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Incidence and Remission of Urinary Incontinence in a Community Based Population of Women \geq 50 Years

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Abstract

Introduction and Objective—To determine incidence, remission and predictors of change in urinary incontinence in women \geq 50 in a racially diverse population.

Methods—Subjects were women \geq 50 with 4 year follow-up incontinence information in the Health and Retirement Study. Women with Any UI (AUI) and Severe UI (SVUI) were evaluated. Repeated measures logistic regression determined predictors of progression to and improvement of SVUI.

Results—11,591 women were evaluated. AUI 4 year cumulative incidence was 12.7%–33.8% (5th vs. 9th decades). SVUI incidence was lower but also increased with age. Among the predictors of improvement in SVUI were age (9th vs. 5th decade OR=6.06), ethnicity (Black vs. White OR=.57). Improvement of SVUI (45.8% overall) decreased with age (9th vs. 5th decade OR=.12).

Conclusions—SVUI incidence increased and remission decreased with age. Ethnicity and age predicted SVUI progression while age predicted improvement. Rates of the latter were high, particularly in younger patients.

Keywords

Urinary Incontinence; Incidence; Remission; Predictors

Introduction

Urinary incontinence is a common condition which poses psychological and economic burden upon individuals and society. Urinary incontinence cost an estimated 19.5 billion dollars in 2000^[1] and prevalence estimates range from 10–40% in older women.^[2] Much of our understanding of urinary incontinence and associated conditions come from cross-sectional studies. A National Institute of Health panel recently emphasized the importance of longitudinal studies in understanding the natural history of incontinence and characterizing its predictors.^[3]

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Urinary incontinence incidence information is scarce and largely limited to Caucasian populations.^[2,3] Waetjen analyzed 5 year longitudinal data in a multi-racial population of mid-life women and found differences in incontinence prevalence and incidence between Hispanic, African American and Caucasian women.^[4] In contrast, others found no racial differences in incontinence incidence over 3 year follow-up in an older group of subjects.^[5] Given the ethnic diversity of the U.S. it is important to understand whether racial and ethnic differences occur in urinary incontinence.

While the body of information describing urinary incontinence incidence is relatively small compared to prevalence data, the amount of information regarding its remission is still smaller.^[6-14] The few available studies report remission proportions that are similar to or higher than those of incidence. This suggests that incontinence status is dynamic and that its prevalence in a population might be accurately predicted by taking into account both incidence and remission proportions.

We sought to evaluate urinary incontinence incidence and remission over 4 years in women 50 years of age and to focus particularly on its associations with age and ethnicity. Since we believe that severe urinary incontinence (SVUI) is the more clinically significant condition we also chose to evaluate predictors of progression to or improvement from SVUI in this population.

Materials and Methods

We evaluated development and resolution of urinary incontinence in subjects enrolled in the Health and Retirement Study (HRS).^[15] The HRS, initiated in 1992, collects health and socio-economic information in a representative sample of community-dwelling adults over age 50 and their spouses. It is a multi-stage area probability sample of U.S. residents. Information collected is available on a publicly available database (<http://hrsonline.isr.umich.edu>). The HRS is managed jointly by the National Institute of Aging and the University of Michigan Institute for Social Research. Because data is de-identified the University of New Mexico IRB granted this study exempt status (HRRC #07-284).

Five birth cohorts were introduced into the HRS at varying times from 1992–2004. Urinary incontinence questions were first administered in 1993. For our study we only included women 50 years who had information regarding incontinence status with at least four year follow-up. Urinary incontinence questions were administered in 1993, 1995, 1996 and every two years through 2006. We consolidated 1995 and 1996 incontinence information to approximate 2 year reporting intervals for this portion of the cohort. We report incontinence information from years 1993, 1995–1996, 1998 and 2 year intervals thereafter.

We chose to use initial four year follow-up data for this analysis. In patients with longer periods of follow up, observations after four years were excluded from analysis to avoid generating multiple data points from the same subject. If a subject died during the 4 year follow-up period, the information from that 4 year interval was not included in incidence/remission calculations.

