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ENHANCED EPIDEMIOLOGICAL SUMMARY

Concussion Incidence in Ontario: 2023–2024

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Highlights

- This Enhanced Epidemiological Summary presents the number and rate of all concussions (January 2022 to December 2023) and sport-related concussion (January 2023 to December 2024) in Ontario children and youth ages 0–25 years
- One-in-four hospitalizations and one-in-three visits to the emergency department (ED) for concussions were due to sport-related concussions
- Hospitalizations due to sport-related concussion decreased from 2023 to 2024, while ED visits due to sport-related concussions slightly increased among males
- Generally, 10–14 year olds had the highest sport-related concussion rates, followed by 15–19 year olds
- Males had higher rates of hospitalizations and ED visits due to sport-related concussion compared to females
- By sport, hospitalizations due to ATV/snowmobile use were the highest, followed by hospitalizations for concussions due to cycling. For ED visits, concussions suffered by those hit by a ball or bat were the highest, followed by ice hockey (other than "other sports injuries")
- Excluding motorized sport and recreational activity, hospitalizations were highest for hit by ball or bat and ice hockey
- Rates of hospitalizations and ED visits due to sport-related concussion varied by public health unit
- Key strategies to prevent sport-related concussion in youth include mouthguard use and policy disallowing bodychecking in youth ice hockey, neuromuscular training programmes (including specific concussion prevention exercises) in rugby, reducing contact in practice in youth football, and policy mandating concussion management to reduce recurrent concussion

Introduction

Data analysed in this report supplements Concussion Incidence in Ontario: 2015–2023, a previous report on concussion published in January, 2025. The data we report includes the number of youth (ages 0–25 years) that were hospitalized and presented to the emergency department (ED) as the result of a sport-related concussion. We also present the number of youth that reported to a physician in Ontario due to any concussion (sport and non-sport related). We report the number of concussions across sport type [including concussions suffered from all-terrain vehicle (ATVs) and snowmobile use] and across public heath units in Ontario. We also provide a summary of review-level literature on effective interventions to address sport-related concussions. For more information on the methods used in this report, please see the Technical Notes section, at the end of the report.

Background

Concussions are a traumatic brain injury induced by biomechanical forces caused by a direct or indirect blow to the head, face, neck, or elsewhere on the body.[1] Concussions can present with many or few symptoms including dizziness, headache and loss of consciousness.[1] Concussions are challenging to treat because they affect brain function, rather than structure.[2] Early recognition and diagnoses of concussions are critical for ensuring full recovery.

Sport-related concussions are a common cause of concussions among adolescents, with non-sport-related concussions being more common among younger children (largely due to falls within the home or in the playground).[3] In a recent meta-analyses, pooling concussion data across several published studies, it was reported that the incidence of sport-related concussion in youth (≤ 18 years of age) per 1,000 hours of play was 4.36 [95% confidence interval (CI): 3.13 – 6.07] with significant variability across sport type.[4] For example, concussion incidence was lowest in basketball (incidence rate= 0.28/1,000 player hours) and highest in rugby 7s (incidence rate= 12.31/1,000 player hours). The increasing rates of concussions among children and youth and the variability in rates across sports, deserve the attention of public health authorities.[4]

Since its passing in 2018, Ontario's *Rowan's Law (Concussion Safety)* legislation has improved sport-related concussion safety for children and youth by creating concussion education, prevention, detection and management mechanisms.[5] Recommendation Two of the Rowan's Law Advisory Committee's was to report on sport-related concussion incidence in children and youth ages 0–25 years in Ontario, annually. The Ontario Ministry of Health has partnered with Public Health Ontario to analyse and report sport-related concussion data using health administrative databases.

Results

Hospitalizations

There were a total of 389 unique concussion-related hospitalizations and 110 unique hospitalizations for sport-related concussion in Ontario among children and youth ages 0–25 years from January 2023 to December 2024. This represents 28.3% of all hospitalizations for concussion during this period (Figure 1).

Rates of sport-related concussion hospitalizations decreased from 1.30 per 100,000 population in 2023 to 1.11 per 100,000 population in 2024. The rate of non-sport related concussion hospitalizations increased from 2.96 per 100,000 population in 2023, to 3.16 per 100,000 population in 2024 (Table 1).

Figure 1: Number of Hospitalizations Due to All Concussions and Sport-related Concussion in Ontario, January 2023–December 2024

