HHS Public Access

Author manuscript

Neurourol Urodyn. Author manuscript; available in PMC 2022 February 01.

Published in final edited form as:

Neurourol Urodyn. 2021 February ; 40(2): 632–641. doi:10.1002/nau.24613.

Prevalence of Childhood Trauma and its Association with Lower Urinary Tract Symptoms in Women and Men in the LURN Study

Julia Geynisman-Tan, MD[1], **Margaret Helmuth, MA**[2], **Abigail R. Smith, PhD**[2], **H. Henry Lai, MD**[3], **Cindy L. Amundsen, MD**[4], **Catherine S. Bradley, MD, MSCE**[5], **Margaret G. Mueller, MD**[1], **Christina Lewicky-Gaupp, MD**[1], **Steven E. Harte, PhD**[6], **J. Eric Jelovsek, MD, MMEd, MSDS**[4], **Symptoms of Lower Urinary Tract Dysfunction Research Network (LURN) Study Group**

[1]Northwestern Medicine, Urogynecology and Reconstructive Surgery, Chicago IL

[2]Arbor Research Collaborative for Health, Ann Arbor MI

[3]Washington University in St. Louis, Departments of Surgery (Urology) and Anesthesiology, St. Louis MO

[4]Duke University, Department of Obstetrics and Gynecology, Durham, NC

[5]University of Iowa, Carver College of Medicine, Iowa City IA

[6]University of Michigan, Departments of Anesthesiology and Internal Medicine-Rheumatology, Ann Arbor MI

Abstract

Aims: To describe the association between childhood traumas (death of a family member, severe illness, sexual trauma, parental separation) reported by women and men and lower urinary tract symptoms (LUTS).

Methods: In this secondary analysis of the LURN Observational Cohort Study, participants completed the LUTS Tool, Childhood Trauma Events Scale (CTES), PROMIS Depression and Anxiety and Perceived Stress Scale. LUTS Tool responses were combined to quantify urinary urgency, frequency, incontinence, and overall LUTS severity. Multivariable linear regression tested associations between trauma and LUTS; mental health scores were tested for potential mediation.

Results: In this cohort (n=1011; 520 women, 491 men), more women reported experiencing at least one trauma (75% vs. 64%, p<0.001), >three traumas (26% vs. 15%, p<0.001), and childhood sexual trauma (23% vs. 7%, p<0.001), and reported higher impact from traumatic events compared with men (median (IQR) CTES score=10 [5–15] vs. 6 [4–12], p<0.001). The number of childhood traumatic events was not associated with severity of overall LUTS (p=0.79), urinary frequency (p=0.75), urgency (p=0.61), or incontinence (p=0.21). Childhood *sexual* trauma was significantly associated with higher incontinence severity (adjusted mean difference 4.5 points, 95%CI=1.11–7.88, p=0.009). Mental health was a mediator between trauma and LUTS among those with at least one childhood trauma.

Corresponding Author: Julia Geynisman-Tan, MD; Northwestern Medicine, Urogynecology and Reconstructive Surgery; 250 E Superior Street, Suite 5-2370, Chicago IL; 312-694-7337, Julia.Geynisman-Tan@nm.org.

Conclusions: Although *total* childhood trauma is not associated with LUTS, childhood sexual trauma is associated with urinary incontinence severity. For patients with childhood trauma, half of the effect of CTE Impact score on overall LUTS severity is mediated through the association between trauma and the patient's mental health.

Keywords

lower urinary tract symptoms; childhood trauma; urinary incontinence; overactive bladder; post-traumatic stress disorder

INTRODUCTION

In his landmark book, "The Body Keeps the Score," Van der Kolk writes: "We have learned that trauma is not just an event that took place sometime in the past; it is also the imprint left by that experience on brain and body. Trauma, a deeply distressing personal experience, results in a fundamental reorganization of the way the brain manages perceptions."[1] Childhood trauma fundamentally changes neurodevelopment and impacts decision-making and centralization of pain.[2,3] A reorganization of perceptions, such as urinary urgency, frequency, and bladder pain may contribute to conditions like overactive bladder, urinary incontinence, and bladder pain syndrome. Recent literature in animal models demonstrates how stress and trauma can sensitize micturition pathways and lead to overactive bladder and incontinence.[4] Multiple prior studies have demonstrated an association between lower urinary tract symptoms (LUTS) and sexual trauma.[5–8] This association was reported in a cohort of over 500 women with urinary incontinence who were more likely to have experienced childhood sexual trauma (27%) compared with women without incontinence (15%).[9] However, sexual trauma is only one of many possible traumas, and there is a paucity of literature on the association between *all* types of trauma and urinary symptoms. Additionally, most research on trauma and urinary symptoms has focused on women, and there are few data on the effect of trauma on urinary symptoms in men.