All interviews were administered in person. The question, “During the last 12 months, have you lost any amount of urine beyond your control?” determined presence or absence of Any Urinary Incontinence (AUI). Subjects were also asked, “On how many days in the last month have you lost any urine?” The HRS classified urine loss as 5 days/month, 6–15 days/month or >15 days/month. AUI included all these categories. We defined Severe Urinary Incontinence (SVUI) as urine loss reported > 15 days within the last month, moderate incontinence as 6–15 days/month, and mild incontinence as 5 days/month. Questions distinguishing stress and urge incontinence, first administered in 2002, were not

available for the majority of our subjects at baseline. Thus, incontinence type is not included in this study.

Cumulative four year AUI incidence, remission and initial AUI prevalence were calculated based upon subjects' decade of life and ethnicity. The HRS classifies patients as Hispanic, non-Hispanic White, non-Hispanic African American, and Other. The HRS over-sampled African American and Hispanic respondents in order to allow analysis of ethnic minorities with a smaller overall sample size. The Other ethnic group includes American Indians, Alaskan Natives, Asians and Pacific Islanders. This group was heterogeneous and not over sampled. We grouped subjects by decade into 5th–9th decades based on the age subjects answered baseline incontinence questions.

We calculated cumulative four year incidence for AUI; we took all respondents that denied AUI at baseline then affirmed AUI at four year follow-up and divided that number by respondents at risk. We calculated cumulative four year AUI remission by taking number of respondents that affirmed AUI at baseline but denied AUI at four year follow-up and divided that number by respondents at risk. For SVUI cumulative incidence we included all subjects who denied any urinary incontinence at baseline and affirmed SVUI at follow-up. SVUI remission included all subjects who had SVUI at baseline but denied any urinary incontinence at follow-up. Corresponding average incidence/remissions per year were calculated by dividing four year cumulative incidence/remission by four. AUI and SVUI prevalence are reported as point prevalence

In addition to SVUI incidence and remission we also evaluated progression to and improvement from SVUI. Simple evaluation of incidence (occurrence from complete absence) and remission (complete resolution following initial occurrence) discounts valuable information about individuals in the intermediate, mild and moderate, incontinence states. In order to include information about these subjects, we defined states of SVUI progression and improvement. For progression we calculated proportions of women without incontinence or with mild or moderate incontinence who affirmed SVUI at 4 year follow-up. Progression to SVUI captured information about subjects with mild or moderate incontinence as well as those with absent incontinence, which increased to SVUI. For improvement, we calculated proportions of women with SVUI at baseline who had no incontinence or lesser incontinence, including mild or moderate incontinence, at follow-up.

We extracted additional information from the HRS database regarding variables previously identified as risk factors for urinary incontinence; subjects' history of medical and psychiatric illness, Body Mass Index (BMI), parity and functional limitations. Information regarding hormonal replacement therapy was unavailable. Subjects were queried regarding their medical illness history. They were asked, "Has a doctor ever told you that you had...." hypertension, diabetes mellitus, cancer, lung disease, heart disease, arthritis and stroke. Since Nygaard previously reported co-linearity between disease number and urinary incontinence severity in a different study which utilized the HRS data- base, we chose to stratify subjects as having 0, 1, 2 or 3 medical illnesses.^[16] Separate from these co-morbidities we also recorded the answer to the question "Have you ever seen a doctor for emotional, nervous or psychiatric problems?" as a separate categorical variable.

Subjects were asked to give their height and weight at initial interview. We converted these self-reported values to kilograms/meter² to record BMI. We categorized parity into 0, 1, 2 and > 2 births based on the answers to the question, "How many children have you given birth to?"

We assessed functional limitation by analyzing nine pertinent questions asked consistently from 1995–2006. The 1993 interview, however, included only five of these nine questions.

