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Healthy bladder storage and emptying functions in community-dwelling women measured by a 2-day bladder health diary

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Abstract

Introduction: The prevalence of healthy bladder storage and emptying function in community-dwelling women is not well established.

Methods: A planned secondary analysis of a U.S. cross-sectional study designed to validate a bladder health instrument was conducted in women aged 18 years. A subset was invited to complete the novel 2-day bladder health diary capturing bladder storage and emptying experiences. Overall healthy bladder function was defined as 8 waking/daytime voids and 1

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void during sleeping/nighttime; along with the *absence* of leakage, urgency, emptying difficulties (initiation, flow, efficacy, relief of urge sensation) and pain. Descriptive statistics of healthy bladder functions and regression models of factors associated with healthy function are reported.

Results: Of the 383 invited, 237 (62%) eligible women returned complete dairies. Of these, 12% (29/237) met criteria for overall healthy bladder function. Most (96%) denied pain, 74% had healthy daytime and 83% had healthy nighttime voiding frequency, 64% were continent, 36% reported healthy emptying and 30% denied any urgency episodes. Middle income (OR:95%CI=11.4:1.9-67.4 for \$75k-\$99,999 vs. \$25,000-\$49,999), Graduate education (4.8:1.4-17) and previously seeking treatment for bladder problems (OR:95%CI=0.1; 0-0.9) were associated with overall healthy function.

Conclusion: The prevalence of overall healthy bladder function was very low based on our strict definition of health as measured on a 2-day diary. However, most women had healthy voiding frequency and denied pain or urinary leakage. Post-void dribbling and urgency most commonly contributed to an overall unhealthy bladder. Further investigation is needed to determine whether these diary derived measures are meaningful for patient-oriented bladder health research.

Keywords

Bladder health; bladder storage; bladder emptying; diary; nocturia; urinary continence; urinary frequency

Introduction

Promotion of bladder health and prevention of lower urinary tract symptoms (LUTS) across the life course in women and girls is the primary goal of the Prevention of LUTS (PLUS) Research Consortium.(1) A critical challenge to this research agenda has been the lack of understanding of a spectrum of bladder health, from very healthy to very unhealthy, in community-dwelling populations. Historically, and as with most medical conditions, bladder health has been assumed through the presence or absence of specific symptoms including identification of, and impact from, LUTS in clinical populations. With this lens, existing objective measures of bladder function for population-based research have employed bladder diaries and report “normative values” for individual components of LUTS (e.g., frequency, nocturia, and incontinence).(2) There is a paucity of data on the comprehensive measurement of bladder health using objective measures assessing the absence of any LUTS. To approach this question on a population level, bladder diaries assessing a spectrum of storage and emptying functions are necessary because invasive testing such as physical assessment and urodynamics are not feasible. Voiding diaries have generally been designed to capture urinary frequency, urgency, leakage and, may or may not include voided volumes. Normative values using these types of diaries have been reported(2); however, the evaluation of healthy bladder function across both storage and emptying including post-void dribbling (PVD) and pain symptoms has not been assessed in population-based diary studies.

To further evaluate the experience of bladder health and healthy bladder function in community-dwelling women, the PLUS Research Consortium conducted the Validation of Bladder Health Instrument for Evaluation in Women (VIEW) study to validate a novel

bladder health instrument.(3) As part of this study, a novel 2-day bladder health diary (2D-BHD) was adapted from traditional LUTS-focused voiding diaries to capture a variety of storage and emptying experiences. The aims of this report are to describe the prevalence of overall healthy bladder function and individual healthy storage and emptying functions in community-dwelling women; and to explore factors associated with healthy bladder functions.

Materials and Methods

This was a planned secondary analysis of data collected from participants enrolled in the PLUS Consortium's VIEW cross-sectional study.(3) Individuals self-reported as female at birth and aged 18 years were recruited between September 2019 and August 2020 using a delivery sequence file address-based probability sampling frame across the United States. The details of the primary study and methods have been published.(3) This was an IRB approved study where a sampling of participants who completed the initial validation surveys (including demographics, medical history, LUTS assessments and the bladder health instrument) were invited to complete the 2D-BHD. Return of surveys and diaries implied consent. Those who self-reported neurologic conditions were excluded from analyses.

