Trends and demographic characteristics of physical fighting and fighting-related injuries among Canadian youth, 1993–2010

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ABSTRACT

OBJECTIVES: Physical fighting is a behaviour of concern that puts adolescents at increased risk for injury. The study objectives were to: 1) describe current patterns of physical fighting and fighting-related injury among Canadian adolescents, and 2) investigate potential trends in fighting and fighting-related injuries during the period 1993–2010.

METHODS: Canadian data from cycles 2–6 (1993–2010) of the Health Behaviour in School-aged Children (HBSC) study were used, giving cross-sections for 61,465 grade 6–10 students. Prevalence estimates for physical fighting and fighting-related injury were calculated and described by sex, grade and subjective social status. A trend analysis was conducted across time cycles overall and within subgroups.

RESULTS: A significant increase over time for physical fights was observed overall ($p_{\text{trend}} = 0.015$) and within female, grade 7–8, and high status subgroups, although further time points are necessary to determine this pattern with certainty. There was a significant trend increase over time for fighting-related injury overall and within all subgroups ($p_{\text{trend}} < 0.001$). Males were twice as likely as females to report a physical fight ($p < 0.001$) and fighting-related injury ($p < 0.044$). There was a significant decreased likelihood of physical fight involvement from lower to higher grades ($p < 0.001$), and an increased probability of fighting-related injury with increasing grades for three of five HBSC cycles. Subjective lower status was significantly associated with a higher likelihood of reporting a physical fight at all time points ($p < 0.001$) and fighting-related injury in three of five HBSC cycles.

CONCLUSION: Specific subgroups are more likely to report physical fight participation and sustaining a fighting injury. Understanding the context and trends of these outcomes is informative for public health interventions.

KEY WORDS: Adolescence; epidemiology; injury; physical fighting; trends

La traduction du résumé se trouve à la fin de l'article.

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Physical fighting is a manifestation of interpersonal violence and has become a concerning public health issue worldwide among young people.^{1,2} In studies from the United States, nearly one third of adolescents reported participating in at least one physical fight in the previous year.^{3–5}

Physical fighting puts adolescents at increased risk for injury.^{6–8} Injury is one of the most common reasons for death, hospitalization and disability in young people.^{9–11} Fighting is the fifth most common reason for injury in Canadian youth, and the third most common reason for injuries requiring significant medical treatment or overnight hospital admission. Only vehicle- and bicycle-related injuries are more common among young people for medically treated injuries.⁹ Due to the potential for harm, it is important for researchers to understand who is at risk for fighting and fighting-related injury, and what reasons or mechanisms underpin these outcomes.

There is limited epidemiological information in a Canadian context that is recent and nationally representative. In Canada there is also minimal information on demographic and socio-economic variation of physical fight involvement and fighting-related injuries. Few studies consider the contextual factors of fighting and fighting-related injuries, such as where the event occurred and who was involved. There is also little information regarding trends that indicate whether physical fights and

fighting-related injuries have changed over time. International studies report that physical fighting has decreased over time, although it is difficult to generalize these findings to Canada.²

The objectives of this study were to: 1) describe physical fighting and fighting-related injury among Canadian adolescents by sex, grade and subjective social status; and 2) investigate potential trends of physical fighting and fighting-related injuries between 1993–2010 in the overall population and within subgroups.

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Conflict of Interest: None to declare.

METHODS

Data sources and sample

This study used Canadian data from the Health Behaviour in School-aged Children (HBSC) study.⁶ HBSC is a nationally representative study that was developed in collaboration with the World Health Organization for the purpose of understanding health determinants and behaviours in young people. Canada has collected data every four years since 1998 through questionnaires administered to 11–15 year old students. Six HBSC cycles have been undertaken in Canada during the period 1990–2010. Cycles 2–6 (1993–2010) were used since data for the outcomes of interest were not available for the first cycle. Table 1 includes information about the response rates and sampling strategy for each survey cycle.

The study included a total sample of 61,465 students in grades 6–10. Analysis was undertaken independently for each cycle due to differences in sampling procedures and slight variability in wording and coded responses for each survey item.

Study variables

Physical fighting data were available for cycles 4–6. Participants were asked how many times they were in a physical fight in the previous 12 months. Students who completed this question were categorized as follows: no physical fights, 1 time, 2–3 times, and 4 or more times. A dichotomous variable (“No physical fights” and “One or more physical fights”) was created for cross-tabulations.

