

# Motor Vehicle Collisions in Eastern Ontario

Supplement to the Eastern Ontario Health Unit  
Injury Report

September 8, 2009



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The Eastern Ontario Health Unit recently released a report on injury (May 2009), studying intentional and unintentional injuries and highlighting prevalence and impact on ambulatory visits to an emergency room, hospitalizations and mortality. One of the key findings of the injury report was that motor vehicle collisions are a major cause of ER visit, hospitalization, and mortality in Eastern Ontario; especially for teens aged 15-19 years.

The Ministry of Transport of Ontario collects a fair amount of data whenever a motor vehicle collision requires a police report. Data is gathered on the collision (weather, light condition), vehicles involved (type, color, speed) and the persons involved (age, number, position in vehicle). These three data sources are stored in the Accident Database System (ADS) (data captured on collision form completed by police officers). The health unit was able to obtain a limited amount of data on collisions occurring on its territory as well as data summaries concerning Ontario. Unfortunately, the health unit was not allowed to obtain raw data, which limited statistical analyses, especially cross-tabulations. Whenever possible, data from the Eastern Ontario Health Unit region was compared to Ontario, either in rates or in percentages. Numbers reported are the total number of events from 2003 to 2005, unless otherwise specified.

In the three year period from 2003 to 2005, there was a total of 9,989 collisions implicating 15,983 vehicles in Eastern Ontario, which corresponds to 1.60 vehicles per collision, compared to 708,269 collisions implicating 1,305,036 vehicles in Ontario (1.84 vehicles per collision). In the same time period, there were 5240 persons involved in fatal and personal injury collisions in Eastern Ontario, compared with 415,677 persons in Ontario

Using 2003-2005 combined data, the rate of collisions per 1000 vehicles registered in our region is lower than Ontario: 20.35 collisions per 1000 vehicles registered in Eastern Ontario versus 29.57 collisions per 1,000 registered vehicles in Ontario. The number of vehicles involved in a collision is also lower in Eastern Ontario: 32.57 vehicles involved in a collision per 1000 registered vehicles versus 54.48 in Ontario. Overall rates are lower in Eastern Ontario than in the province; however, local statistics indicate that specific areas or subgroups are worst off in our area than in the province.

The present report will focus on three aspects: the collision (accident), vehicles involved, and people involved.

### **Collision:**

The majority of collisions on the EOHU territory occur during daylight hours (62%) on dry roads (61%) in good condition (98%), in clear weather (75%). Collisions occur infrequently under adverse conditions such as dark lighting (30%) (at night with no artificial lighting), wet roads (18%), icy roads (6%), rain

(10%), and snow (10%). When comparing Eastern Ontario to the province, lighting conditions appear to play an important role. Collisions occur much more frequently in Eastern Ontario at night on unlit roads compared to the province as a whole (30.3% [99.9% CI 31.6% – 29.1%] vs. 18.8%;  $p < 0.001$ ).

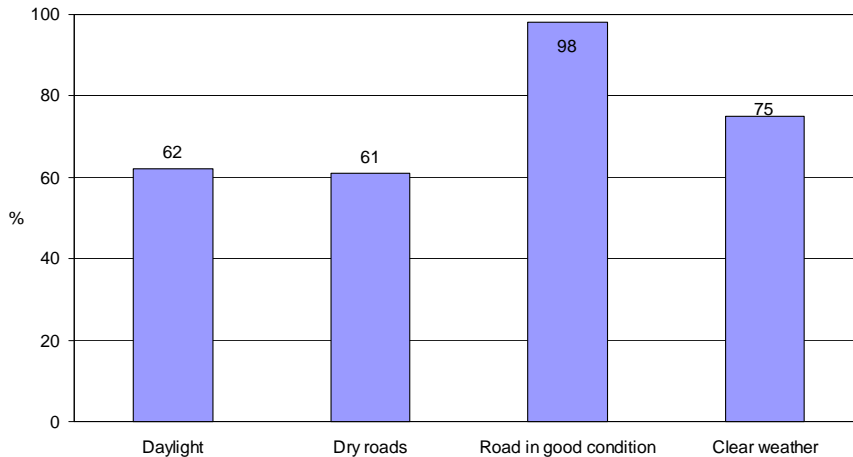


Figure 1: Conditions under which a collision occurred on the EOHU territory.

