Injury Hospitalizations and Socio-Economic Status

Injury is a common cause of hospitalization and one of the leading causes of death and disability, both domestically and internationally.[1–4] Each year, injuries account for nearly 1 in 10 deaths worldwide.[1,3] In Canada alone, there were approximately 14,500 deaths caused by injury (6.4% of all deaths) in 2005.[5]

However, the burden of injury is not evenly distributed among all population groups, particularly between those at different socio-economic levels. Several measures, either in isolation or in combination, have been used as indicators of socio-economic status (SES): income, education, residence, occupation and ethnicity. Regardless of which measure is used, research strongly indicates that people with lower SES have higher morbidity and mortality related to injury than people from higher SES groups.[2, 6–9] This applies to various types of injuries, including motor vehicle traffic injuries, self-inflicted injuries, assault-related injuries, poisoning and burns, and to a variety of settings in which injuries take place, such as at home, at work or in transport.[2, 8, 9]

In this analysis, neighbourhood income quintiles are used as a measure of SES. Neighbourhood income quintiles categorize small geographic areas into five roughly equal population groups. Quintile 1 refers to the least affluent neighbourhoods, while quintile 5 pertains to the most affluent neighbourhoods. (Please see the appendix for detailed methodological notes.)

The aims of this analysis are to examine the relationship between injury hospitalizations and SES in Canada, to uncover areas of potential concern at the national level and to encourage jurisdictions to examine injury disparities at the local level.

Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians. Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.

www.cihi.ca

Canadian Institute
for Health Information
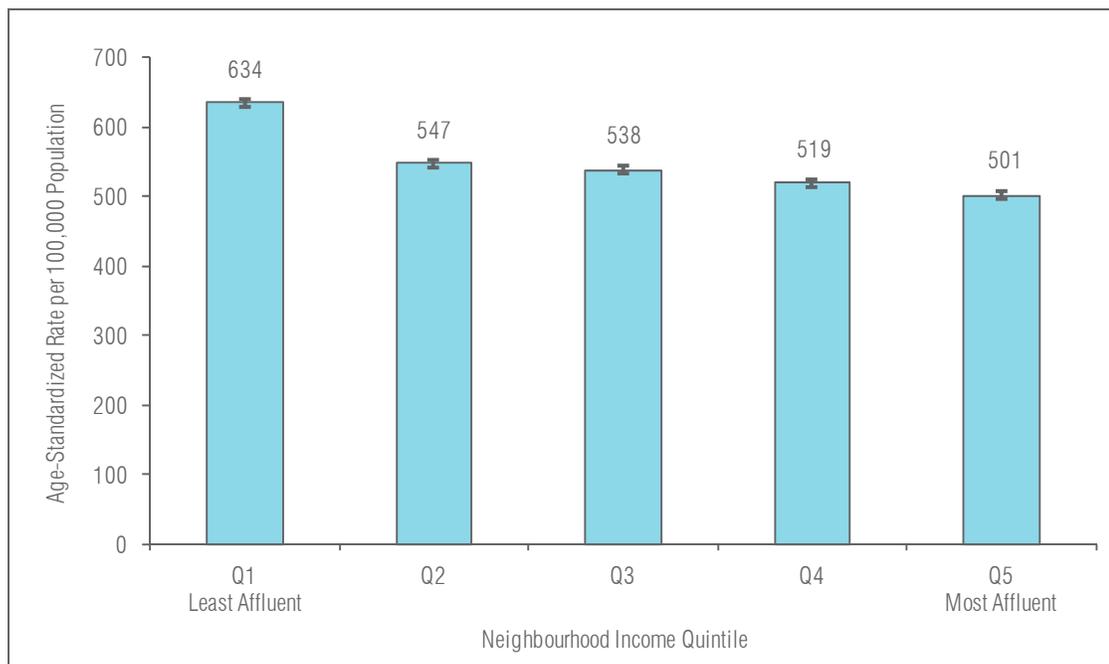
Institut canadien
d'information sur la santé

CIHI ICIS

Taking health information further

How Do Rates of Injury Hospitalizations Compare Across Socio-Economic Groups?

