# THE CANADIAN CHILD SAFETY REPORT CARD – A COMPARISON OF INJURY PREVENTION PRACTICES ACROSS PROVINCES

LIRAZ FRIDMAN

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ABSTRACT

**Background** Health-based report cards have been used as a tool to disseminate research findings to parents, government agencies, stakeholders, and the general public. In Canada, health-based report cards such as the *Canadian Pediatric Society's* report provides a comparison of how provinces measure up to one another on a number of health-based indicators. However, few child health report cards discuss implications for primary prevention policy or practice.

**Methods** The Canadian Child Safety Report Card was developed in three studies using data from the Discharge Abstract Database and provincial coronial data. Interprovincial comparisons were made of measures of morbidity and mortality in chapters two and three. Chapter two focuses on external causes of injury such as falls, poisonings, burns, suffocation, and drowning. Chapter three focuses on transport-related injuries including occupants, cyclists, and pedestrians. Population based morbidity and mortality rates per 100,000 were calculated for children/youth 0-19 years. Percent change in hospitalization and death rates were reported over the 7-year study period (2006-2012). Chapter four ranks provinces to one another through morbidity, mortality, and injury policy measures using evidence-based criteria.

**Results** In Canada, Saskatchewan was the province with the highest rate of injury hospitalization per 100,000 between 2006 and 2012, but incidence decreased from 967 to 852 over the 7-year period, despite not having policies that meet best practice. Ontario had the lowest rate of injury hospitalization per 100,000, however the incidence rate increased slightly from 451 to 479. Only British Columbia decreased the incidence of injuries compared to the Canadian average. The rate decreased from 667 to 515 between 2006 and 2012. This change in incidence over time is observed in a province that complied with best practice evidence-based injury prevention policies. Similar trends were seen in mortality data across provinces.

**Conclusions** This is the first study to compare injuries among children and youth across Canadian provinces in terms of hospitalization, and the enactment of evidence-based policies. This data may allow the influence of all spectrums of prevention by resulting in the harmonization of policy and legislation in Canada. Similar projects in the European Union have started to yield results in terms of harmonizing prevention policies across member states.

# DEDICATION

"Education is the most powerful weapon which you can use to change the world." – Nelson Mandela

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To my parents and my brothers, thank you for always providing me with an environment of support and challenging me to grow and be the best version of myself. I wouldn't be standing here today without your patience, love, and guidance.

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Chapter 1

# Review of the Literature

## *1.1 The Burden of Injury in Canada*

According to the Public Health Agency of Canada (PHAC), injury is the leading cause of death after the first year of birth until the age of 44 (PHAC, 2013). The cost of injury to our society is approximately $26.8 billion each year (Chen et al., 2013; Do et al., 2013; Parachute, 2015; Yanchar et al., 2012). Injury is the fourth leading cause of death for all ages and is the leading cause of potential years of life lost for Canadians <70 years of age (Yanchar et al., 2012). According to the World Health Organization (WHO) in 2004, an estimated 3.9 million unintentional injury-related deaths worldwide occurred annually (Chen et al., 2013). Injuries are defined as "bodily harm resulting from a sudden transfer of energy that exceeds the human body's capacity for resistance." (Pike et al., 2015, p.12). Unintentional injuries are defined as injuries that are not caused with intention to harm (Chen et al., 2013). Among different provinces however the annual number of injuries varies. Chen et al. (2013) reported that between 2001 and 2007, the three territories, the Northwest Territories, Nunavut, and Yukon combined had both the highest overall, and unintentional injury mortality rates. In the same study, British Columbia had the lowest overall mortality rate, and Newfoundland and Labrador had the lowest mortality rate for unintentional injuries, specifically (Chen et al., 2013). In 2015, Parachute[1] released a report that informed Canadians of the economic burden of injury in Canada in 2010. In that report, they estimated the annual burden that injury places on Canadians, the health care system, and society overall amounted to:

- 15,866 deaths

[1] Parachute Canada is a national not-for-profit organization that advocates for injury prevention solutions through knowledge mobilization, public policy, and social awareness efforts.

- 231,596 Canadians hospitalized
- Over 3 million emergency room visits
- Over 55,000 Canadians permanently disabled
- $26.8 billion in total economic costs.

The vast majority of injuries that were described were both predictable and preventable and Parachute estimated that if Canada continued on the current trajectory, then by 2035 injuries will amount to $75 billion and 26,390 lives in Canada. This is equivalent to a 180% increase in cost and a loss of more than 10,000 lives (Parachute, 2015).

When observing global comparisons, Canada's childhood mortality rates were similar to most European countries except for Sweden, Italy, and Finland, which were much lower (Pan et al., 2006). Yanchar et al. (2012) reported that if Canada's injury rate was comparable to that of Sweden in 1991 – 1995 then during this time period, 1,233 children would not have died; 23,000 – 50,000 would not have been hospitalized for an injury; and, more than 250,000 would not have visited an emergency department. Canada ranked 18$^{th}$ of 26 Organisation for Economic Cooperation and Development (OECD) nations for child injury rates according to UNICEF in 2001 (Yanchar et al., 2012). The burden of injury in Canada has been outlined in many studies, however a comparison of Canadian provinces in terms of injury hospitalization, death rates, and policies related to injury has not yet been studied (Chen et al., 2013; Do et al., 2013; Pan et al., 2006; Yanchar et al., 2012). In Canada, the leading causes of injury-related death and hospitalization result from motor-vehicle collisions (MVCs), falls, and sports, although these vary by age, sex, and province (Bell et al., 2012; Billette et al., 2011; SMARTRISK, 2009; Parachute, 2015; Yanchar et al., 2012). Recently, policies and legislations such as bicycle helmet legislation, graduated drivers licensing (GDL), booster seat legislation, among others have been

developed to reduce injuries in these areas (Karkhaneh et al., 2013; Shope, 2007). However, little is known about the effect that these policies have on reducing the burden of injury for children and youth across Canadian provinces. Previous research suggests that investing in evidence-based injury prevention policies and legislation reduces the economic burden on Canadians (PHAC, 2010). In the Cost of Injury report, Parachute summarized the estimated savings to society for certain injury prevention programs/products. For example, for every dollar spent on booster seats, the cost savings to Canadians was $71; similarly, every dollar spent on bicycle helmets saved society $45 (Parachute, 2015).

### *1.2 Fall-related Injuries in Children*

Falls are the leading cause of hospitalization for unintentional injury in Canada, accounting for 37% of hospitalizations (Yanchar et al., 2012). In a study by Chen et al. (2013), falls accounted for 26% of all unintentional injury deaths in Canada for the period 2001 to 2007. In another study that examined adolescent injury deaths and hospitalizations in Canada between 1979 and 2003, researchers found that among adolescents aged 15 – 19 years of age, falls were a main cause for injury hospitalization (Pan et al., 2007).

The number of unintentional hospitalizations and deaths in Canada due to falls may vary across provinces. Leadbeater et al. (2010) studied self-reported youth injuries in British Columbia; they found that injuries to children and youth aged 12 – 19 years of age were most likely to happen when playing a sport, followed by falls. Similarly, this trend was found in other countries. In a systematic review by Khambalia et al. (2006), among the studies identified, young age (0-6), being male, and of low socioeconomic status were all risk factors for fall-related injuries. The authors concluded that despite the burden of fall-related injuries among children and youth, few studies have examined the risk and protective factors among young children.

While falls have been studied in elderly populations, the epidemiology of fall-related injuries is not well established among Canadian children and youth.

### *1.3 Sports and Recreation Related Injuries in Children*

According to the Canadian Community Health Survey (CCHS), two thirds (66%) of injuries were related to sports for Canadian adolescents aged 12 to 19 years of age (Billette & Janz, 2011). Between 2007 and 2010, 56,691 reported sports-related injuries (SRIs) were evaluated in an emergency department (ED) at a hospital that participated in the Canadian Hospitals Injury Reporting & Prevention Program (CHIRPP) (Fridman, Fraser-Thomas, McFaull, & Macpherson, 2013). Of these injuries, 21% were soccer-related (Fridman et al., 2013). The burden of sports-related injuries is of major concern for children under the age of 18. Sports and recreation-related injuries can occur from the improper use of consumer products like helmets or playground equipment. For example, Huchcroft et al. (2013) used CHIRPP data to demonstrate that consumer product-related sport injuries accounted for almost half of all injuries among children and youth. Injuries associated with consumer products can include: 1) defects or lack of quality of the product (sharp edges, poor assembly, product failure), 2) inappropriate use of the product, and 3) non-use of protective gear. In the Huchcroft et al. (2013) study, outdoor play and sports equipment appeared to be associated with the greatest number of injuries, for example swings and monkey bars.

Sports-related head injuries are a health concern for children 18 years of age and younger (Harris, Jones, Rowe, & Voaklander, 2012). The potential long-term effects for children who have sustained a head injury include depression, mild cognitive impairment, and chronic traumatic encephalopathy. Harris et al. (2012) reported that patients under the age of 18 years made up 69.8% of head injuries from a wide range of sports-related activities that were seen in

five EDs across Edmonton, Alberta between April 1998 and March 2008 (Harris et al., 2012). In addition, this study found that the rate of sports-related head injuries per 100,000 for those aged 10-14 and 15-19 years of age was more than triple the rate for those aged 20-24 years. The five specific sports-related activities with the highest rates of head injuries per 100,000 were: hockey (19.3), cycling (11.0), skiing/snowboarding/sledding (10.0), soccer (8.2), and football (6.0) (Harris et al., 2012).

Cycling-related injuries are common in some Canadian provinces (Fridman et al., 2013; Harris et al., 2012; Karkhaneh et al., 2013; Macpherson et al., 2010; Persaud et al., 2012). A study by Persaud et al. (2012) examined the non-use of bicycle helmets and risk of fatal head injury. This study found that between 2006 and 2010, the odds of dying from a head injury with no other injuries was 3.9 times greater for those not wearing a helmet compared to those who did wear a helmet (Persaud et al., 2012). The authors suggested that an increase in helmet use while cycling may prevent deaths, and that awareness should be created through the use of policy changes and educational programs. In another study examining the trend in head injuries associated with bicycle helmet legislation in Alberta, Canada, which targets children/youth <18 years, the authors found that in the post-legislation period, the average annual incidence rate of head injuries decreased from 136.3 to 115.1 per 100,000 for child cyclists under the age of 13 years (Karkhaneh, Rowe, Saunders, Voaklander, & Hagel, 2013). The same study reported no significant difference among adolescents or adults (Karkhaneh et al., 2013). Sports-related injuries are also common among children and youth residing in British Columbia. A study by Leadbeater et al. (2010), found that self-reported injuries among adolescents aged 12 – 19 years were most likely to occur while playing a sport.

Across provinces, the policies related to injury prevention in sports varies. For example, Alberta implemented a helmet law in 2002 and studies have shown the decline in head injuries for child cyclists since this change in legislation (Karkhaneh et al., 2013). The differences between provinces in terms of injury prevention practices need to be elucidated.

### *1.4 Epidemiology of Motor Vehicle Injuries in Children*

In Canada, the leading cause of injury-related death for all ages is due to motor vehicle related (MVC) incidents (Bell et al., 2012; SMARTRISK, 2009; Parachute, 2015). In addition, among children and youth specifically, MVCs are the leading cause of injury mortality (Kmet et al., 2006; Yanchar et al., 2012). More than 240,000 injuries and 3,300 deaths caused by MVCs occurred in Canada each year (Kmet et al., 2003), and of these, approximately 68 children under the age of 14 years died, and an estimated 880 were seriously injured (Yanchar et al., 2012). A more recent study by Rothman et al. (2014) reported that in 2010, 61 children died and more than 9,000 were injured on Canada's roads. In another review by Russell et al. (2011) it was reported that for adolescents aged 16 – 19 years, MVCs accounted for 40% of fatalities from all causes. In a study by Pan et al. (2007), the main causes for adolescent injury-related deaths in Canada listed in order of prevalence included: MVCs, suffocation, firearms, poisoning, and drowning. MVCs vary by province and area. In British Columbia, MVC related mortality was substantially higher in rural than urban areas (Bell et al., 2012). This trend is also seen in Alberta. Between 1997 and 2002 rural children in Alberta were five times more likely to die as a result of an MVC than urban children were, and three times more likely to be admitted to a hospital for a serious injury (Kmet et al., 2006). Injury rates resulting from MVCs also vary by age and sex. In one study, death and hospitalization rates were highest among 15 – 19 year olds compared with younger children (Kmet et al., 2006). Graduated driver licensing (GDL)

programs have been shown to reduce the youngest drivers crash risk by 20 – 40% (Shope, 2007). The same review determined that British Columbia had implemented a 'good' GDL program whereas Ontario's program was 'marginal'. These categories were based on points assigned to each jurisdiction by the Insurance Institute for Highway Safety that analyzed the GDL program's components for their likelihood in reducing injuries (Shope, 2007). In addition, crash rates for adolescents aged 16 years reported rate reductions between 5% and 73% after GDL programs were implemented (Shope, 2007).

The Safe Systems Approach (SSA) is another strategy that has been developed to reduce motor vehicle related injury in some OECD nations (OECD, 2008). SSAs typically aim to:

- Develop a road transport system better able to accommodate human error
- Incorporate many strategies for better management of crash forces
- Rely on strong economic analyses to understand the scale of the trauma problem.

This strategy describes the road user as the weakest link in the transport chain and maintains that organizations should have system design responsibilities to strive to protect all road users from the impact of those behaviors (OECD, 2008). The SSA also strives to reinforce the importance of adequate legislation and enforcement to achieve high levels of road user compliance (OECD, 2008). Differences between provinces in terms of MVC related injuries and policies related to graduated drivers licensing have been studied in some provinces including Nova Scotia, Ontario, Quebec, and British Columbia, however these programs have not been compared across Canada (Traffic Injury Research Foundation, 2005).

### *1.5 Child Safety Legislation/Policies*

In Canada, efforts have been made to reduce childhood injuries through the implementation of policies and laws. For example, legislation requiring graduated driver's

licensing, the use of child booster seats, and bicycle helmets have been enacted in some Canadian provinces in an effort to reduce injuries caused by MVCs.

Bicycle helmet legislation is in effect in eight of the ten Canadian provinces including New Brunswick (NB), British Columbia (BC), Nova Scotia (NS), Prince Edward Island (PEI), Newfoundland and Labrador (NL), Ontario (ON), Alberta (AB), and Manitoba (MB) (Dennis, Ramsay, Turgeon, & Zarychanski, 2010; Parachute, 2014). However, the legislation was introduced in different years with differing requirements in these provinces. Helmet laws are enforced through penalties that range from $21 CAD in New Brunswick up to $180 CAD in Newfoundland and Labrador (Dennis et al., 2010; Parachute, 2014). Ontario was the first province to implement helmet legislation in October 1995 (Parachute; 2014). In April 2015, Newfoundland and Labrador implemented helmet legislation (Parachute, 2014). A study by Dennis et al. (2010) examined rates of cycling related head injuries among young people pre-and post-helmet legislation and compared them to rates in provinces without helmet legislation. They reported that while cycling related head injuries were already decreasing between 1994 and 2008, the decrease was steeper in provinces that had implemented helmet legislation. During this time period, head injuries from cycling-related incidents decreased 56.0% in provinces with helmet legislation compared to 33.1% in those without (Dennis et al., 2010). However, when baseline trends were considered the overall rates of cycling related head injuries were not significantly altered by helmet legislation.

The Cochrane Collaboration systematic review on head and facial injuries among child cyclists reported that the risk of head injury could be reduced up to 88% and the risk of facial injury by 65% by wearing a helmet (Thompson, Rivara, & Thompson, 2000). A study by Macpherson et al. (2008), reported a significantly greater decline in the head injury rates in

provinces where bicycle helmet legislation had been adopted compared with provinces without helmet legislation. Given that helmets are an effective way to reduce cycling related head and facial injuries, a provincial comparison of effective evidence-based helmet legislation needs to be compared across provinces.

Booster seat legislation is another important law in Canada that aims to reduce childhood injuries from MVCs. In nine of the ten provinces excluding Alberta, booster seats are required for children up to a certain age or height/weight however this varies by province (Parachute, 2012). Generally speaking, infants should be placed in a rear-facing car seat (RFCS) until they reach at least 9 kg and a minimum of 1 year of age. Older children should be placed in a forward-facing car seat (FFCS) until approximately 4-5 years of age and a weight of 18-22 kg. Young children should use a booster seat (BS) to allow the proper position for a vehicle's lap and shoulder straps across their pelvis and shoulder (Child Safety Link, 2013). In 2016, the Canadian Pediatric Society (CPS) published a comparative report that rated provinces on a variety of injury prevention policies and legislations. A province was given a status of 'excellent' if they had enacted booster seat legislation that required a child to be restrained until they reached 9 years of age or a height/weight of 145 cm and 18-36 kg, along with public education programs (CPS, 2016). Yanchar et al. (2014) examined changes to knowledge and practice of childhood motor vehicle restraint use in Nova Scotia once booster seat legislation was introduced in 2007. They found that self-reported appropriate use of FFCSs and BSs increased significantly from 74-92% and 58-95% respectively. A provincial comparison of the effectiveness of booster seat legislation on reducing injuries among children related to MVCs is necessary given the current limited research that is available among provinces.

Graduated driver's licensing (GDL) has consistently been shown to reduce motor vehicle crashes among youth (Russell, Vandermeer, & Hartling, 2011; Shope, 2007). Generally, GDL requires novice drivers to go through a number of learning phases where they are supervised in lower-risk conditions until they gain more experience on the roads (Shope, 2007). The types of GDL programs differ among provinces in terms of number of phases, minimum age, supervisory requirements, driver education, blood alcohol content, nighttime and passenger restrictions, and having a sign on your vehicle (Macpherson et al., 2015). In the United States, GDL programs that combined a mandatory waiting period of more than 3-months between stages, a nighttime driving restriction, and greater than 30-hours of supervised driving and/or passenger restrictions were associated with a 16 – 21% reduction in fatal crashes for teen drivers (Chen, Baker, & Li, 2006). A Cochrane Systematic Review concluded that stronger GDL programs (i.e. programs that involve more restrictions for novice drivers) appear to result in a greater reduction in mortality from motor vehicle crashes among young drivers (Russell et al., 2011). It is important to highlight the differences of GDL policies for each province by summarizing the available literature on GDL's relationship to reduced motor vehicle collisions among youth.

Currently, there is little information about the effectiveness of helmet laws, graduated driver's licensing, and booster seat legislation and whether or not these policies reduce childhood injuries when they are enforced. A recent study by Simniceanu et al. (2014), compared child restraint use in Canadian provinces with and without legislation in 2010. In this study, they used an observational survey to compare provinces with new legislation (specific legislation for booster seat use for children ages 4-8 after 2006) including Nova Scotia, New Brunswick, PEI, Newfoundland and Labrador, and British Columbia, old legislation including Ontario and Quebec, and no legislation including Alberta, Saskatchewan, and the territories. This study

showed that there was a statistically significant difference in the rate of overall child restraint use in provinces with new, old, and no legislation. Overall, provinces with new legislation showed a lower rate of use (84.1%) than provinces with old legislation (94.9%) but higher than those without legislation (81.9%) (Simniceanu et al., 2014). This study suggests that injury prevention strategies including enforcement of child restraint use were important in decreasing motor vehicle related injury and death. However, one possibility for these results is that the enforcement of these policies may not have occurred initially and therefore the rates of use may differ over time. Enforcement studies have shown the effectiveness of policy on reducing injury in some provinces such as those related to seat-belt use (Wilson, Wiggins, & Fang, 2010). A study by Wilson et al., (2010) examined the relationship between a regional initiative to increase seat belt use, seat belt wearing rates, and collision casualties in the North Central region of British Columbia. Their study showed that as enforcement became stronger (i.e. more tickets were issued for non-compliance over time) the rates of nonuse of seat belts as well as casualty rates from MVCs significantly declined. This study is one example that demonstrates the effectiveness of legislation along with strict enforcement and highlights the importance of studying similar trends for other laws such as booster seat legislation and helmet laws.

### *1.6 Global Comparisons*

In order to make global comparisons on injury prevention practices in countries around the world a common measure of morbidity and mortality must be adhered to. In 1993, the disability-adjusted life year (DALY) was adopted by countries to measure the burden of disease. The DALY measures the burden of disease by summarizing premature mortality in years of life lost (YLLs), and non-fatal health outcomes in years lived with disability (YLDs) (Haagsma et al., 2016). YLLs are calculated by multiplying deaths by remaining life expectancy at age of

death from a table that estimates premature mortality. YLDs are calculated by multiplying the number of prevalent cases with a certain health outcome by the disability weight that has been assigned to this particular outcome, this ranges from 0 (equivalent to full health) and 1 (equivalent to death). The DALY measure allows for a comparison of the health impact of different injuries and their related risk factors and is important to policy and decision-makers who can use this measure to compare trends over time, and countries to one another (Haagsma et al., 2016). The Global Burden of Disease and Injury (GBD) study was updated by the World Health Organization (WHO) in 2010. This study provided regional and global estimates for 28 causes of injury, 67 risk factors, 20 age groups, and 187 countries in 21 world regions between 1990 and 2010 (Haagsma et al., 2016). In 2013, the GBD estimated that 4.8 million individuals globally died from injuries. Major causes related to unintentional injury death were road-traffic fatalities (29.1%) and falls (11.6%) (Haagsma et al., 2016). There was a significant increase in DALY between 1990 and 2013 for transport injuries and falls, 11.3 and 21.1 percent change, respectively. However, DALYs from other unintentional injuries including drowning, burns, and poisoning decreased over this time period (Haagsma et al., 2016).

Little is known about childhood and adolescent injury prevention practices and policies in Canada. In other areas around the world, such as Europe and New Zealand, child safety report cards have been developed to highlight the causes of injury in order to devise and implement effective injury prevention policies. In 2012, the European Child Safety Alliance launched child safety report cards for 31 countries outlining injury prevention practices and their level of adoption, implementation and enforcement on over 100 strategies that have been shown to prevent unintentional injuries among youth (Vincenten, 2012). Scores on these report cards ranged from 14.5 to 45 points in some countries out of a total of 60. This highlights the unequal

distribution of injuries and strategies that have been implemented to prevent them (Vincenten, 2012). These comparative reports emphasized some important differences in injury policies and legislations including cycling safety, pool fencing to reduce drowning related incidents, product safety laws, and environmental policies, among others. Their findings showed that only 13 countries (42%) had a national helmet law that required the use of a bicycle helmet while cycling, only seven countries (23%) had a national law requiring barrier fencing for private pools, approximately half of the countries (48%) had a national law requiring child resistant packaging of medications, and only 16 countries (52%) had a national law requiring environmental changes to prevent children from falling out of windows (e.g. window guards), and for half of those countries the law only applied to new buildings (Vincenten, 2012). These report cards helped highlight and inform areas for improvement in injury prevention policies and legislations across the European Union.

Canadian provinces vary on injury prevention policies and the rate of hospitalization and deaths due to injury. A Canadian Child Safety report card that relates the burden of injury through morbidity and mortality rates and evidence-based injury prevention policies/legislation will allow for provincial comparisons, with a view to improving legislation across jurisdictions, and reducing the burden of injury death and disability.

***Thesis Objectives***

1. To perform an interprovincial comparison of unintentional population-based injury hospitalization and death rates for Canadian children and youth ages 0-19 between 2006 and 2012.
2. To compare unintentional childhood road traffic related injury hospitalization and death rates across Canadian provinces among children and youth ages 0-19 over time and

highlight differences in provincial evidence-based injury prevention policies and legislations.

3. To create evidence-based child safety report cards that can be used to evaluate and influence policies and practices related to the prevention of unintentional childhood injuries among children and youth ages 0-19.

Chapter Two

MANUSCRIPT 1

# An Interprovincial Comparison of Unintentional Injury Rates in Canada Between 2006 – 2012

Liraz Fridman, PhD Candidate[a], Jessica L. Fraser-Thomas, PhD[a], Ian Pike, PhD[b], Alison K. Macpherson[a]

[a] School of Kinesiology and Health Science, York University, Toronto, Ontario, Canada
[b] Department of Pediatrics, University of British Columbia, Vancouver, British Columbia, Canada

Liraz Fridman
York University
Department of Kinesiology & Health Science
Bethune College
4700 Keele Street
Toronto, Ontario, Canada
M3J 1P3

## Summary

**Background** Unintentional injuries cause more deaths in Canada for children and youth (>1 year) than any other cause, which places a significant economic burden on society. Evidence-based policies and legislations aimed at preventing childhood injuries vary across Canadian provinces. The rate of children/youth hospitalized from a fall-related injury in 2010 was highest among males and females ages 0-9 compared to older children (Parachute, 2015). Policies that have been implemented to prevent these injuries include window safety mechanisms, safer stair gates, and improved playground equipment (Mackay et al., 2011). Other causes of injury that have shown significant morbidity and mortality rates include unintentional poisonings, burns, suffocation, and drowning and a number of evidence-based policies have been implemented across the country to prevent these injuries from occurring. Given the burden of unintentional injuries among children and youth, and the variability in provincial policies, our objective was to perform an interprovincial comparison of unintentional population-based injury hospitalization and death rates for Canadian children and youth ages 0-19 and compare trends between 2006 and 2012.

**Methods** Population-based hospitalization rates per 100,000 from unintentional injuries were calculated for children/youth (<19 years) using data from the Discharge Abstract Database (DAD) between 2006 and 2012. Mortality rates over the same time period were analyzed using provincial coronial data. Percent change in unintentional injury hospitalization rates from 2006 – 2012 were reported for each province.

**Results** The rate of hospitalization from unintentional injuries for children/youth less than 19 years in Canada from all-causes was 567.71 per 100,000 population between 2006-2012. The Canadian population-based injury morbidity rates from all unintentional causes decreased from

584 to 567 per 100,000 (-2.90%). During the study period, Saskatchewan (SK) had the highest overall unintentional injury morbidity rate (907.82 per 100,000) from all unintentional causes and Ontario (ON) had the lowest rate (460.13 per 100,000). SK also had the highest rate of injury hospitalizations for all sub causes except for drowning where Manitoba had the highest rate. ON was the only province with an injury morbidity rate that was consistently below the Canadian average. The mortality rate from all unintentional injury was also highest in SK (17.51 per 100,000) and lowest in ON (5.99 per 100,000) when compared to Canada (7.97 per 100,000).

**Conclusions** Injury prevention policies related to falls, poisonings, burns, suffocation, and drowning vary considerably among provinces. Although the overall injury hospitalization rate is decreasing over time, some sub causes such as choking/strangulation have shown an increase in certain provinces. Evidence-based policies and practices related to childhood injury prevention such as playground equipment safety, carbon monoxide detection, hot water heater temperature regulation, consumer product safety, and four-sided pool fencing among others should be standardized across Canada.

## Background

In Canada, injuries kill more children and youth over the age of one year than any other cause (Public Health Agency of Canada [PHAC], 2013). According to *The Cost of Injury in Canada Report* over 15,000 Canadians died in 2010 as the result of an injury. This amounted to a total economic burden of $26.8 billion. The economic cost per capita and potential years of life lost (PYLL) from injury varies by province. PYLL in Canada was 1,337 per 100,000 population in 2010 with an economic cost of $788 per capita. Ontario had the lowest number of PYLL (1128 per 100,000) and Saskatchewan had the highest (1953 per 100,000). This report highlighted the differences in economic burden from unintentional injuries across Canada (Parachute, 2015).

Injury prevention policies and legislations vary across the country (Macpherson et al., 2015; Rothman et al., 2016). A policy is often considered a form of government action that may involve the modification or implementation of resources to support a value such as injury prevention or safety promotion (Macpherson et al., 2015). Some examples of injury prevention policies include bicycle helmet legislation to prevent head injuries, four-sided pool fencing to prevent drowning-related injuries, and child-proof medical containers to prevent unintentional poisoning (Macpherson et al., 2015). Although evidence on the effectiveness of a number of these injury prevention policies exists and has been demonstrated over time, there is still a lack of harmonization of these policies across jurisdictions (Macpherson et al., 2015).

The burden of unintentional injuries in Canada varies by age, sex, and cause. In 2010, fall-related injuries cost Canadians $8.6 million (Parachute, 2015). The highest rate of hospitalization from fall-related injuries among children under 19 was 151.48 per 100,000 for males ages 0-4 and 120.27 per 100,000 for females ages 5-9. The rate of fall-related mortality

was highest among males ages 15-19 (0.87 per 100,000) and females ages 0-4 (0.11 per 100,000) (Parachute, 2015). The Child Safety Good Practice Guide suggests that window safety mechanisms such as bars and position locking devices are an effective strategy to prevent children from sustaining fall-related injuries (Mackay et al., 2011; Spiegel et al., 1995). Stair gates have also been shown to assist in the reduction of falls down stairs to young children (Mackay et al., 2011; Towner et al., 2001). Other evidence-based policies such as the implementation of safer playground equipment have demonstrated a decrease in the injury rate for children over time (Canadian Standards Association, 2007; Howard et al., 2005; Mackay et al., 2011). Policies and legislations related to the prevention of fall-related injuries in children/youth have shown evidence of effectiveness on a federal level.

Unintentional poisoning related injuries are another significant cause of hospitalization and death in Canada. Over 1,500 people died as the result of an unintentional poisoning related injury in 2010 (Parachute, 2015). Strategies that have been suggested to reduce the burden of these injuries include secure storage for poisons, child resistant packaging, and the availability of poison control centers (Mackay et al., 2011; Krug et al. 1994; Woolf et al., 1992). The pediatric morbidity and mortality rates from unintentional injury poisoning have not been compared to date at a provincial level. Policies related to poison prevention including carbon monoxide (CO) and smoke alarm detector legislation currently vary across Canadian provinces (Parachute, 2015).

Over 40,000 Canadians visited an emergency department (ED) in 2010 for a burn-related injury which resulted in a $366 million cost to society (Parachute, 2015). Children are especially vulnerable to burn related injuries, which are the third leading cause of hospital admissions for young children ages 0-4 (PHAC, 2016). Evidence-based policies for the prevention of burn and

scald related injuries include legislation regulating the temperature of hot water from household taps, however these are not currently regulated on a provincial basis (Peden et al., 2008). Other effective prevention strategies include product modification for child resistant lighters. Although the burden of burn-related injuries has previously been described in Canada, population based rates of injury by province have not been reported.

Children and youth are also susceptible to choking related injuries. In 2010, Bill C-36 became law and introduced new safety legislation that suppliers must comply with so as to better protect the health of Canadians through the manufacturing of safer products. Regulations were also put into effect for product recalls if they were deemed to be unsafe, or pose unnecessary risk to the consumer (Parliament of Canada, 2010). Consumer product safety is one example of a policy that may reduce suffocation-related injuries in children and youth.

In 2016, Clemens et al. published a population-based study of drowning in Canada. The authors reported that between 2008-2012 the incidence rate of unintentional water-related fatalities was 1.05, 0.57, and 1.27 per 100,000 for children/youth ages 0-4, 5-14, and 15-19 respectively. Safer pool-fencing legislation is one example of an evidence based policy that has been implemented in some municipalities across Canada in an effort to prevent unintentional drowning related incidences. Despite the evidence of effectiveness, there is still considerable variation among provinces on pool fencing by-laws (Parachute, 2011).

Given the burden of unintentional injuries among children and youth from a number of preventable causes including falls, poisoning, burns, suffocation, and drowning and the variability in provincial injury prevention policies and legislation in Canada, our objective was to perform an interprovincial comparison of unintentional population-based injury hospitalization and death rates for Canadian children and youth ages 0-19 between 2006 and 2012.

## Methods

### *Data Collection*

#### *Morbidity Data*

We conducted a retrospective analysis using morbidity data from the Canadian Institutes for Health Information (CIHI), extracted from the Discharge Abstract Database (DAD) (CIHI, 2016). This database collects information on all hospital discharges including deaths, sign-outs, and transfers. Data is collected from all provinces and territories except for Québec (QC), who are not required to report this data. Data from the territories was not included in this study because we could not relate these findings to prevention policies and legislations. This data is collected by health professionals who assign diagnostic codes using the International Classification of Diseases and Related Health Problems tenth revision (ICD-10). ICD-10 external codes for unintentional injury mechanisms were categorized as V01 – X59 and Y85-Y86. The DAD consists of many variables some of which include sex, age, and diagnosis. Data is available for fiscal years 1979 – 1980, and 1994 onwards. Children and adolescents aged 0 – 19 years of age who were hospitalized after sustaining an injury between January 1, 2006 and December 31, 2012 in all provinces excluding QC were included in this study.

#### *Mortality Data*

Mortality data was obtained from the Statistics Canada Vital Statistics Death Database. This is an administrative database that collects demographic and medical (cause of death) information from each province and territory annually on all deaths in Canada (Statistics Canada, 2015). The variables that are routinely collected include age, sex, marital status, date of death, place of residence, health status (using ICD-10 codes), and location. ICD-10 external codes for unintentional injury mechanisms were categorized as V01 – X59 and Y85-Y86. Vital Statistics

collects information on childhood death from provincial vital statistics databases, and each case is then manually entered to the national system. On a case by case basis, missing data may be suppressed in the Statistics Canada database. Due to this data suppression, we anticipated an underreporting of childhood death and therefore contacted provincial coroners to obtain the number of childhood deaths on a province by province basis. Children and adolescents who died as the result of an injury between January 1, 2006 and December 31, 2012 were included in this study using coronial data.

*Study Variables*

The primary outcome measure in this study was any injury related hospitalization or death sustained between 2006 and 2012 in Canada. A number of variables were analyzed in this study, including cause of injury and province of residence.

*Statistical Analyses*

We analyzed the population-based hospitalization rates per 100,000 for each province by year, age, and cause of injury, where possible. We also analyzed the injury mortality rates per 100,000 population for Canada over the seven-year period (2006-2012). An average annual incidence rate per 100,000 and a percent change was calculated for morbidity data over the seven-year study period. Percent change was calculated by subtracting the rate of hospitalization in 2006 from the rate of hospitalization in 2012 and dividing by the rate in 2006, multiplied by 100 to represent a percentage. A positive percent change indicates an increase in the rate of injury hospitalization over time and a negative percent change indicates a decrease over time. Data analyses were conducted at the Research Data Centres (RDC) at York University using Statistical Package for the Social Sciences (SPSS) version 24 (IBM Corporation, 2016).

## Results

*Unintentional Injury Rates in Canada*

The average hospitalization rate of all unintentional-related injuries in Canada for children/youth (up to 19 years) was 567.71 per 100,000 population. Between 2006-2012, the Canadian population-based injury morbidity rates from all unintentional causes decreased from 584 to 567 per 100,000 (-2.90%) (see Table 1). Saskatchewan (SK) had the highest average unintentional injury morbidity rate from all causes (907.82 per 100,000) when compared to the Canadian average, and Ontario (ON) had the lowest rate (460.13 per 100,000). However, the SK population based hospitalization rate decreased over time by -11.80%. Of the nine Canadian provinces analyzed (excluding data from QC), six showed a decrease in unintentional injury morbidity rates from 2006-2012 and three provinces (Prince Edward Island [PEI], Nova Scotia [NS], and ON) showed an 18.31, 15.76, and 6.33% increase, respectively (see Table 1).

The average mortality rate from all unintentional injuries in Canada was 7.97 deaths per 100,000 children/youth between 2006-2012 (see Table 2). Compared to the Canadian average, the highest mortality rate was 17.51 per 100,000 population in SK and the lowest rate was 5.99 per 100,000 in ON (see Table 2).

*Provincial Comparisons of Fall-Related Injury Rates*

The average rate of childhood fall-related injury hospitalization in Canada was 112.49 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate from falls decreased from 120.28 to 105.31 per 100,000 (-12.45%) (see Table 3). SK had the highest fall-related population based morbidity rate (195.44 per 100,000) when compared to the Canadian average and ON had the lowest rate (90.44 per 100,000). However, SK showed a -18.43% decrease in hospitalizations over time and ON showed an -11.15% decrease during the

same time period (see Table 3). PEI was the only province that saw an increase (+10.68%) in fall-related hospitalizations over time. British Columbia (BC) had the highest percent decrease (-21.31%) for fall-related injury hospitalizations when provinces were compared (see Table 3).

*Provincial Comparisons of Poisoning-Related Injury Rates*

The average rate of childhood poisoning-related injury hospitalization in Canada was 17.72 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate from unintentional poisonings decreased from 18.38 to 16.64 per 100,000 (-9.47%) (see Table 4). SK had the highest poisoning-related population based morbidity rate of any province (43.49 per 100,000) when compared to the Canadian average, and NS had the lowest rate (13.34 per 100,000). However, SK showed a -20.03% decrease in hospitalizations over time and NS showed an +23.48% increase during the same time period (see Table 4). NS and MB were the only two provinces that showed a percent increase in the rate of poisoning-related hospitalizations over time. PEI had the highest percent decrease (-77.04%) for poisoning-related injury hospitalizations when comparing provinces (see Table 4).

*Provincial Comparisons of Burn-Related Injury Rates*

The average rate of childhood burn-related injury hospitalization in Canada was 7.52 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate from burns decreased from 7.67 to 5.92 per 100,000 (-22.82%) (see Table 5). SK had the highest burn-related population based morbidity rate of any province (14.2 per 100,000) when compared to the Canadian average, and NS had the lowest rate (5.15 per 100,000). However, SK showed a -12.41% decrease in hospitalizations over time and NS showed an -2.35% decrease during the same time period (see Table 5). PEI was the only province that saw an increase (+623.31%) in burn-related hospitalizations over time. Newfoundland and Labrador (NL) had the highest

percent decrease (-59.45%) for burn-related injury hospitalizations when comparing provinces (see Table 5).

*Provincial Comparisons of Suffocation-Related Injury Rates*

The average rate of childhood suffocation-related injury hospitalization in Canada was 3.07 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate from suffocation/choking increased from 2.95 to 3.28 per 100,000 (+11.19%) (see Table 6). SK had the highest suffocation-related population based morbidity rate (6.42 per 100,000) when compared to the Canadian average and ON had the lowest rate (1.74 per 100,000). However, SK showed a -32.53% decrease in hospitalizations over time and ON showed an +25.62% increase during the same time period (see Table 6). SK and AB were the only two provinces that showed a decrease in the rate of suffocation-related hospitalizations over time. New Brunswick (NB) had the highest percent increase (+430%) for suffocation-related injury hospitalizations when comparing provinces to one another (see Table 6). This large percent increase is due to the low hospitalization rate in NB in 2006. From 2007 – 2012 there was less variability in the suffocation-related hospitalization rate in NB.

*Provincial Comparisons of Drowning-Related Injury Rates*

The average rate of childhood drowning-related injury hospitalization in Canada was 1.39 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate from drowning increased from 1.27 to 1.34 per 100,000 (+5.51%) (see Table 7). Manitoba (MB) had the highest drowning-related population based morbidity rate (1.75 per 100,000) when compared to the Canadian average and PEI had the lowest rate (0.86 per 100,000). However, MB showed a -2.11% decrease in hospitalizations over time and PEI had no drowning-related hospitalizations in 2006 or 2012 (see Table 7). NL had the highest percent decrease (-100%) for drowning-related

injury hospitalizations over time. Three provinces (SK, ON, and Alberta [AB]) showed a 44.00, 31.31, and 15.17% change increase in drowning-related hospitalizations respectively (see Table 7).

## Discussion

In Canada, the number of children and youth being hospitalized from injuries has decreased over time, however the rate of change differs among provinces. For all-cause injury hospitalizations including falls, poisoning, burns, suffocation/choking, and drowning, BC had the largest decrease (more than 20%) in injury morbidity rates over time (2006-2012), while PEI saw a 18% increase (see Table 1). SK had the highest rate of injury hospitalization compared to the Canadian average when examining all sub causes except for drowning, where MB had the highest rate. Although SK had a rate that was consistently above the Canadian average, the hospitalization rate decreased over time by -11.80%. ON was the only province with an injury morbidity rate that was consistently lower than the Canadian average. However, over time the rate of hospitalization increased in ON by +6.33%.

Our study found that in Canada, fall-related injuries are decreasing by -12.45%. Only one province, PEI, showed a +10.68 percent increase in the rate of fall-related hospitalizations over time. PEI has a smaller population and therefore rates of injuries are typically unstable in this province which may account for the high percent increase over time. ON was the province that showed the lowest rate of injury hospitalization and deaths from fall-related injuries. Previous literature on fall-related injuries in a pediatric population suggests that window safety mechanisms that prevent children from being able to open windows, including devices such as bars and position locks are one effective strategy to prevent falls (Mackay et al., 2011; Spiegel et al., 1995). Currently there are no national fall-related policies/legislations that require the

installation of these bars/devices in homes. Another common cause of fall-related injuries is from playground equipment. In 1998, the Canadian Standards Association (CSA) introduced new guidelines to make playground equipment safer. Intervention schools that received new safer playground equipment saw a decrease in injuries when compared to non-intervention schools in Toronto (Canadian Standards Association, 2007; Howard et al., 2005; Mackay et al., 2011). The CSA guidelines on playground equipment are an example of an evidence-based policy that has shown evidence of effectiveness in reducing one cause of injury in Canadian children.

Our study found that, in Canada, poisonings account for a high rate of injury hospitalization (17.72 per 100,000) among children. SK had the highest rate of unintentional poisoning related hospitalizations of any province and NS had the lowest rate. However, SK's rate decreased over time by -20.03% whereas NS's rate increased by +23.48%. During the study period, the rate of hospitalization from poisoning has decreased in Canada in seven out of the nine provinces with the exception of NS and MB. A few examples of prevention policies that relate to decreasing the burden of unintentional poisonings include having access to a poison control centre, and installing carbon monoxide (CO) and smoke detectors (Mackay et al., 2011). Economic burden studies have suggested that for every dollar spent on having a poison-control centre, it saves society eight dollars in direct and indirect costs from these injuries (Parachute, 2015). Currently, carbon monoxide (CO) and smoke alarm detector laws vary by province. Six provinces (BC, SK, NB, NS, PEI, NL) do not have a provincial law mandating the use of CO detectors in residential buildings. Other provinces such as ON, require CO alarms to be installed in all buildings that have residential occupancy with a fuel burning appliance or storage garage. Although little is known about how these prevention policies directly affect the rate of injury

morbidity and mortality among children, this is an example of a legislation that may be reducing the burden of childhood injuries in Canada.

In our study, we found that burn-related injuries in Canada were decreasing by over 20% among children and youth, however these rates differed by province, and SK had a rate of burn-related hospitalizations that was two times greater than Canada (14.2 vs. 7.52 per 100,000). With the exception of PEI, all provinces showed a decrease in burn-related hospitalization rates over time with a -22.82% decrease in Canada. Children are susceptible to scalds when they are exposed to water at 60 degrees Celsius for more than a second. To prevent these injuries, hot water taps should be maintained at 49 degrees Celsius (Peden et al., 2008). Building regulations requiring hot water taps to be kept at lower temperatures are not systematically regulated among provinces. In ON for example, as of September 2004, building codes require that all new buildings keep hot water at 49 degrees Celsius, and older plumbing needs to be replaced to meet these standards (Government of Ontario, 2015). However, there is no published literature on the differences between burn-related injuries across province and how this relates to scald prevention policies. Given the large differences between provinces in burn-related hospitalization and death rates, legislation and policies geared towards reducing these types of injuries should be harmonized across the country.

Choking and strangulation related injuries are common among young children. Although the rate of overall hospitalizations from all causes in Canada decreased over time, when we stratified by sub cause, choking/strangulation related injuries increased between 2006-2012 by +11.19%. Choking hazards are primarily associated with food, coins, and toys (American Academy of Pediatrics [AAP], 2010). Legislation that would reduce the risk of choking related injuries in Canada such as Bill C-36 on product safety has not been systematically reviewed at a

provincial level. Food is one cause of choking-related injuries in children under 3-years of age, and a mandatory system to label foods with appropriate warnings according to their choking risk has been suggested (AAP, 2010). The number of choking-related injuries are increasing in Canada over time; policies that focus on reducing these injuries should be implemented on a national basis.

Finally, drowning-related hospitalizations and fatalities also increased over the study period by +5.51%, substantial increases were seen in SK, ON, and AB over time. The first global report on drowning claims that 75% of private back-yard/garden swimming pool drowning deaths among young children could be prevented by four-sided pool fencing, completely separating the pool from the house/yard (World Health Organization [WHO], 2014). Safer pool fencing legislation is currently mandated at a municipal level and varies greatly within and among provinces in Canada (Parachute, 2011). Four-sided pool fencing is one effective prevention policy that should be uniformly implemented across Canada to reduce the burden of childhood drowning related hospitalizations and fatalities.

*Strengths*

The major strength of this study is that it highlighted the differences in childhood injury rates using both hospitalization and mortality data from a number of various sub-causes and provinces over time. In addition, data was reported on a population-based level and was related back to prevention policy/legislation where applicable.

*Limitations*

We were unable to report mortality data from Vital Statistics by sub cause and province due to the discrepancy between provincial and national reporting standards of this data set. At the national level, Statistics Canada manually inputs Vital Statistics Mortality Data from each

individual province, however some data may be suppressed if insufficient variables are included in each report. Due to this discrepancy, there may be a greater or lesser proportion of children captured in the national database and therefore any results would likely be under- or over-estimated. Additionally, we were not able to include Quebec or the Territories in our study.

Another limitation was the lack of information around specific subcauses. For example, unintentional drowning can be coded as "drowning involving bathtub", "drowning involving swimming pool", "drowning involving natural water", and "unspecified drowning" but there is no way to ascertain if the swimming pool was a public pool or a back-yard pool for example.

In addition, factors other than policies/legislations such as awareness campaigns, changes to the built environment, or changes in health service utilization practices may have influenced changes in the pediatric injury rates over time.

## Conclusions

Childhood injury morbidity and mortality rates vary in Canada on a provincial level. Although overall injury rates are decreasing in this population over time, some sub causes such as choking/strangulation and drowning have shown an increased incidence. This is the first study to compare injuries among children and youth across Canadian provinces in terms of hospitalization, death rates and the enactment of evidence-based policies. This data may allow the influence of all spectrums of prevention by resulting in the harmonization of policy and legislation in Canada.