Fighting-related injury was the second main outcome. Data were available in cycles 2–6. Participants were asked whether they had been injured in the previous 12 months, and the cause of their most serious injury. Responses that said “Yes” to being injured with “Fighting” chosen as the cause were coded as a fighting-related injury.

Data for *sex*, *grade* and *subjective social status* were available in all datasets and used as descriptor subgroups. Participants were asked early in the questionnaire to indicate their sex and grade (response groups: grade ≤ 6 , grade 7–8 and grade ≥ 9). Grade categories correspond roughly with students in primary, middle and secondary schools. Subjective social status was measured by the question “How well off do you think your family is?” with five possible responses, which were then grouped into three categories: high social status (“Very well off”, “Well off”), average (“Average”), and low social status (“Not well off”, “Not at all well off”).

Scenario variables

Variables describing the context of the injury and physical fight encounter included: who the fight was with; whether the injury caused missed school or activities; the type of injury; whether medical treatment was required; the location where the injury occurred; whether the injury happened during an activity or club; the season during which the injury happened; and where treatment was received.

Time trends of physical fighting and fighting-related injury were assessed in terms of differences in overall prevalence and prevalence within subgroups for each one-year time point.

Statistical analysis and survey weights

SAS 9.3 (SAS Inc., Cary, NC) was used for all analyses. Each HBSC cycle had various sampling procedures. In accordance with international protocols, cycles 2–5 were designed to be self-weighted and considered characteristics of the Canadian population for the sampling process.^{12,13} Cycle 6 includes survey weights by province and territory within grade groups. Over-represented provinces and territories were given weights of <1 , and under-represented groups were given weights of >1 . Survey weights

Table 1. Dataset details for the Health Behaviour in School-aged Children study cycles from 1993–2010

HBSC cycle	Sample size	Student response rate	School-level response rate	Province/territory response rate	Description of sampling approach
1993–1994	7020	Not available	Not available	Not available	Systematic cluster sampling, with replacement. All non-private school jurisdictions with students in grades 6, 8 and 10 in a Canadian province or territory were identified. These grades were chosen to correspond to the international study age group targets of 11, 13 and 15 year-olds. A representative sample of schools with students at these levels was generated considering student grade, school enrolment size, community size, location in province or territory, language of instruction and public/Catholic jurisdiction. School administrators of the chosen schools were asked to randomly choose one whole class in each of the targeted grades (if they had them) to participate. Under the international protocol prescribing no weighting of data sets, to be nationally representative, the sample was designed to approximately proportionally represent number of students by grade in each of the provinces and territories.
1997–1998	11,415	Not available	Not available	12/12 = 100%	Same as 1993, however a grade-by-grade sample of grades 6–10 was used instead of limiting the dataset to only grades 6, 8 and 10.
2001–2002	7235	7235/9780 = 74%	172/231 = 74.5%	10/13 = 76.9%	Same as 1997.
2005–2006	9717	9707/13,176 = 73.7%	186/248 = 75%	12/13 = 92.3%	Same as 1997.
2009–2010	26,078	26,078/33,868 = 77%	436/765 = 57%	11/13 = 84.6%	Same as 1997, except an attempt at a census for all northern schools was made and an increase in overall sample size was facilitated to allow for reporting at the provincial/territorial level, as well as national reporting. Student data were weighted according to provincial/territorial enrolments to ensure these were nationally representative when national reports were being made.

Table 2. Characteristics of the participants in the Health Behaviour in School-aged Children study from 1993–2010