In 2008–2009, there were just more than 205,000 injury hospitalizations in Canada. The overall age-standardized injury hospitalization rate was 534 per 100,000 population. The least affluent neighbourhoods exhibited the highest rate: 634 per 100,000 population. This rate was approximately 1.3 times higher (p<0.05) than the rate for people living in the most affluent neighbourhoods. Although rates decreased with every income quintile, the largest difference in rates was observed between the least affluent and the second least affluent income quintiles (Figure 1). These differences in rates imply that if every socio-economic group had experienced the same rate as the most affluent group, the national injury hospitalization rate could have been 8% lower. In other words, there would have been about 21,000 fewer injury hospitalizations in Canada in 2008–2009.

Figure 1

Injury Hospitalizations: Age-Standardized Rates by Neighbourhood Income Quintile, Canada, 2008–2009

Notes
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
I represents 95% confidence intervals.
Sources
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Injuries can be broadly classified into two main categories: unintentional and intentional. Intent indicates whether the act that caused the injury was purposeful or not.[10] Most injuries are unintentional and only a small proportion of injuries are intentional.

# Unintentional Injuries and Socio-Economic Status

Hospitalizations for unintentional injuries, which accounted for 94% of all injury hospitalizations in Canada in 2008–2009, exhibited a pattern similar to that for all injuries. The highest rates were in the least affluent neighbourhoods and the lowest were in the most affluent areas, with the largest difference seen between the least affluent and the second least affluent income quintiles.

Are There Differences Between Males and Females?

While hospitalization rates for unintentional injuries were higher for males than for females, similar socio-economic gradients were observed for both sexes. The rates for people residing in the least affluent areas were 18% higher ($p < 0.05$) for males and females compared to their respective counterparts in the most affluent neighbourhoods (Figure 2).

Figure 2

Unintentional Injuries: Age-Standardized Hospitalization Rates by Neighbourhood Income Quintile and Sex, Canada, 2008–2009
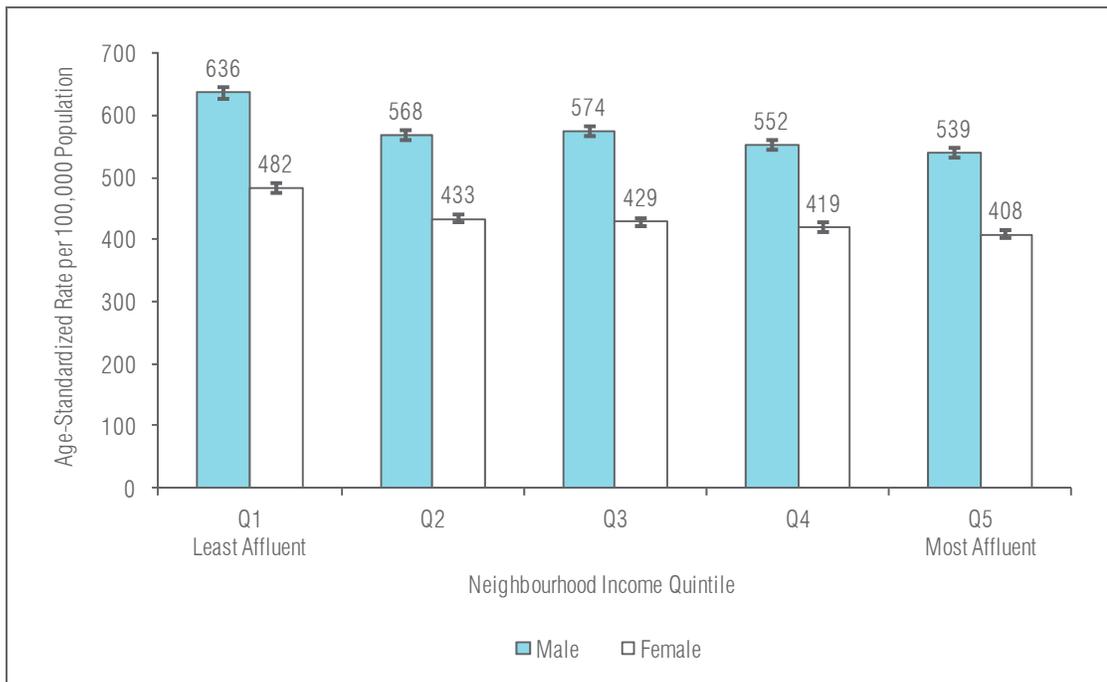
Notes
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
I represents 95% confidence intervals.
Sources
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Causes of Injury