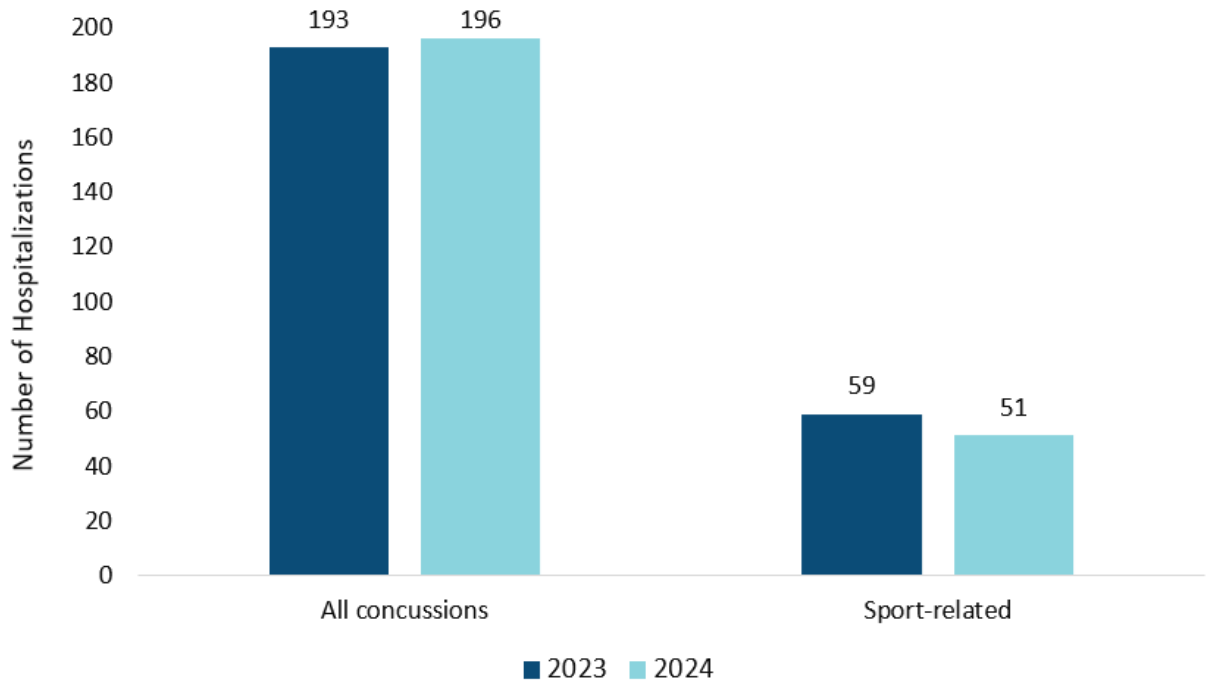


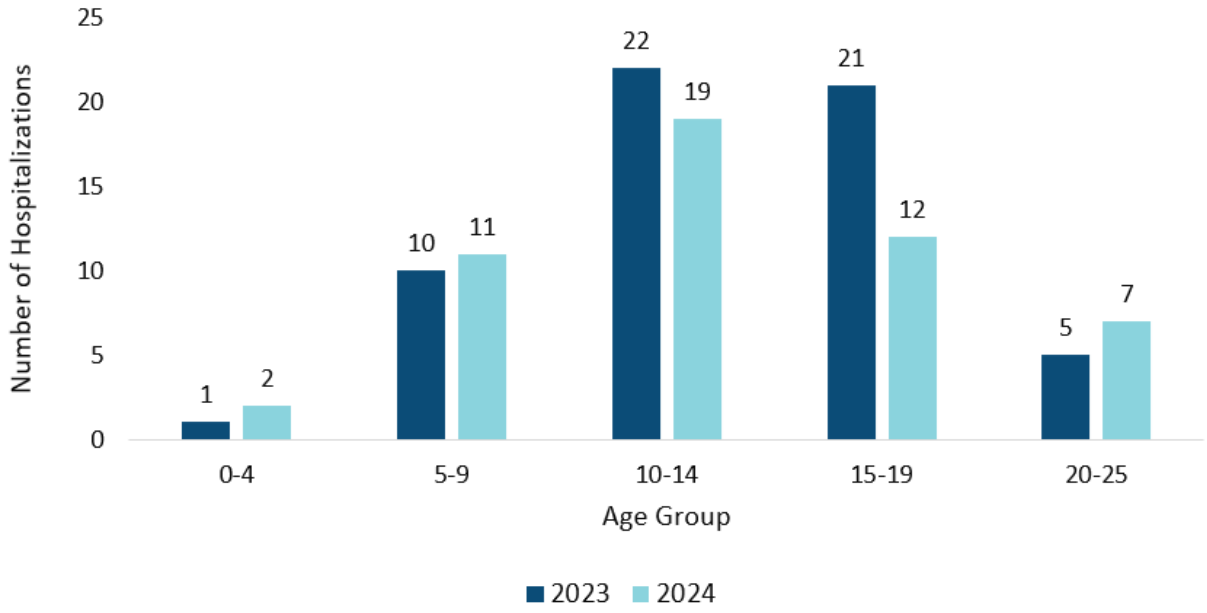
Table 1: Average Rate (Per 100,000 Population) of Hospitalizations for Concussions (Sport-related and Non-sport Related) by Year

Hospitalizations	2023	2024
Sport-related	1.30	1.11
Non-sport related	2.96	3.16
Overall	**4.27**	**4.28**

While the number of hospitalizations due to sport-related concussions decreased in some age groups (i.e., 10–14, 15–19), they increased in others (i.e., ages 0–4, 5–9, and 20–25 year olds) (Figure 2). The 15–19 year olds had the largest decrease, compared to other age groups (Figure 2).

Overall, the 10–14 year olds had the highest number of hospitalizations due to sport-related concussions, as well as the highest rate of hospitalization per 100,000 population, followed by 15–19 year olds (Figure 2, Table 2).

Figure 2: Number of Hospitalizations Due to Sport-related Concussions in Ontario, January 2023–December 2024 by Age Group



Males had a higher number of hospitalizations due sport-related concussions compared to females (Figure 3, Table 2).

Figure 3: Number of Hospitalizations Due to Sport-related Concussions in Ontario, January 2023–December 2024 by Sex

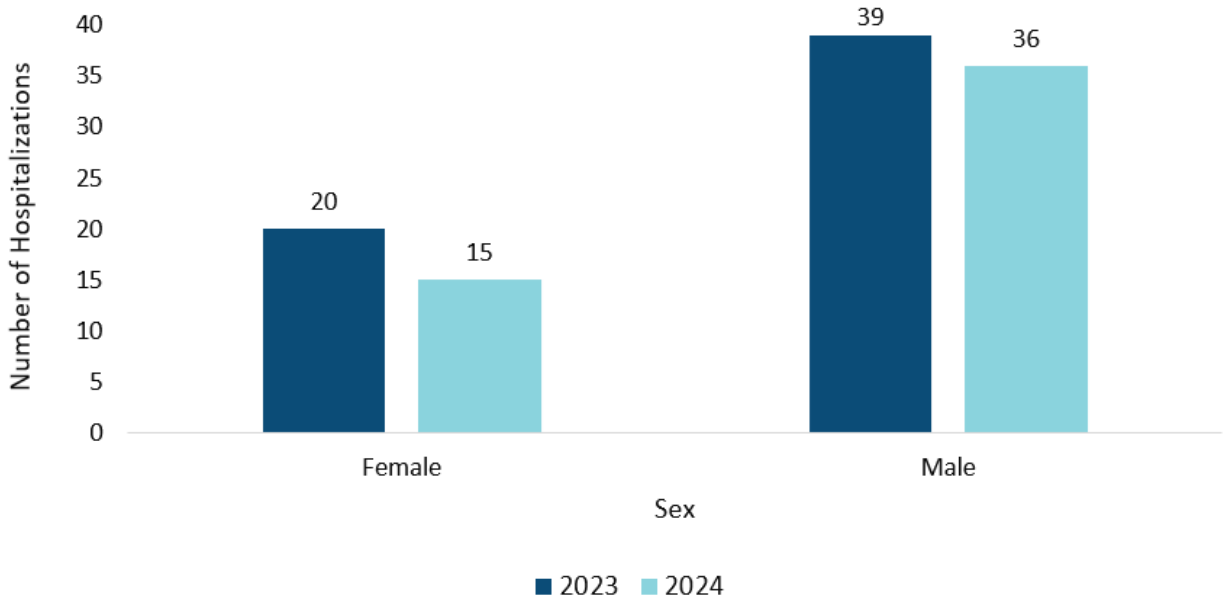


Table 2: Average Rate (Per 100,000 Population) of Hospitalizations for Sport-related Concussions by Age Group and Sex, by Year

Hospitalizations	2023	2024
Male	1.68	1.53
Female	0.91	0.67
Age 0–4	0.13	0.26
Age 5–9	1.30	1.42
Age 10–14	2.74	2.36
Age 15–19	2.35	1.32
Age 20–25	0.38	0.53

Between January 2023 and December 2024, the rate of hospitalizations from ATV/snowmobile use was the highest, followed by cycling. The rate of hospitalizations due to soccer, ice skates and recreational boating were the lowest (Table 3). Excluding motorized recreational activity, hospitalizations were highest for hit by ball or bat, ice hockey and from playground activity.