The aims of this study were to describe the number and type of childhood traumas reported by women and men presenting to specialty care with LUTS and to describe associations between LUTS and the number, type, and self-reported impact of trauma experiences. We hypothesized that childhood traumatic events are common in patients with LUTS, and that higher childhood trauma impact scores are associated with LUTS severity. We also hypothesized that depression, anxiety, and stress are involved in the causal pathway between childhood trauma and LUTS.

MATERIALS and METHODS

Study design and population

This was a secondary analysis of baseline data obtained from the Symptoms of Lower Urinary Tract Research Network (LURN) Observational Cohort Study. The study enrolled 519 men and 545 women from urology and urogynecology clinics at six clinical sites in the United States from 2015–2017. Adult men and women seeking treatment for LUTS were enrolled if they reported at least one urinary symptom based on a 1-month recall period on

the LUTS Tool[10] (LUTS Tool, Version 1.0. Copyright 2007 by Pfizer, Inc. Used with permission.), and did not have pelvic pain, a neurologic condition, history of pelvic malignancy, ongoing chemotherapy, major psychiatric disorder, or recent third-line treatment for urgency incontinence. The full study's design, methods, and exclusion criteria have been reported previously.[11] Participants completed a baseline assessment, including physical exam; medical history; and self-reported measures of urinary, bowel, and sexual function, mental and psychosocial health, and physical functioning.

Measures

The Childhood Traumatic Event Scale (CTES)[12] was used to assess traumatic events occurring prior to the age of 17. The scale includes domains of death of a family member or close friend, parental divorce or separation, traumatic sexual experience, victim of violence, extreme illness or injury, or other major event. For each event endorsed, participants were asked to rate the effect of the trauma on their lives on a 1 to 7 scale. This scale was summed among those experiencing at least one event to form the CTE Impact Scale, ranging from 1–42. Higher scores indicate a greater number and impact from trauma.

LUTS were measured using the LUTS Tool[10] and the Pelvic Floor Distress Inventory Short Form (PFDI-20).[13] The LUTS Tool is a 44-item questionnaire with 22 symptom severity questions using a 1-week recall period. It assesses a range of LUTS on a 5-point rating scale and 22 associated bother questions. Higher scores indicate worsening LUTS. The LUTS severity items were used to create a summary score of overall severity by calculating the weighted Euclidean length of the items and re-scaling the scores to range from 0 (no symptoms) to 100 (most severe symptoms).[14] The same method was used to calculate symptom domain subscores for frequency, post-micturition, urgency, voiding, pain, and incontinence symptoms using the relevant items. The PFDI-20 was used as a secondary outcome in women, and assesses the presence and bother of urinary, prolapse, and bowel symptoms in women with pelvic floor disorders.[13] Higher scores indicate higher number and bother of symptoms.

Finally, mental health (depression, anxiety, and stress) was hypothesized to be on the causal pathway between childhood trauma and urinary symptoms. Depression and anxiety were assessed using Patient-Reported Outcomes Measurement Information System (PROMIS) items[15] and summarized using T-scores. Stress was assessed using the Perceived Stress Scale (PSS),[16] a score summarized from 10 items assessing stress in the past month on a rating scale, ranging from 0 to 40, with higher scores indicating more stress.

Statistical analysis

Participants who completed the CTES and at least 15 items on the LUTS Tool were included in this analysis. The associations between overall and symptom-specific LUTS and number of CTEs, CTE Impact Scale, and presence of sexual trauma, were explored using Spearman and Pearson correlations and non-parametric analysis of variance (ANOVA), as appropriate. Comparisons between sex were made using t-tests, non-parametric ANOVA, and chi-square tests, as appropriate.

Multivariable linear models testing the association between measures of childhood trauma and LUTS were fitted. Model selection was guided by best subsets, based on r-squared; all measures listed above were available for selection. All final models included sex, and each exposure of interest was tested in separate models (number of CTE, presence of sexual trauma, and CTE Impact score among those with at least one CTE). Potential confounders and effect modifiers included in the analysis were demographic information (age, sex, race, ethnicity, education, marital status), clinical characteristics (body mass index [BMI], smoking status, alcohol use, birth history and menopausal status among women; and comorbidities, including diabetes, sleep apnea, and psychiatric diagnoses). The 18-item Functional Comorbidity Index[17] was used to assess comorbidities associated with physical functioning. The Genitourinary Pain Index (GUPI)[18] was used to assess pelvic pain. PROMIS Gastrointestinal [GI] Constipation, Diarrhea, and Fecal Incontinence scales were used to assess bowel symptoms.[19] Short forms of the PROMIS measures were used to derive T-scores normalized to the US population (mean=50, SD=10), with higher scores indicating more symptoms. T-scores from PROMIS physical functioning,[20] mobility subdomain, and sleep disturbance[21] forms were similarly calculated.

