Published in final edited form as:

Female Pelvic Med Reconstr Surg. 2010 September ; 16(5): 278–283. doi:10.1097/SPV.0b013e3181ed3e31.

Urinary incontinence, fecal incontinence and pelvic organ prolapse in a population-based, racially diverse cohort. Prevalence and risk factors

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Abstract

Objectives—We investigated the prevalence of and risk factors for combinations of urinary incontinence (UI), fecal incontinence (FI) and pelvic organ prolapse (POP) in racially diverse women over age 40.

Methods—The Reproductive Risks for Incontinence Study at Kaiser (RRISK) is a population-based study with data from 2106 women > 40 years. Pelvic floor conditions were determined by self-report. Risk factors were assessed by self-report, interview and record review. Independent risk factors were identified by multinomial logistic regression analysis.

Results—At least one pelvic floor condition was reported by 714 (34%) women. Of these, 494 (69%) had UI only, 60 (8%) POP only, and 46 (6%) had FI only. Both UI and FI were reported by 64 (9%), both UI and POP by 51 (7%). Among women with FI, 60% reported more than one condition. Corresponding figures for POP and UI were 49% and 18%. Estrogen use and constipation were shared risk factors for UI, FI and POP. BMI was a unique risk factor for UI only, diabetes for FI only and parity for POP only. No clear pattern could be found to support the hypothesis that risk factors for single conditions are more strongly associated with combined conditions.

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The study was conducted in California, USA

The authors have no conflicts of interest.

Reprints will not be available

Conclusions—Patients with FI or POP often have concomitant UI. These diseases both share and have unique risk factors in a complex pattern.

Keywords

fecal incontinence; pelvic floor disorders; pelvic organ prolapse; prevalence; risk factors; urinary incontinence

INTRODUCTION

Urinary incontinence (UI) and pelvic organ prolapse (POP) are common conditions that profoundly affect quality of life and have large economic costs^{1–10}. Fecal incontinence (FI), although less common, is a very distressing condition also associated with substantial adverse affects on quality of life^{11–14}. While these three conditions are known to occur concomitantly in many women, little is known about the prevalence of different combinations of the conditions in a general population. Whether they are different presentations of a common pelvic floor disease, or they are distinct and separate conditions, is a matter of both scientific and practical interest. Risk factors for UI, POP and FI^{6, 8, 13, 15–17}, have been investigated; however, little is known about the degree to which these three conditions share risk factors. The more risk factors are being shared, the more this will support a hypothesis that UI, POP an FI should not be regarded as different conditions, but rather different symptoms of a common underlying pathological process.

The aim of the present study was to investigate the prevalence and associated risk factors for UI, POP and FI, as well as combinations of these conditions, in a racially diverse population-based cohort of women. We also wanted to explore the hypothesis that UI, POP and FI may be different presentations of a common pelvic floor disease.

MATERIALS AND METHODS

From October 1999 through February 2003, 2109 community-dwelling women were enrolled in the Reproductive Risks for Incontinence Study at Kaiser (RRISK), a population-based, racially diverse cohort of middle-aged and older women⁶. The study population was constructed by identifying women between 40 and 69 years of age who, since age 18, had been members of the Kaiser Permanente Medical Care Program of Northern California (KPMCP), a large integrated health care delivery system with over 3 million members that serves about 25% of the population in the area. While previous studies have found KPMCP members to under-represent extremes in economic status and to be slightly more educated, members have been shown to be very similar to the population in the geographic area served with respect to all other demographic characteristics¹⁸. Details of the recruitment have been reported previously⁶. Of the 2,109 women in the RRISK cohort, three women were excluded due to a missing response to one of the three pelvic floor conditions.

Pelvic floor conditions were assessed by self-report. Women were defined as having UI if they reported weekly or greater UI and as having FI if they reported monthly or greater FI, since these frequencies have been observed as having substantial impact on daily activities^{13, 19, 20}. Pelvic organ prolapse was defined by self-reported symptoms of either a

“feeling of bulging, pressure or protrusion” or a “visible bulging or protrusion from your vagina” in the past 12 months ⁸.