Table 3: Number and Rate of Hospitalizations (Per 100,000 Population) for Sport-related Concussions by Sport or Mechanism, January 2023–December 2024

Mechanism	2023–2024	Rate per 100,000 *
Hit by ball/bat	8	0.18
Cycling	22	0.48
Fall involving rollerblade/scooter/skateboard	4	0.09
Football/rugby	5	0.11
Ice hockey	7	0.15
Ice skates	2	0.04
Playground equipment	7	0.15
Ski/snowboard	6	0.13
Soccer	2	0.04
Tobogganing	3	0.07
Recreational boating	2	0.04
ATV/snowmobile	26	0.57
Other sports related injuries	16	0.35

*Rate represents the total number of sport-related concussions for both 2023 and 2024 divided by the average population in 2023 and 2024

The rates of hospitalizations due to sport-related concussion varied by public health unit (PHU) in 2023–2024 (Table 4, Figure 4). North Bay Parry Sound District and Sudbury PHUs had the highest rates, followed by Northeastern.

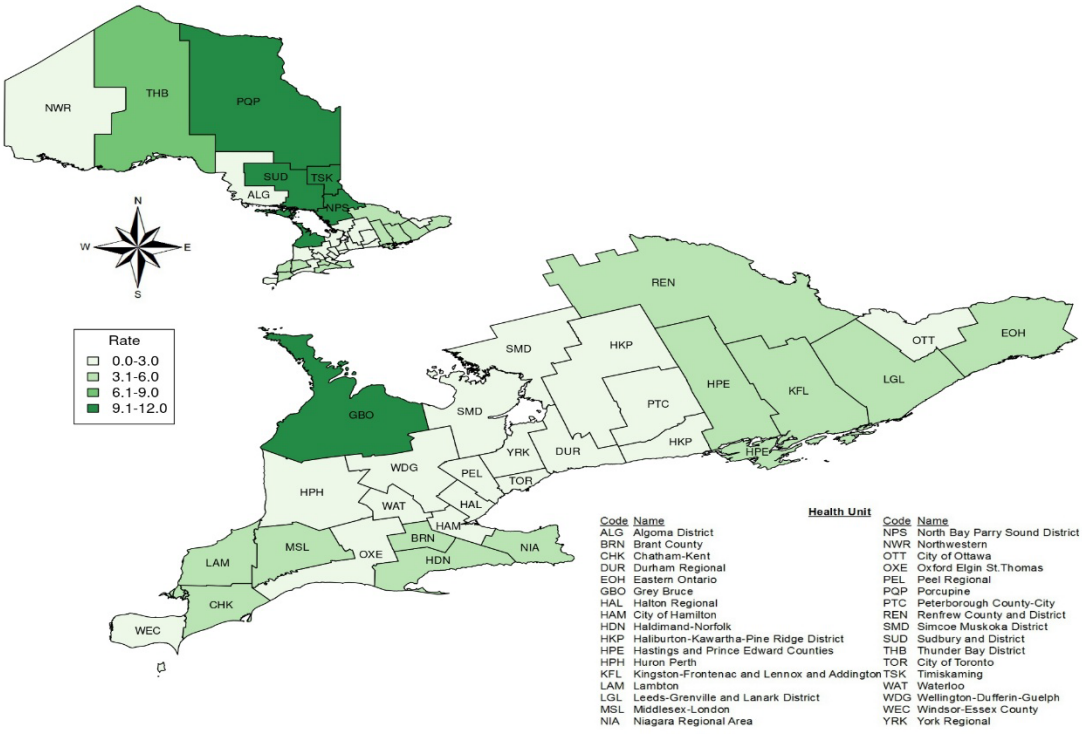
Table 4: Number and Rate of Hospitalizations (Per 100,000 Population) for Sport-related Concussions by Public Health Unit, January 2023–December 2024

Public Health Unit	2023–2024	Rate per 100,000*
Algoma Public Health	0	0
Chatham-Kent Public Health	1	3.36
Durham Region Health Department	6	2.59
Eastern Ontario Health Unit	3	4.90
Grand Erie Public Health	5	5.84
Grey Bruce Public Health	5	10.16
Halton Region Health Department	6	2.88
Hamilton Public Health Services	2	1.13
Huron Perth Public Health	0	0
Lakelands Public Health	2	2.30
Lambton Public Health	2	5.34
Middlesex-London Health Unit	8	4.73
Niagara Region Public Health	6	4.24
North Bay Parry Sound District Health Unit	4	12.04
Northeastern Public Health	4	11.69
Northwestern Public Health	0	0
Ottawa Public Health	4	1.21
Peel Public Health	9	1.65
Public Health Sudbury & Districts	7	12.03
Region of Waterloo Public Health	3	1.40
Renfrew County and District Health Unit	1	3.41
Simcoe Muskoka District Health Unit	1	0.56
Southeast Health Unit	8	5.25

Public Health Unit	2023–2024	Rate per 100,000*
Southwestern Public Health	2	2.83
Thunder Bay District Health Unit	4	8.79
Toronto Public Health	7	0.81
Wellington-Dufferin-Guelph Public Health Unit	2	1.97
Windsor-Essex County Health Unit	4	2.88
York Region Public Health	5	1.34

*Rate represents the total number of sport-related concussions for both 2023 and 2024 divided by the average population in 2023 and 2024

Figure 4: Rate of Hospitalizations (Per 100,000 Population) for Sport-related Concussions by Public Health unit, January 2023–December 2024



Technical notes:

- Public Health Units within recent mergers are presented with the same rates (e.g., the rate from Grand Erie Public Health - formed by Brant County Health Unit and the Haldiman-Norfolk Health Unit is presented for both Brant County and Haldiman-Norfolk)
- Algoma Health Unit, Huron Perth Health Unit and Northwestern Health Unit reported no hospitalizations.

Emergency Department Visits

There were a total of 36,716 concussion-related ED visits and 12,154 sport-related concussion ED visits in Ontario among children and youth ages 0–25 from January 2023 to December 2024. This represents 33.3% of all ED visits for concussions during this period (Figure 5).

Rates of ED visits for all concussions decreased from 404.95 per 100,000 population in 2023 to 401.73 per 100,000 population in 2024. The rate of ED visits for sport-related concussions increased slightly from 134.23 per 100,000 population in 2023 to 134.68 per 100,000 population in 2024 (Table 5).

The rate of ED visits for non-sport related concussions was higher than the rate of ED visits due to sport-related concussions in Ontario in 2023 and 2024 (Figure 5, Table 5).

