INJURY INSIGHT
A Publication of the BC Injury Research and Prevention Unit in partnership with Karin Goodison

SNOWMOBILING INJURIES

The Issue

Snowmobile-related injuries are the most common cause of severe injuries sustained in winter sports and recreation activities.[1] Mortality is high – snowmobiling is the second most common cause of fatalities of all sports and recreation activities in Ontario.[2] Over a 12–year period, 1,046 people died in snowmobile crashes in Canada.[3] Over 660,000 snowmobiles were registered in Canada in 2004 (Canadian Council of Snowmobile Organizations), and 133,000 of these were in BC. It is estimated that approximately 1% of the Canadian population enjoy snowmobiling. Every year, 3.17% of these recreationalists are injured – 88.2 per 100,000 have a catastrophic injury and 36.5 per 100,000 die.[2] The majority (62.1%) of severe injuries and deaths sustained during snowmobile-related activities occurred among riders under the age of 30 years.[2] A significant number of injuries occur in children of all ages with injuries occurring in drivers as young as 5 years old. The severity of injuries and high incidence of death, especially in young people demonstrate that snowmobiling is a significant public health concern.

photo courtesy Government of Canada - Digital Connections from Canadian Council of Snowmobile Organizations

BACKGROUND AND PUBLIC HEALTH BURDEN…

- Snowmobiles often weigh over 600 lbs and can travel at speeds well over 120 km/hr. Stopping distances can be significant, ranging from 52 ft at 25kph to 272 ft at 72kph.[4]
- Snowmobiling has become an increasingly popular winter sport which is enjoyed by more than 2 million North Americans.[5]
- Each year more than 200 North Americans die and another 14,000 experience snowmobile-associated injuries.[5]
- Many of these injuries are of high severity, with snowmobiling having the highest Injury Severity Score (ISS).[5]
- Snowmobiling injuries also incur the highest mean length of stay (LOS) of winter sports and recreation-related severe injury hospitalizations.[5]

USEFUL WEBSITES AND RESOURCES…

- **The Safe Riders!** Snowmobile Safety Awareness Program http://www.snowmobilers.org/saferider/homepage/page_02.html
- **Sled Smart** Program in rural schools www.albasnowmobile.ab.ca/safety/safety.html
- **BC Snowmobile Federation** – safety tips, avalanche awareness, snowmobile operator safety courses http://www.bcsf.org/safety/
- **Transport Canada** – Safe Snowmobiling http://www.tc.gc.ca/eng/roadsafety/tp-tp2436-rs200001-menu-199.htm
- **Caring for Kids** – Snowmobiles: Safety Tips for Families http://www.caringforkids.cps.ca/handouts/snowmobiles
- **ZacsTracs** – Avalanche Skills Training http://www.zacstracs.com/
- **UBC Avalanche Research Group** http://www.geog.ubc.ca/avalanche/Publications.html
- **Canadian Avalanche Society** http://www.avalanche.ca/cac

Risk Factors for Snowmobiling Injuries

Male Gender

- Male snowmobilers outnumber females by a ration of 2:1, but are 6 times more likely to sustain a catastrophic injury.[2]
- Research shows that males are more likely than females to sustain an injury from snowmobiling.[6-12]

Young Age

- Snowmobile-related injuries occur primarily in those aged 11-40 years.[2]
- The peak incidence occurs in the 21-30 year old age category (40% of catastrophic injuries), while those aged 11-20 years old and 31-40 years old, account for almost 20% each. [2]
- 12% of injuries occur in children younger than 17 years of age.[4]

Location

- In Canada, 80% of snowmobile-related deaths occur off-trail, despite the bulk of km being ridden on maintained trails.[13]
- In Manitoba, only 16% of snowmobiling incidents occurred on groomed trails, while 31% occurred on roads.[7]
- In BC, avalanches contribute to a significant number of snowmobiling injuries each year.[14]
- During the 2010/11 season, 6 snowmobilers were killed in avalanches in Canada – 5 occurred in BC.[14]
- In 2008/09, 19 recreational snowmobilers died in BC as a result of being buried in avalanches.[14]