To have comparable results for all years we quantified functional limitation as a percentage of the number of questions asked and grouped results into three categories; no limitations, limitations in 1%–25% of questions asked and limitations in >25% of questions asked.

Age, ethnicity, parity, medical co-morbidities, history of psychiatric illness, BMI and functional limitations were entered into a stepwise logistic regression model to determine which variables were most closely associated with development or improvement of SVUI at four year follow-up (PROCGENMOD, SAS/STAT® version 9.1, Copyright 2004, SAS Institute, Cary, NC). The same variables were also entered into a separate model to determine predictors of improvement of SVUI. Adjusted odds ratios (OR) were generated for both models and expressed with 95% Confidence Intervals (CI).

Results

There were 29,065 men and women enrolled in the HRS cohorts. Response rates were 84% in all years of follow-up.^[14] Baseline information regarding presence or absence of AUI was available for 14,246 women 50 years. Baseline AUI prevalence was 19.2% (2,733/14,246). Of 14,246 women with AUI data, one percent (202/14,246) of women was missing SVUI information, resulting in 14,089 women with baseline SVUI data. Baseline SVUI prevalence was 6.3% (891/14,089). Proportions of women with AUI and SVUI at baseline based upon ethnicity and decade of life are recorded in Table 1.

Ten percent (1,425/14,246) of women died between baseline and follow-up (Table 1). In the AUI group after we excluded women who died and excluded the 1230 women (8.6%) missing follow-up information, 11,591 women remained for incidence and remission analysis. In this cohort of women with AUI incidence/remission data, 2187 affirmed AUI (Table 2) and 9404 denied AUI at baseline. Of the 9404 women who denied AUI at baseline, 1483 affirmed its presence at follow-up for a 4 year cumulative incidence of 15.8%, or average annual incidence of 4.0%. Of the 2,187 women who affirmed AUI at baseline 793 denied its presence at follow-up for a 4 year cumulative remission of 36.3%, or average annual remission of 9.1%. We also analyzed four year cumulative incidence and remission estimates for AUI based upon decade of life and ethnicity (Table 3).

There were 11,341 women available for analysis of SVUI incidence and remission. Of the 9,347 women who denied urinary incontinence at baseline, 461 affirmed SVUI at follow-up for a 4 year cumulative incidence of 4.9%, or average annual SVUI incidence of 1.2%. Of the six hundred fifty women who affirmed SVUI at baseline (Table 2), 161 denied its presence at follow-up for a 4 year cumulative remission of 24.8%, or average annual remission of 6.2%.

Rate of progression to SVUI from absent or lesser incontinence over 4 years was 6.7% (711/10,691 subjects) and the SVUI improvement rate over 4 years was 45.8% (298/650 subjects). Improvement from SVUI and progression to SVUI over 4 years based on decade of life and ethnicity is reported in Table 4.

Logistic regression was used to determine predictors of progression to SVUI and improvement from SVUI. Progression to SVUI increased with age in all ethnic groups (Table 2). The odds of developing SVUI increased with each decade of life after the 6th decade (Table 2). Compared to the 5th decade, odds of developing SVUI increased more than three-fold by the 8th decade and six-fold by the 9th decade. Ethnic differences also existed in SVUI development. Hispanic women had approximately two-thirds and African American women had approximately half the odds of developing incident SVUI compared to White women (Table 2). Just as age and ethnicity were both predictors of SVUI progression, history of 2 medical conditions, BMI, history of psychiatric illness and

increased functional limitations were associated with SVUI development (Table 2). Parity was a predictor of urinary incontinence progression on logistic regression with a Wald Chi-square $P=0.001$. However, odds ratio estimates all crossed one, indicating a weak effect (Table 2).

Predictors of SVUI improvement on logistic regression were BMI and decade of life (Table 2). Odds of SVUI improvement decreased with each decade of life after the 6th decade (Table 2). Very obese women (BMI ≥ 35) were also less likely to experience SVUI improvement (Table 2).

