

Evidence-Based Recommendations for All-terrain Vehicles (ATV)

September 13, 2023

Provincial Injury Prevention ATV Recommendations

Copyright © 2023, Alberta Health Services. This material is intended for general information only and is provided on an “as is,” “where is” basis. Although reasonable efforts were made to confirm the accuracy of the information, Alberta Health Services does not make any representation or warranty, express, implied or statutory, as to the accuracy, reliability, completeness, applicability or fitness for a particular purpose of such information. This material is not a substitute for the advice of a qualified health professional. Alberta Health Services expressly disclaims all liability for the use of these materials, and for any claims, actions, demands or suits arising from such use.

Table of Contents

| | |
|---|----|
| Introduction | 4 |
| ATV Injuries: All Age Groups..... | 6 |
| ATV Injuries: Children and Youth | 7 |
| Summary of Evidence for ATV-Injury Risk Factors: | 9 |
| Age: | 9 |
| Helmet Use..... | 9 |
| Alcohol and other Drug Use..... | 10 |
| Carrying Passengers | 10 |
| Safety Training and Experience..... | 10 |
| Size of ATVs..... | 11 |
| Sex | 11 |
| Environmental Conditions..... | 11 |
| Injury Prevention Organization Recommendations for ATV Operation: | 11 |
| Literature-based Recommendations for ATV Operation:..... | 13 |
| Next Steps to Improve ATV Safety in Alberta:..... | 14 |

Introduction

All-terrain vehicles (ATVs), also referred to as quads, or quad bikes, are motorized vehicles that are maneuvered on off-high way terrain and designated trails. ATVs can be used as a recreational activity and are also used for occupational purposes including farming, agriculture or transportation in rural and remote areas. ATVs come in varying weights and sizes. The average adult sized ATVs can weigh anywhere from 100 to over 500 kilos (220 to 1150 pounds) and youth size ATVs are 100 to 250 kilos (250 to 550 pounds). The average ATV is 83 inches in length and 47 inches in width (BoostATV.com). ATVs have up to four balloon-style tires with a seat in the middle that a rider straddles. The base design does not come with safety features like roll bars, roll cages, or seatbelts. ATVs have evolved in their manufacturer and design and can come as side-by-side models that carry passengers. The evidence presented in this document pertain only to ATVs intended for a single rider and does not refer to side-by-sides, off-road utility vehicles, or utility terrain vehicles (UTVs) although the evidence-based recommendations for ATV operation can be used as a general guide for all off-highway vehicles. For a description of the vehicle type covered by this document, please refer to Appendix (A).

Due to their high center of gravity, narrow wheel stance and short wheelbase, ATVs can tip easily and can throw riders off. ATV rollovers and flips can occur and are the leading cause of ATV-related deaths (IPC, 2021). The most common mechanism of ATV-related injuries are ejections (where the operator is thrown off the quad bike), rollovers (where the operator can get trapped under their vehicle), and collisions (Adil et al., 2017). Between 2016 through 2020, 64 Albertans died due to ATV-related injuries. On average, 13 Albertans die every year from ATV-related injury (IPC, 2021).

ATV use is popular in Alberta, however, ATV injuries continue to negatively impact Albertans, their families and communities and place a preventable burden on the provincial health system.

Provincial Injury Prevention ATV Recommendations

This document provides an overview of ATV related harms for key populations, ATV risk factors and associated harm, and recommendations to mitigate harm based on the latest evidence for safe ATV riding and guidance from leading injury prevention organizations including Canadian Paediatric Society (CPS), Canadian Association of Paediatric Surgeons (CAPS), Parachute, Injury Prevention Centre (IPC) and the American Association of Pediatrics (AAP). AHS is an evidence informed organization and encourages AHS staff and external partners to use healthy public policy, such as this document, to raise awareness of key injury prevention messages around ATV use in Alberta. This document is intended for health promotion facilitators and other healthcare professionals working in the community to apply evidence to their injury prevention work. The recommendations made in this document serve as guiding principles on ATV safety which professionals can use to engage with communities.