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**Table 1: Population Based Injury Hospitalization Rate per 100,000 from all unintentional causes by Canadian Province (2006 – 2012) among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% Change* |
|---|---|---|---|---|---|---|---|---|---|
| ***PEI*** | 692.84 | 739.34 | 721.16 | 840.77 | 628.72 | 682.27 | 819.7 | 731.94 | 18.31 |
| ***NS*** | 592.33 | 643.91 | 600.3 | 602.6 | 620.98 | 643.73 | 685.67 | 626.39 | 15.76 |
| ***ON*** | 451.23 | 449.61 | 441.55 | 448.25 | 467.86 | 482.95 | 479.78 | 460.13 | 6.33 |
| ***BC*** | 667.55 | 636.66 | 583.96 | 574.30 | 547.24 | 537.95 | 515.72 | 580.56 | -22.74 |
| ***SK*** | 967.06 | 941.56 | 912.18 | 897.19 | 931.13 | 855.56 | 852.98 | 907.82 | -11.80 |
| ***NB*** | 774.55 | 741.93 | 729.07 | 700.75 | 717.48 | 658.19 | 689.43 | 716.57 | -10.99 |
| ***MB*** | 607.32 | 627.39 | 623.5 | 578.87 | 581.64 | 593.56 | 555.7 | 595.26 | -8.50 |
| ***NL*** | 722.32 | 670.52 | 704.26 | 636.89 | 579.54 | 641.93 | 667.26 | 660.75 | -7.62 |
| ***AB*** | 687.21 | 687.04 | 665.51 | 673.18 | 677.59 | 677.10 | 679.99 | 678.19 | -1.05 |
| ***Canada*** | 584.00 | 578.00 | 558.00 | 557.00 | 562.00 | 568.00 | 567.00 | 567.87 | -2.90 |

A positive change indicates an annual increase over time; a negative percentage indicates a decrease over time

**Table 2: Population Based Mortality Rate per 100,000 (2006-2012) from all unintentional injuries among children and youth, 0-19 years**

| *Province* | *All Unintentional Injuries* |
|---|---|
| ***BC*** | 8.35 |
| ***AB*** | 8.70 |
| ***SK*** | 17.51 |
| ***MB*** | 11.93 |
| ***ON*** | 5.99 |
| ***NS*** | 9.81* |
| ***NB*** | 13.45 |
| ***PEI*** | 10.35 |
| ***NL*** | 9.68 |
| ***CAN*** | 7.97 |

*Estimated from RDC Data – Vital Statistics Death Database

**Table 3: Fall-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***PEI*** | 124.36 | 156.28 | 108.63 | 154.24 | 170.09 | 127.36 | 137.64 | 139.75 | 10.68 |
| ***BC*** | 144.93 | 130.74 | 127.13 | 126.38 | 116.56 | 118.81 | 114.05 | 125.53 | -21.31 |
| ***NL*** | 140.90 | 133.92 | 119.35 | 113.14 | 121.62 | 114.43 | 112.78 | 122.44 | -19.96 |
| ***SK*** | 218.51 | 219.90 | 186.44 | 192.33 | 189.89 | 183.88 | 178.23 | 195.44 | -18.43 |
| ***MB*** | 105.76 | 101.71 | 126.09 | 91.51 | 87.03 | 102.77 | 89.42 | 100.55 | -15.45 |
| ***NS*** | 153.39 | 174.78 | 159.56 | 128.81 | 124.30 | 110.18 | 130.60 | 140.74 | -14.86 |
| ***ON*** | 96.15 | 93.30 | 93.01 | 87.36 | 89.58 | 88.13 | 85.43 | 90.44 | -11.15 |
| ***NB*** | 173.51 | 190.61 | 164.59 | 162.89 | 170.21 | 147.86 | 161.69 | 167.51 | -6.81 |
| ***AB*** | 131.34 | 146.10 | 128.42 | 135.00 | 129.94 | 130.11 | 126.12 | 132.36 | -3.97 |
| ***Canada*** | 120.28 | 120.27 | 114.78 | 110.21 | 108.87 | 107.68 | 105.31 | 112.49 | -12.45 |

**Table 4: Poisoning-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***NS*** | 11.33 | 14.41 | 12.65 | 12.34 | 14.03 | 14.79 | 13.99 | 13.34 | 23.48 |
| ***MB*** | 17.42 | 18.69 | 18.96 | 18.87 | 15.34 | 18.06 | 20.42 | 18.25 | 17.22 |
| ***PEI*** | 26.65 | 33.06 | 27.16 | 36.29 | 6.07 | 36.39 | 6.12 | 24.58 | -77.04 |
| ***SK*** | 50.43 | 46.67 | 45.59 | 41.27 | 44.72 | 35.02 | 40.33 | 43.49 | -20.03 |
| ***NB*** | 29.81 | 25.93 | 27.43 | 30.12 | 32.30 | 23.28 | 25.46 | 27.79 | - 14.59 |
| ***NL*** | 24.08 | 23.53 | 22.78 | 20.07 | 19.35 | 26.05 | 20.68 | 22.37 | -14.12 |
| ***BC*** | 20.00 | 20.86 | 18.60 | 19.13 | 17.58 | 20.28 | 17.21 | 19.10 | -13.95 |
| ***AB*** | 20.46 | 23.34 | 20.77 | 17.94 | 19.31 | 20.06 | 17.96 | 19.95 | -12.22 |
| ***ON*** | 13.81 | 14.88 | 14.21 | 14.32 | 12.48 | 12.47 | 12.83 | 13.57 | -7.10 |
| ***Canada*** | 18.38 | 19.32 | 18.16 | 17.79 | 16.69 | 17.08 | 16.64 | 17.72 | -9.47 |

**Table 5: Burn-related injury hospitalization rate per 100,000 between 2006-2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***PEI*** | 2.96 | 6.01 | 9.05 | 6.05 | 6.07 | 3.03 | 21.41 | 7.76 | 623.31 |
| ***NL*** | 11.59 | 15.38 | 16.40 | 8.21 | 11.06 | 13.96 | 4.70 | 11.64 | -59.45 |
| ***BC*** | 8.56 | 8.06 | 8.89 | 6.93 | 6.62 | 7.45 | 4.15 | 7.24 | -51.52 |
| ***NB*** | 7.75 | 9.65 | 10.36 | 12.91 | 11.80 | 7,55 | 4.46 | 9.23 | -42.45 |
| ***ON*** | 6.97 | 6.83 | 7.28 | 5.56 | 5.79 | 6.73 | 5.31 | 6.36 | -23.82 |
| ***MB*** | 11.40 | 13.63 | 11.38 | 13.84 | 9.70 | 5.92 | 8.97 | 10.67 | -21.32 |
| ***SK*** | 12.33 | 14.56 | 17.05 | 11.42 | 18.70 | 14.59 | 10.80 | 14.20 | -12.41 |
| ***NS*** | 4.25 | 4.80 | 7.30 | 6.42 | 5.51 | 3.57 | 4.15 | 5.15 | -2.35 |
| ***AB*** | 7.04 | 7.30 | 8.53 | 9.40 | 8.26 | 7.32 | 7.00 | 7.84 | -0.57 |
| ***Canada*** | 7.67 | 8.08 | 8.72 | 7.48 | 7.38 | 7.41 | 5.92 | 7.52 | -22.82 |

**Table 6: Suffocation/Choking-related injury hospitalization rate per 100,000 between 2006-2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***NB*** | 0.60 | 3.62 | 2.44 | 3.07 | 4.35 | 6.92 | 3.18 | 3.43 | 430.00 |
| ***NL*** | 0.89 | 2.71 | 0.91 | 2.74 | 1.84 | 0 | 3.76 | 1.83 | 322.47 |
| ***NS*** | 3.30 | 4.32 | 3.41 | 4.44 | 9.02 | 12.24 | 6.22 | 6.07 | 88.48 |
| ***ON*** | 1.60 | 1.25 | 1.57 | 2.12 | 1.87 | 1.77 | 2.01 | 1.74 | 25.62 |
| ***MB*** | 3.17 | 3.17 | 3.48 | 2.52 | 3.13 | 3.43 | 3.71 | 3.23 | 17.03 |
| ***BC*** | 3.40 | 3.72 | 3.51 | 4.34 | 1.65 | 4.04 | 3.84 | 3.50 | 12.94 |
| ***PEI*** | 5.92 | 9.02 | 6.03 | 6.05 | 0 | 6.06 | 6.12 | 5.61 | 3.38 |
| ***SK*** | 7.47 | 9.71 | 6.30 | 5.16 | 7.33 | 4.01 | 5.04 | 6.42 | -32.53 |
| ***AB*** | 6.15 | 5.31 | 5.90 | 5.51 | 3.43 | 4.56 | 5.01 | 5.12 | -18.54 |
| ***Canada*** | 2.95 | 3.00 | 3.00 | 3.27 | 2.72 | 3.26 | 3.28 | 3.07 | 11.19 |

**Table 7: Drowning-related injury hospitalization rate per 100,000 between 2006-2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***NB*** | 0.00 | 1.20 | 0.00 | 0.61 | 1.86 | 1.89 | 3.18 | 1.23 | - |
| ***NS*** | 0.00 | 0.96 | 1.95 | 2.47 | 1.00 | 1.02 | 1.55 | 1.27 | - |
| ***PEI*** | 0.00 | 0.00 | 3.01 | 0.00 | 0.00 | 3.03 | 0.00 | 0.86 | - |
| ***SK*** | 0.75 | 2.24 | 2.22 | 1.47 | 1.47 | 1.46 | 1.08 | 1.53 | 44.00 |
| ***ON*** | 0.99 | 1.22 | 1.38 | 0.87 | 1.58 | 1.61 | 1.30 | 1.28 | 31.31 |
| ***AB*** | 1.45 | 1.00 | 1.42 | 1.95 | 1.07 | 1.91 | 1.67 | 1.50 | 15.17 |
| ***NL*** | 1.78 | 0.00 | 0.91 | 2.74 | 0.00 | 0.93 | 0.00 | 0.92 | -100.00 |
| ***BC*** | 2.06 | 1.55 | 2.07 | 1.55 | 1.65 | 1.03 | 0.83 | 1.54 | -59.71 |
| ***MB*** | 1.90 | 0.95 | 3.16 | 1.89 | 1.25 | 1.25 | 1.86 | 1.75 | -2.11 |
| ***Canada*** | 1.27 | 1.24 | 1.61 | 1.30 | 1.43 | 1.52 | 1.34 | 1.39 | 5.51 |

Chapter Three

MANUSCRIPT 2

# Childhood Road Traffic Injuries in Canada – A Provincial Comparison of Transport Injury Rates Over Time

Liraz Fridman, PhD Candidate[a], Jessica L. Fraser-Thomas, PhD[a], Ian Pike, PhD[b], Alison K. Macpherson[a]

[a] School of Kinesiology and Health Science, York University, Toronto, Ontario, Canada
[b] Department of Pediatrics, University of British Columbia, Vancouver, British Columbia, Canada

Liraz Fridman
York University
Department of Kinesiology & Health Science
Bethune College
4700 Keele Street
Toronto, Ontario, Canada
M3J 1P3

## Summary

**Background** In Canada, road traffic injuries are the leading cause of death among children and youth ≤ 19 (PHAC, 2013). Motor-vehicle collisions account for half of all transport related incidents. Across the country, there is variability in road traffic injury prevention policies and legislations. Despite evidence that shows that graduated driver's licensing (GDL), booster seat legislation, and bicycle helmet legislation are all effective at reducing injuries among children and youth, there is still a lack of harmonization across provinces in adopting and enforcing these policies and legislation.

**Methods** Population-based hospitalization and death rates per 100,000 were analyzed using data from the Discharge Abstract Database and provincial coroner's reports. Road traffic related injuries sustained by children and youth ≤ 19 years were analyzed by province and sub cause (i.e. occupant, pedestrian, pedal cyclist) between 2006-2012.

**Results** The overall transport-related injury morbidity rate for children/youth in Canada was 70.91 per 100,000 population between 2006-2012. The Canadian population-based injury hospitalization rates from all transport-related causes decreased from 85.51 to 58.77 per 100,000 (-31.27%) during the study period. Saskatchewan (SK) had the highest overall transport related morbidity rate (135.69 per 100,000), and Ontario (ON) had the lowest (47.12 per 100,000). When transport-related sub causes were analyzed by occupant, cyclist, and pedestrian related injuries, Prince Edward Island (PEI), New Brunswick (NB) and SK had the highest rates of injury hospitalization. The mortality rate for all transport-related injuries was highest in SK (10.99 per 100,000), and lowest in ON (3.09 per 100,000) when compared to the Canadian average (4.50 per 100,000).

**Conclusions** Transport-related injuries among children and youth have decreased by almost one-third from 2006 to 2012; however there are still differences among provinces in road traffic safety policies and legislation. Evidence-based injury prevention policies such as graduated driver's licensing, bicycle helmet legislation, and booster seat legislation should be harmonized across Canada.

## Background

Road traffic collisions are the leading cause of injury death among Canadian children and youth (ages 1 – 19 years) (Public Health Agency of Canada [PHAC], 2013). The total economic burden to Canadians in 2010 from transport incidents for all ages was $4.2 billion (Parachute, 2015). Male and female adolescents aged 15-19 had the highest rate of transport-related death, 17.04 and 8.00 per 100,000 respectively, compared to younger children (Parachute, 2015). Motor-vehicle collisions (MVCs) account for 50% of all transport-related costs, pedal cyclists and pedestrians account for the next highest direct costs (Parachute, 2015). There is a large variation between road traffic injury prevention policies and legislation across Canada. Evidence-based injury prevention policies such as those related to motor vehicle occupant safety (graduated driver's licensing [GDL]; booster seat legislation), pedestrian safety, and cyclist safety (helmet legislation) are effective at reducing injuries in children and youth (Macpherson et al., 2015).

GDL has consistently been shown to reduce MVCs in youth (Russell, Vandermeer, & Hartling, 2011; Shope, 2007). Generally, GDL requires novice drivers to go through a number of learning phases where they are supervised in lower-risk conditions until they gain more experience on the roads (Shope, 2007). The types of GDL programs differ between provinces in terms of number of phases, minimum age, supervisory requirements, driver education, blood alcohol content, nighttime and passenger restrictions, and having a sign on your vehicle (Macpherson et al., 2015). However, little is known about the provincial differences in injury rates from transport incidents and how this relates to prevention policies/legislations.

Pedestrian safety laws are another important policy that may affect the number of children being hospitalized or dying from pedestrian motor vehicle collisions (PMVCs).

Pedestrian safety laws are often multifactorial and can involve changes to the built environment, traffic calming strategies, speed reduction, and on street parking limits (AAP, 2009). Previous studies suggest that PMVCs in children/youth who walk to and from school as a form of active transportation are related to the built environment (Rothman et al., 2014). Currently, pedestrian safety laws are mandated on a municipal level and differences between jurisdictions are not well documented.

In a number of studies, child motor vehicle restraints including rear-facing car seats, forward-facing car seats, and booster seats have been shown to significantly reduce the risk of severe injury and death of children who are involved in a MVC (Yanchar, Kirkland, LeBlanc, & Langille, 2012). In Canada, there is some variability in booster seat legislation. Some provinces only have age, weight, and height restrictions whereas other provinces include additional components such as driver responsibility, non-compliance penalties, and public education and incentive programs. Alberta is currently the only province that does not have booster seat legislation in effect. There is a paucity of information on the differences in child occupant related injuries among provinces in Canada.

Legislation requiring citizens to wear a bicycle helmet while cycling varies among provinces. Some provincial laws apply to Canadians of all ages whereas others only apply to children and youth who are less than 18 years of age. In addition, some provinces have enacted legislation that applies to all-wheeled activities including skates, skateboards, and push-scooters. Other differences include where these laws are enforced (all roads vs. public roads) and the extent to which individuals are penalized (variation in monetary fines) (Macpherson et al., 2015). Despite studies that demonstrate that all age laws with steeper fines increase levels of helmet use compliance (Macpherson & Spinks, 2008), in Alberta, Ontario, and Manitoba helmet legislation

only applies to Canadians under the age of 18 and at the time of writing there is no provincial law requiring the use of bicycle helmets in either Saskatchewan or Quebec.

In 2015, Macpherson et al. evaluated a number of pediatric injury prevention policies across Canadian provinces. Using a snowball sampling technique for each province, the researchers compared key informants' perceptions of the quality of three evidence based injury prevention policies (GDL, booster seat legislation, helmet legislation). Authors identified best practices related to each policy through published studies and reviews and obtained expert opinion from researchers, practitioners, and policy makers at a national level. The authors found that experts rated injury prevention policies that aligned with best practice, such as GDL, higher than policies that did not align with best practice (such as bicycle helmet legislation that did not target all ages). Key informants were also likely to rate public awareness and enforcement higher for the policies that followed best-practice guidelines. Despite evidence that shows that certain injury prevention policies such as GDL, booster seat legislation, and helmet legislation are effective in reducing pediatric injuries, there is still a lack of harmonization across provinces in adopting and enforcing these policies and legislations (Macpherson et al., 2015).

Our objective in this study was to compare pediatric road traffic related injury hospitalization and death rates across Canadian provinces and highlight differences in provincial evidence-based injury prevention policies and legislations.

## Methods

### *Data Collection*

#### *Hospitalization Data*

Using data from the Discharge Abstract Database (DAD), maintained by the Canadian Institutes for Health Information (CIHI), we conducted a retrospective analysis of population-

based injury hospitalizations from road traffic incidents. CIHI originally developed the DAD in 1963. This database collects information on hospital discharges including deaths, sign-outs, and transfers. Data from the DAD is also used to populate other CIHI databases such as the hospital mortality database and the hospital mental health database.

Data is collected from all provinces and territories except for Québec, who are not required to report this data. The data is available for fiscal years 1979 – 1980, and 1994 onwards. The DAD contains demographic, administrative, and clinical data for hospital inpatient discharges and day surgery interventions. This data is collected primarily from diagnostic coding that relies on a review of the patient's chart to produce important health information such as health history and current diagnoses. This data is collected by health professionals who assign diagnostic codes using the International Classification of Diseases and Related Health Problems tenth revision (ICD-10). External causes of injury were grouped based on the ICD-10 codes. All unintentional transport injury codes V01-V99 were analyzed. Children and youth (0-19 years) who were hospitalized after sustaining a road traffic related injury between January 1, 2006 and December 31, 2012 in all provinces excluding QC were included in this study.

*Death Data*

The Statistics Canada Vital Statistics – Death Database was used to analyze population based mortality rates resulting from road traffic injuries among children and youth (0-19 years of age). This is an administrative database that collects demographic and medical (cause of death) information from each province and territory annually on all deaths in Canada.

Data is extracted from administrative files and through mandatory surveys. The following variables are available for each death in Canada: demographics (age, sex, marital status, date of death, place of residence, and birthplace of the deceased), health status (underlying cause of

death using ICD-10 codes), and location (province or territory where death occurred and place of accident). All unintentional transport injury codes V01-V99 were analyzed. Data from the Vital Statistics Death Database is collected from each province and entered manually; if variables are missing on an individual basis, these cases may not be entered into the national system. The number of deaths in this database is therefore likely underreported and for data quality purposes we obtained the number of childhood deaths from chief coroners or medical examiners in each province. This provincial coronial data was used in conjunction with the Vital Statistics Death Database to analyze the rate among children and youth (0-19 years) who died after sustaining a transport related injury between January 1, 2006 and December 31, 2012 in all provinces.

*Study Variables*

We examined the number of road traffic related injury hospitalization and deaths in Canada between 2006 – 2012 as our primary outcome measure. Variables including cause of injury, year, and resident province were analyzed where applicable.

*Statistical Analyses*

Population-based rates per 100,000 were calculated for both hospitalization and death data. Hospitalization data was also analyzed as an average annual incidence rate and percent change over time. Mortality rates were calculated for road traffic fatality data. Data analyses was conducted at the Research Data Centres at York University using SPSS version 24.

## Results

*Unintentional Transport-Related Injury Rates in Canada*

Between 2006 and 2012, the population based hospitalization rate for transport related injuries was 70.91 per 100,000 for Canadian children and youth. Over the seven-year study period, transport-related injuries decreased by over 30% from 85.51 to 58.77 per 100,000.

Saskatchewan (SK) had the highest average transport related morbidity rate (135.69 per 100,000) compared to the Canadian average, and Ontario (ON) had the lowest (47.12 per 100,000) (see Figure 1). SK population based hospitalization rate decreased by almost 20% over time. All nine Canadian provinces analyzed showed a decrease in transport-related injury morbidity rates from 2006 – 2012; the decreases ranged from -4.24% in Nova Scotia (NS) to -44.33% in New Brunswick (NB) (see Table 1).

The mortality rate from all road traffic related injuries in Canada was 4.50 deaths per 100,000 children/youth between 2006-2012. Compared to the Canadian average, the highest mortality rate was 10.99 per 100,000 population in SK and the lowest rate was 3.09 per 100,000 in ON (see Table 2).

*Provincial Comparisons of Occupant-Related Injury Hospitalization*

The average rate of childhood occupant-related injury hospitalization in Canada was 22.05 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate decreased from 28.64 to 16.97 per 100,000 (-40.75%) for children who were occupants in a MVC (see Table 3). Prince Edward Island (PEI) had the highest occupant-related population based morbidity rate (55.64 per 100,000) when compared to the Canadian average, and ON had the lowest rate (13.81 per 100,000). However, PEI showed the highest percent decrease in hospitalizations over time of any province (-64.50%) (See Table 3). All nine Canadian provinces analyzed showed a decrease in occupant-related injury morbidity rates from 2006 – 2012, the decreases ranged from

-13.57% in SK to -64.50% in PEI.

*Provincial Comparisons of Cyclist-Related Injuries*

The average rate of childhood cyclist-related injury hospitalization in Canada was 17.58 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate decreased from 21.87 to 14.30 per 100,000 (-34.61%) for child cyclists (see Table 4). NB had the highest cyclist-related population based morbidity rate of any province (27.87 per 100,000) when compared to the Canadian average, and ON had the lowest (13.72 per 100,000). However, NB showed the highest percent decrease in hospitalizations over time (-60.15%) (See Table 4). Eight of nine provinces analyzed showed a decrease in cyclist-related injury morbidity rates from 2006-2012, the decreases ranged from -2.60% in Alberta (AB) to -60.15% in NB. PEI showed a +37.73% increase in cyclist-related hospitalizations over time.

*Provincial Comparisons of Pedestrian-Related Injuries*

The average rate of childhood pedestrian-related injury hospitalization in Canada was 7.51 per 100,000 population. Between 2006-2012, the population-based injury morbidity rate decreased from 8.29 to 6.29 per 100,000 (-24.13%) for child pedestrians (see Table 5). SK had the highest pedestrian-related population based morbidity rate (13.31 per 100,000) when compared to the Canadian average and PEI had the lowest rate (3.02 per 100,000). Eight of nine provinces analyzed showed a decrease in pedestrian-related injury morbidity rates from 2006-2012, the decreases ranged from -9.10% in Manitoba (MB) to -100% in PEI. NS showed a +9.75% increase in pedestrian-related hospitalizations over time.

## Discussion

All cause transport-related injury hospitalization rates have decreased by approximately one-third among children and youth over time. However, the rate of hospitalization from road traffic incidents differs among provinces. During the study period, Saskatchewan had an injury

hospitalization rate that was almost double that of the Canadian average. Occupant-related hospitalizations decreased by over 40% in Canada. This was the only sub cause in which every province showed a percent decrease over time. Cyclist-related hospitalizations accounted for the next highest morbidity rate after occupant injuries. In all provinces except for PEI, cyclist-related injuries demonstrated a decrease between 2006 and 2012. Pedestrian-related injuries also decreased in Canada by approximately one-quarter. Except for Manitoba, which showed a +10% increase in pedestrian injury hospitalizations, all other provinces had a decrease in pediatric morbidity rates.

Transport-related injury prevention policies targeted at occupants, cyclists, and pedestrians such as GDL, booster seat legislation, and helmet legislation, vary substantially among and within provinces. GDL can affect occupant, cyclist and pedestrian related injuries. Helmet laws and booster seat legislation may also be related to cyclist and occupant injuries respectively. Macpherson et al. (2015) surveyed injury prevention experts across Canada and compared their perceptions of the quality, awareness, and enforcement of three evidence-informed injury prevention policies – GDL, bicycle helmet legislation, and booster seat legislation. They found that experts generally rated policies highly when they aligned with evidence and best-practice but that there was still room for improvement and harmonization of these policies across Canadian provinces.

In our study, occupant, cyclist and pedestrian related injuries have decreased by 40%, 34%, and 24% respectively. One policy that may be affecting the decrease in motor vehicle related injury hospitalization rates over time is GDL. In the United States, GDL programs that combined a mandatory waiting period of more than 3-months between stages, a nighttime driving restriction, and greater than 30 hours of supervised driving and/or passenger restrictions

were associated with a 16 – 21% reduction in fatal crashes among teen drivers (Chen, Baker, & Li, 2006). All provinces in Canada require new drivers to pass a learner/novice phase. The majority of provinces (BC, AB, ON, QC, NS, NB, NL) require 2 levels/phases before being a fully licensed driver. However, some provinces (SK, MB, PEI) also have a third stage that must be successfully passed before being permitted to drive without restrictions. The age at which drivers can obtain a learner's permit varies by province, with youth as young as 14-years being able to apply for a learner's permit in Alberta. In the majority of provinces, the minimum age is 16 years old. In SK, MB and PEI if the driver is 15-years of age and enrolled in the high school driver education program they are eligible to receive a learner's permit. All provinces require new drivers to have a supervisor in the car at the first/novice stage. Some provinces require the supervisor to be fully licensed and have blood alcohol concentration restrictions (MB, ON, QC, PEI, NL) whereas other provinces (BC, AB, SK, NS, NB) only have varying age and licensure requirements. All provinces require novice drivers to have a zero blood alcohol content (BAC) level during their level/stage one driver training. In addition to differences between the number of phases, minimum age and supervisory requirements, provinces also differ with regard to mandatory driver education programs, and nighttime and passenger restrictions (see Table 6). A Cochrane Systematic Review concluded that stronger GDL programs (i.e. programs that involve more restrictions for novice drivers) appear to result in a greater reduction in mortality from motor vehicle crashes among young drivers (Russell et al., 2011). GDL policies across Canada should be harmonized and involve a greater number of restrictions for novice drivers including a minimum duration in the learner phase of 12 months, at least 50 hours of supervised practice, and no time discounts for driver education (TIRF, 2008).

Occupant-related injuries have decreased in every province over time. This may be due to effective booster seat legislation implementation across the country. Snowdon et al. (2009) performed the first Canadian study that evaluated the effectiveness of booster seat legislation on restraint use among children aged 4-8 years old. They found that in provinces with legislation, 91.9% of children were restrained and of those 24.6% used a booster seat specifically. Conversely, 84.4% of children in provinces without legislation were restrained and of those only 16.6% used a booster seat. In all provinces with booster seat legislation, except for QC, children must ride in a booster seat until they are a minimum of 4 feet, 9 inches (145 cm) tall, or a minimum of 9 years old. In addition, SK, MB, ON, PEI, NB, and NL also have weight recommendations, requiring a child to have reached a body weight of between 18 – 36 kilograms before graduating from a booster seat. Every province except NL have penalties for drivers who do not comply to the use of an appropriate booster seat to restrain child passengers. These penalties have been in place since 2009 for every province except for Manitoba (enacted penalties in 2013) and Saskatchewan (enacted penalties in 2014). Provinces in Canada also vary in requirements and penalties related to driver responsibility, public education, and incentive programs for booster seats (see Table 7). In Nova Scotia, Yanchar et al (2012) examined discrepancies between knowledge of child motor vehicle restraints and actual practice of these various stages by parents of children less than 12-years of age. They found that inconsistences between messages from various safety organizations, guidelines provided by child restraint manufacturers, and legislative policies of different provinces and territories made it difficult for parents to determine the best motor vehicle restraint for their children (Yanchar et al., 2012). This study provides evidence to support booster seat legislation that is consistent across provinces.

Cycling-related hospitalization rates have been decreasing in Canada over time in every province except for PEI. However, cycling-related hospitalization rates have been inconsistent throughout the study period and this variability may be attributed to other factors such as weather changes, changes to the built environment, or increased reporting. Bicycle helmet legislation is one way to prevent cycling-related injuries. In Canada, only three provinces (AB, MB, ON) do not have helmet legislation that applies to all ages but only applies to children/youth less than 18-years of age. BC and NS also have legislation that requires individuals participating in all-wheeled activities including skates, skateboards, and push-scooters to be wearing a helmet. Penalties for not complying with bicycle helmet use also vary by province, with the smallest fine of $21 in NB and the largest fine of up to $100 in BC, PEI, and NL (see Table 8). Previous studies have demonstrated that all age laws with higher penalties increase levels of helmet use compliance (Macpherson & Spinks, 2008). Bicycle helmet legislation that applies to Canadians of all ages should be uniform across provinces.

Pedestrian safety laws differ at a municipal level in Canada. Active transportation studies have examined the relationship between observed walking to school and child pedestrian collisions, these studies suggest that modification to the built environment may promote both walking to school and increase safety (Rothman et al., 2014). Policies related to pedestrian safety are multifactorial and can involve designing safe routes for children to walk to school including side walk design, traffic calming, on-street parking limits, having adequate numbers of trained crossing guards, and escort programs for young children (AAP, 2009). These factors should be mandated on a provincial level and harmonized among jurisdictions.

*Strengths*

This study compared differences in population-based rates of hospitalization and death from a number of road traffic related causes and provinces over time. We also related our findings back to prevention policy/legislation where applicable.

*Limitations*

Due to differences in reporting standards on a provincial and national level, we were unable to report mortality data by province and sub cause by year. Statistics Canada receives vital statistics mortality data from each province and it is manually inputted into the national system, however data may be suppressed if there is insufficient information on each case. This discrepancy may lead to a greater or lesser proportion of children being captured in the Statistics Canada database and therefore the results would not be reflective of the true number of injury deaths. As a method of data quality control, we contacted the chief coroners/medical examiners in each province to obtain coronial data on child injury death.

Additionally there are a multitude of factors that affect injury outcomes and therefore there is no way of showing causality between policy and outcomes.

## Conclusions

Although transport-related injuries have decreased in Canadian children over time, there are still inconsistences between road traffic safety policies across the country. Evidence-based policies targeted towards occupant, cyclist, and pedestrian safety such as GDL, bicycle helmet legislation, pedestrian safety laws, and booster seat legislation should follow best practice guidelines and be standardized in Canada.

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**Table 1: Population Based Injury Hospitalization Rate per 100,000 from all transport-related causes by Canadian Province (2006 – 2012) among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% Change* |
|---|---|---|---|---|---|---|---|---|---|
| ***NB*** | 153.24 | 115.21 | 104.85 | 103.27 | 88.21 | 84.31 | 85.31 | 105.34 | -44.33 |
| ***MB*** | 118.11 | 95.69 | 93.22 | 84.90 | 87.03 | 83.77 | 67.45 | 89.93 | -42.89 |
| ***BC*** | 103.08 | 99.76 | 80.82 | 81.08 | 71.37 | 68.82 | 60.76 | 80.84 | -41.06 |
| ***ON*** | 56.16 | 54.33 | 48.98 | 43.52 | 43.01 | 45.05 | 38.65 | 47.12 | -31.18 |
| ***PEI*** | 136.20 | 102.18 | 93.54 | 136.1 | 78.97 | 100.1 | 97.87 | 106.53 | -28.14 |
| ***AB*** | 114.57 | 109.27 | 105.47 | 98.58 | 87.23 | 86.71 | 83.42 | 97.65 | -27.19 |
| ***NL*** | 138.22 | 122.16 | 148.51 | 96.72 | 87.53 | 107.92 | 108.08 | 115.77 | -21.81 |
| ***SK*** | 146.80 | 148.59 | 154.56 | 143.33 | 119.87 | 119.67 | 118.1 | 135.69 | -19.55 |
| ***NS*** | 81.18 | 78.27 | 69.56 | 69.59 | 72.67 | 81.10 | 77.74 | 75.73 | -4.24 |
| ***Canada*** | 85.51 | 80.63 | 74.47 | 69.01 | 63.65 | 64.34 | 58.77 | 70.91 | -31.27 |

A positive change indicates an annual increase over time; a negative percentage indicates a decrease over time

**Table 2: Population Based Mortality Rate per 100,000 (2006-2012) from all transport related injuries among children and youth, 0-19 years**

| *Province* | *All Road Traffic Injuries* |
|---|---|
| ***BC*** | 4.45 |
| ***AB*** | 5.50 |
| ***SK*** | 10.99 |
| ***MB*** | 6.41 |
| ***ON*** | 3.09 |
| ***NS*** | 5.60* |
| ***NB*** | 10.38 |
| ***PEI*** | 6.90 |
| ***NL*** | 4.19 |
| ***CAN*** | 4.50 |

*Estimated from RDC Data – Vital Statistics Death Database

**Table 3: Occupant-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***PEI*** | 94.75 | 63.11 | 39.23 | 51.41 | 54.67 | 51.55 | 33.64 | 55.64 | -64.50 |
| ***BC*** | 29.48 | 28.81 | 24.91 | 20.99 | 19.55 | 19.35 | 12.55 | 22.24 | -57.43 |
| ***NB*** | 47.70 | 39.81 | 29.26 | 36.27 | 32.92 | 28.94 | 22.92 | 34.12 | -51.95 |
| ***MB*** | 42.43 | 32.95 | 30.65 | 33.64 | 33.81 | 27.72 | 21.66 | 31.80 | -48.95 |
| ***ON*** | 19.24 | 16.74 | 14.72 | 11.56 | 12.16 | 11.47 | 10.69 | 13.81 | -44.44 |
| ***AB*** | 41.69 | 36.94 | 33.12 | 28.21 | 27.79 | 24.83 | 27.67 | 31.36 | -33.63 |
| ***NL*** | 32.10 | 38.91 | 29.15 | 26.46 | 21.19 | 37.21 | 23.49 | 29.83 | -26.82 |
| ***NS*** | 28.32 | 34.57 | 24.32 | 26.16 | 25.56 | 32.65 | 22.80 | 27.81 | -19.49 |
| ***SK*** | 54.16 | 62.35 | 67.83 | 56.37 | 42.16 | 41.96 | 46.81 | 53.01 | -13.57 |
| ***Canada*** | 28.64 | 26.46 | 23.41 | 20.53 | 19.55 | 18.82 | 16.97 | 22.05 | -40.75 |

**Table 4: Cyclist-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***PEI*** | 8.88 | 6.01 | 18.10 | 39.32 | 12.15 | 3.03 | 12.23 | 14.23 | 37.73 |
| ***NB*** | 44.72 | 32.57 | 32.92 | 30.12 | 18.01 | 17.62 | 17.82 | 27.87 | -60.15 |
| ***MB*** | 21.53 | 17.74 | 13.27 | 14.46 | 15.03 | 14.64 | 12.07 | 15.52 | -43.94 |
| ***NL*** | 36.56 | 24.43 | 20.95 | 24.64 | 19.35 | 18.61 | 20.68 | 23.68 | -43.44 |
| ***BC*** | 34.22 | 31.91 | 20.98 | 24.30 | 22.24 | 20.39 | 19.80 | 24.84 | -42.14 |
| ***NS*** | 28.32 | 15.85 | 22.38 | 15.79 | 16.04 | 13.77 | 16.58 | 18.49 | -41.45 |
| ***ON*** | 16.65 | 15.81 | 13.57 | 12.65 | 12.22 | 14.34 | 10.72 | 13.72 | -35.62 |
| ***SK*** | 25.03 | 22.77 | 19.64 | 19.90 | 17.23 | 20.80 | 18.36 | 20.51 | -26.65 |
| ***AB*** | 18.44 | 21.12 | 22.62 | 20.86 | 17.70 | 18.78 | 17.96 | 19.63 | -2.60 |
| ***Canada*** | 21.87 | 20.19 | 17.67 | 17.20 | 15.45 | 16.39 | 14.30 | 17.58 | -34.61 |

**Table 5: Pedestrian-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* | *Average Rate* | *% change* |
|---|---|---|---|---|---|---|---|---|---|
| ***NS*** | 7.08 | 3.36 | 5.35 | 5.92 | 10.53 | 5.61 | 7.77 | 6.49 | 9.75 |
| ***PEI*** | 5.92 | 3.01 | 6.03 | 3.02 | 0.00 | 3.03 | 0.00 | 3.02 | -100.00 |
| ***AB*** | 9.84 | 8.07 | 6.89 | 8.97 | 6.87 | 9.13 | 5.64 | 7.90 | -42.68 |
| ***SK*** | 13.82 | 14.19 | 16.31 | 13.26 | 13.56 | 13.13 | 9.00 | 13.31 | -34.88 |
| ***BC*** | 12.37 | 13.12 | 9.41 | 9.31 | 8.69 | 9.42 | 8.09 | 10.06 | -34.60 |
| ***NB*** | 4.77 | 4.22 | 6.71 | 8.61 | 4.35 | 6.92 | 3.18 | 5.54 | -33.33 |
| ***NL*** | 11.59 | 9.95 | 18.22 | 9.12 | 8.29 | 6.51 | 8.46 | 10.33 | -27.00 |
| ***ON*** | 5.66 | 6.51 | 5.77 | 5.78 | 5.34 | 6.25 | 5.09 | 5.77 | -10.07 |
| ***MB*** | 13.62 | 12.04 | 12.01 | 10.38 | 7.51 | 9.03 | 12.38 | 10.99 | -9.10 |
| ***Canada*** | 8.29 | 8.32 | 7.55 | 7.61 | 6.89 | 7.64 | 6.29 | 7.51 | -24.13 |

## Table 6: Graduated Driver's Licensing by Province

| | Year of Implementation | Supervisory Driver (Yes/No), Minimum Age | Driver education/training | Number of Phases | Blood Alcohol Content (BAC) | Restrictions: Night (Y/N) Passengers (Y/N) | Sign-on vehicle |
|---|---|---|---|---|---|---|---|
| **PROVINCE** | | | | | | | |
| British Columbia | 1998 | Yes (25 years or older with a valid Class 1-5 driver's license)<br><br>16 years | Voluntary | 2 | Zero | Yes: no driving between 12 AM – 5 AM<br><br>Passengers: limit of 2 | Mandatory |
| Alberta | 2003 | Yes (18-year-old; fully licensed)<br><br>14 years | Voluntary | 2 | Zero | Yes: no driving between 12 AM – 5 AM<br><br>Passengers: limited to number of working seatbelts | None |
| Saskatchewan | 2005 | Yes: occupies the front passenger seat<br><br>16 years or 15 years (if enrolled in the high school education program) | Mandatory for all new drivers | 3 | Zero | Only immediate family permitted in vehicle between midnight and 5 a.m.<br><br>Passengers: limited to number of seatbelts | None |
| Manitoba | 2003 | Yes: Fully licensed for at least 3 years, 0 BAC<br><br>16 years or 15 years (if enrolled in the high school education program) | Voluntary | 3 | Zero | No night time restrictions<br>Limited to 1 supervising driver in the front seat, and number of working seatbelts | None |
| Ontario | 1994 | Yes: Fully licensed, with at least 4 years driving experience, BAC<.05, seated in front seat<br><br>16 years | Voluntary | 2 | Zero | Yes: no driving between 12 AM – 5 AM<br>Must have supervisor at all times; other passengers limited to number of seatbelts | None |
| Quebec | 1997 | Yes: Fully licensed for 2 years, BAC<=.08, seated in front seat<br><br>16 years | Mandatory | 2 | Zero | None | None |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Nova Scotia | 1994 | Yes: Experienced driver with at least a Class 5 license<br><br>16 years | Mandatory<br>Long course: 25 hours in class & 10 hours in car<br>Short course: 6 hours in class | 2 | Zero | May drive after midnight with supervisor<br><br>No passengers except supervisor | None |
| Prince Edward Island | 2000 | Yes: Has valid license for at least 4 years for same class of vehicle, BAC<.05<br><br>16 years or 15 years (if enrolled in the high school education program) | Voluntary | 3 | Zero | Refrain from driving between 1 a.m. and 5 a.m. for drivers under 21 years<br><br>No passengers, except supervisor or family members | Mandatory |
| New Brunswick | 1996 | Fully licensed, seated in front seat<br><br>16 years | Voluntary | 2 | Zero | Yes: no driving between 12 AM – 5 AM<br><br>No passengers except supervisor | None |
| Newfoundland and Labrador | 1999 | Four years of driving experience, BAC = 0<br><br>16 years | Voluntary | 2 | Zero | Yes: no driving between 12 AM – 5 AM<br><br>No passengers except supervisor (except for parents/guardians if driver is enrolled in driver education and accompanied by a licensed instructor) | Mandatory |

**Table 7: Booster Seat Legislation by Province**

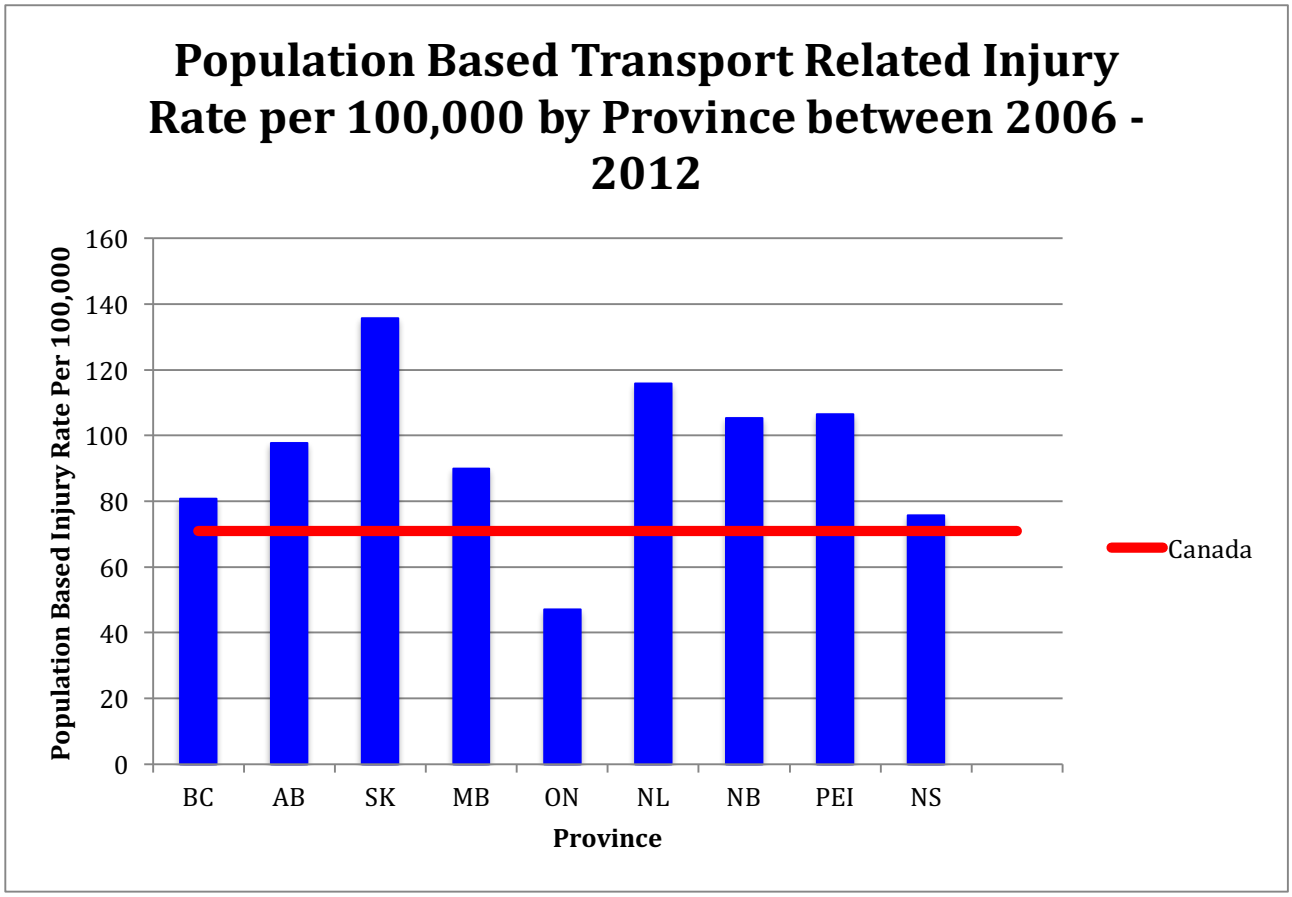
| | Year of Implementation | Age | Height/Weight | Public Education | Incentive Program | Non-Compliance Penalties | Driver Responsibility |
|---|---|---|---|---|---|---|---|
| **Province** | | | | | | | |
| **BC** | 2008 | 9 years old | 4 feet 9 inches (145 cm); no weight restrictions | YES | YES | YES | YES |
| **AB** | **NO PROVINCIAL LEGISLATION** | | | | | | |
| **SK** | 2014 | 7 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | YES (since 2014) | YES (since 2014) | NO |
| **MB** | 2012 | 9 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | NO | YES (since 2013) | YES |
| **ON** | 2005 | 8 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | YES | YES | YES |
| **QC** | 2002 | No age restrictions | 25 inches (63 cm); no weight restrictions | YES | NO | YES | NO |
| **NS** | 2007 | 9 years old | 4 feet 9 inches (145 cm); no weight restrictions | YES | YES | YES | YES |
| **PEI** | 2008 | 9 years old | 4 feet 9 inches (145 cm); 40 lbs (18 kg) | YES | YES | YES | YES |
| **NB** | 2008 | 9 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | NO | YES | YES |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **NL** | 2008 | 4 and 8 years old | 4 feet 9 inches (145 cm); between 40 lbs (18 kg) and 80 lbs (36 kg) | NO | NO | NO | NO |

**Table 8: Bicycle Helmet Legislation by Province**

| | Age | Effective Date | Penalty |
|---|---|---|---|
| **PROVINCE** | | | |
| British Columbia | Applies to all ages | September 3, 1996<br><br>2003: updated to include helmet use for all wheeled activities including skates, skateboards, and push-scooters | Fine up to: $100 |
| Alberta | Applies only to those <18 years of age | May 1, 2002 | Fine: $69 |
| Saskatchewan | **NO PROVINCIAL LAW** | | |
| Manitoba | Applies only to those <18 years of age | May 1 2013 | Fine up to: $50 |
| Ontario | Applies only to those <18 years of age | October 1, 1995 | Fine: $60 |
| Quebec | **NO PROVINCIAL LAW** | | |
| Nova Scotia | Applies to all ages | July 1, 1997<br><br>2007: updated to include helmet use for all wheeled activities including skates, skateboards, and push-scooters | Fine minimum: $25 |
| Prince Edward Island | Applies to all ages | July 5, 2003 | Fine up to: $100 |
| New Brunswick | Applies to all ages | December 15, 1995 | Fine: $21 |
| Newfoundland and Labrador | Apples to all ages | April 1, 2015 | Fine up to: $100 |

**Figure 1: Population Based Injury Rate from All Transport-Related Causes per 100,000 by Province Between 2006 - 2012**



Chapter Four

MANUSCRIPT 3

# The Canadian Child Safety Report Card – A Comparison of Injury Prevention Practices Across Provinces

Liraz Fridman, PhD Candidate[a], Jessica L. Fraser-Thomas, PhD[a], Ian Pike, PhD[b], Alison K. Macpherson[a]

[a] School of Kinesiology and Health Science, York University, Toronto, Ontario, Canada
[b] Department of Pediatrics, University of British Columbia, Vancouver, British Columbia, Canada

Liraz Fridman
York University
Department of Kinesiology & Health Science
Bethune College
4700 Keele Street
Toronto, Ontario, Canada
M3J 1P3

## Summary

**Background** Injury prevention report cards that raise awareness about the preventability of childhood injuries have been published by the European Union and the World Health Organization. These report cards highlight the inequalities between injury prevention practices within and among countries around the world. Policy-makers and stakeholders have identified research availability as an important enabler to the enactment of injury legislation. In Canada, there is currently no childhood injury report card that ranks provinces on injury rates and the enactment of evidence-based prevention policies.