**Most collisions that took place in Eastern Ontario occurred (2003-2005) under good road and weather conditions**

Occurrence of a collision is relatively equal throughout the week, although they seem to occur somewhat less frequently on Sundays and somewhat more on Fridays, a pattern similarly found at the provincial level. It is unclear whether higher/lower volume of traffic is responsible for this fluctuation or if some other factor is present. Table 1 shows the number of collisions per day in our region and in Ontario.

	EOHU (2003-2005)		Ontario (2003-2005)	
	N	%	N	%
Monday	1,330	13.3%	99,028	14.0%
Tuesday	1,413	14.1%	102,972	14.5%
Wednesday	1,517	15.2%	104,233	14.7%
Thursday	1,464	14.7%	109,054	15.4%
Friday	1,644	16.5%	122,232	17.3%
Saturday	1,425	14.3%	94,517	13.3%
Sunday	1,196	12.0%	76,233	10.8%
<b>Total</b>	<b>9,989</b>	<b>100.0%</b>	<b>708,269</b>	<b>100.0%</b>

Table 1: Number of collision according to day of week

In addition, we combined collisions occurring on Saturdays and Sundays. When compared to the province, Eastern Ontario has a statistically higher rate of collision occurring during the weekend (26.2% [99.9% CI 27.7% – 24.8%] vs. 24.1%;  $p < 0.001$ ) than Ontario.

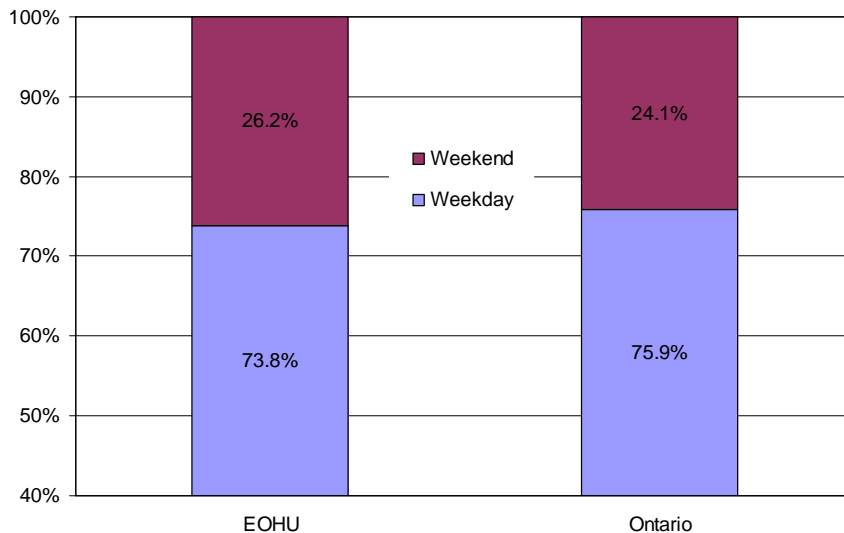


Figure 2: Days collisions occurred on the EOHU territory and in Ontario.

**Eastern Ontario has significantly more collisions occurring on Saturday (including Friday night after midnight) and Sunday than Ontario.**

Based on the posted maximal speed allowed, about half of all collisions occurred in a municipal setting (max speed 60 km/h or less), about one third on a secondary road (max speed 70-90 km/h) and 15% on highway 401 or 417. About three quarters of all collisions resulted in property damage only (no injury) and 21.9% of all collisions resulted in non-fatal injuries (compared to 21.5% in Ontario).

The police collision reports include the road or highway number on which the collision occurred. However, the frequency of collisions on a road is primarily a function of how much that road is travelled. Without performing a circulation survey, it is impossible to conclude that a certain road is “more dangerous” than another. However, it is possible to report that, of all collisions resulting in a police report from 2003 to 2005 on the EOHU territory (5 counties), 1.00% occurred on road 34, 2.27% occurred on road 138, 7.26% occurred on highway 401, and 7.81% occurred on highway 417.

From 2003 to 2005, 44 collisions resulted in at least one fatality (41 resulting in one fatality and 3 in two); however small, the rate of 4.4 fatal collisions per 1,000

(99% confidence interval 5.5 – 3.3) is statistically higher than the provincial rate of 3.0 fatal collisions per 1,000 collisions.

