their reporting should be highly accurate. Indeed, self-reported information for multiple variables evaluated in our analyses has been validated previously in the NHS cohorts^{24–26}. Third, although we identified higher parity as a risk factor for UI in women with diabetes, we cannot differentiate between vaginal delivery vs. C-section because we did not collect information on type of delivery. Finally, we had limited numbers of cases in our UI type analyses, which precluded estimation of incidence rates by racial group or highly stable RRs. However, these data still represent the largest study of incident UI to date among women with T2D, and therefore our study provides valuable information for better understanding UI in T2D. Finally, our population consists of 96% white women. Although we were able to clearly demonstrate lower prevalence and incidence rates for UI in black and Asian women, we could not evaluate risk factors by race; thus, more research is needed in racial minorities.

Epidemiologic studies in other cohorts have reported on UI in individuals with T2D, although these investigations have been substantially smaller than our study. The Reproductive Risks of Incontinence Study at Kaiser (n=486) reported a 51% prevalence of at least monthly UI and a 35% prevalence of at least weekly UI in women with diabetes mellitus, both of which are highly consistent with the prevalence that we estimate in our study²⁷. Similarly, National Health and Nutrition Examination Survey reported a prevalence of at least weekly UI of 35% among 246 women with T2D¹, and the Action for Health in Diabetes Study (Look AHEAD, n=2,994) found a prevalence of at least weekly UI that was 27%²⁸. Although a few studies have reported the percentage of incident UI cases among those with T2D, they have not provided estimates of UI incidence rates among individuals with T2D; thus, it is difficult to compare results from these studies to our own. Furthermore, initial studies have identified white race, BMI, parity, hysterectomy, and smoking as risk factors for prevalent UI in those with T2D^{1, 28, 29}. These findings are generally consistent with our results, with the exception that smoking was not associated with UI in our study (although we had a very small number of smokers and thus limited power to detect effects). Finally, limited information is available on diabetes-related factors in relation to UI. In two studies, microvascular complications were found to be associated with an increased risk of developing UI in those with T2D, which is similar to the results presented here^{5, 30}. Thus, appropriate management of diabetes may help reduce UI risk in T2D, and UI may provide additional impetus for women with T2D to take measures to reduce their risk of developing complications.

In conclusion, we found that UI prevalence was very high (48%) at baseline and the UI incidence rate was 9.1 per 100 person-years among women with T2D in the NHS cohorts. We also identified multiple risk factors for UI in women with T2D, providing new information about the burden of UI in these individuals and suggesting potential ways for these women to reduce UI.

Acknowledgments

Funding support: The National Institutes of Health funded this study of urinary incontinence (DK 62438) and continues to provide funding for the ongoing Nurses' Health Study (CA 87969, CA 50385).