The 2D-BHD was adapted from standardized voiding diaries commonly used for LUTS outcome assessments, and supplemented based on expert opinion and information gathered from focus groups and cognitive evaluations of women's preferred bladder health terminology.(3-5) Two days of data collection was selected in order to minimize the participant burden of longer diaries and to capture nocturnal events that may not be accurately reflected in a single 24-hour or 1-day diary. Figure 1 displays how the 2D-BHD captured subjective bladder storage function, including frequency (waking/daytime and sleeping/nighttime), continence, sensation of urgency and pain; and subjective emptying including initiation, stream flow, efficacy, sensation of urge relief, completeness, PVD and pain.(6,7)

The diary was used to define each individual storage and emptying function. Figure 1 demonstrates one day of the 2D-BHD and how data were captured (e.g., PVD presence as a "yes" response in column 6). Healthy storage on the diary was defined as a mean of 8 voids during waking hours over the 2 days, 1 voids during sleeping hours between day 1 and day 2, and the absence of any episodes of urinary leakage, urinary urgency, or "pain while holding urine" on both days of the diary. Healthy emptying was defined as "yes" responses to "easy starting to pee", "continuous stream", "feeling the bladder empty" and the "need to pee feeling is gone;" plus a "no" response to the items "did you dribble pee when you were done" and "pee sensation uncomfortable or painful." Overall healthy bladder function was defined as *both* healthy storage and healthy emptying as defined above. Baseline characteristics including demographics, financial income and security, medical history, height and weight were obtained by self-report

Sample size calculations were not conducted as this was a subanalysis of data collected from the parent study.(3) Descriptive statistics were used to report prevalence of overall healthy bladder function, healthy storage, and healthy emptying. Individual components of urinary

frequency (waking and sleeping), presence and degree of urinary incontinence, frequency of urgency episodes and frequency of emptying experiences with each void were reported. Presence of pain with storage or emptying on either day was also described. Percentages, means, standard deviations (SD), medians, and interquartile ranges (IQR) were used to describe the distribution of these reported emptying experiences. Adjusted prevalence was also estimated by weighting participants by the inverse of their sampling probability to correct for survey non-response. Exploratory backward stepwise logistic regression models identifying demographic and medical characteristics associated with healthy functions at a $p < 0.2$ are reported in adjusted odds ratios (OR) with 95% confidence intervals (95% CI). Missing values were handled by single imputation for regression models using fully conditional specification methods.⁽⁸⁾ Imputation and regression were conducted using SAS 9.4, and all other analyses were conducted using R 4.0.2. Pearson's correlation coefficient was used to assess the correlation between day 1 and day 2 of the diaries.

Results

A total of 6,000 invitations to participate in the VIEW study were mailed, with 4,975 having eligible participants and deliverable addresses. A total of 604 women (12.1%) responded to the primary survey and 383 were invited to complete the 2D-BHD. A total of 248 (65%) of those invited returned complete diaries and 237 were used for analysis (Figure 2). Table 1 describes the demographics and characteristics of the 237 respondents. The mean age was 55.9 ± 15.4 years with 3% describing their race as Asian, 6% Black, 89% White, and 87% non-Hispanic origin; 37% had a healthy body mass index, and 56% overweight or obese; 55% denied comorbid conditions (sleep apnea, diabetes, high blood pressure, depression, asthma/chronic lung disease)