**Methods** Three main injury categories were evaluated to compare provinces to one another on injury prevention rates and strategies, which included morbidity, mortality, and policy indicators. Nine provinces (BC, AB, SK, MB, ON, NS, NB, PEI, & NL) were ranked against each other on the following 5 criteria: 1) population-based hospitalization rate per 100,000; 2) percent change in hospitalization rate per 100,000; 3) population-based mortality rate per 100,000; 4) percent change in mortality rate per 100,000; 5) evidence-based policy assessment.

**Results** Of nine provinces analyzed on 5 sub criteria, BC was given the best ranking in Canada and SK was given the lowest ranking. In general, BC had a morbidity and mortality rate that was close to the Canadian average and decreased over the study period. In addition, BC had a number of injury prevention policies and legislation in place that followed best-practice guidelines. SK had a higher rate of injury hospitalization and death, however over time, SK's rate of injury hospitalization decreased. SK had a number of prevention policies in place with the exception of bicycle helmet legislation.

**Conclusions** Canadian provinces vary in their rates of morbidity and mortality from injury. Generally, provinces that had a number of strong evidence-based injury prevention policies in place also had fewer injury hospitalizations and deaths.

## Background

Reports that highlight the burden of injury have been published on global, national, and local levels. In 2008, the World Health Organization (WHO) published the *World report on child injury prevention,* this report aimed to raise awareness about risk factors and impacts of child injury on a global scale. The WHO also aimed to draw attention to the preventability of childhood injuries and made recommendations that can be implemented around the world. This report compared Canada to other countries in terms of injury rates and specific prevention policies and legislation. However, there was no information on how Canada ranked in comparison to other countries on various indicators of injury. In 2011, UNICEF published a report card that measured the level of childhood well-being in 29 of the richest nations. This report card averaged 26 indicators across five dimensions including material well-being, health and safety, education, behaviors and risks, and housing and environment. This report highlighted the need for internationally comparable data on critical indicators of injury as it is a leading cause of child mortality in Canada (UNICEF, 2011).

In 2012, the European Child Safety Alliance published the Child Safety Report Card, which compared 31 European countries to each other on the burden of unintentional injuries, the adoption, implementation, and enforcement of national level policies as well as links between effective policies and health outcomes (Mackay & Vincenten, 2012). These report cards highlighted inequalities in injury prevention practices across countries and called for consistent application and enforcement of evidence-based safety policies (Vincenten, 2012).

In Canada, the Canadian Paediatric Society (CPS) published a report titled, *Are We Doing Enough? – A status report on Canadian public policy and child and youth health* (2016). The CPS compared Canadian provinces to one another on a number of healthcare policies

including bicycle helmet legislation, booster seat legislation, sports safety including all-terrain vehicles and ski/snowboard legislation among others. This was the first comparative report that examined evidence-based injury prevention policies. However, this report did not rank provinces with one another, but gave them a score from poor to excellent based on the province's changes in public policy from 2012 to 2016. Currently, there is no provincial report card in Canada that ranks provinces with each other by examining the burden of injury and evidence-based prevention policies.

Multiple studies have outlined the need for a comparative provincial report to assist policy makers and end users in implementing and harmonizing evidence-based prevention policies in Canada (Macpherson et al., 2015; Pike et al., 2010; Pike et al., 2015; Rothman et al., 2016). The development of injury prevention legislation involves multiple sectors outside of healthcare such as product safety (e.g. child resistant caps on medications) and education (e.g. playground equipment) (Rothman et al., 2016). In 2016, Rothman et al. performed a study to determine the key barriers and enablers to enacting child and youth injury prevention legislation by topic across Canada. These topics included bicycle helmets, cell phone-distracted driving, booster seats, ski helmets, graduated driver's licensing (GDL), among others (Rothman et al., 2016). The most frequent barriers that were identified by stakeholders in this study included competing policy priorities (i.e. focusing on distracted driving instead of ski helmets) and insufficient managerial/political support/will (Rothman et al., 2016). One important enabler to enactment of injury legislation that was identified, was research availability on injury rates and effective policies. Researchers need to outline what evidence-based injury prevention policies are currently enacted in Canada in order to achieve harmonization of injury prevention policies and legislations across provinces.

Injury prevention legislation has been implemented at different points in time across Canada and at the time of writing, some provinces still do not have certain policies in place. For instance, bicycle helmet legislation was first implemented by New Brunswick (NB) and Ontario (ON) in 1995 although NB's law applies to all ages and ON only applies to children and adolescents <18 years (Parachute, 2014). Newfoundland and Labrador did not implement bicycle helmet legislation until 2015 and Saskatchewan and Quebec currently still do not have laws mandating the use of helmets when cycling (Rothman et al., 2016). Another example in differences between injury prevention policies and legislation can be seen with ski helmets. Nova Scotia is currently the only province that requires Canadians to wear helmets on the ski slopes, and this law was implemented in 2012 (Rothman et al., 2016). Survey respondents agreed that among all of the injury prevention topics that were presented, the biggest barriers to implementing legislation were competing policy priorities and insufficient managerial/political support/will. Ski and bicycle helmet legislation were cited most often as having barriers to enactment, and this may be because these issues lacked provincial legislation in several provinces (Rothman et al., 2016). Respondents identified research availability as an important enabler to the enactment of injury legislation. In addition to strong evidence of effectiveness of the injury prevention intervention and its legislation, respondents identified that surveillance data was also important so as to establish injury rates from specific causes and the use of protective devices such as helmets (Rothman et al., 2016). Another crucial enabler that was identified through the open-ended portion of the survey was the existence of legislation in other jurisdictions. This highlights the importance of providing stakeholders with a comparative child safety report in Canada.

Using a modified Delphi approach, Pike et al. (2010) determined the importance of including policy injury indicators that measure the impact of legislation on the burden of injury among children and youth. Some examples of policy indicators include GDL or helmet laws (Pike et al., 2010). Policy experts rated both the 'usefulness' and 'likelihood to prompt action' between 6.13 and 7.93 on a 9-point Likert-type scale. Pike et al. (2010) also found that indicators related to injury mortality rate were rated high in usefulness and likelihood to prompt action.

In 2015, Pike et al. published another study to develop youth injury prevention recommendations for stakeholders and policymakers in Canada using a modified Delphi approach. Thirteen experts reached a consensus on 19 injury prevention recommendations. Among these, the third recommendation targeted the government and the role that they play in injury prevention through the development and enforcement of good policies. Some of these policies include the appropriate training and safe operation of motor vehicles, the reduction of impaired driving, sport helmet use and concussion prevention and management (Pike et al., 2015). The findings from these studies highlight the importance of gathering and analyzing data on morbidity and mortality rates by province to create comparative reports for policy makers and end users.

A study by Macpherson et al. (2015) that evaluated injury prevention policies including GDL, booster seat legislation and helmet legislation across Canadian provinces demonstrated that key informants were more likely to rate injury prevention policies that aligned with best practice such as GDL higher than policies that were not evidence-based such as bicycle helmet legislation that only targets children/youth. Although studies have shown that injury prevention policies that are evidence-informed are effective at reducing pediatric injury rates, there are still inconsistencies in the adoption and enforcement of these policies among provinces.

In Canada, no provincial report card currently exists that ranks provinces based on injury rates and the enactment of evidence-based prevention policies. Our objective in this study was to create evidence-based child safety report cards that can be used to evaluate and influence policies and practices related to the prevention of childhood injuries.

## Methods

*Criteria*

Three main injury categories were evaluated to compare provinces with one another on injury prevention rates and strategies; which included morbidity, mortality, and policy indicators. Two measures were used to establish injury morbidity in each province - these included the population-based hospitalization rate per 100,000 and the percent change in hospitalization rate over time (2006-2012).

Hospitalization data was obtained from the Canadian Institutes for Health Information (CIHI) – Discharge Abstract Database (DAD). To obtain the population-based rate from all unintentional injuries, International Classification of Diseases and Related Health Problems tenth revision (ICD-10) codes V01-X59 and Y85-Y86 were summed and divided by the population of children and youth, 0-19 years in each province and subsequently compared to the Canadian average over the 7-year study period.

The percent change in the hospitalization rate was calculated using the following formula: V2 – V1/V1 X 100 where V2 represents the population-based hospitalization rate from all unintentional injuries in 2012 and V1 represents the population-based hospitalization rate from all unintentional injuries in 2006. A positive percent change indicated that the rate of unintentional injury hospitalization increased over time and a negative percent change indicated a decrease.

To analyze population-based mortality rates in each province, we obtained data from Statistics Canada – Vital Statistics Death Database. Vital Statistics in each province reports provincial deaths to Statistics Canada and each case is manually input into the national data set. If there is insufficient information or missing data on a case by case basis this data may be suppressed in the Vital Statistics Death Database. Due to this data suppression, we anticipated an underreporting of injury mortality data and therefore contacted the chief coroner/medical examiner in each province to obtain coronial data and assure quality control. Each province reported the number of unintentional injury related deaths and all transport related deaths for children/youth 0-19 between 2006 and 2012. We analyzed the population-based rate of mortality and the percent change over time using both the Vital Statistics Death Database and the coronial data with the methods described above.

We defined a policy as a form of government action that involves the modification or implementation of resources to support a value such as injury prevention or safety promotion at the provincial level. A total of six injury prevention policies were evaluated including smoke and carbon monoxide detectors, pedestrian safety, distracted driving, bicycle helmet legislation, booster seat legislation, and graduated driver's licensing. These policies were chosen because they have been implemented in an effort to prevent injuries that cause the greatest burden on children and youth including falls, MVCs, burns, poisoning, suffocation/choking, and drowning. We ranked provinces on the policy that existed outside of the study time period (i.e. 2006-2012) to reflect an improvement or update of evidence-based criteria over time. Scores on each policy ranged from 0 to 3 (none = 0, fair = 1, good = 2, excellent = 3) providing each province with a range between 0 and 18 points. The criteria for each policy varied and is described in Appendix A.

*Rankings*

Nine provinces (BC, AB, SK, MB, ON, NS, NB, PEI, & NL) were ranked with each other on the following 5 criteria: 1) population-based hospitalization rate per 100,000; 2) percent change in hospitalization rate per 100,000; 3) population-based mortality rate per 100,000; 4) percent change in mortality rate per 100,000; 5) evidence-based policy assessment.

The population-based hospitalization rate per 100,000 was ranked by assigning the highest value (9) to the province that had the lowest morbidity rate between 2006-2012. The percent change in hospitalization rate per 100,000 was ranked by assigning the highest value (9) to the province that had the largest percent decrease (negative change) over time. The same method was used to assign the rank for the population-based mortality rate per 100,000 and the percent change in mortality rate per 100,000.

Finally, each of the six policies that were evaluated were summed to give an overall policy ranking to each province. Scores ranged between 0 and 18 points. The province with the highest point value was given a ranking of nine.

*Overall Score*

Each province was given an overall score by summing the values in the 5 sub criteria. Scores ranged between 5 and 45. The province with the highest score was given an overall ranking of one.

## Results

*Population-Based Hospitalization Rate per 100,000 (2006-2012) Ranking*

Between 2006 and 2012 the average population-based hospitalization rate per 100,000 from all unintentional causes was 567.87 per 100,000 in Canada. Of the nine provinces analyzed, the ranking in order, from lowest (highest rate of injury hospitalization) to highest (lowest rate of

injury hospitalization) was SK, PEI, NB, AB, NL, NS, MB, BC, and ON. SK had an average injury hospitalization rate of 907.82 per 100,000 (nearly double that of the Canadian average) and ON had a rate of 460.13 per 100,000.

*Percent Change in Hospitalization Rate per 100,000 (2006-2012) Ranking*

Over the 7-year study period, the overall population-based hospitalization rate for Canada decreased by -2.66%. Of the nine provinces analyzed, the ranking in order from lowest (largest positive change) to highest (largest negative change) was, PEI, NS, ON, AB, NL, MB, NB, SK, and BC. The rate of injury hospitalization increased in PEI by +18.31% and decreased in BC by -22.74%.

*Population-Based Mortality Rate per 100,000 (2006-2012) Ranking*

In Canada, children/youth aged 0-19 had an average unintentional injury related death rate of 7.97 per 100,000 between 2006 and 2012. Of the nine provinces analyzed, the ranking, in order from lowest (highest rate of injury death) to highest (lowest rate of injury death), was SK, NB, MB, PEI, NS, NL, AB, BC, and ON. SK had an average injury death rate of 17.62 per 100,000 and ON had a rate of 5.99 per 100,000.

*Percent Change in Mortality Rate per 100,000 (2006-2012) Ranking*

Deaths in Canada from all unintentional injuries decreased by -23.86% over time. Of the nine provinces analyzed, the ranking in order from lowest (largest positive change) to highest (largest negative change), was SK, MB, NL, NB, NS, BC, ON, AB, and PEI. The rate of injury death increased in SK by +17.77% and decreased in PEI by -74.17%.

*Evidence-Based Policy Score*

The quality of each policy was assessed using evidence-based criteria. Parachute Canada is a national not-for-profit organization that advocates for injury prevention solutions through

knowledge mobilization, public policy, and social awareness efforts. Parachute provides reports on their website that summarizes injury prevention policies and highlights differences across provinces (http://www.parachutecanada.org/policy). We used these high-level summaries to distinguish between none, fair, good and excellent policies in our study. We examined differences between provincial criteria for each policy in the Parachute reports and aligned these factors with best practices from the literature in order to distinguish between none, fair, good and excellent. For example, we used the TIRF recommendations to establish what criteria would provide a province with an excellent status for GDL (Parachute 2015; TIRF, 2008).

*Smoke & Carbon Monoxide Detectors*

Provinces were given a score of excellent on smoke & carbon monoxide (CO) detectors if they required that mandatory CO and smoke alarms be installed on each floor in a dwelling. One province, MB, received an 'excellent' score (3 points) on this policy. Two provinces (AB & ON) received a 'good' score (2 points) which indicated that the policy required mandatory detectors in all dwelling units but not necessarily on each floor. Four provinces (BC, NS, PEI, & NL) received a 'fair' score (1 point) because the policies required mandatory smoke alarms but no provincial CO detector law was present. Finally, 2 provinces (SK & NB) received a 'none' score (0 points) because there was no provincial CO detector law and the smoke alarm regulations in these provinces were repealed. Smoke & CO detector policies were evaluated through the summary on Parachute's website which was last updated in March 2015 (Parachute, 2015).

*Pedestrian Safety*

The quality of pedestrian safety laws in each province were evaluated based on the following criteria: speed limits in residential and school zones, double fines in residential and

school zones, and having provisions for a "pedestrian only" zone which are defined as areas officially set apart within a highway for the exclusive use of pedestrians. One province, ON, scored 'excellent' (3 points) for having pedestrian laws that included speed limits in residential zones of 50 km or less, speed limits in school zones, and double fines in both residential and school zones. NS & NB scored 'good' (2 points); their laws had stipulations on speed limits in residential and school zones as well as pedestrian zones, but no double fines in residential zones. The majority of provinces (BC, AB, MB, PEI, & NL) received a score of 'fair' (1 point). These provinces all had speed limit restrictions in residential zones but they only had some of the other criteria mentioned above. Finally, SK's speed limits in both residential and school zones are set individually by municipalities; they do not have double fines in either areas and there are no pedestrian safety zones therefore they were given a score of 'none' (0 points). Pedestrian safety policies were evaluated through the summary on Parachute's website which was last updated in September 2014 (Parachute, 2014).

*Distracted Driving*

All provinces had distracted driving laws that banned the use of a hand-held cellular phones while driving a motor vehicle. BC, ON, and PEI were given an 'excellent' status (3 points) because their distracted driving laws included provisions on hand-held electronic entertainment devices alongside hand-held communication devices and their fines ranged between $490 - $1200 for first or second offenses and 3-5 demerit points. The remaining provinces (AB, SK, MB, NS, NB, and NL) received a 'good' score (2 points). These laws did not ban the use of hand-held entertainment devices and fines ranged between $100-$350 for first or second offenses and 3-5 demerit points. Distracted driving laws were evaluated through the summary on Parachute's website which was last updated in June 2016 (Parachute, 2016).

*Bicycle Helmet Legislation*

In BC and NS, bicycle helmet legislation applies to all ages and all wheeled activities including non-motorized skates, skateboards, and push scooters; these provinces received a score of 'excellent' (3 points). NB, PEI, and NL laws apply to all ages but do not apply to other wheeled activities and therefore these provinces were given a score of 'good' (2 points). In MB and ON, laws only apply to children/youth <18 years and these provinces scored 'fair' (1 point) on this policy. Finally, SK currently has no provincial law mandating the use of helmets while cycling and scored 'none' (0 points). Bicycle helmet legislation was evaluated through the summary on Parachute's website which was last updated in December 2014 (Parachute, 2014).

*Booster Seat Legislation*

The quality of booster seat legislation in each province was evaluated based on the following criteria: age/weight & height restrictions, public education and incentive programs, noncompliance penalties, and driver responsibility. In BC, ON, NS, and PEI, all of the above-mentioned criteria were integrated into the province's booster seat legislation and therefore they received a score of 'excellent' (3 points). SK, MB, and NB received a score of 'good' (2 points), these provinces had age/weight and height restrictions but they only had some of the other criteria mentioned above. One province, NL, scored 'fair' (1 point) on their booster seat legislation because they did not have public education or incentive programs, and there were no noncompliance penalties or driver responsibility stipulations in place. Currently there is still no booster seat legislation enacted in AB ('none'; 0 points). Booster seat legislation was evaluated through the summary on Parachute's website which was last updated in September 2014 (Parachute, 2014).

*Graduated Driver's Licensing (GDL)*

GDL programs vary across provinces. A number of criteria are considered including minimum age, blood alcohol concentration (BAC), supervisory requirements, driver education, nighttime and passenger restrictions, and signs on vehicles. Currently no province has a GDL program that meets all of the evidence-based criteria for best practice. The Traffic Injury Research Foundation (TIRF) highlighted three main criteria that each province should employ at the learner phase: 1) minimum of 12-months' duration in the learner's phase, 2) a mandatory requirement for supervised practice of at least 50-hours, and 3) the elimination of "time discounts" for drivers who attend education programs. No province currently meets all 3 standards therefore the highest rating that was given was 'good' (2 points) to the majority of provinces (BC, AB, ON, NB, PEI, & NL) and SK, MB, and NS were given a score of 'fair' (1 point) since their GDL programs required less than 12-months of duration in the learner phase. GDL was evaluated through the summary on Parachute's website and the TIRF website (Parachute, 2015; TIRF, 2008).

*Overall Score*

An overall score and ranking was obtained for each province by summing the individual rankings using the above criteria. The province with the highest composite score was given a ranking of one. Of the nine provinces analyzed, the ranking in order from lowest (highest number of points across criteria) to highest (lowest number of points across criteria), was BC, ON, AB, NS, MB, PEI, NL, NB, and SK.

## Discussion

Canadian provinces vary in their rates of child and youth morbidity and mortality from injury. Generally, provinces that have a number of strong evidence-based injury prevention

policies in place also have fewer child and youth injury hospitalizations and deaths. After taking into account the rate of injury hospitalization and death, the percent change in morbidity and mortality rate over time, and evaluating a variety of prevention policies and legislations, BC was the province that was given the highest rank in Canada. Conversely, SK was given the lowest rank in Canada. Over the study period, the number of hospitalizations in SK decreased. Previous studies on evidence-based prevention policies that reduce the burden of childhood injuries in Canada have been performed in a number of areas including smoke alarm legislation, transport related policies - pedestrians, occupants (booster seat legislation, distracted driving, and GDL), and cyclists (bicycle helmet legislation).

Homes that are not equipped with safety devices such as carbon monoxide detectors and smoke alarms increase the risk for burn and smoke inhalation injuries (Pike et al., 2015). The risk of fire-related death is three-fold in homes without working smoke detectors (Parachute, 2015), and according to the *Cost of Injury* report by Parachute, for every dollar spent on smoke alarms, Canadians save $18 in economic costs. In Canada, provinces vary on mandatory smoke and CO detector laws. Our study found that MB had the strongest smoke alarm legislation, mandating the use of smoke and CO detectors on each floor in each dwelling unit. In SK and NB, smoke alarm legislation has been repealed. Systematic reviews have shown that homes that lack smoke detectors present a higher risk of fatal injury (Warda et al., 1999). Harmonizing smoke alarm legislation across the country is a modifiable risk factor that is likely to reduce the number of burn-related injuries.

The effectiveness of a number of transport related policies that apply to pedestrians, occupants, and cyclists have been studied over time. Speed limits are an important factor when considering the severity of pedestrian-related injuries. Evidence has found that childhood

pedestrians are seven times more likely to be hospitalized for a pedestrian related injury in residential neighborhoods with an average vehicle speed of 50 km/h compared to 30 km/h (Desapriya et al., 2011). Vehicles are less likely to speed in areas with increased fines and enforcement. Provinces with double fines in both residential and school zones were given a higher ranking in our evaluation of pedestrian safety laws. ON ranked highly on pedestrian safety legislation because they had provisions in each subcategory except for "pedestrian" zones, whereas SK did not meet any of the evidence-based criteria for a strong pedestrian safety policy. Given the increased number of childhood pedestrian related fatalities at higher speeds, future policy and legislation should attend to the evidence in support of reducing speed limits in residential and school zones to 30 km/h (AAP, 2009; Desapriya et al., 2011).

Distracted driving is another important policy consideration for Canadians. Data from TIRF revealed that in 2008, driver distraction was a factor in 13-16% of fatal crashes in Canada. According to the Canadian Automobile Association (CAA, 2017), drivers engaged in texting are 23-times more likely to be involved in a crash or near collision event. In addition, drivers reaching for a moving object, talking on the phone, and applying makeup are 9-, 5-, and 3-times more likely to be involved in a crash, respectively (CAA, 2017). Distracted driving laws that encompass multiple forms of distraction such as other entertainment devices and eating/drinking in addition to banning cell-phone use, were given a better ranking in the Canadian Child Safety Report Card. BC and ON's distracted driving laws have greater fines and involve more comprehensive forms of distraction and therefore were rated highly. Other provinces should consider the evidence in support of expanding their distracted driving laws to include bans on other forms of distraction with more expensive fines (CAA, 2017).

Cycling-related injuries are another important concern in Canada. Studies have previously shown that bicycle helmet legislation increases helmet use and subsequently prevents head injuries (Macpherson & Spinks, 2008). Helmet laws vary considerably across jurisdictions and some provinces extend helmet laws to other wheeled activities. Evidence suggests that helmet use is greater in areas with all age helmet laws as opposed to those that only apply to children (Dennis et al., 2010; Hagel et al., 2006) and that increased enforcement through fines and tickets increases compliance (Gilchrist et al., 2000). In our study, BC and NS scored the highest ranking for bicycle helmet legislation because their policies extended to all wheeled activities and applied to all age groups. SK currently does not have bicycle helmet legislation in place, and some provinces in Canada such as MB and ON only have bicycle helmet laws for children <18 years. These provinces should adapt their bicycle helmet legislation to align with best practice.

The effectiveness of booster seat legislation has been evaluated in the United States and Canada. A case-control study by Farmer et al. (2009) examined the association between booster seat legislation and fatality among 4-8-year-old children involved in a frontal motor vehicle crash. They found that children who were involved in a crash in a state with a booster seat law were significantly less likely to die. In addition, they found that being restrained in a booster seat had an even greater protective effect for children than being restrained in a seat belt. The authors concluded that states that had enacted booster seat legislation had a higher rate of child restraint and correct booster seat use than states with no law, and there was a 20% reduction in fatalities under legislation. In our study, BC, ON, NS, and PEI all had booster seat legislation in place that included age, height and weight stipulations, public education and incentive programs, non-compliance penalties and driver responsibility and therefore were given higher rankings over

other provinces that did not have booster seat legislation with the same criteria. Given the protective effects that booster seats have on childhood motor vehicle occupants, all provinces including AB should have booster seat legislation in place and they should be uniform across the country.

Finally, GDL criteria varies substantially across provinces. The Traffic Injury Research Foundation (TIRF) report highlighted the evidence-based criteria necessary for a good GDL program in Canada. These included a minimum entry age of 16-years, a driver education program, 12-months' minimum duration in the learner's phase, supervision by a driver who is at least 25-years old, has been fully licensed for one year and is seated in the front of the vehicle, a zero BAC, night restrictions between midnight and 6 AM, no passengers with the exception of the supervisor, "L" sign/plate, and penalties for violating GDL conditions. Currently no province in Canada meets all of the above criteria. At minimum, drivers in the learner phase of a GDL program should remain in this phase for 12-months without time discounts for driver education and should practice driving in supervised conditions for a minimum of 50-hours (TIRF, 2008). None of the provinces required novice drivers to do mandatory training for a minimum of 50-hours and therefore the highest score that was given in this category was 'good'. Only three provinces, SK, MB, and NS received a 'fair' score since their programs did not require drivers to remain in the learner phase for at least 12-months. There is evidence to suggest that GDL programs in Canada should be harmonized and adapted to include best practices.

Provinces that were given higher rankings on the Canadian Child Safety Report Card on morbidity, mortality, and policy indicators including BC, ON, and NS have demonstrated the importance of harmonizing evidence-based prevention policies and legislation across the country in an effort to reduce the burden of childhood injuries in Canada.

*Strengths*

This is the first interprovincial report card that ranks Canadian provinces with one another on a number of injury indicators including hospitalization rate, mortality rate, percent change in injury over time and evidence-based policies.

*Limitations*

The report cards do not take into account contextual factors other than policy/legislation that may affect the injury rate over time. Other factors such as population density, access to health care, changes to the built environment and socioeconomic status also influence the number of children being hospitalized and dying from injuries in Canada.

## Conclusion

The Canadian Child Safety Report Card provided a comparison of injury prevention rates and policies across provinces between 2006 and 2012. BC and ON were the two provinces that consistently reported injury hospitalizations and deaths rates that were closest to the Canadian average and received high rankings on the majority of childhood injury prevention policies. Future preventative efforts need to focus on harmonizing policies in Canada that reflect evidence-based best practices.

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**Table 1: Score based on rank of 5 sub criteria for the Canadian Child Safety Report Card**

| | Population Based Hospitalization Rate per 100,000 (2006-2012) | Percent Change in Hospitalization Rate (2006-2012) | Population Based Mortality Rate per 100,000 (2006-2012) | Percent Change in Mortality Rate (2006-2012) | Evidence-Based Policy Score (0 = none, 1 = fair, 2 = good, 3 = excellent) | Overall Score (Rank) |
|---|---|---|---|---|---|---|
| **BC** | 8 | 9 | 8 | 6 | 8 | 39 (1) |
| **AB** | 4 | 4 | 7 | 8 | 2 | 25 (3) |
| **SK** | 1 | 8 | 1 | 1 | 1 | 12 (9) |
| **MB** | 7 | 6 | 3 | 2 | 5 | 23 (5) |
| **ON** | 9 | 3 | 9 | 7 | 9 | 37 (2) |
| **NS** | 6 | 2 | 5 | 5 | 7 | 25 (3) |
| **NB** | 3 | 7 | 2 | 4 | 5 | 21 (8) |
| **PEI** | 2 | 1 | 4 | 9 | 7 | 23 (5) |
| **NL** | 5 | 5 | 6 | 3 | 3 | 22 (7) |

**Table 2: Score based on rank of Population Based Hospitalization Rate per 100,000 (2006-2012) – All Unintentional Injuries**

| Province | Rate per 100,000 | Score Based on Rank |
|---|---|---|
| BC | 580.56 | 8 |
| AB | 678.19 | 4 |
| SK | 907.82 | 1 |
| MB | 595.26 | 7 |
| ON | 460.13 | 9 |
| NS | 626.39 | 6 |
| NB | 716.57 | 3 |
| PEI | 731.94 | 2 |
| NL | 660.75 | 5 |
| CAN | 567.87 | - |

**Table 3: Score based on rank of Percent Change in Hospitalization Rate (2006 – 2012) – All Unintentional Injuries**

| Province | % Change | Rank |
|---|---|---|
| BC | -22.74% | 9 |
| AB | -1.05% | 4 |
| SK | -11.80% | 8 |
| MB | -8.50% | 6 |
| ON | +6.33% | 3 |
| NS | +15.76% | 2 |
| NB | -10.99% | 7 |
| PEI | +18.31% | 1 |
| NL | -7.62% | 5 |
| CAN | -2.66% | - |

**Table 4: Population Based Mortality Rate per 100,000 (2006-2012) – All Unintentional Injuries**

| Province | Rate per 100,000 | Rank |
|---|---|---|
| BC | 8.35 | 8 |
| AB | 8.70 | 7 |
| SK | 17.51 | 1 |
| MB | 11.93 | 3 |
| ON | 5.99 | 9 |
| NS | 9.81* | 5 |
| NB | 13.45 | 2 |
| PEI | 10.35 | 4 |
| NL | 9.68 | 6 |
| CAN | 7.97 | - |

*Estimated from RDC Data – Vital Statistics Death Database

**Table 5: Percent Change in Mortality Rate (2006-2012) – All Unintentional Injuries**

| Province | % Change | Rank |
|---|---|---|
| BC | -26.73% | 6 |
| AB | -36.23% | 8 |
| SK | +17.77 | 1 |
| MB | +10.92% | 2 |
| ON | -29.01% | 7 |
| NS | -25.34%* | 5 |
| NB | -18.85% | 4 |
| PEI | -74.17% | 9 |
| NL | +5.45% | 3 |
| CAN | -23.85% | - |

* Estimated from RDC Data – Vital Statistics Death Database

Evidence-Based Policy Score (0 = none, 1 = fair, 2 = good, 3 = excellent)

**Table 6: Smoke & CO Detector Scores**

| | |
|---|---|
| BC | Fair = 1 |
| AB | Good = 2 |
| SK | None = 0 |
| MB | Excellent = 3 |
| ON | Good = 2 |
| NS | Fair = 1 |
| NB | None = 0 |
| PEI | Fair = 1 |
| NL | Fair = 1 |

Excellent: Mandatory CO and Smoke Alarms installed on each floor
Good: Mandatory CO and Smoke Alarms required in all dwelling units
Fair: Smoke alarms required, no provincial CO detector law
None: No provincial CO detector law, Smoke Alarm Regulations Repealed

**Table 7: Pedestrian Safety Law Scores**

| | |
|---|---|
| BC | Fair = 1 |
| AB | Fair = 1 |
| SK | None = 0 |
| MB | Fair = 1 |
| ON | Excellent = 3 |
| NS | Good = 2 |
| NB | Good = 2 |
| PEI | Fair = 1 |
| NL | Fair = 1 |

Excellent: Speed limit in residential zones 50 km or less, double fines in residential zones, speed limit in school zones, double fines in school zones
Good: Speed limit in residential zones 50 km or less, speed limit in school zones, double fines in school zones, provision for “pedestrian only” zone
Fair: Speed limit in residential zones 50 km or less, speed limit in school zones, no double fines in residential zones, may include provision for “pedestrian only” zone and fines in school zones
None: speed limits set by municipalities, no double fines in residential or school zones, no provision for “pedestrian only” zone

**Table 8: Distracted Driving Law Scores**

| | |
|---|---|
| BC | Excellent = 3 |
| AB | Good = 2 |
| SK | Good = 2 |
| MB | Good = 2 |
| ON | Excellent = 3 |
| NS | Good = 2 |
| NB | Good = 2 |
| PEI | Excellent = 3 |
| NL | Good = 2 |

Excellent: Fines between $490-$1200 for first or second offense, 3-5 demerit points, and/or ban use of hand-held electronic entertainment devices alongside hand-held communication devices
Good: Fines between $100-$350 for first or second offense, 3-5 demerit points, no ban on use of hand-electronic entertainment devices
Fair: Fines <$100 for first or second offense, <3 demerit points, no ban on use of hand-held electronic entertainment devices
None: no fines for distracted driving

**Table 9: Bicycle Helmet Legislation Scores**

| | |
|---|---|
| BC | Excellent = 3 |
| AB | Fair = 1 |
| SK | None = 0 |
| MB | Fair = 1 |
| ON | Fair = 1 |
| NS | Excellent = 3 |
| NB | Good = 2 |
| PEI | Good = 2 |
| NL | Good = 2 |

Excellent: All age bicycle helmet law, applies to all wheeled activities
Good: All age bicycle helmet law only applies to cycling
Fair: Bicycle helmet law only applies to <18 years,
None: No provincial law requiring the use of bicycle helmets for any age group

**Table 10: Booster Seat Legislation Scores**

| | |
|---|---|
| BC | Excellent = 3 |
| AB | None = 0 |
| SK | Good = 2 |
| MB | Good = 2 |
| ON | Excellent = 3 |
| NS | Excellent = 3 |
| NB | Good = 2 |
| PEI | Excellent = 3 |
| NL | Fair = 1 |

Excellent: Age & Height/Weight Restrictions, Public Education and Incentive Programs in place, noncompliance penalties, driver responsibility
Good: Age & Height/Weight Restrictions, Public Education Programs in place, and/or incentive programs, noncompliance penalties, and/or driver responsibility
Fair: Age & Height/Weight Restrictions, no public education or incentive programs in place, no noncompliance penalties, no driver responsibility
None: No provincial booster seat legislation in place

**Table 11: Graduated Driver Licensing Scores**

| | |
|---|---|
| BC | Good = 2 |
| AB | Good =2 |
| SK | Fair = 1 |
| MB | Fair = 1 |
| ON | Good = 2 |
| NS | Fair = 1 |
| NB | Good = 2 |
| PEI | Good = 2 |
| NL | Good = 2 |

Excellent: minimum of 12 months' duration in learner's phase with no time discounts, mandatory requirement for at least 50 hours of supervised practice
Good: minimum of 12 months' duration in learner's phase (with time discounts) and/or mandatory requirements for at least 50 hours of supervised practice
Fair: no minimum duration of 12 months and/or mandatory requirements for at least 50 hours of supervised practice
None: No provincial graduated driver's licensing required

**Table 12: Overall Policy Score – Total points can range from 0 – 18 (6 policies – minimum score 0, maximum score 3)**

| Province | Total Points | Rank |
|---|---|---|
| BC | 13 | 8 |
| AB | 8 | 2 |
| SK | 5 | 1 |
| MB | 10 | 5 |
| ON | 14 | 9 |
| NS | 12 | 7 |
| NB | 10 | 5 |
| PEI | 12 | 7 |
| NL | 9 | 3 |

**Table 13: Total Score for All Criteria**

| Province | Total Points | Rank |
|---|---|---|
| BC | 38 | 1 |
| AB | 25 | 4 |
| SK | 14 | 9 |
| MB | 22 | 5 |
| ON | 37 | 2 |
| NS | 26 | 3 |
| NB | 21 | 6 |
| PEI | 21 | 6 |
| NL | 21 | 6 |

Chapter 5

# Discussion

## *5.1 An Overview of The Canadian Child Safety Report Card*

The Canadian Child Safety Report Card was developed through the methodology and results described in all three chapters of this dissertation. We initially began by describing the general epidemiology of pediatric injuries in chapter two, by analyzing the rates of hospitalization in each province from a number of injury-related causes including falls, poisoning, burns, suffocation, and drowning. In this study, we demonstrated that the injury morbidity and mortality rates for children/youth 0-19 decreased over a 7-year time period, however trends differ by province and sub cause. For example, we found that in Ontario, Nova Scotia and Prince Edward Island, the overall rate of injury hospitalization increased over time and in Manitoba and Newfoundland and Labrador the average rate of injury death also increased.

Given the variability in overall unintentional injury rates in Canada, we proceeded to analyze specific transport-related causes in chapter three, as these often result in more severe injuries and death. We analyzed the overall hospitalization and death rates from transport injury and further examined specific sub causes such as occupant, pedestrian, and cycling-related injuries. In this study, we demonstrated that transport-related hospitalization and deaths decreased by over 30% and 20%, respectively, in Canada. Sub-cause analyses demonstrated increases in cycling–related hospitalizations in Prince Edward Island and pedestrian-related hospitalizations in Nova Scotia over time. However there was a large variability between study years in the rates of hospitalizations in smaller provinces such as PEI and NS. Our study also reported increases in overall transport related deaths in Saskatchewan, Manitoba, and Prince Edward Island between 2006 and 2012. Finally, in chapter four we combined our findings from

chapters two and three and scored policies using evidence-based criteria to create rankings among provinces on injury prevention strategies. We consulted with key experts from the Canadian Collaborating Centres on Injury Prevention (CCCIP) to establish which indicators should be used, and how these should be scored to determine the ranking for the Canadian Child Safety Report Card. There was considerable variability in the weighting decisions given by different stakeholders across the provinces, therefore a decision was made to leave the indicators unweighted but to create a contextual report that summarizes the changes made to injury prevention policies in each province over time. Taken together, chapters two through four of this dissertation provide Canadians with a broad picture of the burden of pediatric injury in Canada, and related specific injury sub causes with evidence-based policies and legislation, with a goal of providing a comparative tool to experts and stakeholders.

### *5.2 The Public Health Approach*

The field of injury prevention is now recognized as a public health concern (Yanchar et al., 2012). Injuries are not accidents but are predictable and preventable events. The public health approach is preventative in nature, and therefore applies to the injury problem. It involves using the best available evidence from research, context, and experience in order to understand the underlying determinants of health problems, and ultimately, to improve public health practice, programs, and policies. This includes evidence obtained from practitioners, stakeholders, knowledge users, and other resources. The five traditional steps in the public health approach includes: surveillance, research on risk and protective factors, research on interventions, program and policy implementation, and evaluation and monitoring (Pike et al., 2015). Other countries have used the public health approach to create comparative report cards that highlight effective injury prevention practices (MacKay & Vincenten, 2012). As a result of the European Child

Safety Report Card which was published by the European Child Safety Alliance in 2012, some countries in Europe have adopted, implemented and evaluated injury prevention policies and practices resulting in harmonization across jurisdictions (Vincenten, 2012). The overall goal of the *Canadian Child Safety Report Card* is to create an advocacy tool for policy makers, stakeholders and end users that compares Canadian provinces and ranks them on measures of injury morbidity, mortality, and evidence-based legislations that can be used to harmonize effective policies across the country. This chapter outlines how the studies described and the Canadian child safety report card fits within the public health approach framework.

### *5.3 Surveillance*

The first step of the public health approach is surveillance. This involves defining the problem by describing the burden that injury exerts on Canadians and the health care system through surveillance measures including morbidity and mortality data (Pike et al., 2015). By using these indicators, we are able to highlight both the incidence and severity of certain injury types. In chapters two and three of this dissertation, we defined the childhood injury problem across provinces through the examination and analysis of injury hospitalization and deaths. Previous literature shows that fall-related injuries among children account for the highest number of injury hospitalization in Canada (Parachute, 2015). In order to elucidate the causes of injury that account for greater economic burden and to understand the differences among provinces with and without prevention legislation, we performed the study in chapter two on unintentional injury rates in Canada between 2006 and 2012. Chapter two outlined the burden of injury through an analysis of common causes of hospitalization including falls, poisonings, burns, strangulation, and drowning-related injuries. The findings in this study compared provincial population based rates of injury, and highlighted injury causes that resulted in increased or

decreased hospitalization over time. For example, we observed a -2.90% decrease in all unintentional injuries in Canada. However, specific causes of injury such as suffocation/choking and drowning-related injuries demonstrated an increase in hospitalizations. These types of surveillance measures allow us to focus effective injury prevention strategies, such as evidence-based policies, in specific areas where they are most needed (i.e. four-sided pool fencing to prevent drowning-related incidences).

The majority of childhood-related deaths occur from motor-vehicle crashes (Parachute 2015; PHAC; 2013). The findings in chapter three on childhood road traffic injuries in Canada highlighted the severity of injury through an analysis of provincial coronial data on transport-related fatalities. Our study found that in Canada, road traffic fatalities have decreased by almost one-quarter over time (-23.73%); however some provinces including SK, MB, and PEI experienced increases in the number of transport-related injury deaths. When we examined specific causes, the number of road traffic hospitalizations from occupant and pedestrian injuries decreased, but some provinces, such as PEI, showed an increase in the number of cyclists hospitalized after colliding with a vehicle.

Through our analysis on hospitalization (burden data) from the Discharge Abstract Database, and death (severity data) from Statistics Canada and provincial coroners, we defined the injury problem in each province and provided a measure of surveillance for policy makers, stakeholders, and end users to consider in their evaluation of how their province ranks in comparison to other jurisdictions and to the Canadian average.

### *5.4 Risk & Protective Factors*

Injury is a multifaceted problem involving a number of different social, geographical, and environmental factors. In previous research, one factor shown to reduce the burden of injuries in

children are prevention policies. Studies have demonstrated that when used correctly, car seats reduce the risk of death by 71% for infants and 54% for children 1-4 years respectively and further reduce the risk of hospitalization by 67% (Yanchar et al., 2012). However, in Canada not all provinces have mandated the use of car and booster seats for infants and young children, suggesting that harmonization of best practice is lacking (Yanchar et al., 2012).

In all three of our studies we aimed to compare evidence-based injury prevention policies across provinces. We wanted to establish whether provinces that had more policies in place such as BC and ON also had a reduced incidence of injury morbidity and mortality rates over time. Our focus in these studies was to examine the criteria of each policy in each province to determine if policies aligned with best practice. For example, when we reviewed the booster seat legislation across provinces we determined differences among provinces on a number of criteria. Some of these criteria included age and height/weight stipulations, public education and incentive programs, noncompliance penalties, and driver responsibility. Our study ranked provinces on booster seat legislation based on their alignment with best practice. BC, ON, and NS all had excellent booster seat legislation whereas, at the time of writing, AB had no legislation mandating the use of booster seats. All three provinces that scored 'excellent' on this policy also had hospitalization rates for occupant-related injuries that were below or near the Canadian average. Conversely, the AB rate of hospitalization resulting from occupant-related injuries was nearly double that of the Canadian average. Although we cannot claim that having an injury prevention policy *causes* a reduction in the number of children being hospitalized or dying from injury, we can use this evidence to advocate for stricter legislation as policies are a modifiable factor that has been shown to reduce the burden of injury (CDC, 2014).

### *5.5 Interventions*

The third step of the public health approach is developing and/or selecting effective prevention strategies. Interventions are typically categorized into 'active or behavioral strategies' and 'passive or environmental strategies' (Gielen & Sleet, 2003). Active strategies encourage individuals to take measures to protect themselves from injury, for example, educational interventions that promote the proper installation of child safety seats (Gielen & Sleet, 2003). Whereas passive strategies change products or environments to prevent injury, for example, installing smoke alarm and CO detectors to prevent burn and inhalation injuries (Gielen & Sleet, 2003). Policies and legislation included in the current study, and which serve as key indicators in the *Canadian Child Safety Report Card* are examples requiring both active and passive intervention strategies.

An example of legislation included in this study requiring an active intervention was the use of bicycle helmets. Studies have demonstrated that all age bicycle helmet legislations with greater fines have higher rates of compliance than legislation that only targets children/youth <18 years (Macpherson & Spinks, 2008). In chapter four, provinces with all age bicycle helmet legislations that also applied to other non-motorized activities such as skates, skateboards, and push scooters (BC & NS) were ranked highly on this policy. SK currently does not have bicycle helmet legislation in place and once again we related these interventions back to our surveillance data. Although all of these provinces had a similar population-based injury hospitalization rate from cycling related injuries both BC and NS had a larger percent decrease in hospitalizations over time when compared to SK (-42.14%, -41.45%, and -26.65% respectively). Additionally, BC and NS updated their helmet legislation in 2003 and 2007 respectively to include all wheeled activities which may have reinforced cycling behaviour with an increased focus, education, and

awareness of safety around helmets. We know that injury is a multifactorial problem and factors other than helmet legislation such as changes to the built environment may have contributed to the differences we observed in active intervention strategies between provinces.

An example of passive intervention legislation that was evaluated in this study is GDL. GDL is a policy that was introduced in an effort to reduce the risks associated with inexperienced and/or young drivers. Policy makers implemented GDL programs to gradually expose young drivers to the challenges of driving through education efforts, passenger and nighttime restrictions, and supervised driving conditions (Macpherson et al., 2015). Although our study found that no province met the gold standard for GDL programs, a number of provinces did meet the minimum length of duration in the learner phase (12 months) as recommended by the Traffic Injury Research Foundation (TIRF). In chapter four, we described the differences among provinces on GDL criteria and determined that BC, AB, ON, NB, PEI, and NL should all be given a 'good' score for having comprehensive GDL programs in place. However, in order to meet best practice guidelines, all provinces should require novice drivers to practice in supervised conditions for a minimum of 50-hours and no time discounts should be applied for driver education.

Overall, the *Canadian Child Safety Report Card* fits within the public health approach in two ways. Firstly, through the evaluation of proven interventions such as booster seat legislation, bicycle helmet legislation, and GDL programs, and an associated comparison of these policies and specific criteria across provinces. Secondly, by ranking provinces in Canada on morbidity, mortality, and policy indicators that can eventually be used as an advocacy tool for policymakers and stakeholders to implement and harmonize best practices across Canada.