ATV Injuries: All Age Groups

ATV-related deaths and rates per 100,000 population broken down by age groups for the years 2002 through 2019 in Alberta. Those aged 20-24 years had the highest rate of ATV-related deaths at 0.93 per 100,000 population.

| Age | <16 | 16-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65+ |
|------------------|------|-------|-------|-------|-------|-------|-------|------|
| Number of Deaths | 43 | 13 | 46 | 47 | 37 | 36 | 29 | 22 |
| Rate per 100,000 | 0.32 | 0.36 | 0.93 | 0.44 | 0.36 | 0.37 | 0.39 | 0.29 |

Source: IPC 2020

ATV-related trauma admissions and rates per 100,000 population broken down by age groups for the years 2015 through 2019 in Alberta. Those aged 45-54 years and 16-19 years also had the highest rates of ATV-related trauma admissions at 2.7 and 2.5 per 100,000, respectively, compared to all other age groups.

| Age | <16 | 16-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65+ |
|-----------------------------|-----|-------|-------|-------|-------|-------|-------|-----|
| Number of Trauma Admissions | 33 | 25 | 31 | 73 | 61 | 76 | 46 | 30 |
| Rate per 100,000 | 0.8 | 2.5 | 2.2 | 2.1 | 1.9 | 2.7 | 1.8 | 1.1 |

Source: IPC 2020

**Note Major traumatic injuries are determined by the use of the ISS (Injury Severity Score), an internationally recognized severity of injury measurement. This score does not include all injuries, just those severe enough to be categorized as major traumatic injury.*

ATV Injuries: Children and Youth

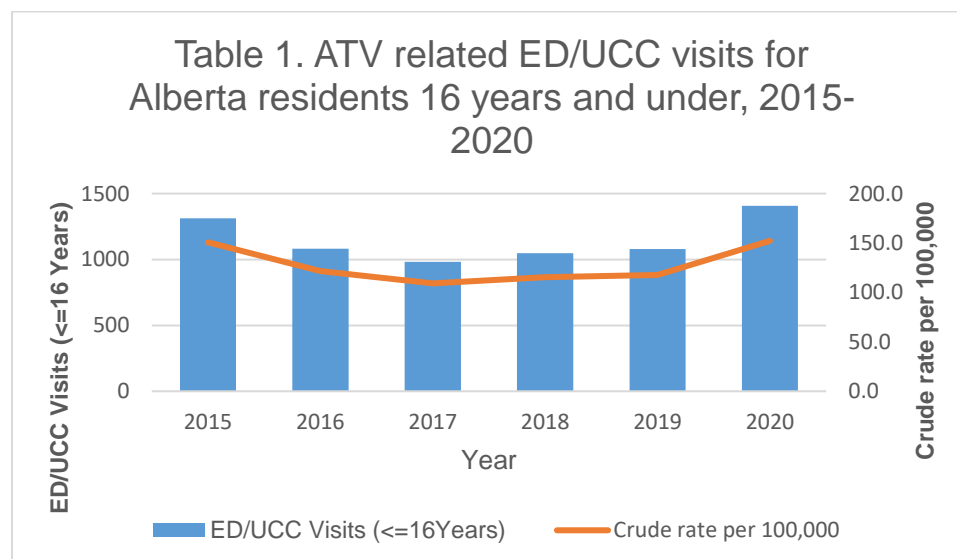
Children and youth 16 years and younger continue to experience ATV-related injuries leading to emergency department (ED) and urgent care centre (UCC) visits, hospitalizations, and death. The following data shows the impact of ATV-related injuries for children and youth 16 years and younger for the years 2015 through 2020 in Alberta. There were:

- 6908 ATV-related ED and UCC visits for children and youth 16 years and younger.
- 563 ATV-related hospitalizations for children and youth 16 years and younger.
- 13 ATV-related deaths for children and youth 16 years and younger.

**The data above was gathered using ICD-10 codes for ATV, snowmobile and off-road vehicle related injuries. Source: Source: Surveillance and Reporting, Alberta Health Services 2022.*

***It is important to note the data above includes Albertans 16 years of age and younger however the rest of the document refers to youth as under 16 years of age.*

Table 1: ATV related ED/UCC visits for Alberta residents 16 years and under, 2015-2020