Figure 5: Number of Emergency Department (ED) Visits Due to All Concussions and Sport-Related Concussions in Ontario, January 2023–December 2024

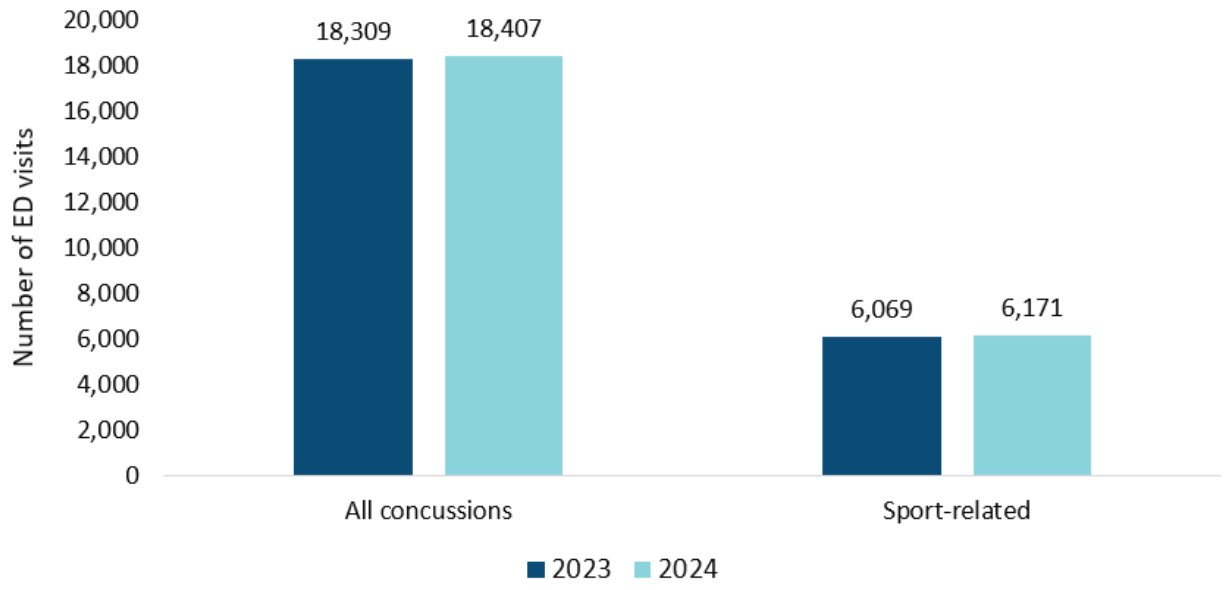


Table 5: Average Rate (Per 100,000 Population) of Emergency Department (ED) Visits for Concussions Overall, Sport-related and Non-sport Related, by Year

ED visits	2023	2024
Overall	404.95	401.73
Sport-related	134.23	134.68
Non-sports related	270.72	267.05

Age groups 0–4, 5–9 and 10–14 years showed small increases in the number of sport-related concussions from 2023 to 2024 while other age groups showed small decreases (Figure 6).

Overall, the 10–14 year olds had the highest number of ED visits due to sport-related concussions, as well as the highest rate of ED visits per 100,000 population, followed by 15–19 year olds (Figure 6, Table 6).

Figure 6: Number of Emergency Department (ED) Visits Due to Sport-related Concussions in Ontario, January 2023–December 2024 by Age Group

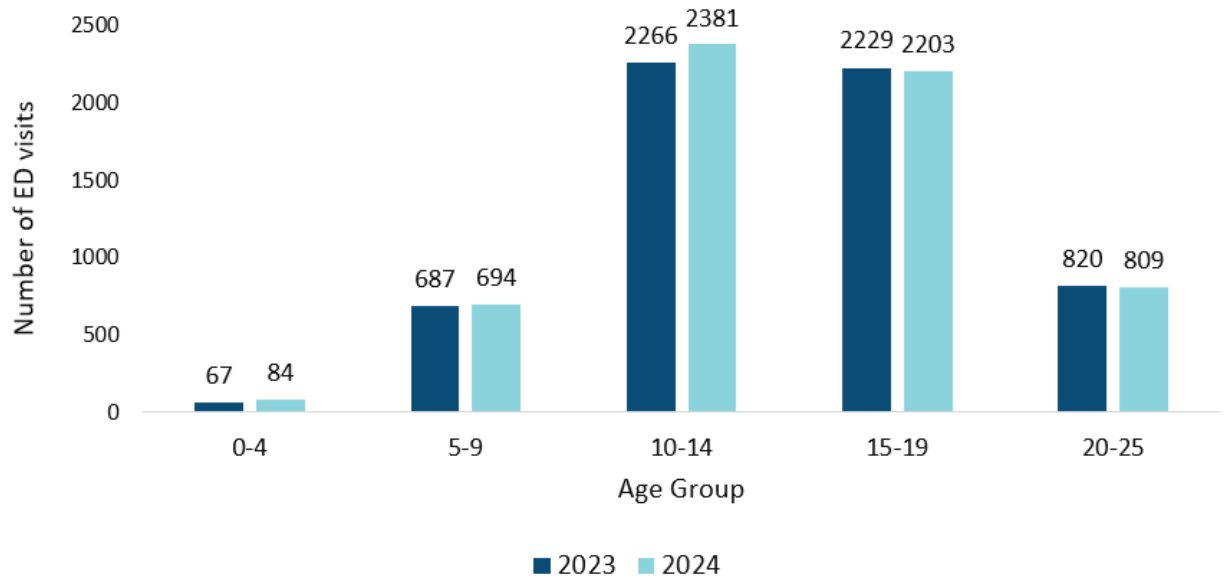


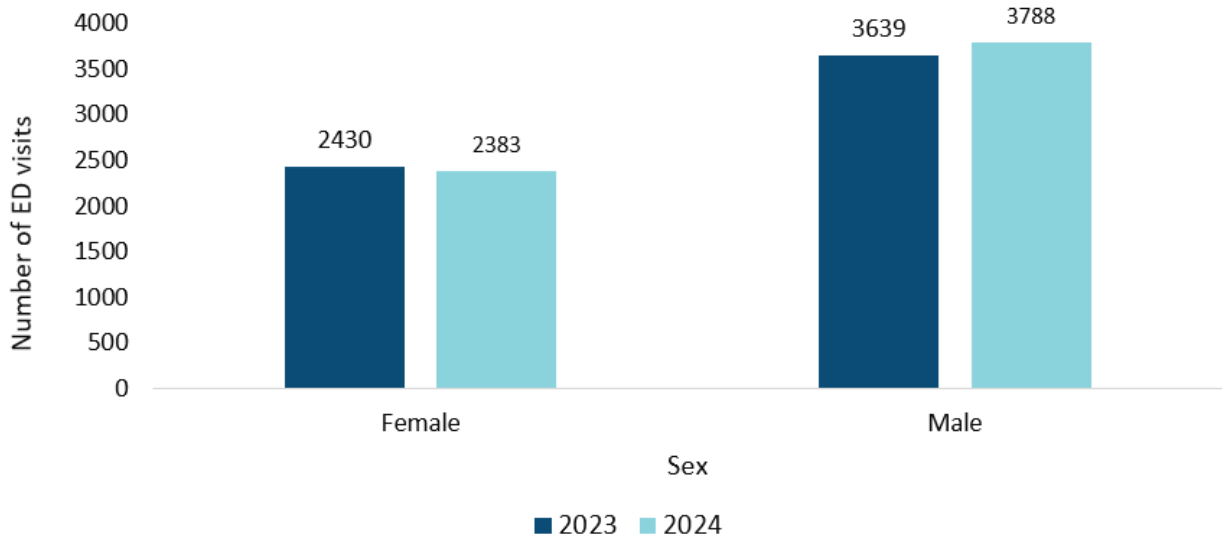
Table 6: Average Rate (Per 100,000 Population) of Emergency Department (ED) Visits for Sport-related Concussions by Age Group and Sex, by Year

ED visits	2023	2024
Male	156.45	160.67
Female	110.69	107.13
Age 0–4	9.00	11.08
Age 5–9	89.07	89.50
Age 10–14	282.06	295.40
Age 15–19	249.14	242.19
Age 20–25	62.72	60.71

Between 2023 and 2024, the number of ED visits due to sport-related concussions in Ontario decreased for females, and increased for males (Figure 7, Table 6).