Factors potentially associated with UI, POP or FI assessed by self-reported questionnaire included age, race/ethnicity, demographic characteristics, reproductive and menopause history, presence of selected medical conditions (e.g. history of irritable bowel syndrome, current constipation) and prior pelvic and other surgeries (e.g. hysterectomy, pelvic organ prolapse repair). Body mass index (BMI) was calculated in kg/m² based on the participant’s weight and height measured at the time of the interview. Number of childbirths and method of delivery (vaginal or cesarean section) were abstracted from review of labor and delivery and surgical medical records archived since 1946. Where information on delivery type was lacking (8%), self-report was used.

Statistical analyses

Prevalence is presented as percentages of the women included in the study (N= 2,106). For each combination of pelvic floor conditions, we estimated prevalence by racial group using a logistic model to adjust for differences in age, body mass index, education, number of vaginal deliveries, current estrogen use, hysterectomy, smoking status, constipation and diabetes. We used a multinomial logit model to estimate and compare the strength of the associations between possible risk factors and different combinations of UI, POP, and FI. Six outcomes were identified including 1. no pelvic floor condition, 2. only UI, 3. only FI, 4. only POP, 5. UI and POP, and 6. UI and FI. The remaining two combinations (POP and FI, and all three conditions) were reported by too few women to analyze separately (n=6 and n=7, respectively). The common reference group was women with none of the conditions. From this model, we are able to identify the specific risk factors for each combination and to compare the strength of the association across the combinations using Chi square tests of heterogeneity. To decide if a risk factor was shared by two or more conditions, it had to be a significant risk factor for at least one condition, and the associations had to go in the same direction and be of approximately the same magnitude. For a variable to be a unique risk factor, it had to be significantly associated with one condition, but not with either of the other two conditions, and this difference in association had to be significant at a *P*-value of <0.10 by test for heterogeneity. For each shared risk factor, we also tested the hypothesis that the risk factor would be more strongly associated with two of the conditions than with either condition individually.

The variables considered for inclusion in the model, including potential confounders, were identified on *a priori* grounds and included all variables in Table 1 with *P*-values < 0.2 in univariable analyses. Chronic obstructive pulmonary disease was omitted from the final models because of its correlation with smoking and menopause was omitted because of its correlation with age. Rather than make a formal correction for multiple comparisons, we were cautious interpreting nominally significant results, evaluating them for consistency with earlier findings and biologic plausibility. The analysis was performed in SAS Version 9.1.3 (SAS Institute, Cary, NC) and Stata Version 8.0 (Stata Corp, College Station, TX).

Ethics

Informed consent was obtained from all participants by telephone and in writing at the time of data collection. All study procedures were approved by the institutional review boards of both the University of California San Francisco and the Kaiser Permanente Division of Research.

RESULTS

The mean ($\pm$ standard deviation) age among the 2,106 women in the RRISK cohort was 55.6 $\pm$ 8.6 years and participants were racially diverse (47% white, 19% African-American, 17% Latina and 17% Asian). Baseline characteristics of women by type of pelvic floor condition(s) reported are shown in Table 1.

In the RRISK cohort, 714 (34%) of the women reported at least one of the three pelvic floor conditions. Among the 714 symptomatic women, 602 (84%) reported weekly UI, 117 (16%) reported symptomatic POP, and 116 (16%) reported monthly FI (Figure 1). Some of these women reported only one condition: 494 (69%) reported weekly UI, 60 (8%) reported symptomatic POP, and 46 (6%) reported monthly FI. Two or more conditions were reported by 16% of women, with similar prevalence of combined UI and FI (9%) and combined UI and POP (7%). For women with one pelvic floor condition, the prevalence of having another condition varied, reported by 18% of women with UI, 49% with POP, and 60% with FI. We saw no difference in the proportion of concomitant conditions when we defined UI by clinical type (stress or urge incontinence) or by UI severity (data not shown). We found strong evidence for clustering of the three pelvic floor conditions, each of which was associated with 2–3 fold increased odds of reporting the others ($P<0.01$ for all).

The prevalence of pelvic floor conditions differed by race after adjustment for common risk factors (Table 2). Overall, weekly UI only was most common (22%), followed by symptomatic POP only (2%), and monthly FI only (2%). African-American and Asian women were significantly less likely to report UI only compared with white women ($P=0.02$ and $P=0.04$, respectively). Although there was limited frequency of combined pelvic floor conditions in these analyses, Latina women were more likely to report combined UI and POP ($P<0.01$).