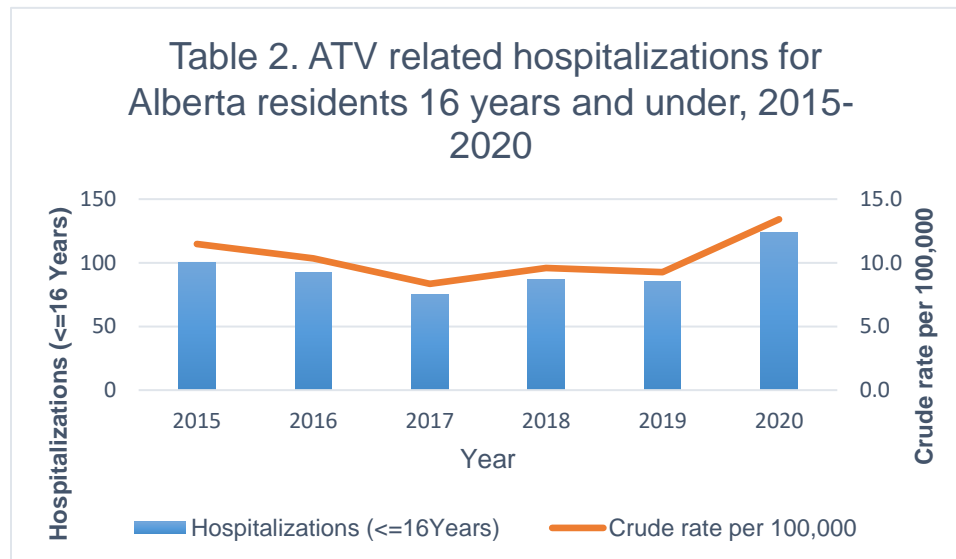
Source: Surveillance and Reporting, Alberta Health Services, 2022.

*Note crude rate is the number of new cases occurring in a specified population per year.

**Crude rate was calculated as the number of deaths/total population multiplied by 100,000.

Provincial Injury Prevention ATV Recommendations

Table 2: ATV related hospitalizations for Alberta residents 16 years and under 2015-2020



AHS Public Health Surveillance and Infrastructure, 2022.

*Note crude rate is the number of new cases occurring in a specified population per year.

**Crude rate was calculated as the number of hospitalizations/total population multiplied by 100,000.

Though it is safest if children under 16 years of age do not ride ATVs, if children under 16 years of age do ride there are harm reduction approaches that can be used. Riders should:

1. Wear a helmet at all times while operating an ATV.
2. Take an ATV safety training course prior to operating an ATV.
3. Ride sober, on clearly marked ATV trails in daylight hours.
4. Not carry passengers.
5. Ride on age and size appropriate ATVs (check manufacturer label for guidelines).
6. Be supervised by a parent or other responsible adult (highly recommended). (IPC, 2021)

More details about these approaches can be found in the Recommendations Section on page 12.

Summary of Evidence for ATV-Injury Risk Factors:

Age:

ATV operators younger than 16 years are at a higher risk than older drivers of injury due to their stage of physical and cognitive development.

- In Alberta, children and youth under 16 years accounted for 43 ATV-related deaths from the years 2002 through 2019 (IPC, 2020).
- The national mean age for ATV hospitalizations among children and youth is 9-13 years old (Parachute, 2021).
- Children and youth under 16 years of age are at a risk of ATV-related injuries due to a lack in physical strength, cognitive maturity and judgement to operate ATVs safely compared to other age groups (Denning and Jennissen, 2018).
- Children and youth under 16 years of age are at a higher risk of ATV-related injuries due to engaging in risky behaviors such as not wearing a helmet, driving impaired (alcohol and/or other drugs), carrying passengers on single-rider ATVs, and riding on terrain not made for ATV use (Public Health Ontario, 2019; Unni et al., 2012; Denning et al., 2018).

Helmet Use

ATV riders not wearing a helmet are at a higher risk of severe head injuries, traumatic brain injuries and other fatal ATV-related injuries compared to riders who wear a helmet.

- Head injuries are the most common type of injury in ATV collisions in Alberta (IPC, 2020).
- 39% of ATV-related deaths in Alberta were due to head injuries (IPC, 2020).
- Costs for treating an inpatient with an ATV-related head injury is 38% higher, on average, than for ATV inpatients without head injuries (Alberta Health, 2015).
- In 2002 through to 2019, there were 262 ATV-related deaths and of the deceased, 58% of the riders were not wearing helmets. Of the children and youth under 16 years in this group, 50% were not wearing helmets at the time of death (IPC, 2020).

Provincial Injury Prevention ATV Recommendations

- Helmet use reduces fatal head injuries by 40% (Denning and Jennissen, 2018).
- As of May 15, 2017, Albertans are required to wear government certified helmets for off-road vehicles, including ATVs operated on public land. (Gov't of Alberta, 2023)

Alcohol and other Drug Use

Operating ATVs under the influence of alcohol or other drugs impairs one's ability to recognize dangers or hazards while riding ATVs and can increase risky behaviours like not wearing helmets or carrying passengers on single-rider ATVs.

