

UCSF

UC San Francisco Previously Published Works

Title

Genitourinary injury from toilets in the USA

Permalink

<https://escholarship.org/uc/item/88w5p7nz>

Journal

BJU International, 112(3)

ISSN

1464-4096

Authors

Glass, Allison S
Bagga, Herman S
Tasian, Gregory E
et al.

Publication Date

2013-08-01

DOI

10.1111/bju.12173

Peer reviewed

Published in final edited form as:

BJU Int. 2013 August ; 112(3): 398–403. doi:10.1111/bju.12173.

No small slam: increasing incidents of genitourinary injury from toilets and toilet seats

Allison S. Glass, Herman S. Bagga, Gregory E. Tasian^{*}, James B. McGeady, Charles E. McCulloch[†], Sarah D. Blaschko, Jack W. McAninch, and Benjamin N. Breyer

Department of Urology, University of California San Francisco (UCSF), San Francisco, CA

[†]Department of Epidemiology and Biostatistics, University of California San Francisco (UCSF), San Francisco, CA

^{*}Division of Urology, Children's Hospital of Philadelphia, Philadelphia, PA, USA

Abstract

- To describe the epidemiology of genitourinary (GU) injury from toilets that present to USA Emergency rooms (ERs).
- The National Electronic Injury Surveillance System (NEISS) is a stratified probability sample of hospital ER visits for USA consumer product-related injuries.
- NEISS was used to estimate total toilet- and toilet seat-related GU injury for the years 2002–2010, as well as to describe demographics and injury characteristics.
- Analyses were performed using strata, primary sampling units and sample weights to accommodate the complex sample survey design.
- Data are reported as national estimates with 95% confidence intervals (CIs) provided.
- In all, 13 175 (95% CI 10 185–16 165) GU injuries related to toilets presented to ERs during 2002–2010.
- The most common mechanism involved crush from accidental fall of toilet seat, described in 9011 (68.4%, 95% CI 6907–11 115) cases.
- Most crush injuries were isolated to the penis (98.1%). Of crush injuries, 81.7% occurred in children aged 2–3 years and 99.3% occurred in the home. Crush injuries increased over the period 2002–2010 ($P = 0.017$) by ≈ 100 per year, ending with an estimated 1707 (95% CI 1011–2402) by 2010.
- Most patients who sustained toilet- and toilet seat-related GU injuries were treated in the ER and then discharged.
- While penile crush injury related to a toilet seat is an uncommon mechanism of urological injury in children, the number of incidents appears to be rising.
- These findings support educational efforts and interventions, such as exchange of heavy toilet seats with slow-close toilet seat technology.

© 2013 BJU International

Correspondence: Benjamin N. Breyer, Department of Urology, UCSF, 400 Parnassus Ave Suite A-610, Box 0738, San Francisco, CA 94143-0738, USA. bbreyer@urology.ucsf.edu.

Conflict of Interest

None declared.

Keywords

penile crush injury; toilet; toilet seat

Introduction

Penile crush injury due to the accidental fall of a toilet seat is an uncommon cause of genitourinary (GU) trauma. However, recent reports suggest an increase in the number of these injuries in young boys, a population particularly vulnerable because of toilet training. In 2009, a 10-year study of non-sexual trauma of male children and adolescents from Graz, Austria identified accidental fall of toilet seats as the leading cause of injury to the penis in this cohort [1]. Tasian et al. [2] recently reviewed the epidemiology of consumer product-related GU injuries in children and found that toilet seats were the most common product associated with penile injuries in children and the fourth most common product associated with paediatric GU injuries overall. Other reports on this specific type of injury exist only as case reports and small case series [3–5].

Penile crush injuries in adults have been associated with penile fracture or urethral injury and carry the potential risks of penile curvature, stricture, or erectile dysfunction; however, the long-term sequelae of these injuries in children remain unknown [6].