Time of Day

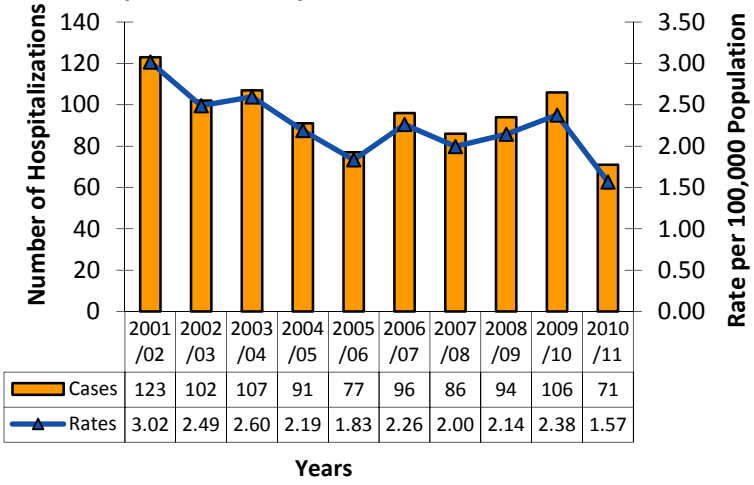
- Researchers in Manitoba demonstrated that 68% of injuries associated with snowmobiling occurred during hours of suboptimal lighting and 18% occurred after midnight.[7]
- Speeds exceeding 50km/h are not recommended after dark as this speed 'overdrives' the headlights, increasing driver reaction time.[7]
- The CDC reported that 54% of 2002/03 winter snowmobiling-related fatalities in Maine, New Hampshire and Vermont occurred after sunset and several cases occurred within 30 minutes of sunset.[12]

Speed

- Excessive speed was the primary cause of the incident for 52% of snowmobile-related injuries and deaths in Maine, between 1991-1996.[11]
- Canadian studies have also identified speed as a key contributing factor in many snowmobiling injuries. [2, 7]

Snowmobiling Injury Hospitalizations

Number and Rates, Snowmobile Injury Hospitalizations by Year, BC, 2001/02-2010/11

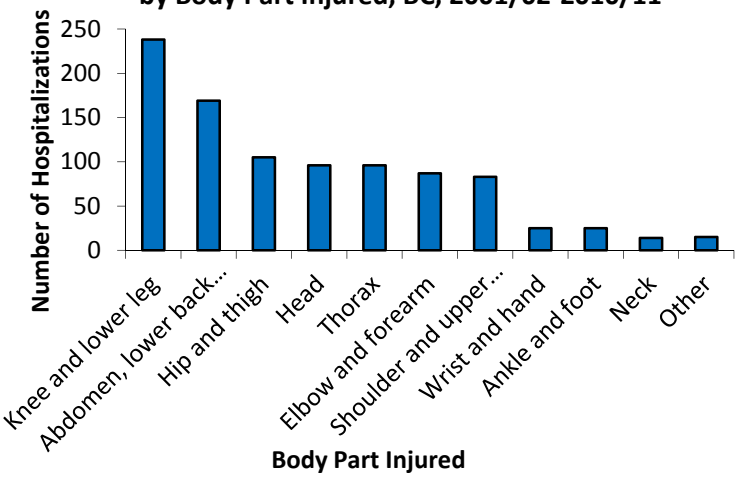


	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Cases	123	102	107	91	77	96	86	94	106	71
Rates	3.02	2.49	2.60	2.19	1.83	2.26	2.00	2.14	2.38	1.57

Years

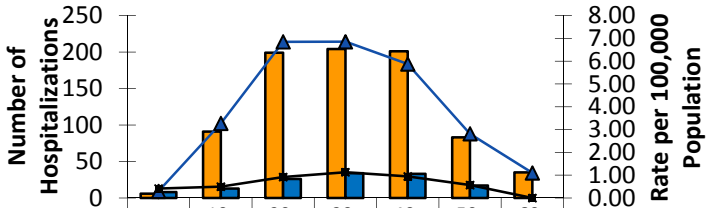
- The rate of snowmobile injuries has been decreasing over time
- Average length of stay in hospital for snowmobile injuries was 4.24 days
- Fractures account for 71.5% of all snowmobile injuries
- Injuries were common to the knee and lower leg
- Adult males aged 20-49 incur the highest rates of snowmobile hospitalizations

Number of Snowmobile Injury Hospitalizations by Body Part Injured, BC, 2001/02-2010/11



Body Part Injured

Number and Rates, Snowmobile Injury Hospitalizations by Age Group, BC, 2001/02-2010/11



	1-9	10-19	20-29	30-39	40-49	50-59	60-79
Male Numbers	6	91	199	204	201	83	35
Female Numbers	8	13	26	34	33	17	0
Male Rates	0.29	3.27	6.85	6.85	5.87	2.82	1.10
Female Rates	0.41	0.50	0.92	1.13	0.95	0.57	0.00