- Of the 195 Albertans who died in ATV incidents in 2002 through 2019, 59% tested positive for alcohol (IPC, 2020).
- Of the major trauma admissions between 2015 and 2019, 45% of people tested positive for alcohol use. Of those who tested positive, 92% were over the legal limit of 0.05 Blood Alcohol Content (BAC) (IPC, 2022).
- The Office of Chief Medical Examiner (OCME) tested 195 deceased ATV drivers for alcohol consumption. Of those tested, 81% of 35 to 44 years old tested positive for alcohol use and 78% of those between 16 and 19 years of age tested positive for alcohol (IPC, 2020).

Carrying Passengers

Riding with passenger(s) on ATVs made for single riding increases the risk of ATV rollovers, collisions or other negative incidents.

- Most ATVs are built for only one person, the driver; carrying a passenger increase the risk of injury to both the driver and passenger. Adding passengers can change the center of gravity, increasing the likelihood of ATV rollovers or crashes. Passengers can also add risk by distraction of the driver, especially for young and inexperienced drivers (Denning and Jennissen, 2018).
- In 2002 through to 2019, 13% of ATV-related deaths were passengers (IPC, 2021)

Safety Training and Experience

- Those without ATV safety training and inexperienced riders are at a higher risk of ATV-related injuries compared to ATV operators who have taken ATV safety training or have experience riding. (Benham et al, 2016)

Provincial Injury Prevention ATV Recommendations

- Currently in Alberta, [ATVcourse.com](https://www.atvcourse.com) offers the Canadian ATV Operator Course, approved and certified by the Canada Safety Council. ([ATVCourse.com](https://www.atvcourse.com))

Size of ATVs

- ATV operators riding a vehicle that is not correctly sized based on their height and weight are at a risk of sustaining serious injuries due to their inability to correctly maneuver the vehicle. (Gill et al, 2019)

Sex

- Males experience more ATV-related injuries than females because more males ride ATVs than females, and males engage in more risky behaviours while riding ATVs compared to females. (Aitken et al, 2004)

Environmental Conditions

- Riding ATVs in the dark, in poor weather conditions, or on paved roads, highways, unmarked trails, and other trails not designated for ATV-use increases the risk of ATV ejections, rollovers and collisions. (Aitken et al, 2004)

Injury Prevention Organization Recommendations for ATV Operation:

Below is a compilation of ATV safety recommendations created by Canada's leading injury prevention organizations, including CPS, CAPS, APP, Parachute, and IPC. Each of these injury prevention organizations are trusted by AHS and are referred to when sharing ATV-related injury prevention messaging. AHS works closely in partnership with Parachute and IPC to ensure ATV safety messaging is consistent, up-to-date and continues to follow an evidence-informed approach.

- AAP, CPS, CAPS, and Parachute, Canada's leading injury prevention organization, continue to affirm that children and youth under 16 years should not operate ATVs (CPS 2020, CAPS 2008, Parachute 2021).
- CPS and CAPS continue to support helmet legislation for ATV operators to increase helmet use to protect riders from fatal head injuries caused by ATV use (CPS 2020; CAPS 2008).

Provincial Injury Prevention ATV Recommendations

- CPS, CAPS, IPC, and Parachute recommend that operators of ATVs designed for single riders should never take on passengers. (CPS 2020; CAPS 2008; IPC 2021; Parachute 2022)
- CPS recommends provinces and territories mandate training courses (CPS 2020).
- AAP also recommends all riders take a hands-on safety course (2022).
- The CPS, CAPS, IPC, and Parachute recommend that ATV drivers complete an approved training course with theoretical and practical components in order to mitigate injury risks (CPS 2020; CAPS 2008; IPC 2021; Parachute 2022).
- CPS continues to affirm that smaller size ATVs should not be used for youth under 16 (CPS 2021).
- IPC states that no child under the age of 16 years should drive an adult-sized quad. Quad manufacturers have recommendations for machines and children and children should only ride quads made for their age, weight, and maturity (IPC 2021).
- AAP states that operators should only ride ATVs that are the right size for the operator. Youth models are available for 6 and older with age-based recommendations (AAP 2022).
- Parachute recommends the use of appropriately sized ATVs including Category Y-12+ ATVs intended for use by children aged 12 or older (under adult supervision) and Category T (Transition Model) ATVs intended for use by an operator aged 14 or older (under adult supervision) (Parachute, 2022).
- CPS, CAPS, IPC, and Parachute recommend that nobody should operate an ATV after consuming alcohol or other substances (CPS, 2020; CAPS 2008, IPC 2021; Parachute 2022).