One of the most striking difference between Eastern Ontario and the province as a whole is the implication of a wild animal in the collision. From 2003 to 2005, in Ontario as a whole, a wild animal is implicated in a collision as a “moveable object” in 41,391 cases or 5.8% of all collisions; in Eastern Ontario, during the same three-year time period, 1,569 collisions implicated a wild animal (15.7%; 99.9% CI 16.5% – 14.9%), which is almost three times that of the province ( $p < 0.001$ ).

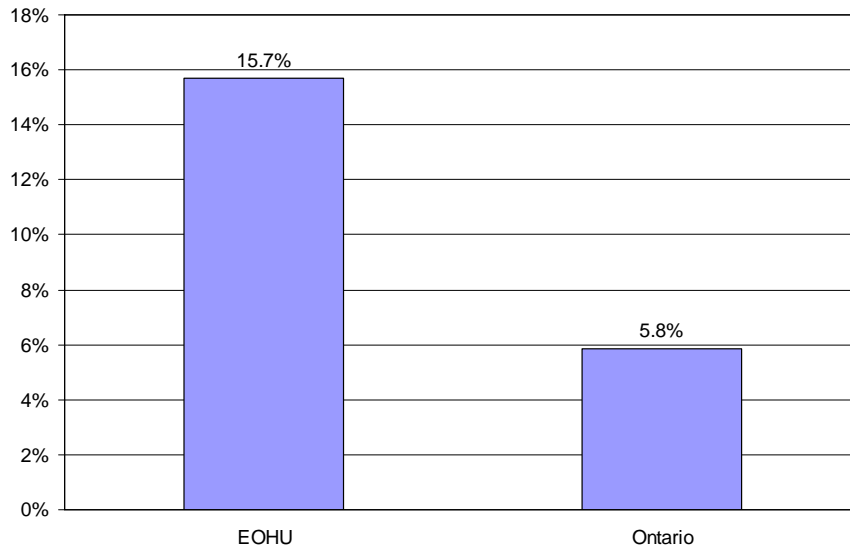


Figure 3: Wild animals implicated in collisions on the EOHU territory and in Ontario.

Wild animals are three times more likely to be involved in collisions in Eastern Ontario than in the province as a whole.

**Vehicles involved:**

From 2003 to 2005, there was a total of 15,983 vehicles implicated in a collision for which a police report was issued, or 32.6 vehicles involved per 1,000 registered vehicles. As a frame of reference, during the same time period, there was a total of 1,305,036 vehicles involved in a collision in Ontario, or 54.5 vehicles involved per 1,000 registered vehicles. Eastern Ontario therefore has fewer vehicles involved in collision per “automotive capita” than Ontario.

The data on vehicle class (table 2) is both interesting and puzzling; statistical analyses reveal highly significant differences ( $p < 0.001$ ) between our territory and Ontario for collisions implicating tractor trailers and collisions implicating motorcycles. Unfortunately, the proportion of missing is also different, which warrants caution when interpreting these results.

Vehicle Class	EOHU (2003-2005)		Ontario (2003-2005)	
	N	%	N	%
Tractor-trailer	355	<b>2.22</b>	22,279	<b>1.71</b>
School bus	102	0.64	5,966	0.46
Regular bus	3	0.02	2,427	0.19
Truck or combination <4600kg	94	0.59	8,950	0.69
School bus - max of 24 passengers	4	0.03	369	0.03
Regular bus - max of 24 passengers and ambulances	14	0.09	838	0.06
Automobile, small truck	12,465	77.99	948,482	72.68
G1 (novice g, level 1)	1	0.01	105	0.01
G2 (novice g, level 2)	7	0.04	2,800	0.21
Motorcycle	71	<b>0.44</b>	3,579	<b>0.27</b>
Missing	2,867	17.94	309,213	23.69
Total	15,983	100.00	1,305,036	100.00

Table 2: Class of license required for vehicle implicated in a collision

In addition, not knowing the number of each type of vehicle, it is impossible to control for this confounding factor; for example, if tractor-trailers constitute a higher proportion of vehicle of or passing through Eastern Ontario compared to Ontario, it is normal that they be more involved in a collision. In other words, if the “presence” rate of a type of vehicle is higher, it is likely that its collision rate will also be higher.