Males had a higher number of ED visits due to sport-related concussions compared to females (Figure 7, Table 6).

Figure 7: Number of Emergency Department (ED) Visits Due to Sport-related Concussions in Ontario, January 2023–December 2024 by Sex



Between January 2023 and December 2024, the rate of ED visits for concussions due to being hit by a ball/bat were the highest, followed by rate of ED visits for concussions due to ice hockey (other than "other sports injuries"). The rate of ED visits for concussions due to tobogganing remained the lowest (Table 7).

Table 7: Number and Rate of ED Visits (Per 100,000 Population) for Sport-related Concussions by Mechanism, January 2023–December 2024

Mechanism	2023–2024	Rate per 100,000*
Baseball	93	2.04
Hit by ball/bat	2515	55.25
Cycling	726	15.95
Fall involving rollerblade/scooter/skateboard	271	5.95
Football/rugby	1231	27.05
Ice hockey	2067	45.41
Ice skates	487	10.70
Playground equipment	552	12.13
Pool and natural water swimming/diving/drowning	87	1.91
Ski/snowboard	783	17.20
Soccer	753	16.54
Tobogganing	49	1.08
Recreational boating	92	2.02
ATV/Snowmobile	363	7.98
Other sports related injuries	2171	47.70

*Rate represents the total number of sport-related concussions for both 2023 and 2024 divided by the average population in 2023 and 2024

Between January 2023 and December 2024, the rate of ED visits due to sport-related concussion varied by public health unit (Table 8, Figure 8). Grey Bruce and North Bay Parry Sound District PHUs had the highest rates, followed by Renfrew County.

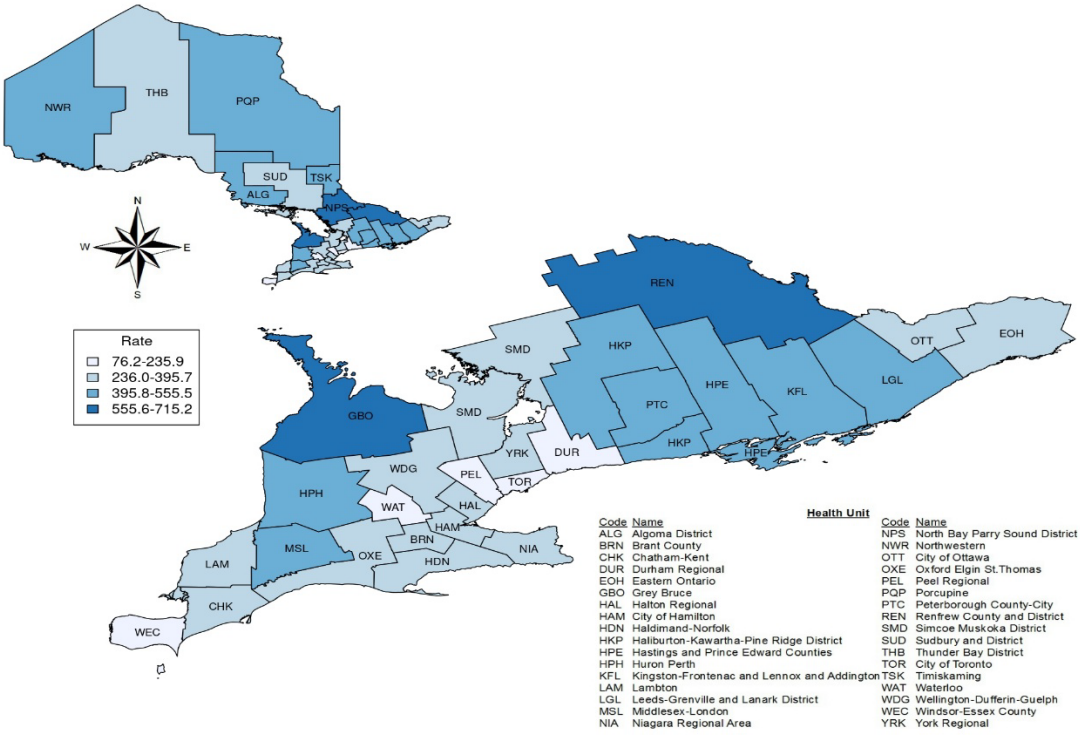
Table 8: Number and Rate of ED Visits (Per 100,000 Population) for Sport-related Concussions by Public Health Unit, January 2023–December 2024

Public Health Unit	2023–2024	Rate per 100,000*
Algoma Public Health	126	411.68
Chatham-Kent Public Health	111	372.56
Durham Region Health Department	534	230.51
Eastern Ontario Health Unit	178	290.64
Grand Erie Public Health	318	371.33
Grey Bruce Public Health	352	715.18
Halton Region Health Department	585	281.21
Hamilton Public Health Services	520	292.51
Huron Perth Health Unit	221	484.83
Lakelands Public Health Unit	348	400.70
Lambton Health Unit	120	320.64
Middlesex-London Health Unit	674	398.24
Niagara Region Public Health	438	309.69
North Bay Parry Sound District Health Unit	193	580.97
Northeastern Public Health	179	522.91
Northwestern Health Unit	126	448.96
Ottawa Public Health	885	266.77
Peel Public Health	725	133.30
Public Health Sudbury & Districts	195	335.17
Region of Waterloo Public Health	365	170.61
Renfrew County and District Health Unit	164	558.57
Simcoe Muskoka District Health Unit	629	350.23
Southeast Health Unit	766	502.58

Public Health Unit	2023–2024	Rate per 100,000*
Southwestern Public Health	266	376.62
Thunder Bay District Health Unit	174	382. 21
Toronto Public Health	1438	166.52
Wellington-Dufferin-Guelph Public Health Unit	319	314.92
Windsor-Essex County Health Unit	106	76.23
York Region Public Health	1183	317.68

*Rate represents the total number of sport-related concussions for both 2023 and 2024 divided by the average population in 2023 and 2024

Figure 8: Rate of ED Visits (Per 100,000 Population) for Sport-related Concussions by Public Health Unit, January 2023–December 2024



Technical notes:

