

CHIRPP INJURY REPORT

Canadian Hospitals Injury Reporting and Prevention Program



Injuries associated with ... Backyard Trampolines

1999-2003 (full) and 2004-2006 update (limited), all ages

SOURCE OF THE STATISTICS

Injury data were obtained from the database of the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP). CHIRPP is an injury surveillance system operating in the emergency departments of 10 pediatric and 4 general hospitals in Canada. Data collection began in April 1990 at the pediatric hospitals and between 1991 and 1995 in the general hospitals. CHIRPP is a program of the Injury and Child Maltreatment Section of the Health Surveillance and Epidemiology Division, Public Health Agency of Canada.

Briefs and reports are updated when there is reason to believe the injuries or circumstances surrounding the injuries have changed. For example, the report of injuries associated with a specific product would be updated if the manufacturing regulations for the product are changed to include a new safety element. There is no need to update reports on a regular basis because the data collection sites are not a representative sample of all Canadian hospitals. Frequent updates would simply increase the number of records included in the report but not necessarily result in any change in the patterns and distributions found.

LIMITATIONS

It is important to note that the injuries described do not represent all injuries in Canada, but only those seen at the emergency departments of the 15 hospitals in the CHIRPP network. Since most of the data comes from the pediatric hospitals, which are in major cities, injuries suffered by the following people are under-represented in the CHIRPP database: older teenagers and adults, who are seen at general hospitals; native people; and people who live in rural areas. Fatal injuries are also under-represented in the CHIRPP database because the emergency department data do not capture people who died before they could be taken to hospital or those who died after being admitted.

INCLUSION AND EXCLUSION CRITERIA

A February 2006 search of the CHIRPP database for injuries related to backyard trampolines occurring between 1999 and 2003 was conducted (all ages; 574,520 total records searched). All trampoline-related cases were identified using the CHIRPP code for trampoline (code 1180) and bilingual (English and French) text string searches. This dataset was further refined to include only large backyard trampolines by removing cases involving 'mini' or exercise trampolines, water or inflatable types, incidents occurring in schools or gymnastics clubs and other records involving competitive trampolining. The final dataset contained a total of 2,705 records.

An updated dataset was also extracted as of June 2007. This dataset contained 1,749 cases and some results are presented where indicated.

RECOMMENDED CITATION

Injury briefs and reports and data from them may be copied and circulated freely provided that the source is acknowledged. The following citation is recommended:

Health Surveillance and Epidemiology Division (Public Health Agency of Canada). *Injuries Associated with Backyard Trampolines: Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) database, 1999-2003 (cumulative to February 2006), All ages, 2,705 records. Update 2004-2006, 1749 cases.*

FOR MORE INFORMATION

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Background

Trampoline-related injuries have become increasingly common in recent years due to the availability of relatively low-cost backyard models. Lack of supervision and the potential for high impact scenarios and neurotrauma has resulted in this activity gaining the attention of injury researchers (e.g. 1-5).

Trampoline injuries in CHIRPP

Numerous CHIRPP studies related to trampoline injuries have been conducted. The first was published in 1990 ⁶ using the first four months of CHIRPP data (March 1990-June 1990, ages 0-19 years). Forty-one cases involving all types of trampolines were described. Most (60%) of the incidents occurred at private residences. The male:female (M:F) ratio was 0.78 and 43.9% of the injuries involved 10-14 year-old children. Fractures accounted for 41% of all injuries.

In July 1991 ⁷ the first report was updated with 158 more cases. About two-thirds occurred in or around a private home. The M:F ratio was 0.71 and 51% involved 8-12 year-old children. Fractures, dislocations and sprains accounted for 77% of all injuries.

A further update was done in August 1994 ⁸. All types of trampolines were included. Since six general hospitals were added to the program in the 1991-1994 period, all ages were analysed. Almost two-thirds (64.9%) of the 1,042 incidents occurred at private residences. The M:F ratio was 0.83 and 45.3% of the injuries involved 10-14 year-old children. About one-third (36%) of the injuries were fractures.

