

---

**Central East  
Health Information Partnership**

---

**Driver Residence Analysis  
of Motor Vehicle Collisions**

**A Discussion Paper on the Potential of MTO  
Data to Address Population Health Issues**

**August 2002**



**Driver Residence Analysis of Motor Vehicle Collisions: A Discussion  
Paper on the Potential of MTO Data to Address Population Health  
Issues**

Sten Ardal, Michaela Berkowitz-Sandhu, Graham Woodward

August 2002



## Executive Summary

Motor Vehicle Collisions (MVCs) are a major cause of premature death and injury in Ontario. One of the Ontario Ministry of Health and Long-Term Care's public health targets is a 20% reduction in MVC injuries and deaths by 2010. The Central East Health Information Partnership's (CEHIP) Public Health and Health Council partners serve a large, highly mobile, and rapidly growing population. A population-based analysis of collisions and injuries is required for injury prevention programs and for the planning of health and emergency response services.

Our analysis differs from current reporting practices that focus on the place of occurrence when describing MVCs and associated injuries. By incorporating driver residence information, we have shown that up to half of the collisions involving CEHIP Region residents occur outside of their home county. Our findings also reveal wide variations in the numbers of drivers, collisions, and injuries. Overall, this report demonstrates how MTO databases can be used to provide population-based analyses as a compliment to information currently available in the *Ontario Road Safety Annual Report*.

## Background

The Ontario Trauma Registry has reported that motor vehicle collisions (MVCs) result in half of all serious injuries in Canada. In 1998, 854 Ontario residents died as a result of MVCs. As well, MVCs were implicated in 13% of hospital injury admissions and almost half of all severe injuries reported. This significant human and health resources burden makes reduction of MVCs a health planning priority. An objective identified in the Ontario Ministry of Health and Long Term Care's Mandatory Health Programs and Services Guidelines is to "reduce the rates of injuries caused by cycling crashes and motorized vehicle crashes... that lead to hospitalization or death by 20 per cent by the year 2010". Clearly, information on accidents and injuries is critical to assist public health departments as they work to meet this challenge.

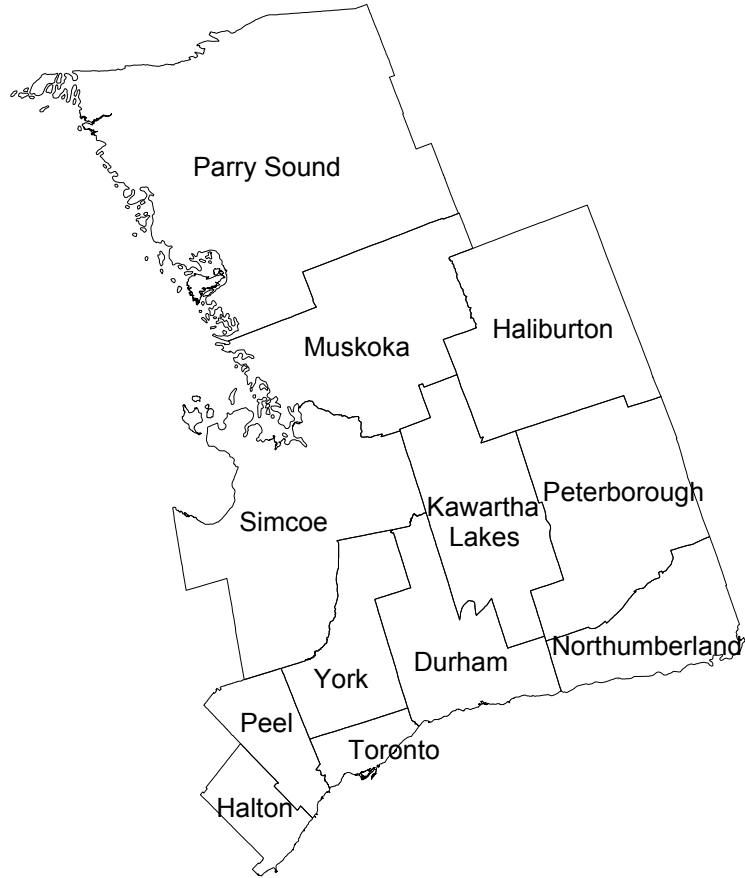
The Ministry of Transportation of Ontario (MTO) defines a MVC as any incident in which bodily injury or damage to property is sustained as a result of the movement of a motor vehicle, or of its load while a motor vehicle is in motion. An MVC is reportable when the collision involves an injury or fatality; there is property damage in excess of a monetary value prescribed in law<sup>1</sup>; or if charges are laid as a result of the collision. The Ministry of Transportation of Ontario maintains records of reportable motor vehicle collisions based on information recorded by attending police officers, or information reported to Collision Reporting Centres by those involved.