Injuries can also be classified by causes (or mechanisms of injury),[i] such as falls, motor vehicle traffic injuries, drowning or fire.[10]

Among hospitalizations for unintentional injuries, falls and motor vehicle traffic injuries were the most frequent causes, followed by injuries where the casualties were struck by or against an object and injuries involving cutting or piercing. Hospitalizations for injuries caused by other mechanisms, such as suffocation, drowning, fire or others, occurred less frequently.

Hospitalization rates for falls, motor vehicle traffic injuries and injuries involving cutting or piercing—which are mainly caused by powered hand tools, household machinery or other sharp objects—were highest in the least affluent neighbourhoods and lowest in the most affluent areas. In contrast, hospitalization rates for injuries where the casualties were struck by or against an object—mainly sports-related injuries—were slightly higher in the most affluent neighbourhoods (Table 1). One possible explanation could be that people in more affluent neighbourhoods may have a higher participation rate in sports and/or leisure activities which may, in turn, lead to certain types of injuries.[7, 11–13]

Table 1

Unintentional Injuries: Age-Standardized Hospitalization Rates by Mechanism of Injury and Neighbourhood Income Quintile, Canada, 2008–2009

Mechanism of Injury	Age-Standardized Rates per 100,000 Population and 95% Confidence Intervals				
	Quintile 1 (Least Affluent)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (Most Affluent)
Fall	339 (335–343)	300 (296–304)	299 (295–303)	287 (283–291)	283 (280–287)
Motor Vehicle Traffic	60 (58–62)	54 (53–56)	54 (52–56)	51 (49–53)	47 (45–48)
Struck by or Against an Object	25 (24–26)	24 (23–25)	26 (24–27)	25 (24–27)	29 (28–31)
Cutting or Piercing	12 (11–13)	10 (9–11)	10 (9–10)	9 (8–9)	7 (6–8)
Other	128 (125–131)	118 (116–121)	119 (116–122)	118 (115–121)	110 (108–113)
Total Unintentional Injuries	**564 (559–570)**	**507 (501–512)**	**507 (501–512)**	**490 (485–496)**	**476 (471–482)**

Notes
"Struck by or against an object" mainly represents sports-related injuries.
"Cutting or piercing" mainly represents injuries caused by using powered hand tools or household machinery, glass or other sharp objects.
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
Sources
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Falls: The Most Common Cause of Injury Hospitalizations

Falls are the most common cause of injury hospitalizations in Canada. In 2008–2009, falls represented 60.6% of all injury hospitalizations and 64.3% of those for unintentional injuries.

---

i.   Hospitalizations resulting from poisoning and other non-traumatic injuries are not included.

Falls, Age and Socio-Economic Status

Do age and socio-economic status make a difference for fall-related hospitalizations? For young people, up to age 24, SES did not make a difference. Hospitalization rates for unintentional falls in children (0 to 14 years of age) and young people (15 to 24 years of age) presented no significant variation between neighbourhood income quintiles (Figure 3).