### *5.6 Implementation, Evaluation, and Monitoring of Policy*

Our studies addressed the first three steps of the public health approach by identifying the burden of injury, outlining risk and protective factors, and creating an intervention/advocacy tool through the Canadian child safety report card. The final steps in the public health approach involve implementing the reports cards and subsequently evaluating and monitoring their use by policymakers, stakeholders, and knowledge users. From the beginning of this project, we used an integrated knowledge translation approach and consulted with injury experts from the Canadian Collaborating Centres on Injury Prevention (CCCIP), and Parachute in order to establish the criteria and rankings that were most useful to individuals in each province. We will continue to work with key informants from multiple sectors on the *Canadian Child Safety Report Card* and we plan to complete these steps of the public health approach by implementing, evaluating, and monitoring policy change as a result of the findings in the provincial report cards.

### *Strengths and Limitations*

The *Canadian Child Safety Report Card* has a number of strengths and limitations that apply to this study and specific sub-studies within. This is the first project that ranks Canadian provinces by comparing them with one another on measures of injury hospitalizations, deaths, and differences related to evidence-based prevention policies. Secondly, we analyzed data over a 7-year time period, and as a result we were able to illustrate percent changes in injury rates over time. Finally, we were able to ascertain what factors were important to include in these report cards by consulting with injury experts across Canada.

The major limitation to this study was the data used to establish mortality rates from injury. Initially, we applied for access to the Vital Statistics Death Database through the Research Data Centres (RDC) at York University. After analyzing the death data in each

province resulting from all unintentional and transport-related injuries, we observed a discrepancy in the findings when we compared the rates to the provincial Vital Statistics Death Database in BC. The reason for this discrepancy may be due to data suppression at the national level, as some cases may not have been manually entered into the Vital Stats database because of missing variables/information supplied by the coroner's office in BC. As a method of data quality control, we subsequently contacted the office of the chief coroner/medical examiner's in each province and obtained coronial data. Where possible, we used the provincial numbers to calculate the rate of mortality from unintentional injuries over time. In addition, there is currently no standardized process across provinces for assigning death codes from injury therefore the results that are reported may be over or underestimated. The intent of injury can be hard to dichotomize into unintentional or intentional for many causes. For example, if a child or youth dies as the result of falling out of a window this may be classified as an unintentional fall but could also be the result of homicide or suicide. In addition, coronial data in different provinces vary in their coding systems (i.e. do not necessarily rely on ICD-10-CA) therefore some injury categories may have a smaller or larger number of reported injuries for each cause.

Additionally, there are contextual variables such as population density, geographical differences, access to health care, and variability in the built environment factors that differ among provinces. The studies included as a part of the *Canadian Child Safety Report Card* have not taken into account these external factors. However, we will consult with provincial representatives and injury experts to include a contextual summary for each province.

Finally, the *Canadian Child Safety Report Card* provides measures of morbidity, mortality, and policies from 2006 to 2012, there may be additional changes in the rates of injury and updated policies since 2012, that are not reflected in this report.

### *Summary and Conclusions*

The *Canadian Child Safety Report Card* has used a public health approach framework and provides policymakers and end users with a summary of the burden and severity of unintentional injury related hospitalizations and deaths among children/youth (19 years and less) over a seven-year time period. The report also highlights evidence-based prevention policies as one protective factor that may reduce the number of childhood deaths in Canada. Chapter two focused on the general epidemiology of pediatric injury in Canada and summarized differences in injury hospitalization between provinces from a number of common causes. Chapter three provided a more specific analysis of transport-related injuries in children as these injuries cause a significant burden to society and are the leading cause of injury related death in Canada. Finally, chapter four focused on injury prevention policies and used a ranking system developed in collaboration with key injury prevention stakeholders in Canada in order to evaluate the quality of prevention policies across the country. As a whole, the *Canadian Child Safety Report Card* can be used as an advocacy/intervention tool to target future preventative efforts through the harmonization of best practice policies.

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# Appendices

## APPENDIX A: Morbidity & Mortality Results

**Table 1: Population Based Injury Hospitalization Rate per 100,000 from all unintentional causes by Canadian Province (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % Change |
|---|---|---|---|---|---|---|---|---|---|
| **PEI** | 692.84 | 739.34 | 721.16 | 840.77 | 628.72 | 682.27 | 819.7 | 731.94 | 18.31 |
| **NS** | 592.33 | 643.91 | 600.3 | 602.6 | 620.98 | 643.73 | 685.67 | 626.39 | 15.76 |
| **ON** | 451.23 | 449.61 | 441.55 | 448.25 | 467.86 | 482.95 | 479.78 | 460.13 | 6.33 |
| **BC** | 667.55 | 636.66 | 583.96 | 574.30 | 547.24 | 537.95 | 515.72 | 580.56 | -22.74 |
| **SK** | 967.06 | 941.56 | 912.18 | 897.19 | 931.13 | 855.56 | 852.98 | 907.82 | -11.80 |
| **NB** | 774.55 | 741.93 | 729.07 | 700.75 | 717.48 | 658.19 | 689.43 | 716.57 | -10.99 |
| **MB** | 607.32 | 627.39 | 623.5 | 578.87 | 581.64 | 593.56 | 555.7 | 595.26 | -8.50 |
| **NL** | 722.32 | 670.52 | 704.26 | 636.89 | 579.54 | 641.93 | 667.26 | 660.75 | -7.62 |
| **AB** | 687.21 | 687.04 | 665.51 | 673.18 | 677.59 | 677.10 | 679.99 | 678.19 | -1.05 |
| **Canada** | 584.00 | 578.00 | 558.00 | 557.00 | 562.00 | 568.00 | 567.00 | 567.87 | -2.90 |

A positive change indicates an annual increase over time; a negative percentage indicates a decrease over time

**Table 2: Population Based Injury Hospitalization Rate per 100,000 from all transport-related causes by Canadian Province (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % Change |
|---|---|---|---|---|---|---|---|---|---|
| **NB** | 153.24 | 115.21 | 104.85 | 103.27 | 88.21 | 84.31 | 85.31 | 105.34 | -44.33 |
| **MB** | 118.11 | 95.69 | 93.22 | 84.90 | 87.03 | 83.77 | 67.45 | 89.93 | -42.89 |
| **BC** | 103.08 | 99.76 | 80.82 | 81.08 | 71.37 | 68.82 | 60.76 | 80.84 | -41.06 |
| **ON** | 56.16 | 54.33 | 48.98 | 43.52 | 43.01 | 45.05 | 38.65 | 47.12 | -31.18 |
| **PEI** | 136.20 | 102.18 | 93.54 | 136.1 | 78.97 | 100.1 | 97.87 | 106.53 | -28.14 |
| **AB** | 114.57 | 109.27 | 105.47 | 98.58 | 87.23 | 86.71 | 83.42 | 97.65 | -27.19 |
| **NL** | 138.22 | 122.16 | 148.51 | 96.72 | 87.53 | 107.92 | 108.08 | 115.77 | -21.81 |
| **SK** | 146.80 | 148.59 | 154.56 | 143.33 | 119.87 | 119.67 | 118.1 | 135.69 | -19.55 |
| **NS** | 81.18 | 78.27 | 69.56 | 69.59 | 72.67 | 81.10 | 77.74 | 75.73 | -4.24 |
| **Canada** | 85.51 | 80.63 | 74.47 | 69.01 | 63.65 | 64.34 | 58.77 | 70.91 | -31.27 |

A positive change indicates an annual increase over time; a negative percentage indicates a decrease over time

**Table 3: Fall-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **PEI** | 124.36 | 156.28 | 108.63 | 154.24 | 170.09 | 127.36 | 137.64 | 139.75 | 10.68 |
| **BC** | 144.93 | 130.74 | 127.13 | 126.38 | 116.56 | 118.81 | 114.05 | 125.53 | -21.31 |
| **NL** | 140.90 | 133.92 | 119.35 | 113.14 | 121.62 | 114.43 | 112.78 | 122.44 | -19.96 |
| **SK** | 218.51 | 219.90 | 186.44 | 192.33 | 189.89 | 183.88 | 178.23 | 195.44 | -18.43 |
| **MB** | 105.76 | 101.71 | 126.09 | 91.51 | 87.03 | 102.77 | 89.42 | 100.55 | -15.45 |
| **NS** | 153.39 | 174.78 | 159.56 | 128.81 | 124.30 | 110.18 | 130.60 | 140.74 | -14.86 |
| **ON** | 96.15 | 93.30 | 93.01 | 87.36 | 89.58 | 88.13 | 85.43 | 90.44 | -11.15 |
| **NB** | 173.51 | 190.61 | 164.59 | 162.89 | 170.21 | 147.86 | 161.69 | 167.51 | -6.81 |
| **AB** | 131.34 | 146.10 | 128.42 | 135.00 | 129.94 | 130.11 | 126.12 | 132.36 | -3.97 |
| **Canada** | 120.28 | 120.27 | 114.78 | 110.21 | 108.87 | 107.68 | 105.31 | 112.49 | -12.45 |

**Table 4: Poisoning-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **NS** | 11.33 | 14.41 | 12.65 | 12.34 | 14.03 | 14.79 | 13.99 | 13.34 | 23.48 |
| **MB** | 17.42 | 18.69 | 18.96 | 18.87 | 15.34 | 18.06 | 20.42 | 18.25 | 17.22 |
| **PEI** | 26.65 | 33.06 | 27.16 | 36.29 | 6.07 | 36.39 | 6.12 | 24.58 | -77.04 |
| **SK** | 50.43 | 46.67 | 45.59 | 41.27 | 44.72 | 35.02 | 40.33 | 43.49 | -20.03 |
| **NB** | 29.81 | 25.93 | 27.43 | 30.12 | 32.30 | 23.28 | 25.46 | 27.79 | - 14.59 |
| **NL** | 24.08 | 23.53 | 22.78 | 20.07 | 19.35 | 26.05 | 20.68 | 22.37 | -14.12 |
| **BC** | 20.00 | 20.86 | 18.60 | 19.13 | 17.58 | 20.28 | 17.21 | 19.10 | -13.95 |
| **AB** | 20.46 | 23.34 | 20.77 | 17.94 | 19.31 | 20.06 | 17.96 | 19.95 | -12.22 |
| **ON** | 13.81 | 14.88 | 14.21 | 14.32 | 12.48 | 12.47 | 12.83 | 13.57 | -7.10 |
| **Canada** | 18.38 | 19.32 | 18.16 | 17.79 | 16.69 | 17.08 | 16.64 | 17.72 | -9.47 |

**Table 5: Burn-related injury hospitalization rate per 100,000 between 2006-2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **PEI** | 2.96 | 6.01 | 9.05 | 6.05 | 6.07 | 3.03 | 21.41 | 7.76 | 623.31 |
| **NL** | 11.59 | 15.38 | 16.40 | 8.21 | 11.06 | 13.96 | 4.70 | 11.64 | -59.45 |
| **BC** | 8.56 | 8.06 | 8.89 | 6.93 | 6.62 | 7.45 | 4.15 | 7.24 | -51.52 |
| **NB** | 7.75 | 9.65 | 10.36 | 12.91 | 11.80 | 7,55 | 4.46 | 9.23 | -42.45 |
| **ON** | 6.97 | 6.83 | 7.28 | 5.56 | 5.79 | 6.73 | 5.31 | 6.36 | -23.82 |
| **MB** | 11.40 | 13.63 | 11.38 | 13.84 | 9.70 | 5.92 | 8.97 | 10.67 | -21.32 |
| **SK** | 12.33 | 14.56 | 17.05 | 11.42 | 18.70 | 14.59 | 10.80 | 14.20 | -12.41 |
| **NS** | 4.25 | 4.80 | 7.30 | 6.42 | 5.51 | 3.57 | 4.15 | 5.15 | -2.35 |
| **AB** | 7.04 | 7.30 | 8.53 | 9.40 | 8.26 | 7.32 | 7.00 | 7.84 | -0.57 |
| **Canada** | 7.67 | 8.08 | 8.72 | 7.48 | 7.38 | 7.41 | 5.92 | 7.52 | -22.82 |

**Table 6: Suffocation/Choking-related injury hospitalization rate per 100,000 between 2006-2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **NB** | 0.60 | 3.62 | 2.44 | 3.07 | 4.35 | 6.92 | 3.18 | 3.43 | 430.00 |
| **NL** | 0.89 | 2.71 | 0.91 | 2.74 | 1.84 | 0 | 3.76 | 1.83 | 322.47 |
| **NS** | 3.30 | 4.32 | 3.41 | 4.44 | 9.02 | 12.24 | 6.22 | 6.07 | 88.48 |
| **ON** | 1.60 | 1.25 | 1.57 | 2.12 | 1.87 | 1.77 | 2.01 | 1.74 | 25.62 |
| **MB** | 3.17 | 3.17 | 3.48 | 2.52 | 3.13 | 3.43 | 3.71 | 3.23 | 17.03 |
| **BC** | 3.40 | 3.72 | 3.51 | 4.34 | 1.65 | 4.04 | 3.84 | 3.50 | 12.94 |
| **PEI** | 5.92 | 9.02 | 6.03 | 6.05 | 0 | 6.06 | 6.12 | 5.61 | 3.38 |
| **SK** | 7.47 | 9.71 | 6.30 | 5.16 | 7.33 | 4.01 | 5.04 | 6.42 | -32.53 |
| **AB** | 6.15 | 5.31 | 5.90 | 5.51 | 3.43 | 4.56 | 5.01 | 5.12 | -18.54 |
| **Canada** | 2.95 | 3.00 | 3.00 | 3.27 | 2.72 | 3.26 | 3.28 | 3.07 | 11.19 |

**Table 7: Drowning-related injury hospitalization rate per 100,000 between 2006-2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **NB** | 0.00 | 1.20 | 0.00 | 0.61 | 1.86 | 1.89 | 3.18 | 1.23 | - |
| **NS** | 0.00 | 0.96 | 1.95 | 2.47 | 1.00 | 1.02 | 1.55 | 1.27 | - |
| **PEI** | 0.00 | 0.00 | 3.01 | 0.00 | 0.00 | 3.03 | 0.00 | 0.86 | - |
| **SK** | 0.75 | 2.24 | 2.22 | 1.47 | 1.47 | 1.46 | 1.08 | 1.53 | 44.00 |
| **ON** | 0.99 | 1.22 | 1.38 | 0.87 | 1.58 | 1.61 | 1.30 | 1.28 | 31.31 |
| **AB** | 1.45 | 1.00 | 1.42 | 1.95 | 1.07 | 1.91 | 1.67 | 1.50 | 15.17 |
| **NL** | 1.78 | 0.00 | 0.91 | 2.74 | 0.00 | 0.93 | 0.00 | 0.92 | -100.00 |
| **BC** | 2.06 | 1.55 | 2.07 | 1.55 | 1.65 | 1.03 | 0.83 | 1.54 | -59.71 |
| **MB** | 1.90 | 0.95 | 3.16 | 1.89 | 1.25 | 1.25 | 1.86 | 1.75 | -2.11 |
| **Canada** | 1.27 | 1.24 | 1.61 | 1.30 | 1.43 | 1.52 | 1.34 | 1.39 | 5.51 |

**Table 8: Occupant-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **PEI** | 94.75 | 63.11 | 39.23 | 51.41 | 54.67 | 51.55 | 33.64 | 55.64 | -64.50 |
| **BC** | 29.48 | 28.81 | 24.91 | 20.99 | 19.55 | 19.35 | 12.55 | 22.24 | -57.43 |
| **NB** | 47.70 | 39.81 | 29.26 | 36.27 | 32.92 | 28.94 | 22.92 | 34.12 | -51.95 |
| **MB** | 42.43 | 32.95 | 30.65 | 33.64 | 33.81 | 27.72 | 21.66 | 31.80 | -48.95 |
| **ON** | 19.24 | 16.74 | 14.72 | 11.56 | 12.16 | 11.47 | 10.69 | 13.81 | -44.44 |
| **AB** | 41.69 | 36.94 | 33.12 | 28.21 | 27.79 | 24.83 | 27.67 | 31.36 | -33.63 |
| **NL** | 32.10 | 38.91 | 29.15 | 26.46 | 21.19 | 37.21 | 23.49 | 29.83 | -26.82 |
| **NS** | 28.32 | 34.57 | 24.32 | 26.16 | 25.56 | 32.65 | 22.80 | 27.81 | -19.49 |
| **SK** | 54.16 | 62.35 | 67.83 | 56.37 | 42.16 | 41.96 | 46.81 | 53.01 | -13.57 |
| **Canada** | 28.64 | 26.46 | 23.41 | 20.53 | 19.55 | 18.82 | 16.97 | 22.05 | -40.75 |

**Table 9: Cyclist-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **PEI** | 8.88 | 6.01 | 18.10 | 39.32 | 12.15 | 3.03 | 12.23 | 14.23 | 37.73 |
| **NB** | 44.72 | 32.57 | 32.92 | 30.12 | 18.01 | 17.62 | 17.82 | 27.87 | -60.15 |
| **MB** | 21.53 | 17.74 | 13.27 | 14.46 | 15.03 | 14.64 | 12.07 | 15.52 | -43.94 |
| **NL** | 36.56 | 24.43 | 20.95 | 24.64 | 19.35 | 18.61 | 20.68 | 23.68 | -43.44 |
| **BC** | 34.22 | 31.91 | 20.98 | 24.30 | 22.24 | 20.39 | 19.80 | 24.84 | -42.14 |
| **NS** | 28.32 | 15.85 | 22.38 | 15.79 | 16.04 | 13.77 | 16.58 | 18.49 | -41.45 |
| **ON** | 16.65 | 15.81 | 13.57 | 12.65 | 12.22 | 14.34 | 10.72 | 13.72 | -35.62 |
| **SK** | 25.03 | 22.77 | 19.64 | 19.90 | 17.23 | 20.80 | 18.36 | 20.51 | -26.65 |
| **AB** | 18.44 | 21.12 | 22.62 | 20.86 | 17.70 | 18.78 | 17.96 | 19.63 | -2.60 |
| **Canada** | 21.87 | 20.19 | 17.67 | 17.20 | 15.45 | 16.39 | 14.30 | 17.58 | -34.61 |

**Table 10: Pedestrian-related injury hospitalization rate per 100,000 between 2006 – 2012 by Province among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Rate | % change |
|---|---|---|---|---|---|---|---|---|---|
| **NS** | 7.08 | 3.36 | 5.35 | 5.92 | 10.53 | 5.61 | 7.77 | 6.49 | 9.75 |
| **PEI** | 5.92 | 3.01 | 6.03 | 3.02 | 0.00 | 3.03 | 0.00 | 3.02 | -100.00 |
| **AB** | 9.84 | 8.07 | 6.89 | 8.97 | 6.87 | 9.13 | 5.64 | 7.90 | -42.68 |
| **SK** | 13.82 | 14.19 | 16.31 | 13.26 | 13.56 | 13.13 | 9.00 | 13.31 | -34.88 |
| **BC** | 12.37 | 13.12 | 9.41 | 9.31 | 8.69 | 9.42 | 8.09 | 10.06 | -34.60 |
| **NB** | 4.77 | 4.22 | 6.71 | 8.61 | 4.35 | 6.92 | 3.18 | 5.54 | -33.33 |
| **NL** | 11.59 | 9.95 | 18.22 | 9.12 | 8.29 | 6.51 | 8.46 | 10.33 | -27.00 |
| **ON** | 5.66 | 6.51 | 5.77 | 5.78 | 5.34 | 6.25 | 5.09 | 5.77 | -10.07 |
| **MB** | 13.62 | 12.04 | 12.01 | 10.38 | 7.51 | 9.03 | 12.38 | 10.99 | -9.10 |
| **Canada** | 8.29 | 8.32 | 7.55 | 7.61 | 6.89 | 7.64 | 6.29 | 7.51 | -24.13 |

**Table 11: Population Based Injury Hospitalization Rate Per 100,000 by Cause in British Columbia (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 667.55 | 636.66 | 583.96 | 574.30 | 547.24 | 537.95 | 515.72 | -22.74 |
| **Falls** | 144.93 | 130.74 | 127.13 | 126.38 | 116.56 | 118.81 | 114.05 | -21.31 |
| **Transport** | 103.08 | 99.76 | 80.82 | 81.08 | 71.37 | 68.82 | 60.76 | -41.10 |
| **Occupant** | 29.48 | 28.81 | 24.91 | 20.99 | 19.55 | 19.35 | 12.55 | -57.43 |
| **Cyclist** | 34.22 | 31.91 | 20.98 | 24.30 | 22.24 | 20.39 | 19.80 | -42.14 |
| **Pedestrian** | 12.37 | 13.12 | 9.41 | 9.31 | 8.69 | 9.42 | 8.09 | -34.60 |
| **Poisoning** | 20.00 | 20.86 | 18.60 | 19.13 | 17.58 | 20.28 | 17.21 | -13.95 |
| **Burns** | 8.56 | 8.06 | 8.89 | 6.93 | 6.62 | 7.45 | 4.15 | -51.52 |
| **Suffocation/Choking** | 3.40 | 3.72 | 3.51 | 4.34 | 1.65 | 4.04 | 3.84 | 12.94 |
| **Drowning** | 2.06 | 1.55 | 2.07 | 1.55 | 1.65 | 1.03 | 0.83 | -59.71 |

**Table 12: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Alberta (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 687.21 | 687.04 | 665.51 | 673.18 | 677.59 | 677.10 | 679.99 | -1.05 |
| **Falls** | 131.34 | 146.10 | 128.42 | 135.00 | 129.94 | 130.11 | 126.12 | -3.97 |
| **Transport** | 114.57 | 109.27 | 105.47 | 98.58 | 87.23 | 86.71 | 83.42 | -27.19 |
| **Occupant** | 41.69 | 36.94 | 33.12 | 28.21 | 27.79 | 24.83 | 27.67 | -33.63 |
| **Cyclist** | 18.44 | 21.12 | 22.62 | 20.86 | 17.70 | 18.78 | 17.96 | -2.60 |
| **Pedestrian** | 9.84 | 8.07 | 6.89 | 8.97 | 6.87 | 9.13 | 5.64 | -42.68 |
| **Poisoning** | 20.46 | 23.34 | 20.77 | 17.94 | 19.31 | 20.06 | 17.96 | -12.22 |
| **Burns** | 7.04 | 7.30 | 8.53 | 9.40 | 8.26 | 7.32 | 7.00 | -0.57 |
| **Suffocation/Choking** | 6.15 | 5.31 | 5.90 | 5.51 | 3.43 | 4.56 | 5.01 | -18.54 |
| **Drowning** | 1.45 | 1.00 | 1.42 | 1.95 | 1.07 | 1.91 | 1.67 | 15.17 |

**Table 13: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Saskatchewan (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 967.06 | 941.56 | 912.18 | 897.19 | 931.13 | 855.56 | 852.98 | -11.80 |
| **Falls** | 218.51 | 219.90 | 186.44 | 192.33 | 189.89 | 183.88 | 178.23 | -18.43 |
| **Transport** | 146.80 | 148.59 | 154.56 | 143.33 | 119.87 | 119.67 | 118.1 | -19.55 |
| **Occupant** | 54.16 | 62.35 | 67.83 | 56.37 | 42.16 | 41.96 | 46.81 | -13.57 |
| **Cyclist** | 25.03 | 22.77 | 19.64 | 19.90 | 17.23 | 20.80 | 18.36 | -26.65 |
| **Pedestrian** | 13.82 | 14.19 | 16.31 | 13.26 | 13.56 | 13.13 | 9 | -34.88 |
| **Poisoning** | 50.43 | 46.67 | 45.59 | 41.27 | 44.72 | 35.02 | 40.33 | -20.03 |
| **Burns** | 12.33 | 14.56 | 17.05 | 11.42 | 18.70 | 14.59 | 10.80 | -12.41 |
| **Suffocation/Choking** | 7.47 | 9.71 | 6.30 | 5.16 | 7.33 | 4.01 | 5.04 | -32.53 |
| **Drowning** | 0.75 | 2.24 | 2.22 | 1.47 | 1.47 | 1.46 | 1.08 | 44.00 |

**Table 14: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Manitoba (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 607.32 | 627.39 | 623.50 | 578.87 | 581.64 | 593.56 | 555.70 | -8.50 |
| **Falls** | 105.76 | 101.71 | 126.09 | 91.51 | 87.03 | 102.77 | 89.42 | -15.45 |
| **Transport** | 118.11 | 95.69 | 93.22 | 84.90 | 87.03 | 83.77 | 67.45 | -42.89 |
| **Occupant** | 42.43 | 32.95 | 30.65 | 33.64 | 33.81 | 27.72 | 21.66 | -48.95 |
| **Cyclist** | 21.53 | 17.74 | 13.27 | 14.46 | 15.03 | 14.64 | 12.07 | -43.94 |
| **Pedestrian** | 13.62 | 12.04 | 12.01 | 10.38 | 7.51 | 9.03 | 12.38 | -9.10 |
| **Poisoning** | 17.42 | 18.69 | 18.96 | 18.87 | 15.34 | 18.06 | 20.42 | 17.22 |
| **Burns** | 11.40 | 13.63 | 11.38 | 13.84 | 9.70 | 5.92 | 8.97 | -21.32 |
| **Suffocation/Choking** | 3.17 | 3.17 | 3.48 | 2.52 | 3.13 | 3.43 | 3.71 | 17.03 |
| **Drowning** | 1.90 | 0.95 | 3.16 | 1.89 | 1.25 | 1.25 | 1.86 | -2.11 |

**Table 15: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Ontario (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 451.23 | 449.61 | 441.55 | 448.25 | 467.86 | 482.95 | 479.78 | 6.33 |
| **Falls** | 96.15 | 93.30 | 93.01 | 87.36 | 89.58 | 88.13 | 85.43 | -11.15 |
| **Transport** | 56.16 | 54.33 | 48.98 | 43.52 | 43.01 | 45.05 | 38.65 | -31.18 |
| **Occupant** | 19.24 | 16.74 | 14.72 | 11.56 | 12.16 | 11.47 | 10.69 | -44.44 |
| **Cyclist** | 16.65 | 15.81 | 13.57 | 12.65 | 12.22 | 14.34 | 10.72 | -35.62 |
| **Pedestrian** | 5.66 | 6.51 | 5.77 | 5.78 | 5.34 | 6.25 | 5.09 | -10.07 |
| **Poisoning** | 13.81 | 14.88 | 14.21 | 14.32 | 12.48 | 12.47 | 12.83 | -7.10 |
| **Burns** | 6.97 | 6.83 | 7.28 | 5.56 | 5.79 | 6.73 | 5.31 | -23.82 |
| **Suffocation/Choking** | 1.60 | 1.25 | 1.57 | 2.12 | 1.87 | 1.77 | 2.01 | 25.62 |
| **Drowning** | 0.99 | 1.22 | 1.38 | 0.87 | 1.58 | 1.61 | 1.30 | 31.31 |

**Table 16: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Nova Scotia (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 592.33 | 643.91 | 600.30 | 602.60 | 620.98 | 643.73 | 685.67 | 15.76 |
| **Falls** | 153.39 | 174.78 | 159.56 | 128.81 | 124.30 | 110.18 | 130.60 | -14.86 |
| **Transport** | 81.18 | 78.27 | 69.56 | 69.59 | 72.67 | 81.10 | 77.74 | -4.24 |
| **Occupant** | 28.32 | 34.57 | 24.32 | 26.16 | 25.56 | 32.65 | 22.80 | -19.49 |
| **Cyclist** | 28.32 | 15.85 | 22.38 | 15.79 | 16.04 | 13.77 | 16.58 | -41.45 |
| **Pedestrian** | 7.08 | 3.36 | 5.35 | 5.92 | 10.53 | 5.61 | 7.77 | 9.75 |
| **Poisoning** | 11.33 | 14.41 | 12.65 | 12.34 | 14.03 | 14.79 | 13.99 | 23.48 |
| **Burns** | 4.25 | 4.80 | 7.30 | 6.42 | 5.51 | 3.57 | 4.15 | -2.35 |
| **Suffocation/Choking** | 3.30 | 4.32 | 3.41 | 4.44 | 9.02 | 12.24 | 6.22 | 88.48 |
| **Drowning** | 0 | 0.96 | 1.95 | 2.47 | 1.00 | 1.02 | 1.55 | - |

**Table 17: Population Based Injury Hospitalization Rate Per 100,000 by Cause in New Brunswick (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 774.55 | 741.93 | 729.07 | 700.75 | 717.48 | 658.19 | 689.43 | -10.99 |
| **Falls** | 173.51 | 190.61 | 164.59 | 162.89 | 170.21 | 147.86 | 161.69 | -6.81 |
| **Transport** | 153.24 | 115.21 | 104.85 | 103.27 | 88.21 | 84.31 | 85.30 | -44.34 |
| **Occupant** | 47.70 | 39.81 | 29.26 | 36.27 | 32.92 | 28.94 | 22.92 | -51.95 |
| **Cyclist** | 44.72 | 32.57 | 32.92 | 30.12 | 18.01 | 17.62 | 17.82 | -60.15 |
| **Pedestrian** | 4.77 | 4.22 | 6.71 | 8.61 | 4.35 | 6.92 | 3.18 | -33.33 |
| **Poisoning** | 29.81 | 25.93 | 27.43 | 30.12 | 32.30 | 23.28 | 25.46 | -14.59 |
| **Burns** | 7.75 | 9.65 | 10.36 | 12.91 | 11.80 | 7,55 | 4.46 | -42.45 |
| **Suffocation/Choking** | 0.60 | 3.62 | 2.44 | 3.07 | 4.35 | 6.92 | 3.18 | 430 |
| **Drowning** | 0 | 1.20 | 0 | 0.61 | 1.86 | 1.89 | 3.18 | - |

**Table 18: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Prince Edward Island (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 692.84 | 739.34 | 721.16 | 840.77 | 628.72 | 682.27 | 819.70 | 18.31 |
| **Falls** | 124.36 | 156.28 | 108.63 | 154.24 | 170.09 | 127.36 | 137.64 | 10.68 |
| **Transport** | 136.20 | 102.18 | 93.54 | 136.10 | 78.97 | 100.07 | 97.87 | -28.14 |
| **Occupant** | 94.75 | 63.11 | 39.23 | 51.41 | 54.67 | 51.55 | 33.64 | -64.50 |
| **Cyclist** | 8.88 | 6.01 | 18.10 | 39.32 | 12.15 | 3.03 | 12.23 | 37.73 |
| **Pedestrian** | 5.92 | 3.01 | 6.03 | 3.02 | 0 | 3.03 | 0 | -100.00 |
| **Poisoning** | 26.65 | 33.06 | 27.16 | 36.29 | 6.07 | 36.39 | 6.12 | -77.04 |
| **Burns** | 2.96 | 6.01 | 9.05 | 6.05 | 6.07 | 3.03 | 21.41 | 623.31 |
| **Suffocation/Choking** | 5.92 | 9.02 | 6.03 | 6.05 | 0 | 6.06 | 6.12 | 3.38 |
| **Drowning** | 0 | 0 | 3.01 | 0 | 0 | 3.03 | 0 | - |

**Table 19: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Newfoundland and Labrador (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 722.32 | 670.52 | 704.26 | 636.89 | 579.54 | 641.93 | 667.26 | -7.62 |
| **Falls** | 140.90 | 133.92 | 119.35 | 113.14 | 121.62 | 114.43 | 112.78 | -19.96 |
| **Transport** | 138.22 | 122.16 | 148.51 | 96.72 | 87.53 | 107.92 | 108.08 | -21.81 |
| **Occupant** | 32.10 | 38.91 | 29.15 | 26.46 | 21.19 | 37.21 | 23.49 | -26.82 |
| **Cyclist** | 36.56 | 24.43 | 20.95 | 24.64 | 19.35 | 18.61 | 20.68 | -43.44 |
| **Pedestrian** | 11.59 | 9.95 | 18.22 | 9.12 | 8.29 | 6.51 | 8.46 | -27.00 |
| **Poisoning** | 24.08 | 23.53 | 22.78 | 20.07 | 19.35 | 26.05 | 20.68 | -14.12 |
| **Burns** | 11.59 | 15.38 | 16.40 | 8.21 | 11.06 | 13.96 | 4.70 | -59.45 |
| **Suffocation/Choking** | 0.89 | 2.71 | 0.91 | 2.74 | 1.84 | 0 | 3.76 | 322.47 |
| **Drowning** | 1.78 | 0 | 0.91 | 2.74 | 0 | 0.93 | 0 | -100 |

**Table 20: Population Based Injury Hospitalization Rate Per 100,000 by Cause in Canada (2006 – 2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % change |
|---|---|---|---|---|---|---|---|---|
| **All Unintentional** | 458.74 | 453.52 | 437.99 | 437.73 | 441.89 | 447.02 | 446.55 | -2.66 |
| **Falls** | 120.28 | 120.27 | 114.78 | 110.21 | 108.87 | 107.68 | 105.31 | -12.45 |
| **Transport** | 85.51 | 80.63 | 74.47 | 69.01 | 63.65 | 64.34 | 58.77 | -31.27 |
| **Occupant** | 28.64 | 26.46 | 23.41 | 20.53 | 19.55 | 18.82 | 16.97 | -40.75 |
| **Cyclist** | 21.87 | 20.19 | 17.67 | 17.20 | 15.45 | 16.39 | 14.30 | -34.61 |
| **Pedestrian** | 8.29 | 8.32 | 7.55 | 7.61 | 6.89 | 7.64 | 6.29 | -24.13 |
| **Poisoning** | 18.38 | 19.32 | 18.16 | 17.79 | 16.69 | 17.08 | 16.64 | -9.47 |
| **Burns** | 7.67 | 8.08 | 8.72 | 7.48 | 7.38 | 7.41 | 5.92 | -22.82 |
| **Suffocation/Choking** | 2.95 | 3.00 | 3.00 | 3.27 | 2.72 | 3.26 | 3.28 | 11.19 |
| **Drowning** | 1.27 | 1.24 | 1.61 | 1.30 | 1.43 | 1.52 | 1.34 | 5.51 |

**Table 21: Population Based Injury Mortality Rate per 100,000 from all unintentional causes by Canadian Province (2006-2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % Change |
|---|---|---|---|---|---|---|---|---|
| **BC** | 9.69 | 9.50 | 9.41 | 7.03 | 8.48 | 7.24 | 7.10 | -26.73 |
| **AB** | 11.62 | 11.06 | 8.20 | 8.00 | 6.87 | 7.96 | 7.41 | -36.23 |
| **SK** | 13.45 | 16.80 | 22.24 | 15.48 | 20.16 | 18.61 | 15.84 | 17.77 |
| **MB** | 11.72 | 12.04 | 10.43 | 10.69 | 11.27 | 14.33 | 13.00 | 10.92 |
| **ON** | 7.48 | 6.61 | 5.71 | 5.94 | 6.02 | 4.87 | 5.31 | -29.01 |
| **NS** | 11.80* | 11.52* | 7.78 | 8.88 | 12.03 | 7.65 | 8.81 | -25.34 |
| **NB** | 14.91 | 21.11 | 12.19 | 11.06 | 13.67 | 8.81 | 12.10 | -18.85 |
| **PEI** | 23.69 | 12.02 | 12.07 | 3.02 | 9.11 | 6.07 | 6.12 | -74.17 |
| **NL** | 6.24 | 10.86 | 14.58 | 9.12 | 15.66 | 4.65 | 6.58 | 5.45 |
| **Canada** | 7.25 | 7.07 | 6.26 | 5.71 | 6.22 | 5.45 | 5.52 | -23.86 |

A positive change indicates an annual increase over time; a negative percentage indicates a decrease over time
*No data was available in Nova Scotia for 2006/2007 so values were estimated using Vital Statistics Death Data

**Table 22: Population Based Mortality Rate per 100,000 (2006-2012) from all unintentional injuries among children and youth, 0-19 years**

| Province | All Unintentional Injuries |
|---|---|
| **BC** | 8.35 |
| **AB** | 8.70 |
| **SK** | 17.51 |
| **MB** | 11.93 |
| **ON** | 5.99 |
| **NS** | 9.81* |
| **NB** | 13.45 |
| **PEI** | 10.35 |
| **NL** | 9.68 |
| **CAN** | 7.97 |

*Estimated from RDC Data – Vital Statistics Death Database

**Table 23: Population Based Injury Mortality Rate per 100,000 from all transport related causes by Canadian Province (2006-2012) among children and youth, 0-19 years**

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | % Change |
|---|---|---|---|---|---|---|---|---|
| **BC** | 5.88 | 5.68 | 4.75 | 3.93 | 4.55 | 2.90 | 3.42 | -41.84 |
| **AB** | 8.16 | 7.19 | 4.92 | 5.19 | 4.10 | 4.46 | 4.70 | -42.40 |
| **SK** | 7.84 | 7.84 | 13.34 | 12.16 | 14.30 | 9.85 | 11.52 | 46.94 |
| **MB** | 6.65 | 7.29 | 3.48 | 5.35 | 5.32 | 9.03 | 7.74 | 16.39 |
| **ON** | 4.35 | 3.59 | 2.63 | 3.02 | 2.70 | 2.51 | 2.79 | -35.86 |
| **NS** | 8.02* | 10.56* | 5.35 | 4.44 | 5.01 | 3.06 | 5.18 | -35.41 |
| **NB** | 11.93 | 15.08 | 10.97 | 7.38 | 12.42 | 5.66 | 8.91 | -25.31 |
| **PEI** | 14.80 | 3.01 | 12.07 | 0.00 | 9.11 | 6.07 | 3.06 | 79.32 |
| **NL** | 2.68 | 6.33 | 4.56 | 5.74 | 7.37 | 0.93 | 1.88 | -29.85 |
| **Canada** | 4.49 | 4.21 | 3.28 | 3.26 | 3.34 | 2.82 | 3.16 | -29.75 |

A positive change indicates an annual increase over time; a negative percentage indicates a decrease over time
*No data was available in Nova Scotia for 2006/2007 so values were estimated using Vital Statistics Death Data

**Table 24: Population Based Mortality Rate per 100,000 (2006-2012) from all transport related injuries among children and youth, 0-19 years**

| Province | All Road Traffic Injuries |
|---|---|
| **BC** | 4.45 |
| **AB** | 5.50 |
| **SK** | 10.99 |
| **MB** | 6.41 |
| **ON** | 3.09 |
| **NS** | 5.60* |
| **NB** | 10.38 |
| **PEI** | 6.90 |
| **NL** | 4.19 |
| **CAN** | 4.50 |

*Estimated from RDC Data – Vital Statistics Death Database

## APPENDIX B: Ranking & Policy Criteria

**Table 25: Score based on rank of 5 sub criteria for the Canadian Child Safety Report Card**

| | Population Based Hospitalization Rate per 100,000 (2006-2012) | Percent Change in Hospitalization Rate (2006-2012) | Population Based Mortality Rate per 100,000 (2006-2012) | Percent Change in Mortality Rate (2006-2012) | Evidence-Based Policy Score (0 = none, 1 = fair, 2= good, 3 = excellent) | Overall Score (Rank) |
|---|---|---|---|---|---|---|
| **BC** | 8 | 9 | 8 | 6 | 8 | 39 (1) |
| **AB** | 4 | 4 | 7 | 8 | 2 | 25 (3) |
| **SK** | 1 | 8 | 1 | 1 | 1 | 12 (9) |
| **MB** | 7 | 6 | 3 | 2 | 5 | 23 (5) |
| **ON** | 9 | 3 | 9 | 7 | 9 | 37 (2) |
| **NS** | 6 | 2 | 5 | 5 | 7 | 25 (3) |
| **NB** | 3 | 7 | 2 | 4 | 5 | 21 (8) |
| **PEI** | 2 | 1 | 4 | 9 | 7 | 23 (5) |
| **NL** | 5 | 5 | 6 | 3 | 3 | 22 (7) |

**Table 26: Score based on rank of Population Based Hospitalization Rate per 100,000 (2006-2012) – All Unintentional Injuries**

| Province | Rate per 100,000 | Rank |
|---|---|---|
| BC | 580.56 | 8 |
| AB | 678.19 | 4 |
| SK | 907.82 | 1 |
| MB | 595.26 | 7 |
| ON | 460.13 | 9 |
| NS | 626.39 | 6 |
| NB | 716.57 | 3 |
| PEI | 731.94 | 2 |
| NL | 660.75 | 5 |
| CAN | 567.87 | - |

**Table 27: Score based on rank of Percent Change in Hospitalization Rate (2006 – 2012) – All Unintentional Injuries**

| Province | % Change | Rank |
|---|---|---|
| BC | -22.74% | 9 |
| AB | -1.05% | 4 |
| SK | -11.80% | 8 |
| MB | -8.50% | 6 |
| ON | +6.33% | 3 |
| NS | +15.76% | 2 |
| NB | -10.99% | 7 |
| PEI | +18.31% | 1 |
| NL | -7.62% | 5 |
| CAN | -2.66% | - |

**Table 28: Population Based Mortality Rate per 100,000 (2006-2012) – All Unintentional Injuries among children and youth, 0-19 years**

| Province | Rate per 100,000 | Rank |
|---|---|---|
| BC | 8.35 | 8 |
| AB | 8.70 | 7 |
| SK | 17.51 | 1 |
| MB | 11.93 | 3 |
| ON | 5.99 | 9 |
| NS | 9.81* | 5 |
| NB | 13.45 | 2 |
| PEI | 10.35 | 4 |
| NL | 9.68 | 6 |
| CAN | 5.19 | - |

*Estimated from RDC Data – Vital Statistics Death Database

**Table 29: Percent Change in Mortality Rate (2006-2012) – All Unintentional Injuries among children and youth, 0-19 years**

| Province | % Change | Rank |
|---|---|---|
| BC | -26.73% | 6 |
| AB | -36.23% | 8 |
| SK | +17.77% | 1 |
| MB | +10.92% | 2 |
| ON | -29.01% | 7 |
| NS | -25.34%* | 5 |
| NB | -18.85% | 4 |
| PEI | -74.17% | 9 |
| NL | +5.45% | 3 |
| CAN | -25.07% | - |

* Estimated from RDC Data – Vital Statistics Death Database

Evidence-Based Policy Score (0 = none, 1 = fair, 2 = good, 3 = excellent)

**Table 30: Smoke & CO Detector Scores**

| | |
|---|---|
| BC | Fair = 1 |
| AB | Good = 2 |
| SK | None = 0 |
| MB | Excellent = 3 |
| ON | Good = 2 |
| NS | Fair = 1 |
| NB | None = 0 |
| PEI | Fair = 1 |
| NL | Fair = 1 |

Excellent: Mandatory CO and Smoke Alarms installed on each floor
Good: Mandatory CO and Smoke Alarms required in all dwelling units
Fair: Smoke alarms required, no provincial CO detector law
None: No provincial CO detector law, Smoke Alarm Regulations Repealed

**Table 31: Pedestrian Safety Law Scores**

| | |
|---|---|
| BC | Fair = 1 |
| AB | Fair = 1 |
| SK | None = 0 |
| MB | Fair = 1 |
| ON | Excellent = 3 |
| NS | Good = 2 |
| NB | Good = 2 |
| PEI | Fair = 1 |
| NL | Fair = 1 |

Excellent: Speed limit in residential zones 50 km or less, double fines in residential zones, speed limit in school zones, double fines in school zones
Good: Speed limit in residential zones 50 km or less, speed limit in school zones, double fines in school zones, provision for "pedestrian only" zone
Fair: Speed limit in residential zones 50 km or less, speed limit in school zones, no double fines in residential zones, may include provision for "pedestrian only" zone and fines in school zones
None: speed limits set by municipalities, no double fines in residential or school zones, no provision for "pedestrian only" zone

**Table 32: Distracted Driving Law Scores**

| | |
|---|---|
| BC | Excellent = 3 |
| AB | Good = 2 |
| SK | Good = 2 |
| MB | Good = 2 |
| ON | Excellent = 3 |
| NS | Good = 2 |
| NB | Good = 2 |
| PEI | Excellent = 3 |
| NL | Good = 2 |

Excellent: Fines between $490-$1200 for first or second offense, 3-5 demerit points, and/or ban use of hand-held electronic entertainment devices alongside hand-held communication devices
Good: Fines between $100-$350 for first or second offense, 3-5 demerit points, no ban on use of hand-electronic entertainment devices
Fair: Fines <$100 for first or second offense, <3 demerit points, no ban on use of hand-held electronic entertainment devices
None: no fines for distracted driving

**Table 33: Bicycle Helmet Legislation Scores**

| | |
|---|---|
| BC | Excellent = 3 |
| AB | Fair = 1 |
| SK | None = 0 |
| MB | Fair = 1 |
| ON | Fair = 1 |
| NS | Excellent = 3 |
| NB | Good = 2 |
| PEI | Good = 2 |
| NL | Good = 2 |

Excellent: All age bicycle helmet law, applies to all wheeled activities
Good: All age bicycle helmet law only applies to cycling
Fair: Bicycle helmet law only applies to <18 years,
None: No provincial law requiring the use of bicycle helmets for any age group

**Table 34: Booster Seat Legislation Scores**

| | |
|---|---|
| BC | Excellent = 3 |
| AB | None = 0 |
| SK | Good = 2 |
| MB | Good = 2 |
| ON | Excellent = 3 |
| NS | Excellent = 3 |
| NB | Good = 2 |
| PEI | Excellent = 3 |
| NL | Fair = 1 |

Excellent: Age & Height/Weight Restrictions, Public Education and Incentive Programs in place, noncompliance penalties, driver responsibility
Good: Age & Height/Weight Restrictions, Public Education Programs in place, and/or incentive programs, noncompliance penalties, and/or driver responsibility
Fair: Age & Height/Weight Restrictions, no public education or incentive programs in place, no noncompliance penalties, no driver responsibility
None: No provincial booster seat legislation in place

**Table 35: Graduated Driver Licensing Scores**

| | |
|---|---|
| BC | Good = 2 |
| AB | Good =2 |
| SK | Fair = 1 |
| MB | Fair = 1 |
| ON | Good = 2 |
| NS | Fair = 1 |
| NB | Good = 2 |
| PEI | Good = 2 |
| NL | Good = 2 |

Excellent: minimum of 12 months' duration in learner's phase with no time discounts, mandatory requirement for at least 50 hours of supervised practice
Good: minimum of 12 months' duration in learner's phase (with time discounts) and/or mandatory requirements for at least 50 hours of supervised practice
Fair: no minimum duration of 12 months and/or mandatory requirements for at least 50 hours of supervised practice
None: No provincial graduated driver's licensing required