The aim of the present study was to describe the demographic and injury characteristics of those who present to the Emergency Room (ER) with GU injury related to toilets or toilet seats. We hypothesised that a substantial number of the GU injuries seen in USA ERs result from toilet seat crush injuries, particularly in the paediatric population.

Materials and Methods

The National Electronic Injury Surveillance System (NEISS) is a prospectively compiled database that collects data related to ER visits involving injuries associated with the use of consumer products, as previously described [7,8]. The NEISS has >100 participating hospital ERs within the USA and its territories, each of which have at least six beds and are operated 24 h a day. The system is operated by the USA Consumer Products Safety Commission (CPSC) and data is reviewed at secondary and tertiary levels to ensure quality control. Using weighted factors provided by the CPSC, the NEISS provides a stratified probability sample that is validated to provide national estimates of consumer product-related injuries [9–11].

After Institutional Review Board exemption was obtained, NEISS was queried to identify individuals with GU injuries related to toilets and toilet seats for years 2002–2010. Data related to patient demographics and injury variables including age, race, gender, organ involved, diagnosis, mechanism of injury, location and ER disposition were obtained. Brief narrative descriptions of the injury (one or two sentences provided by the healthcare provider at the time of injury) are included in the NEISS dataset and each individual narrative was examined separately to confirm variables (injury site, mechanism of injury, injury diagnosis) by three co-authors (A.S.G., B.N.B., H.S.B.).

NEISS product codes were used to identify all GU injuries related to toilet or toilet seat during 2002–2010. Age was categorised as: 0–1, 2–3, 4–7, 8–11, 12–15, 16–18 and >18 years. These categories were chosen to reflect various stages of development. Race information was classified by the NEISS database as per the USA census and included Caucasian, Black, Asian, Native American, Pacific Islander, Other or Unknown.

GU injury sites were characterised as penis, scrotum, external female genitalia, internal GU organ, or non-specified male or female organ. Diagnosis codes provided by the NEISS were the following: burn, amputation, ingestion, concussion, contusion, crush, foreign body, fracture, haematoma, laceration, nerve damage, internal injury puncture, strain/sprain, haemorrhage, poisoning, avulsion, dermatitis or other. The primary mechanism of injury was provided in dataset (i.e. crush, fall, topical, etc.) and confirmed with review of narratives. Cases were stratified as either crush vs non-crush injury. Details of diagnostic imaging and physical examination findings by clinicians were inconsistently provided in the narratives, and thus, these details and specific GU injuries diagnoses (i.e. urethral injury) could not be accurately described and are therefore not reported.

Location of injury included home, school, other public place or unknown/not reported. Disposition from the ER was classified as either (i) treated and discharged, (ii) treated and admitted, (iii) treated and transferred, (iv) observed in ER, (v) left without being seen or against medical advice, or (vi) death. Injury incidents and proportions by year were also described.

All analyses were performed accommodating the strata, primary sampling units and probability weights in NEISS [11]. Totals and proportions are given as national estimates with 95% CIs, unless specified as being actual, unweighted case numbers. Probability of injury per year was assessed with logistic regression models of the estimation sample.

Results

Based on 468 actual cases, a total of 13 175 patients (95% CI 10 185–16 165) presented to USA ERs with toilet- or toilet seat- related GU injuries from 2002 to 2010, accounting for 3.3% of all GU injuries that presented to the ER ($n = 394\,438$, 95% CI 330 257–458 612) during the study period. Primary mechanism of injury included toilet seat crush (68.4%), fall (21.6), catch (5.0%), topical (1.3%) and non-specified (3.8%). Data is presented by crush vs non-crush injuries.