Evidence-Based Recommendations for ATV Operation:

For all ATV operators, on public land and private, the following recommendations are made for safe ATV riding:

| | |
|------------------------|--|
| Age | ATV operators are a minimum of 16 years or older. |
| Helmet use | ATV operators wear government approved helmets at all times. |
| Safety gear | ATV operators wear eye protection goggles, protective clothing such as jackets, full length pants, gloves and proper footwear including boots. |
| Alcohol use | ATV operators refrain from consuming alcohol and/or other drugs, prior to and during ATV operation. |
| Safety training | ATV operators should complete an approved training course prior to riding that includes both knowledge-based and practical skill-based components. |
| Passengers | ATV operators do not carry passengers on ATVs designed for a single rider. |
| ATV size | ATV operators ride ATVs that are age-appropriate, and size-appropriate to their height and weight according to the manufacturer label. |
| Child and youth safety | As youth develop skills for ATV use, consider these guidelines to ride safely and reduce the risk of injury: mandatory helmet use, parental or adult supervision (defined by Parachute as the continuous attention of an adult of at least 18 years who has an unobstructed view and is within sight of the child and/or youth operating the ATV), ATV safety training with education on the risks associated with ATV riding, riding on clearly marked ATV trails, avoiding paved trails and highways, riding sober, and using age and size appropriate ATVs. |

Next Steps to Improve ATV Safety in Alberta:

- As a member of the Alberta Quad Safety Working Group, advocate for education, awareness, and resource development on ATV safety.
- Work with healthcare professionals, children and youth, parents, and the community to advocate for ATV safety and education.
- Continue to monitor evidence in Alberta and other jurisdictions regarding ATV safety to inform recommendations and interventions regarding safe use for occupational, transportation and recreational ATV purposes.
- Continue to collect ATV-related injury data in Alberta.
- Collaborate with key stakeholders working to improve ATV safety to reduce ATV-related injuries in Alberta.
- Continue to develop ATV safety messaging, resources, and tools for healthcare professionals, health promotion facilitators and others working the community on ATV safety and injury prevention.
- Collaborate and build coalitions in communities interested in ATV safety.
- Work on strategies to increase helmet use, decrease alcohol and substance use and promote safe ATV-use practices.
- Evaluate current training safety courses and measure change in ATV operator behaviour.

Appendix A:

All-terrain Vehicle classification



Known as: All-terrain vehicles (ATVs), quads, quad bikes, four-wheeler

Open (lacks roll bars or roll cages)

Handle-bars to steer

Low pressure tires

Long seat for single rider to straddle

References

Adil, M T et al. "All-Terrain Vehicle(ATV) Injuries - An Institutional Review Over 6 Years." *The Ulster medical journal* vol. 86,2 (2017): 103-107.

Aitken ME, Graham CJ, Killingsworth JB, et al. (2004). All-terrain vehicle injury in children: strategies for prevention *Injury Prevention*.10:303-307.

Alberta All-Terrain Vehicle (ATV) Working Group (2009). Common messages for ATV safety: A guide for injury prevention stakeholders. Alberta Centre for Injury Control & Research. Edmonton: Alberta.

Alberta Health Surveillance and Assessment (2015) Estimated Impact of ATV Helmet Use on Injuries and Direct Health Care System Costs. Alberta

Alberta Health Services (2009). Health & Safety Advisory. It's time to take ATV safety seriously. Alberta Health Services. Alberta.

Alberta Health Services Public Health Surveillance and Infrastructure.

American Academy of Pediatrics. (2022) ATVs Are Not Safe for Children: AAP Policy Explained. Retrieved August, 2023 from <https://www.healthychildren.org/English/safety-prevention/at-play/Pages/ATV-Safety-Rules.aspx>

ATV Course .com. (n.d.) Take your ATV Safety Course Online! Retrieved August, 2023 from: <https://www.atvcourse.com/>

Canadian Paediatric Society. Injury Prevention Committee (2020). Preventing injuries from all-terrain vehicles. Retrieved Dec 12, 2022. from <http://www.cps.ca>.

