



Concussions in Alberta: Emergency Department Visits, 2013 – 2022

July 2024

CONCUSSIONS IN ALBERTA: EMERGENCY DEPARTMENT VISITS, 2013 – 2022

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SUGGESTED CITATION

Concussions in Alberta. Edmonton, AB: Injury Prevention Centre, 2024

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INTRODUCTION

Concussions are the most common form of traumatic brain injury (TBI), yet this significant health issue is under-reported due to a lack of education and awareness among the general public and inconsistent and limited availability of data related to the burden of this injury.¹

The data presented in this report represents only a fraction of the concussions in Alberta, as it only includes data from Emergency Departments and Urgent Care Centres; it does not include concussions treated at physicians' offices, walk-in clinics, or those not recognized or treated.

Each year, concussions contribute to a substantial number of emergency department visits and some hospital admissions.

A concussion may be caused by either a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head. As the body's control centre, any damage to the brain can cause serious problems.

Symptoms of a concussion can include:²

- **Somatic** (e.g., headache), cognitive (e.g., feeling like in a fog) and / or emotional symptoms (e.g., mood swings)
- **Physical signs** (e.g., loss of consciousness, amnesia, neurological deficit)
- **Balance impairment** (e.g., gait unsteadiness)
- **Behavioural changes** (e.g., irritability)
- **Cognitive impairment** (e.g., slowed reaction times)
- **Sleep / wake disturbance** (e.g., sleepiness, drowsiness)

The selection of leading causes included in this report was based on the percentage of emergency department visits with a concussion, the number of visits, and the availability of actionable prevention strategies.

¹ Rajabali F, Ramsden R, Wada M, Turcotte K, Babul S. Concussion in Children and Youth; Vancouver Coastal Health Authority. Vancouver, BC: BC Injury Research and Prevention Unit, 2015
² McCrory P, Meeuwisse W, Dvorak J, et al Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016 Br J Sports Med
Published Online First: 26 April 2017. doi: 10.1136/bjsports-2017-097699

AN AVERAGE OF
14,876
CONCUSSIONS
ARE DIAGNOSED AT
EMERGENCY
DEPARTMENTS
EACH YEAR IN ALBERTA



THAT MEANS **EACH DAY**, THERE ARE
41 DIAGNOSED CONCUSSIONS



37% ARE FROM FALLS 
20% ARE FROM SPORTS 

FALL-RELATED
CONCUSSIONS

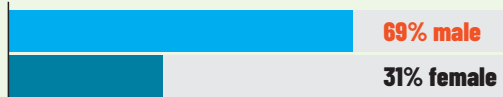


SPORT-RELATED
CONCUSSIONS

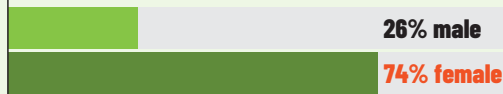


IN ALBERTA

OFF-ROAD
VEHICLES






ANIMAL-
RIDDEN



BOTTOM LINE

CONCUSSIONS ARE **NOT** SIMPLY

-  A 'SPORTS' ISSUE
-  A 'MALE' ISSUE
-  AN 'URBAN' ISSUE

Injury and Concussions Overview, Alberta 2013-2022

(excludes adverse events, medical / surgical complications)

Avg. number, ED Visits each year

488,192

Avg. number, Concussions each year

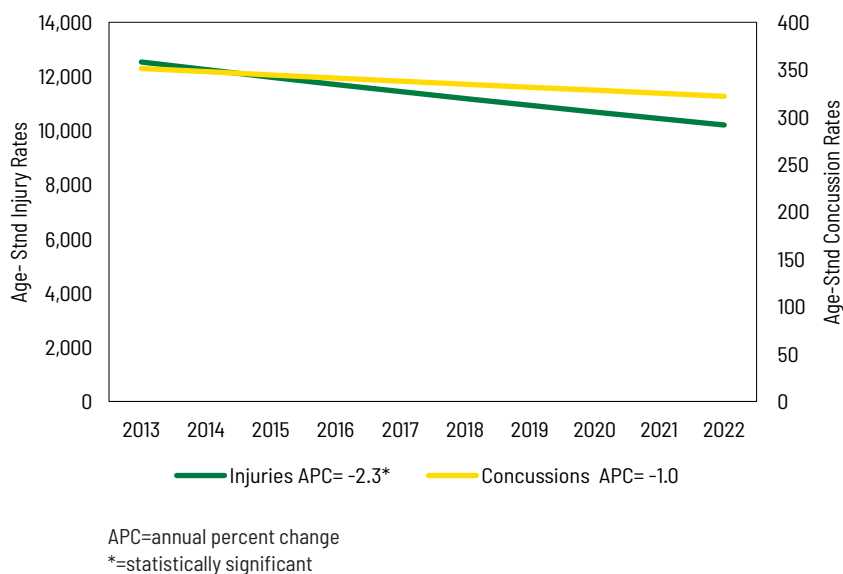
14,876

% Concussions of Injuries

3%

- » On average there were 488,192 injury emergency department / urgent care visits each year (excluding adverse events and medical / surgical complications).
- » On average there were 14,876 injury visits with a diagnosis of concussion.
- » Concussions accounted for 3% of all injury visits.

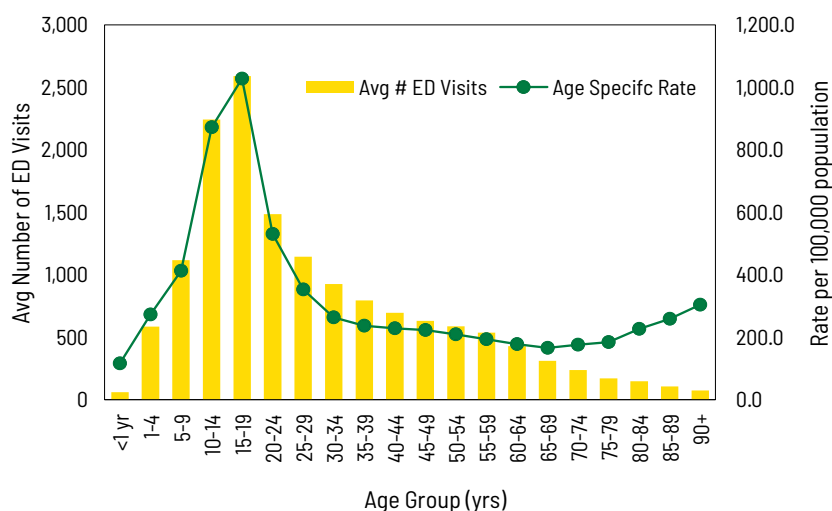
Injury Concussion Visit Rates by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Over the 10-year period from 2013 to 2022, the overall (excluding adverse events and medical / surgical complications) injury rate experienced an average statistically significant decrease of 2.3% each year.

Over this same period, the rate of injury visits with a diagnosis of concussion had an average decrease of 1.0% each year.

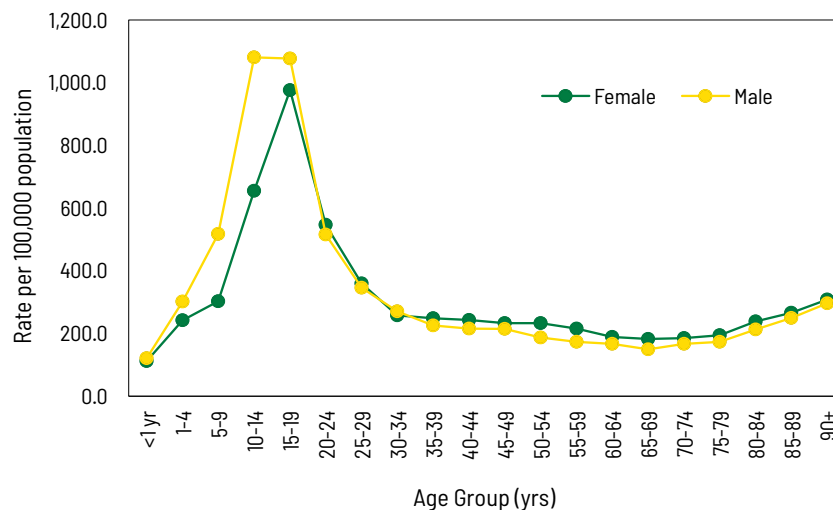
Number and Rate of Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 15 and 19 years of age had the highest average number of concussion emergency department / urgent care centre visits. This age group also had the highest rate.

Residents between 10 and 14 years of age had the second highest number and rate of injury emergency department / urgent care centre visits.

Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Males had higher concussion rates than females until the age of 19. From age 20 onward, females had rates slightly higher than males.

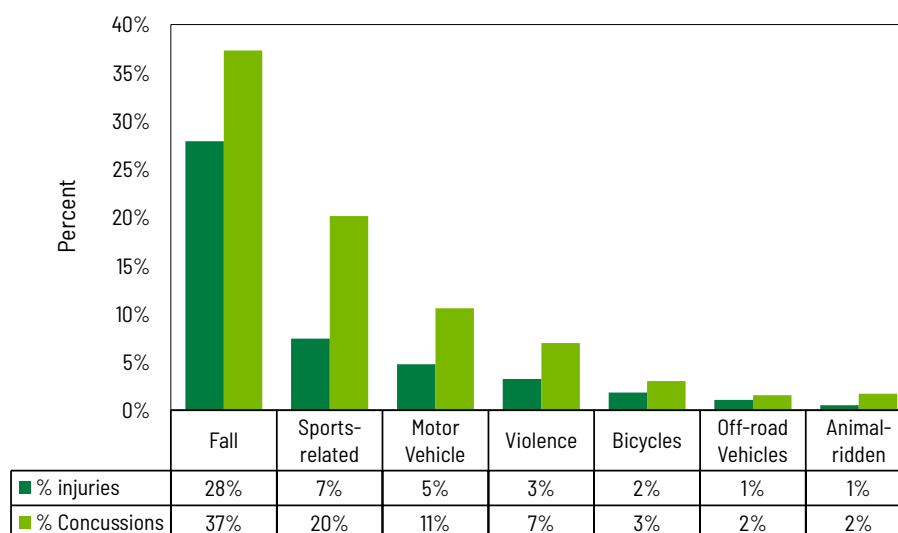
Number of Injury and Concussion Visits by Mechanism of Injury, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

Mechanism	Avg # of Injuries each year	Avg # Concussions each year	% of Mechanism from all injuries	% of Concussions from all Concussions	% of Concussions from Specific Mechanism
Fall	136,174	5,549	28%	37%	4%
Sports-related	36,347	2,996	7%	20%	8%
Motor Vehicle	23,300	1,573	5%	11%	7%
Violence	15,901	1,040	3%	7%	7%
Bicycles	9,075	452	2%	3%	5%
Off-road Vehicles	5,312	233	1%	2%	4%
Animal-ridden	2,663	254	1%	2%	10%
All Injuries	488,192	14,876			3%

When we look at the number of injuries and concussions by mechanism of injury:

- » Falls accounted for 28% of all injury visits (n=136,174), but accounted for 37% of all concussion with 5,549 visits diagnosed with a concussion. Of all fall visits, 4% were diagnosed with a concussion.
- » Sports-related injuries accounted for 7% of all injury visits (n=36,347 visits), and accounted for 20% of all concussion, with 2,996 visits diagnosed with a concussion. Of all sports-related visits, 8% were diagnosed with a concussion.
- » Motor vehicle injuries accounted for 5% (n=23,300) of all injury visits and accounted for 11% of all concussion visits with 1,573 visits diagnosed with a concussion. Of all motor vehicle-related visits, 7% were diagnosed with a concussion.
- » Violence injuries accounted for 3% of all injuries with 15,901 visits, but accounted for 7% of all visits diagnosed with a concussion. Of all the violence-related injury visits, 7% were diagnosed with a concussion.
- » Bicycles injuries accounted for 2% of all injury visits (n=9,075), but accounted for 3% of all visits diagnosed with a concussion. Of all bicycle injury visits, 5% were diagnosed with a concussion.
- » Off-road vehicle injuries accounted for 1% of all injury visits with 5,312 visits. They accounted for 2% of all visits diagnosed with a concussion. Of all the off-road-vehicle injury visits, 4% of the visits were diagnosed with a concussion.
- » Animal-ridden injuries accounted for 1% of all injuries with 2,663 visits. Animal-ridden visits accounted for 2% of all concussion diagnosis. Of all animal-ridden visits, 10% were diagnosed with a concussion.