Discussion

Prevalence data give an accurate snapshot of the extent of disease at a point in time but incidence and remission better reveal dynamic aspects of a disease that recurs and remits. Much has been written regarding urinary incontinence prevalence but less has been reported regarding its incidence and remission.^[2,3] This relative paucity of information is due to inherent difficulties obtaining longitudinal data. The HRS offers a wealth of information about a community-based population with long term follow-up and afforded us the opportunity to evaluate urinary incontinence over time. We specifically investigated development and resolution of incontinence based on age and ethnicity.

Our annualized AUI incidence varied with age and ranged from 3.18% to 8.45%. Others have reported incontinence incidence ranges of 3.2%–20% per year.^[5,6] Our study lies within the lower range of previous reports. There are several explanations for this. First, the HRS over-sampled African-American and Hispanic women, groups found to have decreased incontinence proportions.^[2,3,4] Second, this population was community-based. Compared to institutionalized elderly women with reported 2 month urinary incontinence incidence rates as high as 21%,^[8] incontinence incidence in the HRS subjects were much lower. Third, interviews were conducted in person and respondent bias may have occurred with under-reporting of urinary incontinence, a socially unacceptable problem. Last, the HRS questionnaire structure may have affected incontinence rates. Herzog, whose interview included 24 incontinence questions compared to the 3–8 in the HRS, reported a 20% incontinence incidence.^[6] The smaller number of questions and decreased emphasis on incontinence issues may have resulted in a lower incontinence incidence in the HRS population compared to that of Herzog's.

Mortality in our subjects may also affect the incidence of incontinence in our study. Since this study, like all incidence studies, assumes the conditional probability of survival to calculate follow-up data, the effect of mortality on incidence cannot be calculated. This issue assumes greater importance in a study of elderly subjects such as ours. Elderly subjects with multiple co-morbidities are more likely to die during the observation period and therefore be excluded from analysis. This effect is likely accentuated in studies with longer periods of observation. Since urinary incontinence occurs more commonly in subjects with increased co-morbidities exclusion of these patients creates a selection bias that may result in a lower incidence of urinary incontinence in the study population.^[17,18] Consistent with this explanation, our incidence results were similar to a study of elderly women reporting 5–10 year follow-up^[10] and much lower than another which reported one year follow-up.^[6]

We also reported on AUI remission. The relatively sparse data regarding incontinence remissions have reported rates of 2%–28% per year.^[11,12] We found AUI annualized remissions (8.23%–10.04%) in a range intermediate to these studies. Since others have found remission to be more common in younger women,^[12,14] our relatively lower

remission numbers may have been due to the greater representation of older women in our population.

SVUI findings, however, may be most relevant to clinicians. SVUI represents women more likely to present for treatment. We analyzed not only SVUI incidence, but also identified a number of predictors of SVUI progression. Age and ethnicity were major predictors of progression to SVUI from continence or lesser degrees of incontinence. Similar to reports by others, SVUI progression increased with age.^[9,10,12,14] In addition, we found odds of SVUI progression were lower for Black and Hispanic women than White women. These minority groups were less likely to have progression of incontinence despite the fact they were less likely to be insured^[19] and potentially less likely to seek care for incontinence. This suggests race may exert a protective effect against SVUI progression. Psychiatric illness and increased medical co-morbidities, parity and functional limitations, all predictors of progression to SVUI in our work, have been shown to have a positive association with incontinence in prior studies.^[10, 16,20–23] The weaker effect of parity in our study may be explained by the numbers of older women enrolled (approximately 40% were > 70 years). Since Rortveit found the association of incontinence and parity decreased with age and incontinence was unassociated with parity in women over 65 years,^[23] the larger number of older women in this study may have diminished the importance of parity as a predictor of SVUI.