Crush injury

In all, 9011 crush injuries (68.4%; 95% CI 6907–11 115) related to toilets or toilet seats were noted during the study period, all of which occurred in males and mechanism was described as accidental fall of toilet seat. The mean age for crush injury was 3.9 years (95% CI 2.9–5.0). In all, 7362 injuries occurred in children aged 2–3 years (81.7%, 95% CI 5433–9291) and the remaining 1369 were in those aged 4–7 years (15.2%; 95% CI 826–1913). Only five actual cases of such injury were reported within adults, all of whom were aged > 40 years (Fig. 1). Of cases in which race was known (72.8%), 61.1% were Caucasian, 16.2% were Black, 0.2% were Asian and 22.5% were described as Other. Of the 249 actual records in which location of injury was identified, 243 (99.3%) crush injuries that occurred in the home, while 25 injuries (0.3%) occurred at school and 27 injuries (0.4%) in other public area.

In most cases, crush injury was limited to the penis (98.1%). Table 1 compares injury site and primary diagnosis for crush and non-crush injuries. In all, 97.0% of patients with crush injuries received treatment within the ER and were subsequently discharged. A total of 121 patients (1.3%; 95% CI –43 to 285) left without being seen. Six cases (0.1%; 95% CI –6 to 19) required admission to hospital for treatment. This estimate was based on a single actual case of hospital admission describing a 2-year-old boy with penile laceration. Additionally, 146 patients (1.6%; 95% CI –59 to 351) were transferred to another facility for treatment. This estimate was based on two actual cases involving hospital transfer, which describe a 3-year-old boy with penile laceration and a 56-year-old man who presented with cellulitis of the scrotum and was transferred because of sepsis. No deaths were reported.

Figure 2 shows incidents of crush and non-crush injuries per year. From 2002 to 2010, crush injuries were increasing ($P = 0.017$) by ≈ 100 per year, providing for an estimated 1707 injuries (95% CI 1011–2402) by 2010. Similarly, overall toilet- or toilet seat-related GU injuries were increasing ($P = 0.021$) by 130 incidents per year during the study period.

Non-crush Injury

Non-crush injury occurred in 4164 (31.6%; 95% CI 2891–5437) cases that were related to either toilets (55.0%) or toilet seats (45.0%) as the product associated with injury. The most common mechanism of injury was fall, including falling ‘on’ or falling ‘off’ of a toilet (68.3%), followed by catch injury (i.e. unintentional trapping of genitalia between toilet seat/lid and toilet bowl but unrelated to accidental fall of toilet seat) (15.7%), non-specific injury (12.0%) and topical injury, i.e. contact dermatitis (4.1%).

With a mean age of 29.4 years (95% CI 22.7–36.1), non-crush injuries were most commonly identified in those aged > 18 years, accounting for a total of 2045 injuries (49.1%; 95% CI 1267–2823). Of the actual cases in those aged > 18 years, three occurred in those aged 19–28 years (2.2%), 17 in those aged 29–45 years (12.7%), 11 in those aged 46–65 years (8.2%) and 17 in those aged > 65 years (12.7%) (Fig. 1). Of incidents in which race was identified (74.0%), 77.8% of cases were as Caucasian, 15.3% were Black, 0.5% were Asian and 6.4% were Other. Most (71.8%) injuries occurred at home, 10.7% at other public place, 2.3% at school and 15.3% at a non-specified location.

Of female non-crush injuries (29.3%), external genital injury was identified in most cases (92.9%). A single case of renal injury was reported and was the only internal organ injury seen in the study period. Specifically, this case described a 75-year-old woman who while attempting to use a bedside commode in her nursing home, fell and experienced pelvic fracture and renal contusion. Most (96.0%) of the non-crush injuries were managed within the ER with subsequent discharge. In all, 150 patients (3.6% of non-crush injuries; 95% CI – 41 to 342) required admission for further treatment. This estimate was based on three actual cases requiring admission, all involving adult patients who sustained genital laceration injuries with two cases involving more complicated history, including a 36-year-old woman with syncope and a 94-year-old man with haematuria and acute renal failure. Disposition was not recorded for the remaining cases (0.4%). There were no transfers or deaths reported.

Across the study period, non-crush injuries had small, statistically non-significant increases (yearly increase of 40 incidents per year, 95% CI – 19 to 98, $P = 0.153$), and provided for 790 injuries (95% CI 368–1211) in 2010 (Fig. 1).