Only 29 women (12%) had overall healthy bladder function based on our strict definition (Table 2). Healthy storage occurred in 45 (19%): the mean voiding frequency during waking hours of 8 per day (across both days) occurred in 175 (74%) and 1 episodes of nocturia occurred in 196 (83%). Mean frequency of urination for the whole cohort was 7.5 ± 2.4 (median=7, IQR=3) per 24 hours, with 7.2 ± 2.2 (median=7, IQR=3) during waking hours and 0.8 ± 1.2 (median 0, IQR=1) during sleeping hours. The correlation coefficient between day 1 and day 2 of the diaries was high (0.73, $p < 0.01$). A total of three participants reported voiding 3 times a day and three reported fewer than 3 times per day; these women were included in the "healthy" group for these analyses. Nocturia occurred once in 72 (30%), twice in 28 (12%) and 3 or more times in 13 (5%) of participants. A total of 151 (64%) were continent (i.e., denied any urine leakage) over the 2D-BHD; however, those with leakage reported an average of 1.9 ± 1.8 (median=1, IQR=2) leaks per 24-hour period with the majority of leaks being small (69%), and the rest medium (19%) or large (12%) volume. Only 71 (30%) denied any single urgency episode over 2-days. In those who reported any urgency, the mean daily number of urgency episodes was 3.2 ± 2.5 (median=2.5, IQR=4) and within those women who reported any urgency, 37% (IQR=45) of their daily voids were associated with urgency. Pain during storing was experienced by 10 (4%).

Healthy emptying was experienced by 85/236 (36%) women. Of the 152 who reported unhealthy emptying experiences, the most common symptom was PVD ($n=123/152$, 81%)

followed by non-continuous stream (n=74/152, 49%), feeling of incomplete emptying (n=46, 30%) and difficulty starting stream (n=40, 26%). Of those reporting one or more unhealthy emptying experiences on either day of the diary, 28% of their voids were described as unhealthy experiences, mostly consisting of PVD which occurred in 22% of their voids. Pain during emptying occurred in 9/234(4%). Overall, the vast majority of women, (91%) denied any pain with storage or emptying, and of the 19 who reported any pain for either day, only one (5%) had pain with both storage and emptying. Weighted estimates were similar across functions and symptoms and are reported in Table 2.

Stepwise logistic regression models (Table 3) identified income (OR:95%CI=11.4: 1.9-67.4 for \$75k-\$99,999 vs. \$25,000-\$49,999) and education (4.8: 1.4-17 for graduate vs. bachelor's degree) as positively associated with overall healthy bladder function, and previously seeking treatment for bladder problems as inversely associated (0.1: 0-0.9). Not surprisingly, those who had sought treatment for bladder problems were less likely to have healthy voiding frequency (0.3: 0.1-0.7), absence of leakage (0.3: 0.1-0.6), easy stream (0.4: 0.2-0.9) or absence of PVD (0.3: 0.1-0.6). Those with fewer comorbidities were more likely to not have leakage (0.7: 0.5-0.9), urgency (0.6: 0.4-0.8), or PVD (0.6: 0.5-0.9). Those working compared to not working were more likely to not wake up more than once from sleep to urinate (2.3: 1.1-4.9). There were too few women with pain to evaluate associations between pain-free bladder experiences and baseline characteristics. Of note, overall healthy bladder function did not appear to decrease across age groups (Supplemental Table 1) and age was no longer significantly associated with healthy voiding frequency on multivariate analysis (Table 3).

Discussion

In this sample of community-dwelling women, without self-reported neurologic conditions, we report new information on the prevalence and factors associated with healthy bladder function as measured by a novel 2-day bladder health diary that incorporates frequency, urgency and continence in addition to emptying experiences and pain, which are not typically included in existing diaries. Based on our strict definition, the prevalence of overall healthy bladder function for all storage and emptying components was very low. While three in four women voided 8 or fewer times during waking and 1 or fewer times during sleeping hours, most community-dwelling women reported emptying irregularities with urinary urgency episodes occurring approximately 3 times per day. While two-thirds of women denied leakage; in those who reported leakage, most reported small amounts approximately twice a day. Post-void dribbling was the most common reported unhealthy function; details related to this symptom and overall impact on women were not captured. Further qualitative exploration of this experience is warranted. Factors associated with healthy bladder functioning also include fewer comorbidities, household income, graduate level education and working at a job. As expected, having not sought care for bladder problems was associated with healthy storage and emptying functions.