	HBSC cycle									
	1993–1994*		1997–1998*		2001–2002		2005–2006		2009–2010	
Overall	<i>N</i> = 7020 [†]		<i>N</i> = 11,415 [†]		<i>N</i> = 7235 [†]		<i>N</i> = 9717 [†]		<i>N</i> = 26,078 [†]	
Descriptors										
Age (mean ± SD)	13.5 ± 1.7		13.8 ± 1.6		13.6 ± 1.5		14.0 ± 1.5		13.8 ± 1.6	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Sex										
Male	3350	(47.9)	5500	(48.4)	3357	(46.4)	4604	(47.4)	12,815	(49.2)
Female	3644	(52.1)	5870	(51.6)	3878	(53.6)	5111	(52.6)	13,254	(50.8)
Grade										
≤6	2329	(33.2)	2137	(18.7)	2063	(28.5)	1723	(17.7)	5165	(19.8)
7–8	2356	(33.5)	4296	(37.7)	2788	(38.5)	3670	(37.8)	10,471	(40.2)
≥9	2335	(33.3)	4967	(43.6)	2384	(33.0)	4324	(44.5)	10,442	(40.0)
Subjective social status										
Low	923	(13.2)	1562	(13.9)	597	(8.9)	808	(8.6)	2339	(9.5)
Average	2931	(42.0)	4890	(43.5)	2315	(34.3)	3003	(32.0)	8276	(33.6)
High	2574	(36.9)	4784	(42.6)	3826	(56.8)	5585	(59.4)	13,998	(56.9)
Unknown	549	(7.9)	–	–	–	–	–	–	–	–
Total	6977	(100)	11,236	(100)	6738	(100)	9396	(100)	24,613	(100)
Missing	43		179		497		321		1466	
Outcomes										
Physical fighting										
None	–	–	–	–	4542	(65.0)	5652	(58.8)	16,203	(64.4)
1 time					1192	(17.0)	1705	(17.7)	4092	(16.3)
2–3 times					787	(11.2)	1372	(14.3)	3067	(12.2)
4 or more times					472	(6.8)	885	(9.2)	1786	(7.1)
Total					6993	(100)	9614	(100)	25,148	(100)
Missing					242		103		930	
Fighting-related injury										
No injury	4371	(63.3)	6962	(63.6)	3574	(52.0)	5364	(56.0)	12,959	(51.6)
Yes	92	(1.3)	119	(1.1)	116	(1.7)	216	(2.2)	543	(2.1)
No, injury not related to fighting	2442	(35.4)	3870	(35.3)	3184	(46.3)	4001	(41.8)	11,632	(46.3)
Total	6905	(100)	10,951	(100)	6874	(100)	9581	(100)	25,134	(100)
Missing	115		464		361		136		944	

* No physical fighting variables from HBSC 1993–1994 and 1997–1998.

† Variable totals may not equal sample size because of missing data for some variables.

ranged from 0.017 to 3.655.^{6,11} Prevalence estimates were derived from specific time cycles, and cross-tabulations were performed to obtain frequencies, percentages and prevalence ratios with 95% confidence intervals). The Cochran-Armitage test for trend was used to establish the significance of increasing or decreasing prevalence trends over time. Ethical approval for this analysis was obtained from the Queen's University Health Sciences Research Ethics Board (File # 6011541).

RESULTS

Distribution of the participants by demographic characteristics and outcomes can be found in Table 2.

Prevalence of physical fighting

The prevalence of physical fighting one or more times ranged from 35.1%–41.2%, and peaked at 41.2% in 2005/2006 (Figure 1). The prevalence from 2001–2010 displays a significant change over time despite the prevalence decrease in 2009/2010 ($p_{\text{trend}} = 0.015$). A significant difference in prevalence from 2001–2010 was also observed in specific groups, including females ($p_{\text{trend}} < 0.001$), grade 7–8 students ($p_{\text{trend}} = 0.008$) and high subjective social status individuals ($p_{\text{trend}} = 0.002$). We do recognize however that further time points are necessary to determine the extent and direction of this trend with certainty.

In demographic subgroups, the prevalence of fighting was higher in males than in females (48.3%–53.4% vs. 23.8%–30.3%

Figure 1. Prevalence of physical fighting (one or more times) over time (2001–2010). Overall $p_{\text{trend}} = 0.015$

respectively) (Table 3). Males were also twice as likely to report a physical fight for each time cycle ($p < 0.001$).

As compared to students in grades ≥9, students in grades ≤6 had an approximately 20%–30% higher likelihood of reporting a physical fight in the previous year, while grade 7–8 students had 10%–20% increased risk (Table 4). This decrease of physical fight involvement from lower to higher grades was significant within each cycle ($p_{\text{trend}} < 0.001$).