Discussion

Between 2002 and 2010, toilets or toilet seats were involved in 3.3% of all consumer product-related GU injuries. Recent studies have found that toilet seats are a common cause of traumatic penile injury in pre-school age boys [1,2]. The present results confirm these observations, as this demographic comprised 63.4% of overall injuries and 81.7% of male crush injuries. Most crush and non-crush injuries occurred in the home and were managed with outpatient treatment.

Coined the ‘penile slam syndrome’, penile crush injury due to accidental fall of toilet seat was first described in a 1973 *Journal of American Medical Association* editorial [12]. Acknowledged as a preventable injury, the Accident Prevention Committee of the American Academy of Pediatrics argued for parental education and use of well-cushioned toilet seats [13]. Subsequent measures to prevent toilet seat injury include manufacturing and use of ‘U’-shaped toilet seats in public restrooms, which were primarily implemented to prevent

accidental spread of sexually transmitted diseases [4]. Recent reports have faulted use of heavy ceramic or wood toilet seats [1,3,4], which are reportedly increasing in sales within USA and Westernised markets [14]. Further, the rise in persons who are overweight or obese has resulted in companies that manufacture larger and heavier toilet seats such as the 'Big John' toilet seat, manufactured by a company that offers specialty products for plus size customers [15]. Technology to prevent such injuries include 'slow-close' or 'soft-fall' toilet seats and lids, which have been available since 1995 [16]. The present study provides evidence that penile crush injuries are increasing, further supporting use of these preventative interventions. Averaging \$40–75 (American dollars) from major retailers, these products cost four- to eight-times more than traditional basic toilet seats [16,17], which may account for presumably poor utilisation. However, the 'Big John' toilet seats are also markedly expensive, retailing at \$199 [15].

GU crush injury in adults was much less common than in children, noted in five actual cases (ages ranging from 42 to 65 years). In two men, penile contusion resulted from accidental fall of the toilet seat at home. In another man, injury resulted from accidental fall of the toilet seat lid using a public restroom. Because of presumed greater height discrepancies between seat and genitalia in adults, the exact mechanism remains unclear. The other two men experienced scrotal catch injury while using the toilet from a seated position, one of whom was described as a 56-year-old with spina bifida whose scrotal injury resulted in sepsis.

Traumatic penile injuries warrant evaluation for penile fracture and/or urethral injury. Clinicians should perform a detailed history, physical examination and urine analysis. Signs such as gross haematuria, blood at the urethral meatus or the inability to void warrant further diagnostics and imaging. Depending on the patient's age, ultrasound, urethrography or flexible cystoscopy may be necessary to confirm the injury. Toilet injuries are heterogeneous and should be managed on a case-to-case basis. Minor injuries can be treated with supportive care, while more severe injuries, e.g. penile fracture or severe urethral crush injury, may require operative intervention.

The most common mechanism of non-crush GU injury was fall (68.3%). Since bathrooms often have hard and potentially slippery surfaces, they are a high-risk location for fall-related injuries. The Centers for Disease Control reviewed NEISS data from 2008 and found that unintentional bathroom injuries represented a significant proportion of the 22 million nonfatal injuries in persons aged 15 years. It was reported that 14.1% of these injuries were related to standing up, sitting down on or using the toilet, only second to bathtub or shower injuries (65.8 per 100 000). Further, these injuries were noted to be highest in those aged 65–85 years (51.7%) [18]. Notably, we report a single internal GU organ injury identified within non-crush injuries. This case was described as an elderly female who while attempting to use a bedside commode in her nursing home, fell and experienced pelvic fracture and renal contusion.

Topical injury was the second most common mechanism of non-crush injuries (9%). Several case reports describe incidents of contact dermatitis from unusual toilet seat products, such as exotic woods, polyurethane chemicals or even use of harsh toilet seat detergents [19–22]. Of non-crush injuries, five actual cases of contact dermatitis occurred after sitting on a toilet seat. Four of these injuries occurred in the home and one after public toilet use.