Two further studies reported on detailed circumstances for single years (1996 and 1998; all ages, all trampoline types) ^{9,10}. The 1996 study described 393 cases and the 1998 report, 557. The patterns were similar to the previous studies.

In 2003 a detailed study looked at all trampoline-related hospital admissions cumulative to August 2002 ¹¹. In this study mini-trampolines were excluded but other-than private residence locations were included (*i.e.* gymnastics clubs, school gyms). Overall, 611 cases were identified. About three-quarters of the injuries happened at a private residence. The M:F ratio was 0.96 and children 5-14 years accounted for 81.5% of their injuries (median age: 9 years). Between 1990 and 2001, there was a 56% increase in the number of trampoline-related cases requiring admission to hospital per 100,000 cases of all CHIRPP admissions (Table 1).

Table 1. Patients admitted to hospital for backyard trampoline-related injuries, 1990-2001, all ages ¹. Expressed as a proportion (per 100,000) of all admitted cases.

Year	n/100,000	Grouped years	
		Group	n/100,000
1990	605.0	1990-1996	479.0
1991	425.0		
1992	522.8		
1993	513.4		
1994	458.5		
1995	482.9		
1996	443.8		
1997	730.8	1997-2001	883.9 *
1998	858.0		
1999	912.0		
2000	944.0		
2001**	996.0		

¹ Originally presented at the 2003 British Columbia Injury Prevention Conference. Data included incidents occurring at schools and gymnastics clubs, 7.7%.

* There was a significant increase in the number of trampoline-related CHIRPP hospital admissions in the period from 1997-2001 compared to 1990-1996 ($\chi^2 = 53.95$, $p < 0.0001$, OR=1.85 (1.56,2.20)).

** 2001 is incomplete

The current study is a further update providing data for the most recent 5-year period (1999-2003) and a subsequent update for 2004-2006. This research excludes mini-, exercise and water trampolines as well as incidents occurring in gymnastics clubs and school gyms.

Location

Although the search did not restrict on the location, the exclusions (described above) resulted in most cases occurring in the backyards or surrounding property of private homes (Table 2).

There were 299 cases where the location was unknown. Compared to the cases where the location was reported, these cases did not differ in pattern on several key variables including age, sex, day of the week, time of day, month and body part. However, there was a significant difference in the proportion of patients admitted to hospital and in those with fractures. In the cases where the location was unknown (n=299), 21.7% of patients were admitted to hospital and 56.5% suffered a fracture, compared to 11.2% and 46.0%, respectively, for cases where the location was reported (n=2,406) ($p < 0.0001$, $p < 0.005$). Hospital admissions and fractures are proxies for severity and in CHIRPP overall it is typical for cases with missing values (for location

and other variables) to be of higher severity. For the purposes of this analysis, these 299 cases are considered probable backyard-related incidents and are combined with the 2,406 known cases.

Table 2. Backyard trampoline-related injuries, location, CHIRPP, all ages, 1999-2003

Location	#cases (%)
Private residence, other	1,189 (44.0)
Private residence, patient's own	1,180 (43.6)
Private residence, NFS	36 (1.3)
Other ¹	1 (<0.1)
Unknown	299 (11.1)
Total	2,705 (100.0)

¹ This case involved a trampoline on the grounds of a hotel, set up for guests to use.

Proportion of cases by year

Table 3 shows the proportion of cases by year for the period 1999-2006. There was a significant increase in all trampoline-related cases between 1999 and 2006 ($p < 0.001$, $\chi^2 = 11.84$). There is a non-significant trend ($p = 0.5$) in the admissions data over the same time period.