The adjusted associations between potential risk factors and each pelvic floor condition alone and combinations of these conditions are shown in Table 3. Two risk factors, estrogen use and constipation, were shared for UI only, FI only and symptomatic POP only. Age was a shared risk factor for UI and FI, while current smoking was a shared risk factor for UI and symptomatic POP, though a marginally stronger risk factor for POP ($P=0.08$ for heterogeneity). Being a college graduate was the only additional risk factor shared between FI and POP. African-American and Asian race were protective, compared to White, for UI and POP. BMI met our definition of a unique risk factor for UI, being significantly associated with UI but not associated with FI or POP, with this difference in association being significant by the test for heterogeneity. Diabetes was found to be a unique risk factor for FI, and parity a unique risk factor for symptomatic POP. Hysterectomy was not a significant risk factor for any of the three conditions alone.

Table 3 also compares the association of risk factors with combinations of the conditions compared to each of the conditions alone. The risk of having both UI and POP for Latina women was significantly greater than the risk for either UI or POP alone (OR=3.1, vs OR=1.2 for UI only and OR=0.9 for POP only, test for heterogeneity for both comparisons, $P=0.02$). Parity appeared to have a clearly stronger association with a combination of two disorders, weekly UI and monthly FI, (OR=3.2) than with either disorder alone (OR= 1.2 and 1.4, respectively), though this difference was only significant with respect to the UI only group.

DISCUSSION

In this racially diverse population-based cohort of middle-age and older women, one-third of women reported at least one of the three pelvic floor conditions that included weekly UI, symptomatic POP or monthly FI. UI was most prevalent (29%) with symptomatic POP and fecal incontinence having much lower prevalence (6%). The prevalence of each condition observed in our study is similar to those reported in other population-based studies^{1-4, 6, 9-14}. A previous study showed a somewhat lower prevalence of UI compared to our study, whereas FI and POP were experienced by similar proportions of women aged 40–59 years (17.2% had UI, 3.8% had POP and 9.9% had FI)²¹.

Two or more conditions were reported by 5% of all women and 16% of women with at least one condition. Women with FI or POP were more likely than those with UI to report more than one condition (60%, 49% and 18%, respectively) which is because UI was much more prevalent.

We found that 8% of women reported both $\geq$ weekly UI and $\geq$ monthly FI. In a previous population-based study, 11% reported stress urinary incontinence and FI among women aged 40–69 years²². Prevalence of combined urinary incontinence and POP were similar between the two studies (6% in our study vs. 3% in the previous study, which included only stress UI) as was the prevalence of combined POP and FI (1% vs. 3%, respectively). A general practice based study found a prevalence of 10% for combined UI and FI²³.

The relationship between the three pelvic floor conditions is poorly understood and little investigated. It is well known that they often occur concomitantly. Whether they are symptoms due to a common pathological process, shared risk factors, or often co-exist simply by chance is, however, unknown. Risk factors for each condition have, on the other hand, been identified in previous studies. Our study found that the overlap in the disorders cannot be explained by chance. We then evaluated potential-risk factors for one or more of the disorders separately, with respect to the other disorders and to combined disorders. If UI, FI and POP are part of the same pelvic floor process, we expected the conditions will have common risk factors and that a risk factor would be more strongly associated with combined conditions than with a single condition. We found only weak evidence for such a relationship. Two risk factors, constipation and estrogen use, appeared to be shared across all three conditions, and an additional four risk factors (age, African-American race, college graduate and current smoker) appeared to be shared between two of the conditions. In contrast, three risk factors appeared to be unique (e.g. BMI for UI, parity for POP and

diabetes for FI). Parity has previously been shown to be a strong risk factor for UI in younger age groups, but not in the age group investigated in the current study²⁴. This most likely reflects a combination of shared and separate risk factors and mechanisms underlying these three related conditions. Similarly, the evidence for a stronger association between risk factors and combined conditions, compared to each condition alone, is inconsistent. While odds ratios were notably higher in the combined groups compared to women with single conditions for several risk factors (e.g. estrogen, hysterectomy, parity and smoking for UI and FI combined, and being Latina, parity and constipation for the UI and POP combined), this difference was significant only in the association of Latina race and prevalent UI and POP combined. Prior studies do not provide comparable data, and since there is no clear interpretation of this finding it may be due to chance.

While physiologic models of UI, FI and POP share pelvic floor dysfunction as a common mechanism²⁵, discussion of the pathophysiology of these disorders is beyond the scope of the current paper. However, further research should be designed to pursue this matter.