**Table 36: Overall Policy Score – Total points can range from 0 – 18 (6 policies – minimum score 0, maximum score 3)**

| Province | Total Points | Rank |
|---|---|---|
| BC | 13 | 8 |
| AB | 8 | 2 |
| SK | 5 | 1 |
| MB | 10 | 5 |
| ON | 14 | 9 |
| NS | 12 | 7 |
| NB | 10 | 5 |
| PEI | 12 | 7 |
| NL | 9 | 3 |

**Table 37: Total Score for All Criteria**

| Province | Total Points | Rank |
|---|---|---|
| BC | 38 | 1 |
| AB | 25 | 4 |
| SK | 14 | 9 |
| MB | 22 | 5 |
| ON | 37 | 2 |
| NS | 26 | 3 |
| NB | 21 | 6 |
| PEI | 21 | 6 |
| NL | 21 | 6 |

**Table 38: Smoke & Carbon Monoxide (CO) Detector Laws by Province**

| | | | |
|---|---|---|---|
| Province | Mandatory CO Detector | Mandatory Smoke Alarm | Comments |
| British Columbia | No | Yes | Smoke alarms required in all dwelling units |
| Alberta | Yes | Yes | Smoke alarms required in all dwelling units |
| Saskatchewan | No | No | The Canadian Electrical Code (Saskatchewan Amendments) Regulations, 2003 are repealed. |
| Manitoba | Yes | Yes | Smoke alarms required in each sleeping room and floor |
| Ontario | Yes | Yes | Smoke alarms required in all dwelling units |
| New Brunswick | No | No | Smoke Alarms and Smoke Detectors Regulation of the Fire Prevention Act was repealed. |
| Nova Scotia | No | Yes | Smoke alarms required in each sleeping area |
| Prince Edward Island | No | Yes | Smoke alarms are required in all bedrooms, outside each sleeping area, and on each level. |
| Newfoundland and Labrador | No | Yes | Every bedroom in every home or apartment is required to have a smoke alarm. |

**Table 39: Pedestrian Safety Laws by Province**

| | | | | | |
|---|---|---|---|---|---|
| Province | Speed Limit in Residential Zones | Speed Limit in School Zones | Double Fines in Residential Zones | Double Fines in School Zones | Provision for "Pedestrian Only" Zone |
| British Columbia (Motor Vehicle Act) | 50 km/h (unless otherwise posted) | 30 km/h (on school days, 8:00 AM – 5:00 PM) | NO | NO | NO |
| Alberta (Traffic Safety Act) | 50 km/h (unless otherwise posted) | 30 km/h (hours set by municipality) | NO | NO | NO |
| Saskatchewan (Traffic Safety Act) | Speed limit set by municipality | Speed limit set by municipality | NO | NO | NO |
| Manitoba (Highway Traffic Act) | 50 km/h (unless otherwise posted) | Speed limit set by municipality | NO | NO | YES |
| Ontario (Highway Traffic Act) | 50 km/h (unless otherwise posted) | Speed limit set by municipality | YES (in marked community safety zones) | YES (in marked community safety zones) | NO |
| New Brunswick (Motor Vehicle Act) | 50 km/h (unless otherwise posted) | 50 km/h (on weekdays, 7:30 AM – 4:00 PM) | NO | YES | YES |
| Nova Scotia (Motor Vehicle Act) | 50 km/h | 30 km/h (if speed limit in the area is 50 km/h)<br><br>50 km/h (if speed limit in the area is greater than 50 km/h) | NO | YES | YES |
| Prince Edward Island (Highway Traffic Act) | 50 km/h (unless otherwise posted) | 60 km/h (8:00 AM – 5:00 PM, unless otherwise posted) | NO | YES (minimum fine of $100) | YES |
| Newfoundland and Labrador (Highway Traffic Act) | 50 km/h (unless otherwise posted) | 50 km/h (on school days, 7:00 AM – 5:00 PM) | NO | NO | YES |

**Table 40: Distracted Driving Laws by Province**

| | | | | | |
|---|---|---|---|---|---|
| Province | Cellular Phone Legislation | Other Legislation | Effective Date | Fine | Points |
| British Columbia | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs, GPS, & Entertainment Devices (ex. Audio Players) | January 1, 2010 | $543-$1600 | 4 |
| Alberta | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs, GPS, & Reading/Viewing Printed Material | September 1, 2011 | $287 | 3 |
| Saskatchewan | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs | January 1, 2010 | $280 | 4 |
| Manitoba | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs | July 15, 2010 | $200 | 5 |
| Ontario | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs & Entertainment Devices (ex. Audio Players) | October 26, 2009 | $490 | 3 |
| New Brunswick | Ban use of hand-held devices while operating a motor vehicle | - | June 6, 2011 | $172.50 | 3 |
| Nova Scotia | Ban use of hand-held devices while operating a motor | Restrictions on TVs | April 1, 2008 | $233.95 - $578.95 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| | vehicle | | | | |
| Prince Edward Island | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs | January 23, 2010 | $500-$1200 | 5 |
| Newfoundland and Labrador | Ban use of hand-held devices while operating a motor vehicle | Restrictions on TVs | October 1, 2010 | $100-$400 | 3 |

**Table 41: Bicycle Helmet Legislation by Province**

| | Age | Effective Date | Penalty |
|---|---|---|---|
| **PROVINCE** | | | |
| British Columbia | Applies to all ages | September 3, 1996<br><br>2003: updated to include helmet use for all wheeled activities including skates, skateboards, and push-scooters | Fine up to: $100 |
| Alberta | Applies only to those <18 years of age | May 1, 2002 | Fine: $69 |
| Saskatchewan | **NO PROVINCIAL LAW** | | |
| Manitoba | Applies only to those <18 years of age | May 1 2013 | Fine up to: $50 |
| Ontario | Applies only to those <18 years of age | October 1, 1995 | Fine: $60 |
| Quebec | **NO PROVINCIAL LAW** | | |
| Nova Scotia | Applies to all ages | July 1, 1997<br><br>2007: updated to include helmet use for all wheeled activities including skates, skateboards, and push-scooters | Fine minimum: $25 |
| Prince Edward Island | Applies to all ages | July 5, 2003 | Fine up to: $100 |
| New Brunswick | Applies to all ages | December 15, 1995 | Fine: $21 |
| Newfoundland and Labrador | Apples to all ages | April 1, 2015 | Fine up to: $100 |

**Table 42: Booster Seat Legislation by Province**

| | Year of Implementation | Age | Height/Weight | Public Education | Incentive Program | Non-Compliance Penalties | Driver Responsibility |
|---|---|---|---|---|---|---|---|
| **Province** | | | | | | | |
| **BC** | 2008 | 9 years old | 4 feet 9 inches (145 cm); no weight restrictions | YES | YES | YES | YES |
| **AB** | **NO PROVINCIAL LEGISLATION** | | | | | | |
| **SK** | 2014 | 7 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | YES (since 2014) | YES (since 2014) | NO |
| **MB** | 2012 | 9 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | NO | YES (since 2013) | YES |
| **ON** | 2005 | 8 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | YES | YES | YES |
| **QC** | 2002 | No age restrictions | 25 inches (63 cm); no weight restrictions | YES | NO | YES | NO |
| **NS** | 2007 | 9 years old | 4 feet 9 inches (145 cm); no weight restrictions | YES | YES | YES | YES |
| **PEI** | 2008 | 9 years old | 4 feet 9 inches (145 cm); 40 lbs (18 kg) | YES | YES | YES | YES |
| **NB** | 2008 | 9 years old | 4 feet 9 inches (145 cm); 80 lbs (36 kg) | YES | NO | YES | YES |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **NWFL** | 2008 | 4 and 8 years old | 4 feet 9 inches (145 cm); between 40 lbs (18 kg) and 80 lbs (36 kg) | NO | NO | NO | NO |

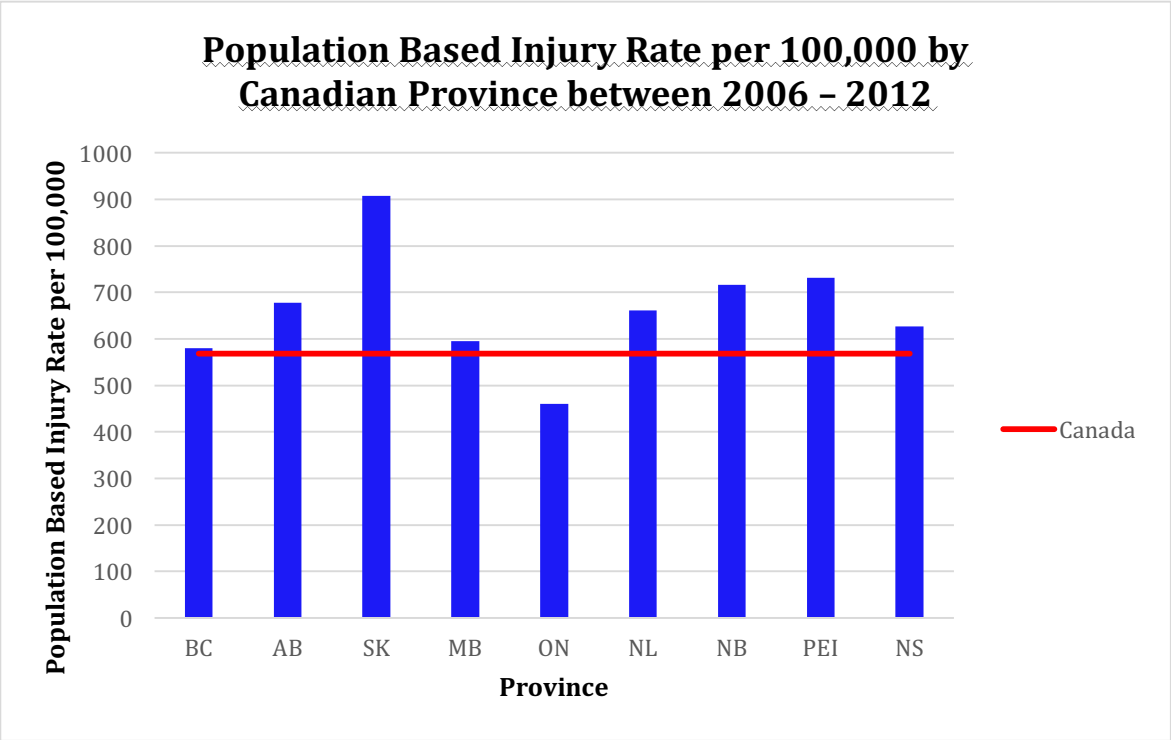
## Table 43: Graduated Driver's Licensing by Province

| | Year of Implementation | Supervisory Driver (Yes/No), Minimum Age | Driver education/training | Blood Alcohol Content (BAC) | Restrictions: Night (Y/N) Passengers (Y/N) | Sign-on vehicle |
|---|---|---|---|---|---|---|
| **PROVINCE** | | | | | | |
| British Columbia | 1998 | Yes (25 years or older with a valid Class 1-5 driver's license)<br><br>16 years | Voluntary | Zero | Yes: no driving between 12 AM – 5 AM<br><br>Passengers: limit of 2 | Mandatory |
| Alberta | 2003 | Yes (18-year-old; fully licensed)<br><br>14 years | Voluntary | Zero | Yes: no driving between 12 AM – 5 AM<br><br>Passengers: limited to number of working seatbelts | None |
| Saskatchewan | 2005 | Yes: occupies the front passenger seat<br><br>16 years or 15 years (if enrolled in the high school education program) | Mandatory for all new drivers | Zero | Only immediate family permitted in vehicle between midnight and 5 a.m.<br><br>Passengers: limited to number of seatbelts | None |
| Manitoba | 2003 | Yes: Fully licensed for at least 3 years, 0 BAC<br><br>16 years or 15 years (if enrolled in the high school education program) | Voluntary | Zero | No night time restrictions<br>Limited to 1 supervising driver in the front seat, and number of working seatbelts | None |
| Ontario | 1994 | Yes: Fully licensed, with at least 4 years driving experience, BAC<.05, seated in front seat<br><br>16 years | Voluntary | Zero | Yes: no driving between 12 AM – 5 AM<br>Must have supervisor at all times; other passengers limited to number of seatbelts | None |
| Quebec | 1997 | Yes: Fully licensed for 2 years, BAC<=.08, seated in front seat<br><br>16 years | Mandatory | Zero | None | None |

| | | | | | | |
|---|---|---|---|---|---|---|
| Nova Scotia | 1994 | Yes: Experienced driver with at least a Class 5 license<br><br>16 years | Mandatory<br>Long course: 25 hours in class & 10 hours in car<br>Short course: 6 hours in class | Zero | May drive after midnight with supervisor<br><br>No passengers except supervisor | None |
| Prince Edward Island | 2000 | Yes: Has valid license for at least 4 years for same class of vehicle, BAC<.05<br><br>16 years or 15 years (if enrolled in the high school education program) | Voluntary | Zero | Refrain from driving between 1 a.m. and 5 a.m. for drivers under 21 years<br><br>No passengers, except supervisor or family members | Mandatory |
| New Brunswick | 1996 | Fully licensed, seated in front seat<br><br>16 years | Voluntary | Zero | Yes: no driving between 12 AM – 5 AM<br><br>No passengers except supervisor | None |
| Newfoundland and Labrador | 1999 | Four years of driving experience, BAC = 0<br><br>16 years | Voluntary | Zero | Yes: no driving between 12 AM – 5 AM<br><br>No passengers except supervisor (except for parents/guardians if driver is enrolled in driver education and accompanied by a licensed instructor) | Mandatory |

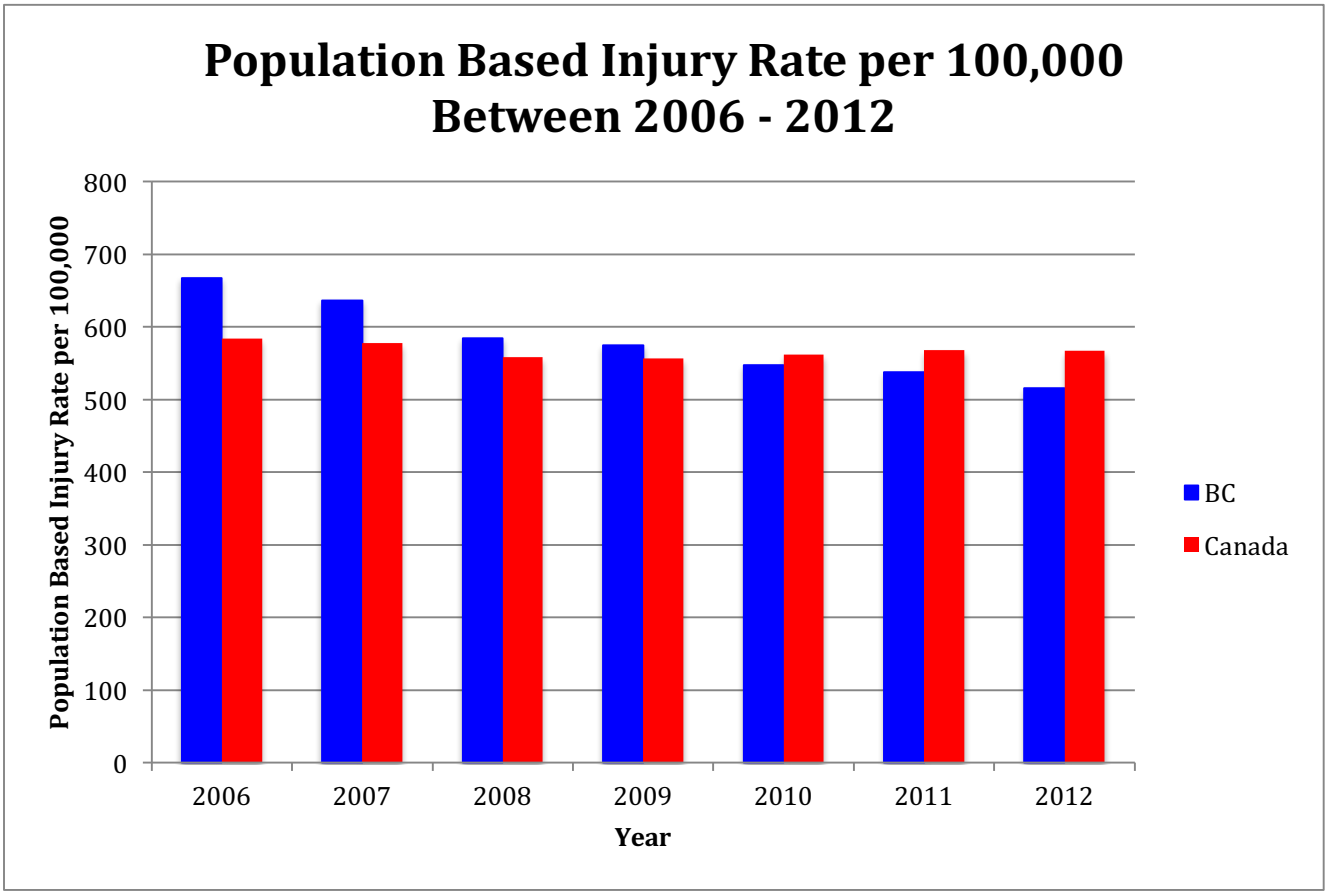
APPENDIX C: Population-Based Hospitalization Rates/Trends Compared to the Canadian Average for All Injury Causes

Figure 1: Population Based Injury Rate per 100,000 by Canadian Province between 2006 – 2012




*Canadian average excludes QC

Figure 2: British Columbia: Population Based Injury Rate per 100,000 Between 2006 – 2012




*Canadian average excludes QC

Figure 3: Alberta: Population Based Injury Rate per 100,000 Between 2006 – 2012

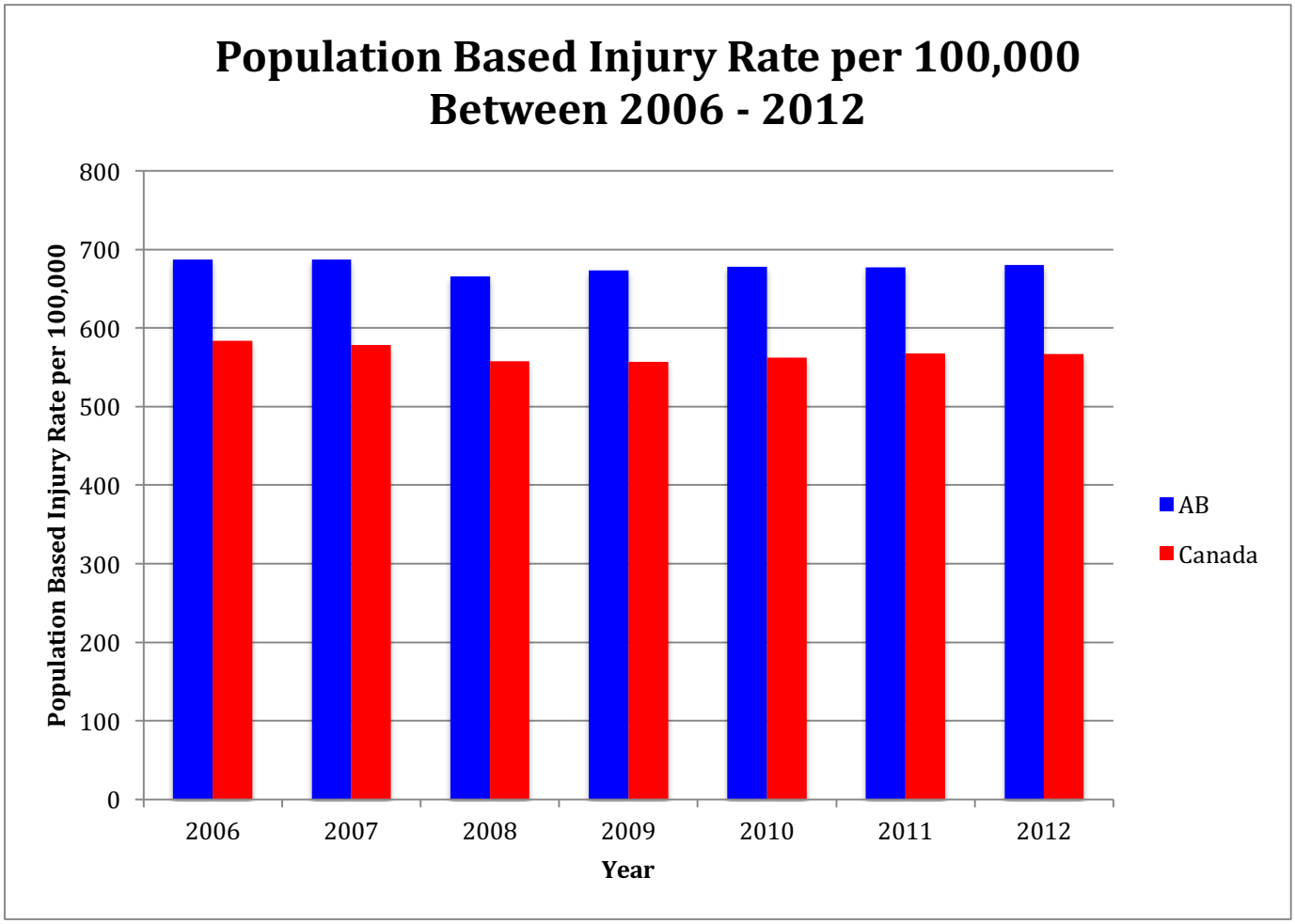
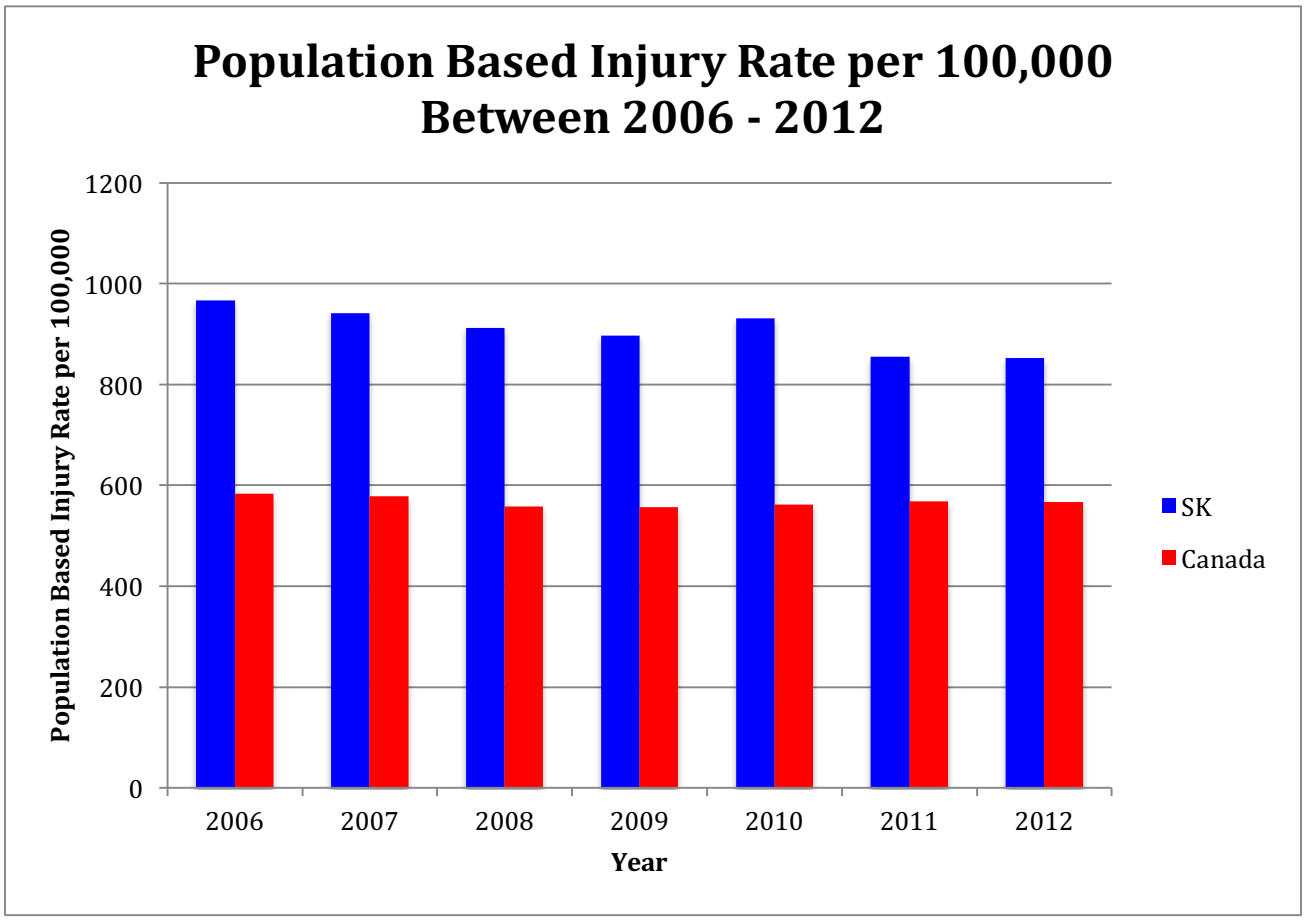


Figure 4: Saskatchewan: Population Based Injury Rate per 100,00 Between 2006 – 2012




*Canadian average excludes QC

Figure 5: Manitoba: Population Based Injury Rate per 100,000 Between 2006 – 2012

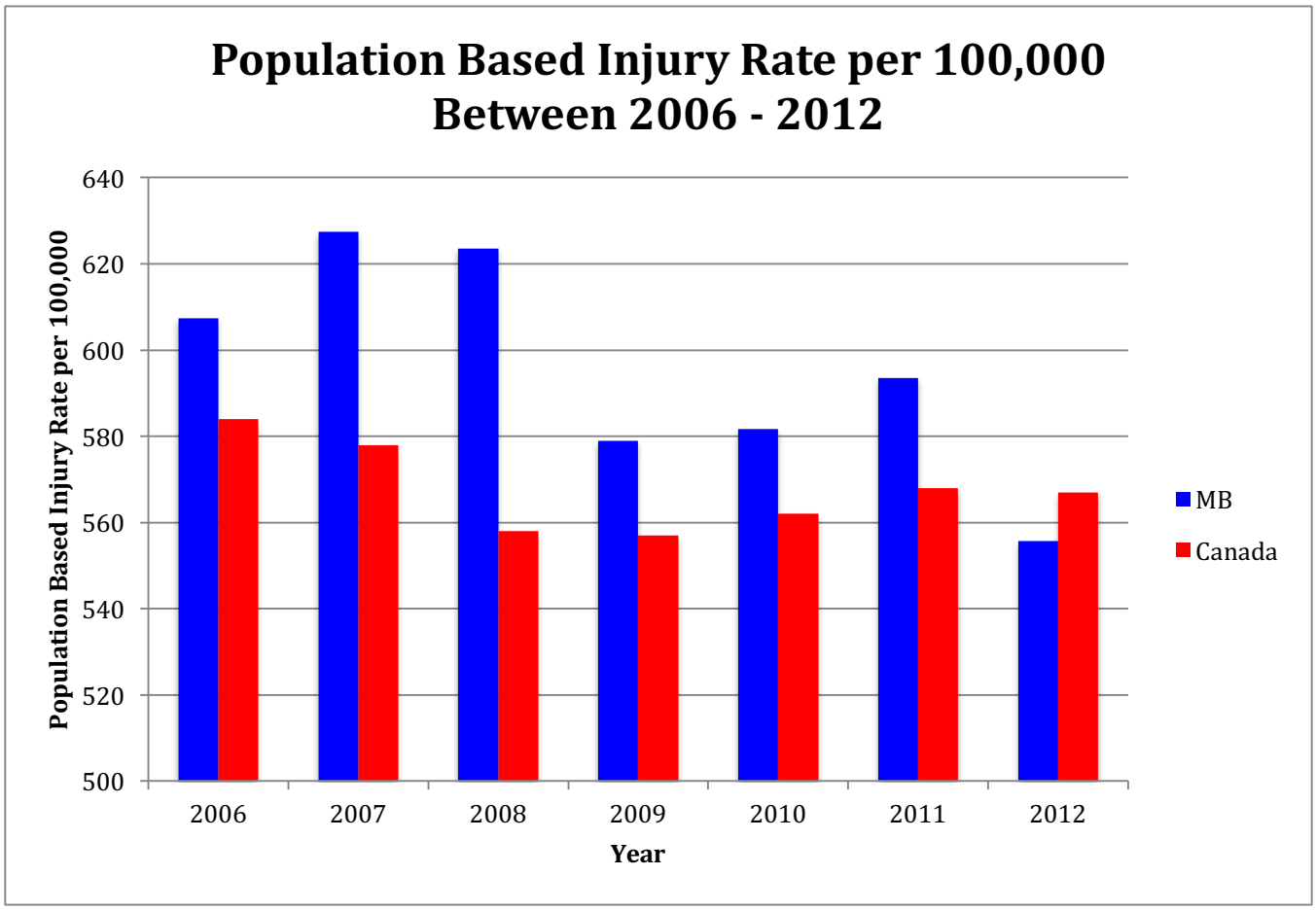
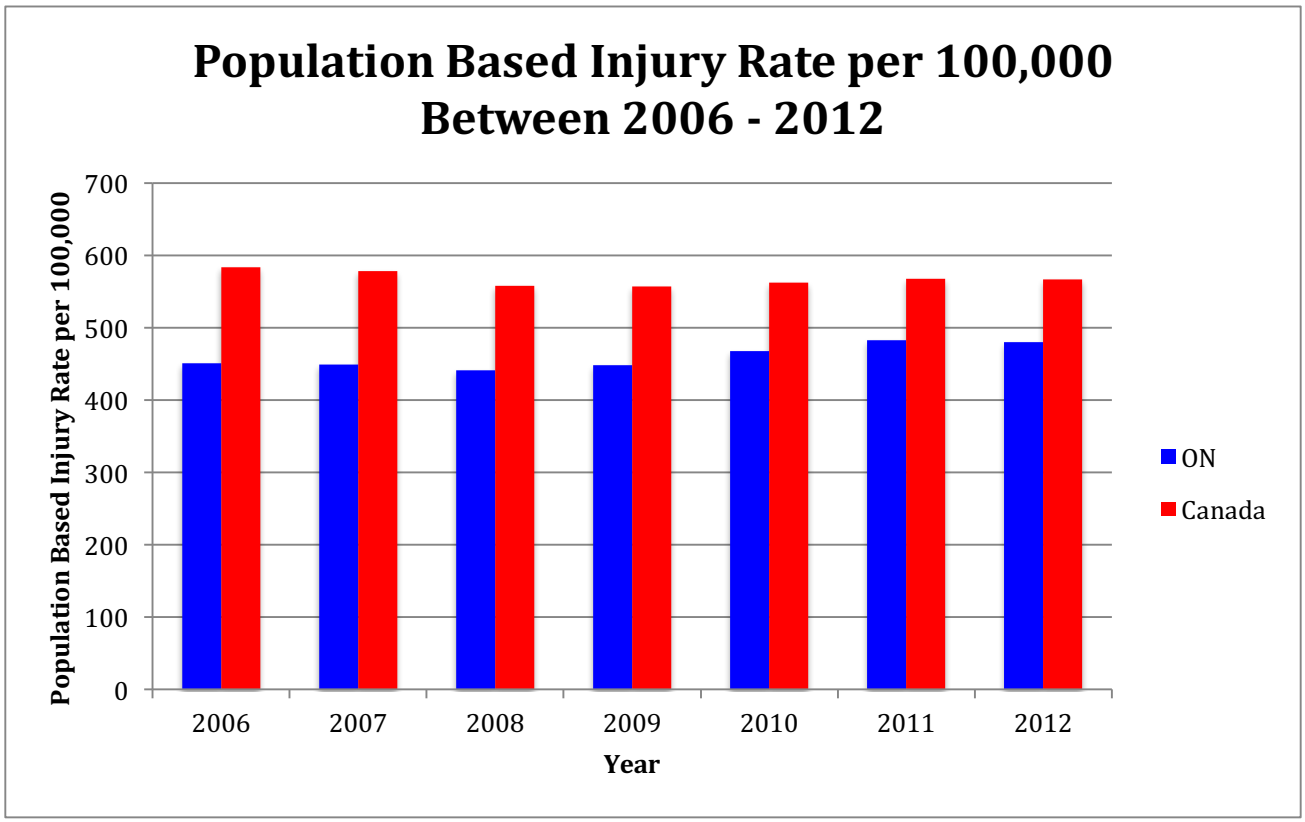
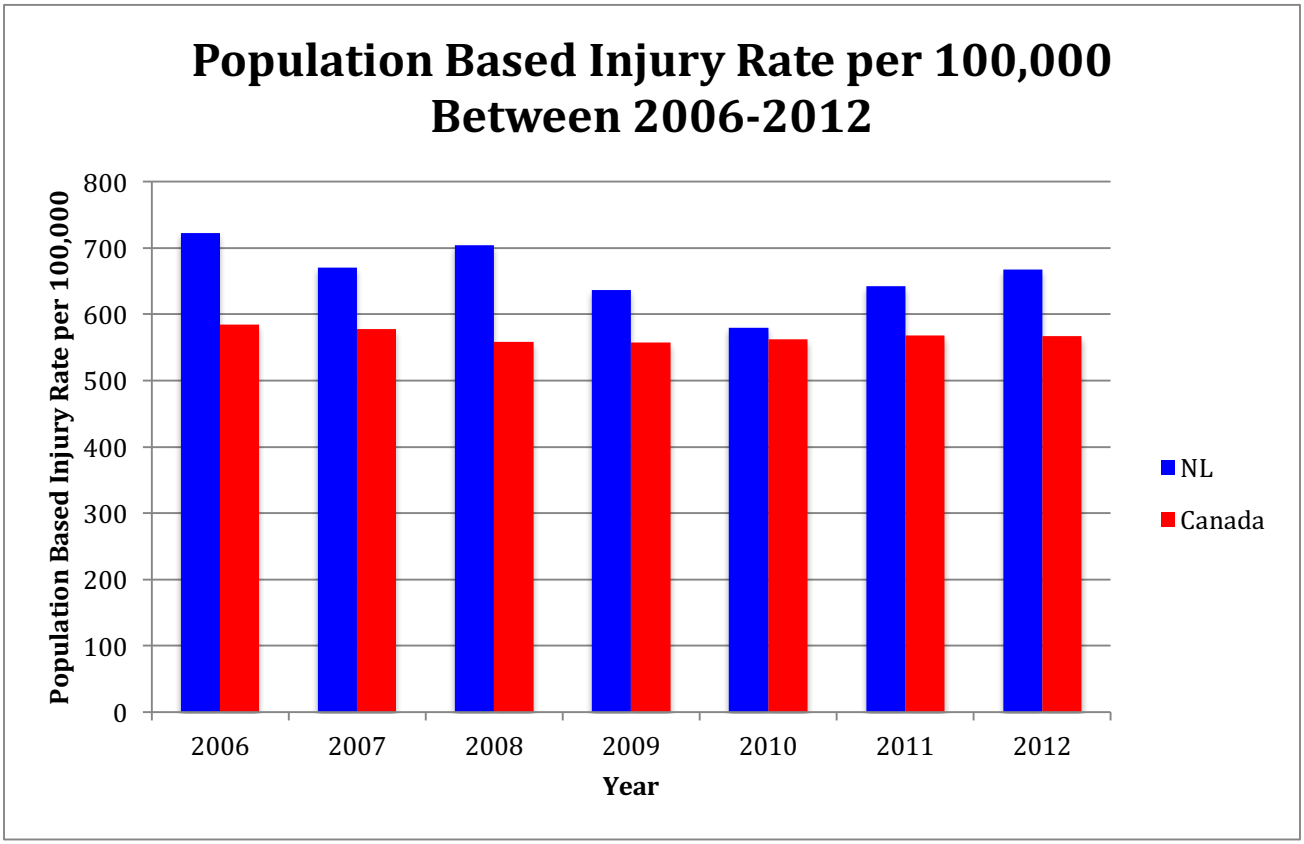


Figure 6: Ontario: Population Based Injury Rate per 100,000 Between 2006 – 2012



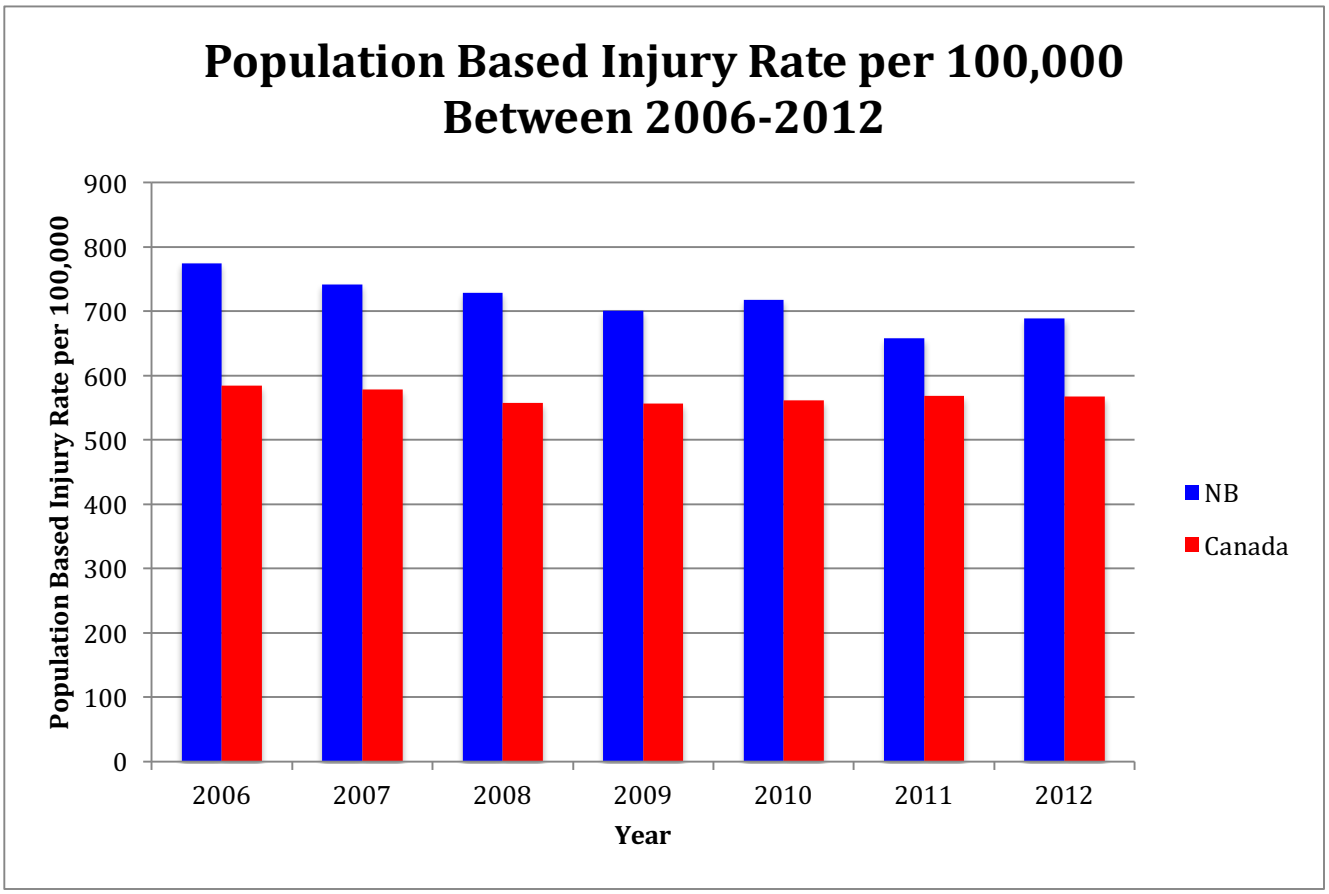

*Canadian average excludes QC

Figure 7: Newfoundland and Labrador: Population Based Injury Rate per 100,000 Between 2006 – 2012



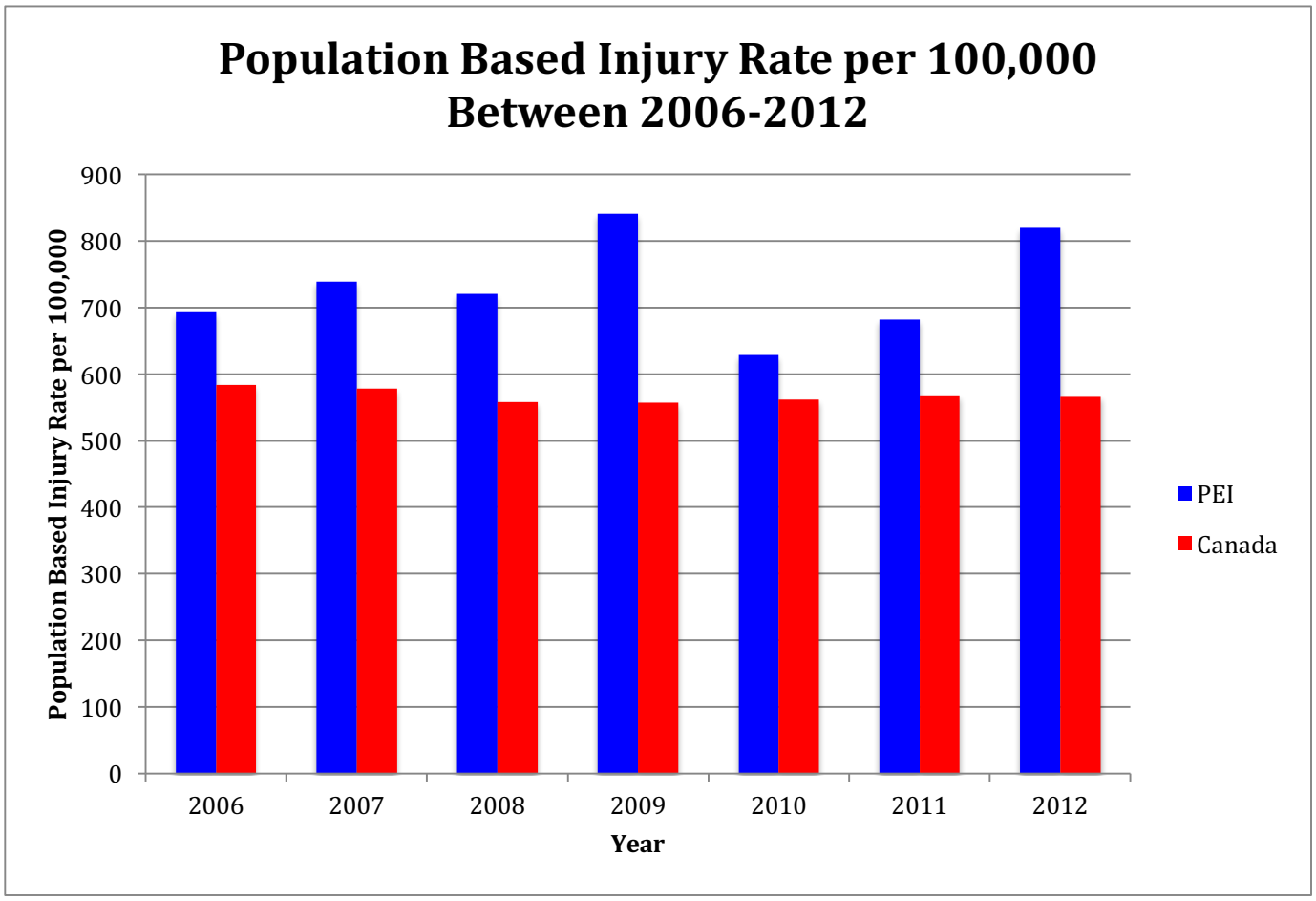

*Canadian average excludes QC

Figure 8: New Brunswick: Population Based Injury Rate per 100,000 Between 2006 – 2012



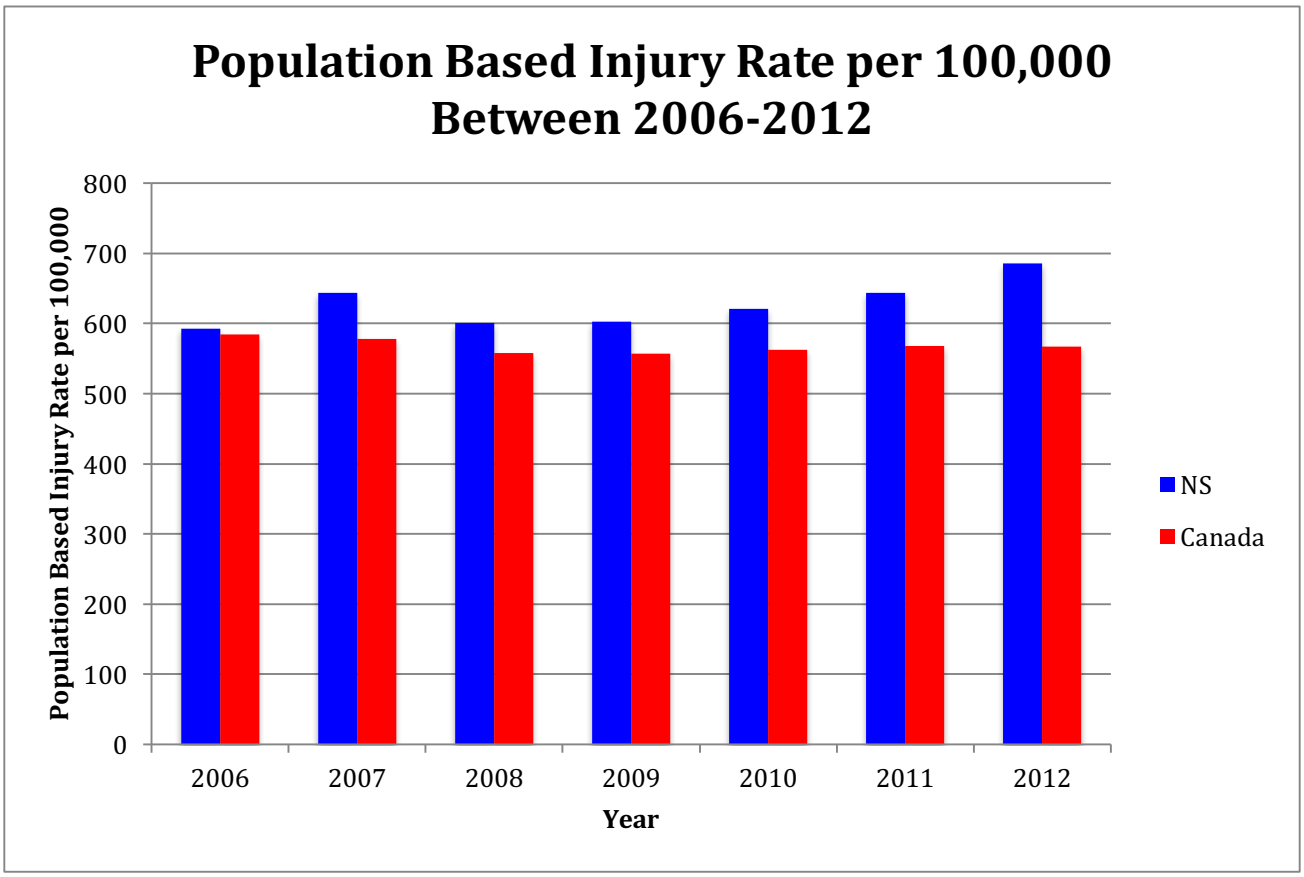

*Canadian average excludes QC

Figure 9: Prince Edward Island: Population Based Injury Rate per 100,000 Between 2006 – 2012