Table 3. Backyard trampoline-related injuries, proportion of cases by year, CHIRPP, all ages, 1999-2006

Year	# cases	#/100,000 CHIRPP cases ¹	#/100,000 CHIRPP admitted cases ²
1999 *	459	420.6	896.7
2000 *	469	411.6	964.9
2001 *	503	439.7	878.6
2002	594	508.0	901.9
2003	684	594.2	873.0
2004	645	541.0	1,016.3
2005	649	574.4	884.8
2006 **	451	799.0	1,139.5
Total	4,454	519.0	934.8

¹ Number of cases per 100,000 CHIRPP records of all types for the given year.

² Number of cases per 100,000 CHIRPP hospital admissions of all types for the given year.

* The proportions for the admitted cases are slightly different from those presented in Table 1 because the denominator used to re-calculate the proportion changes slightly when the database is updated.

** 2006 is incomplete (Jan to Aug)

Age and Sex Distribution

Table 4 details the age and sex distribution. Although youth between the ages of 10 and 14 years accounted for 43.3% of incidents, as a proportion of all same-age cases, children 5-9 years were most frequent at 855 cases per 100,000 CHIRPP cases of all types. The median age was 10.1 years (range: 13 months to 53.7 years). The interquartile range (25th to 75th percentiles) was 7 years to 12.8 years. Males represented 51.6% of incidents.

Table 4. Backyard trampoline-related injuries, age and sex distribution, CHIRPP, 1999-2003

Age Group (years)	# cases (%)	#/100,000 CHIRPP ¹	M:F ratio ²	M:F ratio CHIRPP ³
1	24 (0.9)	64.7	2.00	1.25
2-4	288 (10.6)	316.4	0.85	1.34
5-9	997 (36.9)	855.0	1.02	1.40
10-14	1,172 (43.3)	802.2	1.17	1.64
15-19	188 (7.0)	308.7	1.07	1.72
20+	36 (1.3)	46.7	0.89	1.71
Total	2,705 (100.0)	511.5	1.07	1.51

¹ Because CHIRPP collects information from ten children's hospitals and only four of the general hospitals, there is a high number of young children in the database. Using cases per 100,000 within an age group (instead of percentage by age group) adjusts for this uneven distribution.

² M:F = Male to female ratio (#males/#females)

³ The M:F ratio in the entire CHIRPP database for the given age group.

Circumstances and direct cause of the injury

Table 5 details the direct cause of injury. The direct cause points to the circumstances of the incident, although there is some overlap, e.g. "multiple children jumping on the trampoline, other child pushed patient off trampoline -hit ground". There were 117 cases (4.3%) involving the patient attempting a flip or somersault and 3 cases (0.1%) where the trampoline broke. It should be noted that the distribution in table 5 cannot be directly compared to previous reports because cases of overexertion were previously coded with a direct cause as the patient, whereas in this report these cases were classified with trampoline as the direct cause, which makes more sense biomechanically.

Table 5. Backyard trampoline-related injuries, direct cause of injury, CHIRPP, 1999-2003

Direct cause of injury ¹	# cases (%)
The trampoline ²	1,418 (52.4)
Surface ³	781 (28.9)
Other person ⁴	386 (14.3)
The patient ⁵	73 (2.7)
Structure ⁶	24 (0.9)
Other ⁷	13 (0.5)
Unknown	10 (0.4)
Total	2,705 (100.0)

¹ Direct cause of the injury is the structure, person or other factor which caused the injury

² These include cases where the patient over-exerted themselves (*e.g.* ankle sprains, bad landings), or landed on the mat, frame, springs, etc.

³ Other than trampoline mat (*i.e.* ground, cement, patio stones, gravel, grass)

⁴ Impact with other person while multiple people jumping on the trampoline

⁵ *e.g.* patient kneed themselves in the mouth while jumping on trampoline

⁶ includes balconies, fences, sheds and lawn furniture

⁷ includes toys on the trampoline or ground, jumping with popsicle sticks in mouth-fell, pieces of metal on the ground

Month, day of the week, time of day

Three-quarters (77%) of the cases occurred between May and September. Almost half (42.6%) of the incidents occurred on the weekend and over half (55.7%) of the injuries happened between 4:00 pm and 8:59 pm.