Our results differ slightly from a prior meta-analysis and a secondary analysis of interview data of women participating in the Boston Area Community Health survey on urination frequencies captured using recall and not voiding diaries or other real time assessment.

(2,9) In the meta-analysis, the pooled estimate for daytime frequency was 6.6 times/day and nighttime frequency was 0.4 times/night, with 24-hour frequency being 7.0 times per 24-hours. These studies also found similar 95% normative reference ranges for daytime frequency: 11 times per day and 9-10 times per day, respectively, and nighttime frequency was 3 times per night and 2-4 times per night, respectively (2,7). In the current study, which used real time data collection via a bladder diary, the median daytime frequency for community-dwelling women was 7 times/day, median nighttime frequency was 0 times/night, and median 24-hour frequency was 7. These differences might be explained by the current study's selection criteria involving a subset of women participating in the parent study who voluntarily returned the 2D-BHD or may also reflect the differences secondary to the method of measurement. Also, estimation of urination frequencies, particularly daytime frequency by recall versus real time data collection using a bladder diary is less reliable as women both overestimate and underestimate their daytime frequency, whereas nighttime frequency tends to be somewhat similar or overestimated.(10,11) The prevalence of continence by diary in this population is consistent with epidemiologic data reporting ranges of urinary incontinence from 25% to 45% (i.e. continence of 55% to 75%).(12) Population based studies using voiding diaries measuring incontinence, urgency, post void dribbling, and pain are lacking. Therefore, these data add new information regarding bladder storage and emptying habits in community-dwelling women.

Factors predictive of overall healthy bladder function and specific aspects of healthy storage and emptying functions have not been reported in the literature. Interestingly, we did not find an association between healthy bladder function and age, despite the fact that prevalence of LUTS increases with age. We did find that increasing number of comorbidities were negatively associated with overall healthy bladder function, while higher incomes were positively associated with overall healthy bladder function. Similarly, increasing number of comorbidities was positively associated with urinary urgency episodes and PVD, the most frequent unhealthy storage and emptying experiences respectively. Our findings support the established associations between comorbid conditions (e.g., obesity, heart disease, diabetes, and pulmonary disease)(13-15) and LUTS. Not surprisingly, women who had sought treatment for bladder problems were also less likely to have healthy bladder function. However, care seeking for women with LUTS is low(16), thus the implications of these findings are of limited importance. An unanticipated finding was that women who were working were less likely to have nocturia than those who were not working. The reason for this is unclear and should be explored further in future studies.

Strengths of this study include the use of a novel 2-day bladder health diary capturing both storage and emptying symptoms in addition to pain. This diary allowed investigators to capture storage and emptying experiences in real time. By not focusing only on the presence of individual LUTS outcomes, the bladder diary also allowed investigators to objectively examine the full spectrum of bladder storage and emptying experiences, including post-void dribbling, incomplete emptying and pain. Most clinical research and clinical practice guidelines(17,18) suggest obtaining bladder diary data as presented in a tabular format and includes voiding times, fluid intake and urine output volumes, types of beverages consumed, ratings of urgency, report of urinary incontinence, and pad usages. Very few

diaries, especially for women, include the full spectrum of bladder storage and emptying experiences such as post-void dribbling, incomplete emptying and pain.