References

1. Brown JS, Vittinghoff E, Lin F, et al. Prevalence and risk factors for urinary incontinence in women with type 2 diabetes and impaired fasting glucose: findings from the National Health and Nutrition Examination Survey (NHANES) 2001–2002. *Diabetes Care*. 2006; 29:1307. [PubMed: 16732013]
2. Lewis CM, Schrader R, Many A, et al. Diabetes and urinary incontinence in 50- to 90-year-old women: a cross-sectional population-based study. *Am J Obstet Gynecol*. 2005; 193:2154. [PubMed: 16325633]
3. Melville JL, Katon W, Delaney K, et al. Urinary incontinence in US women: a population-based study. *Arch Intern Med*. 2005; 165:537. [PubMed: 15767530]
4. Danforth KN, Townsend MK, Lifford K, et al. Risk factors for urinary incontinence among middle-aged women. *Am J Obstet Gynecol*. 2006; 194:339. [PubMed: 16458626]
5. Lifford KL, Curhan GC, Hu FB, et al. Type 2 diabetes mellitus and risk of developing urinary incontinence. *J Am Geriatr Soc*. 2005; 53:1851. [PubMed: 16274364]
6. Brown JS, Seeley DG, Fong J, et al. Urinary incontinence in older women: who is at risk? Study of Osteoporotic Fractures Research Group. *Obstet Gynecol*. 1996; 87:715. [PubMed: 8677073]
7. Sampsel CM, Harlow SD, Skurnick J, et al. Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. *Obstet Gynecol*. 2002; 100:1230. [PubMed: 12468167]
8. Waetjen LE, Liao S, Johnson WO, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: a longitudinal analysis of data: study of women's health across the nation. *Am J Epidemiol*. 2007; 165:309. [PubMed: 17132698]
9. Danforth KN, Townsend MK, Curhan GC, et al. Type 2 diabetes mellitus and risk of stress, urge and mixed urinary incontinence. *J Urol*. 2009; 181:193. [PubMed: 19013621]
10. Waetjen LE, Ye J, Feng WY, et al. Association between menopausal transition stages and developing urinary incontinence. *Obstet Gynecol*. 2009; 114:989. [PubMed: 20168098]
11. Manson JE, Rimm EB, Stampfer MJ, et al. Physical activity and incidence of non-insulin-dependent diabetes mellitus in women. *Lancet*. 1991; 338:774. [PubMed: 1681160]
12. National Diabetes Statistics. 2011; 2011
13. Grodstein F, Fretts R, Lifford K, et al. Association of age, race, and obstetric history with urinary symptoms among women in the Nurses' Health Study. *Am J Obstet Gynecol*. 2003; 189:428. [PubMed: 14520212]
14. Townsend MK, Curhan GC, Resnick NM, et al. The incidence of urinary incontinence across Asian, black, and white women in the United States. *Am J Obstet Gynecol*. 2010; 202:378 e1. [PubMed: 20042169]
15. Herzog AR, Fultz NH. Prevalence and incidence of urinary incontinence in community-dwelling populations. *J Am Geriatr Soc*. 1990; 38:273. [PubMed: 2179368]
16. Hunskaar S, Arnold EP, Burgio K, et al. Epidemiology and natural history of urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct*. 2000; 11:301. [PubMed: 11052566]
17. Chiarelli P, Brown W, McElduff P. Leaking urine: prevalence and associated factors in Australian women. *Neurourol Urodyn*. 1999; 18:567. [PubMed: 10529705]
18. Townsend MK, Danforth KN, Lifford KL, et al. Incidence and remission of urinary incontinence in middle-aged women. *Am J Obstet Gynecol*. 2007; 197:167 e1. [PubMed: 17689637]

19. Townsend MK, Danforth KN, Rosner B, et al. Physical activity and incident urinary incontinence in middle-aged women. *J Urol*. 2008; 179:1012. [PubMed: 18206951]
20. Townsend MK, Curhan GC, Resnick NM, et al. BMI, waist circumference, and incident urinary incontinence in older women. *Obesity (Silver Spring)*. 2008; 16:881. [PubMed: 18379564]
21. Townsend MK, Curhan GC, Resnick NM, et al. Postmenopausal hormone therapy and incident urinary incontinence in middle-aged women. *Am J Obstet Gynecol*. 2009; 200:86 e1. [PubMed: 19019333]
22. Grodstein F, Lifford K, Resnick NM, et al. Postmenopausal hormone therapy and risk of developing urinary incontinence. *Obstet Gynecol*. 2004; 103:254. [PubMed: 14754692]
23. Sandvik H, Hunskaar S, Seim A, et al. Validation of a severity index in female urinary incontinence and its implementation in an epidemiological survey. *J Epidemiol Community Health*. 1993; 47:497. [PubMed: 8120507]
24. Colditz GA, Martin P, Stampfer MJ, et al. Validation of questionnaire information on risk factors and disease outcomes in a prospective cohort study of women. *Am J Epidemiol*. 1986; 123:894. [PubMed: 3962971]
25. Wolf AM, Hunter DJ, Colditz GA, et al. Reproducibility and validity of a self-administered physical activity questionnaire. *Int J Epidemiol*. 1994; 23:991. [PubMed: 7860180]
26. Rimm EB, Stampfer MJ, Colditz GA, et al. Validity of self-reported waist and hip circumferences in men and women. *Epidemiology*. 1990; 1:466. [PubMed: 2090285]
27. Doshi AM, Van Den Eeden SK, Morrill MY, et al. Women with diabetes: understanding urinary incontinence and help seeking behavior. *J Urol*. 2010; 184:1402. [PubMed: 20727547]
28. Phelan S, Kanaya AM, Subak LL, et al. Prevalence and risk factors for urinary incontinence in overweight and obese diabetic women: action for health in diabetes (look ahead) study. *Diabetes Care*. 2009; 32:1391. [PubMed: 19487639]
29. Lawrence JM, Lukacz ES, Liu IL, et al. Pelvic floor disorders, diabetes, and obesity in women: findings from the Kaiser Permanente Continence Associated Risk Epidemiology Study. *Diabetes Care*. 2007; 30:2536. [PubMed: 17620443]
30. Jackson SL, Scholes D, Boyko EJ, et al. Predictors of urinary incontinence in a prospective cohort of postmenopausal women. *Obstet Gynecol*. 2006; 108:855. [PubMed: 17012446]