Our study results also revealed significant information not only about remission but also improvement of SVUI. The SVUI annualized remission of 6.2% in this study was higher than the 2.0% remission of frequent incontinence reported by Lifford.^[12] This may be partially explained by racial differences. Our population, which over-sampled African American and Hispanic women, differed from the Caucasian population reported upon by Lifford. More important than SVUI remission was the wide-spread improvement in SVUI over 4 years. Age and BMI were both predictors of SVUI improvement. Odds of SVUI improvement were over 70% higher in the 5th compared to 8th decade of life and very obese women (BMI ≥ 35) were half as likely to experience SVUI improvement compared to women of normal habitus. Although the improvement rate for SVUI was greater in African American women than in White women, the logistic regression equation did not identify race as a predictor of improvement. This was possibly due to the small numbers of minority women with SVUI at baseline.

A limitation of this study, like many population surveys, is that the data is based on self-report without objective verification. Others have found urinary incontinence questionnaires to have good reproducibility and specificity suggesting that reports are reliable although somewhat lacking in sensitivity.^[6] Additional limitations of this study include inability to distinguish between stress and urge incontinence and lack of information quantitating urine loss. These problems will be remediated in future work which will focus on subjects from 2002 onward when the HRS began recording urinary incontinence frequency, quantity and subtype. The impact of treatment effect upon our population is also unknown. The HRS, like most natural history studies, does not report intervening treatment.^[5,6,8,11–14.] Lifford's group noted that only 18% of their subjects with frequent incontinence sought treatment and only a minority (10% of cases over 2 years) reported effective treatment.^[12] This is lower than the SVUI improvement rate in our study and suggests that factors other than treatment play a significant role in the improvement of SVUI. More complete evaluation of treatment effect and comparison of ethnic groups' treatment seeking behaviors need to be addressed in future work. Last, it should be noted that we did not adjust for overweighting of African American and Hispanic women in the HRS sample, so the overall incidence proportions may be specific to this population and may not represent incidence for the U.S. population as a whole.

The study has several strengths. Health questions were administered via in person interviews which decreased missing data problems and potentially improved the accuracy of information obtained. In addition, the number of women in the 5th–8th decades in the study, particularly the large number of African Americans allowed us to evaluate urinary incontinence incidence and remission based upon differences due to age and race/ethnicity. Finally, the scope of the HRS questionnaire and the longitudinal design of the database allowed us to evaluate covariates which predict SVUI progression and improvement.

In summary, we identified significant rates of progression and improvement in incontinence over time, even in those with the most severe symptoms; this suggests the dynamic status of urinary incontinence in a large population. Symptoms were not static even among women with the most severe disability, those with SVUI. Decade of life was a major predictor for both progression and improvement of SVUI and ethnicity played a significant role in its progression. Prevalence of incontinence is dependent on the balance between remission and incidence rates, rates that will fluctuate depending on the age and race/ ethnicity of study populations. It is these population differences, as well as difference in questionnaire design and study methodology, that may be responsible for some of the wide variations in incontinence prevalence and incidence rates reported in the literature to date.

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Brief Summary

Development of severe urinary incontinence (SVUI) in women increases with age, improvement of SVUI decreases with age, and SVUI development differs between ethnic groups

Table 1
Baseline Prevalence Any Urinary Incontinence & Severe Urinary Incontinence & Deaths from Baseline to Follow-up