Additional strengths of the study include its use of a national based sampling strategy and high completion rates of the 2-day bladder health diary. We attribute this high compliance to the short diary duration and ease of completion. The ideal duration of a diary is of debate, with 3-day diaries being most used in clinical research. However, the timing and duration of collecting bladder diary data often balances the frequency of LUTS with patient burden. Participant burden is the main drawback of diaries, as diaries are not completed in real-time and bladder data ascertained from recall bias may not be accurate as compared with patient reported outcome measures.(19). These limitations were also noted in a recent systematic review on normative bladder data by Wyman et al where the main source of measurement included bladder diary data.(9)

Study limitations include lack of validation of the 2-day diary, non-universal response, and the operational definition of nocturia which only measured one night of diary keeping. Based on the VIEW study design, the effect of specific comorbidities, medications, and fluid intake types and volume on bladder function was not assessed, which could impact the findings by over or underestimating healthy bladder functions. For example, fluid intake is directly related to urinary frequency and may overestimate unhealthy storage function in the setting of excessive fluid intake.(9) Future study of normative voiding frequency controlling for fluid intake is warranted. Additional limitations to the study include that specific reasons for care seeking and presence of active treatment (e.g., medication therapy for OAB) were not captured. In addition, although use of a 2-day paper bladder diary , versus a 3- or 7- day diary may have reduced participant burden, it also may have underestimated outcomes (20,21). However, a recent study showed that frequency, incontinence episodes, and other events on the first day of a 3-day diary highly correlated with subsequent days.(22) In our study, the correlation between day 1 and 2 on the diaries was strong, suggesting the 2 day diary was sufficient to capture voiding frequency. It is possible, however, that the paper diaries may not have been completed in real time, resulting in recall bias.(19) (9) Future studies are needed to determine whether the use of electronic diaries and momentary assessments may improve adherence and accuracy.(21)

Conclusion

In conclusion, a strict definition of overall bladder health based on bladder diaries alone may not represent “normal” for women. The presence of a sudden and urgent need to void may not be unhealthy, rather a natural response when bladder storage capacity is stressed. Emptying difficulties including PVD and non-continuous urine stream also occur commonly. Future research should investigate whether women perceive these changes in bladder storage and emptying functions as unhealthy to develop a more informed definition of bladder health and shared treatment goals.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Please complete the following questions for **Day 1**.

What time did you get up for the day? : AM PM
 What time did you go to bed? : AM PM
 Are you breastfeeding? Yes No
 Do you think you have a bladder infection today? Yes No
 Did you experience pain while you were holding urine? Yes No
 Pee sensation uncomfortable or painful? Yes No

Participant ID:
 Date: / / 20

Did you use any pads for pee leaks? Yes No

Please list the number of pads used today:

Pantyliners: # Maxi pads: # Pull-on/Adult Briefs with Tabs: #

Did this represent a typical or normal day for you? Yes No → Please state what was different:

Column 1	Column 2	Column 3			Column 4	Column 5		Column 6		
Peed	Time of Pee or Leak	Accidental Leak			Urgency	Pee Experience		After-Pee Experience		
Check Pee or Leak or Both	Time of Pee or Leak	Amount of Pee Leakage (check one if leak)			Had a sudden and urgent need to pee	Easy starting to pee	Continuous pee stream	Do you feel bladder is empty?	Is the "need to pee feeling" gone?	Did you dribble pee when you were done?
<input type="checkbox"/> P <input type="checkbox"/> L <input type="checkbox"/> B	<input type="text"/> : <input type="text"/> <input type="checkbox"/> AM <input type="checkbox"/> PM	Small (S)	Medium (M)	Large (L)	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
1		<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> L						

Figure 1. Elements collected day 1 of the novel 2-day bladder health diary
 Storage and voiding experiences as captured on the 2-day bladder health diary. Note the day 2 diary mirrors day 1 collection.