Compared to the province as a whole, vehicles involved in a collision in Eastern Ontario are likely to be older. Table 3 shows that vehicles involved in a collision in Ontario are more frequently new (less than 1 year old) or recent (2-4 years) whereas vehicles in Eastern Ontario are generally older (5 years or more, but less than 20 years) ( $p < 0.001$ ).

Model Year	EOHU (2003-2005)		Ontario (2003-2005)	
	N	%	N	%
One year old or less	2,368	14.8	202,161	15.5
2-4 years	3,556	22.2	303,758	23.3
5-7 years	3,236	20.2	254,629	19.5
8-10 years	2,629	16.4	194,406	14.9
11-19 years	3,206	20.1	253,847	19.5
20 yrs or more	222	1.4	17,680	1.4
Missing	766	4.8	78,555	6.0
Total	15,983	100.0	1,305,036	100.0

Table 3: Model year of vehicle implicated in a collision

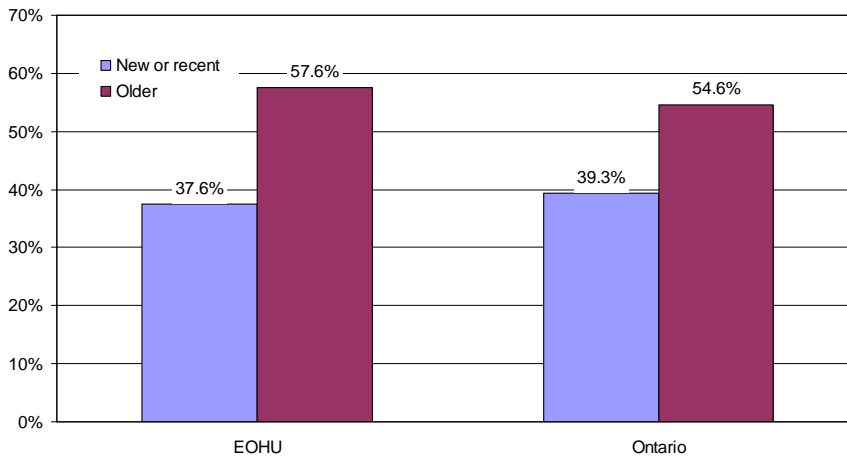


Figure 4: Age of vehicles involved in a collision recoded as new-recent (4 years or less) and older (5 years or more but less than 20 years).

Vehicles involved in collisions were older in Eastern Ontario compared to Ontario.

As part of recording information on vehicle(s) involved, some data is also collected on the driver. For example, data shows that 66.3% of drivers of vehicles involved in a collision resulting in a police report were males (68.1% in Ontario). The gender difference can be explained by the fact that men drive, on average, 74% more kilometres per year than women, thus increasing their likelihood of being involved in a collision.<sup>1</sup>

<sup>1</sup> Li G, Baker SP, Langlois JA, Kelen GD. Are female drivers safer? An application of the decomposition method. *Epidemiology*. 1998; 9(4):379-84.

There is no difference between Eastern Ontario and the province concerning the driver having a suspended license (0.2%). However, drivers from Eastern Ontario are less likely to be implicated in a hit-and-run (apprehended or not) (4.65% [99.9% CI 4.06% - 5.24%] vs. 5.44%;  $p < 0.001$ ).

Officers completing the police report are required to assess drivers' action(s). Drivers from Eastern Ontario implicated in a collision were less likely to have been driving properly ( $p < 0.05$ ) and more likely to have exceeded the speed limit (1.2% vs. 0.7%;  $p < 0.001$ ), to have driven too fast for the road or weather conditions (6.8% vs. 4.8%;  $p < 0.001$ ), to have lost control (8.9% vs. 6.4%;  $p < 0.001$ ), and to have failed to yield (9.0% vs. 7.2%;  $p < 0.001$ ).

Excessive speed (number of km/hr over the speed limit) was calculated and results show that Eastern Ontario drivers had more frequently exceeded the speed limit by less than 20 km/h (6.45% vs. 3.11%) and by 20-49 km/h (1.54% vs. 0.95%) ( $p < 0.001$  for both). However, this last result should be interpreted with caution in view of the large amount of missing data (6% in EO and 28% in Ontario).

Drivers from Eastern Ontario are also more likely to have been impaired (combination of "had been drinking", "ability impaired – alcohol over 0.08", "ability impaired – alcohol", "ability impaired – drugs") 1.0% vs. 0.8% ( $p < 0.05$ ) and to have been inattentive (13.9% vs. 7.6%;  $p < 0.001$ ).