	5th	6th	7th	8th	9th
White					
Any UI	18.29%(691/3777)	18.47%(460/2490)	23.19%(717/3092)	28.40%(324/1141)	34.66%(61/176)
Severe UI	4.26%(161/3777)	5.90%(147/2490)	8.21%(254/3092)	12.36%(141/1141)	19.32%(34/176)
% died	2.54% (96/3777)	5.42%(135/2490)	12.10%(374/3092)	31.81%(363/1141)	52.27%(92/176)
African American					
Any UI	10.21%(92/901)	13.94% (76/545)	13.70%(73/533)	23.6%(50/214)	17.86% (5/28)
Severe UI	2.22%(20/901)	5.69% (31/545)	4.69% (25/533)	8.8% (19/214)	10.71%(3/28)
% died	3.55% (32/901)	8.81% (48/545)	18.57%(99/533)	29.44%(63/214)	53.57%(15/28)
Hispanic					
Any UI	11.36%(56/493)	10.78%(19/269)	17.90%(41/229)	19.12%(13/68)	27.27%(3/11)
Severe UI	2.23% (11/493)	3.35% (9/269)	5.68%(13/229)	11.76% (8/68)	18.18%(2/11)
% died	3.04%(15/493)	7.06%(19/269)	13.97%(32/229)	11.76% (8/68)	63.64%(7/11)
Other					
Any UI	9.84%(12/122)	19.44%(14/72)	13.64%(9/66)	38.89%(7/18)	0%(0/1)
Severe UI	3.28% (4/122)	5.56% (4/72)	3.03% (2/66)	16.67% (3/18)	0%(0/1)
% died	1.64%(2/122)	9.72% (7/72)	16.67%(11/66)	38.89%(7/18)	0%(0/1)
Overall					
Any UI	16.08%(851/5293)	17.15%(579/3376)	21.43%(840/3920)	27.34%(394/1441)	31.94%(69/216)
Severe UI	3.70%(196/5293)	5.66% (191/3376)	7.50%(294/3920)	11.87% (171/1441)	18.06%(39/216)
% died	2.74%(145/5293)	6.19%(209/3376)	13.16%(516/3920)	30.60%(441/1441)	52.78%(114/216)

Table 2

Subjects' Baseline Characteristics with Any Urinary Incontinence & Severe Urinary Incontinence* & Predictors of Progression to Severe Urinary Incontinence and Improvement of Severe Urinary Incontinence

	Subjects with Any UI N=2187	Subjects with Severe UI N=650	Predictors Severe UI Progression Odds Ratio (95% CI)	Predictors Severe UI Improvement Odds Ratio (95% CI)
Decade Life				
<i>5th decade</i>	35.5% (777/2187)	26.8% (174/650)	<i>Reference group</i>	<i>Reference group</i>
<i>6th decade</i>	22.6% (495/2187)	24.2% (157/650)	1.21 (0.97–1.52)	0.70 (0.45–1.10)
<i>7th decade</i>	30.3% (663/2187)	33.7% (219/650)	1.84 (1.50–2.26)	0.61 (0.40–0.91)
<i>8th decade</i>	10.6% (231/2187)	13.5% (88/650)	3.69 (2.84–4.78)	0.28 (0.16–0.49)
<i>9th decade</i>	1.0% (21/2187)	1.9% (12/650)	6.06 (3.43–10.68)	0.12 (0.02–0.57)
Ethnicity				
<i>White</i>	83.5% (1825/2187)	84.0% (546/650)	<i>Reference group</i>	
<i>African American</i>	10.3% (225/2187)	10.2% (66/650)	0.57 (0.45–0.73)	
<i>Hispanic</i>	4.8% (105/2187)	4.5% (29/650)	0.67 (0.49–0.92)	
<i>Other</i>	1.5%(32/2187)	1.4% (9/650)	1.16 (0.68–1.97)	
Parity*				
<i>0</i>	10.3% (222/2160)	8.4% (54/640)	<i>Reference group</i>	
<i>1</i>	10.4%(225/2160)	12.0%(77/640)	0.71 (0.51–1.00)	
<i>2</i>	24.5%(530/2160)	23.3%(149/640)	0.77 (0.58–1.03)	
<i>>2</i>	54.8%(1183/2160)	56.3%(360/640)	1.08 (0.84–1.39)	
# Medical Co-morbidities				
<i>0</i>	18.1%(395/2187)	12.5% (81/650)	<i>Reference group</i>	
<i>1</i>	28.5%(624/2187)	25.4% (165/650)	0.92 (0.72–1.17)	
<i>2</i>	27.3%(596/2187)	27.7% (180/650)	1.32 (1.03–1.69)	
<i>3</i>	26.2%(572/2187)	34.5% (224/650)	1.61 (1.23–2.10)	
BMI (kg/m²)				
<i><25</i>	34.0% (743/2187)	27.7% (180/650)	<i>Reference group</i>	<i>Reference group</i>
<i>25 to <30</i>	33.8% (740/2187)	32.0% (208/650)	1.21 (1.00–1.46)	0.72(0.48–1.10)
<i>30 to <35</i>	19.9% (436/2187)	22.8% (148/650)	1.12 (0.88–1.42)	0.66 (0.42–1.05)
<i>35</i>	12.3% (268/2187)	17.5% (114/650)	1.82 (1.38–2.41)	0.45 (0.27–0.74)
Psychiatric History				
<i>No</i>	75.9%(1659/2187)	74.6% (485/650)	<i>Reference group</i>	
<i>Yes</i>	24.1% (528/2187)	25.4% (165/650)	1.64 (1.35–1.99)	
Functional Limitations				
<i>None</i>	20.4% (447/2187)	14.5% (94/650)	<i>Reference group</i>	
<i>0 and 25% limited</i>	22.0% (480/2187)	17.2% (112/650)	1.37 (1.07–1.76)	
<i>>25%</i>	57.6% (1260/2187)	68.3% (444/650)	2.36 (1.89–2.94)	

