

Emergency Department Visits for Concussions

A concussion is a brain injury that occurs when the head hits an object, or a moving object hits the head, causing the brain to move back and forth rapidly in the skull.¹ Concussions are common sports injuries, especially among children and youth.¹ Without proper management, concussions may lead to permanent and severe brain damage.¹ There are many ways to reduce chances of getting a concussion, including wearing a helmet and other protective equipment when riding a bike or playing sports, wearing a seatbelt, using car safety seats or booster seats for children, and taking steps to improve safety and reduce the risk of falls.²

This report only includes concussions diagnosed at an emergency department (ED), not concussions diagnosed by a primary care physician, at a walk-in clinic, or concussions of residents who do not seek any medical care.

Purpose of Health Indicator Report: To provide information on emergency department visits due to concussions among Halton and Ontario residents

Data Source: IntelliHEALTH Ontario - National Ambulatory Care Reporting System (NACRS)³ for ED visits and Population Estimates⁴ for the populations of Halton and Ontario

Data Collection Period: 2004-2013

For more information on definitions, statistical significance, data interpretation and limitations in this report, see the [data notes](#) section on the last page.

Overall Findings and Trends Over Time:

- In 2013, the age-standardized rate of emergency department (ED) visits with a diagnosis of a concussion was lower among Halton residents [159(±11) per 100,000] compared to Ontario residents [202(±3) per 100,000], and this difference was statistically significant (see **Figure 1**).
- From 2004 to 2013 the age-standardized rate of ED visits with a diagnosis of a concussion increased among both Halton and Ontario residents, and these increases were statistically significant (see **Figure 1**).
 - For Halton residents rates increased from [69(±8) per 100,000] to [159(±11) per 100,000].
 - For Ontario residents rates increased from [87(±2) per 100,000] to [202(±3) per 100,000].

Note: It is not possible to determine if the observed increase in the rate of ED visits with a diagnosis of a concussion over time in both Halton and Ontario is related an increase in the incidence of concussions, increased awareness of concussions and subsequent health issues, or both.⁵

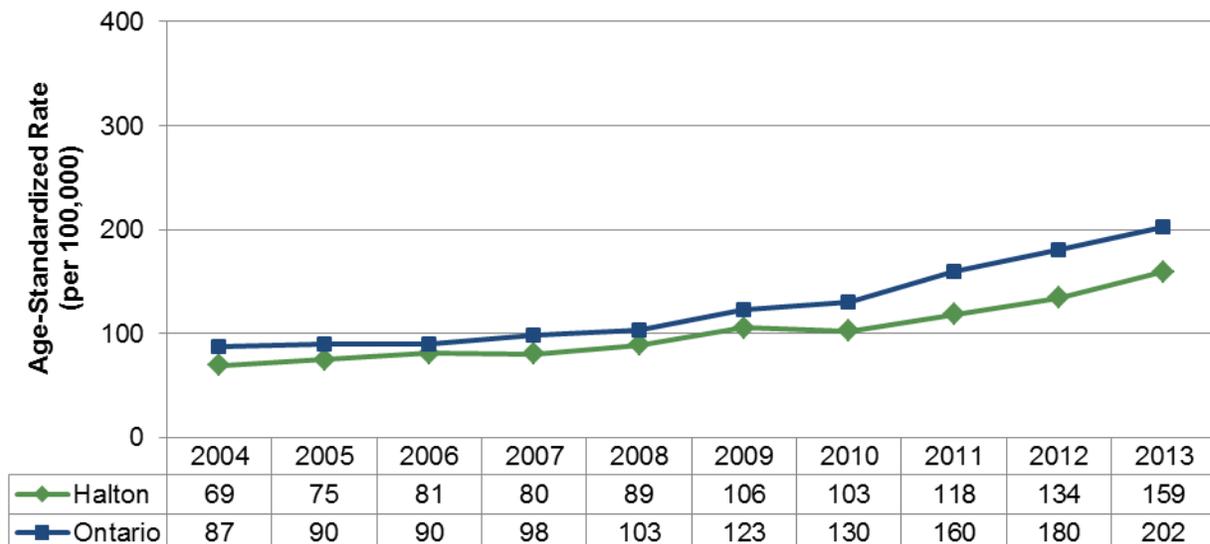


Figure 1: Age-standardized rates (per 100,000) of ED visits with a diagnosis of a concussion, Halton Region and Ontario, 2004-2013

Sex:

- In 2012/13, Halton males [167(±12) per 100,000] had a higher age-standardized rate of ED visits with a diagnosis of a concussion than females [123(±10) per 100,000], and this difference was statistically significant (see **Figure 2**).