However, for young adults (age 25 to 44), older adults (age 45 to 64) and seniors (age 65+), the rates of hospitalizations for falls presented a socio-economic gradient, with the highest rates in the least affluent areas. The largest disparities were observed for older adults, where the hospitalization rate for falls in the least affluent neighbourhoods was 1.5 times higher (p<0.05) than for those in the most affluent areas.

For seniors, the hospitalization rate for falls in the least affluent neighbourhoods was 1.2 times higher (p<0.05) than for those in the most affluent areas. The largest difference was noted between the least affluent and the second least affluent neighbourhood income quintiles. The relative difference between income groups was lower in seniors compared to other age groups. However, the absolute difference in rates was the largest because seniors experienced the highest rate of hospitalizations for unintentional falls (1,714 per 100,000 population). This suggests that actions targeted to prevent hospitalizations for falls and reduce disparities in this age group would have the greatest potential benefit.

Figure 3

Unintentional Falls: Age-Specific Hospitalization Rates by Neighbourhood Income Quintile, Canada, 2008–2009
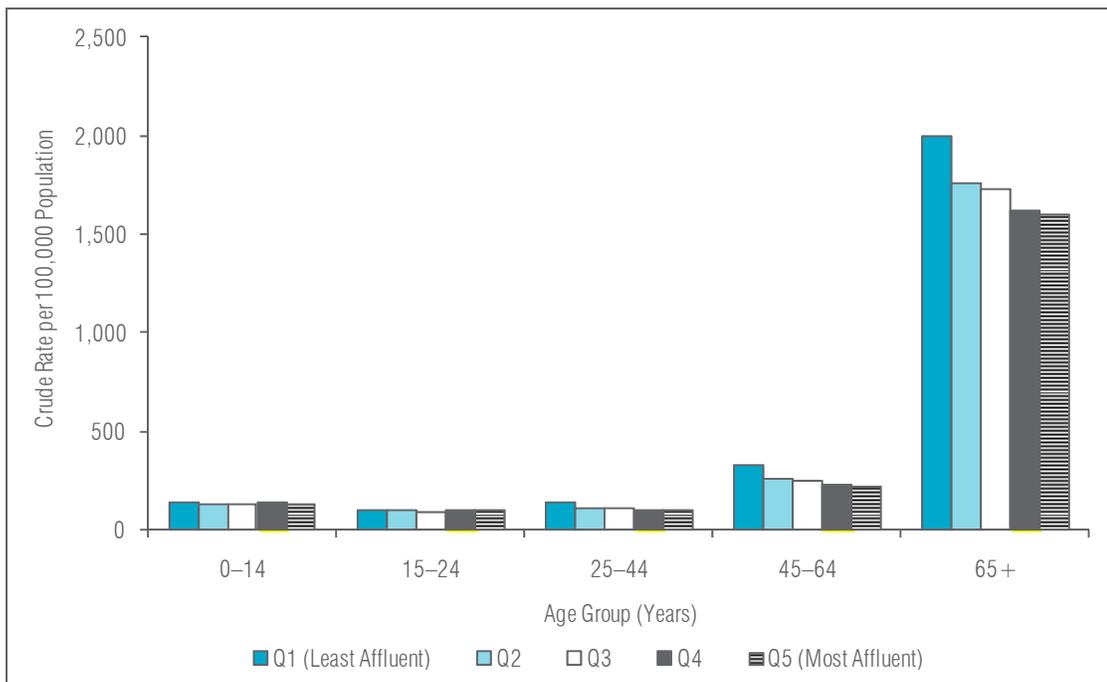
Note
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
Sources
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Motor Vehicle Injuries: The Second Leading Cause of Injury Hospitalizations

Injuries related to motor vehicle accidents account for approximately one-quarter of the total number of injury deaths worldwide.[1] In Canada alone, there were approximately 3,000 deaths caused by motor vehicle accidents (21% of all injury-related deaths) in 2005.[5] In fact, these types of injuries are predicted to be the second leading cause of potential years of life lost and the third leading cause of disability-adjusted life years by 2020.[14]

In Canada, in 2008–2009, hospitalizations for motor vehicle traffic injuries represented 8.6% of all injury hospitalizations and 9.2% of hospitalizations for unintentional injury.