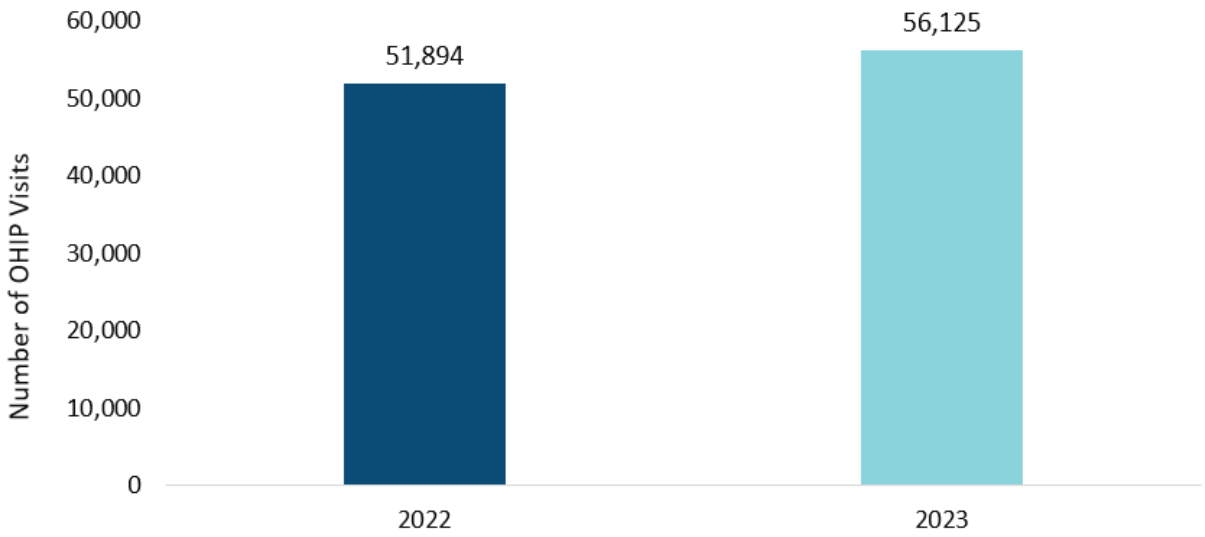
- Public Health Units within recent mergers are presented with the same rates (e.g., the rate from Grand Erie Public Health - formed by Brant County Health Unit and the Haldiman-Norfolk Health Unit is presented for both Brant County and Haldiman-Norfolk)

Ontario Health Insurance Plan (OHIP) Visits

Data entry for Ontario Health Insurance Plan (OHIP) visits due to concussion for 2024 was not complete at the time of publication of this report; therefore, data presented here is for 2022–2023.

There were a total of 108,019 OHIP visits due to concussion in Ontario among children and youth ages 0–25 from January 2022 to December 2023, with an increase from 2022 to 2023 (Figure 9). This represents a rate of 1164.0 per 100,000 population in 2022 and 1241.4 per 100,000 population in 2024.

Figure 9: Number of Ontario Health Insurance Plan (OHIP) Visits by Distinct Health Card Number Due to Concussions in Ontario, January 2022–December 2023 by Year



Deaths

There were no deaths associated with concussion in Ontario among children and youth ages 0–25 from January 2023 to December 2024.

Effective Interventions to Address Sport-related Concussions

There are many effective interventions to reduce the number and severity of sport-related concussions. Many of these strategies are population level interventions that can be advocated for by public health practitioners when working with local sport organizations. Two recent systematic reviews and meta-analyses by Eliason et al. and Al Attar et al. describe interventions and their effectiveness, specifically in a youth sporting population, excluding motorized sport and recreational activity.[6,7] These strategies are grouped into three categories:

- Protective equipment
- Training practices
- Policies/rules and regulations

A summary of the interventions is provided below.

Protective Equipment

- Mouthguards are effective at preventing concussions in ice hockey.
- Proper helmet fit, helmets with thicker padding over the zygoma/mandible area and compliance with the National Football League (NFL) approved helmets reduce the risk of concussions among American Football players. Hard shell helmets with full facial protection are better than flexible headgear at preventing concussions in Lacrosse.
- There is conflicting evidence regarding whether headgear is effective at preventing concussions in soccer or rugby.

Training Practices

- Comprehensive coaching education programs (including proper equipment fitting, tackling technique, strategies for reducing player contact and concussion awareness), particularly when combined with instituted guidelines restricting contact in practices; and adding a player safety coach during practices are effective at reducing sport-related concussion in American football.
- Training programs focused on increasing core strength are effective for concussion prevention in American football, soccer, and volleyball players.
- Neuromuscular training (consisting of balance training, whole body resistance, static neck contractions, plyometric training and landing/cutting maneuvers) at least three times per week is effective at preventing concussions among rugby players.
- Correct ball-heading technique through behavioural skill training and visual and sensorimotor training is effective at reducing concussion in soccer athletes, in addition to limiting head contact.

Policies and Regulations

- Policies disallowing bodychecking, stricter rule enforcement to prevent obstruction, and suspension for exceeding a threshold for penalty minutes in ice hockey have been shown to reduce sport-related concussion.
- Rules limiting collisions between the base runner and the catcher at home plate in professional baseball has shown to significantly reduce catcher concussion rates.
- Rules minimizing intentional contact to the head or neck and minimizing bodychecking in lacrosse, reduce the risk of concussion.
- Reducing the frequency and/or duration of collision practices, rules aimed at moving up the kickoff line and moving back the touchback line (increasing the kickoff landing in the end zone and the likelihood of more touchbacks), penalizing players intentionally initiating contact using the top of their helmet, implementing initiatives directly targeted at reducing concussions, improved concussion detection and diagnosis, and improved concussion protocols (e.g., preseason concussion education, preparticipation assessments, structured plan for concussion diagnosis, postinjury management and return to play) were found effective for concussion prevention in American football.
- Implementation of concussion legislation (consisting of mandatory removal from play, requirements to receive clearance to return to play from a licensed health professional, and education of coaches, parents, and athletes) has been shown to reduce recurrent sport-related concussion in youth American football in the United States.
- Regulations to limit player-to-player contact and to prohibit tackling, and the introduction of red cards in soccer, has been shown to reduce the risk of concussion.

Discussion

The data presented in this document updates and expands upon a previous report published in January 2025 on the incidence of concussion in Ontario from 2015 to 2023.[8] In the present summary, we report that one-in-four hospitalizations and one-in-three ED visits for concussions were due to sport-related concussions.

As with our previous report, individuals ages 10–14 and 15–19 years continue to have the highest number of hospitalizations and ED visits due to sport-related concussions with males consistently having higher rates compared to females. The number of sport-related concussions decreased slightly from 2023 to 2024 among females and increased slightly among males.