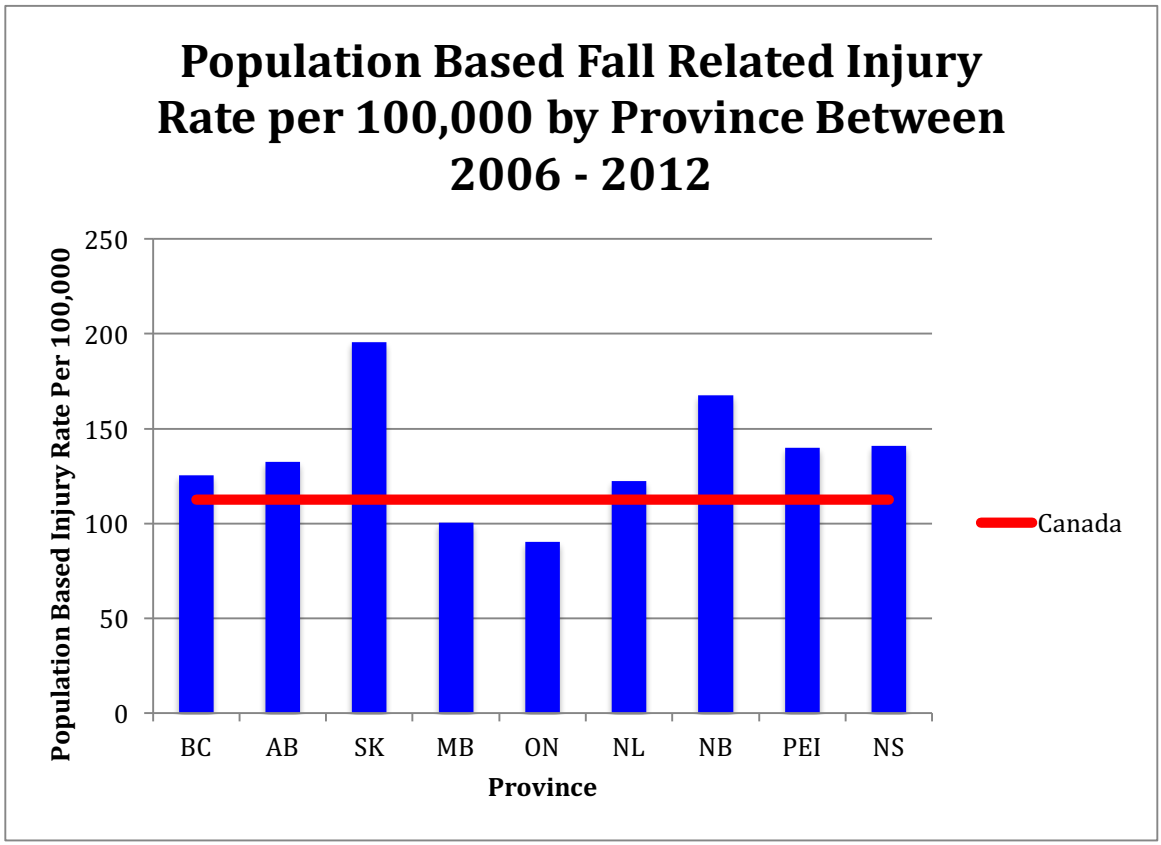

*Canadian average excludes QC

Figure 10: Nova Scotia: Population Based Injury Rate per 100,000 Between 2006 – 2012



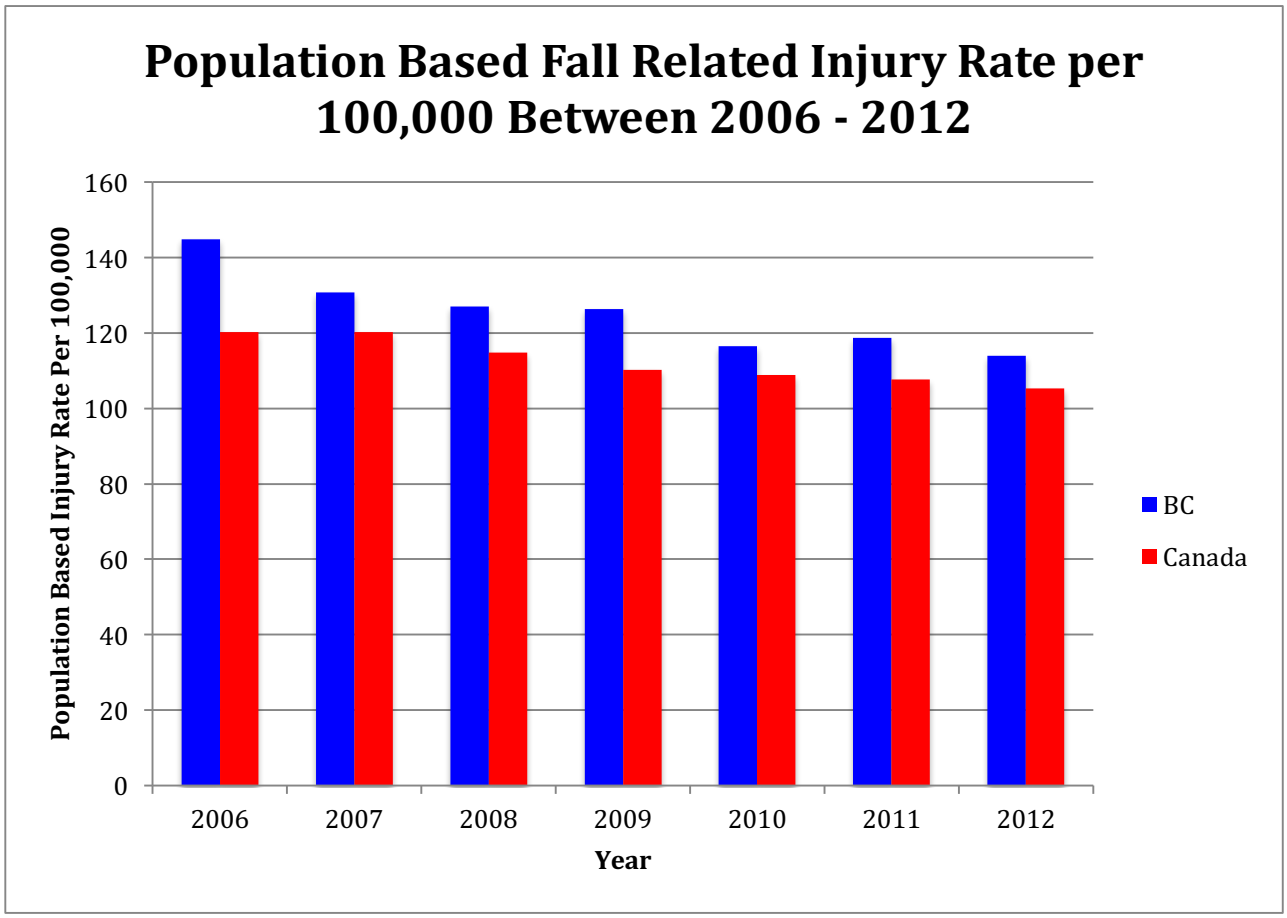

*Canadian average excludes QC

Figure 11: Population Based Fall Related Injury Rate per 100,000 by Canadian Province between 2006 – 2012



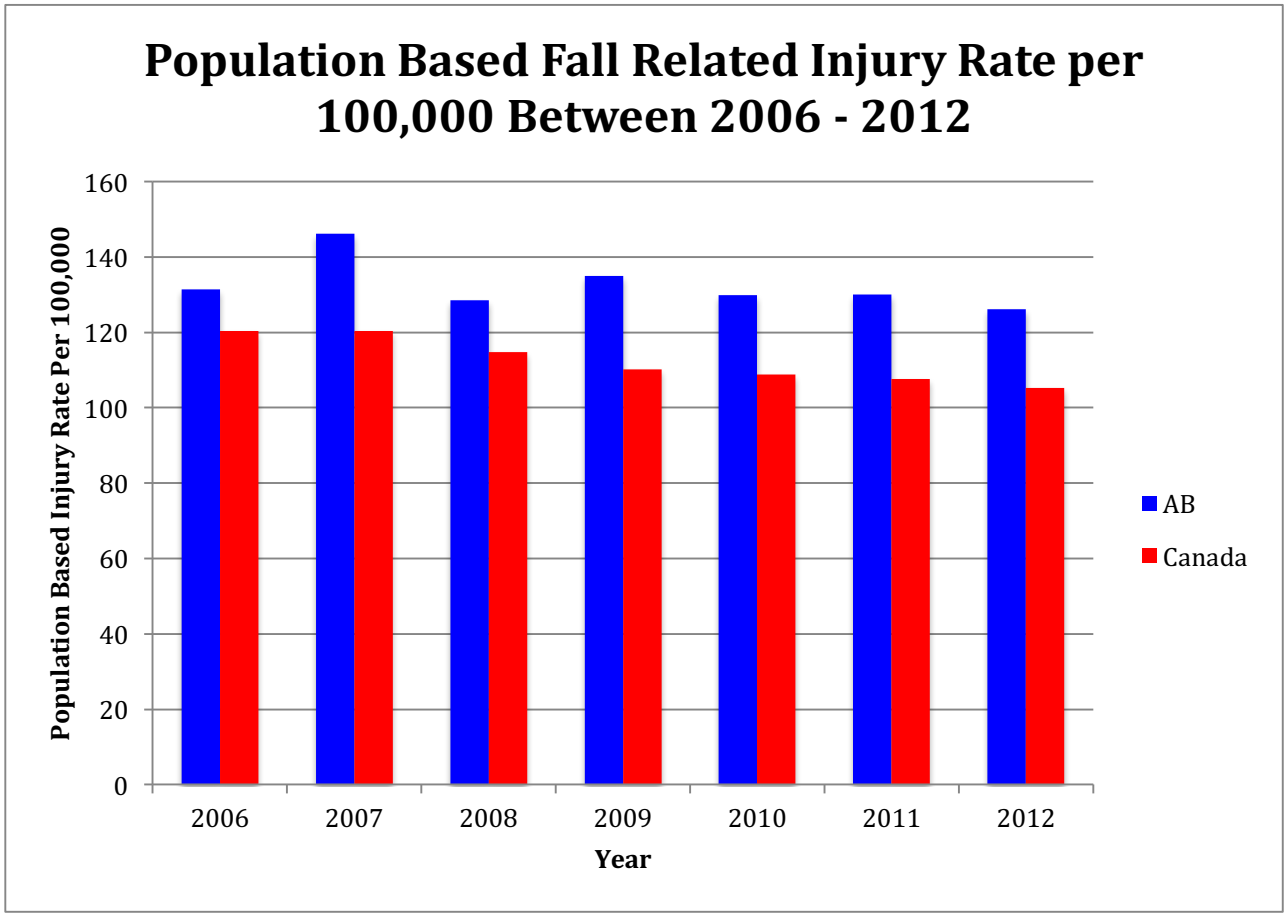

*Canadian average excludes Quebec

Figure 12: British Columbia: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



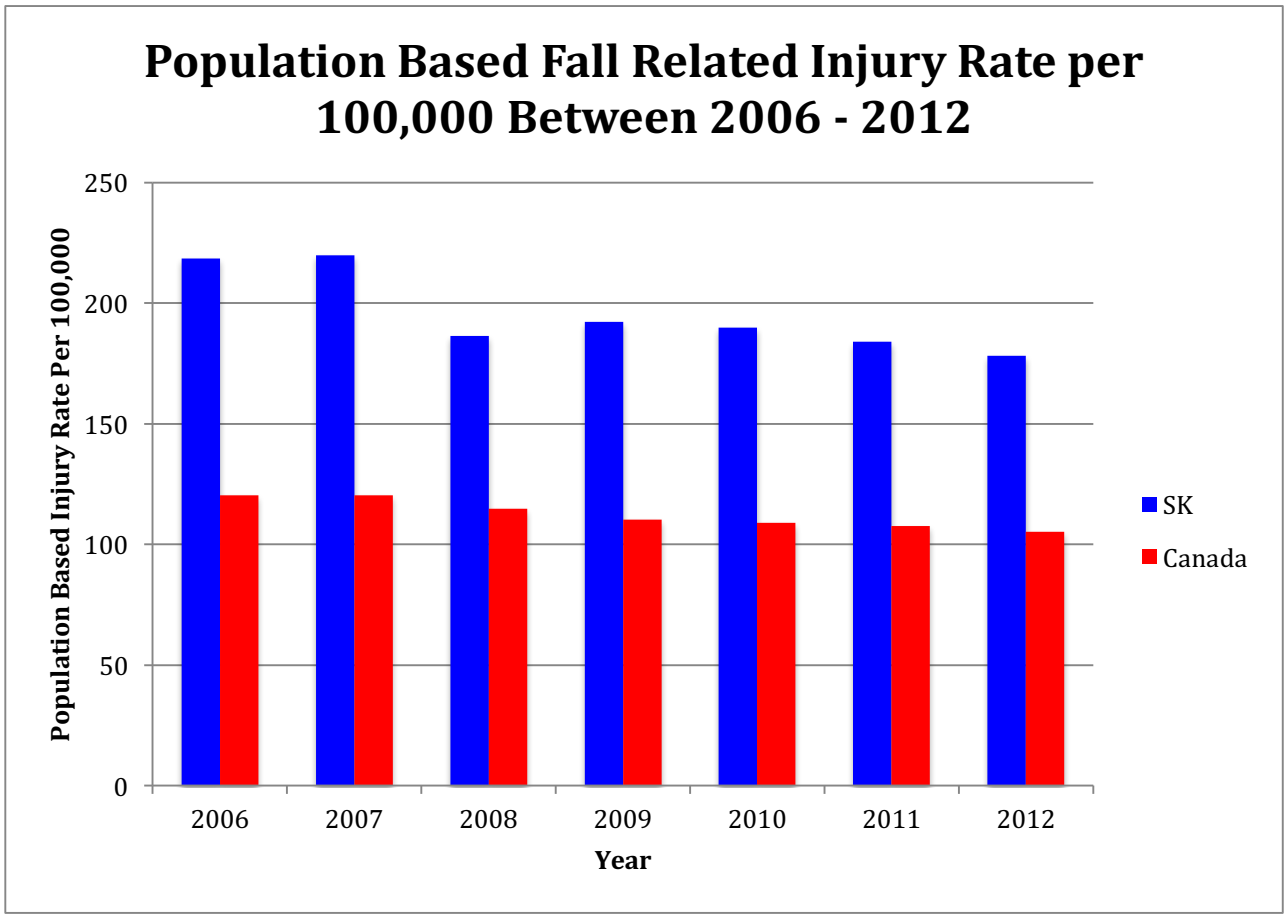

*Canadian average excludes Quebec

Figure 13: Alberta: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



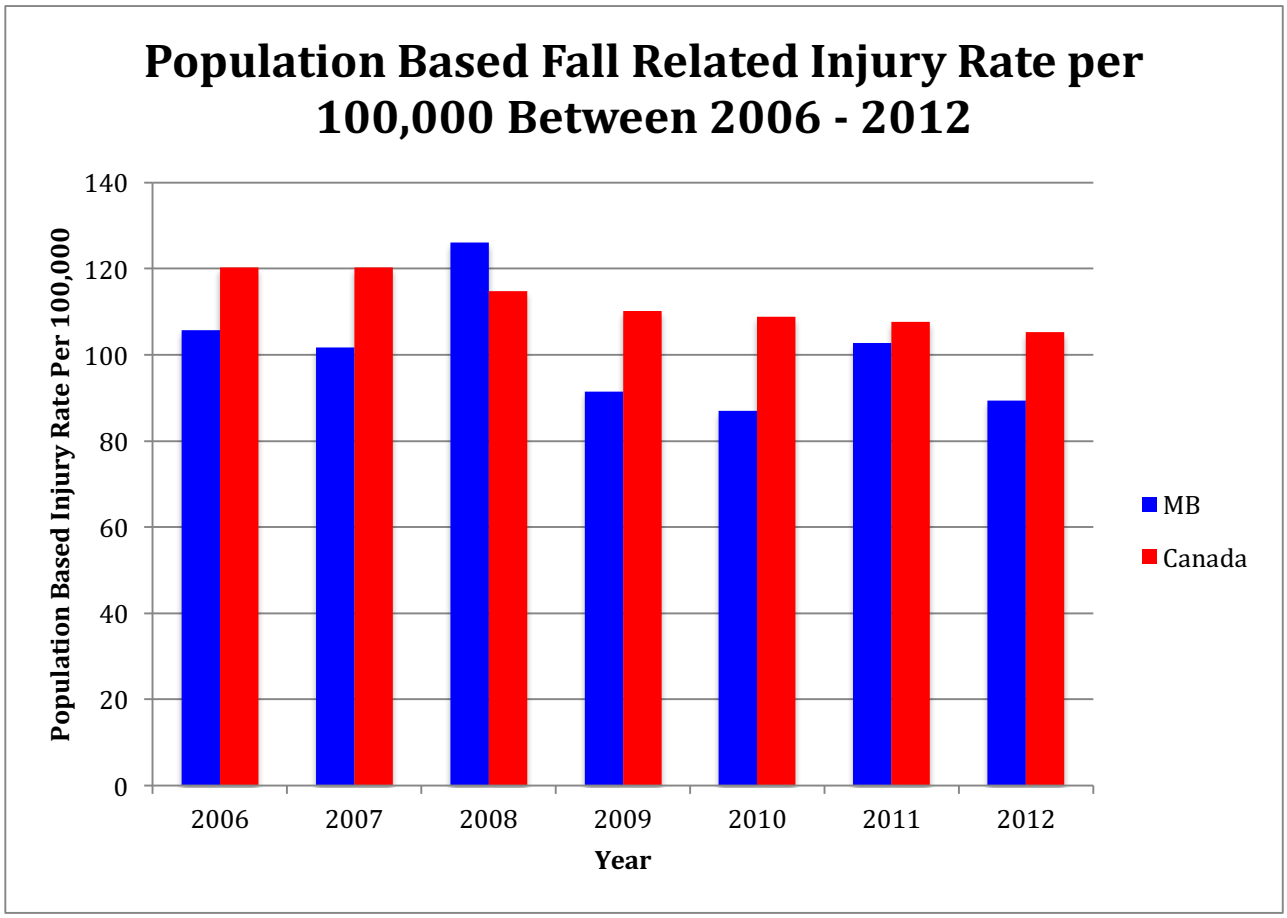

*Canadian average excludes Quebec

Figure 14: Saskatchewan: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



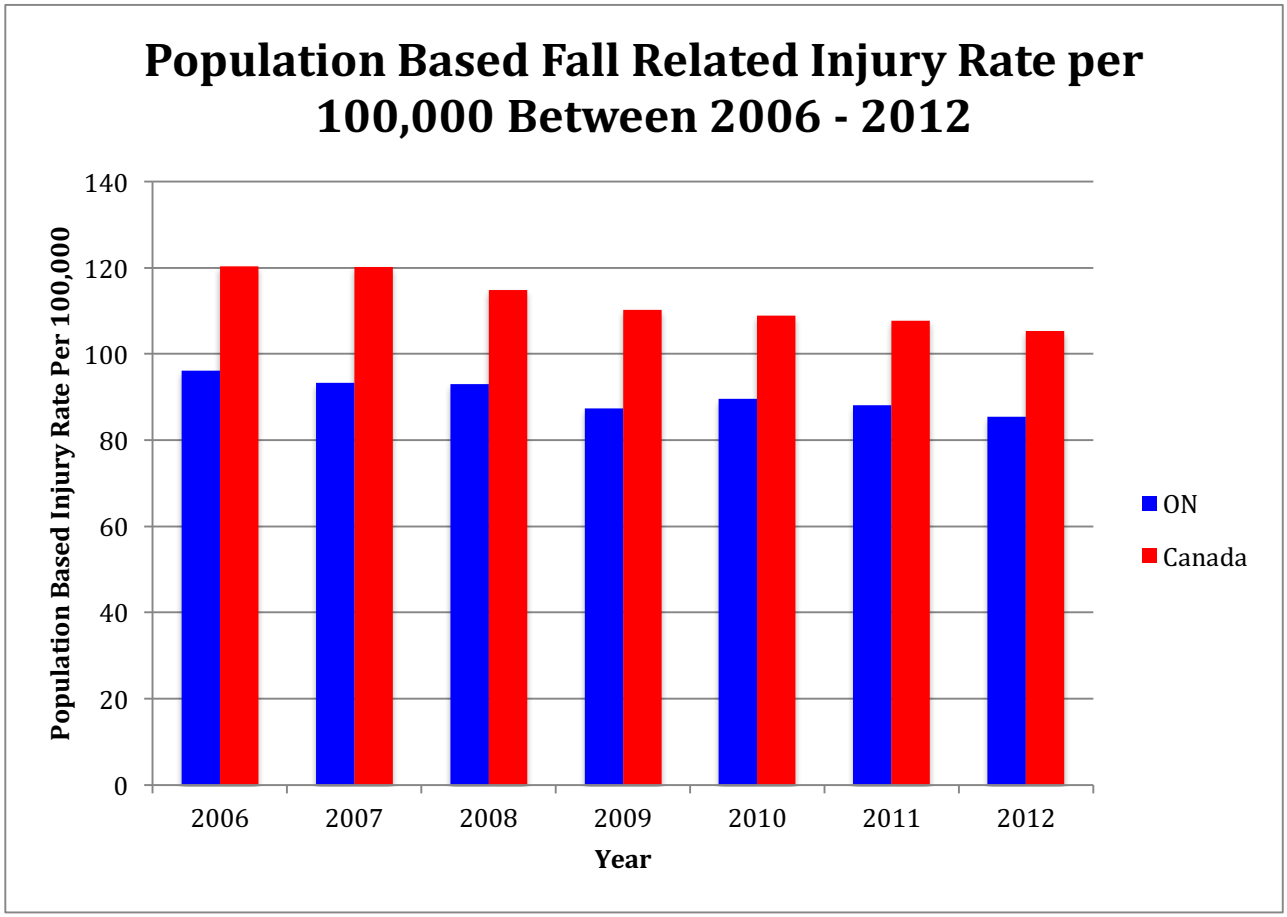

*Canadian average excludes Quebec

Figure 15: Manitoba: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



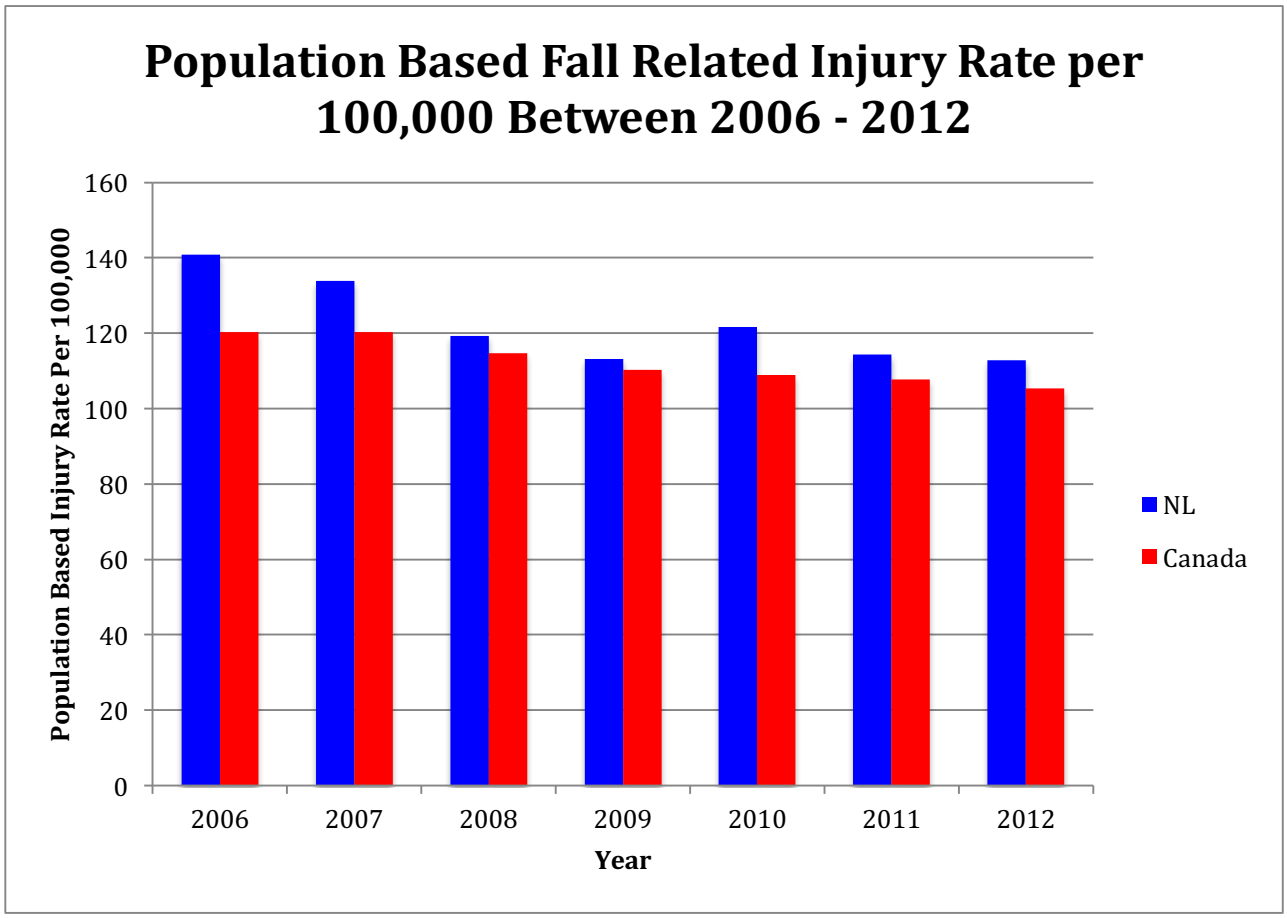

*Canadian average excludes Quebec

Figure 16: Ontario: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



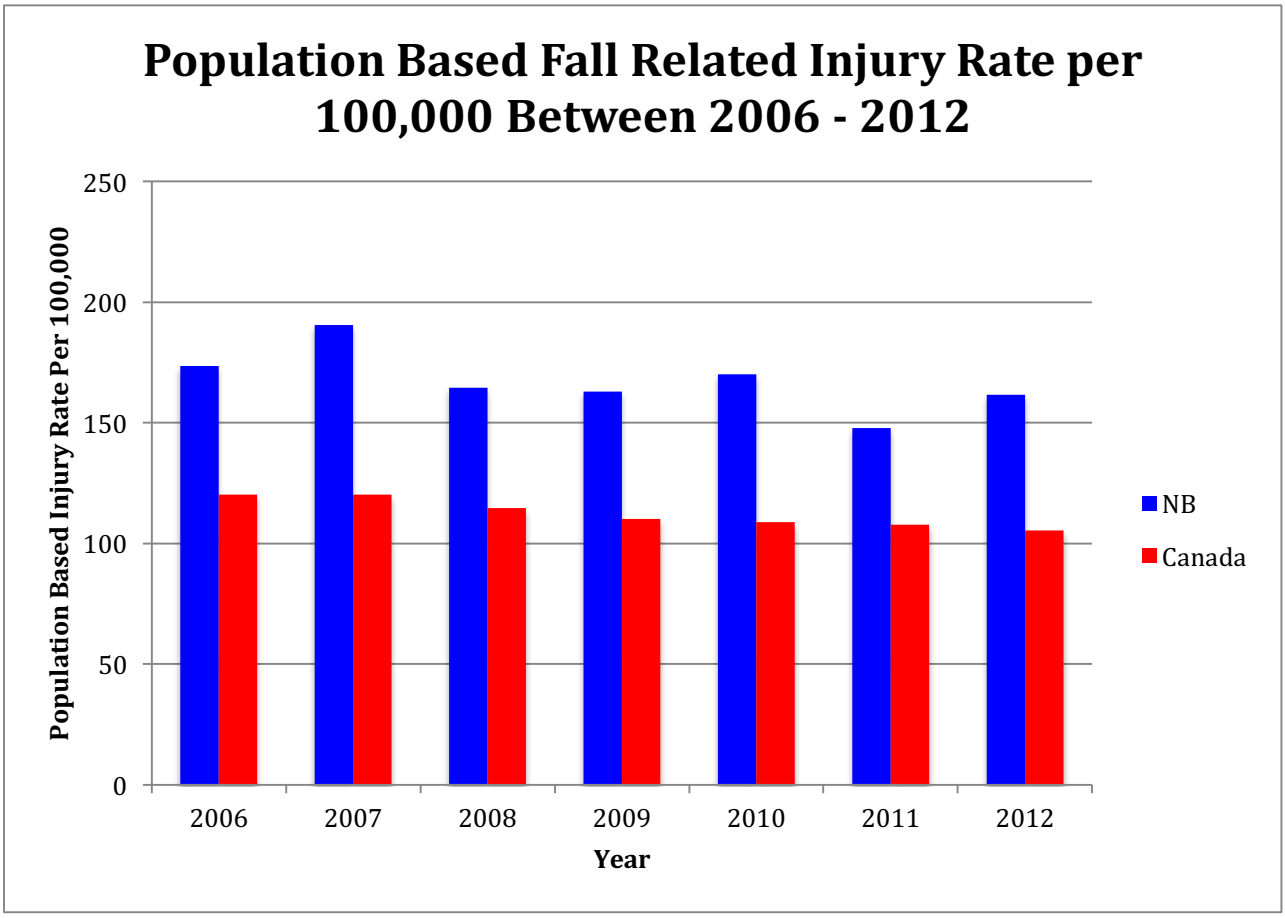

*Canadian average excludes Quebec

Figure 17: Newfoundland and Labrador: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



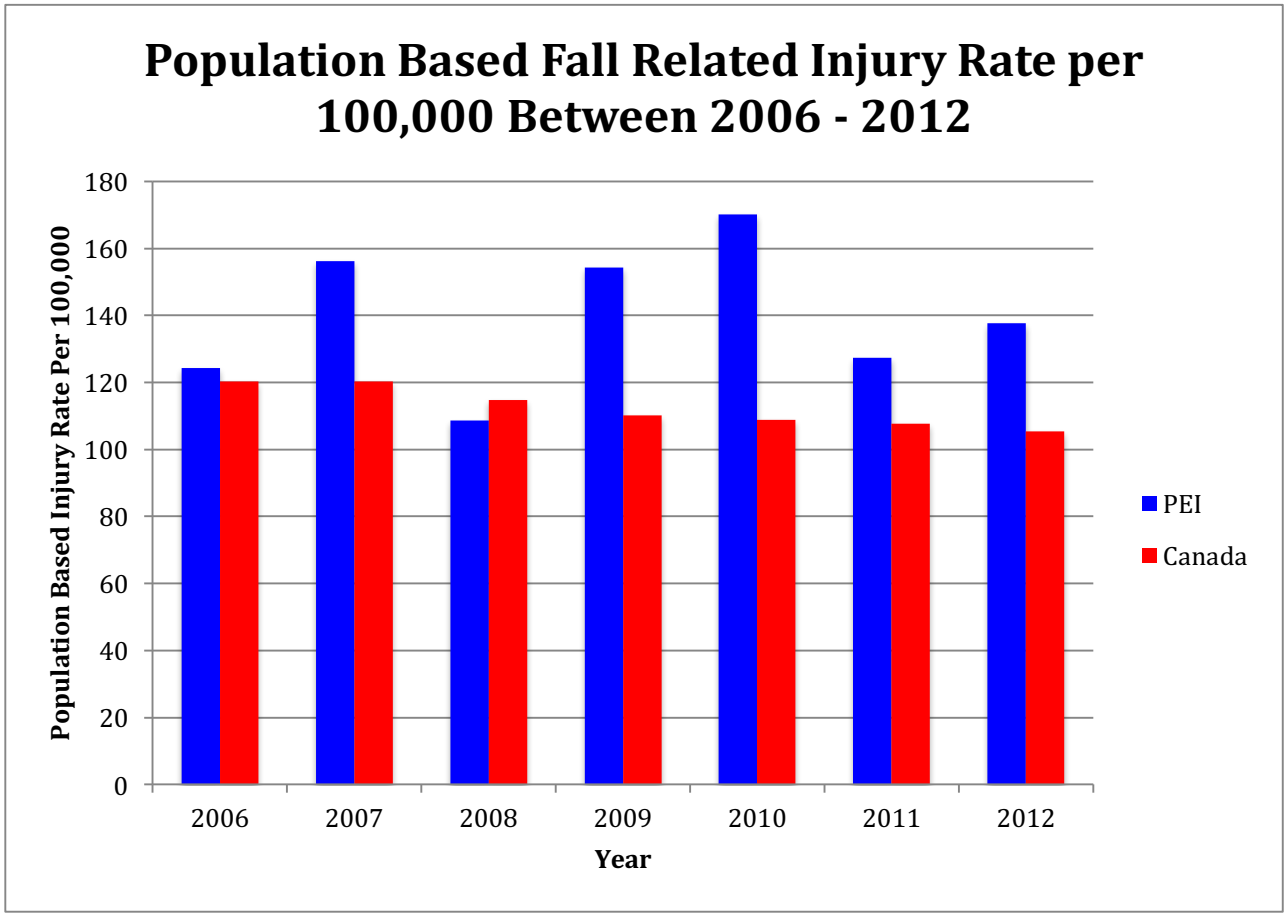

*Canadian average excludes Quebec

Figure 18: New Brunswick: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



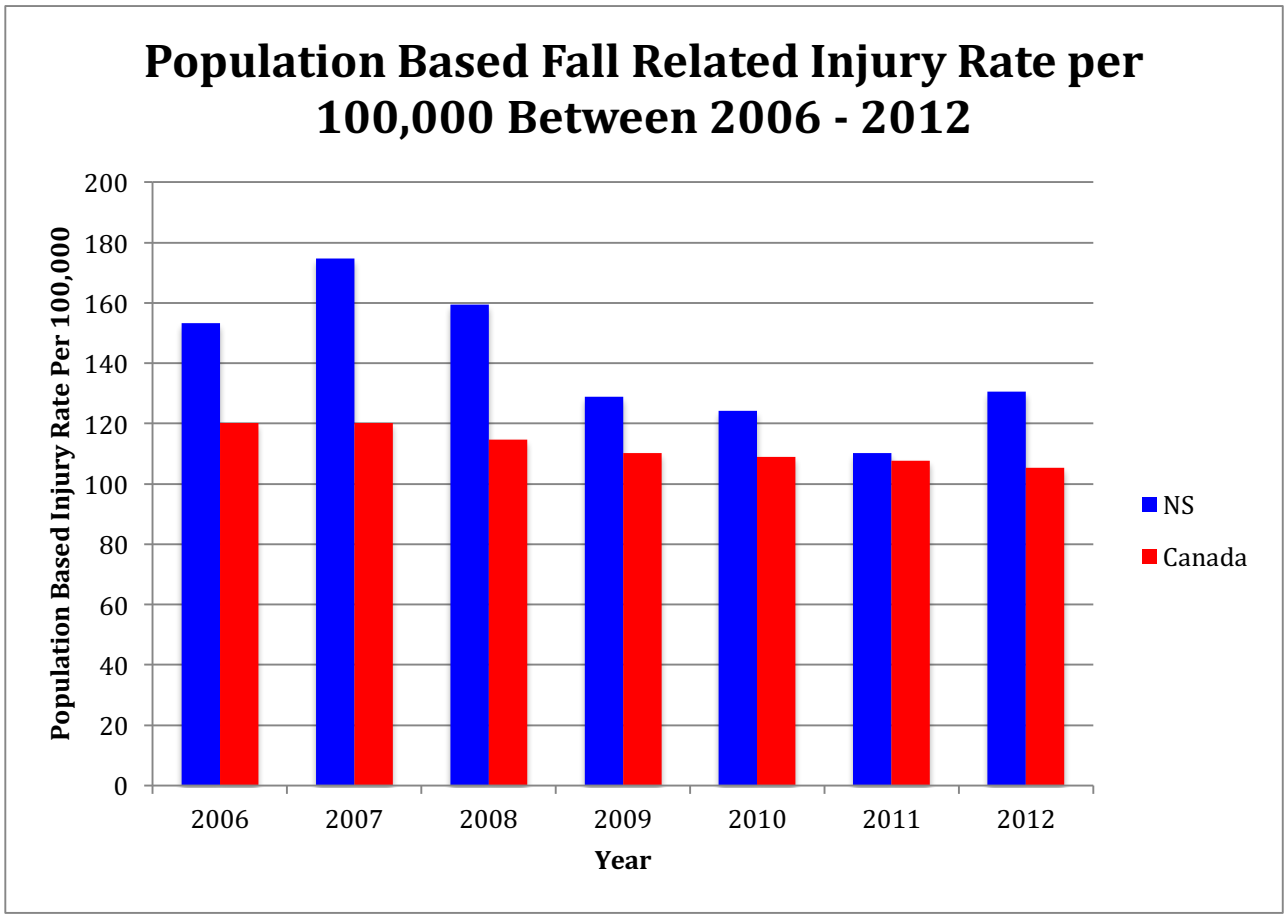

*Canadian average excludes Quebec

Figure 19: Prince Edward Island: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



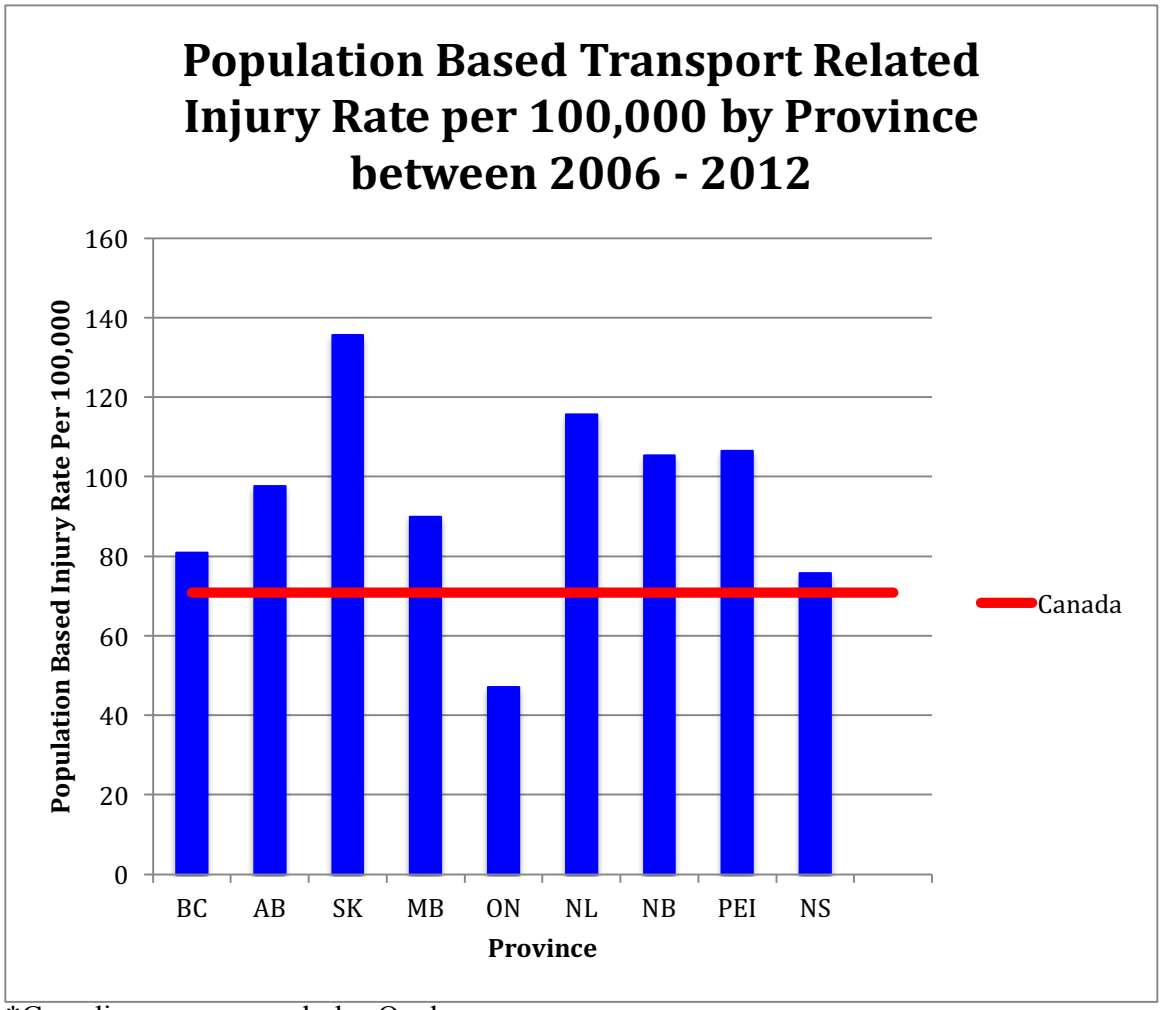

*Canadian average excludes Quebec

Figure 20: Nova Scotia: Population Based Fall Related Injury Rate per 100,000 Between 2006 – 2012



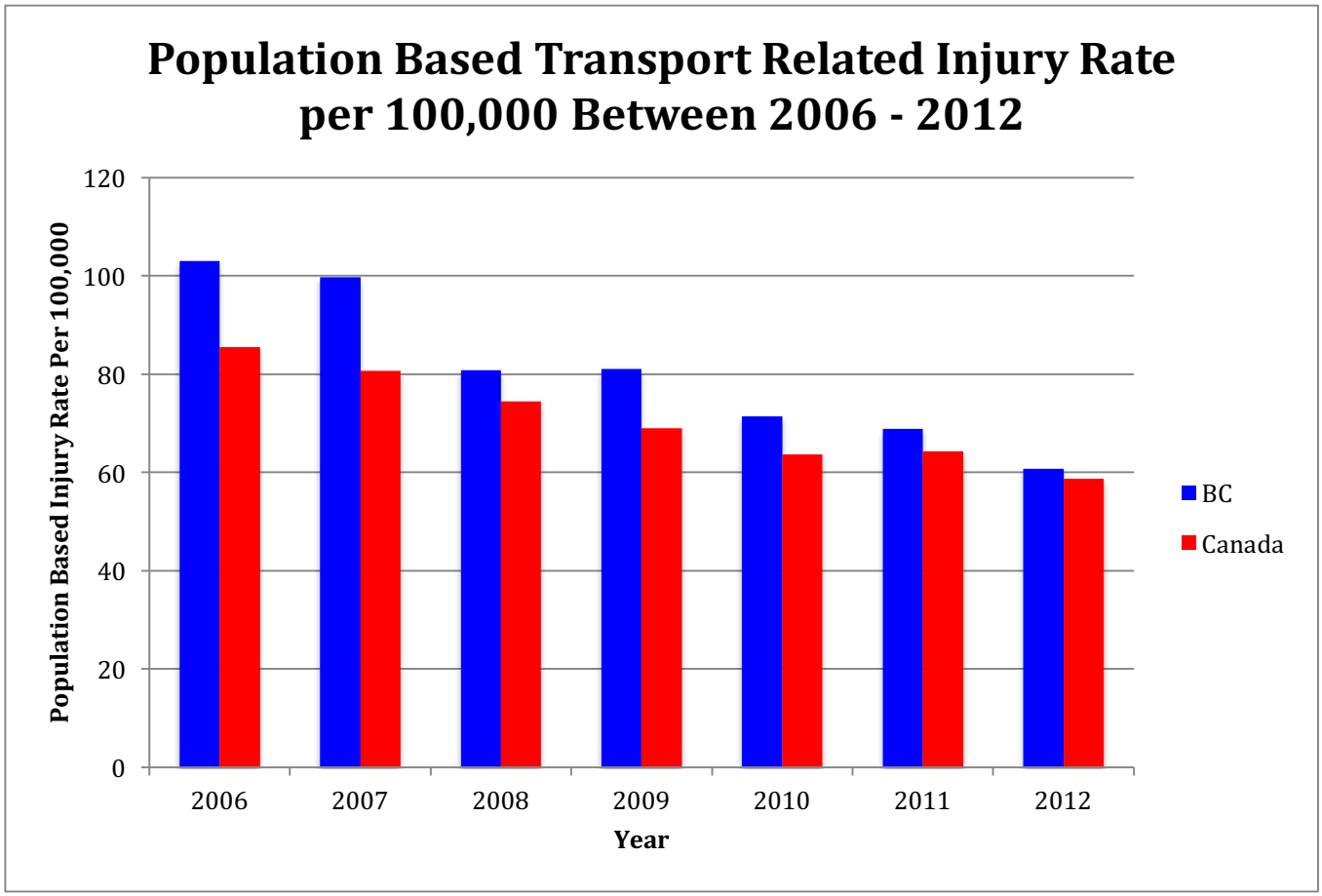

*Canadian average excludes Quebec

Figure 21: Population Based Transport Related Injury Rate per 100,000 by Canadian Province between 2006 – 2012