A study including women with UI or POP found that one third of women with UI had concomitant FI²⁶. These results are in contrast with our study which found 13% of women with UI also had FI. The former study was, however, not population-based. Another study reported that 62% of women undergoing UI surgery had symptoms of FI²⁷, and a third study reported that 38% of women with UI had POP, and 19% had FI. Hence, there is a large variability in reported data, which stems from differences in the populations studied as well as differences in definitions of the conditions.

The results of our study suggest that UI, FI and POP are to some degree independent in that there are differences in their association with risk factors, and the association with risk factors is not consistently stronger for combination of conditions than for single conditions. However, we also found evidence for shared risk factors and a stronger association between some risk factors and combined, compared to single, conditions, suggesting there may be a degree of shared mechanism(s) underlying all three conditions. These findings may affect the decision of whether to adjust for concomitant pelvic floor conditions when modeling the association between a possible risk factor and the primary condition of interest. When evaluating risk factors for any one condition, adjusting for the presence of the other conditions may inappropriately attenuate the association with a shared risk factor that operates through a shared mechanism. Given that we have little evidence that any one pelvic floor condition actually causes another, and that there are few risk factors for one pelvic floor condition that are likely to result from the presence of another pelvic floor condition, not adjusting for the other conditions is a reasonable methodological strategy.

Our study had several limitations. It was cross-sectional and thus cannot determine causal associations. This is particularly important when interpreting the results for risk factors such as estrogen use and hysterectomy. The participants were middle-age and older community-dwelling women with long-term enrollment in a pre-paid health delivery system with generally equal access to care. Therefore, these results may not be generalizable to younger or older women or those without insurance. We included different ethnic groups in this study; however, it is important to bear in mind that especially African-American and Asia-

American women are highly diverse genetically. Further subgroup analyses were not feasible in this study, but may be worth consideration in the planning of future studies. In the current study, even though it is based on a large cohort, some combinations of conditions were uncommon, limiting power. Thus the negative results cannot be considered conclusive.

In this racially diverse population-based cohort of middle-aged and older women, over one-third of women reported at least one of the three pelvic floor conditions that included weekly UI, symptomatic POP or monthly FI. Urinary incontinence was most prevalent, with symptomatic POP and monthly fecal incontinence having much lower and similar prevalence. These diseases both share and have unique risk factors in a complex pattern, and this should be taken into account when prevention strategies are being discussed. Clinicians should also be aware that half or more of women presenting with POP or FI have symptoms of more than one condition. Choice of treatment should only be made when patients have had a full examination for all three conditions.

Acknowledgments

Funding Support: This study was funded by R01-HD-41134 NICHD Reproductive Risk Factors for Pelvic Organ Prolapse and the National Institutes Diabetes, Digestive and Kidney Diseases (NIDDK) Grant # DK53335 and the NIDDK/Office of Research on Women's Health Specialized Center of Research Grant # P50 DK064538.