Compared to students from subjectively high social status families, participants who reported low social status were 20%–30% more likely to report a physical fight in the previous

Table 3. Prevalence of physical fighting (one or more times) and fighting-related injury for each HBSC cycle (1993–2010) overall and by demographic characteristic (sex, grade and subjective social status); trend analysis across HBSC time cycles also reported

HBSC cycle	Physical fight (1 or more times) <i>n</i> (%)				Fighting-related injury <i>n</i> (%)					
	2001–2002	2005–2006	2009–2010	<i>p</i> _{trend} [†]	1993–1994	1997–1998	2001–2002	2005–2006	2009–2010	<i>p</i> _{trend} [†]
Variable										
Sex										
Male	1552 (48.3)	2421 (53.4)	5944 (48.7)	0.167	57 (1.7)	74 (1.4)	64 (2.0)	149 (3.3)	360 (2.9)	<0.001
Female	899 (23.8)	1541 (30.3)	2997 (23.2)	0.001	34 (0.9)	44 (0.8)	52 (1.4)	67 (1.3)	183 (1.4)	<0.001
Grade										
≤6	733 (37.7)	819 (48.1)	1992 (40.9)	0.275	17 (0.7)	14 (0.7)	24 (1.2)	32 (1.9)	87 (1.8)	<0.001
7–8	984 (36.3)	1612 (44.3)	3652 (36.4)	0.008	28 (1.2)	48 (1.2)	43 (1.6)	106 (2.9)	196 (1.9)	<0.001
≥9	734 (31.4)	1531 (35.8)	3300 (32.3)	0.335	47 (2.0)	57 (1.2)	49 (2.1)	78 (1.8)	260 (2.6)	<0.001
Subjective social status										
Low	239 (40.4)	414 (51.3)	964 (42.3)	0.452	11 (1.2)	20 (1.3)	17 (3.0)	41 (5.1)	91 (4.0)	<0.001
Average	850 (36.9)	1299 (43.5)	3073 (37.9)	0.367	41 (1.4)	55 (1.2)	44 (2.0)	68 (2.3)	210 (2.6)	<0.001
High	1272 (33.4)	2132 (38.4)	4504 (32.8)	0.002	32 (1.3)	42 (0.9)	52 (1.4)	102 (1.8)	223 (1.6)	0.001
Overall*	2451 (35.1)	3962 (41.2)	8945 (35.6)	0.015	92 (1.3)	119 (1.1)	116 (1.7)	216 (2.3)	543 (2.2)	<0.001

Note: No physical fighting variables from HBSC 1993–1994 and 1997–1998.

* Overall *n* and % calculated from total HBSC population for that cycle.

† Cochran-Armitage test for trend for physical fighting and fighting-related injury across HBSC time cycles. 2001–2010 for physical fighting, and 1993–2010 for fighting-related injuries.

12 months, while those of self-reported average social status had an approximately 10%–15% higher likelihood. Table 4 shows a significant decline in risk from high to low social status groups for all cycles ($p_{\text{trend}} < 0.001$).

Table 5 reports with whom each individual engaged in a fight. Approximately 43% of those who participated in at least one fight reported fighting with a friend or someone they knew, followed by: brother or sister, total stranger, parent or adult family member, and boyfriend, girlfriend or date.

Prevalence of fighting-related injury

Overall fighting-related injury ranged from 1.1%–2.3% (Figure 2). The trend test indicated a significant increase over time in the overall prevalence of fighting-related injury and within all subgroups ($p_{\text{trend}} < 0.001$).

In Table 4, males had 1.5–2.5 fold increased likelihood of reporting a fighting-related injury compared to females ($p < 0.05$). Individuals in grades ≤6 had 30%–60% reduced likelihood of reporting a fighting-related injury compared to those in higher grades (Table 4). This association was only significant for 1993/1994, 2001/2002 and 2009/2010. Grade 7–8 participants for most cycles except 2005/2006 had a 24%–40% lower likelihood of reporting a fighting-related injury compared to participants in grades ≥9. There is an increasing likelihood for fighting-related injury with higher grades in 1993/1994, 2001/2002, and 2009/2010 ($p_{\text{trend}} < 0.05$).

Table 4 shows that for cycles 4–6, those with low subjective social status were 2–3 times significantly more likely to report a fighting-related injury compared to those with high social status. For all cycles except the last, there was a 13%–60% insignificant higher likelihood of fighting-related injury for individuals of average social status compared to those with higher social status. Lower subjective social status was associated with an increased likelihood of reporting a fighting-related injury ($p_{\text{trend}} < 0.001$).