The combination of excessive speed and impaired ability may explain why collisions in Eastern Ontario resulted in more serious vehicle damage than in Ontario. Damage was assessed as "severe" or "vehicle demolished" in 21.4% of collision in Eastern Ontario vs. 16.2% in Ontario ( $p < 0.001$ ).

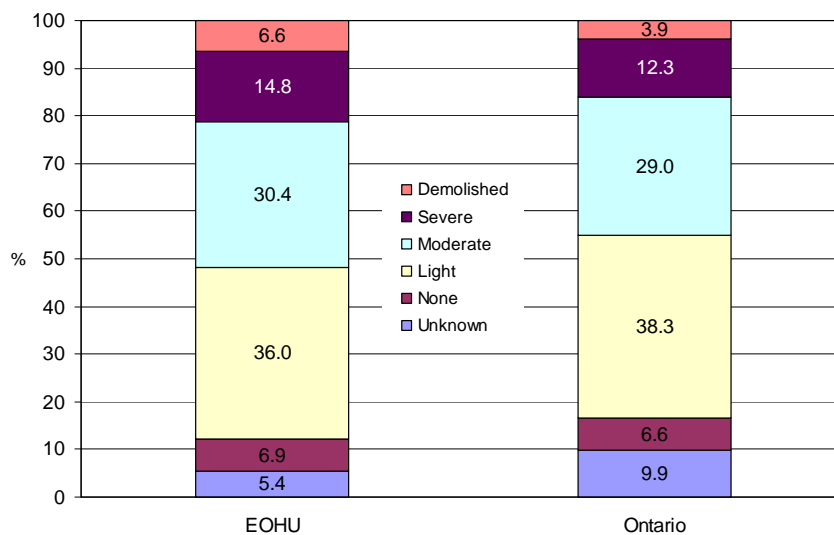


Figure 5: Assessment of the severity of damages to vehicles involved in a collision.

Collisions occurring in Eastern Ontario resulted in more severe vehicle damage than those in Ontario.

### **People involved:**

There were 5,422 persons involved in fatal and personal injury collisions in Eastern Ontario and 434,495 in Ontario during the 2003-2005 three-year period. To be included in the “People involved” component of the database, at least one person involved in the collision (as driver or passenger of one of the vehicle or a pedestrian) has to report pain/injury or has to show sign of pain/injury; if at least one person is injured, data is captured on everyone involved. The “People involved” database thus excludes all property damage-only collisions. Even when included in the “People” database, a large proportion is listed as “no injury”: 40% in Eastern Ontario and 48% in Ontario. Table 4 shows in detail the severity of injuries of those involved: when compared to the province, “no injury” is less frequently reported in Eastern Ontario ( $p < 0.001$ ) and major or fatal injuries are more frequent (4.7% vs. 3.1%;  $p < 0.001$ ).

The following details the Ministry’s definition of injuries:

- None: Uninjured person
- Minimal injury: Person did not go to hospital when leaving the scene of the collision. Includes minor abrasions, bruises, and complaints of pain.
- Minor injury: Person went to hospital and was treated in the emergency room but was not admitted.
- Major injury: Person admitted to hospital. Also, includes person admitted for observation.
- Fatal injury: Person killed immediately or within 30 days of the motor vehicle collision.

	EOHU (2003-2005)		Ontario (2003-2005)	
	N	%	N	%
None	2,152	39.7	209,350	48.2
Minimal	1,550	28.6	121,876	28.1
Minor	1,464	27.0	89,841	20.7
Major	209	3.9	11,032	2.5
Fatal	47	0.9	2,396	0.6
Total	5,422	100.0	434,495	100.0

Table 4: Severity of injuries of anyone involved in a fatal and personal injury collision