Injuries

Table 6 displays the injuries sustained by the patients. Almost half of the injuries (47.2%) were fractures and 21.8% of them were sprains/strains. There were 21 concussions, 5 internal injuries and 2 intracranial injuries. It should be noted that CHIRPP allows the identification of up to three injuries; table 6 details only the first, most serious injury. About 5% of patients suffered more than one injury.

Table 6. Backyard trampoline-related injuries, CHIRPP, 1999-2003

Body part nature of injury	# cases (%)
Lower Extremity fracture sprain/strain/dislocation soft tissue/bruise, abrasion, muscle/tendon laceration	1,076 (39.8) 440 384 236 16
Upper Extremity fracture soft tissue/bruise, abrasion, muscle/tendon sprain/strain/dislocation laceration	1,065 (39.4) 797 130 128 10
Face laceration soft tissue, bruise/abrasion fracture dental injury eye injury sprain/strain	163 (6.0) 69 36 25 24 8 1
Neck (excluding cervical spine/cord) sprain/strain soft tissue/bruise, abrasion injury to muscle/tendon	137 (5.1) 88 42 7
Trunk (excl. Spine/cord) soft tissue, bruise/abrasion, muscle/tendon sprain/strain injury to internal abdominal organ rib fracture other trunk injuries	114 (4.2) 66 35 5 3 5
Head minor closed head injury concussion scalp laceration soft tissue/bruise, abrasion intracranial skull fracture	97 (3.6) 49 21 19 5 2 1
Spine and Cord fracture dislocation nerve injury other	19 (0.7) 10 4 1 4
Other and Unknown	34 (1.3)
Total	2,705 (100.0)

Treatment in Emergency

Table 7 shows the treatment received by the patients in the emergency room. Over half (57.1%) of the patients required medical follow-up, were kept in emergency for prolonged observation or were admitted to hospital compared to 41.1% for the database overall (same age range and time frame).

Table 7. Treatment received in the emergency department, backyard trampoline injuries, CHIRPP, 1999-2003

Disposition	# cases (%)	% cases CHIRPP ¹
Left without being seen	29 (1.1)	1.5
Advice only	407 (15.1)	17.0
Treated, medical follow-up if necessary	725 (26.8)	40.5
Treated, medical follow-up required	1,167 (43.1)	33.4
Short stay, observed in ED	42 (1.6)	1.8
Admitted to hospital	335 (12.4)	5.9
Fatal	0.0	<0.1
Total	2,705 (100.0)	100.0

¹ The proportion of cases in the entire CHIRPP database for the given disposition, over the same time period.

Injury severity by direct cause

Table 8 shows the proportion of fractures, hospital admissions and closed head injuries (used as proxies for severity) by direct cause. Patients who landed on the ground or other non-trampoline surface had a higher proportion of fractures and hospital admissions compared to those injured by other direct causes.

Table 8. Backyard trampoline injuries, proportion of fractures, closed head injuries and hospital admissions for the main direct causes of injury, CHIRPP 1999-2003

Direct cause	n	% fractures	% CHI ¹	% admitted
Trampoline	1,418	41.7	2.0	9.9
Surface	781	64.7	2.9	19.7
Other person	386	41.5	4.4	7.7
The patient	73	16.4	0.0	8.2

¹ CHI: closed head injury includes minor closed head injury, concussion, intracranial

Selected variable proportions by year and age group

Tables 9 and 10 present the proportions of selected variables by year and age group, respectively. These tables are updated as each new year of data becomes available and are used as a red flag system for possible equipment or environment changes. The annual pattern has remained stable with some minor year-to-year fluctuations. There are significant differences in the variables by age group.