The least affluent neighbourhoods experienced the highest hospitalization rate for motor vehicle traffic injuries. The rates decreased as neighbourhood income increased (Table 2). These gradients were found for most types of motor vehicle traffic injuries, such as those involving drivers or passengers, pedestrians and pedal cyclists, but not for those involving motorcyclists. For example, hospitalization rates for motor vehicle traffic injuries involving pedestrians indicated a more than twofold difference between the least affluent neighbourhoods (11 per 100,000) and the most affluent areas (4 per 100,000). For motor vehicle traffic injuries, overall as well as for each type, the rates were higher in males.

Table 2

Motor Vehicle Traffic Injuries: Age-Standardized Hospitalization Rates by Neighbourhood Income Quintile, Canada, 2008–2009

Type of Injury	Age-Standardized Rates per 100,000 Population and 95% Confidence Intervals				
	Quintile 1 (Least Affluent)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (Most Affluent)
Occupant of Any Type of Vehicle (Including Driver or Passenger)*	38 (37–40)	35 (34–37)	36 (34–37)	34 (33–36)	32 (30–33)
Pedestrian Injured in Collision With Vehicle	11 (10–11)	8 (7–8)	7 (6–7)	6 (5–6)	4 (4–5)
Motorcycle Rider	6 (6–7)	8 (7–9)	8 (7–9)	8 (8–9)	8 (7–8)
Pedal Cyclist Injured in Collision With Vehicle	3 (3–4)	2 (2–3)	2 (2–2)	1 (1–2)	2 (1–2)
Unspecified/Other	2 (2–2)	1 (1–1)	1 (1–2)	1 (1–2)	1 (1–1)
Total Motor Vehicle Traffic Injuries	**60 (58–62)**	**54 (53–56)**	**54 (52–56)**	**51 (49–53)**	**47 (45–48)**

Notes
* Occupant of any type of vehicle: car, truck, bus, etc.
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
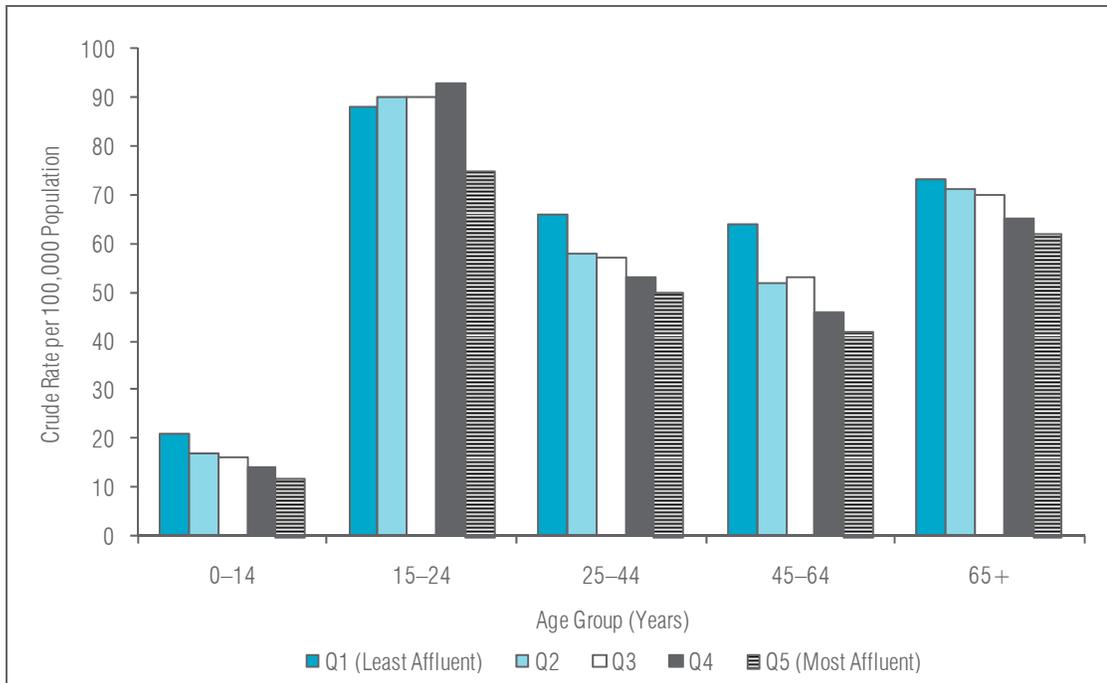**Sources**
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Is Age a Factor?