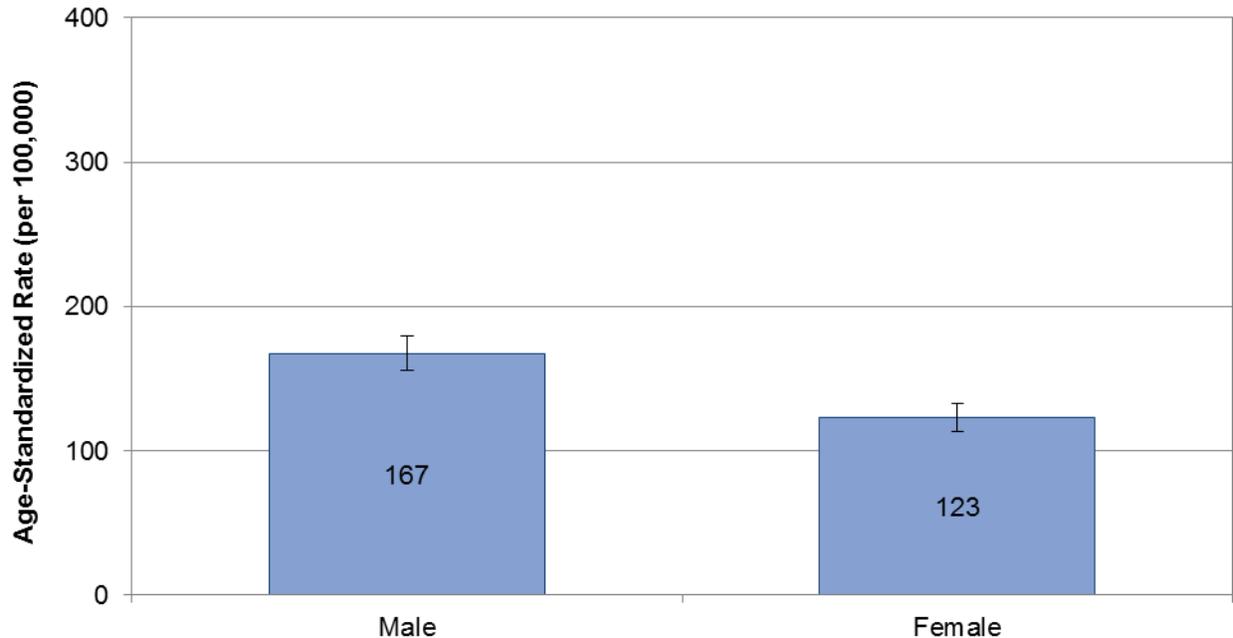


Figure 2: Age-standardized rates (per 100,000) of ED visits with a diagnosis of a concussion, by sex, Halton Region, 2012-2013 combined

Age:

- In 2012/13, the age-specific rate of ED visits with a diagnosis of a concussion was almost twice as high among Halton residents aged 5-19 compared to residents aged 20-24, and more than three times as high as any other age group. Starting at ages 5-19, the age specific rate of ED visits with a diagnosis of a concussion decreased as age increased (see **Figure 3**)