This is the first study to use a national sample to investigate GU injuries sustained from toilet seats and toilets that present to USA ERs. Strengths of the present study include use of a large database validated to provide national estimates. As NEISS reflects only injuries that present to the ER, it is possible the actual number of GU injuries sustained from toilets and

toilet seats is greater, especially because most injuries we identified were minor and may have presented to outpatient primary care or urgent care providers. Further, data on evaluation and treatment, including surgical interventions or imaging was unavailable. This is an important limitation, as specific GU injury diagnoses, such as urethral, glans, or erectile body injury, as well as long-term clinical outcomes of those patients who required admission or transfer would have provided greater clinical insight into the epidemiology of these injuries.

In conclusion, over the past decade, there has been an increase in the number of GU injuries related to toilets and toilet seats that present to USA ERs. Toilet seat crush injury is an important cause of urological trauma in toilet training boys. While the majority of both crush and non-crush injuries were minor and managed with outpatient treatment, the long-term consequences remain unknown. Educating parents and healthcare providers of potential bathroom hazards and encouraging use of safety measures is warranted.

Acknowledgments

B.N.B. was supported by NIH grant K12DK083021.

Abbreviations

CPSC	USA Consumer Products Safety Commission
ER	Emergency Room
GU	genitourinary
NEISS	National Electronic Injury Surveillance System

References

1. Widni EE, Hollwarth ME, Saxena AK. Analysis of nonsexual injuries of the male genitals in children and adolescents. *Acta Paediatr.* 2011; 100:590–3. [PubMed: 21087313]
2. Tasian GE, Bagga HS, Fisher PB, et al. Pediatric genitourinary injuries in the United States from 2002 to 2010. *J Urol.* 2013; 189:288–93. [PubMed: 23174237]
3. Philip J, Bicha S, Mamood E, Sorur M, Ananthakrishnan K, Irwin PP. Public interest warning: should we ban wooden/ornamental toilet seats for male infants? *BJU Int.* 2008; 102:1749. [PubMed: 19035862]
4. Gorman RL, Oderda GM. Penile trauma: small slam revisited. *Pediatr Emerg Care.* 1989; 5:108–9. [PubMed: 2748402]
5. Cass AS, Gleich P, Smith C. Male genital injuries from external trauma. *Br J Urol.* 1985; 57:467–70. [PubMed: 4027520]
6. Morey, AF.; Dugi, DD. Genital and Lower Urinary Tract Trauma. In: Wein, AJ.; Kavoussi, LR.; Novick, AC.; Partin, AW.; Peters, CA., editors. *Campbell-Walsh Urology.* 10. Vol. Chapter 88. Philadelphia, PA: Elsevier; 2012. p. 2507-20.
7. Bagga HS, Tasian GE, Fisher PB, McCulloch CE, McAninch JW, Breyer BN. Product related adult genitourinary injuries treated in united states emergency departments from 2002 to 2010. *J Urol.* 2012; 189:1362–8. [PubMed: 23127766]
8. Glass AS, Bagga HS, Tasian GE, et al. Pubic hair grooming injuries presenting to U.S. emergency departments. *Urology.* 2012; 80:1187–91. [PubMed: 23040729]
9. Annest JL, Mercy JA, Gibson DR, Ryan GW. National estimates of nonfatal firearm-related injuries. Beyond the tip of the iceberg. *JAMA.* 1995; 273:1749–54. [PubMed: 7769767]
10. Hopkins RS. Consumer product-related injuries in Athens, Ohio, 1980–85: assessment of emergency room-based surveillance. *Am J Prev Med.* 1989; 5:104–12. [PubMed: 2730789]