Percent of Injury and Concussion Visits by Mechanism of Injury, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



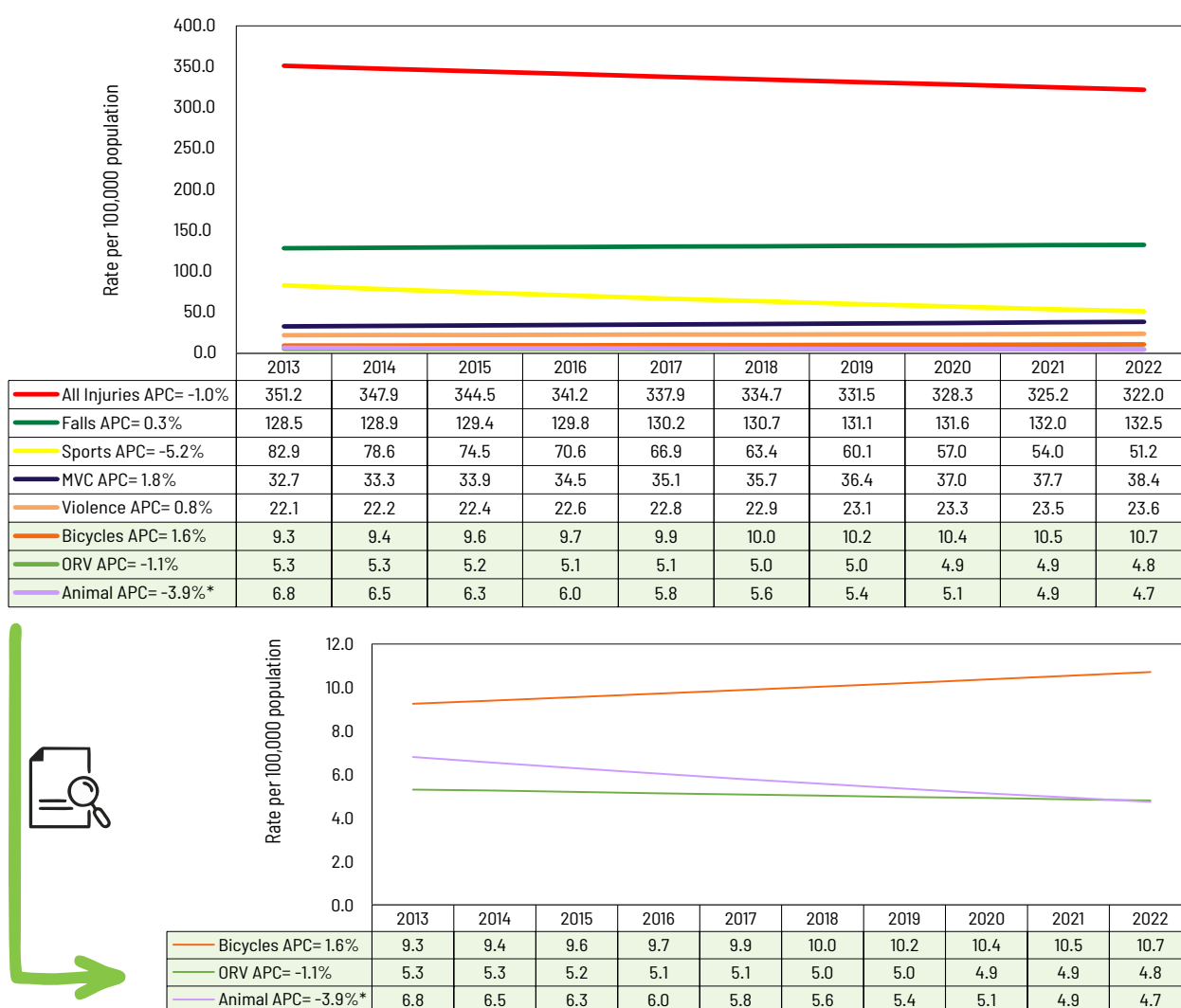
The mechanism of injuries presented in this graph and report are based on the number of emergency department visits, the proportion of concussions and the availability of evidence-based, actionable injury prevention strategies and messaging.

- » The top 7 mechanisms of injury accounted for 47% of the injury visits and 81% of the concussion diagnosed visits.
- » Falls accounted for the highest percentage of injury visits (28%) and the highest percentage of concussions with 37%.
- » Sports-related injuries accounted for 7% of the injuries and 20% of the concussion diagnoses.
- » Motor vehicle injuries accounted for 5% of all injury visits and 11% of the concussion diagnoses.
- » Violence injuries accounted for 3% of injury visits and 7% of the concussion diagnoses.
- » Bicycle injuries accounted for 2% of injury visits and 3% of the concussion diagnoses.
- » Off-road vehicle injuries accounted for 1% of injury visits and 2% of the concussion diagnoses.
- » Animal-ridden injuries accounted for 1% of injury visits and 2% of the concussion diagnoses.

Struck by / against a person / object accounted for 11% of the injuries and 14% of the concussions. Due to the lack of specificity and of actionable prevention strategies and messaging, this mechanism of injury was not included in further analysis.

CONCUSSIONS IN ALBERTA: EMERGENCY DEPARTMENT VISITS, 2013 – 2022

Concussion Visit Rates by Mechanism of Injury, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

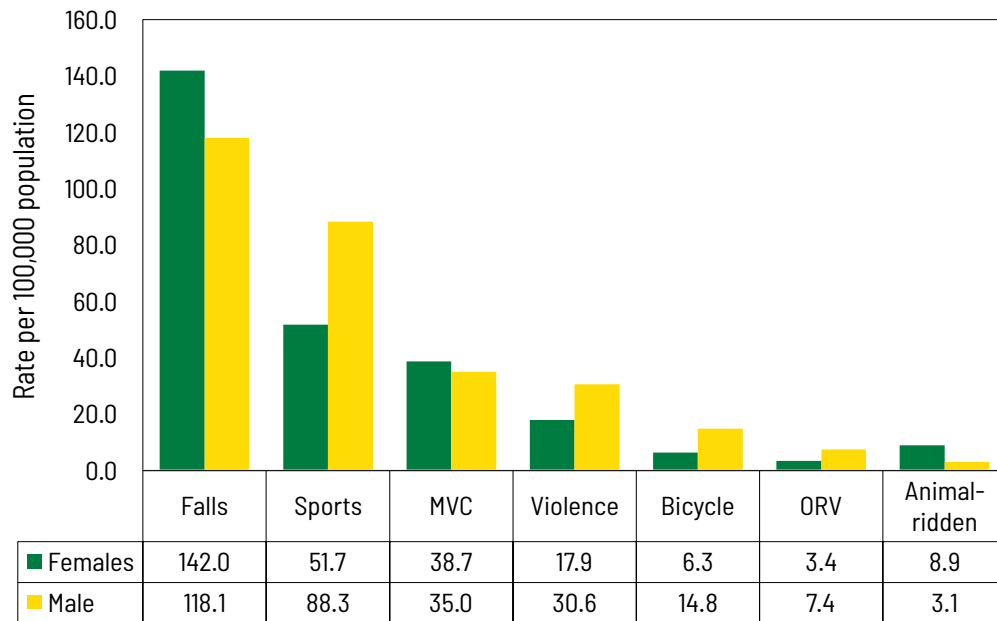


APC=annual percent change

*=statistically significant

- » Overall, concussion injury emergency department / urgent care centre visit rate decreased an average of 1.0% each year.
- » Violence concussions decreased an average of 0.8% each year.
- » Off-road vehicle concussions decreased an average of 1.1% each year.
- » Animal-riden concussions decreased an average of 3.9% each year.

Concussion Visits Rates by Mechanism of Injury and Sex, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



- » Males had higher concussion visit rates than females for all leading mechanism with the exceptions of falls, motor vehicle collisions and animal-ridden.
- » Females had higher fall concussion rate than males.
- » Males had higher sports concussion rate than females.
- » Females had a higher motor vehicle collision concussion rate than males.
- » The concussion rate for violence injuries was almost twice that for males than females.
- » The rate of bicycle concussions was higher than that of females.
- » The rate for off-road vehicle concussion rate for males was more than twice that of females.
- » The concussion rate for animal-ridden injuries for females was almost 3 times higher than the concussion rate for males.

Falls & Concussions

Avg # Injuries
each year

136,174

Avg # Concussions
each year

5,549

% of Falls from
all Injuries

28%

% of Concussions from
all Concussions

37%

% of Concussions
from Falls

4%

- » On average, there were 136,174 fall emergency department / urgent care centre visits each year.
- » On average, there were 5,549 fall-related visits with a diagnosis of concussion.
- » Falls were the leading cause of injury emergency department / urgent care centre visits and accounted for 28% of injury visits.
- » Of all injury visits diagnosed with a concussion, 37% were the result of a fall.
- » Of all fall visits, 4% were diagnosed with a concussion.

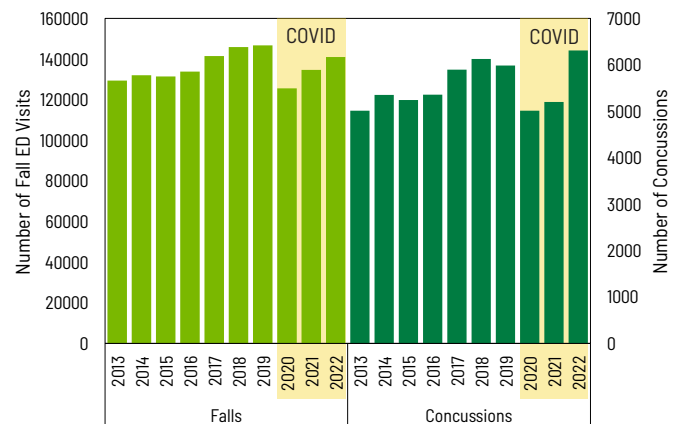
Number of Fall Injuries and Fall-related Concussions Visits by Year, Emergency Dept. / Urgent Care Centres, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 13,724 fall injury visits each year, 5,567 of which were diagnosed with a concussion.

In 2020, the total number of fall injury visits decreased by 9% to 12,551 visits, and the number of fall injury visits diagnosed with a concussion decreased by 10% to 5,010.

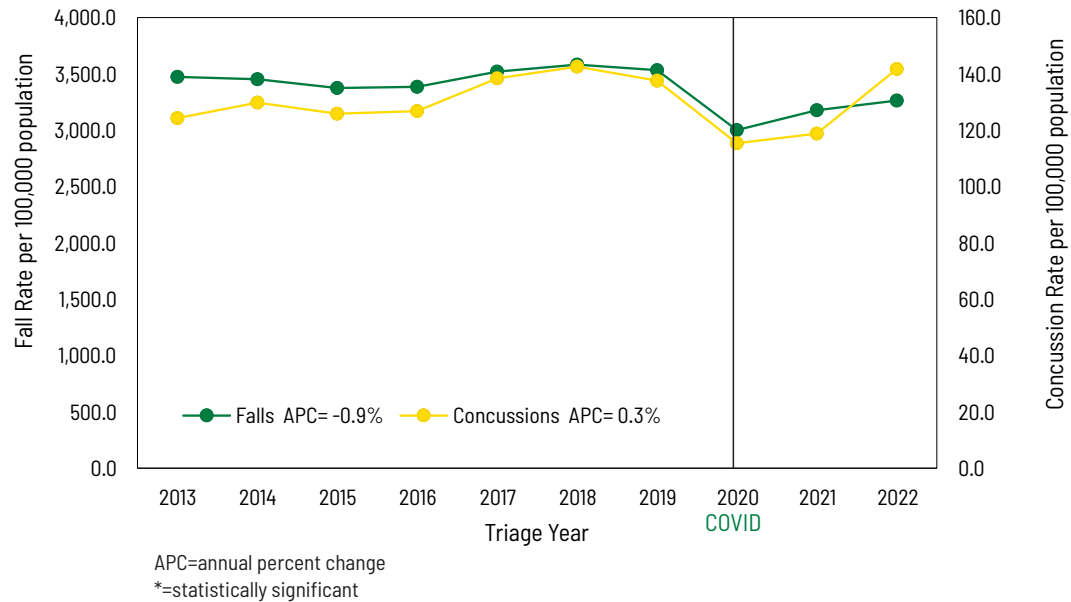
In 2021, the total number of fall injury visits decreased by 2% to 13,463 from the prior-to-COVID-19 average, and the number of fall injury visits diagnosed with a concussion decreased 7% to 5,201.