Context of fighting-related injury

Table 6 shows participants who reported a fighting-related injury in the previous 12 months according to the circumstances of the injury. Some questions were not available for all cycles.

For all available cycles, over 50% of those who reported a fighting-related injury missed at least one day of school or activities due to injury.

The three most common results for fighting-related injury were: broken bones, cut or puncture wounds, and bruises or internal bleeding. Broken bones were most common in 1993/1994, and bruises/internal bleeding in 1997/1998 and 2001/2002.

Information on whether the injury needed medical treatment was available in 3 cycles. For 1993/1994, 57.6% of fighting-related injuries required medical treatment. This decreased to 50.2% in 2005/2006 and 46.8% in 2009/2010.

The earliest three cycles stated that most fighting-related injuries occurred in the home or yard, school, and street or parking lot. There is a shift from 2005/2006 onwards where the most common place an injury occurred was the street followed by the school and home.

Determining whether the injury happened during an organized activity or club was possible for the middle three cycles. For all available cycles, 10.1%–26.8% of fighting-related injuries occurred during an organized activity.

Fighting-related injuries most commonly occurred in autumn and second most commonly in summer for the first two cycles, then in spring for 1993/1994 (16%) and in winter for 1997/1998 (14.9%). 2001/2002 presented a different order, where fights most commonly occurred in spring (43.1%), followed by winter (25.7%), autumn (16.5%) and summer (14.7%).

Data pertaining to where the patient was treated were available for 2001/2002 and 2005/2006. Patients were most commonly treated for their injury in emergency rooms, doctors' offices or health clinics.

Table 4. Prevalence ratios and 95% confidence intervals for the outcomes of physical fighting and fighting-related injury by demographic characteristics across HBSC cycles, 1993–2010

HBSC cycle	Physical fighting (1 or more times) prevalence ratio (95% CI)					Fighting-related injury prevalence ratio (95% CI)				
	2001–2002	2005–2006	2009–2010	1993–1994	1997–1998	2001–2002	2005–2006	2009–2010	1993–1994	1997–1998
Sex										
Male	2.03 (1.90–2.17)	1.76 (1.67–1.85)	2.10 (2.03–2.18)	1.84 (1.20–2.80)	1.82 (1.26–2.64)	1.45 (1.01–2.08)	2.50 (1.88–3.33)	2.08 (1.75–2.49)	Ref.	Ref.
Female	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
p-Value	<0.001	<0.001	<0.001	0.004	0.001	0.044	<0.001	<0.001		
Grade										
≤6	1.20 (1.10–1.30)	1.34 (1.26–1.43)	1.27 (1.21–1.32)	0.37 (0.21–0.63)	0.58 (0.33–1.04)	0.58 (0.36–0.94)	1.04 (0.69–1.56)	0.68 (0.54–0.87)	Ref.	Ref.
7–8	1.16 (1.07–1.25)	1.24 (1.17–1.31)	1.13 (1.09–1.17)	0.60 (0.38–0.95)	0.98 (0.67–1.44)	0.76 (0.51–1.14)	1.60 (1.20–2.14)	0.76 (0.63–0.91)	Ref.	Ref.
≥9	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
p-Trend	<0.001	<0.001	<0.001	0.001	0.116	0.023	0.261	<0.001		
Subjective social status										
Low	1.21 (1.09–1.35)	1.34 (1.24–1.44)	1.29 (1.22–1.36)	0.96 (0.49–1.90)	1.47 (0.87–2.50)	2.12 (1.23–3.64)	2.78 (1.95–3.96)	2.43 (1.91–3.09)	Ref.	Ref.
Average	1.10 (1.03–1.18)	1.13 (1.08–1.20)	1.16 (1.12–1.20)	1.13 (0.72–1.79)	1.28 (0.86–1.91)	1.41 (0.95–2.10)	1.24 (0.91–1.68)	1.59 (1.32–1.91)	Ref.	Ref.
High	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
p-Trend	<0.001	<0.001	<0.001	0.913	0.117	0.005	<0.001	<0.001		

* No physical fighting variables from HBSC 1993–1994 and 1997–1998.