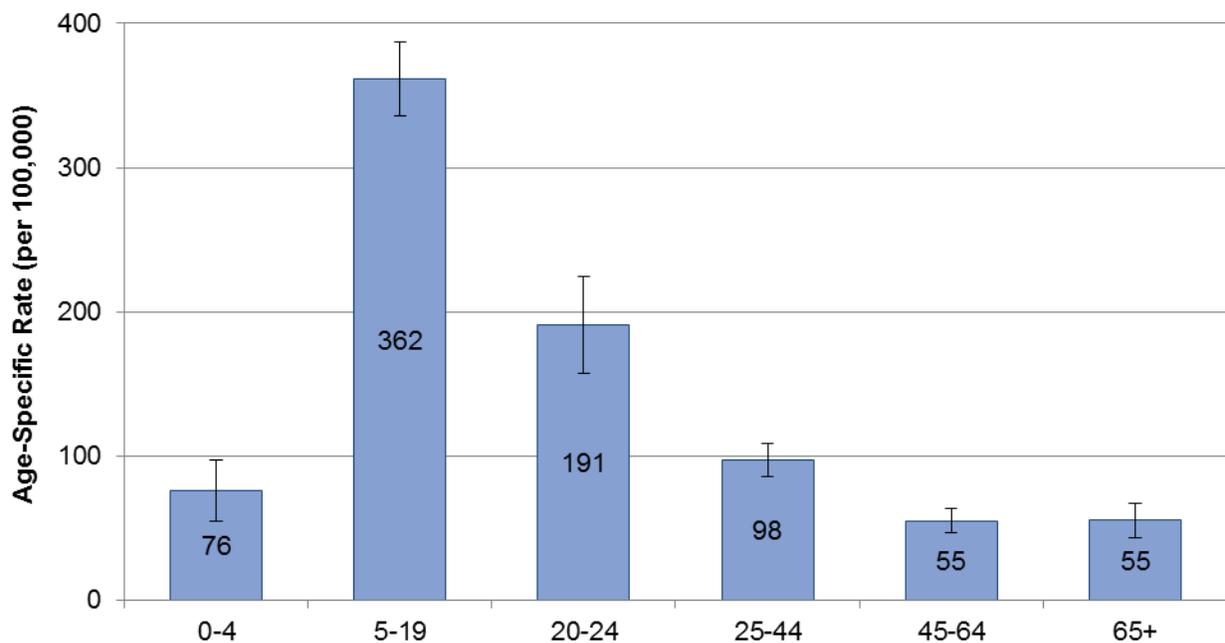


Figure 3: Age-specific rates (per 100,000) of ED visits with a diagnosis of a concussion, Halton Region, 2012-2013 combined

Municipality:

- In 2012/13, Milton [199(±22) per 100,000] had the highest age-standardized rate of ED visits with a diagnosis of a concussion, followed by Halton Hills [173(±24) per 100,000], Oakville [157(±13) per 100,000] and Burlington [100(±11) per 100,000] (see **Figure 4**). These differences were statistically significant when comparing Burlington to all other municipalities, and when comparing Oakville to Milton.

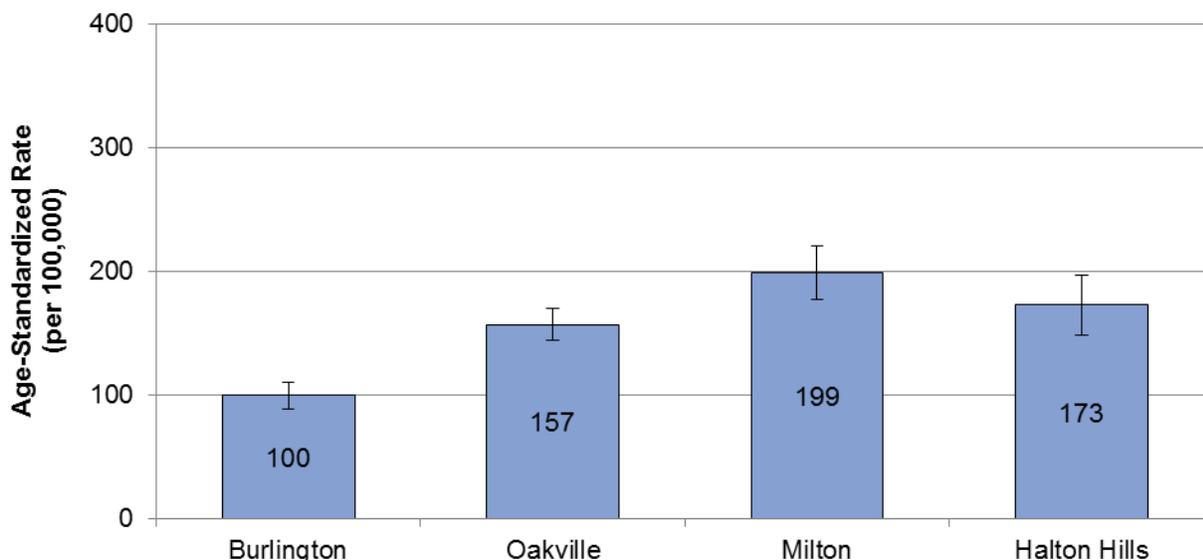


Figure 4: Age-standardized rates (per 100,000) of ED visits with a diagnosis of a concussion, by municipality, Halton Region, 2012-2013 combined

Neighbourhood Income:

- In 2012/13, the age-standardized rate of ED visits with a diagnosis of a concussion increased as income increased (see **Figure 5**). These differences were statistically significant when comparing the low income group [101(±44) per 100,000]* to the high income group [182(±11) per 100,000].