In 2022, the total number of fall injury visits increased by 3% to 14,095 from the prior-to-COVID-19 average, and the number of fall injury visits diagnosed with a concussion increased 13% to 6,311.



Falls include: ice and snow, slipping / tripping / stumbling, due to collision with, or pushing by another person (not sports-related), while being carried or supported by another person, falls involving wheelchairs and other types of walking devices, from furniture, playground equipment including trampolines, stairs / steps, ladders / scaffolding, out of / from buildings or structures, falls from high place, falls from one level to another, falls on same level, unspecified fall.

Falls and Fall-related Concussion Visit Rates by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

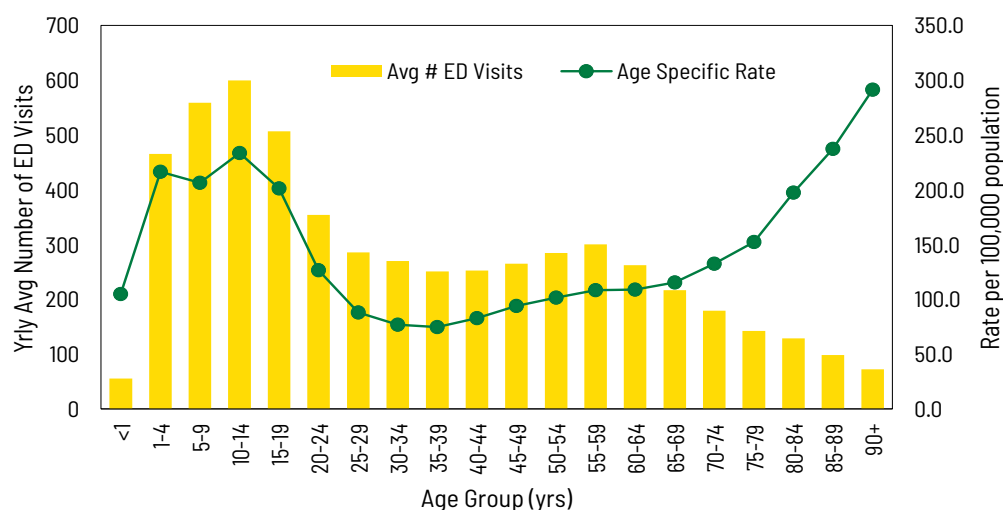


Over the 10-year period, the fall visit rate experienced an average decrease of 0.9% each year.

During this same time period, the fall concussion visit rate experienced an average increase of 0.3% each year.

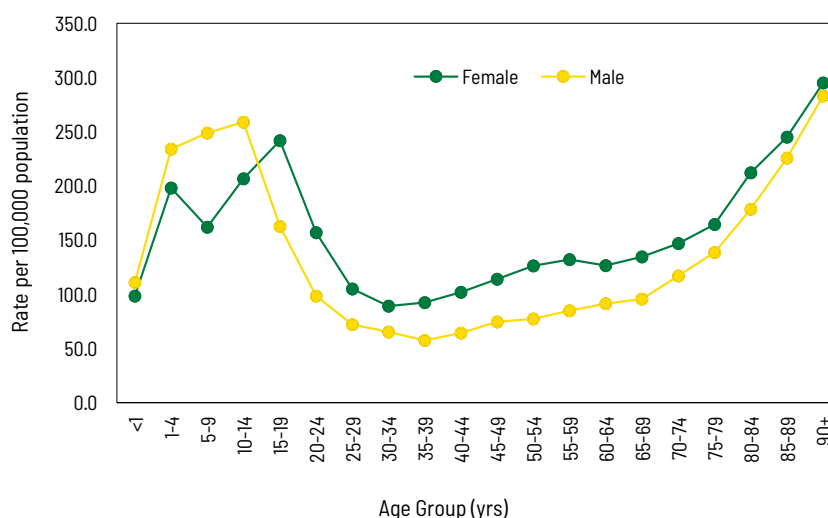
In 2020, due to COVID-19, there were fewer visits and therefore lower fall injury and fall concussion rates.

Number and Rate of Fall Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre Visits, Alberta, 2013-2022



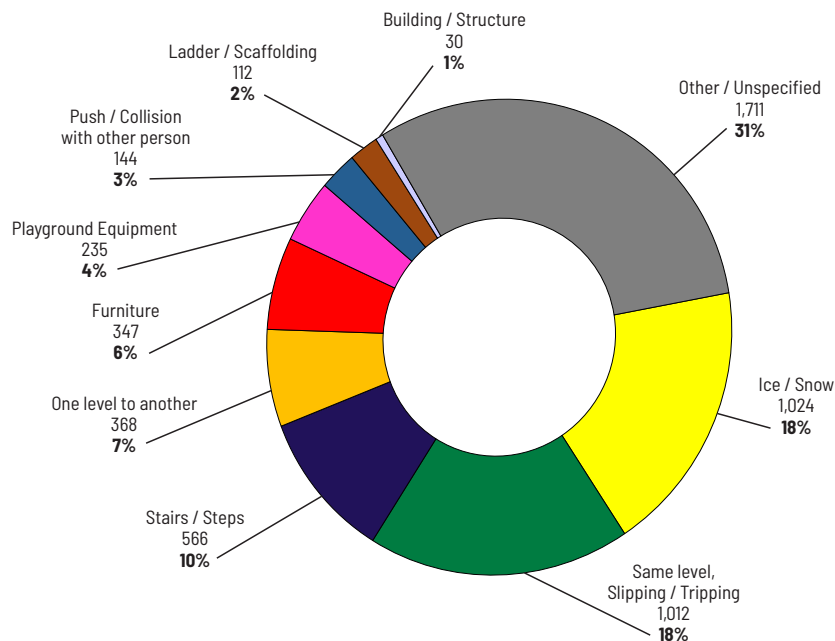
Alberta residents between 10 and 14 years of age had the highest average number of fall-related concussions emergency department / urgent care centre visits. However, residents 90 of age and older had the highest fall-related concussion visit rate.

Fall Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Males had higher fall-related concussion rates than females until age 14 years of age. From age 15 onward, females had rates higher than males.

Fall Concussion Visits by Fall Mechanism, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Of the mechanisms identified, falls on ice / snow accounted for 18% with an average of 1,024 visits each year. This was followed by falls as a result of slipping / tripping on the same level with 1,012 visits, accounting for 18%.

Concussions diagnosed as a result of falling from stairs / steps accounted for 10% of the fall concussions, with an average of 566 visits each year.

Concussions as a result of falling from one level to another accounted for 7% of fall concussion visits, with an average of 368 visits each year.

Concussions as a result of a fall from furniture accounted 6% of fall concussions, with an average of 347 visits each year.

Concussions as a result of a fall from playground equipment accounted for 4%, with 235 visits each year.

Concussions as a result of being pushed or colliding with another person accounted for 3%, with 144 visits each year.

Concussions as a result of falling from a ladder or scaffolding accounted for 2%, with 112 visits each year.

Concussions as a result of falling from a building / structure accounted for 1% of the fall concussions, with an average of 30 visits each year.

The largest category of other / unspecified (due to a lack of documentation) accounted for 31%, with an average of 1,711 visits each year.

Sports & Concussions

Avg # Injuries
each year

36,347

Avg # Concussions
each year

2,996

% of Sports from
all Injuries

7%

% of Concussions from
all Concussions

20%

% of Concussions
from Sports

8%

- » On average, there were 36,347 sports-related emergency department / urgent care centre visits each year.
- » On average, there were 2,996 sports-related visits with a diagnosis of concussion.
- » Sports-related injury emergency department / urgent care centres accounted for 7% of all injury visits.
- » Of all injury-related visits diagnosed with a concussion, 20% were as a result of a sports-related injury.
- » Of all sports-related visits, 8% were diagnosed with a concussion.

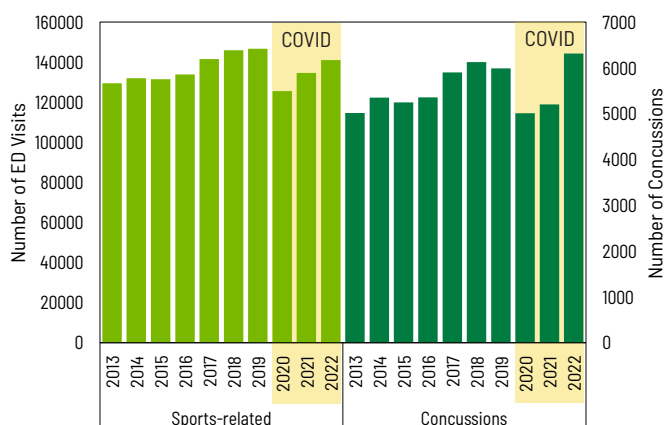
Number of Sport Injuries and Sport Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 38,868 sports-related visits each year, 3,366 of which were diagnosed with a concussion

In 2020, the total number of sport injury visits decreased by 32% to 12,347 visits, and the number of sport injury visits diagnosed with a concussion decreased by 49% to 1,700.

In 2021, the total number of sport injury visits decreased by 21% to 30,569 from the prior-to-COVID-19 average, and the number of sport injury visits diagnosed with a concussion decreased 39% to 2,066.

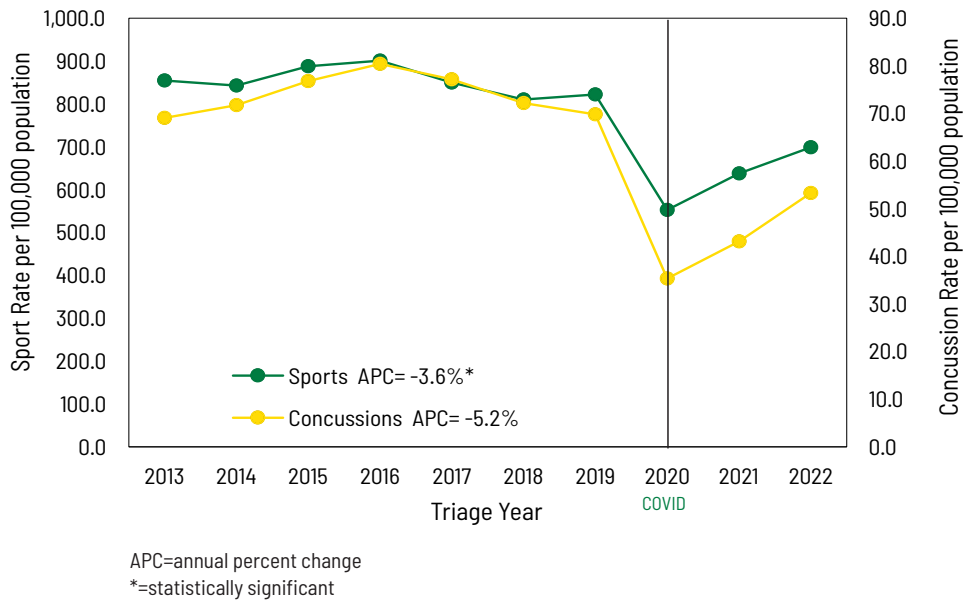
In 2022, the total number of sport injury visits decreased by 12% to 34,306 from the prior-to-COVID-19 average, and the number of sport injury visits diagnosed with a concussion decreased 22% to 2,630.