Analysis of hospitalizations for motor vehicle traffic injuries found that in all age groups (except age group 15 to 24) the rates were the lowest in the most affluent neighbourhoods and the highest in the least affluent areas. The socio-economic gradients were larger for children, adults (age 25 to 44) and older adults (age 45 to 64) (Figure 4).

Figure 4

Motor Vehicle Traffic Injuries: Age-Specific Hospitalization Rates by Neighbourhood Income Quintile, Canada, 2008–2009

Note
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
Sources
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Intentional Injuries and Socio-Economic Status

As noted, most injury is unintentional; intentional injuries represent the minority of injuries in Canada. Among hospitalizations for intentional injury, assault is the most prevalent type, followed by suicide and other intentional injuries. In prior studies, the risk of assault was found to be significantly higher for persons living in poorer neighbourhoods.[15]

In 2008–2009, hospitalizations for assault-related injuries represented 4.4% of all injury hospitalizations in Canada. The lowest rate was found in the most affluent neighbourhoods (18 per 100,000). The rate was three times higher in the least affluent neighbourhoods (56 per 100,000).

Are There Differences Between Males and Females?

Overall, rates of hospitalization for assault-related injuries for males were higher than for females. However, for both males and females, the highest hospitalization rates were for those living in the least affluent neighbourhoods. Although rates decreased with every increasing income quintile, the largest difference in rates was observed between the least affluent and the second least affluent income quintiles (Figure 5).

Figure 5

Assault-Related Injuries: Age-Standardized Hospitalization Rates by Neighbourhood Income Quintile and Sex, Canada, 2008–2009

Notes
Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.
I represents 95% confidence intervals.
Sources
National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec; 2006 Census, Statistics Canada.

Concluding Remarks

This analysis illustrated that hospitalizations for injuries—unintentional and intentional—present a consistent association with socio-economic status. Simply put, the lower the residential neighbourhood affluence, the higher the rate of hospitalizations for injuries.

This is important because multiple preventive strategies have proven effective in reducing injuries.[9, 16] These include targeted educational strategies, such as community-based programs and home education. Also, legislation, regulation and enforcement of practices—such as using helmets and seat belts, banning baby walkers and limiting or avoiding alcohol consumption when driving—have been shown to be effective in reducing injuries.[4, 9]

However, to date it is not known whether these strategies also work to reduce disparities.[4, 17] A thorough understanding of how socio-economic characteristics are related to injury hospitalizations could assist policy-makers, legislators, researchers, health care professionals and community partners in identifying areas for improvement. This could, in turn, lead to the development of interventions that target specific, at-risk population groups. This analysis could also provide a baseline from which to assess if disparities across socio-economic groups are decreasing over time. It could thereby measure improvements and successes.

Appendix: Methodological Notes

Defining Injury Hospitalization Rate

Definition

Age-standardized rate of acute care hospitalization due to injury resulting from the transfer of energy (excluding poisoning and other non-traumatic injuries), per 100,000 population

Method of Calculation

(Total number of hospitalizations due to injury / Total mid-year population) x 100,000 (age-adjusted)

Injury was identified by any of the following external cause of injury codes with a diagnosis type of 9.