This report analyzed data for both hospitalizations and ED visits due to concussion by sport. We report that ATV/snowmobile use and cycling were the sports that reported the highest numbers of concussion hospitalizations. As previously reported by Public Health Ontario, the number of youth hospitalizations related to ATV and snowmobile use in Ontario are high,[9] with over 250 ATV and snowmobile-related hospitalizations in children ages 0–19 in 2023 alone.[10] Further, previous data suggest ATV/snowmobile injuries are higher in rural/remote communities[9] where access to concussion diagnoses, management and prevention programs may be limited compared to urban settings.[11] Children and youth under the age of 16 are particularly vulnerable to injury with ATV and snowmobile use.[9] The most common mechanism causing hospitalizations in this youth population is from falling off, being ejected or being crushed by the vehicle itself,[9] all mechanisms that can contribute to suffering a concussion. Second to ATV/snowmobile use, was concussions due to cycling. It is likely the high number of cycling hospitalizations were due to youth cycling on roads, with exposure to motor vehicles. Literature in this area reports exposure to motor vehicles significantly increases the risk of severe injury in cycling, with a near 4-fold increase in the odds of severe injury (i.e., hospitalized for their injury), compared to controls (i.e., those released from ED) (odds ratio= 3.91; 95% CI: 2.26–6.78).[12] In this report, we are unable to determine if these cases were wearing helmets when the injury occurred.

Being hit by a ball or bat and playing ice hockey were the activities associated with the highest number of ED visits due to concussions (other than “other sport injuries”), with males reporting more ED visits compared to females. This corresponds with literature in this area, reporting ice hockey as the sport type most associated with concussions.[13] In a 2023 study examining concussion rates across collision sports, ice hockey reported the highest rates of concussion (15.8 concussions/100 participants/year) of all sports examined in this study (i.e., rugby, American football and lacrosse).[13] Older males (ages 10–19 years) in our data suffered the highest number of ED visits due to concussion which also aligns with previous literature.[13] Older males are more likely to play collision sports compared to females, thus suffering concussions, likely from player-to-player contact.[14]

We report the number and rate of both hospitalizations and ED visits by PHU in Ontario. This included the new Ontario public health unit mergers of Haldiman-Norfolk Health Unit and Brant County Health Unit (Grand Erie Public Health), Kingston, Frontenac and Lennox & Addington Public Health, Hastings and Prince Edward Counties Health Unit and Leeds, Grenville and Lanark District Health Unit (South East Public Health), Porcupine and Timiskaming Health Unit (Northeastern Public Health), and Haliburton-Kawartha Pine Ridge District and Peterborough Public Health (Lakeland Public Health). North Bay Parry Sound and Sudbury District Health Unit had the highest rate of hospitalizations for concussions. Algoma, Huron Perth and Northwestern public health units did not report any hospitalizations from 2023 to 2024. Despite this, these PHUs reported over 470 ED visits due to sport-related concussion. It is possible that a number of concussions were underreported due to limited access to concussion care.

There are various effective interventions to prevent sport-related concussions. This includes protective equipment, training programmes, and policies and rules aimed at reducing the risk of sport-related injuries broadly, and concussion specifically. There is lack of high-quality evidence for concussion prevention in activities like ATV/snowmobile use and cycling; two mechanisms highlighted from our data as an important cause of sport-related concussions in Ontario youth. As reported previously, we are unable to ascertain if helmets were worn at the time of injury in these cases. Helmet use; however, has been shown to reduce overall head injury in both ATV and snowmobile use, including traumatic brain injury and intracranial hemorrhages.[9] Further, there is sufficient evidence that demonstrates the protective effect of helmet use in cycling for head injuries, particularly severe injuries.[15] It is reported that children and youth not wearing a helmet have a two-fold higher odds of hospitalization compared to those wearing helmets.[12]

Despite evidence not being available across all sporting activities, there are examples of effective policies or rules to reduce concussions that can apply to more than one sport type. For example, eliminating body checking in ice hockey and reducing player to player contact in rugby, lacrosse, American football and even soccer, have been shown to reduce sport-related concussion in youth.[6] Further, the implementation of concussion legislation has been shown to reduce recurrent sport-related concussion in youth American football.[16] This legislation consisted of mandatory removal from play, requirements to receive clearance to return to play from a licensed health professional, and concussion education for coaches, parents, and athletes;[16] all components consistent with Ontario's Rowan's Law.

There are some limitations to this analysis, most of which are inherent in the databases used. First, the number of sport-related concussions reported here does not capture the total number of concussions in Ontario. For example, youth who do not present to a practitioner or to a health institution were not included in the analyses. The number of concussions reported in this summary represent the most severe cases of sport-related concussion, including those that presented to a health practitioner or were hospitalized for their injury. The true number of concussions suffered by youth in Ontario is unknown. Most cases of concussion; however, are mild with recovery occurring within hours or days of the injury. A second limitation includes our inability to report repeat concussions, which carry higher risk of persistent symptoms and subsequent morbidity. Future work should seek data sources that report repeat concussions; these data are necessary for prevention serious injury and death. Third, the majority of published studies on effective interventions to reduce concussion are based on male participants and in organized sport-related settings.[6] Finally, the ICD10-CA codes used to report the mechanism of sport-related injury lack the specificity needed to complete a more accurate, by sport analysis. For example, the code "hit by ball or bat" does not specify the sport associated with this code. Furthermore, the codes do not specify organized v. unorganized and competitive v. non-competitive sporting activity. There is a need for comprehensive, sport specific ICD10-CA codes to better understand and report on sport-related concussion.

In conclusion, we observed a slight decrease in hospitalizations and ED visits due to concussions between 2023 and 2024, except for sport-related concussions among males which increased. OHIP visits due to concussions also increased. Our data on age and sex-specific sport-related concussion rates are consistent with our previous report.[8] ATV/snowmobile use and cycling were associated with high rates of hospitalizations due to concussions, while being hit a ball and playing ice hockey were associated with high rates of ED visits. Northern PHUs reported the highest rates of hospitalizations and ED visits. Evidence supports that policy-level interventions such as reducing player to player contact and Rowan's Law, applicable across all forms of organized sports, are necessary to address sport-related concussions among children and youth. Hence, the importance of its sustained and effective implementation including continued monitoring of concussions and sport-related concussion in Ontario.

Technical Notes

Data Sources

Data were extracted from the following data sources:

- National Ambulatory Care Reporting System (NACRS) for emergency department visits.
- Discharge Abstract Database (DAD) for hospitalizations due to concussion
- Ontario Health Insurance Plan (OHIP) (OHIP Claims History Database - CHDB) for concussions reported to Ontario Physicians
- Vital Statistics (VS) database for all concussion related deaths
- Demography Division of Statistics Canada database (estimated using Census data) was used for population estimated
- All databases were obtained from IntelliHealth

Injury Codes

Concussion cases were selected using the International Classification of Diseases (10th Revision) (ICD-10CA) code for concussion S06.0 from NACRS, DAD and VS databases. For concussions reported to Ontario physicians, all cases reported using the OHIP code 850.

To report sport-related concussion, we extracted cases from a cross-tab of the S06.0 concussion code with the following injury external cause codes:

- Baseball: W22.05, W51.05
- Hit by ball/bat: W21.00, W21.01
- Cycling: V10-V19
- Fall involving rollerblade/scooter/skateboard: W02.02, W02.03, W02.080, W02.087
- Football/rugby: W22.03, W51.03
- Hockey: W21.02, W21.03, W22.02, W51.02
- Ice skates: W02.00
- Playground equipment: W09.00-W09.09
- Pool and natural water swimming/diving/drowning: W16, W67-W74
- Ski/snowboard: W02.01, W02.04, W22.00, W51.00
- Soccer: W22.04, W51.04
- Tobogganing: W22.01, W51.01
- Recreational boating: V90-V94, only (0.2-0.8)
- ATV/Snowmobile: V86
- Other sports related injuries: W02.088, W21.08, W21.09, W22.07, W51.07

Unique visits with S06.0 concussion code and injury external cause codes mentioned in the above were identified as sport-related concussions.

