

Published in final edited form as:

*Int Urogynecol J.* 2011 December ; 22(12): . doi:10.1007/s00192-011-1503-3.

## Urinary incontinence self-report questions: reproducibility and agreement with bladder diary

**Catherine S. Bradley,**

Comprehensive Access and Delivery Research and Evaluation (CADRE) Center, Iowa City Veterans Affairs Health Care System, Iowa City, IA, USA; Department of Obstetrics and Gynecology, University of Iowa, Iowa City, IA, USA; Department of Obstetrics & Gynecology, University of Iowa Hospitals & Clinics, 200 Hawkins Drive, Iowa City, IA 52242, USA

**Jeanette S. Brown,**

Department of Obstetrics, Gynecology, and Reproductive Sciences, University of California, San Francisco, CA, USA

**Stephen K. Van Den Eeden,**

Kaiser Permanente Division of Research, Oakland, CA, USA

**Michael Schembri,**

Department of Obstetrics, Gynecology, and Reproductive Sciences, University of California, San Francisco, CA, USA

**Arona Ragins, and**

Kaiser Permanente Division of Research, Oakland, CA, USA

**David H. Thom**

Department of Family and Community Medicine, University of California, San Francisco, CA, USA

Catherine S. Bradley: catherine-bradley@uiowa.edu

### Abstract

**Introduction and hypothesis** This study aims to measure self-report urinary incontinence questions' reproducibility and agreement with bladder diary.

**Methods** Data were analyzed from the Reproductive Risk of Incontinence Study at Kaiser. Participating women reporting at least weekly incontinence completed self-report incontinence questions and a 7-day bladder diary. Self-report question reproducibility was assessed and agreement between self-reported and diary-recorded voiding and incontinence frequency was measured. Test characteristics and area under the curve were calculated for self-reported incontinence types using diary as the gold standard.

**Results** Five hundred ninety-one women were included and 425 completed a diary. The self-report questions had moderate reproducibility and self-reported and diary-recorded incontinence and voiding frequencies had moderate to good agreement. Self-reported incontinence types identified stress and urgency incontinence more accurately than mixed incontinence.

**Conclusions** Self-report incontinence questions have moderate reproducibility and agreement with diary, and considering their minimal burden, are acceptable research tools in epidemiologic studies.

## Keywords

Reproducibility of results; Sensitivity and specificity; Stress urinary incontinence; Urinary incontinence, classification; Urgency urinary incontinence

---

## Introduction

Stress and urgency urinary incontinence are common conditions in middle-aged and older women that negatively impact quality of life. Despite increased attention to this area in recent years, research is still needed to better understand the natural history of incontinence and factors which may impact the incidence, progression, and resolution of incontinence symptoms [1]. While clinical practice guidelines recommend using history, examination, bladder diary, urinalysis, and postvoid residual measurement findings in diagnosing incontinence type [2, 3], such evaluations are not feasible in large epidemiologic studies. Large studies typically rely on self- or telephone-administered questionnaires to classify type of incontinence as well as incontinence frequency and severity [4].

Estimates of the prevalence of and risk factors for incontinence by type, stress, or urgency, have been based on responses to simple self-report questions; however, little information is available assessing the accuracy and reliability of such questions. To measure the reproducibility (test–retest reliability) of self-report questions and to assess the agreement between voiding and incontinence frequency and incontinence classification determined by self-report questions and the bladder diary, we used data from the Reproductive Risk of Incontinence Study at Kaiser (RRISK), a racially/ethnically diverse population-based cohort of over 2,000 women in Northern California that contained extensive measures of incontinence.

## Materials and methods

The RRISK study enrolled 2,109 randomly selected women within pre-specified age and race strata who were 40–69 years of age as of January 1, 1999 from the Kaiser Permanente Medical Care Program of Northern California. As previously reported, women were enrolled with a goal of obtaining approximately equal numbers of women in each 5-year age group with a race/ethnicity composition of 20% black, 20% Hispanic, 20% Asian–American, and 40% white (non-Hispanic) [5]. Informed consent was obtained from all subjects and the study was approved by the Institutional Review Board of the Kaiser Foundation Research Institute and the Committee on Human Research of the University of California, San Francisco.