Table 9. Proportions of selected variables by year, backyard trampoline injuries, CHIRPP, 1999-2006 (N=4,454), all ages

Year	% adm ¹	% Fx ²	%CHI ³	% UE ⁴	%LE ⁵	%HF ⁶	% NkSp ⁷
1999	14.6	49.7	1.5	41.0	41.2	7.8	5.0
2000	14.7	45.4	3.6	40.5	35.8	13.7	5.3
2001	12.9	44.9	1.8	36.6	42.0	8.8	6.2
2002	11.1	49.7	3.4	42.4	38.1	9.6	5.2
2003	9.9	46.3	2.8	37.0	41.5	8.6	6.7
2004	12.5	52.7	3.1	41.9	38.4	9.9	4.7
2005	10.8	44.5	3.1	37.4	38.8	10.8	4.9
2006 *	11.8	52.1	2.4	41.5	41.9	8.9	3.1
Overall	12.1	48.1	2.8	39.7	39.7	9.7	5.2

¹ admitted to hospital

² fractures

³ closed head injuries (minor closed head injuries, concussion, intracranial)

⁴ upper extremity injuries

⁵ lower extremity injuries

⁶ head and face injuries (including CHI)

⁷ Neck and spinal injuries

* the year 2006 is incomplete (Jan to Aug)

Table 10. Proportions of selected variables by age group, backyard trampoline injuries, CHIRPP, 1999-2006* (N=4,454), all ages

Age group	% adm ¹	% Fx ²	%CHI ³	% UE ⁴	%LE ⁵	%HF ⁶	% NkSp ⁷
0-4 (n=591)	15.1	63.8	2.5	44.8	43.0	8.1	2.0
5-9 (n=1,736)	13.7	52.9	2.8	45.4	35.4	9.0	5.1
10-14 (n=1,796)	10.4	42.2	2.7	36.3	40.4	10.3	6.2
15 + (n=331)	8.1	26.9	3.3	18.7	52.0	13.3	6.0
Overall (N=4,454)	12.1	48.1	2.8	39.7	39.7	9.7	5.2

* the year 2006 is incomplete (Jan to Aug)

¹ admitted to hospital

² fractures

³ closed head injuries (minor closed head injuries, concussion, intracranial)

⁴ upper extremity injuries

⁵ lower extremity injuries

⁶ head and face injuries (including CHI)

⁷ Neck and spinal injuries

Comparison to other sports and recreational activities

Table 11 presents trampoline injuries in the context of other selected sports and recreational activities in the CHIRPP database over the same time period and age range.

Table 11. Frequency of sports and recreation (SPAR) injuries, CHIRPP database, 1999-2003, ages 1 year and older, both sexes

Activity	Estimated number of Cases ¹	Percent of all SPAR	% admitted to hospital
Bicycling	15,945	10.2	10.2
Soccer	14,822	9.5	2.5
Basketball	14,323	9.1	1.4
Ice Hockey	13,759	8.8	3.3
Football	7,217	4.6	2.8
Snowboard	6,314	4.0	12.0
Skateboard	5,004	3.2	7.3
Baseball	4,386	2.8	2.9
Inline skating	3,815	2.4	7.5
Ice skating	3,802	2.4	3.2
Sledding	3,796	2.4	9.4
Alpine skiing	3,497	2.2	12.9
Swimming	3,234	2.1	4.9
Trampoline	2,705	1.7	12.4
Volleyball	2,515	1.6	1.4
Gymnastics	2,013	1.3	6.4
Rugby	1,737	1.1	3.6
Martial arts	1,526	<1.0	2.0
Mini-scooter	1,365	<1.0	6.2
Dancing	1,345	<1.0	2.0
Other	43,648	27.8	-
Overall SPAR	156,717	100.0	5.3

¹ Based on a search of contributing factor codes; frequencies are estimates based on uncleaned data.

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