Note: the number of sports-related injuries and concussions reported in this chapter will differ from the numbers presented in the overview chapter in this report. Sports-related injury visits in this chapter are based on the use of ICD-10-CA codes **and / or** the voluntary sport and recreation activity classification system. Only the ICD-10-CA codes were used for the sports-related concussions noted earlier in this report.

Sports-related activities include: falls on same level from collisions, pushing or shoving by or with another person in sports; striking against or struck accidentally by objects or persons in sports; and with subsequent fall. Excludes: bicycles, off-road vehicles, animal ridden injuries. Percentages and rates were not adjusted for the number of registered participants, frequency of play, duration of play or seasonal weather conditions.

Sport Injury and Sport Concussion Rate Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

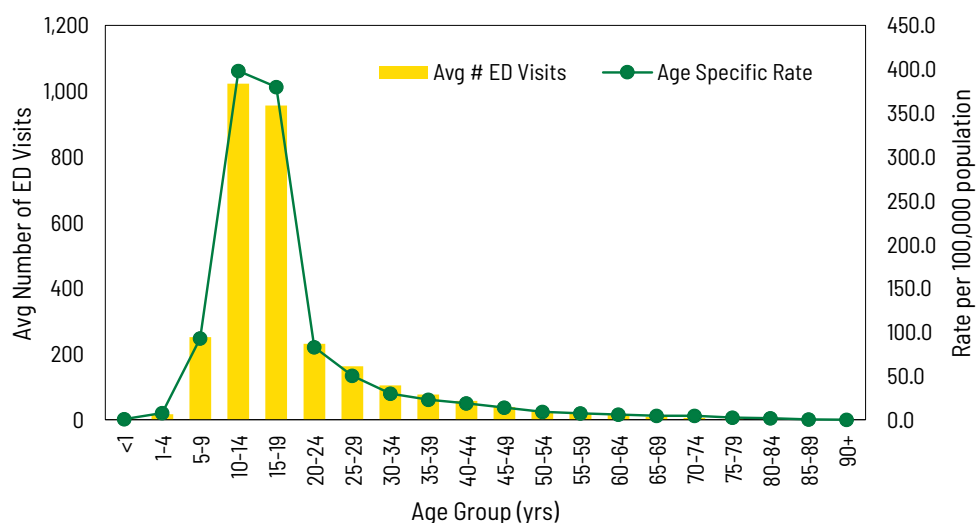


Over the 10-year period, the sports injury visit rate experienced a statistically significant average decrease of 3.6% each year.

During this same time period, the sport concussion visit rates experienced an average decrease of 5.2% each year.

In 2020, due to COVID-19, there were fewer visits and therefore lower sport injuries and sport concussion rates.

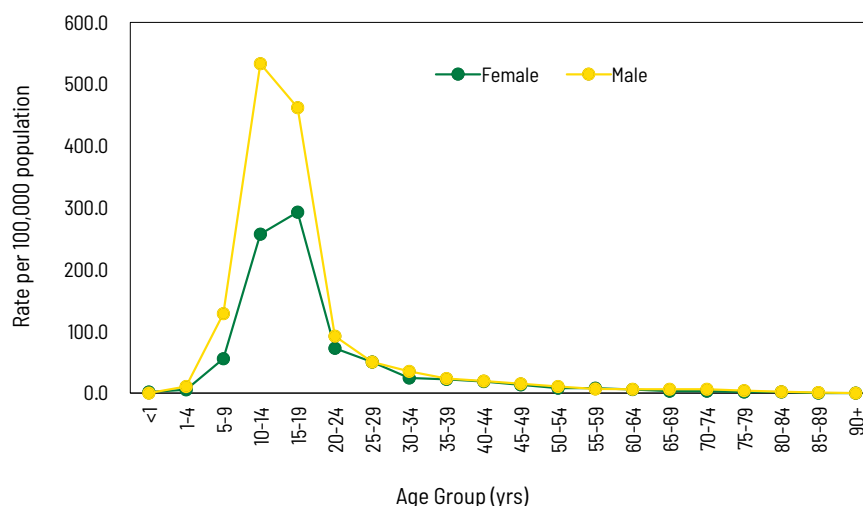
Number and Rate of Sport Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 10 and 14 years of age had the highest average number and rate of sport concussion emergency department / urgent care centre visits.

Youth 15 to 19 years of age had the second highest average number and rate of sport concussion emergency department visits.

Sport Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Males had higher sports concussion rates than females in all age groups. Males between 10 and 14 years had the highest rate. This was followed by males between 15 to 19 years of age.

Number of Sport Injuries and Concussion Visits by Sport Activity, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

Sport / Activity	Average # Visits Each Year	Average # Concussions Each Year	% of Sports Visits From All Sports Injuries	% of Concussions From All Concussions	% of Concussions from Specific Sports Activity
Hockey (ice-default)	8,027	753	25	29	9
Snowboarding / Snowskating	2,935	247	9	9	8
Soccer	2,336	239	7	9	10
Football	1,260	167	4	6	13
Skiing (recreation-default)	2,399	166	8	6	7
Basketball	1,484	115	5	4	8
Rugby	572	109	2	4	19
Skateboarding / Longboarding	2,820	107	9	4	4
Baseball	1,261	73	4	3	6
Tobogganing	746	69	2	3	9
Skating (ice-default)	628	52	2	2	8
Volleyball	542	50	2	2	9
Lacrosse	351	44	1	2	13
Ringette	151	31	0	1	21
Non-motorized Scooter	770	29	2	1	4
Total	31,510	2,626	100	100	8

- » Hockey had the highest number of visits each year (n=8,027) accounting for 25% of all sport injury visits.
- » Ringette was the sporting activity which had highest percent of diagnosed concussions. Of the 151 visits due to a ringette injury, 31 (21%) were diagnosed with a concussion.
- » Rugby was the sport with the second-highest percent of diagnosed concussions. Of the 572 rugby injury visits, 19% (n=109) were diagnosed with a concussion.

Motor Vehicles & Concussions

Avg # Injuries
each year

23,300

Avg # Concussions
each year

1,573

% of Motor Vehicle from
all Injuries

5%

% of Concussions from
all Concussions

11%

% of Concussions
from Motor Vehicle

7%

- » On average, there were 23,300 motor vehicle injury emergency department / urgent care centre visits each year.
- » On average, there were 1,573 motor vehicle visits with a diagnosis of concussion.
- » Motor vehicle injury emergency department / urgent care centres accounted for 5% of all injury visits.
- » Of all injury visits diagnosed with a concussion 11% were as a result of a motor vehicle incident.
- » Of all motor vehicle visits, 7% were diagnosed with a concussion.

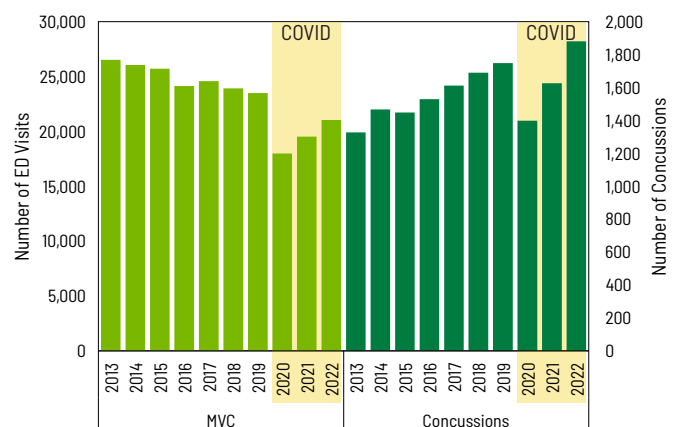
Number of Motor Vehicle Injuries and Motor Vehicle Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 24,921 motor vehicle injury visits each year, 1,546 of which were diagnosed with a concussion.

In 2020, the total number of motor vehicle injury visits decreased by 28% to 17,986 visits, and the number of motor vehicle injury visits diagnosed with a concussion decreased by 10% to 1,399.

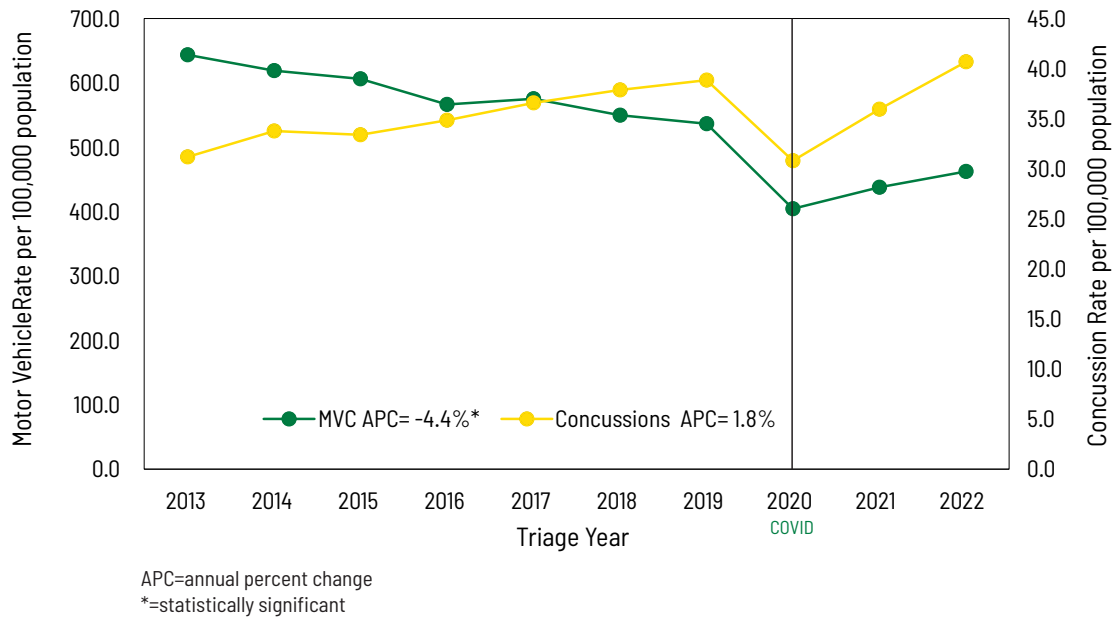
In 2021, the total number of motor vehicle injury visits decreased 22% to 19,522 from the prior-to-COVID-19 average, and the number of motor vehicle injury visits diagnosed with a concussion increased 5% to 1,626.

In 2022, the total number of motor vehicle injury visits decreased by 16% to 21,040 from the prior-to-COVID-19 average, and the number of motor vehicle injury visits diagnosed with a concussion increased 22% to 1,880.



Motor vehicle events include: traffic-related, non-traffic and boarding / alighting incidents involving pedestrians, motorcycles, cars, pickup trucks, vans, heavy transport vehicles, buses, other land transport vehicles. Excludes: bicycles and off-road vehicles which are reported separately.

Rate of Motor Vehicle Injuries and Motor Vehicle Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

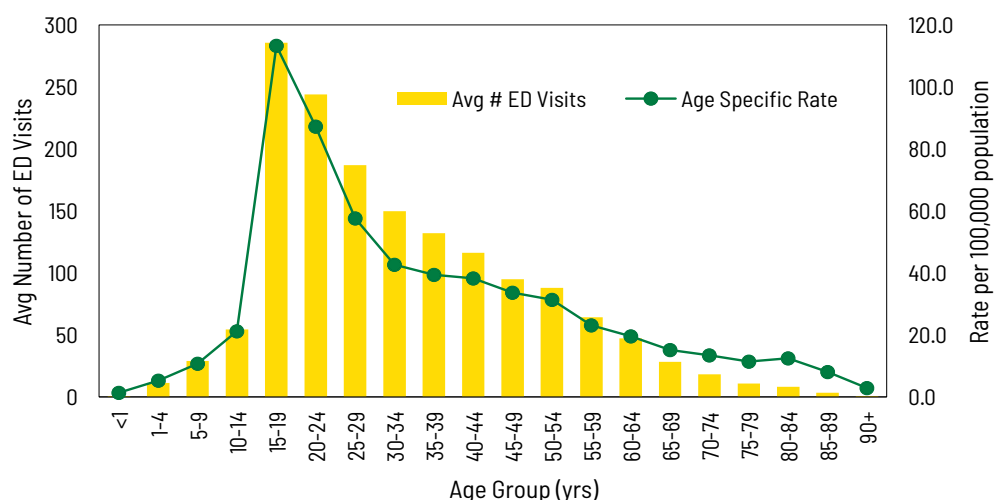


Over the 10-year period, the motor vehicle visit rate experienced a statistically significant average decrease of 4.4% each year.