References

1. Hannestad YS, Rortveit G, Sandvik H, Hunskaar S. A community-based epidemiological survey of female urinary incontinence: the Norwegian EPINCONT study. *Epidemiology of Incontinence in the County of Nord-Trøndelag*. J Clin Epidemiol. 2000; 53:1150–7. [PubMed: 11106889]
2. Hendrix SL, Clark A, Nygaard I, Aragaki A, Barnabei V, Mctiernan A. Pelvic organ prolapse in the Women's Health Initiative: gravity and gravidity. *Am J Obstet Gynecol*. 2002; 186:1160–6. [PubMed: 12066091]
3. Nygaard I, Bradley C, Brandt D. Pelvic organ prolapse in older women: prevalence and risk factors. *Obstet Gynecol*. 2004; 104:489–97. [PubMed: 15339758]
4. Thom D. Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. *J Am Geriatr Soc*. 1998; 46:473–80. [PubMed: 9560071]
5. Thom DH, Nygaard IE, Calhoun EA. Urologic diseases in America project: urinary incontinence in women-national trends in hospitalizations, office visits, treatment and economic impact. *J Urol*. 2005; 173:1295–301. [PubMed: 15758785]
6. Thom DH, Van Den Eeden SK, Ragins AI, et al. Differences in prevalence of urinary incontinence by race/ethnicity. *J Urol*. 2006; 175:259–64. [PubMed: 16406923]
7. Wilson L, Brown JS, Shin GP, Luc KO, Subak LL. Annual direct cost of urinary incontinence. *Obstet Gynecol*. 2001; 98:398–406. [PubMed: 11530119]
8. Rortveit G, Brown JS, Thom DH, Van Den Eeden SK, Creasman JM, Subak LL. Symptomatic pelvic organ prolapse: prevalence and risk factors in a population-based, racially diverse cohort. *Obstet Gynecol*. 2007; 109:1396–403. [PubMed: 17540813]
9. Bradley CS, Nygaard IE. Vaginal wall descensus and pelvic floor symptoms in older women. *Obstet Gynecol*. 2005; 106:759–66. [PubMed: 16199633]
10. Tegerstedt G, Maehle-Schmidt M, Nyren O, Hammarstrom M. Prevalence of symptomatic pelvic organ prolapse in a Swedish population. *Int Urogynecol J Pelvic Floor Dysfunct*. 2005; 16:497–503. [PubMed: 15986100]
11. Nakanishi N, Tatara K, Naramura H, Fujiwara H, Takashima Y, Fukuda H. Urinary and fecal incontinence in a community-residing older population in Japan. *J Am Geriatr Soc*. 1997; 45:215–9. [PubMed: 9033523]

12. Nelson R, Norton N, Cautley E, Furner S. Community-based prevalence of anal incontinence. *Jama*. 1995; 274:559–61. [PubMed: 7629985]
13. Varma MG, Brown JS, Creasman JM, et al. Fecal incontinence in females older than aged 40 years: who is at risk? *Dis Colon Rectum*. 2006; 49:841–51. [PubMed: 16741640]
14. Goode PS, Burgio KL, Halli AD, et al. Prevalence and correlates of fecal incontinence in community-dwelling older adults. *J Am Geriatr Soc*. 2005; 53:629–35. [PubMed: 15817009]
15. Hannestad YS, Rortveit G, Daltveit AK, Hunskaar S. Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. *Bjog*. 2003; 110:247–54. [PubMed: 12628262]
16. Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Urinary incontinence after vaginal delivery or cesarean section. *N Engl J Med*. 2003; 348:900–7. [PubMed: 12621134]
17. Danforth KN, Townsend MK, Lifford K, Curhan GC, Resnick NM, Grodstein F. Risk factors for urinary incontinence among middle-aged women. *Am J Obstet Gynecol*. 2006; 194:339–45. [PubMed: 16458626]
18. Krieger N. Overcoming the absence of socioeconomic data in medical records: validation and application of a census-based methodology. *Am J Public Health*. 1992; 82:703–10. [PubMed: 1566949]
19. Brown JS, Seeley DG, Fong J, Black DM, Ensrud KE, Grady D. Urinary incontinence in older women: who is at risk? Study of Osteoporotic Fractures Research Group. *Obstet Gynecol*. 1996; 87:715–21. [PubMed: 8677073]
20. Uustal Fornell E, Wingren G, Kjolhede P. Factors associated with pelvic floor dysfunction with emphasis on urinary and fecal incontinence and genital prolapse: an epidemiological study. *Acta Obstet Gynecol Scand*. 2004; 83:383–9. [PubMed: 15005787]
21. Nygaard I, Barber MD, Burgio KL, et al. Prevalence of symptomatic pelvic floor disorders in US women. *Jama*. 2008; 300:1311–6. [PubMed: 18799443]
22. Lawrence JM, Lukacz ES, Nager CW, Hsu JW, Luber KM. Prevalence and co-occurrence of pelvic floor disorders in community-dwelling women. *Obstet Gynecol*. 2008; 111:678–85. [PubMed: 18310371]
23. Sliker-Ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Prevalence of double incontinence, risks and influence on quality of life in a general female population. *Neurourol Urodyn*. 2009
24. Rortveit G, Hannestad YS, Daltveit AK, Hunskaar S. Age- and type-dependent effects of parity on urinary incontinence: the Norwegian EPINCONT study. *Obstet Gynecol*. 2001; 98:1004–10. [PubMed: 11755545]
25. Abramowitch SD, Feola A, Jallah Z, Moalli PA. Tissue mechanics, animal models, and pelvic organ prolapse: a review. *Eur J Obstet Gynecol Reprod Biol*. 2009; 144(Suppl 1):S146–58. [PubMed: 19285776]
26. Jackson SL, Weber AM, Hull TL, Mitchinson AR, Walters MD. Fecal incontinence in women with urinary incontinence and pelvic organ prolapse. *Obstet Gynecol*. 1997; 89:423–7. [PubMed: 9052598]
27. Kjolhede P, Hallbook O, Ryden G, Sjodahl R. Anorectal manometry in women with urinary stress incontinence. *Acta Obstet Gynecol Scand*. 1997; 76:266–70. [PubMed: 9093143]

Figure 1.