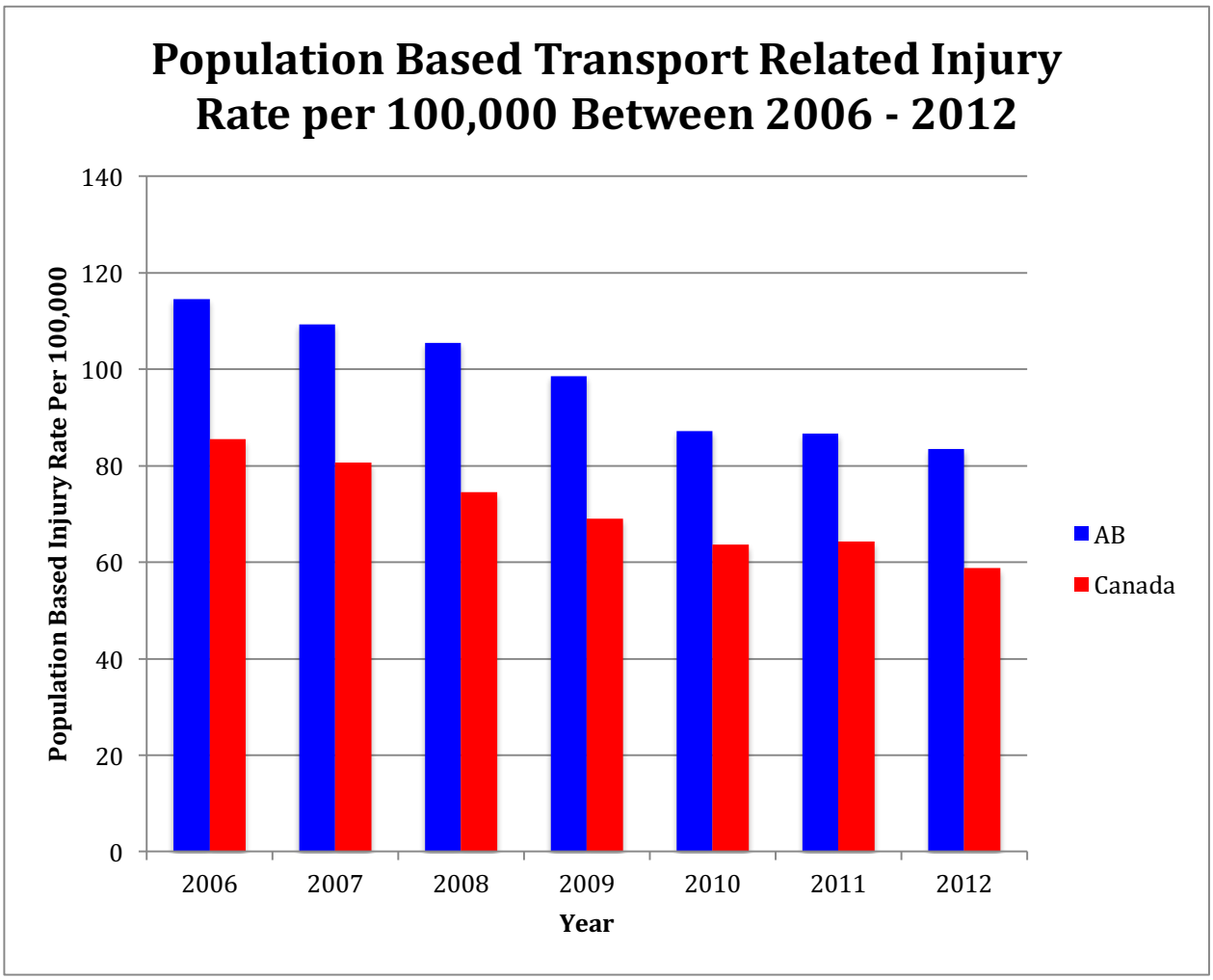

*Canadian average excludes Quebec

Figure 22: British Columbia: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



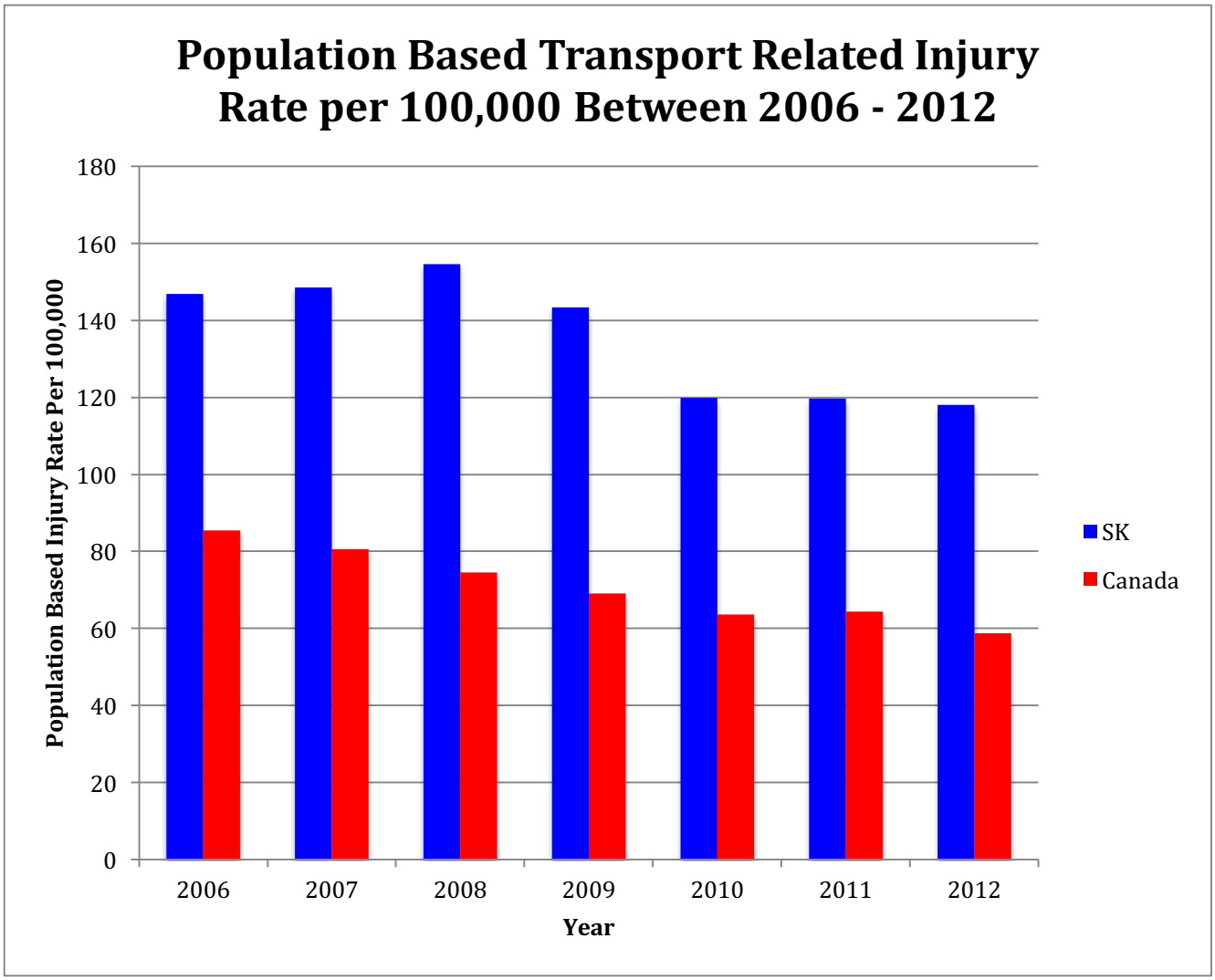

*Canadian average excludes Quebec

Figure 23: Alberta: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



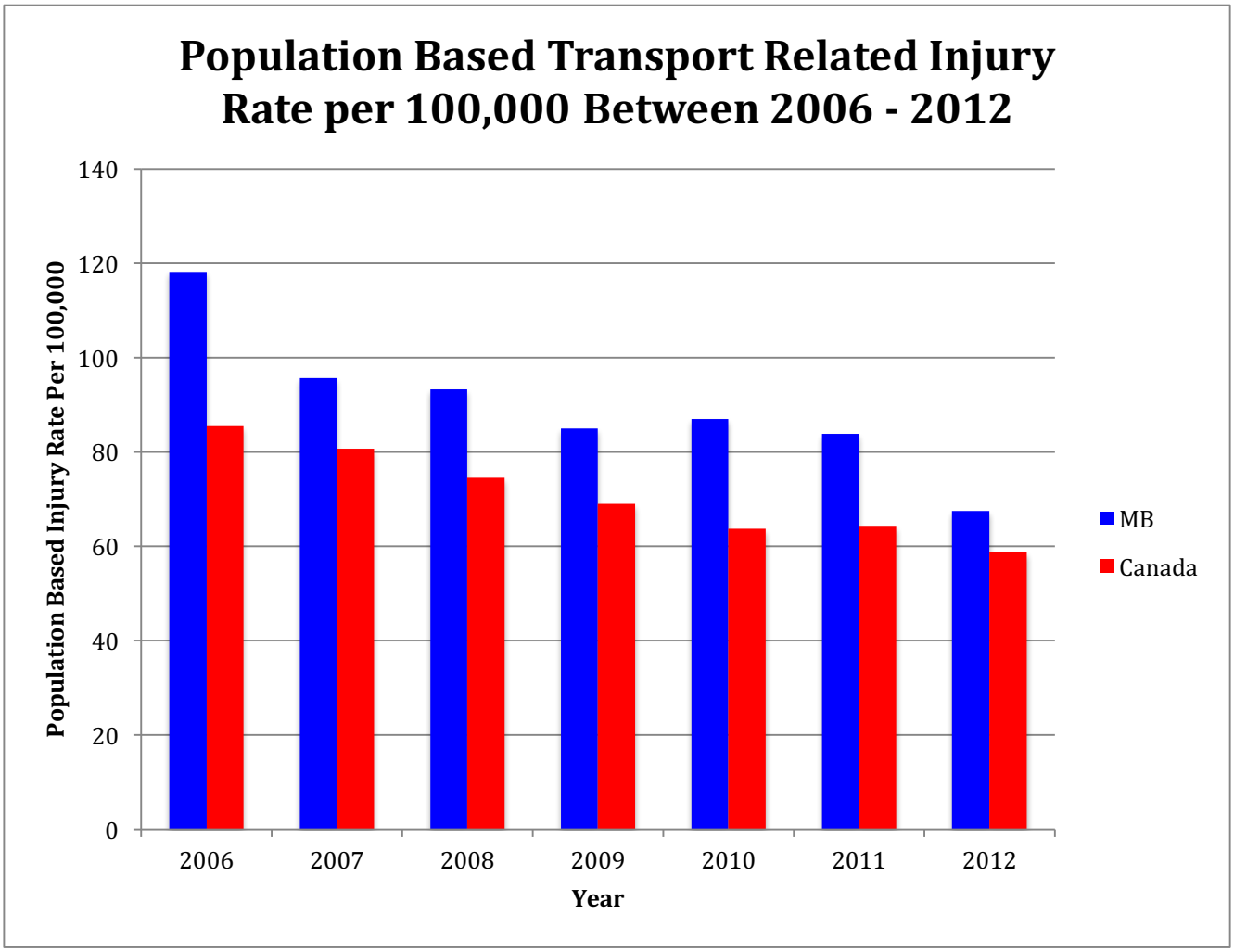

*Canadian average excludes Quebec

Figure 24: Saskatchewan: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



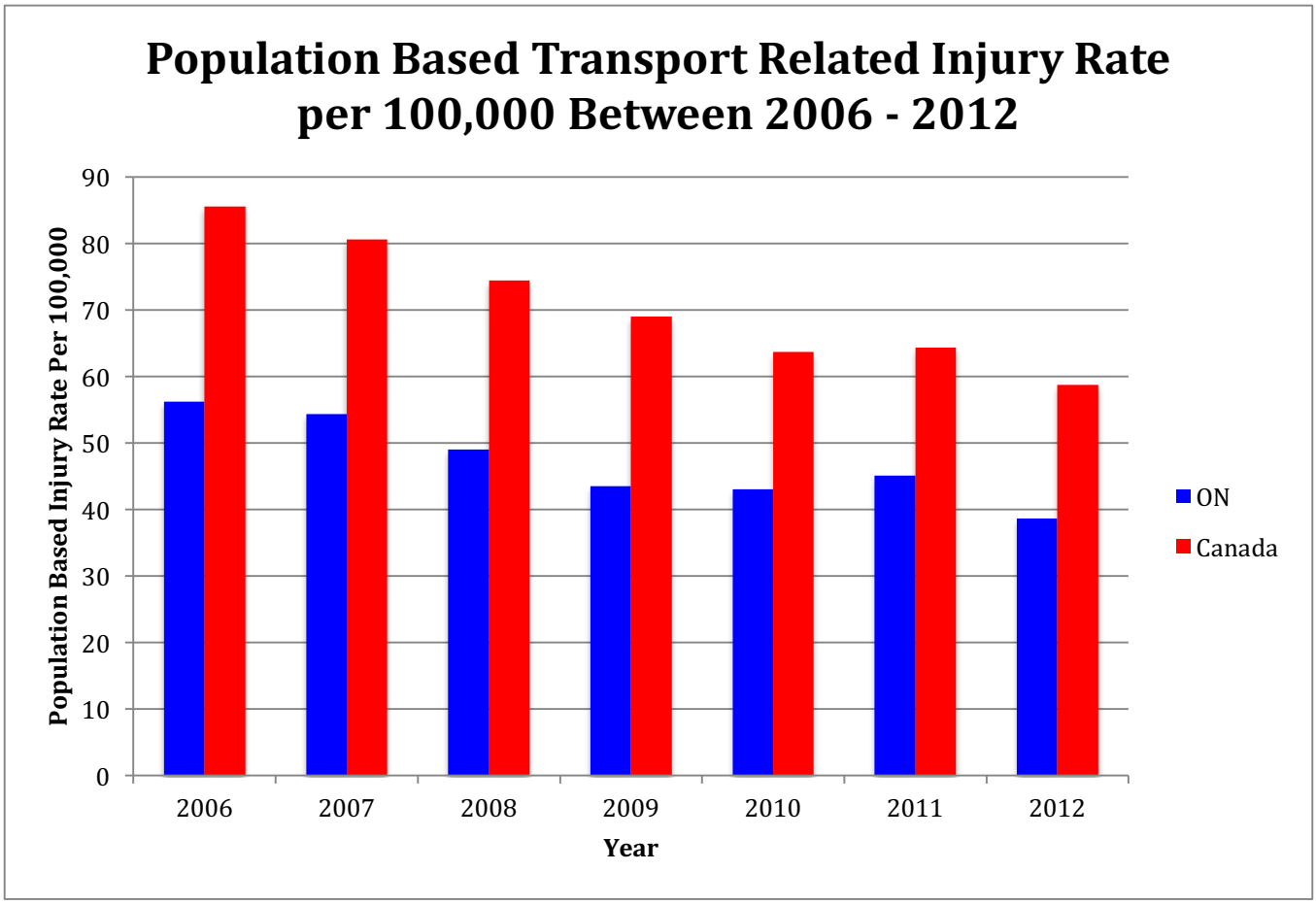

*Canadian average excludes Quebec

Figure 25: Manitoba: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



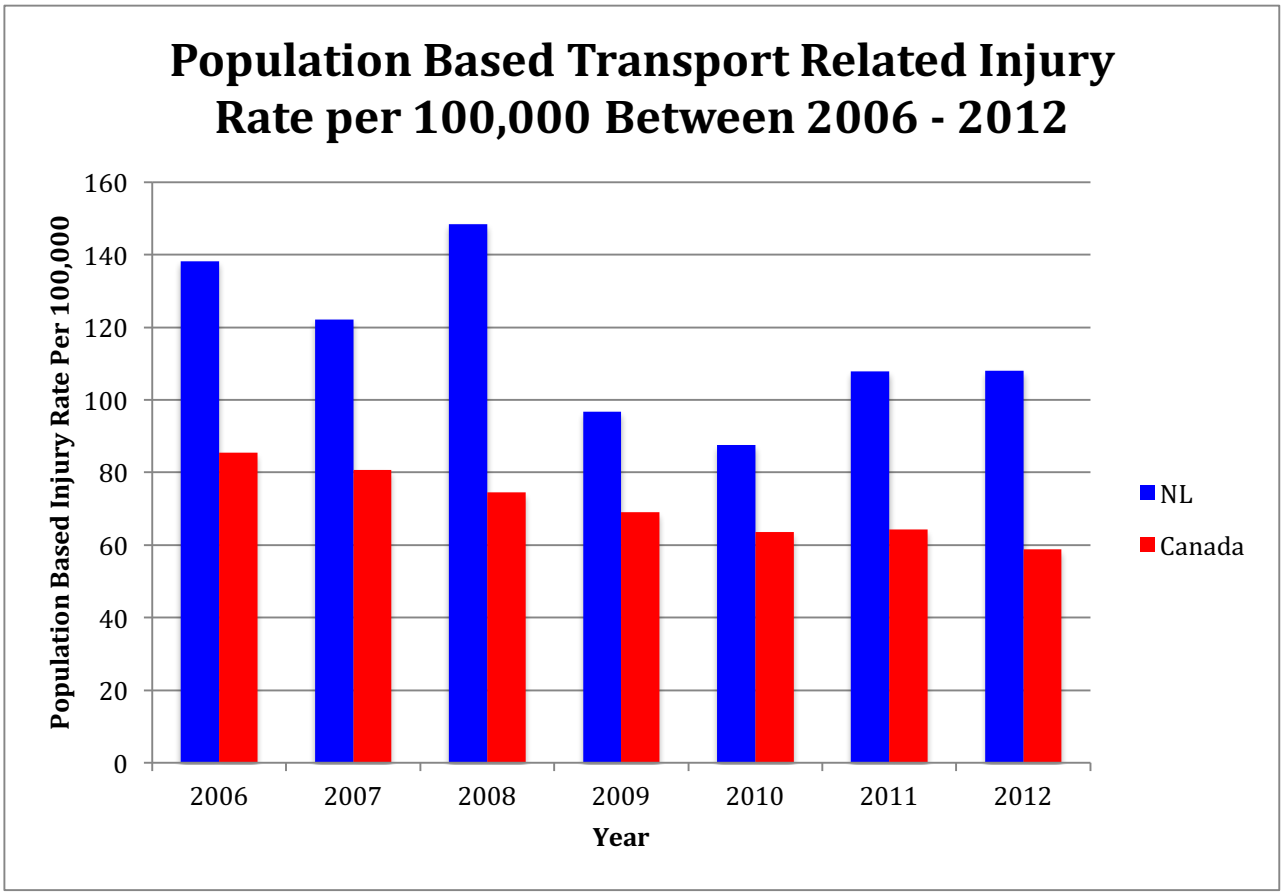

*Canadian average excludes Quebec

Figure 26: Ontario: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



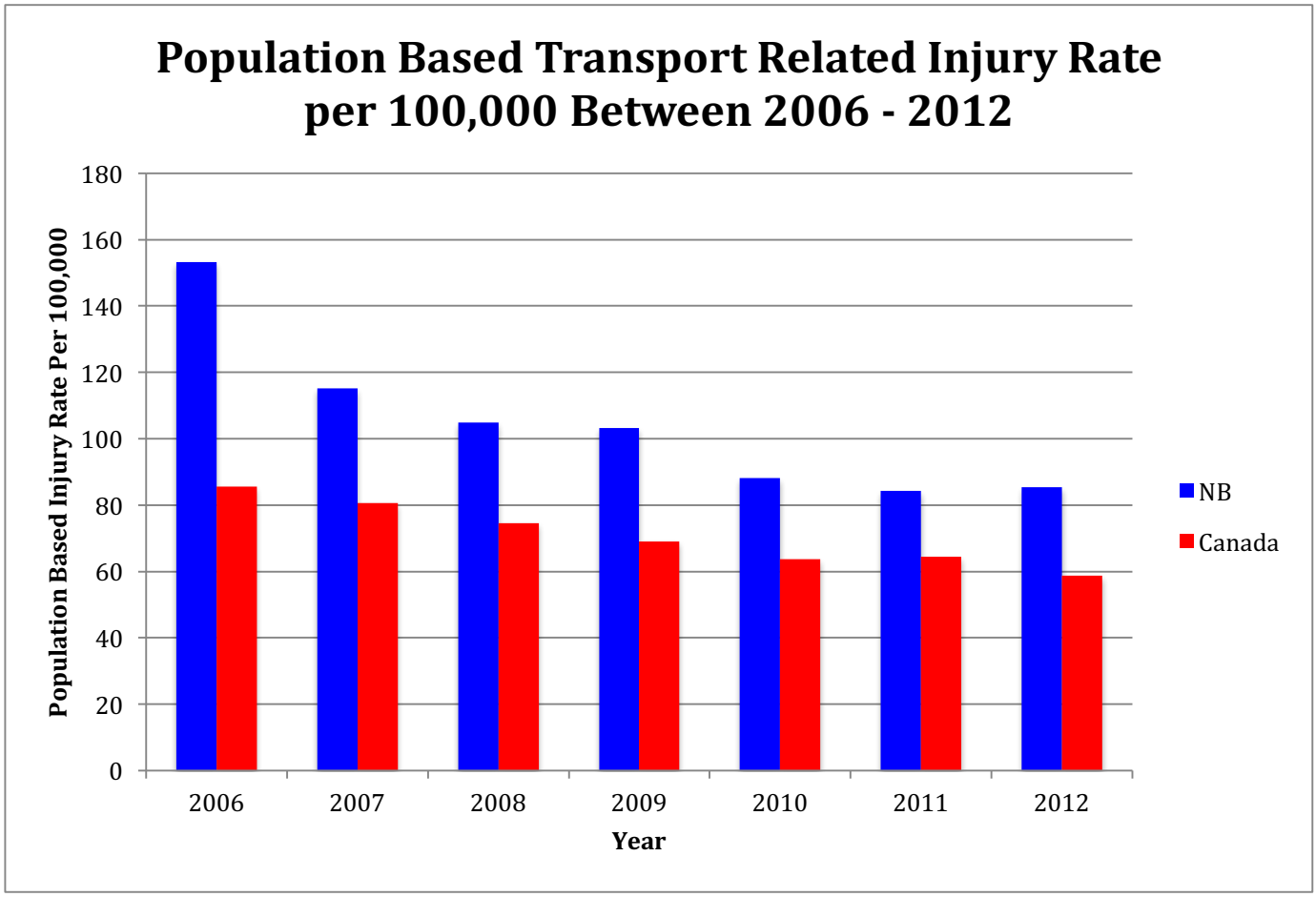

*Canadian average excludes Quebec

Figure 27: Newfoundland and Labrador: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



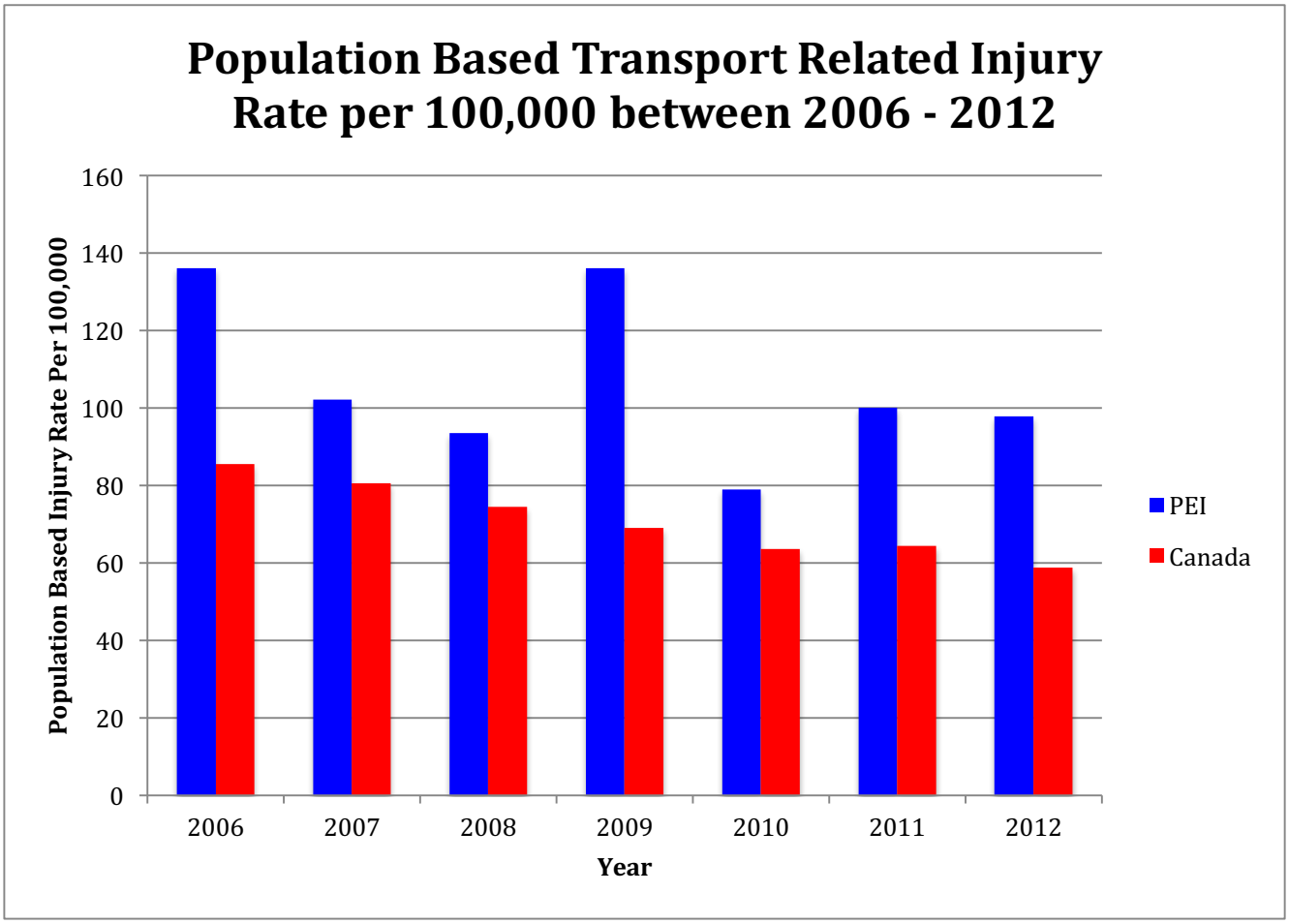

*Canadian average excludes Quebec

Figure 28: New Brunswick: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



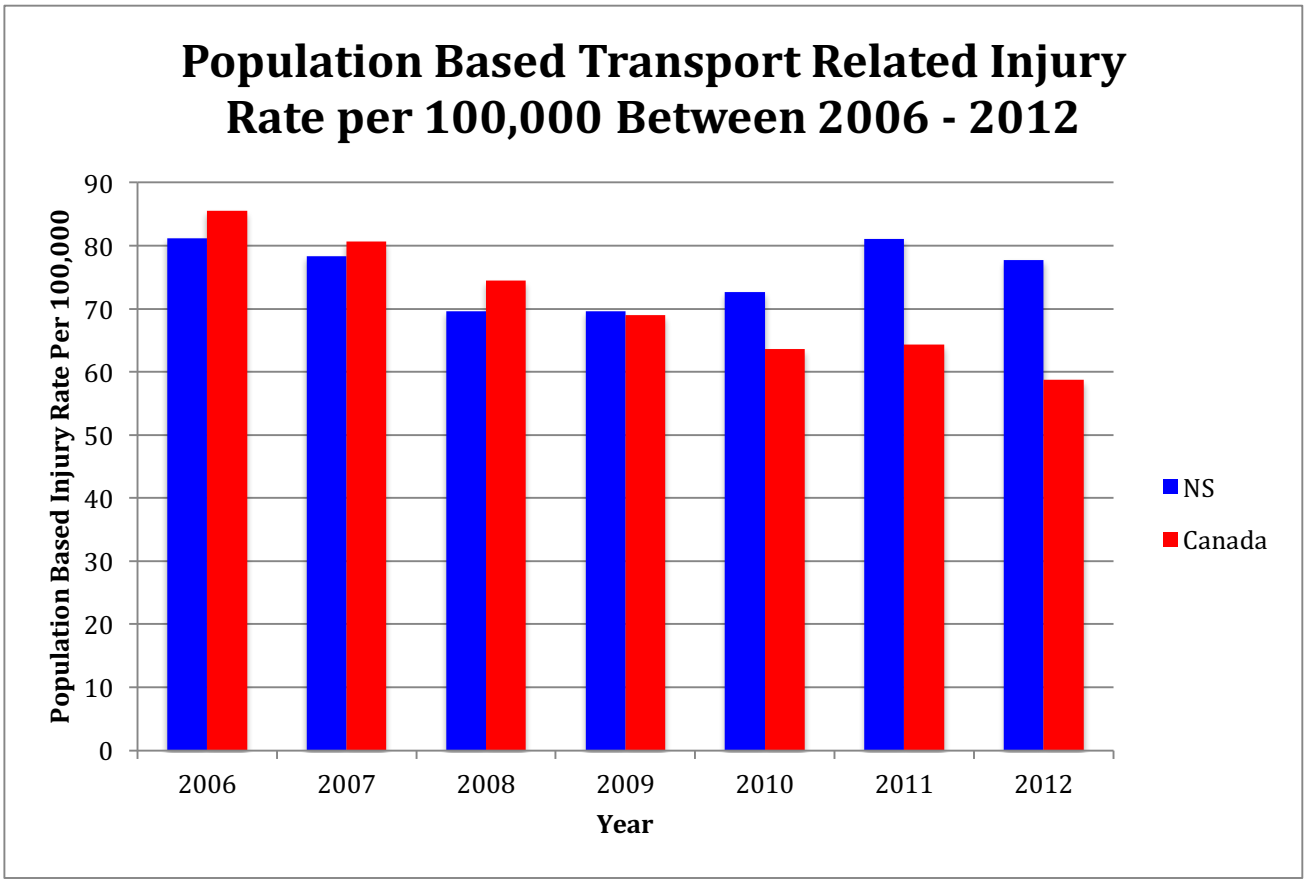

*Canadian average excludes Quebec

Figure 29: Prince Edward Island: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



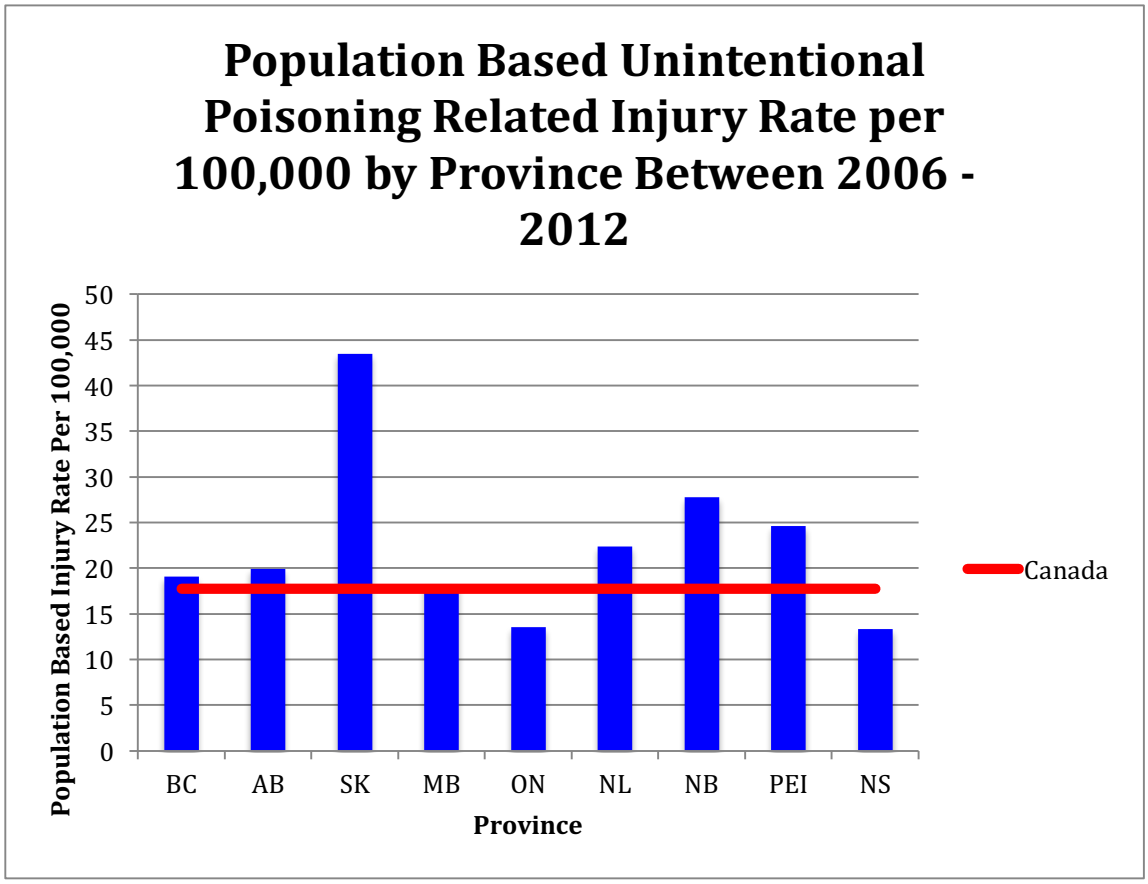

*Canadian average excludes Quebec

Figure 30: Nova Scotia: Population Based Transport Related Injury Rate per 100,000 Between 2006 – 2012



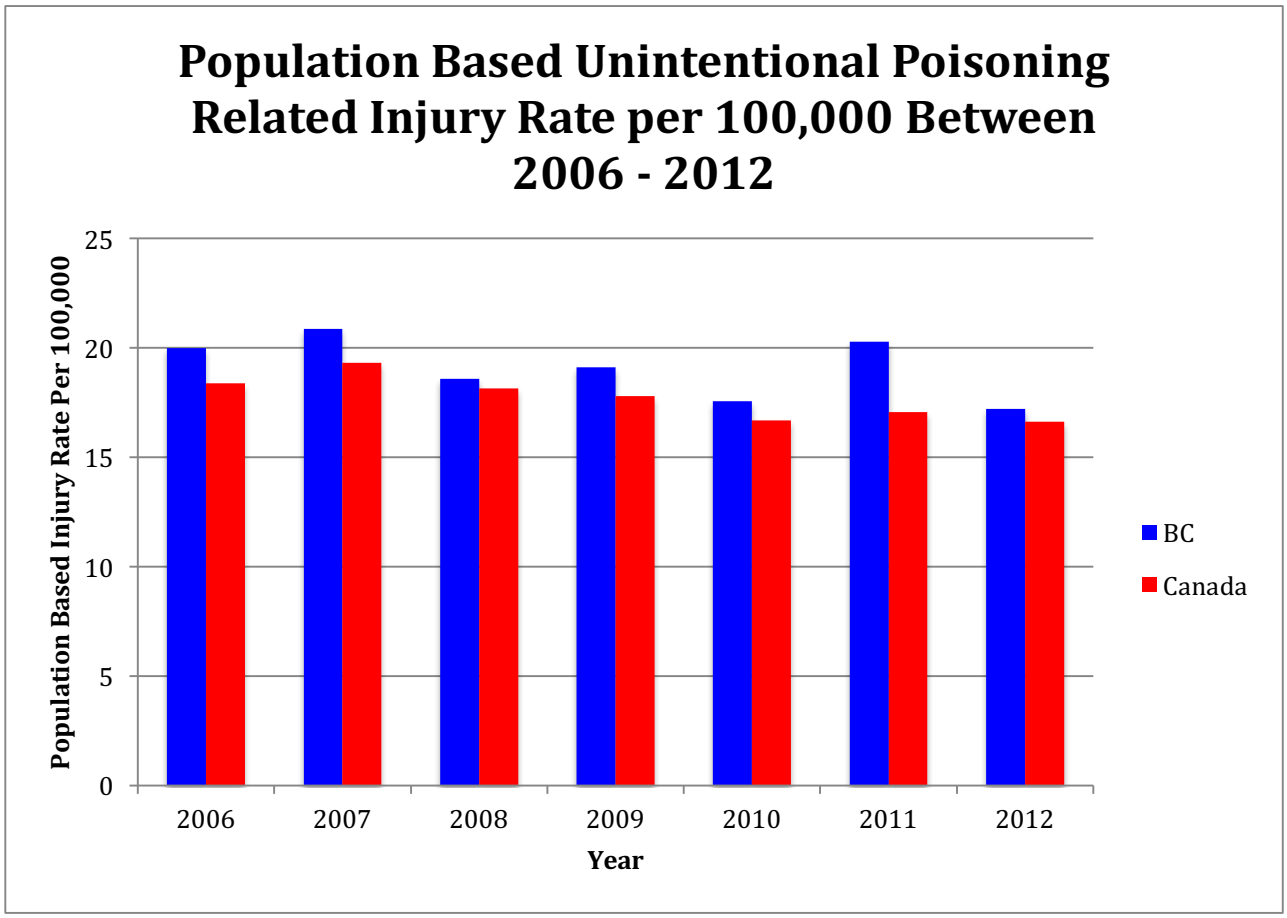

*Canadian average excludes Quebec

Figure 31: Population Based Unintentional Poisoning Related Injury Rate per 100,000 by Canadian Province between 2006 – 2012



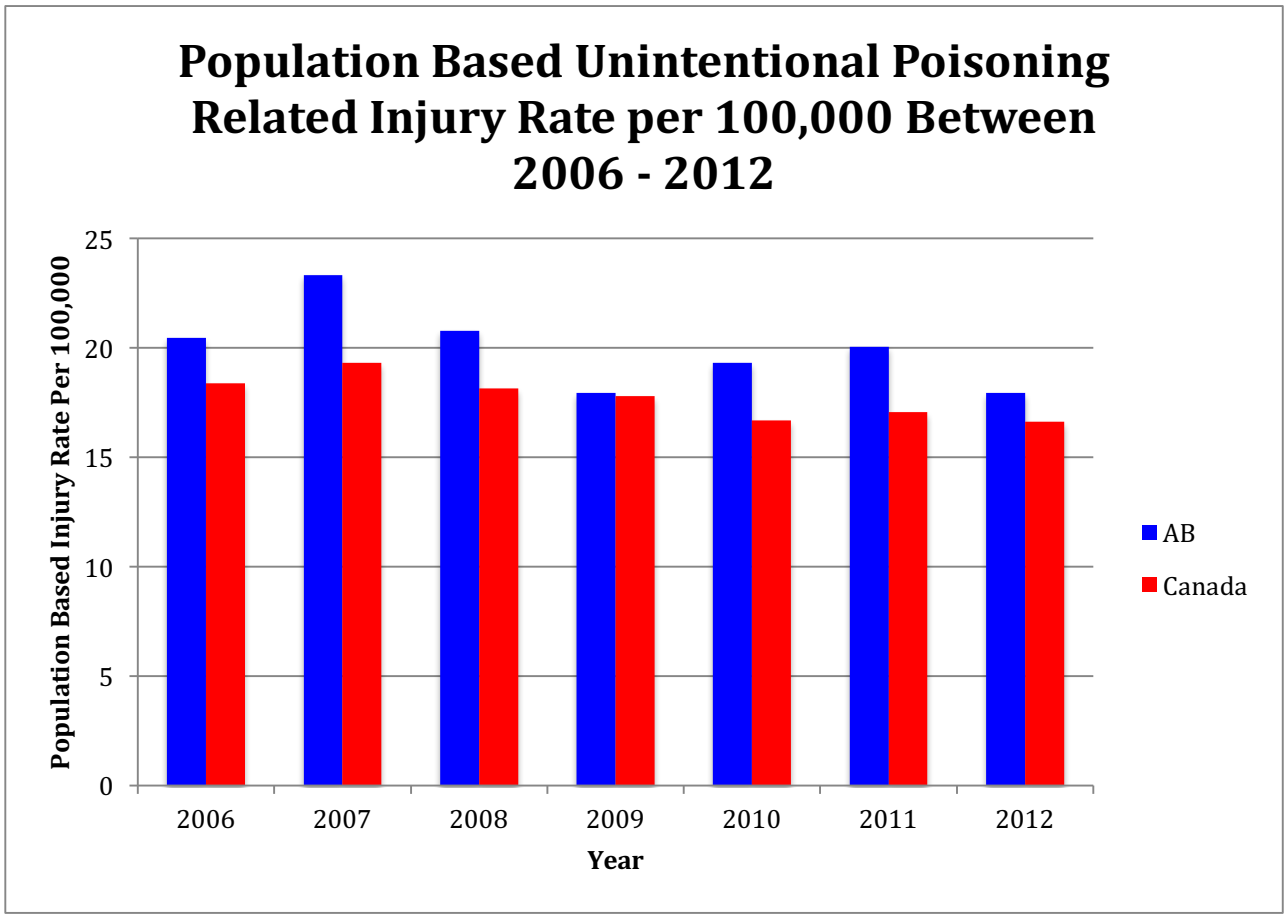

*Canadian average excludes Quebec

Figure 32: British Columbia: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