* See text Results section, paragraph 5

Table 3

Four Year Cumulative Incidence & Remission of Any Urinary Incontinence

4 Year Cumulative Incidence Urinary Incontinence									
Decade	5th	6th	7th	8th	9th				
Non-Hispanic White	14.13% (382/2704)	17.57% (308/1753)	17.51% (330/1885)	23.36% (125/535)	29.51% (18/61)				
<i>Avg incidence Per year</i>	3.53%	4.39%	4.38%	5.84%	7.38%				
African American	7.93% (54/681)	10.47% (40/382)	18.62% (65/349)	28.28% (28/99)	44.44% (4/9)				
<i>Avg incidence Per year</i>	1.98%	2.62%	4.66%	7.07%	11.11%				
Hispanic	13.04% (48/368)	14.57% (29/199)	12.33% (18/146)	28.89% (13/45)	66.67% (2/3)				
<i>Avg incidence Per year</i>	3.26%	3.64%	3.08%	7.23%	16.67%				
Other	5.26% (5/95)	5.13% (2/39)	20.45% (9/44)	33.33% (2/6)	100% (1/1)				
<i>Avg incidence Per year</i>	1.32%	1.28%	5.11%	8.33%	25%				
Overall 4 year Cumulative Incidence	12.71% (489/3848)	15.97% (379/2373)	17.41% (423/2424)	24.53% (168/685)	33.78% (25/74)				
<i>Overall Avg incidence/yr</i>	3.18%	3.99%	4.35%	6.13%	8.45%				
4 Year Cumulative Remission Urinary Incontinence									
Decade	5th	6th	7th	8th	9th				
Non-Hispanic White	37.3% (238/638)	32.09% (129/402)	32.19% (187/581)	31.18% (58/186)	33.33% (6/18)				
<i>Avg remission Per year</i>	9.33%	8.02%	8.05%	7.80%	8.33%				
African American	53.66% (44/82)	38.98% (23/59)	48.98% (24/49)	46.88% (15/32)	33.33% (1/3)				
<i>Avg remission Per year</i>	13.42%	9.75%	12.25%	11.72%	8.33%				
Hispanic	53.19% (25/47)	43.48% (10/23)	51.85% (14/27)	25% (2/8)	0% (0/0)				
<i>Avg remission Per year</i>	13.30%	10.87%	12.96%	6.25%	0%				
Other	50% (5/10)	72.73% (8/11)	50% (3/6)	20% (1/5)	0% (0/0)				
<i>Avg remission Per year</i>	12.50%	18.18%	12.50%	5.00%	0%				
Overall 4 year Cumulative Remission	40.15% (312/777)	34.34% (170/495)	34.39% (228/663)	32.9% (76/231)	33.33% (7/21)				
<i>Overall Avg remission/yr</i>	10.04%	8.59%	8.60%	8.23%	8.33%				