Data Caveats

The number of concussion-related hospitalizations and ED visits reported here is higher than in our previous report, Concussion Incidence in Ontario: 2015–2023. This is due to updates to the IntelliHealth data sources used, resulting in the addition of new cases.

The number of sport-related concussion is higher in this report compared to our previous report, Concussion Incidence in Ontario: 2015–2023. This is due to the inclusion of codes specific to the mechanism of concussion to complete a by sport comparison. Our previous report included external cause codes W21 (striking against or struck by sports equipment) and W02 (fall involving ice-skates, skis, roller-skates, or skateboards) (please see table above with injury codes for injury external cause codes used in this report).

Data Analysis

The number of concussions in our population (children and youth ages 0–25 years) was stratified into the following groups:

- Age: Grouped into 0–4, 5–9, 10–14, 15–19, 20–25 years of age
- Sex at birth: Female, Male
- Sport: baseball, hit by ball/bat, cycling, fall involving rollerblade/scooter/ skateboard, football/rugby, hockey, ice skates, playground equipment, pool and natural water swimming/diving/drowning, pool and natural water swimming/diving/drowning, ski/snowboard, soccer, tobogganing, recreational boating, ATV/snowmobile use, other sports related injuries
- Public Health Unit

Notes

For ED visits or hospitalizations with multiple injury external cause codes, the following rules were applied to determine mechanism:

- If the visit was coded as ‘other sports related injuries’ and another specific sport was specified, the specified sport was chosen as the mechanism of injury
- If the visit described more than one sport as the mechanism of injury, the first sport coded was chosen as the mechanism of injury

References

1. Harmon KG, Drezner JA, Gammons M, Guskiewicz KM, Halstead M, Herring SA, et al. American Medical Society for Sports Medicine position statement: concussion in sport. Br J Sports Med. 2013;47(1):15-26. Erratum in: Br J Sports Med. 2013;47(3):184. Available from: https://doi.org/10.1136/bjsports-2012-091941
2. Kass JS. Clinical Key: overview: concussion [Internet]. Philadelphia, PA: Elsevier; 2024 [cited 2026 Feb 6]. Available from: https://www.elsevier.com/products/clinicalkey
3. Patel DS, Yucknut E, Ahmed N. Incidence and risk factors for concussions. In: Patel DS, editor. Concussion management for mrimary mare. Cham: Springer, 2025. Available from: https://doi.org/10.1007/978-3-031-85516-0_2
4. Ingram V, Fielding M, Dunne LAM, Piantella S, Weakley J, Johnston RD, et al. The incidence of sports-related concussion in children and adolescents: a systematic review and meta-analysis. Sports Med Open. 2025;11(36). Available from: https://doi.org/10.1186/s40798-025-00834-9
5. Ontario. Ministry of Tourism, Culture and Sport. Creating Rowan's Law: report of the Rowan's Law Advisory Committee [Internet]. Ottawa, ON. King's Printer for Ontario; 2023 [modified 2023 Jul 18; cited 2025 Oct 3]. Appendix A, Rowan Stringer coroner's inquest jury recommendations. Available from: https://www.ontario.ca/document/creating-rowans-law-report-rowans-law-advisory-committee
6. Eliason PH, Galarneau J-M, Kolstad AT, Pankow MP, West SW, Bailey S, et al. Prevention strategies and modifiable risk factors for sport-related concussions and head impacts: a systematic review and meta-analysis. Br J Sports Med. 2023;57:749-61. Available from: https://doi.org/10.1136/bjsports-2022-106656
7. Al Alttar WSA, Mahmoud H, Alfadel A, Faude O. Does headgear prevent sport-related concussion? A systematic review and meta-analysis of randomized controlled trials including 6311 players and 173,383 exposure hours. Sports Health. 2024;16(3):473480. Available from: https://doi.org/10.1177/19417381231174461
8. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Concussion incidence in Ontario [Internet]. Toronto, ON: King's Printer for Ontario; 2025. Available from: https://www.publichealthontario.ca/-/media/Documents/C/25/concussion-incidence-ontario.pdf
9. Ontario Agency for Health Protection and Promotion (Public Health Ontario); Chu A, Orr S, Moloughney B, McFaull S, Russell K, Richmond SA. The epidemiology of all-terrain vehicle- and snowmobile-related injuries in Ontario. Toronto, ON: Queen's Printer for Ontario; 2019. Available from: https://www.publichealthontario.ca/-/media/Documents/A/2019/atv-snowmobiles-injuries-report.pdf
10. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Snapshots: hospitalizations for injuries [Internet]. Toronto, ON: King's Printer for Ontario; [modified 2025 Apr 22; cited 2025 Oct 3]. Available from: https://www.publichealthontario.ca/en/Data-and-Analysis/Injuries-Data/Injury-Hospitalization
11. Ellis MJ, Russell K. The potential of telemedicine to improve pediatric concussion care in rural and remote communities in Canada. Front Neurol. 2019;10:840. Available from: https://doi.org/10.3389/fneur.2019.00840

12. Hagel BE, Romanow NTR, Enns N, Williamson J, Rowe BH. Severe bicycling injury risk factors in children and adolescents: a case–control study. Accid Anal Prev. 2015;78:165-72. Available from: https://doi.org/10.1016/j.aap.2015.03.002
13. West SW, Pankow MP, Gibson ES, Eliason P, Black AM, Emery CA. Injuries in Canadian high school boys' collision sports: insights across football, ice hockey, lacrosse, and rugby. Sport Sci Health. 2023;19:1129-37. Available from: https://doi.org/10.1007/s11332-022-00999-w
14. Cassinat JJ, Grise A, Aceto M, Wright V. Pediatric concussions in contact sports: a 10-year retrospective analysis of mechanisms and associated symptoms. Orthop J Sports Med. 2024;12(8):23259671241262010. Available from: https://doi.org/10.1177/23259671241262009
15. Høye A. Bicycle helmets – to wear or not to wear? A meta-analyses of the effects of bicycle helmets on injuries. Accid Anal Prev. 2018;117:85-97. Available from: https://doi.org/10.1016/j.aap.2018.03.026
16. McCrea M, Broglio S, McAllister T, Zhou W, Zhao S, Katz B, et al.; CARE Consortium Investigators. Return to play and risk of repeat concussion in collegiate football players: comparative analysis from the NCAA Concussion Study (1999-2001) and CARE Consortium (2014-2017). Br J Sports Med. 2020;54(2):102-9. Available from: https://doi.org/10.1136/bjsports-2019-100579

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