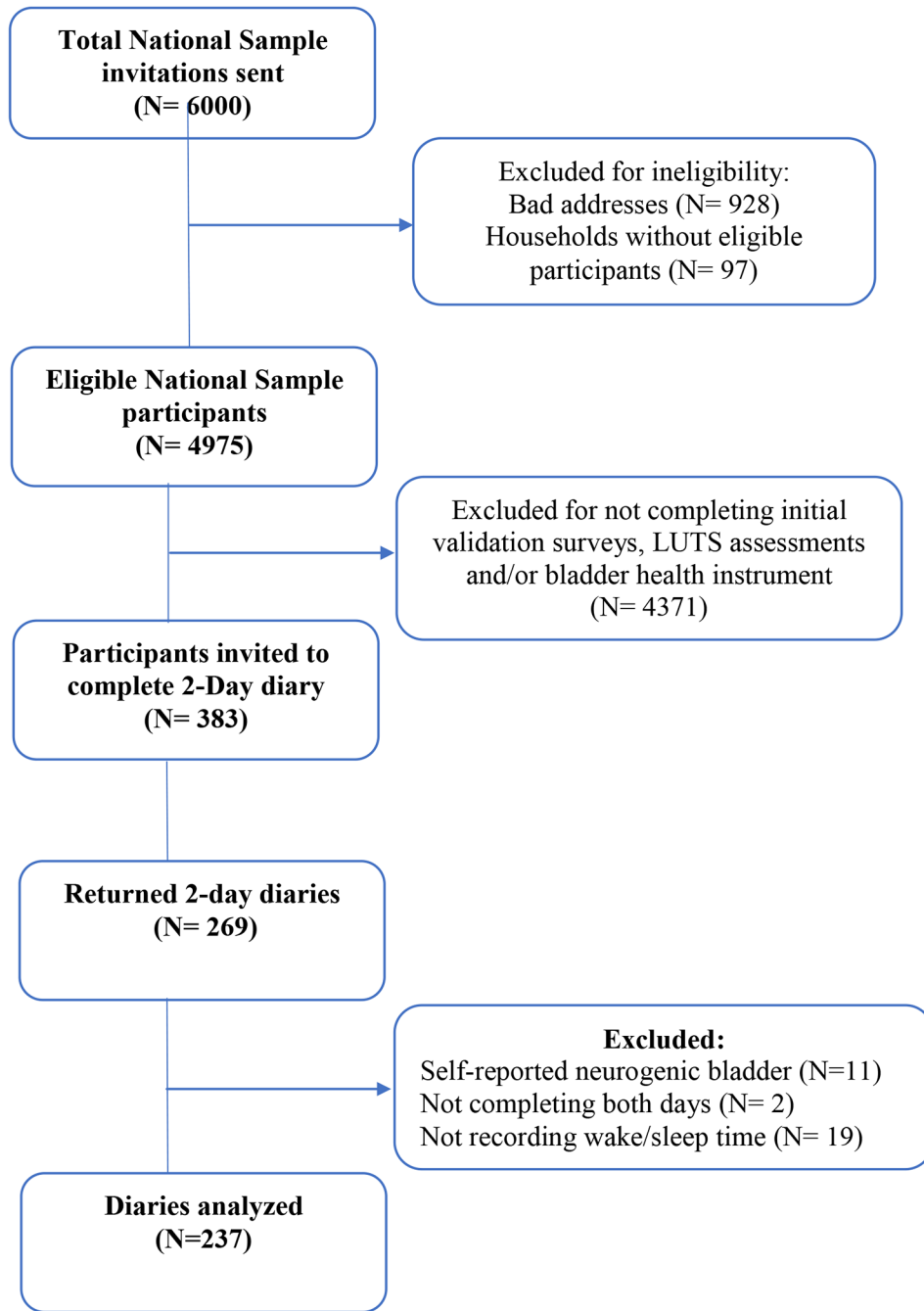


Figure 2.
Study flow diagram
LUTS = Lower Urinary Tract Symptoms

Table 1.

Descriptive statistics among those who completed a 2-day bladder health diary.