Data were collected by pre-interview questionnaire and reviewed during an in-person interview performed in the woman's home or at a Kaiser clinic. Interviewers were all women and a bilingual interviewer was available for women who preferred to be interviewed in Spanish. During the interview, women who reported current incontinence symptoms that occurred at least weekly completed a self-administered questionnaire focusing on voiding and incontinence frequency and incontinence type (“self-report questions”). The questionnaire was reviewed by the interviewer for completeness before concluding the interview. Additional data collected during the interview included age, race, education, income, employment status, and reproductive history.

Participants who completed the self-report questions were asked to complete a 7-day bladder diary, and a randomly selected subgroup was also mailed a shorter self-report incontinence questionnaire 2 weeks after the initial interview for reliability testing of selected questions.

One reminder telephone call was made to each participant asking them to return the questionnaire.

### Self-report incontinence questions

The self-report incontinence questionnaire asked women to report the number of urinary leaks that occurred during the daytime over the past 7 days, the number of leaks that occurred during the nighttime over the past 7 days, and the numbers of daytime and nighttime voids over a single day. Additional questions focused on incontinence type.

The self-report questions used to classify incontinence type (Appendix 1) were modified from questions validated by comparison to clinical and urodynamic diagnoses [4, 6]. For this study, two methods of classifying incontinence type based on the self-report questions were used: a single question and a three-question method. The single question method classified incontinence type by directly asking participants which type of leakage occurred most often during the past 7 days: stress (leakage with “coughing, lifting, sneezing or exercise”), urgency (leakage “following a physical sense of urgency that you were going to urinate”), other (leakage with “neither an activity nor a sense of urgency”), or mixed (leakage “about equally often with an activity or with a sense of urgency”). For the three-question method, incontinence type was classified based on participants' reports of the numbers of incontinence episodes that occurred in the past 7 days with stress (“an activity like coughing, lifting, sneezing or exercise”), urgency (“a physical sense of urgency”), or other (“without a sense of urgency and without an activity like coughing, lifting, sneezing or exercise”). Women were classified as having stress, urgency or “other” incontinence if at least 50% of all incontinence episodes reported were classified as stress, urgency, or other, respectively. Women were classified as having mixed incontinence if reported types of leakage episodes occurred with equal frequency or if no single type of leakage represented at least 50% of the total leakage episodes reported.

### Bladder diaries

Participants reported numbers of voids, episodes of urine leakage, and the reason for urine leakage each time it occurred (stress, urgency, and other) in 7-day bladder diaries. Participants' bladder diaries were included in the analysis if at least 5 days were complete. Incontinence episodes were grouped by type (stress, urgency, and other) and ratios of the total number of each type of incontinence episode to the total number of episodes recorded were calculated. Women were classified as having stress, urgency, or “other” incontinence based on diary if 50% or more of the total incontinence episodes recorded on the diary were identified as stress, urgency, or other incontinence types, respectively. Women were classified as having mixed incontinence based on the diary if recorded types of incontinence episodes occurred with equal frequency or if no single type of leakage represented at least 50% of the total incontinence episodes recorded.

### Statistical analysis

Test-retest reliability of the self-report questions was examined for the entire cohort and for women whose test-retest interval was  $\leq 30$  and  $>30$  days. Agreement between continuous variables (number of leaks and voids) by self-report and by diary was evaluated using Spearman correlations, and Fisher's  $z$  transformation was used to calculate confidence intervals (CI). Categorical variables (e.g., incontinence type) were compared using unweighted Kappa coefficients. Sensitivity, specificity, positive, and negative predictive values and area under the curve (AUC) were calculated for incontinence types determined using self-report questions compared to diary data using exact confidence intervals.

Agreement between the self-report questions and diary for number of voids and incontinence episodes was assessed in those women who began the diary within 30 days of the initial interview (when the self-report questions were completed). Agreement between incontinence types was restricted to those that reported at least one urinary leak in the last 7 days by self report and on the 7-day diary. In addition to the 50% threshold used for classifying incontinence types (as above), analyses were repeated using a threshold of 75%.