During this same time period, the motor vehicle concussion visit rate experienced an average increase of 1.8% each year.

In 2020, due to COVID-19, there were fewer visits and therefore lower motor vehicle injury and motor vehicle concussion rates.

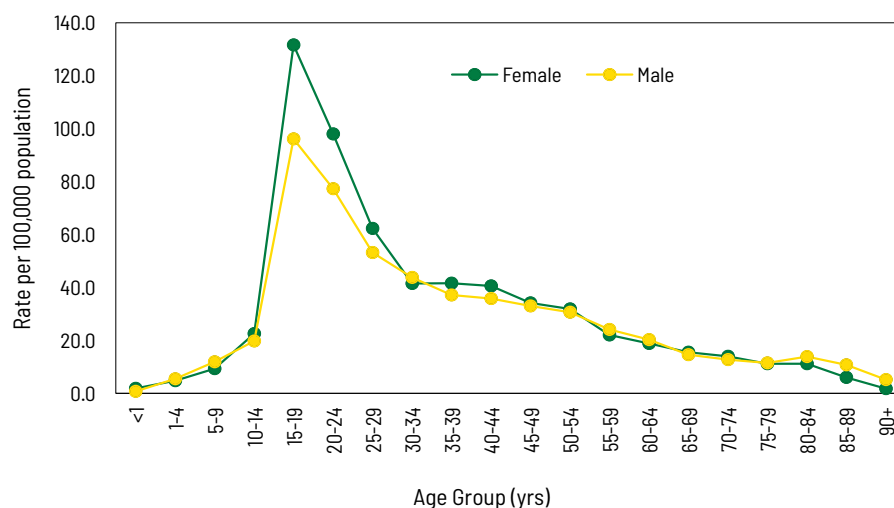
Number and Rate of Motor Vehicle Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 15 and 19 years of age had the highest average number and rate of motor vehicle concussion emergency department / urgent care centre visits.

Those 19 to 24 year of age had the second highest average number and rate of motor vehicle concussion emergency department visits.

Motor Vehicle Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre Visit Rates by Sex and Age Group, Alberta, 2013-2022



Females 15 to 19 years of age had the highest motor vehicle concussion emergency department visit rate. This was followed by females 20 to 24 years of age. This was closely followed by males 15 to 19 years of age.

Violence & Concussions

While the Injury Prevention Centre focuses on unintentional injuries, violence-related injuries accounted for a large proportion of concussions and therefore was included.

Avg # Injuries
each year
15,901

Avg # Concussions
each year
1,040

% of Violence-related
from all Injuries
3%

% of Concussions from
all Concussions
7%

% of Concussions
from Violence
7%

- » On average, there were 15,901 violence injury emergency department / urgent care centre visits each year.
- » On average, there were 1,040 violence-related visits with a diagnosis of concussion.
- » Violence injury emergency department / urgent care centres visits accounted for 3% of all injury visits.
- » Of all injury visits diagnosed with a concussion, 7% were as a result of a violent incident.
- » Of all violence visits, 7% were diagnosed with a concussion.

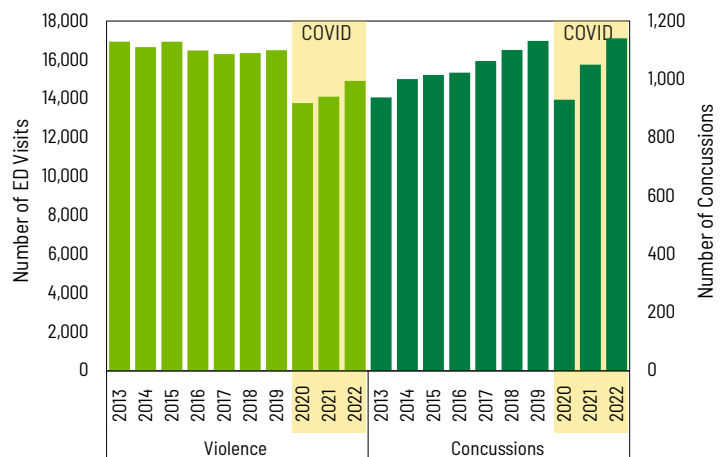
Number of Violence Injuries and Violence Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 16,599 violence-related visits each year, 1,039 of which were diagnosed with a concussion.

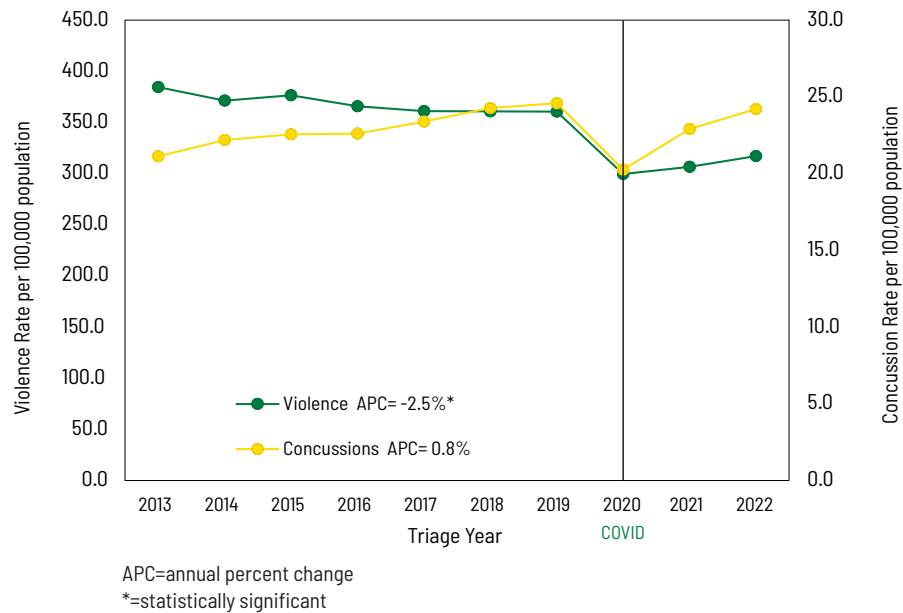
In 2020, the total number of violence injury visits decreased by 28% to 17,986, and the number of violence injury visits diagnosed with a concussion decreased by 10% to 930.

In 2021, the total number of violence injury visits decreased by 17% to 14,118 from the prior-to-COVID-19 average, and the number of violence injury visits diagnosed with a concussion increased 1% to 1,051.

In 2022, the total number of violence injury visits decreased by 10% to 14,919 from the prior-to-COVID-19 average, and the number of violence injury visits diagnosed with a concussion increased 10% to 1,141.



Rate of Violence Injuries and Violence Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

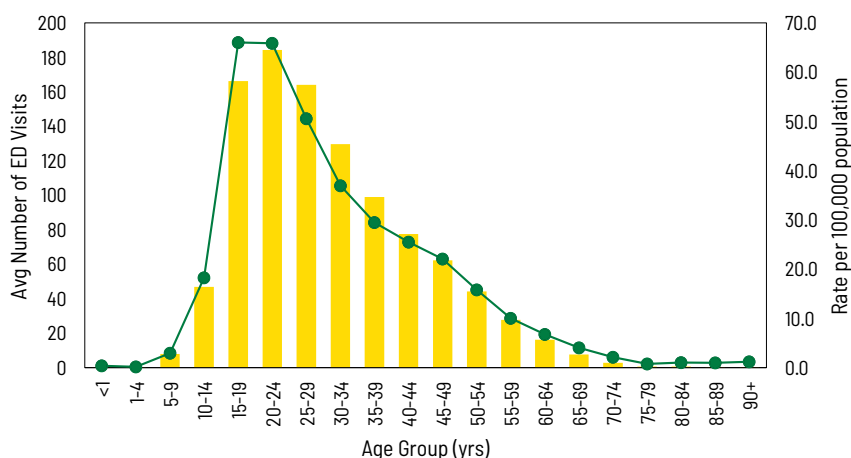


Over the 10-year period, the violence visit rate experienced a statistically significant average decrease of 2.5% each year.

During this same time period, the violence concussion visit rate experienced an average increase of 0.8% each year.

In 2020, due to COVID-19, there were fewer violence visits and therefore lower violence concussion rates.

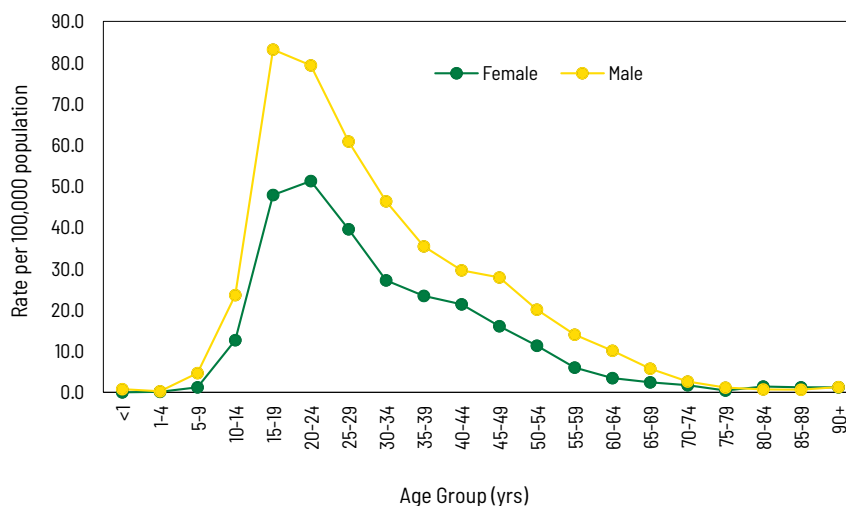
Number and Rate of Violence Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 20 and 24 years of age had the highest average number and rate of violence concussion emergency department / urgent care centre visits.