Each year the MTO publishes the *Ontario Road Safety Annual Report* (ORSAR). This report contains a range of summary statistics relating to motor vehicle travel and collisions and is frequently cited by planners, researchers, and program developers. However, the data in ORSAR are presented primarily by place of occurrence, which does not support population-based analyses. Such analyses require information about the driver's place of residence rather than the event location.

---

<sup>1</sup> In 1978, this monetary value was \$400 and rose to \$700 in 1985. As of 1998, the value is \$1000.

**Figure 1.** Map of Counties in the CEHIP Region.



This report is restricted to the geographic area served by the Central East Health Information Partnership as depicted in Figure 1. References to the “CEHIP Region” encompass the Census Divisions, Public Health Departments and District Health Councils listed in Table 1.

**Table 1.** *Counties, Health Units, and Health Councils within the CEHIP Region.*

<b>Census Division</b>	<b>Health Unit/Department</b>	<b>District Health Council</b>
Simcoe	Simcoe County	Simcoe-York
York	York Region	
Durham	Durham Region	Durham, Haliburton, Kawartha & Pine Ridge
Northumberland	Haliburton, Kawartha Pine Ridge	
Kawartha Lakes (previously Victoria)		
Haliburton		
Peterborough	Peterborough County/City	
Peel	Peel	Halton-Peel
Halton	Halton	
Toronto	Toronto	Toronto
Muskoka	Muskoka Parry Sound	
Parry Sound		

The population in the CEHIP Region has grown by almost 20% in the past ten years, and is projected to continue growing faster than the provincial average. Likewise, the number of licensed drivers and vehicle registrations continues to increase. Between 1989 and 1999, the number of licensed drivers in Ontario grew by 26% and vehicle registrations by 17%. Understanding resident motor vehicle patterns in the CEHIP Region is essential to understand the impact of population growth in this area.

The 1996 Census by Statistics Canada suggests that residents of the CEHIP region are highly mobile. They drive more frequently than other Ontario residents and tend to travel long distances. Up to 50% of residents in areas bordering Toronto work outside their home county, and according to the 1998 General Social Survey by Statistics Canada, the most common destination for weekday travel was work. Such travel concentrates around peak travel times of 8

a.m. and 5 p.m. The Census also found that the proportion of trips from home to a workplace in another county within the CEHIP Region has been increasing since 1986.

## Statement of Issue

Motor vehicle collisions are a major cause of injury and premature death in Ontario. Residents of the CEHIP Region drive their vehicles further and more often than in other parts of the province. High population growth is expected to increase travel volumes in this area, which could, potentially, result in increasing collisions and injuries.

Public Health Departments and District Health Units are mandated to support the planning and implementation of programs to address the health needs of specific populations. The association of MVCs with a number of health outcomes must be better understood to enable CEHIP partners to develop and improve prevention and intervention strategies. Population-based analyses of adverse events are required to identify the community needs for preventative programs and for health and emergency response services.