We hypothesized that CTE was associated with both LUTS and mental health, and that mental health was also associated with LUTS. The overall association between CTE and LUTS was hypothesized to be directly related to LUTS and indirectly related through mental health measures, representing mediation. Mediators are variables that are influenced by the independent variable and, in turn, influence the dependent variable. For each significant exposure/outcome combination, potential mediators (depression, anxiety, and stress) were assessed to calculate the percentage of the total effect of CTE on LUTS potentially mediated by mental health measures. Results can be interpreted as the percentage of the association between CTEs and the LUTS relationship attributed to the pathway that includes mental health as an intermediary between CTEs and LUTS. All analyses were completed using SAS 9.4 (SAS Institute, Cary, NC).

RESULTS

Sample characteristics

Among the 1064 participants, 1011 (491 men and 520 women) completed the CTES and the LUTS Tool and were included in this analysis (Figure 1). Mean age was 58.8 (SD=14.2), and the majority were non-Hispanic (96%), white (81%), and had at least some higher education (88%; Table 1). Additional clinical characteristics and patient-reported measures can be found in Table 1.

Distribution of CTE

Of the 1011 participants, 701 (69%) reported at least one childhood traumatic event on the CTES, and 60% of those reported two or more traumas. The median [IQR] number of events was similar in men and women (1 [1,2] vs 1 [1,3] respectively), but 48% of women experienced two or more events compared with 35% of men (Figure 2a). The most common traumatic events were death of a family member or close friend (49% in women, 40% in men; Figure 2b). Women were more likely than men to report all types of trauma except

"extreme illness or injury," which was more common in men (22% vs. 16%, p=0.02). Among those experiencing one event, the CTE Impact score was higher in women compared with men (median [IQR] 10 [5–15] vs. 6 [4–12], p<0.001; Figure 2c). Women were also more likely to report a traumatic childhood sexual experience (25% vs. 8%, p<0.001).

Relationship between childhood trauma and LUTS

Multivariable models were unable to demonstrate significant associations between number of all traumas and severity of LUTS overall or subscales (Figure 3). In women, the number of traumas was associated with worsening PFDI scores, with each additional trauma endorsed increasing the adjusted average PFDI score by 4.2 (95% CI=2.0–6.7, p<0.001). Compared with those without sexual trauma, participants reporting sexual trauma had worse scores on the urinary incontinence subscale (adjusted mean difference 4.5, 95% CI=1.1–7.9, p=0.009) and worse scores on the PFDI (women only, adjusted mean difference 10.2, 95% CI=2.4–18.1, p=0.01). Among those with at least one childhood trauma, the CTE Impact score was significantly associated with overall LUTS severity and frequency, urgency, and incontinence severity, although the magnitude of effect was small (estimate range 0.20–0.31 unit increase in severity score per unit increase in CTE Impact score; Figure 3). Tests for interactions between sex and measures of childhood trauma in LUTS severity models did not detect differences in effects between men and women.

Mediation of the relationship between childhood trauma and LUTS severity

Mediation analysis results are demonstrated in Table 2. Among those with at least one childhood trauma, 45%, 42%, and 34% of the total effect of the CTE Impact score on overall LUTS severity was mediated by PROMIS Depression, Anxiety, and PSS scores (p=0.009–0.02). This implies that approximately half of the effect of CTE Impact score on overall LUTS severity is direct, while the other half is mediated through the association between trauma and the patient's mental health. For the frequency and urgency subscales, the percentage of the effect of CTE Impact score on severity mediated by the mental health measures was minimal (range 6.3%–16%), indicating a more direct relationship between CTE Impact score and severity of these symptoms. For incontinence, the percentage of this relationship that was mediated was higher (range 54%–38%) but did not reach statistical significance, and the percentage of the relationship between sexual trauma and incontinence severity scores was minimal (range 14%–18%). In women, the relationship between number of CTEs, sexual trauma, and CTE Impact score and PFDI scores was not mediated by mental health.

DISCUSSION

In this study of men and women presenting for care of LUTS, we found that childhood sexual trauma is associated with urinary incontinence severity and that, among people with at least one childhood trauma, the impact of their trauma was associated with the severity of LUTS. We also found that mental health factors are strong mediators in the relationship between childhood trauma and LUTS.

We were unable to find evidence that the total number of *all* childhood traumas was associated with the severity of LUTS in men or women with the current sample size. Given that our statistical analysis plan specified a classical hypothesis testing approach, the study did not provide evidence of similarity between the total number of all childhood traumas and severity of LUTS (see CIs in Figure 3).

Our study highlights the prevalence and clustering of trauma in our population. When expanding the definition of trauma beyond sexual violence to include parental death or divorce, major childhood illness, and physical violence, we found that most patients seeking care for LUTS have experienced at least one of these events in childhood. Furthermore, individuals who reported *any* trauma in their childhoods are more likely to report two or more traumas than one. Not surprisingly, women were much more likely to experience childhood sexual trauma than men; but also, almost 10% of men reported childhood sexual trauma. This knowledge is relevant when we consider the importance of providing trauma-informed care to all our patients.[22–23] The foundation of trauma-informed care is the assumption that *any* patient may have experienced trauma which could be related to their health outcomes and/or be triggered by the health care setting. Therefore, it is our responsibility to ensure sensitivity, trust, and safety in our patient care.