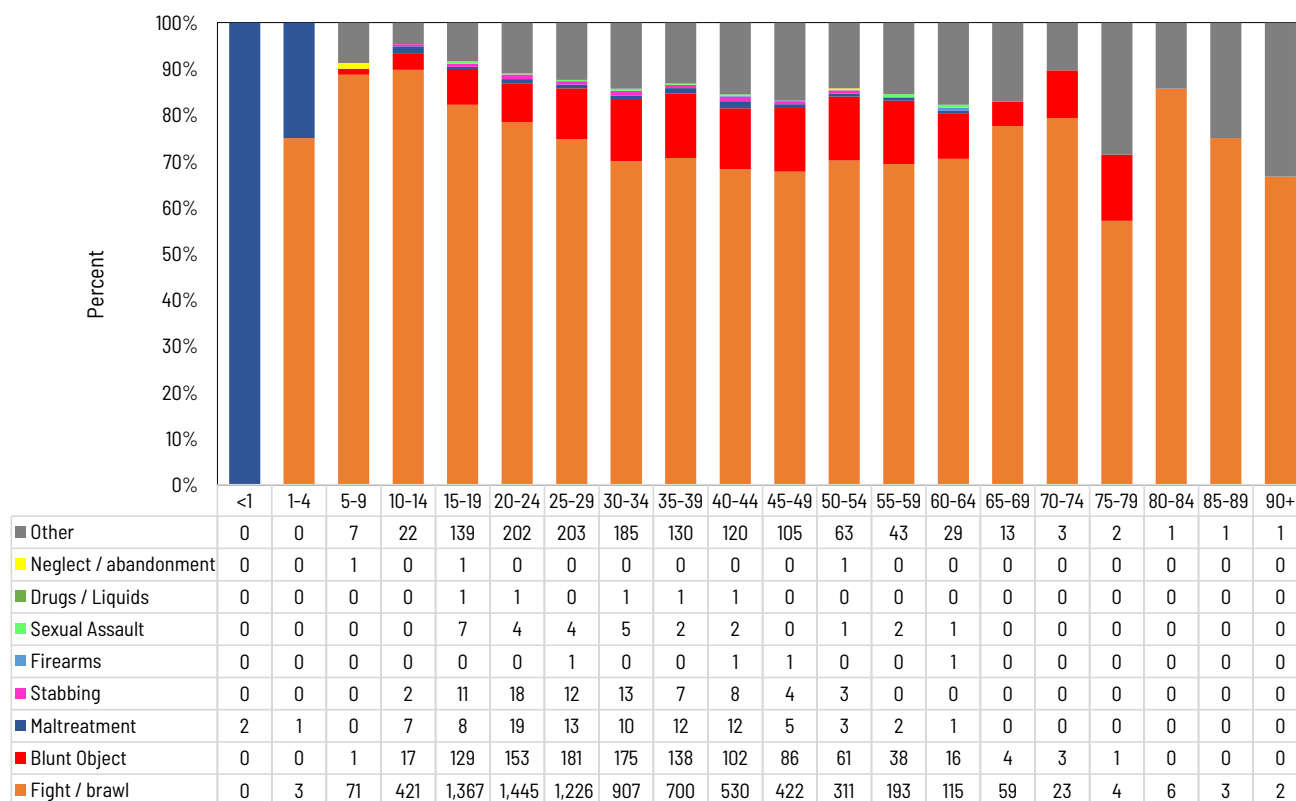
Residents between 15 and 20 years of age had the same violence-related concussion rate as residents 20 to 24 years of age. However, they had fewer emergency department visits.

Violence Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Males had consistently higher violence-related emergency department visits than females in all age groups.

Violence Concussion Visits by Violence Type and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



The leading cause of violence concussion emergency department visits (75%) was fights / brawls, with an average of 781 violence-related concussion visits each year.

This was followed by violence by other means which accounted for 12%, with an average of 127 visits each year. This includes violence, assault by corrosive substance, hanging / strangulation / suffocation, drowning / submersion, explosive material, smoke / fire/flames, steam / hot vapours / hot objects, pushing from a high place, pushing / placing victim before moving object, crashing a motor vehicle, assault by other / unspecified means.

Assault with a blunt object accounted for 11% of violence-related concussion visits with an average of 110 visits each year.

Bicycles & Concussions

Avg # Injuries
each year

9,075

Avg # Concussions
each year

452

% of Bicycle-related
from all Injuries

2%

% of Concussions from
all Concussions

3%

% of Concussions
from Bicycle-related

5%

- » On average, there were 9,075 bicycle injury emergency department / urgent care centre visits each year.
- » On average, there were 452 bicycle injury visits with a diagnosis of concussion.
- » Bicycle injury emergency department / urgent care centres accounted for 2% of all injury visits.
- » Of all injury visits diagnosed with a concussion, 3% were as a result of a bicycle incident.
- » Of all bicycle injury visits, 5% were diagnosed with a concussion.

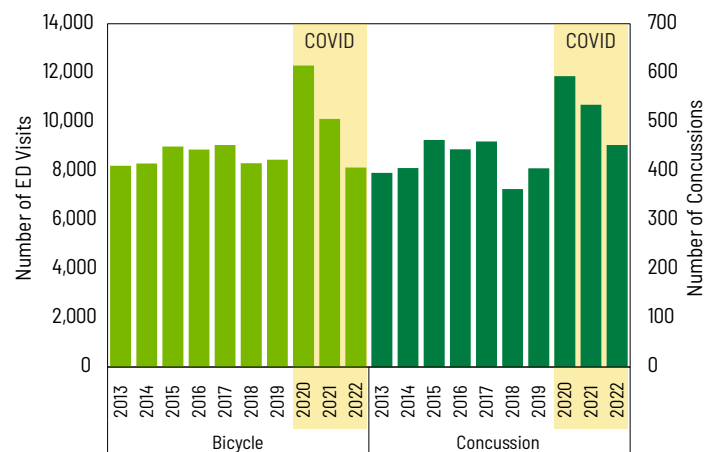
Number of Bicycle Injuries and Bicycle Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 8,598 bicycle-related visits each year, 420 of which were diagnosed with a concussion. Bicycle visits were one of the few mechanisms of injury that experienced an increase in 2020 during COVID-19.

In 2020, the total number of bicycle injury visits increased by 43% to 12,301, and the number of bicycle injury visits diagnosed with a concussion decreased by 41% to 539.

In 2021, the total number of bicycle injury visits increased by 18% to 10,122 from the prior-to-COVID-19 average, and the number of bicycle injury visits diagnosed with a concussion increased 28% to 535.

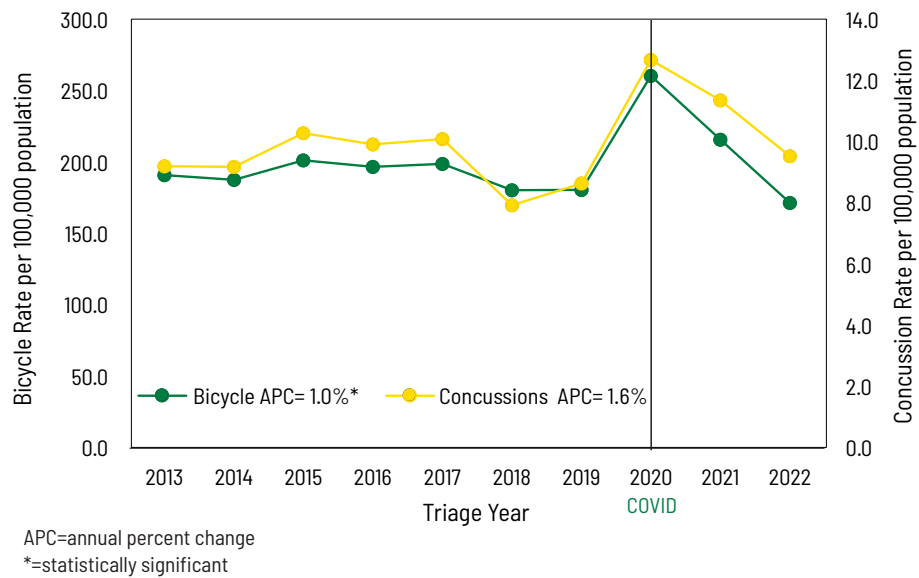
In 2022, the total number of bicycle injury visits increased by 18% to 8,133 from the prior-to-COVID-19 average, and the number of bicycle injury visits diagnosed with a concussion increased 8% to 453.



Bicycle injuries include: traffic and non-traffic injuries. Examples: struck by a vehicle, struck a stationary object, or fall from bicycle.

Percentages and rates were not adjusted for the number of participants, frequency of riding, duration of riding or seasonal weather conditions.

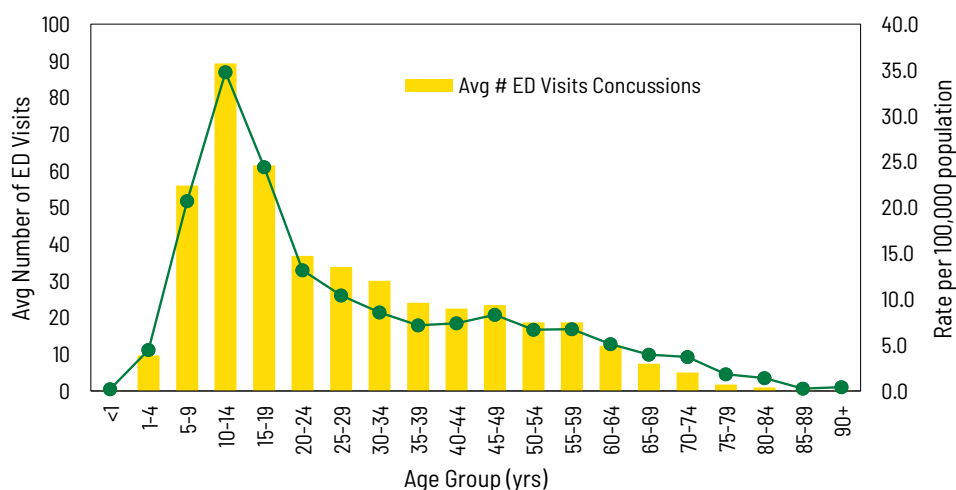
Rate of Bicycle Injuries and Bicycle Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Over the 10-year period, the bicycle visit rate experienced a statistically significant average increase of 1.0% each year.

During this same time period, the bicycle concussion visit rate experienced an average increase of 1.6% each year.

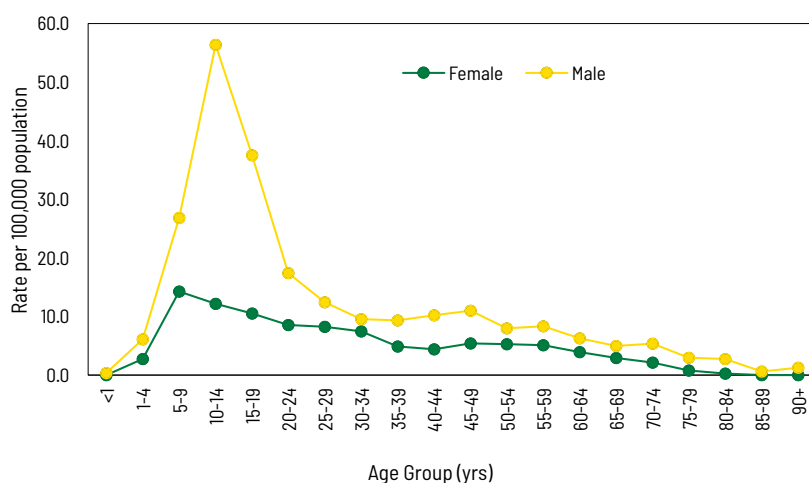
Number and Rate of Bicycle Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 10 and 14 years of age had the highest average number and rate of bicycle concussion emergency department / urgent care centre visits.

This was closely followed by those between 15 and 19 years of age with the second highest number and rate of bicycle concussion emergency department visits.

Bicycle Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Males had consistently higher bicycle concussion emergency department visit rates than females in all age groups.

Males 10 to 14 years of age had the highest bicycle concussion rate.

Off-Road Vehicles & Concussions

Avg # Injuries
each year

5,312

Avg # Concussions
each year

233

% of OHV-related
from all Injuries

1%

% of Concussions from
all Concussions

2%

% of Concussions
from OHV

4%

- » On average, there were 5,312 off-road vehicle injury emergency department / urgent care centre visits each year.
- » On average, there were 233 off-road vehicle injury visits with a diagnosis of concussion.
- » Off-road vehicle injury emergency department / urgent care centres and accounted for 1% of all injury visits.
- » Of all injury visits diagnosed with a concussion, 4% were as a result of an off-road vehicle incident.
- » Of all-road highway vehicle visits, 4% were diagnosed with a concussion.