Note: The increase in ED visits with a diagnosis of a concussion as income increases is similar to the pattern seen with income and sports and recreation injuries. This may be related to different opportunities and exposure to sports activities for people from different socioeconomic levels due to the high cost of enrollment and equipment. For more information on sports and recreation injuries, see the [Halton Injury Report](#).

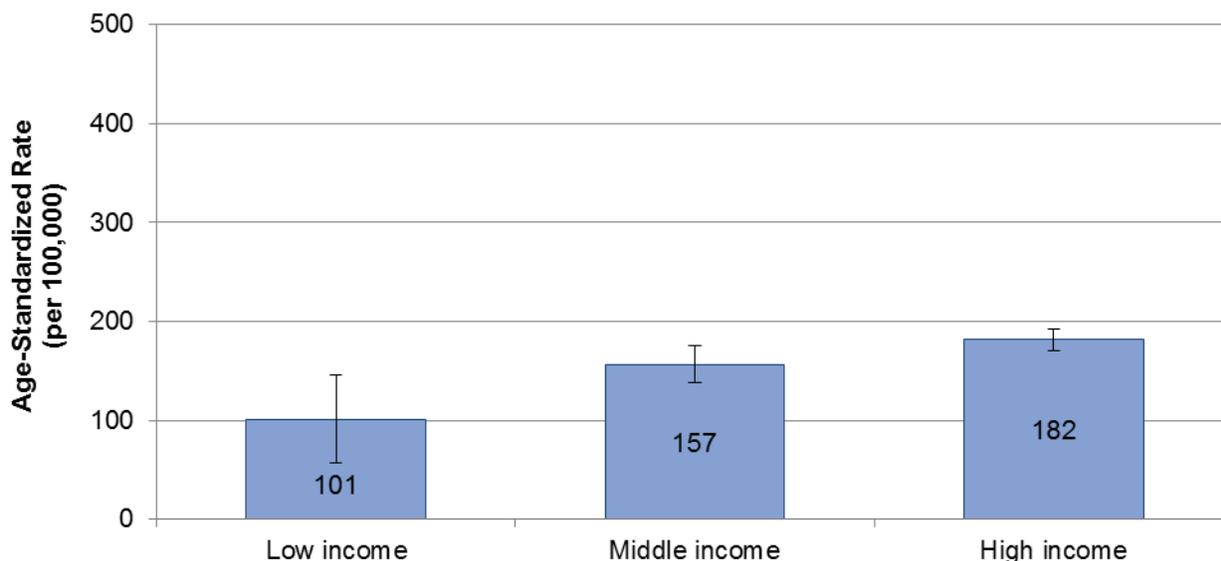


Figure 5: Age-standardized rates (per 100,000) of ED visits with a diagnosis of a concussion, by income, Halton Region, 2012-2013 combined

Summary Table:

- **Table 1** summarizes the average number of cases of concussions per year as well as the crude, age-standardized, and age-specific rates of ED visits with a diagnosis of a concussion among Halton residents. Refer to the [data notes](#) for explanations of each of the types of rates presented in this report.
- It is important to consider these various measurements together, as each measurement captures a different part of the story of ED visits with a diagnosis of a concussion in Halton's population. For example, while Halton Hills has a slightly higher age-standardized rate of ED visits with a diagnosis of a concussion compared to Oakville, the average number of ED visits per year is approximately three times higher in Oakville compared to Halton Hills because Oakville has a much larger population.

Table 1: Average number of cases (per year), crude rates (per 100,000), age-standardized rates (per 100,000) and age-specific rates (per 100,000) of ED visits with a diagnosis of a concussion, by sex, age, municipality and income, Halton Region, 2009-2013

		Average number of cases (per year)	Crude rate (per 100,000)	Age-standardized rate (per 100,000)	Age-specific rate (per 100,000)
2012-2013	All Halton	732	137	145	
Sex	Male	408	156	167	
	Female	324	119	123	
Age	0-4	25	76		76
	5-19	382	362		362
	20-24	63	191		191
	25-44	142	98		98
	45-64	80	55		55
	65+	40	55		55
Municipality	Burlington	169	90	100	
	Oakville	301	155	157	
	Milton	165	185	199	
	Halton Hills	106	168	173	
Income	Low	11	81	101	
	Middle	140	120	157	
	High	558	152	182	

Data notes on next page...