11. Schroeder, T.; Ault, K. The NEISS Sample Design and Implementation: 1997 to Present. Washington, DC: US Consumer Product Safety Commission; 2001. Available at: <http://www.cpsc.gov/neiss/2001d011-6b6.pdf> [Accessed October 17, 2012]
12. Small slam. JAMA. 1973; 224:1414. [PubMed: 4739992]
13. Mofenson HC. Penile trauma. JAMA. 1973; 225:1388–9. [PubMed: 4740668]
14. Parker, PM. The 2007–2012 World Outlook for Wood Toilet Seats. San Diego, CA: Icon Group International Inc; 2006. Available at: <http://www.marketresearch.com/Icon-Group-International-Inc-v609/Outlook-Wood-Toilet-Seats-1389958/> [Accessed March 2013]
15. Big John Products, Inc. [Accessed March 2013] Big John Toilet Seat and Support. 2013. Available at: <http://www.bigjohntoiletseat.com/>
16. Bemis Manufacturing Company. [Accessed April 2013] Bathroom Products. Available at <http://www.toiletseats.com/>
17. The Home Depot U.S.A., Inc. [Accessed April 2013] Home Depot Toilet Seats. Available at www.homedepot.com/Toilets
18. Stevens, JA.; Haas, EN.; Haileyesus, T. Morbidity and mortality weekly report: nonfatal bathroom injuries among persons aged > 15 years – United States, 2008. Centers for Disease Control and Prevention; 2011. Available at: <http://www.cdc.gov/mmwr/pdf/wk/mm6022.pdf> [Accessed March 2013]
19. Ezzedine K, Rafii N, Heenen M. Lymphomatoid contact dermatitis to an exotic wood: a very harmful toilet seat. Contact Dermatitis. 2007; 57:128–30. [PubMed: 17627661]
20. Holme SA, Stone NM, Mills CM. Toilet seat contact dermatitis. Pediatr Dermatol. 2005; 22:344–5. [PubMed: 16060873]
21. Litvinov IV, Sugathan P, Cohen BA. Recognizing and treating toilet-seat contact dermatitis in children. Pediatrics. 2010; 125:e419–22. [PubMed: 20100770]
22. Turan H, Saricaoglu H, Turan A, Tunali S. Polyurethane toilet seat contact dermatitis. Pediatr Dermatol. 2011; 28:731–2. [PubMed: 21575050]