	N	Sample	Weighted
Full Sample	237		
Age; mean (SD)		55.9 (15.4)	55.4 (15.7)
Age Group (%)			
18 to <25	7	3.0%	2.8%
25 to <35	20	8.4%	10.0%
35 to <65	121	51.1%	49.9%
65+	80	33.8%	34.5%
Missing	9	3.8%	2.8%
Gender Identity (%)			
Female/Woman	231	97.5%	97.6%
Trans Male/Trans Man	0	0.0%	0.0%
Genderqueer/Gender nonconforming	0	0.0%	0.0%
Identify in a different way	0	0.0%	0.0%
Missing	6	2.5%	2.4%
Highest education completed (%)			
Less than high school	5	2.1%	2.5%
High school or GED	26	11.0%	11.3%
Some college or AA	72	30.4%	30.0%
Bachelors	52	21.9%	21.5%
Graduate degree	74	31.2%	31.4%
Missing	8	3.2%	3.3%
Hispanic origin (%)			
No	206	86.9%	85.1%
Mexican	3	1.3%	2.0%
Puerto Rican	0	0.0%	0.0%
Cuban	1	0.4%	0.3%
Other	5	2.1%	2.8%
Missing	22	9.3%	9.8%
Race *			
Asian	7	3.0%	5.2%
Black	14	5.9%	5.8%
White	211	89.0%	88.3%
Other Race	2	0.8%	0.9%
Missing	10	4.2%	4.5%
Language spoken at home (%)			
English	227	95.8%	94.9%
Spanish	5	2.1%	3.1%
Other	0	0.0%	0.0%
Missing	5	2.1%	2.0%

	N	Sample	Weighted
Sought care for bladder (%)	49	20.7%	20.7%
Missing	5	2.1%	1.8%
Pregnancies (%)			
0	43	18.1%	18.8%
1	39	16.5%	16.9%
2	76	32.1%	32.4%
3+	72	30.4%	29.5%
Missing	7	3.0%	2.3%
Hysterectomy (%)	54	22.8%	22.7%
BMI (%)			
Underweight (<18.5 kg/m ²)	5	2.1%	1.5%
Healthy Weight (18.5 to <25 kg/m ²)	87	36.7%	36.9%
Overweight (25 to <30 kg/m ²)	65	27.4%	26.9%
Obese (30+ kg/m ²)	68	28.7%	30.5%
Missing	12	5.1%	4.2%
Comorbidities [†] (%)			
0	130	54.9%	54.3%
1	62	26.2%	27.6%
2	33	13.9%	13.6%
3	9	3.8%	3.1%
4+	3	1.3%	1.4%

* Multiple responses allowed so does not sum to 100%.

BMI: Body Mass Index, SD: Standard Deviation

[†] Comorbidities included: sleep apnea, diabetes, high blood pressure, depression, asthma/chronic lung disease, and neurologic disease.

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Table 2.

Prevalence of healthy bladder functions based on 2-day bladder health diary

	N	Sample %	Weighted* %
<i>Overall Healthy Bladder Function</i>	29/237	12%	12%
<i>Overall Healthy Storage</i>	45/237	19%	19%
≤ 8 voids during waking hours	175/237	74%	72%
≤ 1 void during sleeping hours	196/237	83%	83%
No Leakage	151/237	64%	63%
No Urgency	71/237	30%	30%
No Pain storing	224/234	96%	96%
<i>Overall Healthy Emptying</i>	85/236	36%	36%
Easy continuous stream, completely empty	136/237	57%	58%
No post-void dribbling	114/237	48%	47%
No Pain emptying	225/234	96%	96%

* Weighted prevalence accounting for missing data.

Overall healthy bladder function defined as overall healthy storage *and* overall health emptying.

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Table 3.

Stepwise logistic regression models for each healthy bladder definition.