## Results

Of the 2,109 women enrolled in the study, 603 (28.6%) reported weekly incontinence. Of these, 12 women were excluded who reported “continuous” urinary incontinence and were unable to quantify numbers of incontinence episodes, leaving 591 women with weekly incontinence whose data were included in the analyses.

A randomly selected group of 308 women were asked to complete the self-report questions a second time, and 196 (64%) completed and returned the questionnaire (“retest group”). The median test-retest interval was 28 days (range, 7-183 days), and 105 (54%) completed the second questionnaire within 30 days of the initial administration.

Four hundred twenty-five women with weekly incontinence completed the diary (“diary group”). The median interval between completing the self-report incontinence questions and initiating the diary was 1 day (range, 0–231 days), and 409 (96%) began the diary within 30 days of completing the initial self-report questionnaire. The characteristics of the women in each of these (non-exclusive) groups are presented in Table 1. Women who returned the mailed self-report questionnaire (retest group) were older (mean (SD) age 59.9 (7.8) vs. 55.8 (8.4) years,  $p<0.01$ ) and more often unemployed (47% vs. 35%,  $p<0.01$ ) than those who did not return the questionnaire. Women in the diary group were older (mean (SD) age 58.0 (8.7) vs. 54.8 (7.4) years,  $p<0.01$ ), more often white (58% vs. 31%,  $p<0.01$ ), more highly educated (34% vs. 23% had a college or higher degree,  $p<0.05$ ) and more likely unemployed (44% vs. 28%,  $p<0.01$ ) than those who did not complete a diary.

Voiding and incontinence frequency and incontinence episode type reported by self-report questions and the diary were similar (Table 2). By self-report, stress was the most common type of incontinence (37–40%), followed by urgency (31%) and mixed (18–26%) incontinence, whether identified using the single self-report question or using the three-question method. By diary, urgency incontinence was most common (39%), followed by stress (28%) and mixed (21%) incontinence. Five women (1%) reported no leaks occurring during the previous 7 days on the self-report questions, and 34 (8%) had no leaks recorded on the diary.

The self-report incontinence questions demonstrated moderate test-retest reliability (Table 3). Reliability coefficients for numbers of daytime and nighttime urinary leaks and incontinence type (single question) ranged from 0.43-0.58. Kappa reliability coefficients were similar in the overall group and in those with shorter (≤ 30 day) test– retest intervals.

Agreement between the self-report questions and diary results was good for voiding frequencies ( $r=0.61$ – $0.65$ ) and moderate to good for incontinence frequencies by type ( $r=0.41$ – $0.56$ ; see Table 4.) Agreement between self-reported incontinence type and diary-derived incontinence type was lower, whether the self-reported incontinence type was determined using the single question ( (95% CI)=0.35 (0.29–0.42)) or three-question method ( (95% CI)=0.37 (0.30–0.44)). In contrast, very good agreement was seen between the single question self-reported incontinence type and the three-question self-reported incontinence type ( (95% CI)=0.67 (0.62–0.72)).

Sensitivity, specificity, predictive values, and the AUC for stress, urgency, and mixed incontinence based on self-report questions compared to incontinence type determined on bladder diary are presented in Table 5. The single self-report question identified stress and urgency incontinence with an AUC of 0.79 and 0.70, respectively, but the ability to identify mixed incontinence was low. The three-question self-report method had similar results. Self-report questions (using both single and three-question methods) were most sensitive for identifying stress incontinence (sensitivity= 0.78 and 0.82; negative predictive value=0.88 and 0.90, respectively) and most specific for urgency incontinence (specificity=0.88 and 0.89; positive predictive value=0.75 and 0.78, respectively) compared to diary results.

Similar agreement results were seen when a different threshold for defining incontinence type ( 75% of episodes) was applied to define the three-question self-reported incontinence type and diary-based incontinence type (data not shown).

## Discussion

Epidemiologic studies use different methods for assessing and classifying urinary incontinence, but there is little information about the relationships between these different methods making it difficult to compare study results or to choose between measures in designing a study. The current study sought to fill this gap by evaluating the test–retest reliability of common self-report questions, and comparing self-reported voiding and incontinence parameters to 7-day bladder diary results.