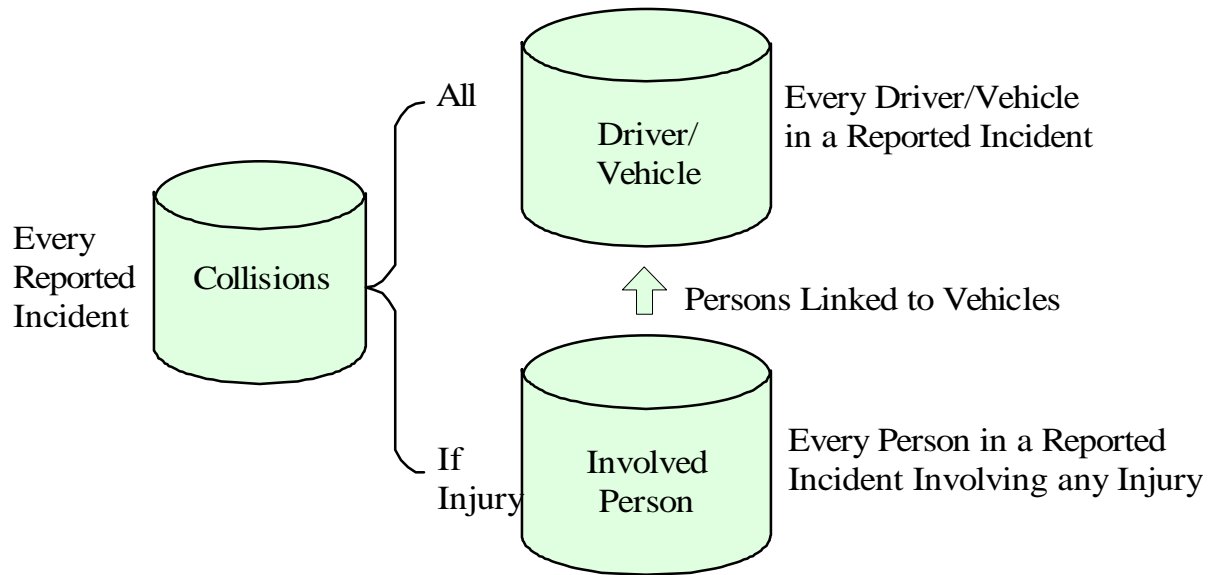
This report will demonstrate how MTO databases can be used to provide population-based analysis as a compliment to information currently available in the annual *Ontario Road Safety Annual Report*.

## Methodology

CEHIP received data from the MTO database in three files for the 1998 calendar year. The first file, the **collision file**, contains one record for each reportable motor vehicle collision. The second file, the **driver/vehicle file**, contains one record for each driver/vehicle involved in each collision. Thus, a collision involving three vehicles would generate one record in the collision file and three records in the driver/vehicle file. The third file, the **involved person file**, includes one record for each person involved in a collision where one or more persons were injured. Collisions with no reported injuries will not generate an entry in this file. Records in all three files contain a unique collision number, as well as vehicle and person number. These numbers are used to link each person to the appropriate vehicle, and the vehicle to the appropriate collision.

The relationship between files is schematically represented in Figure 2.

**Figure 2:** Ministry of Transportation files used for analysis.



The MTO Collision files focus their geographic information on the location of the collision. However, a population-based analysis needs to incorporate residence information along with information on the place of occurrence. This allows one to analyse collision patterns for residents of specific communities. Population-based approaches also facilitate the calculation of rates based on resident characteristics, such as the number of residents, the number of registered drivers, and other demographic characteristics. To carry out this type of analysis, an additional file containing driver registration information was required. When combined with the collision data files, an analytical database was created that contained geographic information on the place of collision and the drivers' place of residence.

Using the Postal Code Conversion File from Statistics Canada, the driver's place of residence was assigned based on the residential postal code. However, some adjustments were required to account for missing information. Overall 17.2% of the drivers were not accurately assigned a residence due to missing, incomplete, or inaccurate postal code information. In most cases the results do



not include these drivers, but where they are included they have been assigned evenly, such that counts by driver residence have been increased by 17.2% for each census division.