Our findings regarding the significant mediation effect between mental health (depression, anxiety, and poor sleep) and urinary symptoms are consistent with prior studies. In their work on overactive bladder in female veterans, Bradley et al reported that a history of post-traumatic stress disorder (PTSD) almost tripled the odds of overactive bladder symptoms (OAB) in these veterans, and that anxiety and a history of sexual abuse predicted the development of *de novo* OAB symptoms.[7,24] Another study of >500,000 male and female veterans found that diagnoses, prescriptions, and treatments for LUTS were twice as common in veterans with PTSD with and without other mental health disorders than in those without mental health symptoms.[25] Unfortunately, the PROMIS tool does not have a PTSD scale, so we could not evaluate the mediation effect of PTSD in our sample.

There are very little data on the effect of childhood trauma on *how* patients make treatment choices for health conditions and whether the effect/success of those treatments is different in survivors of trauma. Specifically for LUTS, pelvic floor physical therapy is frequently recommended but may be triggering, and therefore unsustainable, for some patients with a history of abuse. Likewise, patients with a history of sexual trauma may be reluctant to undergo sensitive procedures, including pelvic exams, bladder catheterizations, cystoscopy, or urodynamics, which may affect their ability to get the most accurate diagnoses or treatments. Therefore, future studies should explore whether a history of childhood sexual trauma impacts the way patients with LUTS choose treatments and whether they respond to those treatments differently than patients with the same LUTS but without a history of trauma.

Our study has several important limitations. The CTES is limited to childhood traumas and does not assess traumatic experiences sustained as an adult or recent traumatic exposure which can be associated with LUTS. Additionally, the demographics of the cohort enrolled in LURN were predominantly white and highly educated and therefore may not be

generalizable when describing rates of childhood trauma, the impact sustained from that trauma, or its impact on the experience of LUTS. Also, the CTES is a self-reported measure which is subject to recall bias, reporting bias, and recall errors.

CONCLUSIONS

In this study, we found that childhood trauma is very common in both men and women with LUTS. While this study was unable to demonstrate that total number of all childhood traumas was significantly associated with LUTS severity in men and women, sexual trauma was, in fact, significantly associated with urinary incontinence severity. The weak associations between childhood trauma and LUTS should be reassuring to clinicians caring for adult patients with LUTS. Since we cannot undo the childhood trauma our patients have experienced, we may be able to shift our focus to other risks and mechanisms for LUTS. Specifically, since so much of the association between childhood trauma and LUTS is mediated by mental health, we could be more prescriptive about mental health treatment in patients with LUTS with a known history of trauma. Providers caring for patients with LUTS should be familiar with assessing patients for a trauma history and referring them to the appropriate counseling services.

ACKNOWLEDGEMENTS

Heather Van Doren, Senior Medical Editor with Arbor Research Collaborative for Health, provided editorial assistance on this manuscript.

This is publication number 26 of the Symptoms of Lower Urinary Tract Dysfunction Research Network (LURN).

Funding

This study is supported by the National Institute of Diabetes & Digestive & Kidney Diseases through cooperative agreements (grants DK097780, DK097772, DK097779, DK099932, DK100011, DK100017, DK099879).

Research reported in this publication was supported at Northwestern University, in part, by the National Institutes of Health's National Center for Advancing Translational Sciences, Grant Number UL1TR001422. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

The following individuals were instrumental in the planning and conduct of this study at each of the participating institutions:

Duke University, Durham, North Carolina (DK097780): PIs: Cindy Amundsen, MD, Eric Jelovsek, MD; Co-Is: Kathryn Flynn, PhD, Matthew O. Fraser, PhD, Todd Harshbarger, PhD, Aaron Lentz, MD, Nazema Siddiqui, MD, Jim Hokanson, PhD, Kevin Weinfurt, PhD Lisa Wruck, PhD; Study Coordinators: Yasmeen Bruton, Folayan Morehead, Nortorious Coleman-Taylor

University of Iowa, Iowa City, IA (DK097772): PIs: Karl Kreder, MD, MBA, Catherine S Bradley, MD, MSCE; Co-Is: Bradley A. Erickson, MD, MS, Vince Magnotta, PhD, Daniel Fick, MD, Philip Polgreen, MD, MPH; Study Coordinators: Mary Eno, Stacy McMichael