We found moderate test–retest reliabilities for self-reported numbers of daytime and nighttime incontinence episodes and incontinence type (single question). Higher reliabilities ( = 0.69–0.78) have been reported for self-report questions on the presence or frequency of stress and urgency incontinence episodes [7, 8], although these studies included very different populations with a different spectrum of incontinence symptoms (women with moderate to severe, largely stress-predominant incontinence in an incontinence treatment trial [7] and elderly community-based Danish women [8]).

The test–retest interval in this study (median interval, 28 days) is longer than that used in many prior studies of the reliability of incontinence self-report and bladder diary outcome measures (range, 3 days to up to 4 weeks) [7–13], and this might partially explain the lower reliability seen. The ideal test–retest interval is long enough to avoid subjects answering questions based on memory and short enough to avoid interval change in the condition being measured and a 2-week interval is often recommended for chronic conditions [14]. The longer interval in this study might have lowered the reliability estimates measured for some self-report questions because of a change in incontinence symptoms. However, the reliability estimates for self-report questions were not consistently higher for those with test–retest intervals < 30 days compared to >30 days in length.

Agreement between self-reported and diary-recorded voiding and leakage frequencies was moderate to good. Similar to our findings, Wyman et al. [13] found correlations of 0.57 and 0.63 for daytime and nighttime micturition frequencies, respectively, when assessed by history and 14-day diary. On the other hand, a study of stress incontinence patients comparing self-reported and diary-recorded urinary frequencies suggested that self-report overestimated daytime urinary frequency [15]. While nighttime voiding frequency strongly agreed with diary results ( $r=0.79$ ), only weak agreement was seen for self-reported and diary-recorded daytime voiding frequency ( $r=0.31$ ). Kenton et al. [16] found moderate correlations (0.50–0.66) in the numbers of incontinence episodes recalled by participants and reported by 7-day diary but significantly more incontinence episodes (median of four more episodes) were reported by recall than by diary at each time point assessed. In contrast,

we found no significant directional differences in voiding frequencies or in the frequency of incontinence episodes reported by self-report and diary.

We also compared type of incontinence defined by two self-report methods (one using a single self-report question and one using responses to three self-report questions) and by bladder diary. The two self-report methods agreed well with each other with respect to type of urinary incontinence ( $\kappa = 0.67$ ), but both had only fair agreement when compared to incontinence type determined using a bladder diary. The moderate agreement between self-reported responses and diary results observed in this study and others may in part result from the normal week-to-week variability of incontinence. In addition, for our study, the incontinence questions were not asked with reference to the same 7-day period as the diary. However, most participants began the 7-day diary within a few days of responding to the self-report questions and we limited our agreement analyses to those who began the diary within 30 days of completing the self-report questions.

The population-based nature of the study sample, the large sample size and its racial and ethnic diversity are strengths of our research. Most previous research on noninvasive incontinence outcome measures has been performed in clinical trial subjects or specialty clinic patients, and therefore may not be generalizable to nontreatment seeking study populations. Thus, these data represent an important contribution to the literature on incontinence outcome measures. We also acknowledge limitations to our research. As a measure of the validity of the RRISK self-report questions, we assessed levels of agreement between these questions and bladder diaries, often used as primary outcome measures for incontinence clinical trials. While bladder diaries are not a true “gold standard” for incontinence type, other diagnostic methods (e.g., clinical examination and urodynamic tests) have their own limitations and are not feasible for use in this type of large community-based study.

In our population-based study of ethnically diverse women with at least weekly incontinence, self-reported voiding and incontinence frequency and type had moderate reproducibility and moderate to good agreement with bladder diary voiding and incontinence parameters. Using self-reported questions to determine incontinence type had only fair agreement with diary-derived incontinence type. Results using a single self-report question were very similar to using three questions, but both differed from incontinence type assessed by diary. These results should be helpful in comparing studies using self-report and bladder diaries to assess incontinence, and when choosing between self-report and bladder diary for use in future studies. Considering their minimal participant burden, self-report questions may be acceptable research tools in studies assessing incontinence outcomes where use of a bladder diary would be infeasible. For example, a genome-wide association study, which would require thousands of affected and unaffected women, would most likely only be accomplished with data ascertained via self-report.