## Results

In 1998 there were 4.5 CEHIP Region residents eligible to drive but there were only 3.7 million registered drivers (Table 2). The ratio of registered drivers to eligible drivers is not uniform across the Region, ranging from 74-96%, and likely reflects the availability of other transportation options. Not surprisingly Toronto has proportionately fewer drivers than more rural areas, such as Parry Sound.

**Table 2:** *Estimated eligible drivers and registered drivers within the CEHIP Region, 1998.*

			Percent Eligible Who Are Registered
Simcoe	274,810	246,340	90%
York	511,889	450,141	88%
Durham	371,014	322,943	87%
Northumberland	67,451	54,882	81%
Kawartha Lakes	56,433	54,354	96%
Haliburton	13,149	11,695	89%
Peterborough	102,144	89,068	87%
Peel	725,244	606,458	84%
Halton	283,809	258,940	91%
Toronto	2,035,334	1,511,593	74%
Muskoka	42,568	36,731	86%
Parry Sound	33,642	31,130	93%
CEHIP Area	4,517,487	3,674,275	81%

\*Intercensal estimate for 1998, ages 16+ (Ontario Ministry of Health and Long-term Care Provincial Health Planning Database 2000)

The ORSAR reports can be assumed to provide a reasonable proxy for population based planning if collision information by driver residence and collision information by place of occurrence show similar distributions. However, Table 3 shows that the allocation of events by place of collision is quite different from the allocation by driver's residence. The percent difference between driver

residence and collision location, yields a measure of the distributional difference<sup>2</sup>. There are about 20% fewer collisions within Kawartha Lakes compared to the overall number for this county's residents. In contrast, Toronto "imports" a net of over 36% more collisions than are attributed to their residents. Thus, the numbers reported by place of occurrence in ORSAR cannot be used to describe the collision experience of a resident population.

**Table 3:** *Counts of drivers involved in collisions in 1998 by driver's county of residence and by county of occurrence.*

Census Division	Drivers Involved in MVCs by Driver Residence*	Drivers Involved in MVCs by Place of Occurrence	
Simcoe	12,857	11,502	-10.5%
York	27,434	22,829	-16.8%
Durham	16,942	12,679	-25.2%
Northumberland	2,223	1,954	-12.1%
Kawartha Lakes	2,589	2,020	-22.0%
Haliburton	512	491	-4.1%
Peterborough	3,425	3,133	-8.5%
Peel	33,765	27,749	-17.8%
Halton	10,880	10,782	-0.9%
Toronto	94,475	128,947	36.5%
Muskoka	1,499	1,727	15.2%
Parry Sound	1,202	1,291	7.4%
CEHIP Area	207,804	225,104	8.3%

\*Weighted to adjust for under-reporting of driver's residence (see Methods).

A clearer understanding of the traffic patterns that produce the disparity between location of collision and driver's residence emerges in Table 4. This table shows that 30% of all reported collisions in the CEHIP region are outside of the driver's county of residence. Only one in seven Toronto drivers are likely to be involved in collisions outside of Toronto, whereas almost half of York resident collisions are in another jurisdiction.

<sup>2</sup> To make this comparison it was necessary to adjust the resident and collision counts as described in the methods section. Accordingly, small differences should not be considered reliable. Subsequent analyses use unadjusted driver's residence calculations.)

**Table 4:** Comparison of drivers involved in collisions inside and outside of their county of residence, 1998.

Census Division	Driver's Collision Inside Home County	Driver's Collision Outside Home County	% Driver Collisions Outside Home County
Simcoe	7,527	3,443	31.4%
York	11,806	11,602	49.6%
Durham	8,471	5,985	41.4%
Northumberland	1,030	867	45.7%
Kawartha Lakes	1,205	1,004	45.5%
Haliburton	227	210	48.1%
Peterborough	2,067	855	29.3%
Peel	16,295	12,516	43.4%
Halton	5,129	4,154	44.7%
Toronto	68,910	11,700	14.5%
Muskoka	872	407	31.8%
Parry Sound	540	486	47.4%
CEHIP Area	124,079	53,229	30.0%

There are many factors that would influence the likelihood that residents will be involved in collisions. The amount of driving, type of driving, road conditions, and traffic volume will all influence the rate of collisions. Table 5 shows the risks of collisions and resulting injury for drivers residing in the CEHIP Region. Toronto drivers present as a high collision risk using this analysis, while Peterborough drivers have far lower collision rates. The collision rate pattern differs however, from the MVC related injury rate pattern. Injury rates for collisions involving Toronto drivers are lower than the rates for Haliburton and Kawartha Lakes.