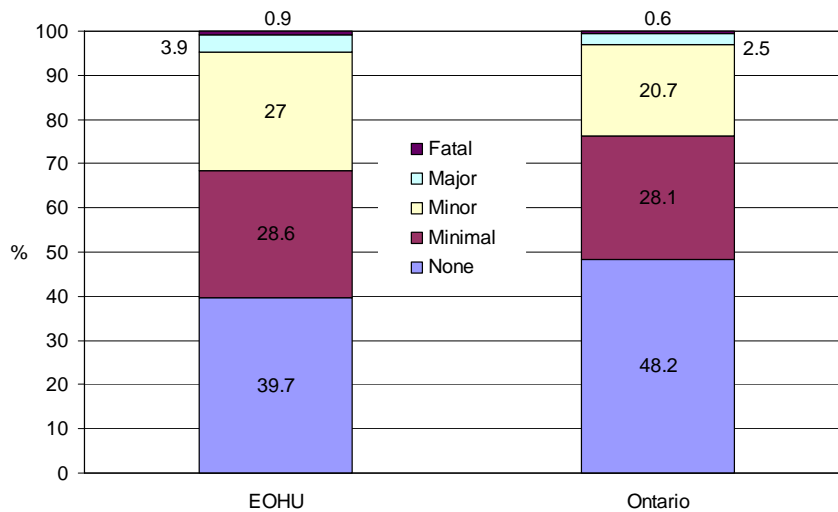


Figure 6: Assessment of the severity of injuries to persons involved in a fatal and personal injury collision.

**Fatal and Personal Injury collisions occurring in Eastern Ontario resulted in more severe injuries than those in Ontario.**

One possible explanation for this last result is the fact that Eastern Ontario also has a significantly higher rate of ejection (partial and complete combined): 3.77% vs. 2.56% in Ontario;  $p < 0.001$ .

In terms of role or position in the collision, 62% of people involved were drivers, 36% were passengers (20% front passenger position), and about 3% were pedestrians.

As we have seen earlier, even though close to two thirds of drivers of vehicles involved in a collision were males, the gender distribution of people involved is close to equal (52.7% males).

One of the most noteworthy results of the main EOHU injury report was the overrepresentation of teens and young adults in motor vehicle collision and the resulting hospitalizations and mortality. The initial report is confirmed by the data from the Ministry of Transport. Table 5 shows the age distribution of people involved in a collision. Teens and young adults aged 10-15 and 16-20 from Eastern Ontario are implicated more frequently than the same age group from the province as a whole (15.8% [99.9% CI 14.3% - 17.2%] vs. 12.0%;  $p < 0.001$ ).

Age group	EOHU (2003-2005)		Ontario (2003-2005)	
	N	%	N	%
00-04	126	2.3	11,122	2.6
05-09	157	2.9	12,306	2.8
10-15	284	<b>5.2</b>	17,789	<b>4.1</b>
16-20	854	<b>15.8</b>	52,259	<b>12.0</b>
21-24	465	8.6	39,395	9.1
25-34	806	14.9	76,871	17.7
35-44	913	16.8	79,047	18.2
45-54	737	13.6	61,045	14.0
55-64	421	7.8	36,102	8.3
65-74	265	4.9	19,481	4.5
75+	198	3.7	13,381	3.1
UK	168	3.1	13,752	3.2
Missing	28	0.5	1,945	0.4
Total	5,422	100.0	434,495	100.0

Table 5: Age group (years) of anyone involved in a fatal and personal injury collision

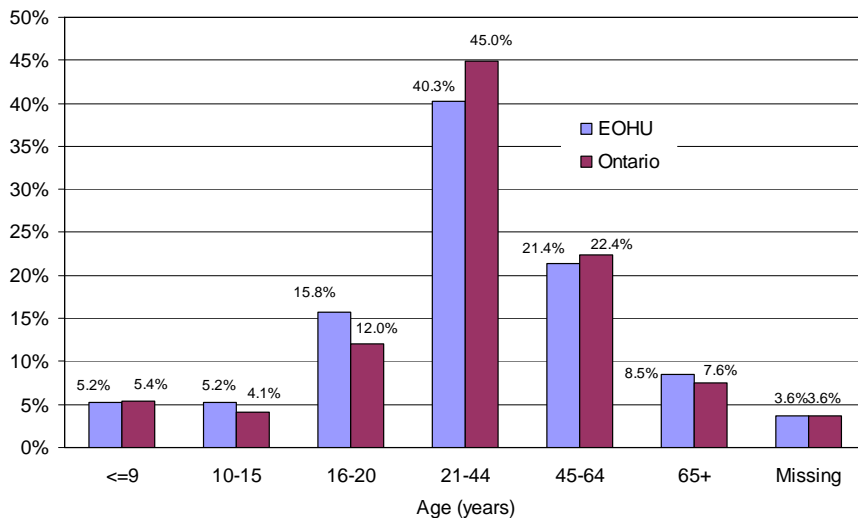


Figure 7: Age of persons involved in a fatal and personal injury collision on the EOHU territory and in Ontario.