Table 4
 Progression to Severe Urinary Incontinence over 4 years & Improvement of Severe Urinary Incontinence over 4 years”

4 Year Cumulative Progression to Severe Urinary Incontinence:									
Decade	5th	6th	7th	8th	9th				
Non-Hispanic White	4.76% (151/3171)	6.33% (126/1990)	8.22% (179/2178)	15.35% (93/606)	21.21% (14/66)				
<i>Avg progression Per year</i>	<i>(1.19%)</i>	<i>(1.58%)</i>	<i>(2.06%)</i>	<i>(3.84%)</i>	<i>(5.30%)</i>				
African American	2.97% (22/741)	4.12% (17/413)	8.27% (31/375)	12.84% (14/109)	12.50% (1/8)				
<i>Avg progression Per year</i>	<i>(0.74%)</i>	<i>(1.03%)</i>	<i>(2.07%)</i>	<i>(3.21%)</i>	<i>(3.13%)</i>				
Hispanic	4.95% (20/404)	3.77% (8/212)	4.94% (8/162)	18.75% (9/48)	50% (2/4)				
<i>Avg progression Per year</i>	<i>(1.24%)</i>	<i>(0.94%)</i>	<i>(1.24%)</i>	<i>(4.69%)</i>	<i>(12.5%)</i>				
Other	2.97% (3/101)	6.25% (3/48)	14.89% (7/47)	28.57% (2/7)	100% (1/1)				
<i>Avg Per year</i>	<i>(0.74%)</i>	<i>(1.56%)</i>	<i>(3.72%)</i>	<i>(7.14%)</i>	<i>(25%)</i>				
Overall 4 year Cumulative Progression	4.44% (196/4417)	5.78% (154/2663)	8.15% (225/2762)	15.32% (118/770)	22.78% (18/79)				
<i>Overall Av/yr</i>	<i>(1.11%)</i>	<i>(1.45%)</i>	<i>(2.04%)</i>	<i>(3.83%)</i>	<i>(5.70%)</i>				
4 Year Cumulative Severe Urinary Incontinence Improvement									
Decade	5th	6th	7th	8th	9th				
Non-Hispanic White	54.48% (79/145)	47.62% (60/126)	43.37% (85/196)	27.54% (19/69)	20.00% (2/10)				
<i>Avg improvement Per year</i>	<i>(13.62%)</i>	<i>(11.91%)</i>	<i>(10.84%)</i>	<i>(6.89%)</i>	<i>(5.00%)</i>				
African American	81.25% (13/16)	45.45% (10/22)	69.23% (9/13)	46.15% (6/13)	0.00% (0/20)				
<i>Avg improvement Per year</i>	<i>(20.31%)</i>	<i>(11.36%)</i>	<i>(17.31%)</i>	<i>(11.54%)</i>	<i>(0%)</i>				
Hispanic	55.56% (5/9)	28.57% (2/7)	37.50% (3/8)	20.00% (1/5)	0.00% (0/0)				
<i>Avg improvement Per year</i>	<i>(13.89%)</i>	<i>(7.14%)</i>	<i>(9.38%)</i>	<i>(5.00%)</i>	<i>(0%)</i>				
Other	25.00% (1/4)	50% (1/2)	100.00% (2/2)	0.00% (0/1)	0.00% (0/0)				
<i>Ave Per year</i>	<i>(6.25%)</i>	<i>(12.50%)</i>	<i>(25.00%)</i>	<i>(0%)</i>	<i>(0%)</i>				
Overall 4 year Cumulative Improvement	56.32% (98/174)	46.5% (73/157)	45.2% (99/219)	29.55% (26/88)	16.67% (2/12)				
<i>Overall Avg improvement/yr</i>	<i>(14.08%)</i>	<i>(11.6%)</i>	<i>(11.3%)</i>	<i>(7.39%)</i>	<i>(4.17%)</i>				