Northwestern University, Chicago, IL (DK097779): PIs: James W Griffith, PhD, Kimberly Kenton, MD, MS, Brian Helfand, MD, PhD; Co-Is: David Cella, PhD, Christina Lewicky-Gaupp, MD, Margaret Mueller, MD, Alex Glaser, MD, Carol Bretschneider, MD, Sarah Collins, MD, Julia Geynisman-Tan, MD; Study Coordinators: Michelle Taddeo, Pooja Talaty, Sylwia Boroska, Melissa Marquez, Pooja Sharma. Dr. Helfand and Ms. Talaty are at NorthShore University HealthSystem

University of Michigan Health System, Ann Arbor, MI (DK099932): PI: J Quentin Clemens, MD, FACS, MSCI; Co-Is: John DeLancey, MD, Dee Fenner, MD, Rick Harris, MD, Steve Harte, PhD, Anne P. Cameron, MD, Aruna Sarma, PhD; Study Coordinators: Linda Drnek, Greg Mowatt, Julie Tumbarello

University of Washington, Seattle Washington (DK100011): PI: Claire Yang, MD; Co-I: Anna Kirby, MD; Study Coordinators: Alice Liu, MPH, Brenda Vicars, RN

Washington University in St. Louis, St. Louis Missouri (DK100017): PI: H. Henry Lai, MD; Co-Is: Gerald L. Andriole, MD, Joshua Shimony, MD, PhD; Study Coordinators: Aleksandra Klim, RN, MHS, CCRC, Linda Black, Patricia Hayden

Arbor Research Collaborative for Health, Data Coordinating Center (DK099879): PI: Robert Merion, MD, FACS; Co-Is: Abigail Smith, PhD, Victor Andreev, PhD, DSc, Brenda Gillespie, PhD; Project Manager: Melissa Fava, MPA, PMP; Clinical Monitor: Melissa Sexton, BA, CCRP; Research Analysts: Margaret Helmuth, MA, Jon Wiseman, MS, Jane Liu, MPH; Project Associate: Levi Hurley

National Institute of Diabetes and Digestive and Kidney Diseases, Division of Kidney, Urology, and Hematology, Bethesda, MD: Project Scientist: Ziya Kirkali MD; Project Officer: Christopher Mullins PhD; NIH Personnel: Tamara Bavendam, MD, Robert Star, MD, Jenna Norton, MPH

REFERENCES

1. Van der Kolk Bessel A. The body keeps the score: Brain, mind, and body in the healing of trauma. New York: Viking, 2014.
2. Meltzer-Brody S, Leserman J, Zolnoun D, et al. Trauma and posttraumatic stress disorder in women with chronic pelvic pain. Obstet Gynecol 2007;109(4):902–908. [PubMed: 17400852]
3. Birn R, Roeber BJ, Pollak SD. Childhood stress, reward and adult decision making. Proceedings of the National Academy of Sciences. 12 2017;114(51):13549–13554.
4. Ercan F, Oktay S, Erin N. Role of afferent neurons in stress induced degenerative changes of the bladder. J Urol 2001;165(1):235–239. [PubMed: 11125416]
5. Jundt K, Scheer I, Schiessl B, et al. Physical and sexual abuse in patients with overactive bladder: is there an association?. Int Urogynecol J Pelvic Floor Dysfunct 2007;18(4):449–453. [PubMed: 16917674]
6. Lai HH, Morgan CD, Vetter J, et al. Impact of childhood and recent traumatic events on the clinical presentation of overactive bladder. Neurourol Urodyn 2016;35(8):1017–1023. [PubMed: 26332868]
7. Bradley CS, Nygaard IE, Torner JC, et al. Overactive bladder and mental health symptoms in recently deployed female veterans. J Urol 2014;191(5):1327–1332. [PubMed: 24316095]
8. Link CL, Lutfey KE, Steers WD, et al. Is abuse causally related to urologic symptoms? Results from the Boston Area Community Health (BACH) Survey. Eur Urol 2007;52(2):397–406. [PubMed: 17383083]
9. Siddiqui NY, Wiseman JB, Cella D, et al. Mental health, sleep, and physical function in treatment-seeking women with urinary incontinence. J Urol 2018;200(4):848–855. [PubMed: 29730202]
10. Coyne KS, Barsdorf AI, Thompson C, et al. Moving towards a comprehensive assessment of lower urinary tract symptoms (LUTS). Neurourol Urodyn 2012;31(4):448–454. [PubMed: 22396308]
11. Cameron AP, Lewicky-Gaupp C, Smith AR, et al. Baseline lower urinary tract symptoms in patients enrolled in LURN: A prospective, observational cohort study. J Urol 2018;199(4):1023–1031. [PubMed: 29111381]
12. Pennebaker JW, Susman JR. Disclosure of traumas and psychosomatic processes. Soc Sci Med (Oxford) 1988;26:327–332.
13. Barber MD, Chen Z, Lukacz E, et al. Further validation of the short form versions of the Pelvic Floor Distress Inventory (PFDI) and Pelvic Floor Impact Questionnaire (PFIQ). Neurourol Urodyn 2011;30(4):541–546. [PubMed: 21344495]
14. Helmuth ME, Smith AR, Andreev VP, et al. Use of Euclidean length to measure urinary incontinence severity based on the lower urinary tract symptoms tool. Am J Obstet Gynecol 2018;218(3):357–359. [PubMed: 29288065]
15. Pilkonis PA, Choi SW, Reise SP, et al. Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS®): depression, anxiety, and anger. Assessment 2011;18(3):263–283. [PubMed: 21697139]
16. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Social Behav 1983;24:385–396.