ICD-10-CA

V01 to V06, V09 to V99, W00 to W45, W46, W49 to W60, W64 to W70, W73 to W77, W81, W83 to W94, W99, X00 to X06, X08 to X19, X30 to X39, X50, X52, X58, X59, X70 to X84, X86, X91 to X99, Y00 to Y05, Y07 to Y09 and Y20 to Y36.

Sources

National Trauma Registry Minimum Data Set, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec.

Population by income quintile for 2008–2009 was projected using 2001 and 2006 Canadian census data.

Injury hospitalizations by cause of injury were classified based on the grouping of the U.S. National Center for Health Statistics.[10]

Defining Neighbourhood Income Quintile

Assigning Patients to Neighbourhood Income Quintiles

Each patient was assigned to a neighbourhood income quintile using Statistics Canada's Postal Code Conversion File Plus (PCCF+).[18] This software links the six-character postal codes to the standard Canadian census geographic areas (such as dissemination areas, census tracts and census subdivisions). By linking postal codes to the census geography, the file facilitates extraction of the relevant census information (for example, income) for each geographic area.

The dissemination area (DA) is the smallest geographical unit available for analysis in the Canadian census, with a targeted population size of 400 to 700 persons.[19] Using PCCF+ (Version 5E),[20] the postal code of the patient's place of residence at the time of hospitalization was mapped to the corresponding 2006 census DA, and the neighbourhood income quintile of that DA was assigned to the patient.

In the PCCF+, for postal codes that map to more than one DA (14% of all postal codes), probabilistic assignment based on population size is used, meaning that the same postal code can be mapped to a different DA if the program is run more than once. To ensure that the same patient with the same postal code was always assigned to the same DA, a unique combination of encrypted health card number, birth date and postal code was assigned to the same DA.

Construction of Income Quintiles for Dissemination Areas

The neighbourhood income quintiles available in the PCCF+ were constructed according to the methods developed at Statistics Canada.[21] A short description of the method is provided below.

Neighbourhood income quintiles were based on the average income per single-person equivalent in a DA obtained from the 2006 census. This measure uses the person weights implicit in the Statistics Canada low-income cut-offs to derive "single-person equivalent" multipliers for each household size.[20] For example, a single-person household received a multiplier of 1.0, a two-person household received a multiplier of 1.24 and a three-person household received a multiplier of 1.53. To calculate average income per single-person equivalent for each DA, total income of the dissemination area was divided by the total number of single-person equivalents. Income quintile for DAs with a household population of less than 250 was imputed based on the neighbouring DAs (where possible), because census data on income for these DAs was suppressed.

Next, quintiles of population by neighbourhood income were constructed separately for each census metropolitan area, census agglomeration or residual area within each province. DAs within each such area were ranked from the lowest average income per single-person equivalent to the highest, and DAs were assigned to five groups, such that each group contained approximately one-fifth of the total non-institutional population of each area. The quintile data was then pooled across the areas. Quintiles were constructed within each area before aggregating to the national or provincial level to minimize the potential effect of the differences in income, housing and other living costs across different areas in the country.

Limitations

Neighbourhood income quintiles derived from linking postal codes to the census are less accurate in rural areas because rural postal codes cover larger geographical areas. Another limitation is that the measure excludes people living in long-term care facilities because income data from the 2006 Canadian census is only available for non-institutional residents. A small proportion of injury hospitalizations (1.6%) could not be assigned to a neighbourhood income quintile. This group includes records with missing income and/or missing residential information.

Acknowledgements

References

1. K. Hofman et al., "Addressing the Growing Burden of Trauma and Injury in Low- and Middle-Income Countries," *American Journal of Public Health* 95, 1 (2005): pp. 13–17.