Effect	Overall Healthy	<= 8 voids while awake	No Nocturia	No Leakage	No Urgency	Easy Continuous Stream *	No Post-void Dribbling
Age							
65-<75	Ref	Ref					
18-<35	0.3 (0.1, 1.0)	0.3 (0.1, 1.0)					
35-<45	0.5 (0.2, 1.5)	0.5 (0.2, 1.5)					
45-<55	0.8 (0.3, 2.1)	0.8 (0.3, 2.1)					
55-<65	1.2 (0.5, 3.2)	1.2 (0.5, 3.2)					
75+	3.1 (0.7, 14.5)	3.1 (0.7, 14.5)					
Previously sought treatment for bladder (Yes vs No)	0.1 (0, 0.9)	0.3 (0.1, 0.7)		0.3 (0.1, 0.6)		0.4 (0.2, 0.9)	0.3 (0.1, 0.6)
Body Mass Index							
Normal	Ref			Ref			
Obese				0.9 (0.4, 2)			
Overweight				2.1 (1, 4.6)			
Underweight				0.4 (0.1, 2.8)			
Comorbidity Count	0.7 (0.4, 1.2)			0.7 (0.5, 0.9)	0.6 (0.4, 0.8)	0.7 (0.5, 1)	0.6 (0.5, 0.9)
Highest Level of Education							
Bachelor's Degree	Ref	Ref					
Graduate Degree	4.8 (1.4, 17)	3.1 (1.2, 8)					
Highschool or GED	1.6 (0.1, 17.1)	0.7 (0.2, 2.3)					
Less than high school	<0.01 (<0.01, >999)	0.2 (0, 1.2)					
Some college or AA	3.2 (0.8, 12.6)	0.6 (0.2, 1.5)					
Typical Financial Situation at End of Month							
Not enough	Ref	Ref			Ref	Ref	Ref
Just enough	1.3 (0.3, 6.4)	1.3 (0.3, 6.4)			0.3 (0.1, 1.3)	0.4 (0.1, 1.4)	0.7 (0.2, 2.7)
More than enough	0.3 (0.1, 1.4)	0.3 (0.1, 1.4)			1.2 (0.3, 4.8)	0.8 (0.2, 2.9)	1.8 (0.5, 6.7)
Some left over	0.9 (0.2, 4.3)	0.9 (0.2, 4.3)			0.8 (0.2, 3.1)	0.9 (0.2, 3.1)	1.6 (0.4, 6)
Hispanic (Yes vs No)							
Housing Type							
							0.2 (0, 0.9)

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Effect	Overall Healthy	<= 8 voids while awake	No Nocturia	No Leakage	No Urgency	Easy Continuous Stream*	No Post-void Dribbling
One-family house	Ref		Ref	Ref	Ref		
Apartment				3.2 (1, 10.7)	0.7 (0.2, 2.6)		
Other housing				2.7 (0.8, 9)	3 (1, 9.7)		
Annual Income							
\$25k-\$49,999	Ref		Ref	Ref			
\$100k-\$149,999	4.3 (0.7, 27.1)		0.4 (0.1, 1.3)	3.4 (1.3, 9.3)			
\$150k or more	6.3 (1, 38.5)		4.5 (0.5, 39)	3.2 (1.1, 9.1)			
\$50k-\$74,999	1.9 (0.3, 13)		0.8 (0.2, 2.4)	1.7 (0.7, 4.2)			
\$75k-\$99,999	11.4 (1.9, 67.4)		0.6 (0.2, 2.1)	3.2 (1.1, 8.8)			
\$24,999 or less	1.6 (0.2, 13.7)		0.3 (0.1, 1)	0.9 (0.3, 2.3)			3.1 (0.6, 15.2)
No health insurance (Yes vs No)		4.5 (0.5, 43.2)					
Homemaker (Yes vs No)		3.2 (1.4, 7.2)				0.7 (0.4, 1.2)	
Retired (Yes vs No)	1.9 (0.7, 4.6)						
Student (Yes vs No)	4.2 (0.8, 21.8)	7.1 (0.8, 65.4)					
Unable to work (Yes vs No)		0.3 (0.1, 1.3)					
Working (Yes vs No)			2.3 (1.1, 4.9)				

Multivariable regression models including variables with p<0.20 on univariate analysis for each healthy bladder definition OR (95% CI). Note, too few with pain for analysis.

* Easy Continuous stream defined as "yes" responses to "easy starting to pee", "continuous stream", "feeling the bladder empty" and the "need to pee feeling is gone;"