Denning GM and CA Jennissen. (2018). Pediatric and adolescent injury in all-terrain vehicles. *Res Sports Med*. 2018;26:38-56.

Emily C. Benham, Samuel W. Ross, Mariana Mavilia, Peter E. Fischer, A. Britton Christmas, Ronald F. Sing. (2017). Injuries from all-terrain vehicles: An opportunity for injury prevention. *The American Journal of Surgery*. 214(2): 211-216.

Fawcett VJ, Tsang B, Taheri A, Belton K, Widder SL. A Review on All Terrain Vehicle Safety. *Safety*. 2016; 2(2):15. <https://doi.org/10.3390/safety2020015>

Gill, P. J., McLaughlin, T., Rosenfield, D., Moore Hepburn, C., Yanchar, N. L., & Beno, S. (2019). All-terrain vehicle serious injuries and death in children and youth: A national

Provincial Injury Prevention ATV Recommendations

survey of Canadian paediatricians. *Paediatrics & child health*, 24(1), e13–e18.
<https://doi.org/10.1093/pch/pxy059>

Government of Alberta. (2023) Off-Highway Vehicle Helmet Law. Retrieved August, 2023 from <https://www.alberta.ca/off-highway-vehicle-helmet-law>

Grummon AH, Heaney CA, Dellinger WA, Wilkins JR 3rd. (2014) What influences youth to operate all-terrain vehicles safely? *Health Education Research*. 29(3):533-46.

Injury Prevention Centre (2020). Quad (ATV) Injuries in Alberta 2002-2019. PowerPoint Presentation. Retrieved August, 2023 from <https://injurypreventioncentre.ca/issues/ohv>

Injury Prevention Centre (2021). Quad/ATV Injuries in Alberta, Injury Prevention Centre Topic Summary. Retrieved August, 2023 from <https://injurypreventioncentre.ca/issues/ohv>

Jennissen CA, Peck J, Wetjen K, et al. (2015). The Safety Tips for ATV Riders (STARs) programme: short-term impact of a school-based educational intervention. *Injury Prevention*. 21:166-172.

Khorsandi, F., Paul D. Ayers, and Eric J. Fong. (2019). Evaluation of Crush Protection Devices for agricultural All-Terrain Vehicles. *Biosystems Engineering*. 185:161-173.

Krislok, Haavard. (2023) Average Weight of Different ATV Types (With Chart). Retrieved August, 2023 from <https://boostatv.com/atv-weight/>

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.

Parachute (2022). ATV Safety. <http://www.parachutecanada.org/policy/item/146>.

Quad (ATV) Injuries in Alberta, 2002-2019. [PowerPoint presentation]. Injury Prevention Centre. [June 2020, citation date: August 2023]. Available from: URL. <https://injurypreventioncentre.ca/issues/ohv>

Trauma Committee of the Canadian Association of Pediatric Surgeons (2008). Canadian Association of Pediatric Surgeons' position statement on the use of all-terrain vehicles by children and youth. *Journal of Pediatric Surgery*. 43: 938-939.

**Provincial Injury Prevention
ATV Recommendations**

Unni, Purnima MPH; Morrow, Stephen E. MD; L. Shultz, Barbara MSN Analysis of pediatric all-terrain vehicle trauma data in Middle Tennessee, Journal of Trauma and Acute Care Surgery: October 2012 - Volume 73 - Issue 4 - p S277-S280 doi: 10.1097/TA0b013e31826b00d7

US Consumer Product Safety Commission (1998). Part 1. Report on 1997 ATV Exposure Survey. US Consumer Product Safety Commission. MD: Bethesda.

US Consumer Product Safety Commission (2005). Part 3 Tab G. Analysis of Petition Requesting Ban of ATV's Sold for the Use of Children Under 16 years of Age. US Consumer Product Safety Commission. Washington, D.C.: p. 121-134. 21/12/2009.

US Consumer Product Safety Commission. All-terrain vehicle 2001 injury and exposure studies. January, 2003. <http://www.cpsc.gov/LIBRARY/FOIA/FOIA03/os/atvex2001.pdf> (Accessed February 23, 2012).

Injury Prevention Centre (2021). Off Highway Vehicle Injuries. Retrieved September, 2022 from <http://injurypreventioncentre.ca/issues/ohv>