## Acknowledgments

The Reproductive Risks of Incontinence Study at Kaiser was funded by the National Institutes of Diabetes, Digestive and Kidney Diseases (NIDDK) grant #5 R01 DK53335 and the NIDDK/Office of Research on Women's Health Specialized Center of Research grant #P50 DK064538. Additional support included grant 5 K23 HD047654 (CSB) from the National Institutes of Child Health and Human Development.

**Financial disclaimer:** CS Bradley received research support from Pfizer and is a Consultant for Astellas/GSK. JS Brown also received research support from Pfizer. SK Eeden received research support from GSK.



## Appendix

### Self-report incontinence questions

Question used to identify “single question” self-reported incontinence type:

1. During the past 7 days, did you accidentally leak urine most often with? (Check one box only.)

- an activity like coughing, lifting, sneezing or exercise
- following a physical sense of urgency that you were going to urinate
- neither an activity nor a sense of urgency
- about equally often with an activity or with a sense of urgency

Questions used to identify “3 question” self-reported incontinence type:

1. During the past 7 days, how many times total did you accidentally leak urine with an activity like coughing, lifting, sneezing or exercise? \_\_\_\_\_
2. During the past 7 days, how many times total did you accidentally leak urine with a physical sense of urgency? (Urgency is defined as a strong urge or pressure to urinate.) \_\_\_\_\_
3. During the past 7 days, how many times total did you accidentally leak urine without a sense of urgency and without an activity like coughing, lifting, sneezing or exercise? \_\_\_\_\_

## References

1. Landefeld CS, Bowers BJ, Feld AD, et al. National Institutes of Health state-of-the-science conference statement: prevention of fecal and urinary incontinence in adults. *Ann Intern Med.* 2008; 148:449–458. [PubMed: 18268289]
2. Assessment and treatment of urinary incontinence. Scientific Committee of the First International Consultation on Incontinence. *Lancet.* 2000; 355:2153–8. [PubMed: 10902644]
3. Fantl JA, Newman DK, Colling J, et al. Urinary incontinence in adults: acute and chronic management Clinical Practice Guideline no 2. US Department of Health and Human Services. Public Health Service, Agency for Health Care Policy and Research; Rockville, MD: 1996.
4. 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; 53:1150–1157. [PubMed: 11106889]
5. Thom DH, van den Eeden SK, Ragins AI, et al. Differences in prevalence of urinary incontinence by race/ethnicity. *J Urol.* 2006; 175:259–264. [PubMed: 16406923]
6. Sandvik H, Hunskaar S, Vanvik A, Bratt H, Seim A, Hermstad R. Diagnostic classification of female urinary incontinence: an epidemiological survey corrected for validity. *J Clin Epidemiol.* 1995; 48:339–343. [PubMed: 7897455]
7. Bent AE, Gousse AE, Hendrix SL, et al. Validation of a two-item quantitative questionnaire for the triage of women with urinary incontinence. *Obstet Gynecol.* 2005; 106:767–773. [PubMed: 16199634]
8. Rohr G, Christensen K, Ulstrup K, Kragstrup J. Reproducibility and validity of simple questions to identify urinary incontinence in elderly women. *Acta Obstet Gynecol Scand.* 2004; 83:969–972. [PubMed: 15453896]
9. Brown JS, McNaughton KS, Wyman JF, et al. Measurement characteristics of a voiding diary for use by men and women with overactive bladder. *Urology.* 2003; 61:802–809. [PubMed: 12670569]