Teens and young adults are more likely to be involved in a collision on the EOHU territory than in the province as a whole.

Cross-tabulation of age by severity of injury revealed that persons involved on a collision on the EOHU territory are more likely to have suffered from injuries requiring hospitalization (minor-major-fatal injury) than Ontario as a whole, for every age group.

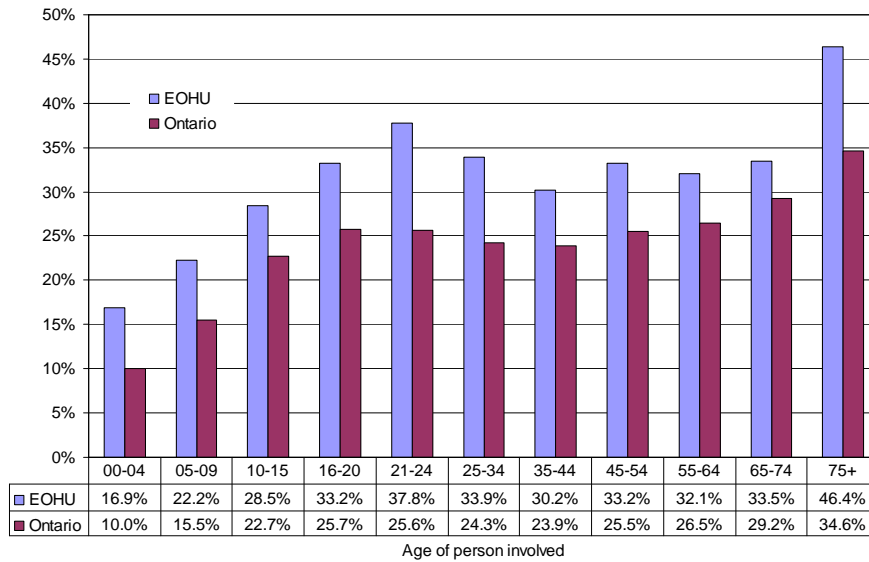


Figure 8: Proportion of injury that required hospitalization (minor – major – fatal injury) by age groups for collisions on the EOHU territory and Ontario as a whole.

Collisions occurring on the Eastern Ontario Health Unit territory are more likely to result in an injury requiring hospitalization compared to Ontario, regardless of age.

**Conclusions:**

The present report is based on summary tables generated by the Ministry of Transport. Unfortunately we were not granted access to the raw data, which greatly limited possible statistical analyses and hindered identification of causal relationships. In addition, some variables had a significant proportion of missing values, which again limited solid interpretation.

Overall, the Eastern Ontario region has a lower rate of motor vehicle collision resulting in a police report than the province as a whole: 20.4 collisions per 1000 vehicles registered in Eastern Ontario versus 29.6 collisions per 1,000 registered vehicles in Ontario.

Surprisingly, the majority of collisions resulting in a police report occur during daylight hours on dry roads in good condition and in clear weather. When comparing the days of the week, collisions are most likely to occur on Fridays and least likely to happen on Sundays. When comparing Eastern Ontario to the province as a whole, collisions are more likely in our region on the weekend. In addition, we have a much higher rate of collision occurring in dark unlit conditions. We also have a rate of collision with a wild animal that is three times higher than the province.

Collisions occurring in Eastern Ontario are associated with a driver going at a speed over the posted limit. There are more collisions in Eastern Ontario involving higher speeds than in Ontario. Collisions in our region result in a higher rate of ejection (partial or complete). Resulting damage to the vehicle due to a collision is more likely to be severe in our region compared to the province. All these factors, and possibly others, lead to Eastern Ontario having a higher mortality rate from collisions resulting in a police report than the province.

Drivers involved in collisions in the EOHU region are more likely to have had impaired faculties and to have driven at excessive speed. Although the data does not allow to positively state they were the drivers, results show that teens and young adults (age 20 years or less) of Eastern Ontario are more involved in collisions than those in the province as a whole.

In addition, collisions occurring on the Eastern Ontario Health Unit territory are more likely to result in an injury requiring hospitalization (minor, major, or fatal injury) compared to Ontario as a whole, regardless of involved person's age.