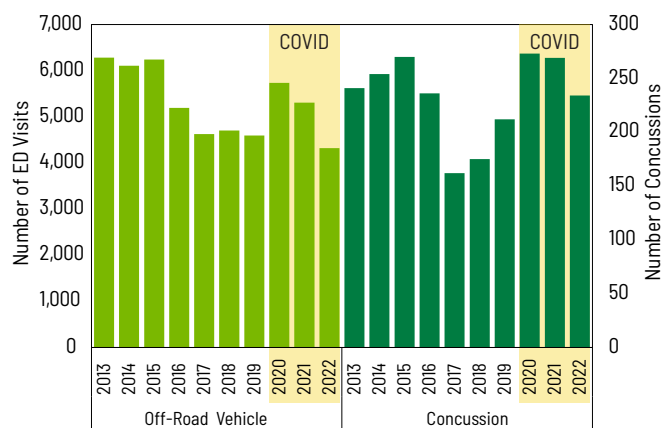
Number of Off-Road Vehicle Injuries and Off-Road Vehicle Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 5,393 ORV-related visits each year, 221 of which were diagnosed with a concussion. ORV visits was one of the few mechanisms of injury that experienced an increase in 2020 during COVID-19.

In 2020, the total number of ORV injury visits increased by 6% to 5,735, and the number of ORV injury visits diagnosed with a concussion decreased by 23% to 273.

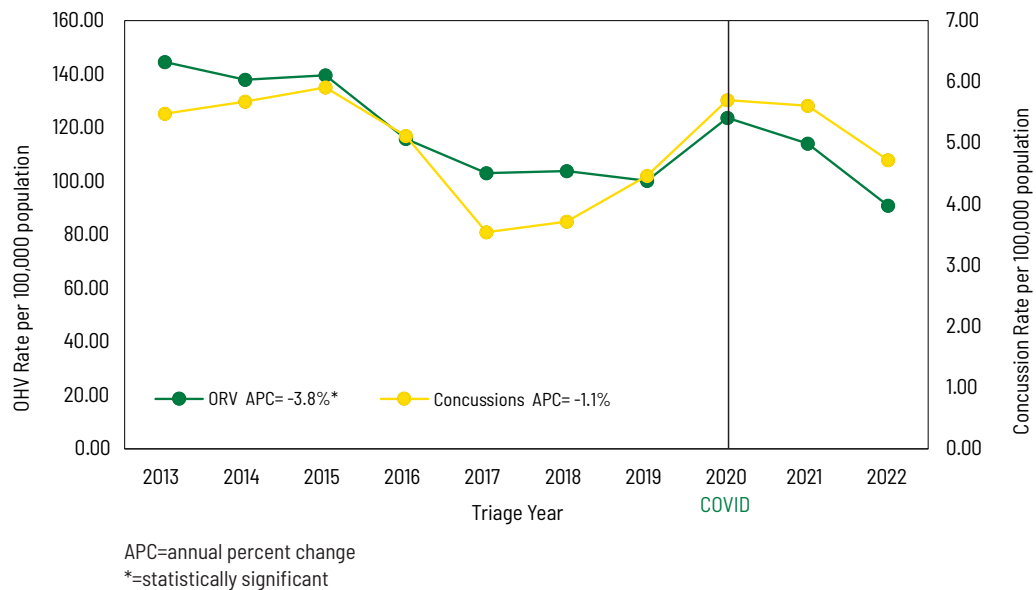
In 2021, the total number of ORV injury visits decreased by 2% to 5,302 from the prior-to-COVID-19 average, and the number of ORV injury visits diagnosed with a concussion increased 21% to 269.

In 2022, the total number of ORV injury visits decreased by 20% to 4,323 from the prior-to-COVID-19 average, and the number of ORV injury visits diagnosed with a concussion increased 6% to 234.



Off-road vehicles (ORV) include: all motor vehicle designed primarily for off-road use. This includes, ATVs, quads, side-by-sides, utility vehicles, dirt bikes, and snowmobiles. Percentages and rates were not adjusted for the number of participants, frequency of riding, duration of riding, or seasonal weather conditions.

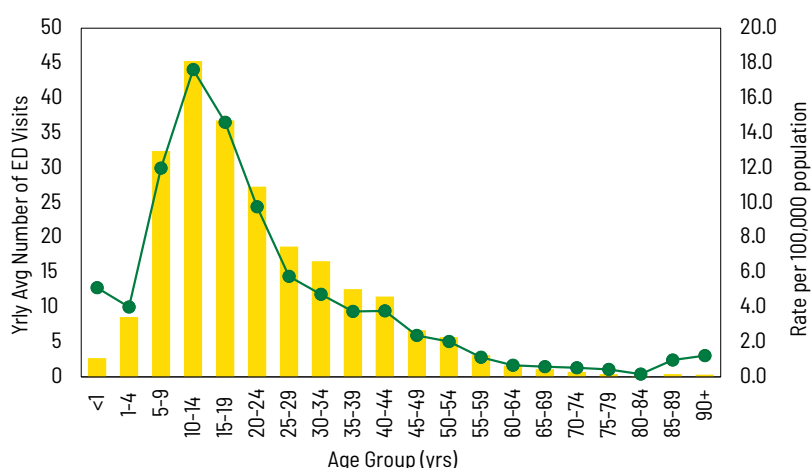
Rate of Off-Road Vehicle Injuries and Off-Road Vehicle Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Over the 10-year period, the off-road vehicle visit rate experienced a statistically significant average decrease of 3.8% each year.

During this same time period, the off-road vehicle concussion visit rate experienced an average decrease of 1.1% each year.

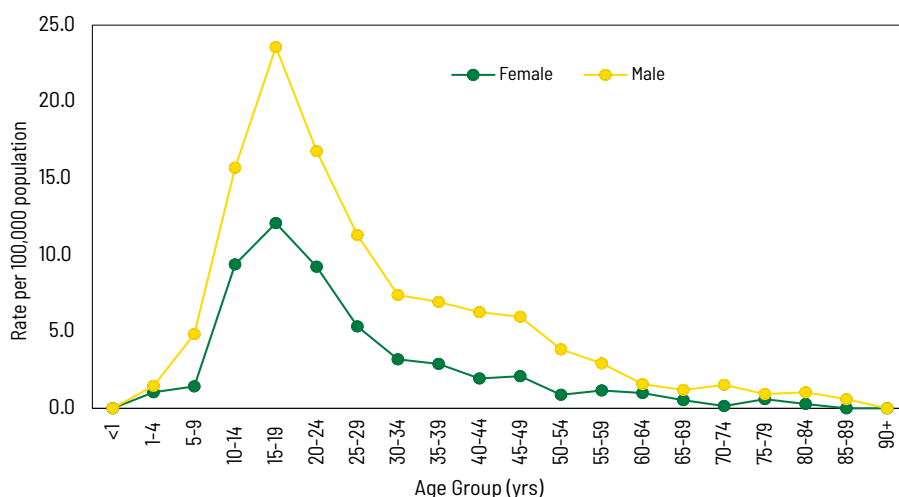
Number and Rate of Off-Road Vehicle Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 10 and 14 years of age had the highest average number and rate of off-road vehicle concussion emergency department / urgent care centre visits.

This was closely followed by those between 15 and 19 years of age with the second highest number and rate of off-road vehicle concussion emergency department visits.

Off-Road Vehicle Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Males had a consistently higher off-road vehicle concussion emergency department visit rates than females in all age groups.

Males 15 to 19 years of age had the highest off-road vehicle concussion rate.

Ridden Animals & Concussions

Avg # Injuries
each year

2,663

Avg # Concussions
each year

254

% of Animal-ridden
from all Injuries

1%

% of Concussions from
all Concussions

2%

% of Concussions
from Animal-ridden

10%

- » On average, there were 2,663 animal ridden-related injury emergency department / urgent care centre visits each year.
- » On average, there were 254 animal ridden injury visits with a diagnosis of concussion.
- » Animal ridden-related injury emergency department / urgent care centres accounted for 1% of all injury visits.
- » Of all injury-related visits diagnosed with a concussion, 2% were as a result of an animal ridden incident.
- » 10% of the animal ridden visits were diagnosed with a concussion.

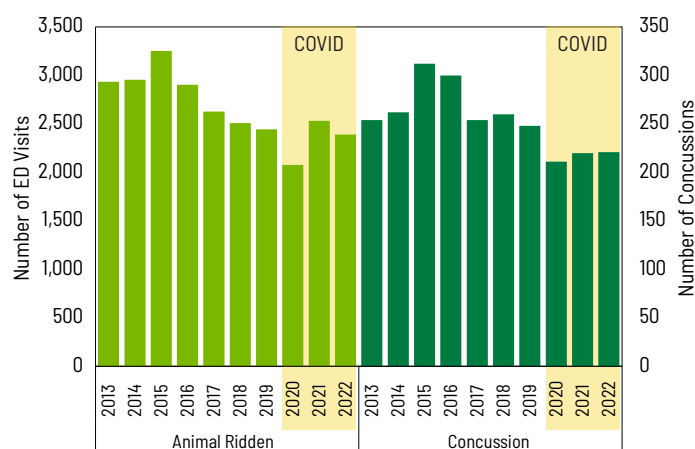
Number of Animal Ridden Injuries and Animal Ridden Concussion Visits by Year, Emergency Dept. / Urgent Care Centre Visits, Alberta, 2013-2022

During the 7 years prior to COVID-19 (2013-2019), on average, there were 2,804 ridden animal-related visits each year, 270 of which were diagnosed with a concussion.

In 2020, the total number of ridden animal injury visits decreased by 26% to 2,078, and the number of ridden animal injury visits diagnosed with a concussion decreased by 22% to 211.

In 2021, the total number of ridden animal injury visits decreased by 10% to 2,533 from the prior-to-COVID-19 average, and the number of ridden animal injury visits diagnosed with a concussion increased 19% to 220.

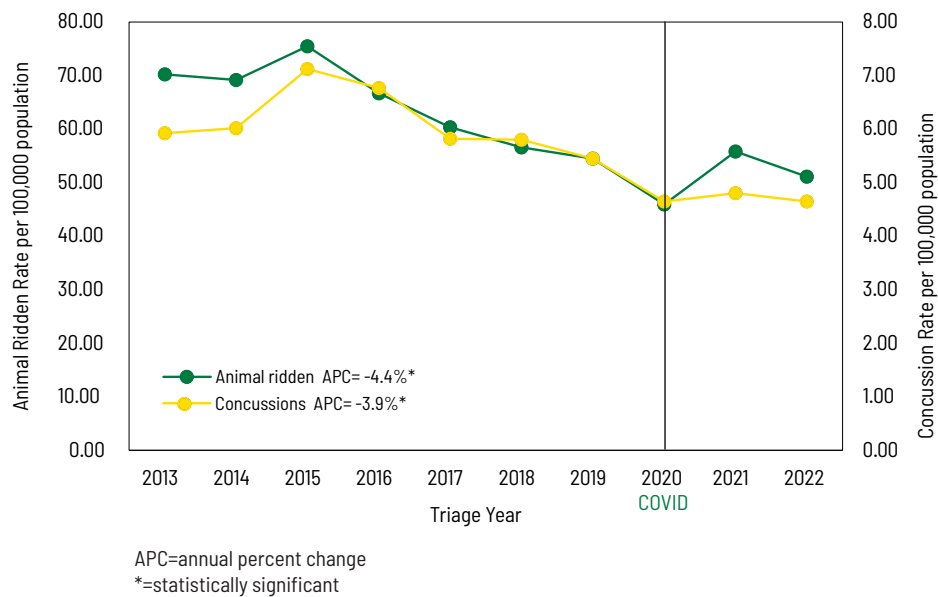
In 2022, the total number of ridden animal injury visits decreased by 15% to 2,391 from the prior-to-COVID-19 average, and the number of ridden animal injury visits diagnosed with a concussion decreased 18% to 221.



Animal ridden includes: animal-rider or occupant of animal-drawn vehicle injured by fall from or being thrown from, collision with pedestrian, vehicle, railway, fixed object (i.e. horseback riding and rodeo).

Percentages and rates were not adjusted for the number of participants, frequency of riding, duration of riding, or seasonal weather conditions.