Age in Crush and Non-Crush Injuries

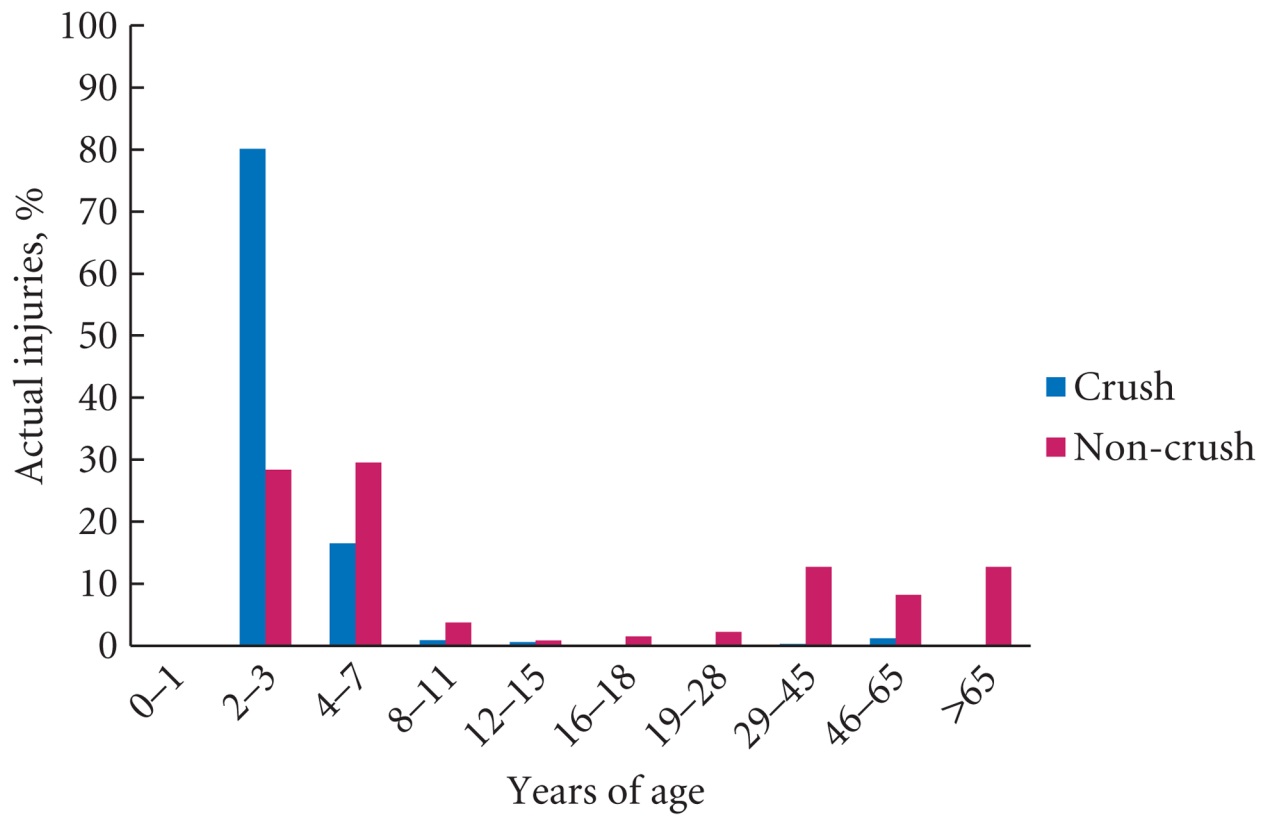


Fig. 1. Percentage of age category for crush and non-crush injuries.



Fig. 2. Estimated incidents of crush and non-crush injuries for years 2002–2010. Error bars represent upper and lower 95% CIs. Number of actual cases is shown above bars.

Table 1

Estimated injuries by organ site and primary diagnosis.

	Crush*		Non-crush*		Total	
	Incidents, n (%)	95% CI	Incidents, n (%)	95% CI	Incidents, n (%)	95% CI
Organ:						
Penis	8845 (98.1)	6732 to 10 958	2138 (51.3)	1323 to 2953	10 983 (83.3)	8 453 to 13 514
Scrotum	114 (1.3)	-50 to 278	784 (18.8)	266 to 1302	898 (6.8)	278 to 1 517
Penis/scrotum	6 (0.1)	-6 to 17	0	0	6 (<0.1)	-6 to 17
Male pubic NOS	46 (0.5)	-22 to 114	50 (1.2)	-5 to 105	96 (0.7)	-17 to 209
External female genitalia	na	na	1156 (27.8)	576 to 1737	1 156 (8.8)	576 to 1 737
Female pubic NOS	na	na	21 (0.5)	-12 to 54	21 (0.2)	-12 to 54
Kidney	0	0	15 (0.4)	-15 to 45	15 (0.1)	-15 to 45
Diagnosis:						
Contusion	6785 (75.3)	5146 to 8425	1286 (30.9)	697 to 1876	8 072 (61.3)	6 159 to 9 985
Laceration	1461 (16.2)	738 to 2185	2386 (57.3)	1392 to 3380	3 847 (29.2)	2 476 to 5 219
Haematoma	625 (6.9)	57 to 1194	15 (0.4)	-15 to 46	641 (4.9)	68 to 1 213
Abrasion	139 (1.5)	-11 to 288	220 (5.3)	-73 to 513	359 (2.7)	29 to 689
Rash	0	0	256 (6.1)	-1 to 513	256 (1.9)	-1 to 513
Total	9011	6907 to 11 115	4164	2891 to 5437	13 175	10 185 to 16 165

NOS, not otherwise specific; na, not applicable. Injuries based on small numbers of actual cases are unreliable as evidenced by a wide CI that crosses 1.

* Correction added on 20 June 2013, after first online publication: the labels for column 1 and 2 have been reversed