Table 5. Reports of physical fighting (one or more times) by with whom they fought from the Canadian HBSC Survey, 2001–2006

	Physical fighting (1 or more times) across HBSC cycles			
	2001–2002 (N = 7235)		2005–2006 (N = 9717)	
	n	(%)	n	(%)
Overall	2451	(35.1)	3962	(41.2)
Who did you fight with?				
Total stranger	222	(9.7)	272	(7.1)
Parent or adult family member	30	(1.3)	100	(2.6)
Brother or sister	515	(22.4)	1101	(28.6)
Boyfriend, girlfriend or date	47	(2.0)	71	(1.8)
A friend or someone I know	987	(42.9)	1666	(43.3)
Other	499	(21.7)	637	(16.6)
Total	2300		3847	
Missing	151		115	

Note: “Who did you fight with” variable is not included in the 2009–2010 HBSC Survey.

Figure 2. Prevalence of fighting-related injuries over time (1993–2010). Overall $p_{\text{trend}} < 0.001$

DISCUSSION

This study shows that physical fighting in children is a relatively common behaviour within Canada (35%–40%), and that obtaining an injury related to fighting (1%–2%) is more rare. Fighting and fighting-related injury prevalence differed significantly over time overall and within specific subgroups. Males are significantly more likely than females to participate in a physical fight and obtain a fighting-related injury. Students in grades six or below were more likely to participate in fights than their older counterparts, while being in a lower grade was protective against fighting-related injury. Individuals from families with subjective low social status were increasingly more likely to obtain both outcomes compared to participants who reported higher subjective social status.

It is possible that because youth are becoming more exposed to violent media, they are also increasingly desensitized to violence and less inhibited when engaging in aggressive activities.¹⁴ Adolescents who are more prone to violent behaviours may have poorer problem-solving skills and coping strategies for solving confrontations, which can result in physical altercations.¹⁵ This is a plausible explanation for the significantly different prevalence estimates over time. It is difficult to determine whether the

Table 6. Reports of injuries related to fighting by variables describing the scenario from the Canadian HBSC Survey, 1993–2010

Variable	Fighting-related injuries across HBSC cycles									
	1993–1994		1997–1998		2001–2002		2005–2006		2009–2010	
	<i>n</i>	(col%)	<i>n</i>	(col%)	<i>n</i>	(col%)	<i>n</i>	(col%)	<i>n</i>	(col%)
Injury caused missed day of school or activities	51	(55.4)	68	(57.1)	59	(51.8)	116	(57.1)	311	(61.5)
Results of injury										
Broken bone	33	(36.6)	18	(15.6)	16	(13.8)	–	–	–	–
Sprain/strain	7	(7.8)	7	(6.1)	10	(8.6)				
Cut or puncture wound	20	(22.2)	10	(8.7)	14	(12.1)				
Concussion or head/neck injury	6	(6.7)	9	(7.8)	7	(6.0)				
Bruises or internal bleeding	16	(17.8)	44	(38.3)	32	(27.6)				
Burns	0	(0)	6	(5.2)	29	(25.0)				
Internal injury (operation)	–	–	–	–	5	(4.3)				
Other	8	(8.9)	21	(18.3)	3	(2.6)				
Total	90		115		116					
Missing	135		464		692					
Injury needed medical treatment	53	(57.6)	–	–	–	–	103	(50.2)	245	(46.8)
Place that injury occurred										
Home/yard	28	(31.1)	50	(42.0)	42	(38.9)	43	(20.5)	93	(18.5)
School	23	(25.6)	30	(25.2)	26	(24.0)	50	(23.8)	127	(25.3)
Sports arena/facility	7	(7.8)	10	(8.4)	7	(6.5)	23	(11.0)	43	(8.6)
Street/parking lot	13	(14.4)	14	(11.8)	23	(21.3)	62	(29.5)	142	(28.2)
Park	6	(6.7)	–	–	–	–	–	–	–	–
Commercial/business area	–	–	–	–	3	(2.8)	–	–	–	–
Other	13	(14.4)	15	(12.6)	7	(6.5)	32	(15.2)	98	(19.4)
Total	90		119		108		210		503	
Missing	136		514		533		148		1334	
Injury happened during activity, league or club	–	–	12	(10.1)	13	(11.4)	55	(26.8)	–	–
Season that injury occurred										
Winter	11	(13.6)	17	(14.9)	28	(25.7)	–	–	–	–
Spring	13	(16.0)	16	(14.0)	47	(43.1)				
Summer	28	(34.6)	35	(30.7)	16	(14.7)				
Fall	29	(35.8)	46	(40.4)	18	(16.5)				
Total	81		114		109					
Missing	365		647		858					
Place treated for most serious injury										
Doctor's office/health clinic	–	–	–	–	30	(30.9)	47	(24.8)	–	–
Emergency room					33	(34.0)	43	(22.8)		
Hospital admission overnight					9	(9.3)	25	(13.2)		
School health services					7	(7.2)	6	(3.2)		
Other					18	(18.6)	68	(36.0)		
Total					97		189			
Missing					898		379			