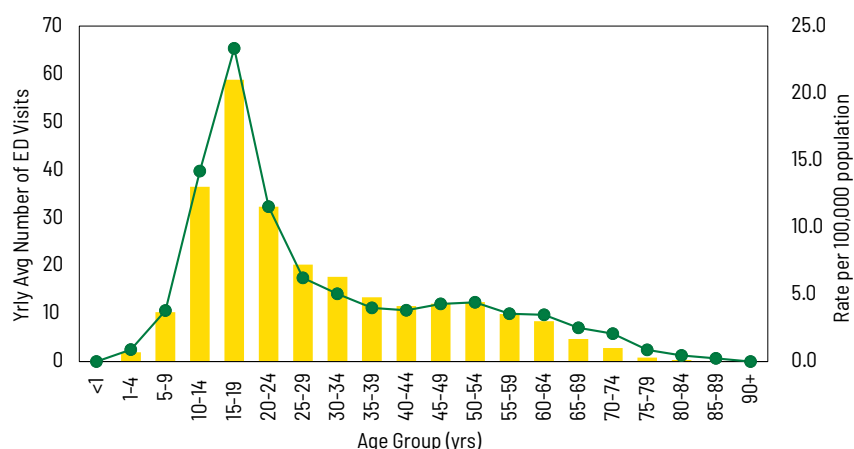
Rate of Animal Ridden Injuries and Animal Ridden Concussion Visits by Year, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Over the 10-year period, the animal ridden visit rate experienced a statistically significant average decrease of 4.4% each year.

During this same time period, the animal ridden concussion visit rate experienced a statistically significant average decrease of 3.9% each year.

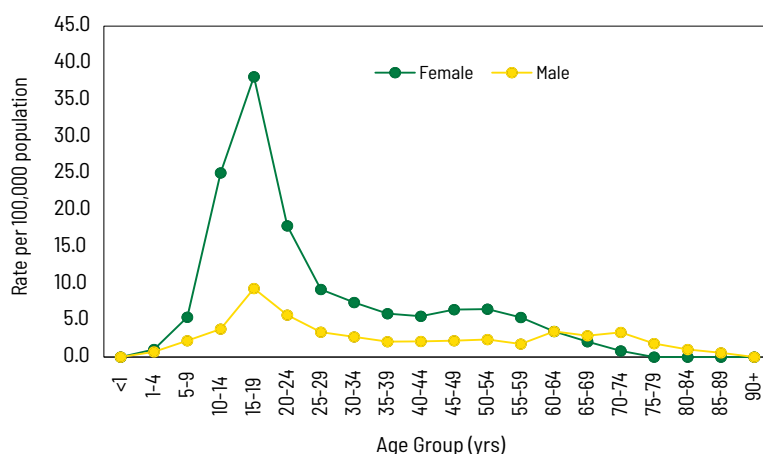
Number and Rate of Animal Ridden Concussion Visits by Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Alberta residents between 15 and 19 years of age had the highest average number and rate of animal ridden concussion emergency department / urgent care centre visits.

This was followed by those between 10 and 14 years of age with the second highest number and rate of animal ridden concussion emergency department visits.

Animal Ridden Concussion Visit Rates by Sex and Age Group, Emergency Dept. / Urgent Care Centre, Alberta, 2013-2022



Animal ridden is one of the few mechanisms of injury in which females had a higher concussion emergency department visit rate than males in all age groups up to 60 years of age. Males older than 60 years of age had higher animal ridden rates than females in the same age groups.

Females 15 to 19 years of age had a rate 4 times higher than males in the same age.

Appendix A - Data Sources & Methods

Data for this report was obtained from Alberta Health. Emergency Department Visits are from the National Ambulatory Care Reporting System (NACRS) with a visit date between January 1, 2013 and December 31, 2022.

The mechanism of injury was determined by the first external cause of injury (V01-Y09) classified according to International Classification of Disease (ICD)-10 CA. Concussions were determined by the nature of injury code S06 in any diagnosis field.

The data are based on emergency department visits rather than individual patients, therefore multiple visits of the same patient for the same injury would be counted as separate cases.

Non-residents of Alberta, those identified as not having an Alberta postal code at the time of the visit were removed. Those identified as being homeless were assigned the zone of the treating facility.

Direct age-standardization method was used as it accounts for differences in the age structures of the populations being compared (study populations), by weighting their respective age-specific rates to the age distribution of a standard population. The Canadian population of 2022 was used as the standard population. No adjustments were made on the number or rates of falls based on weather or other conditions.

Regression analysis of injury data was performed using the Joinpoint Regression Program which was developed by the Statistical Research and Applications Branch of the National Cancer Institute of the U.S. National Institutes of Health. Joinpoint uses statistical analysis to fit the most appropriate trend line model based on the time series data (i.e., age-standardized injury rates). For more information visit: <http://surveillance.cancer.gov/joinpoint/>.

Changes in the trend line are expressed by the average annual per cent change (APC). The sum of the average percentage change between time period will give the overall change.

Percentages and rates were not adjusted for the number of registered participants, frequency of play, duration of play or seasonal weather conditions.

Appendix B - Mechanism of Injury Categories

To ensure the mechanism of injury categories reported by the Injury Prevention Centre (IPC) are comparable to other jurisdictions, IPC conducted a review of the injury reporting systems maintained by the following organizations: Alberta Health, British Columbia Injury Research and Prevention Unit, Canadian Institute for Health Information (CIHI) National Trauma Registry, Centers for Disease Control and Prevention (CDC), and EpiCentre-California.

Based on the current systems and the reporting needs for death, hospital admission, and emergency department visit data, IPC decided that the CIHI-National Trauma Registry system would be used as the foundation for IPC's mechanism of injury category system. This system provides the best degree of specificity needed for reporting.

Enhancements to some of the mechanism of injury categories allow IPC to make national comparisons should the need arise, and to meet more detailed regional / provincial reporting needs. For example: the CIHI system incorporates sports-related injury codes in the "general" mechanism of injury category. While this level of detail may be appropriate for hospital admissions, it does not provide the detail needed to report emergency department visits.

The IPC system reports sports-related "striking against or struck accidentally by objects or person" in the sports-related category. This level of specificity is required as sports-related injuries are within the top 10 mechanisms of injury for emergency department visits. Specificity is also required around fall-related injuries. Falls are the leading cause of injury hospital admissions and emergency department visits (excluding adverse events).

Appendix C – Mechanism of Injury Categories ICD-10CA Codes

Mechanism of Injury	ICD-10 /ICD-10-CA
Motor Vehicle	V02.0-V02.9, V03.0-V03.9, V04.0-V04.9, V09.0, V09.2 V12.0-V12.4, V12.5, V12.9, V13.0-V13.2, V13.4, V13.5, V13.9, V14.0-V14.2, V14.4, V14.5, V14.9, V19.0-V19.2, V19.4, V19.5, V19.6 V2*.0(0-9), V2*.1(0-9), V2*.2(0-9), V2*.3(0-8), V2*.4(0-9), V2*.5(0-9), V29.3 V3*.0(0-9), V3*.1(0-9), V3*.2(0-9), V3*.3(0-9), V3*.4(0-8), V3*.6(0-8), V3*.7(0-8), V3*.9(0-8), V39.5, V39.6, V39.8, V39.9 V4*.0(0-9), V4*.1(0-9), V4*.2(0-9), V4*.3(0-9), V4*.4(0-8), V4*.6(0-8), V4*.7(0-8), V4*.9(0-8), V49.5, V49.6, V49.8, V49.9 V5*.0(0-9), V5*.1(0-9), V5*.2(0-9), V5*.3(0-9), V5*.4(0-8), V5*.5(0-8), V5*.6(0-8), V5*.7(0-8), V5*.9(0-8), V59.4, V59.5, V59.6, V59.8, V59.9 V6*.0(0-9), V6*.1(0-9), V6*.2(0-9), V6*.3(0-9), V6*.4(0-8), V6*.5(0-8), V6*.6(0-8), V6*.7(0-8), V6*.9(0-8), V69.4, V69.5, V69.6, V69.8, V69.9 V7*.0(0-9), V7*.1(0-9), V7*.2(0-9), V7*.3(0-9), V7*.4(0-8), V7*.5(0-8), V7*.6(0-8), V7*.7(0-8), V7*.9(0-8), V79.4, V79.5, V79.6, V79.8, V79.9 V82.0, V82.1, V83.2, V8*.0(3-5), V8*.1(3-5), V83.3, V83.4, V83.5, V83.6, V83.7, V83.9, V84.2, V84.3, V84.4, V84.5, V84.6, V84.7, V84.9, V85.2, V85.3, V85.4, V85.5, V85.6, V85.7, V85.9, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2, V89.9, V98, V99
Bicycle	V10.0-V10.9
Animal-ridden	V80.0-V80.9
Off-highway vehicles	V86.00, V86.08, V86.10, V86.18, V86.2, V86.30, V86.38, V86.4, V86.50, V86.51, V86.58, V86.60, V86.61, V86.68, V86.7, V86.90, V86.91, V86.98
Unintentional Falls	W00, W01, W03, W04, W05.00-W05.09, W06-W19
Sports-Related Injuries	W02.00-W02.08, W21.00-W21.09, W22.00-W22.08, W51.00-W51.08
Violence and Injury Purposely	X85-X94, X95.00-X95.09, X96-X99, Y00-Y09

Appendix D – Definitions

Falls includes:

Ice and snow, slipping / tripping / stumbling, due to collision with, or pushing by another person (not sports-related), while being carried or supported by another person, falls involving wheelchairs and other type of walking devices, from furniture, playground equipment including trampolines, stairs / steps, ladders / scaffolding, out of / from buildings or structures, falls from high place, falls from one level to another, falls on same level, unspecified falls.

Sports-related activities includes:

Falls on same level from collision, pushing or shoving by or with another person in sports; striking against or struck accidentally by objects or persons in sports; and with subsequent fall. Excludes: bicycles, off road vehicles, and animal ridden injuries which are reported separately.

Motor vehicle-related events includes:

Traffic, non-traffic, and boarding incidents involving pedestrians, motorcycles, cars / pickup trucks / vans, heavy transport vehicles, buses, other land transport vehicles. Excludes: bicycles and off-road vehicles which are reported separately.

Violence includes:

Injuries inflicted by another with the intent to injure or kill, by any means.

Bicycles includes:

Traffic and non-traffic injuries. Example: struck by a vehicle, struck stationary object, or fall off bicycle.

Off-road vehicles includes:

All motor vehicles designed primarily for off-road use. This includes, ATVs, quads, side-by-sides, utility vehicles, dirt bikes and snowmobiles.

Animal ridden includes:

Animal-rider or occupant of animal-drawn vehicle injured by fall from or being thrown from, collision with pedestrian, vehicle, railway, fixed object. (i.e. horseback riding and rodeo).

Percentages and rates were not adjusted for the number of participants, frequency of riding, duration of riding or seasonal weather conditions.

A bit about the Injury Prevention Centre

Since 1998, the Injury Prevention Centre (IPC) has been a leader in working with communities and partners to address the issue of injuries in Alberta—an issue that costs Alberta \$7.1 billion each year.

The IPC has a long and proud history of supporting organizations, communities, and individuals to take actions to reduce their injury risk. For decades, often in partnership, we have initiated and implemented province-wide evidence informed initiatives, programs, and advocacy efforts. By focusing on preventing injuries we can save lives. We can also keep Albertans out of emergency rooms and hospital beds. By taking action, we ensure that Albertans stay healthy and fit so that they can continue to live their lives to the fullest.

Taking steps to reduce injury does not mean enveloping our children in bubble wrap; eliminating all risk from our lives. Albertans are risk takers – that’s what makes Alberta the province it is. Rather, preventing injury means using the evidence we have to take the measures we know will save lives and prevent Albertans from getting hurt. As connectors, providers and leaders we remain committed to our vision of ensuring that “Albertans work and play hard, free from life-limiting injuries.”

If you would like additional information about quad-related injuries or other types of injuries, please visit <http://injurypreventioncentre.ca> or contact us via phone at **780.492.6019** or email **ipc@ualberta.ca**



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Funding and Support

The Injury Prevention Centre receives core business funding from Alberta Health and is part of the School of Public Health at the University of Alberta. Provision of funding by Alberta Health does not signify that this project represents the policies or views of Alberta Health.