**Table 5:** *Collision and injury rates for residents of the CEHIP Region, 1998.*

Census Division			Collision Rate/1000 Drivers	Minor or Greater Reported Injury <sup>1</sup>	Reported Injury Rate/1000 Drivers
Simcoe	246,340	10,970	44.5	861	3.5
York	450,141	23,408	52.0	1,467	3.3
Durham	322,943	14,456	44.8	1,103	3.4
Northumberland	54,882	1,897	34.6	171	3.1
Kawartha Lakes	54,354	2,209	40.6	223	4.1
Haliburton	11,695	437	37.4	47	4.0
Peterborough	89,068	2,922	32.8	298	3.3
Peel	606,458	28,810	47.5	2,009	3.3
Halton	258,940	9,283	35.9	700	2.7
Toronto	1,511,593	80,610	53.3	5,087	3.4
Muskoka	36,731	1,279	34.8	120	3.3
Parry Sound	31,130	1,026	33.0	93	3.0
<b>CEHIP Area</b>	<b>3,674,275</b>	<b>177,308</b>	<b>48.3</b>	<b>12,179</b>	<b>3.3</b>

1 - injuries where medical treatment is indicated

The findings in Tables 4 and 5 compliment what is currently known about commuting in the CEHIP Region. With more commuting, one would expect to see higher collision rates with more collisions outside of the driver's county of residence. The Transportation Tomorrow Surveys in the Greater Toronto Area concluded that increased auto-driver trips result from a rising number of licensed drivers, increased vehicle availability, and the decentralization of work areas. This decentralization leads to more long distance commuting, and as may be expected, the collision rates echo the commuting patterns. Commuting times are generally associated with work travel and account for 40% of all reported incidents in the CEHIP Region. In rural areas such as Parry Sound however, where minimal commuting occurs, only 26% of collisions occur during commuting times. In Parry Sound, Muskoka, and Haliburton ("cottage country") half of all reported collisions occur on weekends, when one might expect traffic volumes to increase due to non-resident/tourist travel.

## Conclusions

This report has shown that drivers in the CEHIP region have high mobility and that the likelihood of collisions and MVC related injuries varies across the region. This information can be used to plan, promote, and provide health prevention and health service programs. Results suggest that the approach to promote safety in rural areas will need to differ from approaches adopted in highly urbanized areas. The availability of emergency response systems will also vary, with areas like Toronto likely to require more capacity than areas like Durham. The high commuting and collision rates for drivers in York may suggest the need for further promotion of alternate transportation options. These examples, based on a single information source, are instructive and illustrate the value of a population-based analysis of MTO databases.

The ORSAR provides an excellent overview of MVCs, covers many more dimensions than discussed in this report, and has proven extremely valuable in understanding road safety issues in Ontario. The intent of this report is simply to show another potential and powerful analytic dimension of MTO data. There are many more questions that could be addressed using the data and methods employed in this report. These include a more detailed analysis on commuting times, resident descriptions of weekend traffic incidents in vacation areas, breakdowns by age to identify what age groups are involved where and when, and closer examination of injuries.

Using a population-based perspective to analyze MTO data, one can gain insights not supported by current MVC reporting. Essential to this analytical approach is the driver's information, particularly the driver's place of residence. By combining this type of information with demographic data, health surveys, hospital information, ORSAR, etc., planners and program developers can create a more complete profile of residents, which should lead to more effective prevention and intervention strategies. For the benefit of our Public Health and Health Planning Partners, CEHIP will continue to work with the MTO to support these types of analyses.