Age Group in Years

Alcohol Consumption

- 70.4% of injured snowmobilers in Manitoba had a BAC greater than 0.08.[7]
- Alcohol was involved in 57% of catastrophic snowmobile-related injuries in Ontario.[2]
- A compilation of reports from a variety of US states report a range of 16-67% of fatal snowmobiling injuries involved alcohol.[4]
- 12 years of Canadian data revealed that alcohol was involved in 70.6% of snowmobile-related fatalities.[3]
- Crashes that occurred at night were 6.7 times more likely than daytime crashes to have involved a drinking operator.[3]
- Weekend crashes were 1.8 times more likely as weekday crashes to involve alcohol.[3]
- Fatally injured snowmobile operators aged 26-35 were about 7x more likely to have been drinking than those aged over 55 years.[3]
- Of the almost 71% of drinking drivers, 52.9% had BAC>150mg/dl, 25.8% had a BAC of 81-150 mg/dl and 21.3% had a BAC of 1-80 mg/dl.[3]

Options for Prevention of Snowmobiling Injuries

Education (age-appropriate, at-risk groups)

- The Safe Riders! Snowmobile Safety Awareness Program (International Association of Snowmobile Administrators & American Council of Snowmobile Associations)
- Sled Smart Program for rural schools (Alberta Snowmobile Association)
- Safety tips, avalanche awareness and snowmobile operator courses (British Columbia Snowmobile Federation)

Enactment

- Speed limits, mandatory helmet use, compulsory safety education, age limits for drivers, lower BAC laws.[4]
- Snowmobile legislation varies greatly across Canada – harmonize
- Mandatory safety and avalanche courses
- Enhanced education surrounding snowmobiling laws

Engineering

- Alcohol ignition interlock devices.[3]
- Speed limiting governor to limit maximum speed for newly licensed operators; improvements in headlight luminance, braking, steering, stability.[15]

Enforcement

- Enforcement of legislation could involve increased policing, yet resources are inadequate to patrol
- Snowmobile clubs have attempted to fill in the gaps: STOP Snowmobile Trail Officer Patrol – Ontario provincial police, Ontario Federation of Snowmobile Clubs, and municipal police services (evaluation available)[16]

The Mountain Snowmobile Education Project

- "Will help prepare snowmobilers with knowledge that could save their lives"
- A new Canadian Avalanche Centre (CAC) initiative supported by Federal, Provincial, and Municipal Governments
- Details: http://www.avalanche.ca/cac/mnt-snow-edu-pr

Recommendations

BC should implement a motorized snow vehicles act:

- BC requires a mandatory helmet law for snowmobilers. Helmet use should be a universal requirement for operators and passengers.[8] This is endorsed by the CPS[15] and AAP.[17]
- Children under the age of 16 should not be permitted to operate a snowmobile for the purpose of recreation. This is endorsed by the CPS and AAP.[15, 17]
- A driver's license or certificate of competence should be required to operate a snowmobile. A snowmobile training course and avalanche course are recommended for all riders.
- Speed limits should be posted on groomed trails and roads. A night time speed limit of 50km/h is recommended.
- Headlights and tail lights should be mandatory on all snowmobiles. The use of head and tail lights while operating a snowmobile between sunset and sunrise or in reduced visibility should be legislated. Manufacturers should be encouraged to improve headlight luminance.
- It is against the law (Canada's criminal code) to drive a snowmobile while impaired by alcohol or drugs. Education and enforcement should be utilised to help reduce the number of intoxicated snowmobile drivers and thus the injuries and deaths associated with this high risk combination.
- Enforcement of legislation through a program such as STOP is recommended.[16] Referencing current legislation and programs in Ontario http://www.mto.gov.on.ca/english/safety/topics/snowmobile.shtml and Quebec is recommended.
- Evaluation of the process and the impact of the recommendations should be completed.

Methods

- Data were obtained through the Discharge Abstract Database (DAD) from the BC Ministry of Health.
- Hospitalization information on injuries in the DAD is recorded using the International Classification of Disease version 10 codes (ICD-10). ICD-10 codes used to capture snowmobile injuries were V86.00, V86.10, V86.30, V86.50, V86.51, V86.60, V86.61, V86.90, V86.91.
- Other information obtained from the DAD included demographics such as age and sex of the patient hospitalized as well as the type of injury incurred.

Analyses

- Hospitalizations due to snowmobiling were investigated by year, age group and type of injury. Age standardized rates were calculated by year. Age specific rates were calculated by age group and sex.

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