17. Groll DL, To T, Bombardier C, et al. The development of a comorbidity index with physical function as the outcome. J Clin Epidemiol 2005;58(6):595–602. [PubMed: 15878473]
18. Clemens JQ, Calhoun EA, Litwin MS, et al. Validation of a modified National Institutes of Health chronic prostatitis symptom index to assess genitourinary pain in both men and women. Urology 2009;74(5):983–987.e9873. [PubMed: 19800663]
19. Spiegel BM, Hays RD, Bolus R, et al. Development of the NIH Patient-Reported Outcomes Measurement Information System (PROMIS) gastrointestinal symptom scales [published correction appears in Am J Gastroenterol 2015 Apr;110(4):608]. Am J Gastroenterol 2014;109(11):1804–1814. [PubMed: 25199473]
20. Cella D, Riley W, Stone A, et al. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005–2008. J Clin Epidemiol 2010;63(11):1179–1194. [PubMed: 20685078]
21. Yu L, Buysse DJ, Germain A, et al. Development of short forms from the PROMIS™ sleep disturbance and sleep-related impairment item banks. Behav Sleep Med 2011;10(1):6–24. [PubMed: 22250775]
22. Ravi A, Little V. Providing trauma-informed care. Am Fam Physician 2017;95(10):655–657. [PubMed: 28671409]
23. Oral R, Ramirez M, Coohey C, et al. Adverse childhood experiences and trauma informed care: the future of health care. Pediatr Res 2016;79(1–2):227–233. [PubMed: 26460523]
24. Bradley CS, Nygaard IE, Hillis SL, et al. Longitudinal associations between mental health conditions and overactive bladder in women veterans. Am J Obstet Gynecol 2017;217(4):430.e1–430.e8. [PubMed: 28645572]
25. Breyer BN, Cohen BE, Bertenthal D, et al. Lower urinary tract dysfunction in male Iraq and Afghanistan war veterans: association with mental health disorders: a population-based cohort study. Urology 2014;83(2):312–319. [PubMed: 24149111]

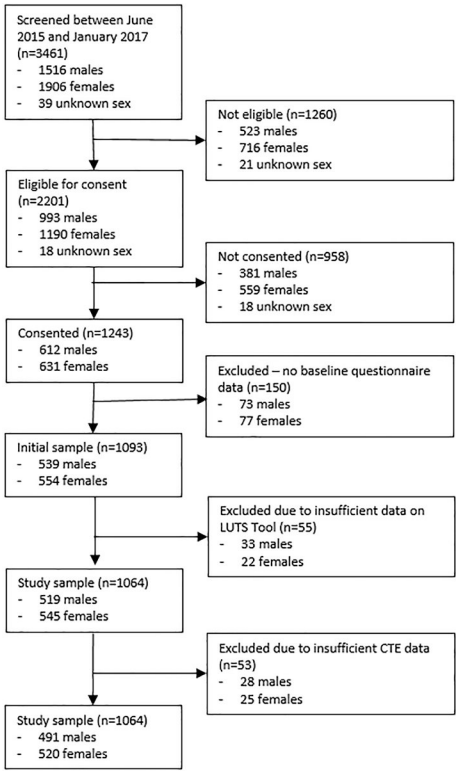
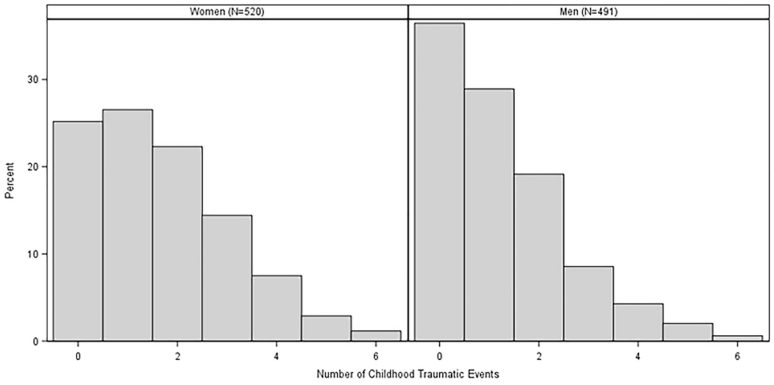