10. Groutz A, Blaivas JG, Chaikin DC, et al. Noninvasive outcome measures of urinary incontinence and lower urinary tract symptoms: a multicenter study of micturition diary and pad tests. *J Urol*. 2000; 164:698–701. [PubMed: 10953128]
11. Locher JL, Goode PS, Roth DL, Worrell RL, Burgio KL. Reliability assessment of the bladder diary for urinary incontinence in older women. *J Gerontol A Biol Sci Med Sci*. 2001; 56:M32–M35. [PubMed: 11193230]
12. Nygaard I, Holcomb R. Reproducibility of the seven-day voiding diary in women with stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct*. 2000; 11:15–17. [PubMed: 10738929]
13. Wyman JF, Choi SC, Harkins SW, Wilson MS, Fantl JA. The urinary diary in evaluation of incontinent women: a test– retest analysis. *Obstet Gynecol*. 1988; 71:812–817. [PubMed: 3368165]
14. Streiner, DL.; Norman, GR. *Health measurement scales: a practical guide to their development and use*. Oxford University Press; New York: 1995.
15. Stav K, Dwyer PL, Rosamilia A. Women overestimate daytime urinary frequency: the importance of the bladder diary. *J Urol*. 2009; 181:2176–2180. [PubMed: 19296975]
16. Kenton K, FitzGerald MP, Brubaker L. What is a clinician to do—believe the patient or her urinary diary? *J Urol*. 2006; 176:633–635. [PubMed: 16813908]



**Table 1**  
**Participant characteristics in women with weekly urinary incontinence and in those included in the retest questionnaire and bladder diary subgroups**

Characteristic	Weekly incontinence (N=591)	Retest questionnaire group (N=196)	Bladder diary group (N=425)
Race			
White	300 (51)	108 (55)	248 (58)
Black	96 (16)	26 (13)	53 (12)
Asian	64 (11)	23 (12)	50 (12)
Latina	121 (20)	37 (19)	67 (16)
Other	10 (2)	2 (1)	7 (2)
Education			
High school or less	124 (21)	39 (20)	79 (19)
Some college	285 (48)	93 (47)	203 (48)
Bachelor degree or more	182 (31)	64 (33)	143 (34)
Age (years)			
40–49	125 (21)	17 (9)	82 (19)
50–59	237 (40)	84 (43)	155 (36)
60	229 (39)	95 (48)	188 (44)
Income			
<\$40,000	154 (28)	50 (27)	103 (26)
\$40,000–59,999	128 (23)	37 (20)	99 (25)
\$60,000	273 (49)	98 (53)	194 (49)
Employment status			
Employed	358 (61)	103 (53)	239 (56)
Unemployed	233 (39)	93 (47)	186 (44)
Parity			
0	88 (15)	23 (12)	63 (15)
1	59 (10)	25 (13)	46 (11)
2	165 (28)	61 (31)	123 (29)
3	278 (47)	87 (44)	192 (45)

Data presented as *n* (%). Percents refer to all participants with data available for the characteristic, which may be less than the number in the entire subgroup due to missing data

**Table 2**  
**Self-report urinary incontinence questions and bladder diary results in women with weekly incontinence**

	Self-report questions <i>N</i> =591 <sup>a</sup>	Bladder diary <i>N</i> =425
Stress leak per 7 days (median, IQR)	2 (0, 7)	1 (0, 4)
Urgency leak per 7 days (median, IQR)	2 (0, 5)	2 (0, 6)
Other leak per 7 days (median, IQR)	0 (0, 2)	0 (0, 1.2)
Daytime leaks per 7 days (median, IQR)	5.5 (3, 14)	6 (3, 12.6)
Nighttime leaks per 7 days (median, IQR)	0 (0, 1)	0 (0, 1.2)
Daytime voids per day (median, IQR)	6 (5, 8)	7.4 (6, 9.1)
Nighttime voids per day (median, IQR)	1 (1, 2)	0.9 (0.3, 1.4)
Incontinence type (single question) ( <i>n</i> (%)) <sup>b</sup>		
Stress	237 (40)	n/a
Urgency	180 (31)	n/a
Mixed	105 (18)	n/a
Other	68 (12)	n/a
Incontinence type (by 50% rule) ( <i>n</i> (%)) <sup>c</sup>		
No leaks	5 (1)	34 (8)
Stress	219 (37)	121 (28)
Urgency	184 (31)	165 (39)
Mixed	151 (26)	88 (21)
Other	32 (5)	17 (4)

*IQR* Intraquartile range

Percents refer to all participants with data available for the characteristic

<sup>a</sup>*N* may vary slightly due to missing data

<sup>b</sup>“Single question” self-reported incontinence type was identified by asking “did you accidentally leak urine most often with: an activity like coughing, lifting, sneezing, or exercise (stress); following a physical sense of urgency that you were going to urinate (urgency); neither an activity nor a sense of urgency (other); and about equally often with an activity or with a sense or urgency (mixed)”