Data Notes:

Definitions:

Emergency department (ED) visit: includes only unscheduled visits to the ED.

Concussions: include any diagnoses of a concussion (ICD10 = S060).⁶

Statistical Significance:

A **95% confidence interval (CI)** refers to the range of values that has a 95% chance of including the true estimate. 95% CIs are reported in brackets or presented as “I” shaped bars in the graphs. A large CI means that there was a large amount of variability in responses or the sample size for the category was small. When CIs do not overlap between 2 or more groups (e.g., when comparing males and females) it means that the differences between the groups are **statistically significant** and unlikely to be due to chance alone. Since overlapping confidence intervals are used to determine statistical significance, p-values are not calculated. This is a conservative approach ($\alpha < 0.01$) which is more appropriate when multiple comparisons are being made, such as in this report. Trends over time were tested for significance using linear regression and autocorrelation.

Data Interpretation:

The National Household Survey (NHS) indicator “in bottom half of the Canadian distribution” was used as a basis for the **neighbourhood income groups**.⁷ The term neighbourhood refers to a single Dissemination Area (DA). This indicator provides the percent of households per DA that were in the bottom half of the Canadian distribution based on adjusted household income. Using this value, all of the DAs in Canada were ranked into 10 equal groups (deciles), and then grouped as low (deciles 1-3), middle (deciles 4-7) or high (deciles 8-10). Each ED record extracted from IntelliHEALTH was assigned to the appropriate DA by using the provided postal code along with the postal code conversion file (2011, PCCF). Since the actual income of individuals is not known, and may vary from their neighbourhood income, misclassification of individuals based on their neighbourhood income instead of household income may diminish the association between income and concussions. Approximately 3.2% of ED records were not included in the income analysis due to no postal code provided, incomplete postal codes, postal codes not matching in the PCCF file, or DA's being suppressed due to small response from the NHS.

Age-standardized rates are calculated using the 1991 population of Canada as the standard population. This ensures that any differences in rates between populations are not due to differences in the age distributions between populations. **Age-specific rates** are calculated by dividing counts of events by the population in that age group. **Crude rates** are calculated by dividing the total number of events by the total population.

Limitations:

Data from 2012 and 2013 were combined to ensure sufficient sample size for analysis.

Rounded CI's were used for the presentation of data; however, non-rounded CI's were used to determine significant differences.

ED visit data do not include concussions that occurred to Halton residents outside of Ontario.

Population counts by DA are only available for 2011, therefore for the income analysis the denominator was the 2011 population of Halton multiplied by two, for each year in the analysis (2012 and 2013).

The National Household Survey (NHS) is more prone to non-response bias compared to the previous long form census. Residents with low incomes, very high incomes, new immigrants, and Aborigines were less likely to respond. Caution should be used when interpreting data for household income. See the [NHS user guide](#) for more information.

Halton Region contains two correctional facilities located in Milton. The DA that includes the two correctional facilities (35240066) was excluded from analysis of sex, age, municipality and income. This DA was excluded because it was not possible to determine the number of prison inmates in the numerator or denominator of the concussions rates due to the nature of census and ED data, and prison populations typically experience higher rates of concussions.⁸ Due to lack of annual population data at the DA level, the DA with the prisons was not excluded from the time trend analysis.

References:

1. Ontario Ministry of Health and Long-Term Care. (2014). Concussions. Accessed April 2015 from <http://www.health.gov.on.ca/en/public/programs/concussions/>
2. Centers for Disease Control and Prevention. (n.d). Heads Up: Preventing Concussion. Accessed April 2015 from http://www.health.gov.on.ca/en/public/programs/concussions/http://www.cdc.gov/concussion/headsup/pdf/Heads_Up_factsheet_english-a.pdf
3. National Ambulatory Care Reporting System, Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, Date Extracted: September 2015.
4. Population Estimates [2003-2013], Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: April 2015.
5. Macpherson, A., Fridman, L., Scolnik, M., Corallo, A., Guttman, A. (2014). A population-based study of paediatric emergency department and office visits for concussions from 2003 to 2010. *Journal of the Canadian Paediatric Society*, 19(10):543-546.
6. World Health Organization (2010). *International statistical classification of diseases and related health problems 10th revision*. Geneva: World Health Organization.
7. Statistics Canada. 2013. Canadian National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013.
8. Ferguson, P.L., et al. (2012). Prevalence of traumatic brain injury among prisoners in South Carolina. *Journal of Head Trauma Rehabilitation*, 27(3):e11-e20.

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