Figure 1.
STROBE diagram



Type	Women	Men	p-value
Death of family member or close friend	254 (49%)	197 (40%)	0.005
Parental divorce or separation	168 (33%)	110 (23%)	<0.001
Traumatic sexual experience	127 (25%)	38 (8%)	<0.001
Victim of violence	75 (15%)	59 (12%)	0.30
Extreme illness or injury	82 (16%)	106 (22%)	0.02
Other	156 (31%)	98 (20%)	<0.001

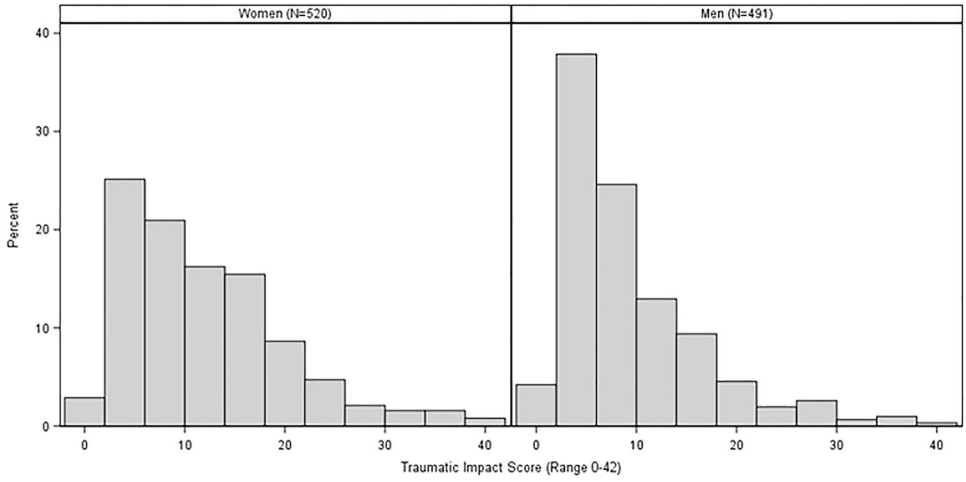


Figure 2.

a) Distribution of number of childhood traumatic events by sex; **b)** Distribution of trauma event reporting by sex; **c)** Distribution of trauma impact score by sex among those with at least one childhood traumatic event

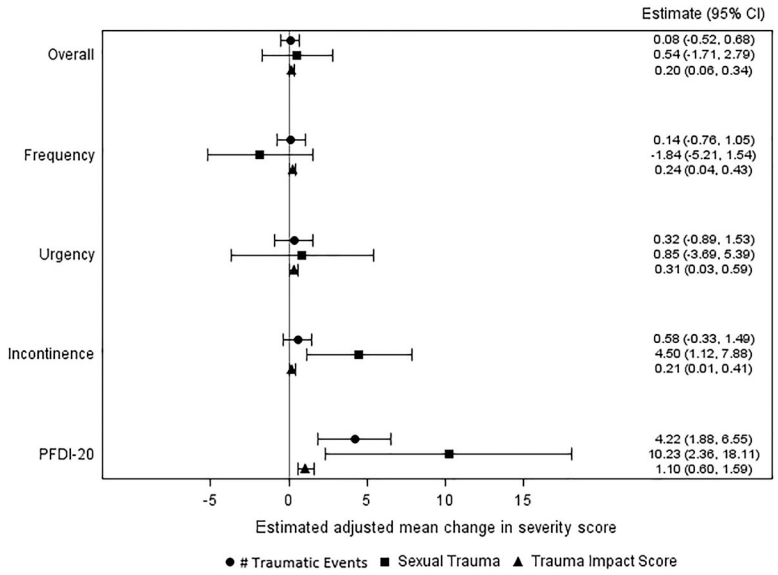


Figure 3.

Estimates of the effect of number of childhood traumatic events (CTEs) and traumatic impact score (among those with at least one CTE) on lower urinary tract symptoms overall severity, and severity of frequency, urgency, and incontinence from adjusted linear models

Table 1.