Overlap of the prevalence of urinary incontinence, symptomatic prolapse, and fecal incontinence among symptomatic women (N=714).

Urinary incontinence = leakage weekly or more; fecal incontinence = leakage monthly or more.

Table 1

Baseline Characteristics of the RRISK Cohort by Pelvic Floor Condition(s) (N=2106)

Characteristic *	No condition n=1392	UI only n=494	POP only n=60	FI only n=46	2 conditions n=114
Age, mean $\pm$ SD	54.9 $\pm$ 8.5	57.4 $\pm$ 8.3	55.7 $\pm$ 8.6	59.6 $\pm$ 8.5	58.9 $\pm$ 8.9
Age (years)					
40–49	455 (33)	98 (20)	16 (27)	7 (15)	22 (19)
50–59	515 (37)	201 (41)	24 (40)	18 (39)	38 (33)
60 or greater	422 (30)	195 (39)	20 (33)	21 (46)	54 (47)
Race					
Caucasian	633 (45)	252 (51)	33 (55)	22 (48)	62 (54)
African-American	273 (20)	82 (17)	6 (10)	8 (17)	14 (12)
Asian	262 (19)	52 (11)	9 (15)	8 (17)	13 (11)
Latina	206 (15)	100 (20)	12 (20)	8 (17)	23 (20)
Other	18 (1)	8 (2)	0 (0)	0 (0)	2 (2)
BMI (kg/m ²)					
<25	535 (39)	111 (23)	29 (48)	15 (33)	27 (24)
25–<30	446 (32)	153 (31)	14 (23)	14 (30)	31 (27)
30–<35	234 (17)	110 (22)	10 (17)	10 (22)	25 (22)
35–<40	101 (7)	68 (14)	5 (8)	5 (11)	16 (14)
≥ 40	69 (5)	48 (10)	2 (3)	2 (4)	14 (12)
College graduate	528 (38)	151 (31)	10 (17)	12 (26)	36 (32)
Current Estrogen Use	372 (27)	185 (37)	23 (38)	20 (43)	50 (44)
Prior Hysterectomy	264 (19)	136 (28)	16 (27)	14 (30)	44 (39)
Postmenopausal	844 (62)	363 (75)	43 (73)	36 (82)	91 (80)
Number of vaginal deliveries, mean $\pm$ SD	1.8 $\pm$ 1.5	2.1 $\pm$ 1.6	2.5 $\pm$ 1.4	2.2 $\pm$ 1.6	2.5 $\pm$ 1.6
Diabetes	99 (7)	49 (10)	4 (7)	9 (20)	13 (11)
COPD	64 (5)	39 (8)	3 (5)	4 (9)	13 (11)
Constipation weekly	1250 (90)	422 (85)	48 (80)	38 (83)	87 (76)
Current Smoker	131 (9)	55 (11)	13 (22)	2 (4)	11 (10)

UI = weekly urinary incontinence; POP = symptomatic pelvic organ prolapse; FI = monthly fecal incontinence; BMI = body mass index; COPD = chronic obstructive pulmonary disorder.

* Data presented as number (percent) or mean ($\pm$ standard deviation).