2. L. Laflamme et al., *Socioeconomic Differences in Injury Risks: A Review of Findings and a Discussion of Potential Countermeasures* (Copenhagen, Denmark: World Health Organization Regional Office for Europe, 2009).

3. M. Peden et al., *The Injury Chartbook: A Graphical Overview of the Global Burden of Injuries* (Geneva, Switzerland: World Health Organization, 2002).

4. Statistics Canada, *Leading Causes of Death in Canada—2005*, last modified 2008, accessed on March 16, 2010, from <http://www.statcan.gc.ca/pub/84-215-x/2009000/tbl/t001-eng.pdf>.

5. Statistics Canada, *Mortality, Summary List of Causes, 2005*, last modified 2005, accessed on March 16, 2010, from <http://www.statcan.gc.ca/pub/84f0209x/84f0209x2005000-eng.htm>.

6. Canadian Institute for Health Information, *Reducing Gaps in Health: A Focus on Socio-Economic Status in Urban Canada* (Ottawa, Ont.: CIHI, 2008).

7. T. Faelker et al., "Socioeconomic Differences in Childhood Injury: A Population Based Epidemiologic Study in Ontario, Canada," *Injury Prevention* 6, 3 (2000): pp. 203–208.

8. C. S. Birken and C. Macarthur, "Socioeconomic Status and Injury Risk in Children," *Paediatrics and Child Health* 9, 5 (2004): pp. 323–325.

9. L. Laflamme et al., *Addressing the Socioeconomic Safety Divide: A Policy Briefing* (Copenhagen, Denmark: World Health Organization Regional Office for Europe, 2009).

10. G. Bergen et al., *Injury in the United States: 2007 Chartbook* (Hyattsville, Maryland: National Center for Health Statistics, 2008).

11. C. Cubbin and G. Smith, *Socioeconomic Inequities in Injury: Critical Issues in Design and Analysis* (Edmonton, Alta.: Alberta Centre for Injury Control & Research, 2002), pp. 349–375.

12. S. J. Gilbride et al., "Socio-Economic Status and Types of Childhood Injury in Alberta: A Population Based Study," *BMC Pediatrics* 6, 30 (2006): p. 30.

13. Injury Examiner, *Socioeconomic Status and Injury* (Edmonton, Alta.: Alberta Centre for Injury Control & Research, 2006), pp. 1–4.

14. C. J. Murray and A. D. Lopez, "Alternative Projections of Mortality and Disability by Cause 1990–2020: Global Burden of Disease Study," *Lancet* 24, 349 (1997): pp. 1498–1504.

15. C. Cubbin et al., "Socioeconomic Status and Injury Mortality: Individual and Neighbourhood Determinants," *Journal of Epidemiology and Community Health* 54, 7 (2000): pp. 517–524.

16. S. Newton and J. Young, *Child & Youth Unintentional Injury in Atlantic Canada: 10 Years in Review* (Toronto, Ont.: Safe Kids Canada, 2009).

17. E. Towner et al., *Injuries in Children Aged 0–14 Years and Inequalities* (London, U.K.: Health Development Agency, 2005).

18. Statistics Canada, *Postal Code Conversion File Plus (PCCF+)*, accessed on March 16, 2010, from <http://www.statcan.gc.ca/bsolc/olc-cel/olc-cel?lang=eng&catno=82F0086X>.

19. Statistics Canada, *2006 Census Dictionary* (Ottawa, Ont.: Statistics Canada, 2007), catalogue no. 92-566-XWE.

20. R. Wilkins, *PCCF+ Version 5E User's Guide. Automated Geographic Coding Based on the Statistics Canada Postal Code Conversion Files, Including Postal Codes Through March 2009* (Ottawa, Ont.: Statistics Canada, Health Analysis Division, 2009), catalogue no. 82F0086-XDB.

21. R. Wilkins et al., "Trends in Mortality by Neighbourhood Income in Urban Canada From 1971 to 1996," *Health Reports* 13, Suppl. (2002): pp. 1–27.