prevalence of fighting is increasing or decreasing over time due to the unusually high prevalence in 2005/2006. Therefore, more time points are necessary in future research to confidently examine the time patterns of physical fighting. Further research is also needed to explain the biological and sociological mechanisms for these increases. Fighting prevalence changed significantly over time within specific subgroups (females, middle school students, and higher social status students). Since there were slight variations in sampling strategy and the 2009/2010 cycle used weighted data, the trend test results shall be interpreted with caution. Further research is needed to understand why physical fighting over time has altered in these groups.

While physical fighting has altered significantly over time within females, descriptive analyses showed that males were significantly more likely than females to participate in physical fights and obtain a fighting-related injury for all time points. This gendered difference was also reported in previous international studies.^{5,6,16} Scientists have postulated biological reasons for the higher prevalence of violent behaviours in males, including the increases of testosterone associated with puberty and increased strength from muscle mass.^{17,18} Individuals who reported their families as of lower social status also had an increased likelihood of

obtaining both outcomes. This relationship with physical fighting is consistent with previous studies, although we recognize the various ways to define and measure socio-economic status and affluence.¹ However, for the relationship between subjective social status and fighting-related injuries, further analysis accounting for multiple affluence measurements and covariates needs to be done.¹⁹

Individuals in grades ≤6 were more likely to participate in fights than their older counterparts. In contrast, however, being in a lower grade was protective against fighting-related injury when compared to higher school levels. These patterns may be because younger adolescents are still developing mentally and physically, and may use physical confrontations to resolve issues. “Play fighting” or “rough-and-tumble play” is a common behaviour among younger people and these behaviours decrease as students approach adulthood.²⁰ Concurrently, adolescents also undergo physiological changes such as increased muscle mass and hormonal changes during puberty. The elevated strength in older adolescents may intensify the physical force exerted in fights, which can increase the likelihood of injury.^{17,21} The way grade school and high school students interpret situations may vary, where the circumstances and consequences behind physical

confrontations may become more severe as adolescents get older; as a result, there may be more intent to harm.²²

Findings associated with the context of fighting and fighting-related injuries showed that the person participants most frequently fought with was “a friend or someone I know” or a sibling. This is logical since adolescents habitually interact with these people. The next most popular response was “other”. There is no information that describes the remaining possible options for this category. It is postulated that the “other” category can represent rivals that the students know sufficiently well to warrant their not being a stranger, but not enough to be “friends”. Future surveys should present the option to describe who the “other” person is.

From 1993–2002, the most common places that a fighting-related injury occurred were in a home or yard and at school. Adolescents spend the majority of their time at home and school, which makes the increased likelihood of obtaining a fighting-related injury more plausible. Information was only available for one cycle (1993/1994) with regard to whether the injury occurred during or outside of school hours. This data would be useful for assessing the context of fighting-related injuries, particularly in relation to differentiating physical bullying or domestic violence. From 2005 onwards, the most common response for where the injury took place shifted from the home to the street. It is unknown why there is a shift in location over time.

Earlier cycles (1993–1998) suggest that fighting-related injuries most commonly occur during the fall, followed by summer. This could be because adolescents return to school and are more likely to go outside during these seasons, which allows for more physical interactions. In 2001/2002, fighting-related injuries were most common during the spring, another time when young people engage in more outdoor activities. It is unclear why there is this seasonal shift for this cycle only.

Data suggest that many of the reported injuries are serious enough to require medical attention. The fact that most of these injuries tend to happen outside of activities or clubs suggests that these outcomes may be associated with levels of supervision. A potential solution could be increased student involvement in supervised activities.

Strengths and limitations

Strengths of this study include that this research uses nationally representative data. This supports its generalizability to the Canadian adolescent population. The large sample size in each cycle also provides substantial power to detect significant differences between subgroups. The results from this study can help identify vulnerable groups and contextual factors that may pose risk, and establish priority areas for preventing physical fights and additional injury risk.