<sup>c</sup>Self-reported incontinence type was identified using three questions in which subjects reported numbers of leak episodes over the past 7 days with activity (stress), with urgency (urgency) or without activity or urgency (other). Diary incontinence type was identified using frequencies of reported stress, urgency, and other leaks on 7-day diaries. For both, women were classified as having stress, urgency, or other incontinence if at least 50% of the total leak episodes were reported as stress, urgency, or other type, respectively. All others were classified as having mixed incontinence

**Table 3**  
**Test–retest reliability of self-report questions in 196 participants**

Self-report question	Coefficient (95% CI)		
	Test–retest interval 30 days ( <i>n</i> =105)	Test–retest interval >30 days ( <i>n</i> =84)	Test–retest interval in entire group ( <i>n</i> =196) <sup>a</sup>
Daytime leaks (per 7 days) <sup>b</sup>	0.43 (0.25, 0.57)	0.48 (0.30, 0.63)	0.48 (0.37, 0.58)
Nighttime leaks (per 7 days) <sup>b</sup>	0.52 (0.36, 0.65)	0.57 (0.40, 0.70)	0.56 (0.45, 0.65)
Type most often leaked (single question) <sup>c</sup>	0.58 (0.45, 0.70)	0.43 (0.29, 0.58)	0.51 (0.42, 0.60)

*CI* confidence interval

<sup>a</sup>The test–retest interval was unknown for seven of the 196 women

<sup>b</sup>Spearman correlation

<sup>c</sup>Kappa coefficient

**Table 4**  
**Agreement between self-reported and diary-recorded voiding and incontinence frequencies ( $n=409$ )**

Variable	Difference (self-report – diary)		Coefficient (95% CI) <sup>a</sup>
	Median	1st and 3rd Quartiles	
Daytime voids (per day)	–1.2	–2.6, –0.1	0.61 (0.55, 0.67)
Nighttime voids (per day)	0.3	–0.1, 0.9	0.65 (0.59, 0.70)
Daytime leaks (per 7 days)	0	–4.0, 4.0	0.51 (0.44, 0.58)
Nighttime leaks (per 7 days)	0	–1.0, 0.0	0.43 (0.34, 0.50)
Stress leak (per 7 days)	0	–1.0, 3.0	0.56 (0.48, 0.62)
Urgency leak (per 7 days)	0	–2.3, 1.0	0.46 (0.38, 0.53)
Other leak (per 7 days)	0	0.0, 0.0	0.41 (0.33, 0.49)

<sup>a</sup>Spearman correlations

**Table 5**  
**Sensitivity, specificity and predictive values (with 95% CI) for urinary incontinence type determined using self-report question(s) (both using single question and three-question methods) compared to incontinence type determined by diary as a gold standard (N=375)**

Incontinence type	Self report definition	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Area under the curve
Stress	Single question	0.82 (0.74–0.89)	0.76 (0.70–0.81)	0.61 (0.53–0.69)	0.90 (0.85–0.94)	0.79 (0.75–0.83)
	Three questions	0.78 (0.70–0.85)	0.77 (0.72–0.82)	0.62 (0.53–0.69)	0.88 (0.83–0.92)	0.78 (0.73–0.82)
Urgency	Single question	0.52 (0.44–0.60)	0.88 (0.82–0.92)	0.75 (0.66–0.83)	0.72 (0.66–0.77)	0.70 (0.65–0.74)
	Three questions	0.54 (0.46–0.62)	0.89 (0.84–0.93)	0.78 (0.69–0.85)	0.73 (0.67–0.78)	0.72 (0.67–0.76)
Mixed	Single question	0.21 (0.13–0.32)	0.84 (0.79–0.88)	0.28 (0.17–0.40)	0.79 (0.74–0.83)	0.53 (0.48–0.58)
	Three questions	0.36 (0.26–0.47)	0.77 (0.72–0.82)	0.31 (0.22–0.42)	0.81 (0.76–0.85)	0.57 (0.51–0.62)

Women with no incontinence on diary ( $n=34$ ) were excluded