Table 1Baseline characteristics in 2000 for NHS and 2001 for NHS II (n=9,994) ^a

	N (%)
Age, in years, mean (SD)	63.5 (10.3)
Race	
White	8,826 (96)
Black	255 (3)
Asian	111 (1)
BMI, in kg/m ²	
<22	636 (6)
22–24	1,175 (12)
25–29	2,907 (29)
30	5,222 (53)
Parity	
0	972 (10)
1–2	3,584 (37)
3+	5,195 (53)
Smoking	
Never	4,790 (48)
Past	4,408 (44)
Current	796 (8)
Physical activity, in MET-hours/week, median (interquartile range)	9.6 (4.6–17.8)
Hysterectomy	4,358 (44)
Post-menopausal hormone use	
Pre-menopausal	1,188 (13)
Never	2,341 (25)
Past	2,658 (29)
Current	3,030 (33)
Diuretic use	2,790 (28)
History of vascular disease	1,392 (14)
Duration of diabetes, in years, median (interquartile range)	7.0 (2.7–14.3)
Diabetes medication use	
None	3,940 (39)
Oral medication only	4,174 (42)
Insulin	1,880 (19)

^aSample sizes and percentages are of non-missing values.

Prevalence of urinary incontinence in 2000/2001 among women with type 2 diabetes mellitus in NHS and NHS II

Table 2

	N	Leak 1/month		Leak 1/week	
		Cases	Prevalence, % (95% CI)	Cases	Prevalence, % (95% CI)
All races	9,994	4,800	48 (47, 49)	2,947	29 (28, 30)
By race ^a					
White	8,826	4,321	49 (48, 50)	2,653	30 (29, 31)
Black	255	85	33 (27, 39) ^b	52	21 (16, 26) ^c
Asian	111	39	37 (28, 46) ^b	17	17 (10, 24) ^c

^aThis does not include 802 women who were missing information on race. Percentages by race are age adjusted.
^bSignificant differences; p<0.0001 comparing black vs. white women and p=0.003 comparing Asian vs. white women.
^cSignificant differences; p=0.0006 comparing black vs. white women and p=0.0008 comparing Asian vs. white women.

Incidence rates of urinary incontinence (per 100 person-years) in 2000–2004/2001–2005 among women with type 2 diabetes mellitus in NHS and NHS II

Table 3

Race	Person-years	Leak 1/month		Leak 1/week	
		Cases	Incidence rate (95% CI)	Cases	Incidence rate (95% CI)
All races	12,787	1,163	9.1 (8.6, 9.6)	435	3.4 (3.1, 3.7)
By race ^a					
White	11,559	1,070	9.3 (8.7, 9.8)	395	3.4 (3.1, 3.8)
Black	453	23	5.1 (3.1, 7.1) ^b	8	1.8 (0.8, 3.5) ^c
Asian	162	15	9.3 (4.3, 14.2)	6	3.7 (1.4, 8.1)

^aThis does not include 309 women who were missing information on race. Percentages by race are age adjusted.

^bp=0.0007 comparing black vs. white women.

^cp=0.03 comparing black vs. white women.