This study also contains important limitations. First, the self-reported nature of the data may present potential misclassification for both the exposures and outcomes due to the subjectivity and interpretation of each variable. For example, asking how “well off” somebody is may be a measure of subjective social status, as we have suggested, however it could also be a measure of family income or material wealth. As there is no availability of current validation studies with Canadian students for this question, the exact interpretation is not known. In addition, fighting-related

injury can be misclassified as sports-related if an injury occurred because of a fight during a sport or martial arts. This indicates that not all fighting-related injuries are being captured.

Students who were absent on the day of the survey due to injury or suspension for engaging in a fight may not have been selected to participate. Furthermore, the study does not consider adolescents who dropped out of school. These individuals may be fundamentally different in how well off they are and their experiences with violence compared to students still enrolled in school. These can indicate selection bias.²

There were also inconsistencies in the collection of data for some variables across HBSC cycles, particularly with respect to the context of the injury, injury severity and care received. This limited our ability to assess some variables for potential confounding or effect modification. Furthermore, the limited number of data points for the trend analysis makes it difficult to assess whether the pattern was linear or exponential. More data points would be informative for trend interpretation.

A last limitation is that the survey only asks participants about the circumstances of their most serious injury. If fighting was not the cause of their most serious injury, data will be truncated. Other less serious fighting injuries may be masked in some circumstances and therefore under-reported in the sample.

CONCLUSION

Physical fighting among young Canadians has become a public health issue of greater concern in the past two decades. Specific subgroups have a higher propensity for physical fight participation and sustaining an injury from these encounters. Understanding the context of these conflicts and injuries can be informative for reducing future occurrences.

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RÉSUMÉ

OBJECTIFS : Les bagarres physiques sont un comportement à problème qui expose les adolescents à des traumatismes. Notre étude visait : 1) à décrire les schémas actuels des bagarres physiques et des traumatismes liés

aux bagarres chez les adolescents canadiens et 2) à enquêter sur les tendances potentielles des bagarres et des traumatismes liés aux bagarres pour la période de 1993 à 2010.

MÉTHODE : Nous avons utilisé les données canadiennes des cycles 2 à 6 (1993–2010) de l'Étude sur les comportements de santé des jeunes d'âge scolaire au Canada (« étude HBSC »), avec des sections transversales pour 61 465 élèves de la 6^e à la 10^e année. Nos estimations de la prévalence des bagarres physiques et des traumatismes liés aux bagarres ont été calculées et décrites selon le sexe, la classe et le statut social subjectif. Nous avons effectué une analyse des tendances globales d'un cycle temporel à l'autre et des tendances dans chaque sous-groupe.

RÉSULTATS : Une augmentation significative des bagarres physiques au fil du temps a été observée dans l'ensemble ($p_{\text{tendance}} = 0,015$) et dans les sous-groupes des filles, des classes de 7^e et de 8^e année, et des élèves au statut social élevé, mais d'autres points dans le temps seraient nécessaires pour délimiter ce schéma avec certitude. Il y a eu une tendance haussière significative des traumatismes liés aux bagarres dans l'ensemble et dans tous les sous-groupes ($p_{\text{tendance}} < 0,001$). Les garçons étaient deux fois plus susceptibles que les filles de déclarer une bagarre physique ($p < 0,001$) et un traumatisme lié à une bagarre ($p < 0,044$). La probabilité de participation à une bagarre physique diminuait significativement entre les premières et les dernières classes ($p < 0,001$), et la probabilité de traumatismes liés aux bagarres augmentait avec la classe dans trois des cinq cycles de l'étude HBSC. Un faible statut social subjectif présentait une corrélation significative avec une probabilité accrue de déclarer une bagarre physique à tous les points dans le temps ($p < 0,001$) et un traumatisme lié à une bagarre dans trois des cinq cycles de l'étude HBSC.

CONCLUSION : Certains sous-groupes sont plus susceptibles de déclarer avoir participé à une bagarre physique et subi un traumatisme lié à une bagarre. Il est instructif pour les mesures d'intervention en santé publique de comprendre le contexte et les tendances de ces résultats.

MOTS CLÉS : adolescent; épidémiologie; traumatismes; bagarres physiques; tendances