Sample characteristics by sex

	Female (n=520)	*Male (n=491)*	*Total (n= 1011)*
Demographics			
Age, mean (SD)	56.4 (14.6)	61.2 (13.4)	58.8 (14.2)
Race, n (%)			
American Indian/Alaskan Native	5 (1%)	3 (1%)	8 (1%)
Asian	14 (3%)	18 (4%)	32 (3%)
African-American	61 (12%)	50 (10%)	111 (11%)
Native Hawaiian/Pacific Islander	1 (0%)	0 (0%)	1 (0%)
White	423 (82%)	394 (81%)	817 (81%)
Multi-Racial/Other	15 (3%)	24 (5%)	39 (4%)
Ethnicity, n (%)			
Hispanic/Latino	21 (4%)	22 (5%)	43 (4%)
Non-Hispanic/Non-Latino	488 (96%)	460 (95%)	948 (96%)
Education, n (%)			
High school or less	56 (11%)	64 (13%)	120 (12%)
Some college/associate degree	180 (35%)	124 (26%)	304 (31%)
Bachelor degree	155 (30%)	109 (23%)	264 (27%)
Graduate degree	122 (24%)	178 (37%)	300 (30%)
Marital status, n (%)			
Single/separated/divorced/widowed	211 (41%)	128 (26%)	339 (34%)
Married/civil union/living with partner	308 (59%)	358 (74%)	666 (66%)
Clinical Characteristics			
BMI, mean (SD)	30.6 (7.9)	29.5 (5.6)	30.1 (6.9)
Current smoker, n (%)	32 (6%)	41 (8%)	73 (7%)
Alcohol use, n (%)			
0–3 alcoholic drinks per week	342 (67%)	254 (52%)	596 (60%)
4–7 alcoholic drinks per week	63 (12%)	80 (16%)	143 (14%)
8–14 alcoholic drinks per week	13 (3%)	45 (9%)	58 (6%)
14+ alcoholic drinks per week	3 (1%)	15 (3%)	18 (2%)
Has not had alcohol in the past	86 (17%)	93 (19%)	179 (18%)
Any vaginal births, n (%)	378 (73%)	-	-
Menopausal status, n (%)			
Pre	181 (36%)	-	-
Post, no hormone replacement therapy	270 (53%)	-	-
Post, hormone replacement therapy	58 (11%)	-	-
Functional comorbidity index, median (IQR)	2.0 (1.0–4.0)	2.0 (1.0–3.0)	2.0 (1.0–3.0)
Diabetes, n (%)	74 (14%)	84 (17%)	158 (16%)
Sleep apnea, n (%)	90 (17%)	128 (26%)	218 (22%)
Psychiatric diagnosis, n (%)	221 (43%)	139 (28%)	360 (36%)
Self-Reported Measures			

	Female (n=520)	***Male (n=491)***	***Total (n= 1011)***
PROMIS constipation T-score, mean (SD)	51.4 (8.8)	48.6 (8.0)	50.1 (8.5)
PROMIS diarrhea T-Score, mean (SD)	48.9 (9.6)	46.7 (7.7)	47.8 (8.8)
PROMIS GI bowel raw score, mean (SD)	5.3 (2.5)	4.8 (1.9)	5.1 (2.2)
GUPI urine subscale, mean (SD)	4.2 (2.7)	4.0 (2.5)	4.1 (2.6)
GUPI pain subscale, mean (SD)	4.6 (4.9)	3.1 (4.1)	3.9 (4.6)
GUPI QOL subscale, mean (SD)	7.3 (2.9)	5.5 (2.9)	6.4 (3.1)
Perceived stress scale, mean (SD)	12.8 (7.5)	10.9 (7.1)	11.9 (7.3)
PROMIS anxiety T-score, mean (SD)	50.3 (9.1)	48.1 (8.9)	49.2 (9.1)
PROMIS depression T-score, mean (SD)	49.4 (8.7)	47.8 (8.6)	48.6 (8.7)
PROMIS physical functioning, mobility subdomain T-score, mean (SD)	47.5 (10.4)	50.0 (9.1)	48.7 (9.9)
PROMIS sleep disturbance T-score, mean (SD)	53.3 (8.7)	51.6 (8.7)	52.5 (8.8)

BMI: body mass index; GUPI: Genitourinary Pain Index; IQR: interquartile range; PROMIS: Patient-Reported Outcomes Measurement Information System; QOL: quality of life; SD: standard deviation.

Table 2.

Mediation analysis

Outcome	Exposure	% Mediated by (p-value)		
		Depression	Anxiety	Stress
Overall severity	CTE impact score	44.9% (0.009)	42.4% (0.01)	33.7% (0.02)
Frequency severity	CTE impact score	11.8% (0.26)	14.7% (0.18)	6.3% (0.45)
Urgency severity	CTE impact score	15.4% (0.08)	15.9% (0.09)	14.5% (0.10)
Incontinence severity	CTE impact score	38.3% (0.08)	32.6% (0.10)	53.5% (0.19)
Incontinence severity	Sexual trauma	15.8% (0.08)	14.1% (0.09)	18.2% (0.08)
PFDI (women only)	Number of CTEs	0.68% (0.84)	6.1% (0.02)	5.5% (0.13)
PFDI (women only)	Sexual trauma	0.6% (0.66)	2.4% (0.13)	3.3% (0.09)
PFDI (women only)	CTE impact score	−1.2% (0.82)	3.2% (0.51)	4.9% (0.21)

Mediation analyses assess the percent of the total effect of childhood trauma on LUTS severity that acts through the measures of self-reported mental health.

CTE: Childhood Trauma Event; PFDI: Pelvic Floor Distress Inventory; LUTS: lower urinary tract symptoms.