Table 2

Prevalence of One or More Pelvic Conditions by Race (N=2106)*

Condition	Overall	White	African-American	Asian	Latina
UI only					
N	494	252	82	52	100
Prevalence [†]	22.3	23.7	17.8	17.8	27.3
<i>p-value</i>		<i>Ref</i>	0.02	0.04	0.20
POP Only					
N	60	33	6	9	12
Prevalence [†]	2.3	2.8	1.2	2.4	2.3
<i>p-value</i>		<i>Ref</i>	0.06	0.71	0.57
FI Only					
N	46	22	8	8	8
Prevalence [†]	1.8	1.7	1.9	2.2	1.9
<i>p-value</i>		<i>Ref</i>	0.77	0.53	0.78
UI + FI					
N	57	37	8	5	6
Prevalence [†]	1.8	2.5	1.1	1.5	1.2
<i>p-value</i>		<i>Ref</i>	0.07	0.38	0.09
UI + POP					
N	44	16	5	7	15
Prevalence [†]	1.6	1.1	0.7	2.1	3.3
<i>p-value</i>		<i>Ref</i>	0.45	0.19	<0.01
FI + POP					
N	6	6	0	0	0
Prevalence [†]	0.3	0.6	0.0	0.0	0.0
<i>p-value</i>		<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
UI + FI + POP					
N	7	3	1	1	2
Prevalence [†]	0.3	0.3	0.3	0.3	0.6

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Condition	Overall	White	African-American	Asian	Latina
<i>p-value</i>		<i>Ref</i>	<i>0.91</i>	<i>0.98</i>	<i>0.48</i>

UI = weekly urinary incontinence; POP = symptomatic pelvic organ prolapse; FI = monthly fecal incontinence; N/A=Not applicable

* Does not include eight women who reported being Native American or other race.

[†]Adjusted for age, body mass index, education, number of vaginal deliveries, current estrogen use, hysterectomy, current smoker, constipation and diabetes.

[‡]Due to the low number of women in this group, the unadjusted prevalence was reported.

Table 3

Adjusted Odds Ratios from Multinomial Logistic Regression Analysis of Women with One More Pelvic Floor Disorders ^{†‡}

Risk Factor [§]	One disorder			Two disorders		P-values for heterogeneity						
	UI Only N=494	FI Only N=46	POP Only N=60	UI+ FI N=57	UI+ POP N=4	UI vs FI	UI vs POP	FI vs POP	UI vs UI+FI	UI vs UI+POP	FI vs UI+FI	POP vs UI+POP
Age per 10 years	1.4 *	1.7 *	0.9	1.7 *	1.3	ns	0.02	0.01	ns	ns	ns	ns
Race												
White	Ref	Ref	Ref	Ref	Ref							
African-American	0.6 *	0.9	0.3 *	0.4 *	0.5	ns	ns	ns	ns	ns	ns	ns
Asian	0.7 *	1.2	0.8	0.6	1.7	ns	ns	ns	ns	0.08	ns	ns
Latina	1.2	1.2	0.9	0.5	3.1 *	ns	ns	ns	0.07	0.03	ns	0.02
Other	1.1	NA	NA	0.9	2.2	ns	ns	ns	ns	ns	ns	ns
College graduate	1.1	1.5	2.5 *	0.7	1.0	ns	0.03	ns	ns	ns	ns	0.09
BMI per 5 units (kg/m ²)	1.4 *	1.1	1.0	1.7 *	1.4 *	0.06	<0.01	ns	0.05	ns	0.01	0.03
Estrogen	1.4 *	1.6	1.4	2.0 *	1.4	ns	ns	ns	ns	ns	ns	ns
Prior hysterectomy	1.2	1.2	1.4	2.1 *	1.4	ns	ns	ns	ns	ns	ns	ns
1 + vaginal deliveries	1.2	1.4	2.8 *	3.2 *	3.9 *	ns	0.06	ns	0.04	0.05	ns	ns
Diabetes	1.0	2.6 *	1.0	2.2 *	0.2	0.03	ns	ns	0.06	0.10	ns	ns
Constipation monthly	1.5 *	1.7	2.1 *	1.6	4.3 *	ns	ns	ns	ns	<0.01	ns	ns
Current smoker	1.5 *	0.5	2.7 *	2.5 *	0.6	ns	0.08	0.04	ns	ns	0.06	0.05

UI = weekly urinary incontinence; POP = symptomatic pelvic organ prolapse; FI = monthly fecal incontinence; BMI = body mass index; Ref = Reference group N/A = Not available due to small numbers; ns=not significant (P>0.2)

* p<0.05

[†] FI+POP and UI+FI+POP groups were excluded from this analysis due to small numbers.

[‡] OR based on multinomial logistic regression. All variables in the table were included in the multinomial model. Risk was compared to women without any condition.

[§] Reference groups for college graduate, estrogen, hysterectomy, diabetes, monthly constipation and current smoker were women without the risk factor.