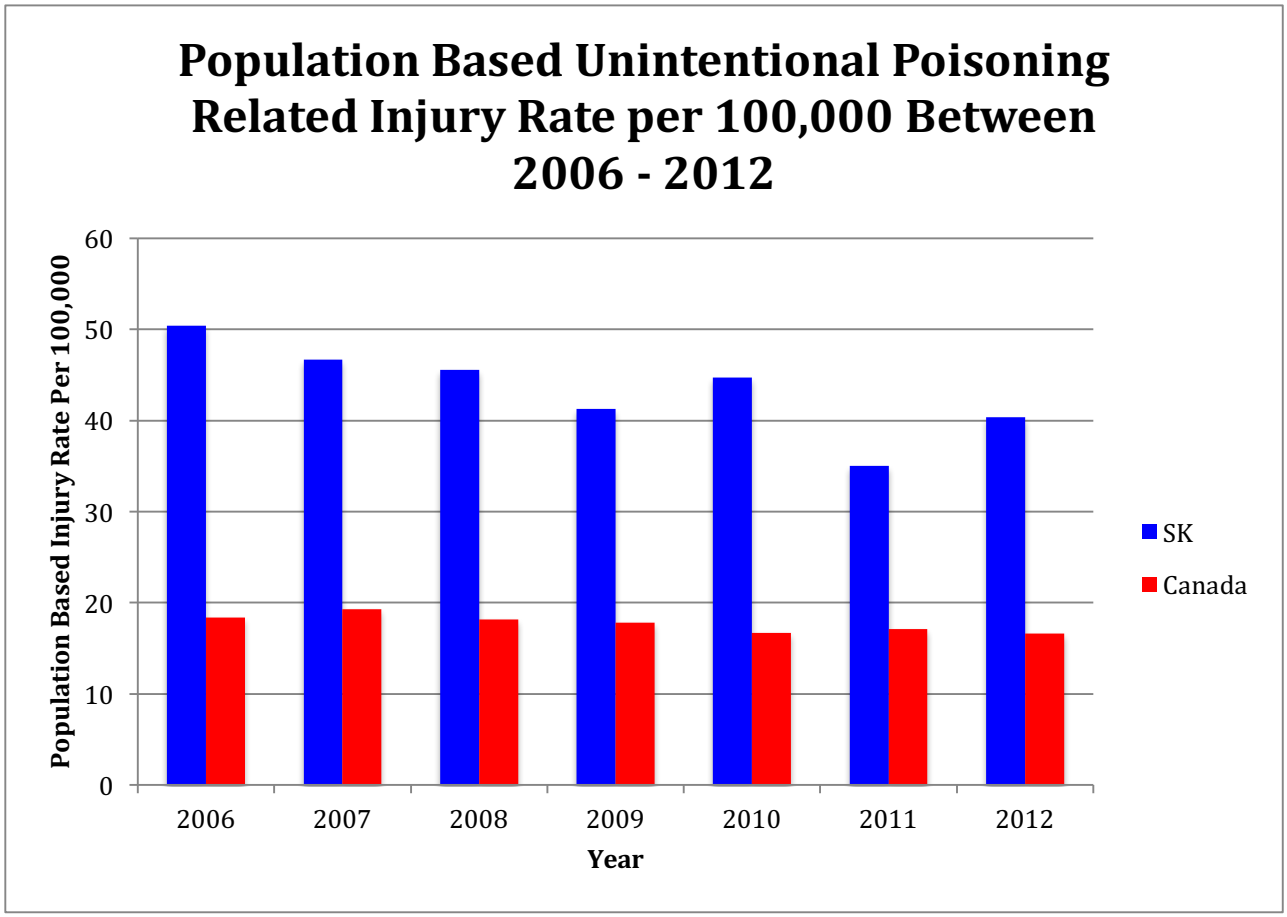

*Canadian average excludes Quebec

Figure 33: Alberta: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



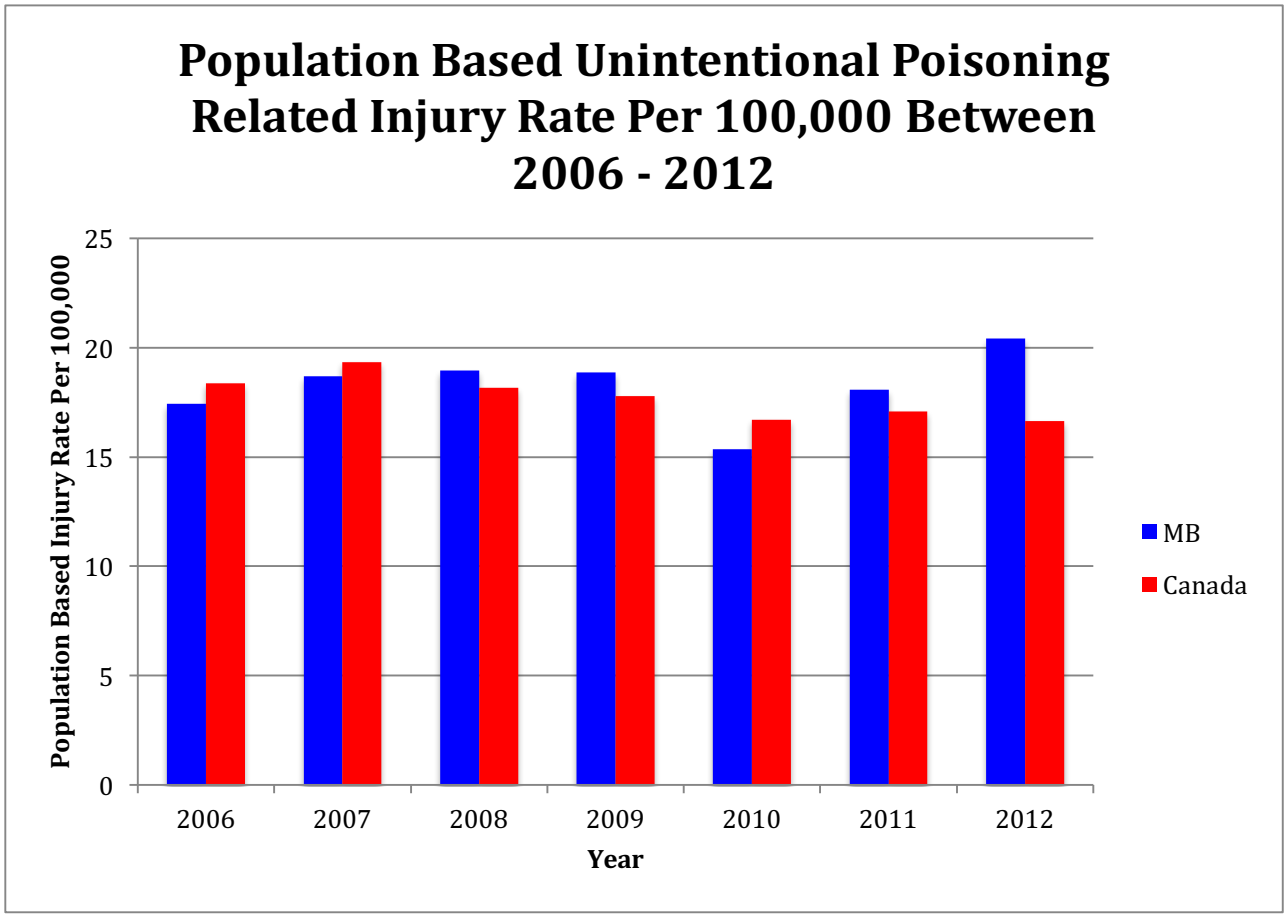

*Canadian average excludes Quebec

Figure 34: Saskatchewan: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



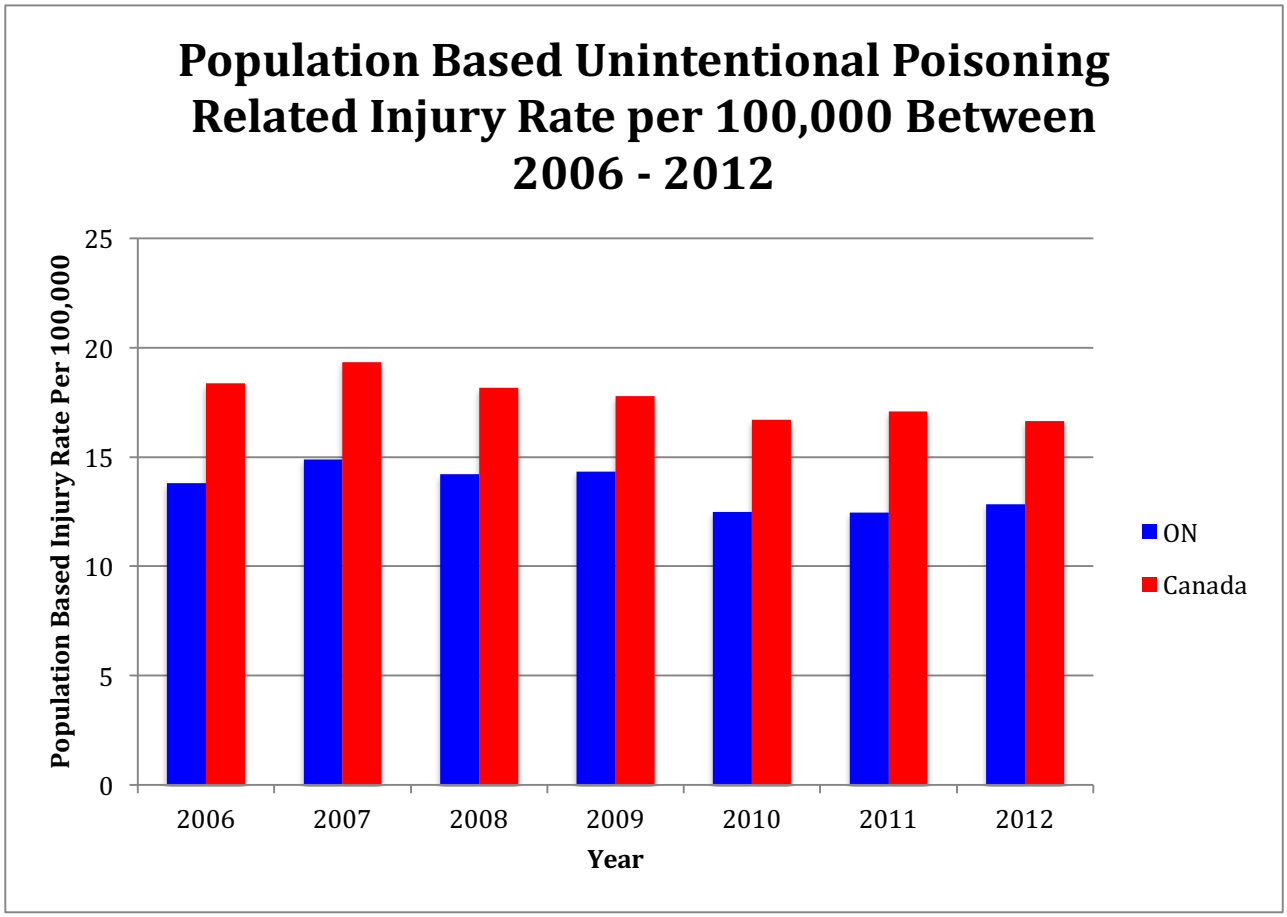

*Canadian average excludes Quebec

Figure 35: Manitoba: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



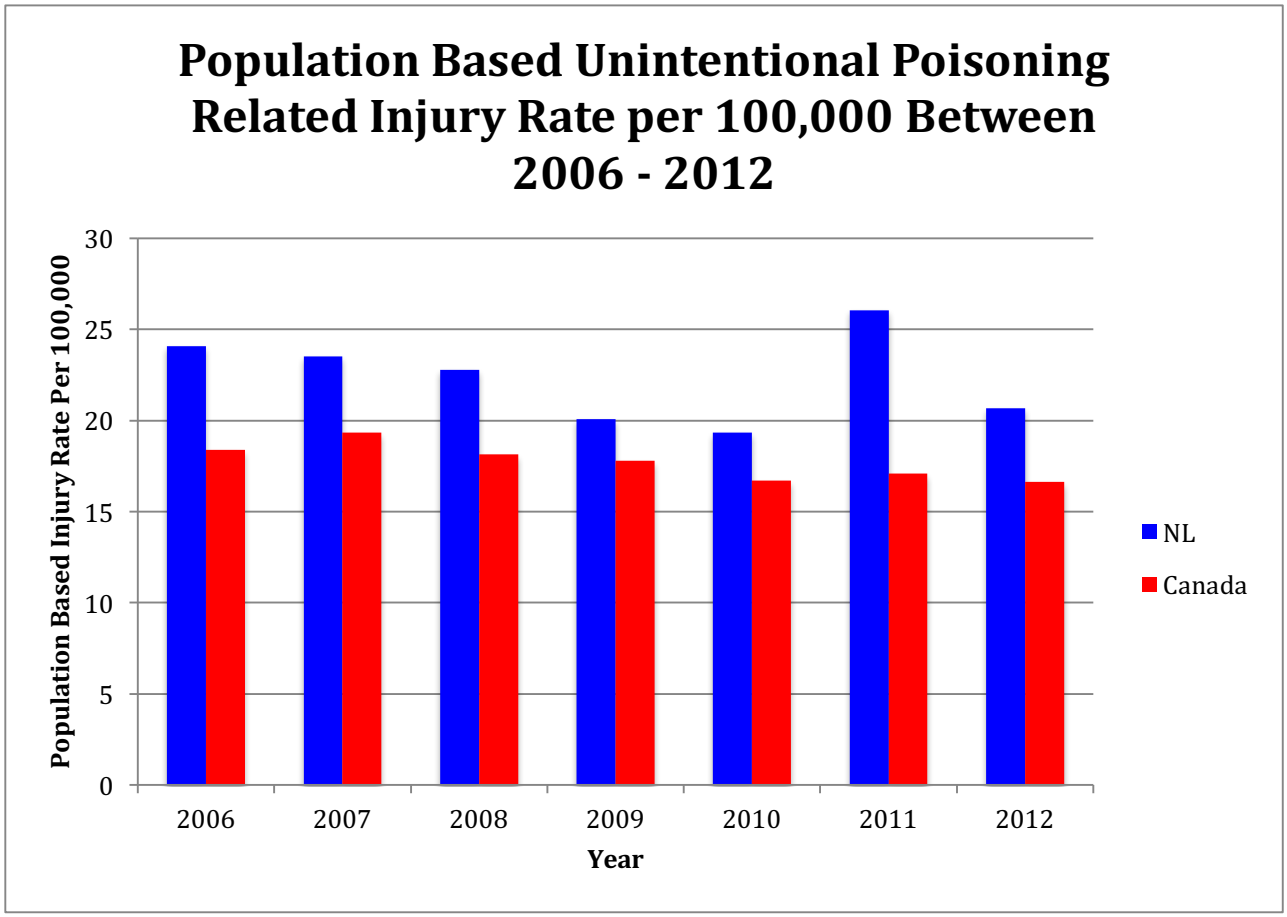

*Canadian average excludes Quebec

Figure 36: Ontario: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



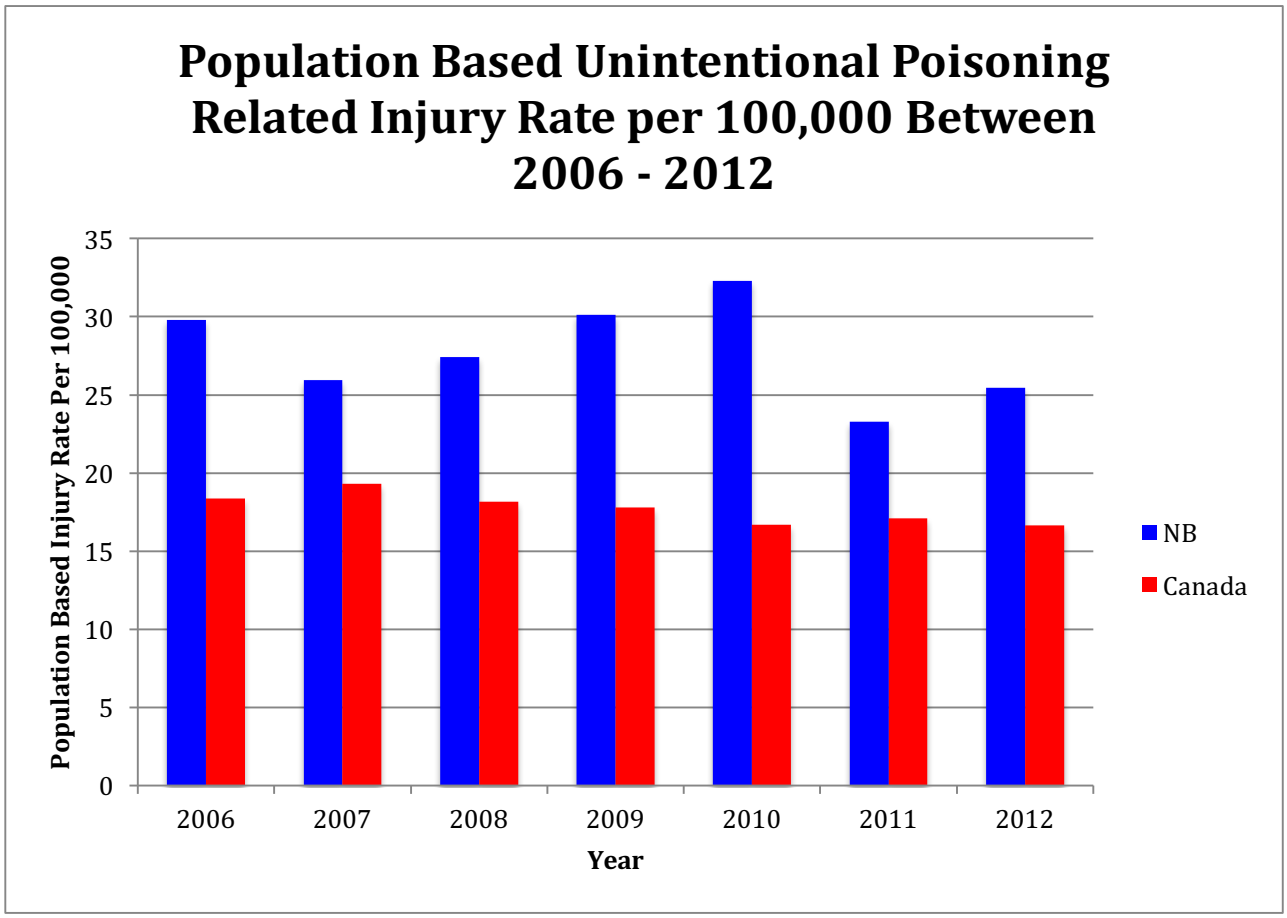

*Canadian average excludes Quebec

Figure 37: Newfoundland and Labrador: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



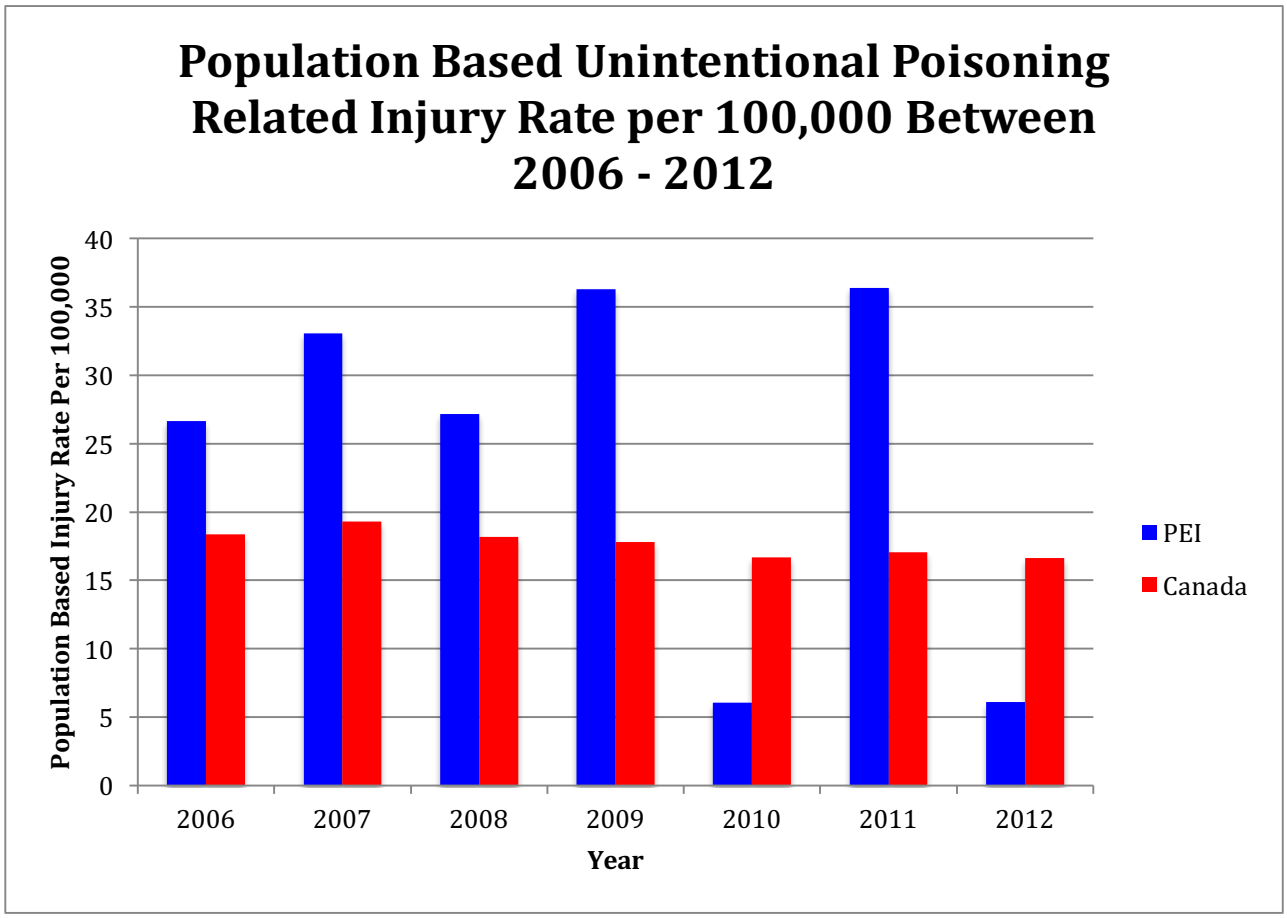

*Canadian average excludes Quebec

Figure 38: New Brunswick: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



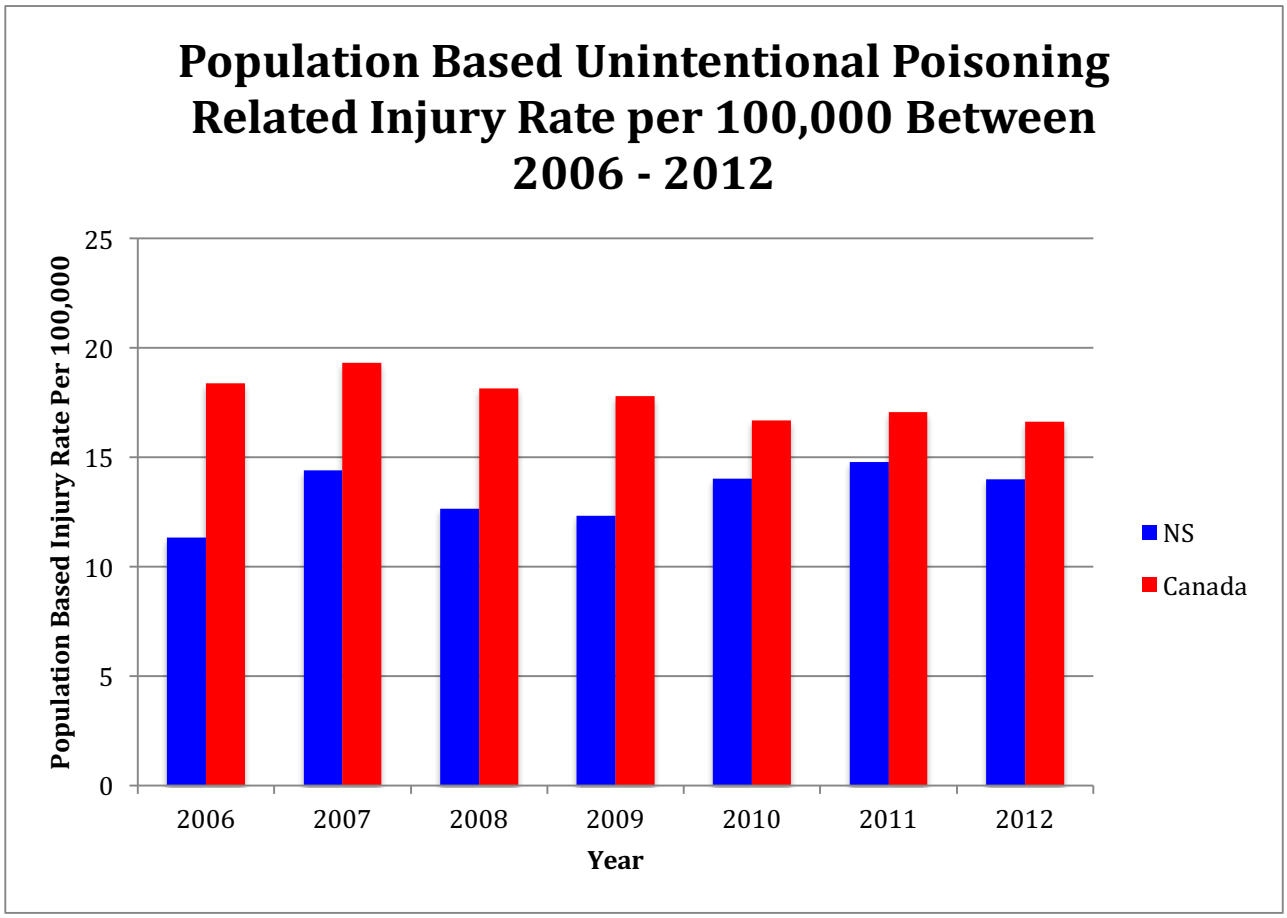

*Canadian average excludes Quebec

Figure 39: Prince Edward Island: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



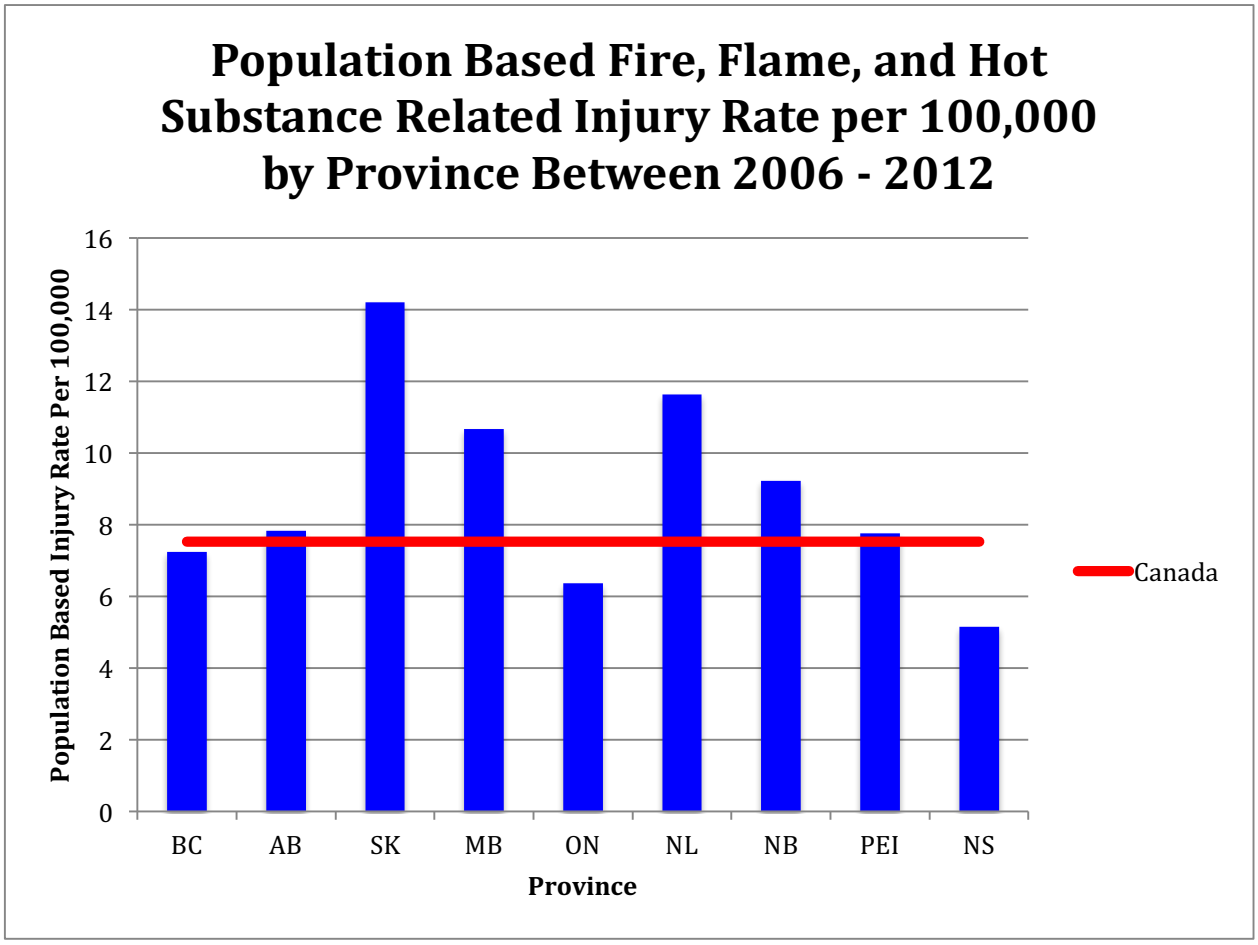

*Canadian average excludes Quebec

Figure 40: Nova Scotia: Population Based Unintentional Poisoning Related Injury Rate per 100,000 Between 2006 – 2012



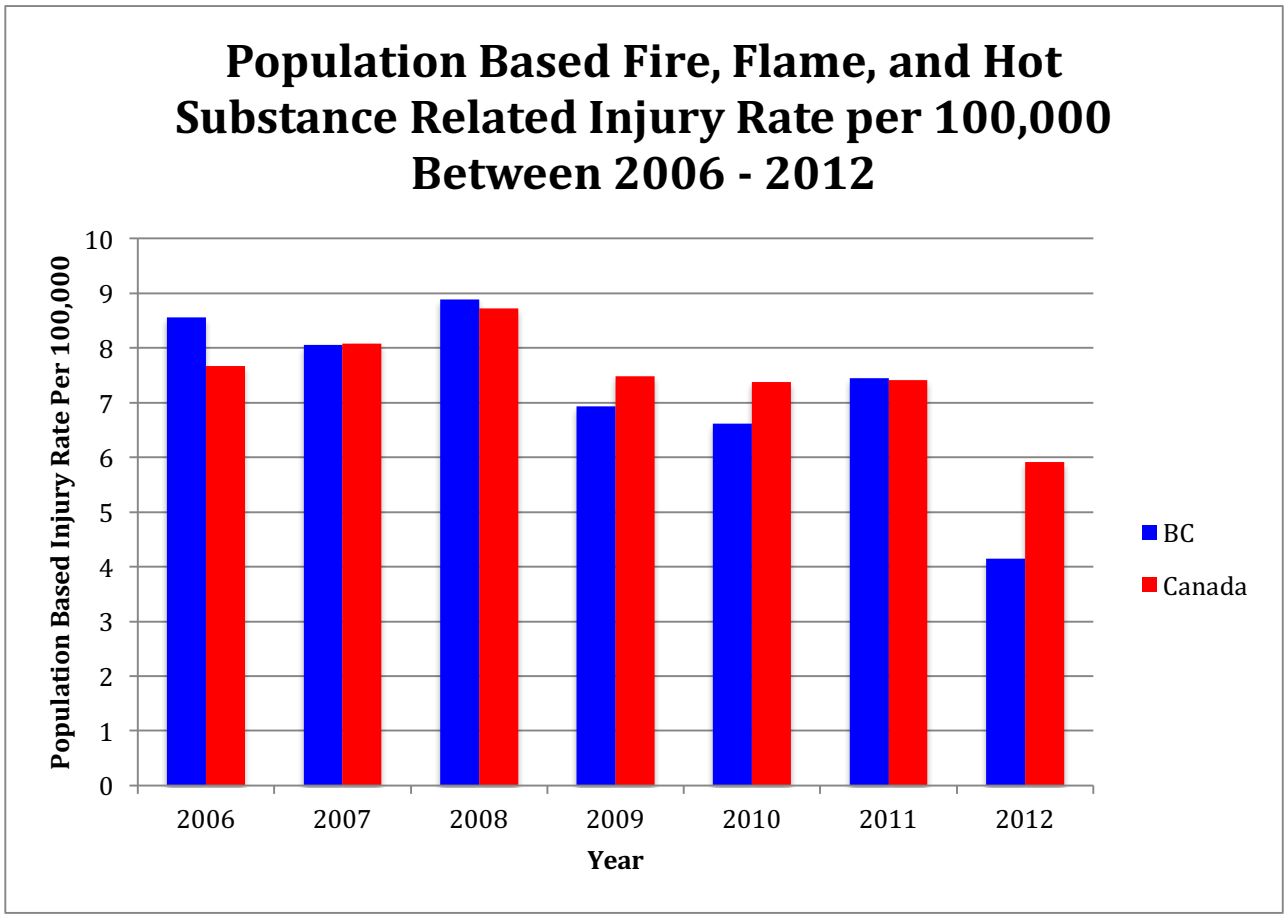

*Canadian average excludes Quebec

Figure 41: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 by Canadian Province between 2006 – 2012



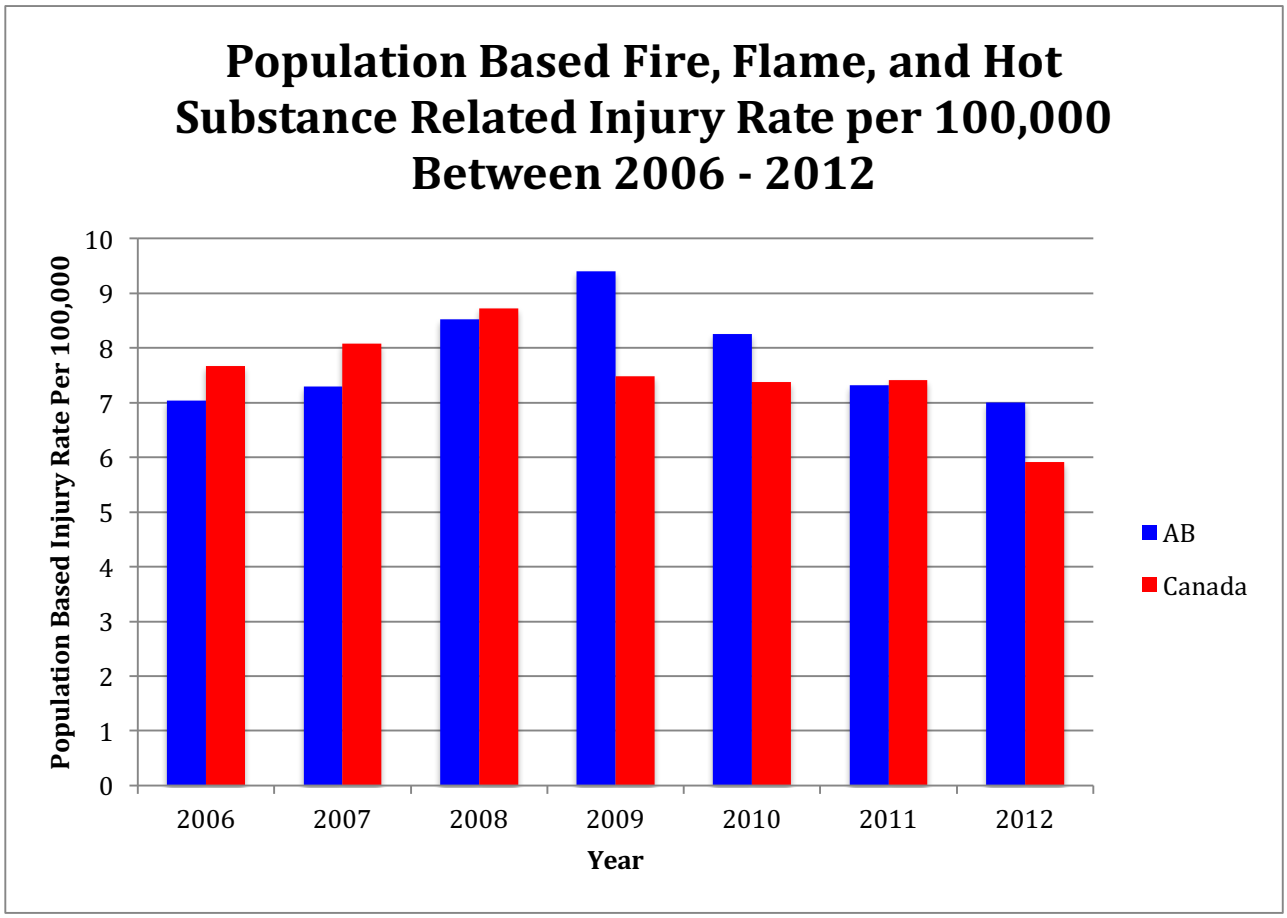

*Canadian average excludes Quebec

Figure 42: British Columbia: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



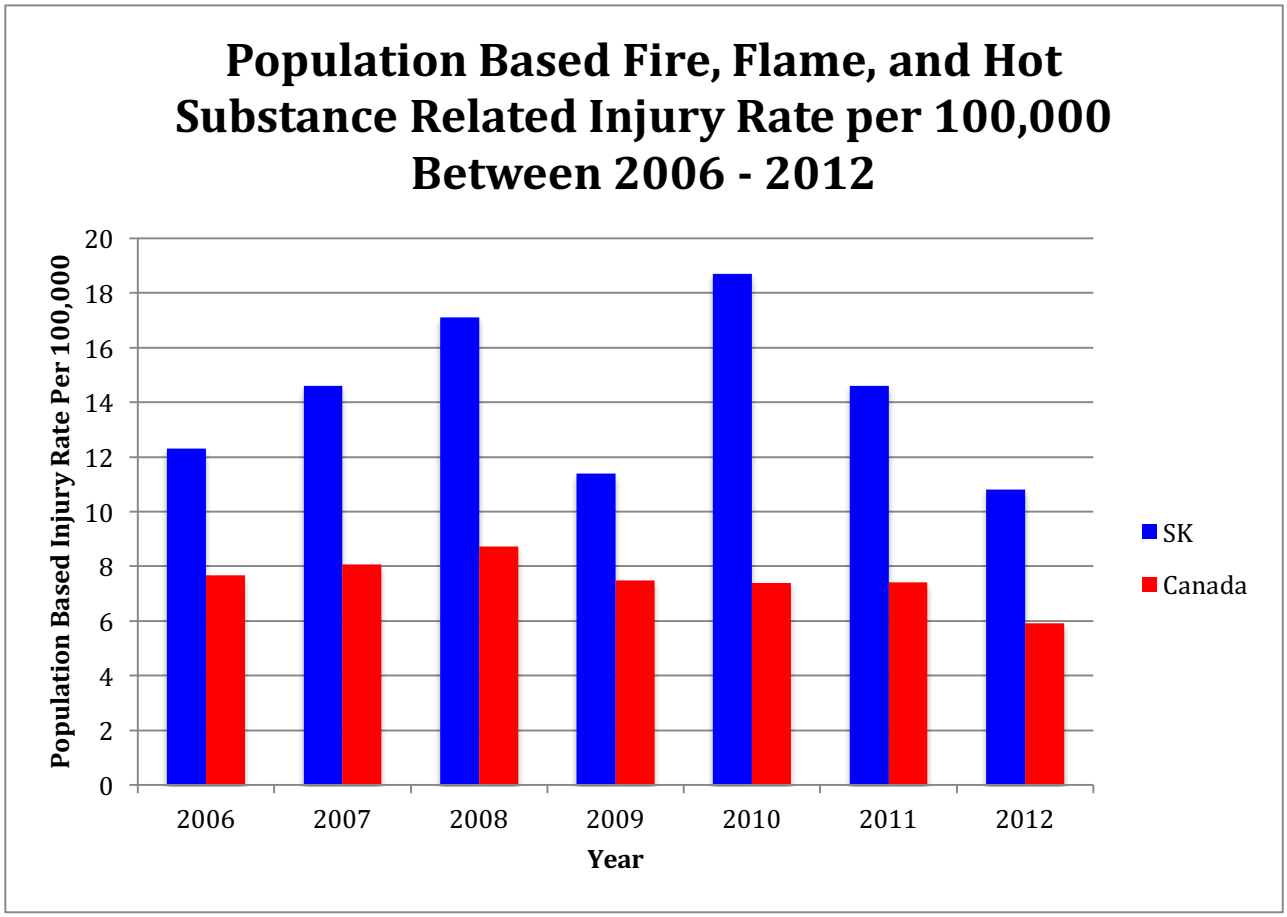

*Canadian average excludes Quebec

Figure 43: Alberta: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



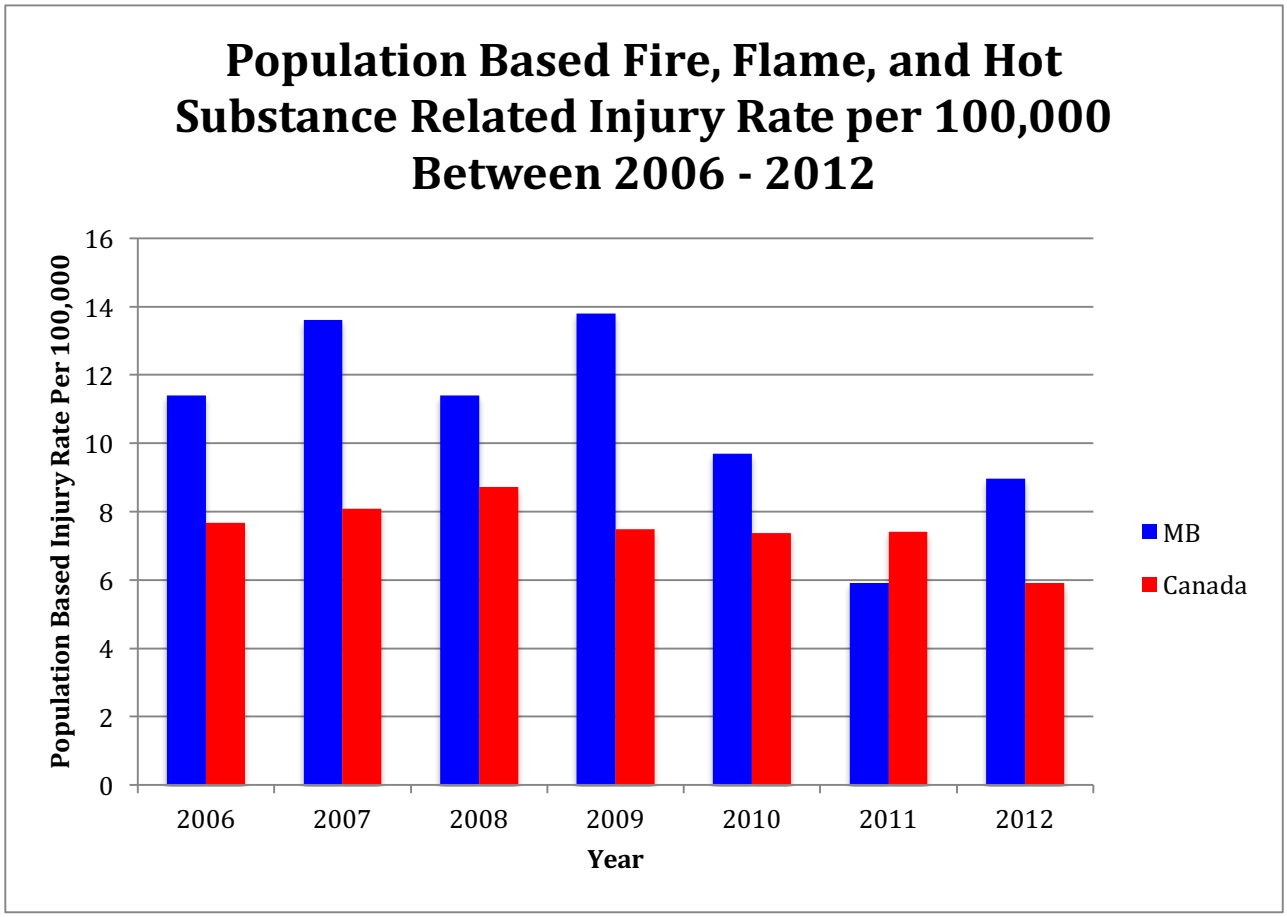

*Canadian average excludes Quebec

Figure 44: Saskatchewan: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



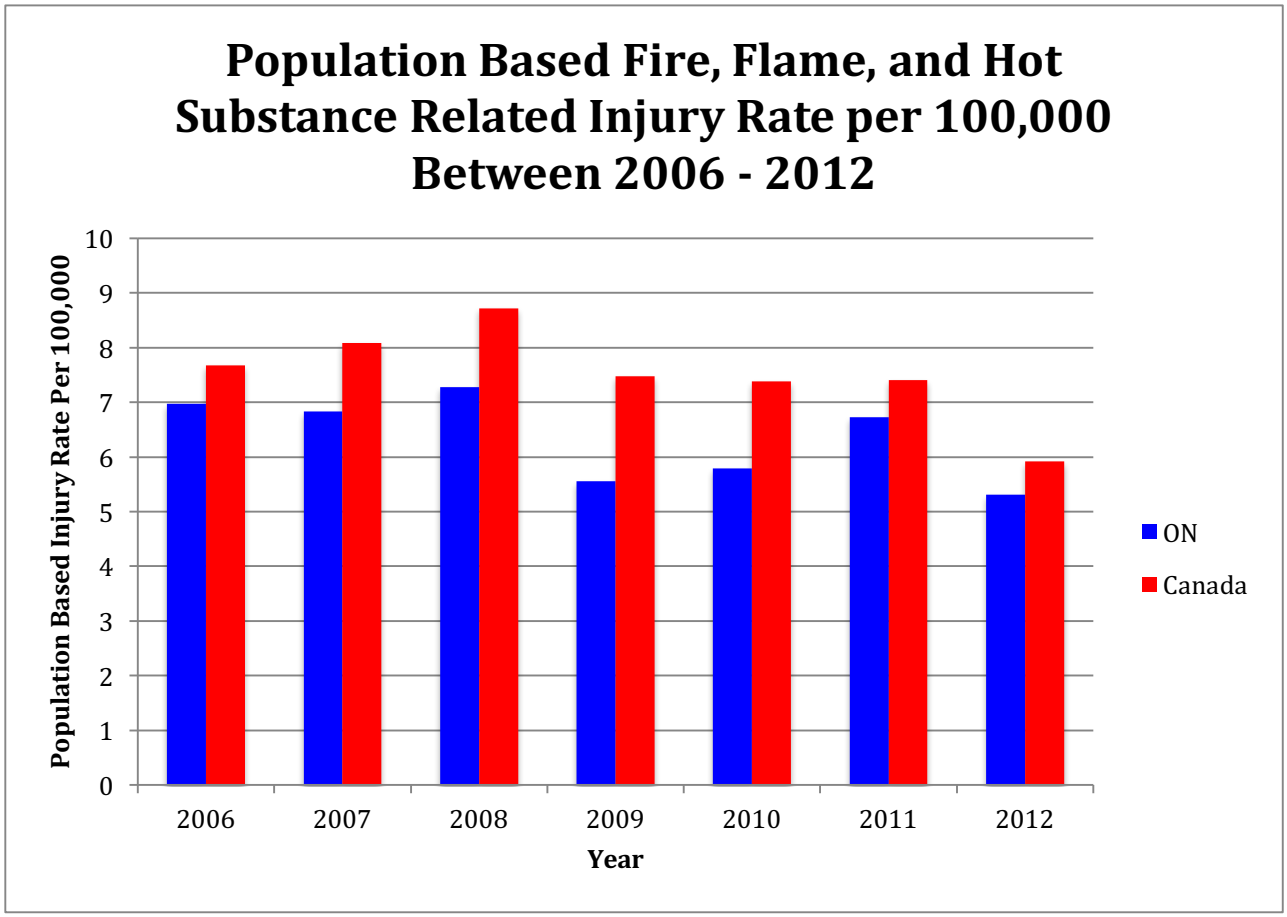

*Canadian average excludes Quebec

Figure 45: Manitoba: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



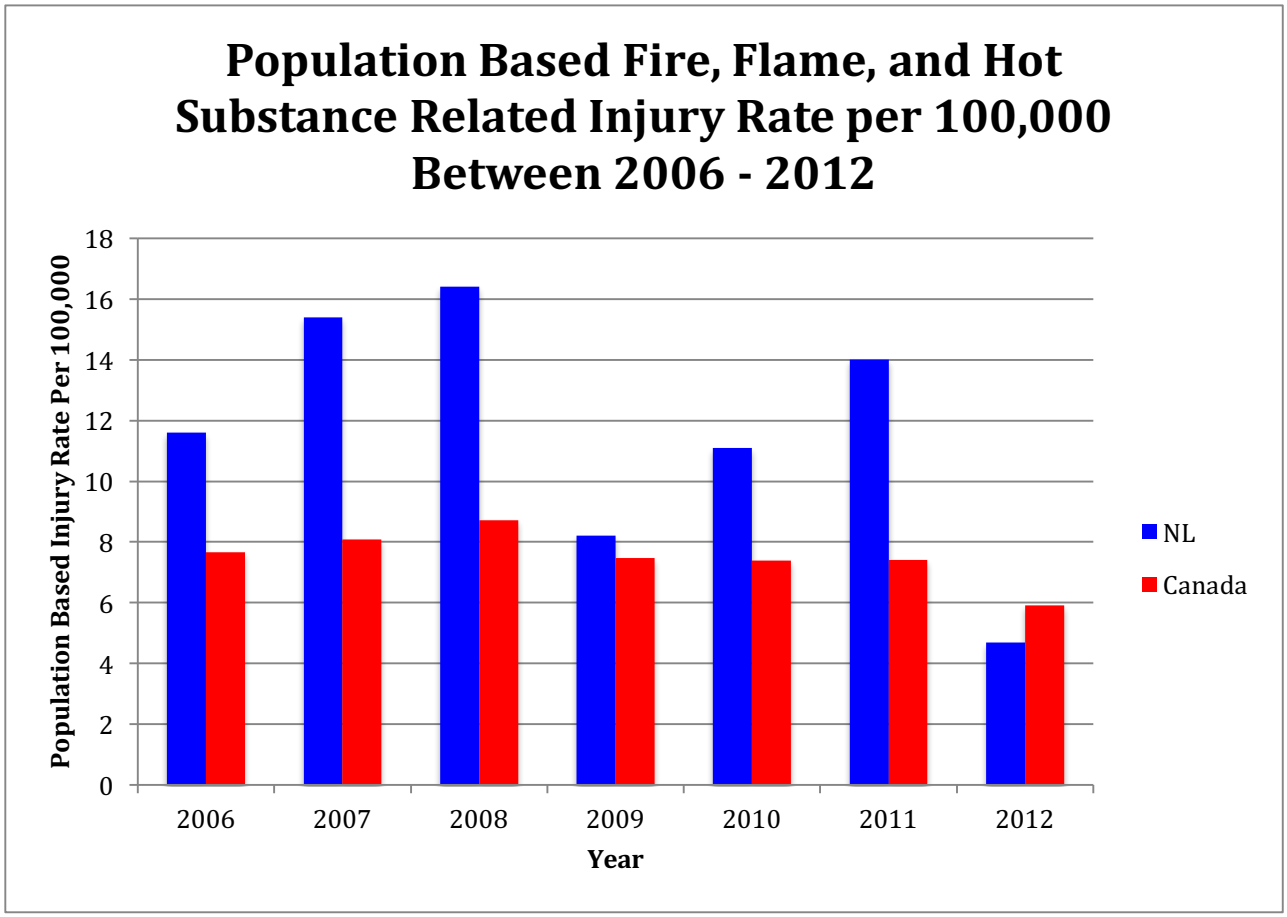

*Canadian average excludes Quebec

Figure 46: Ontario: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



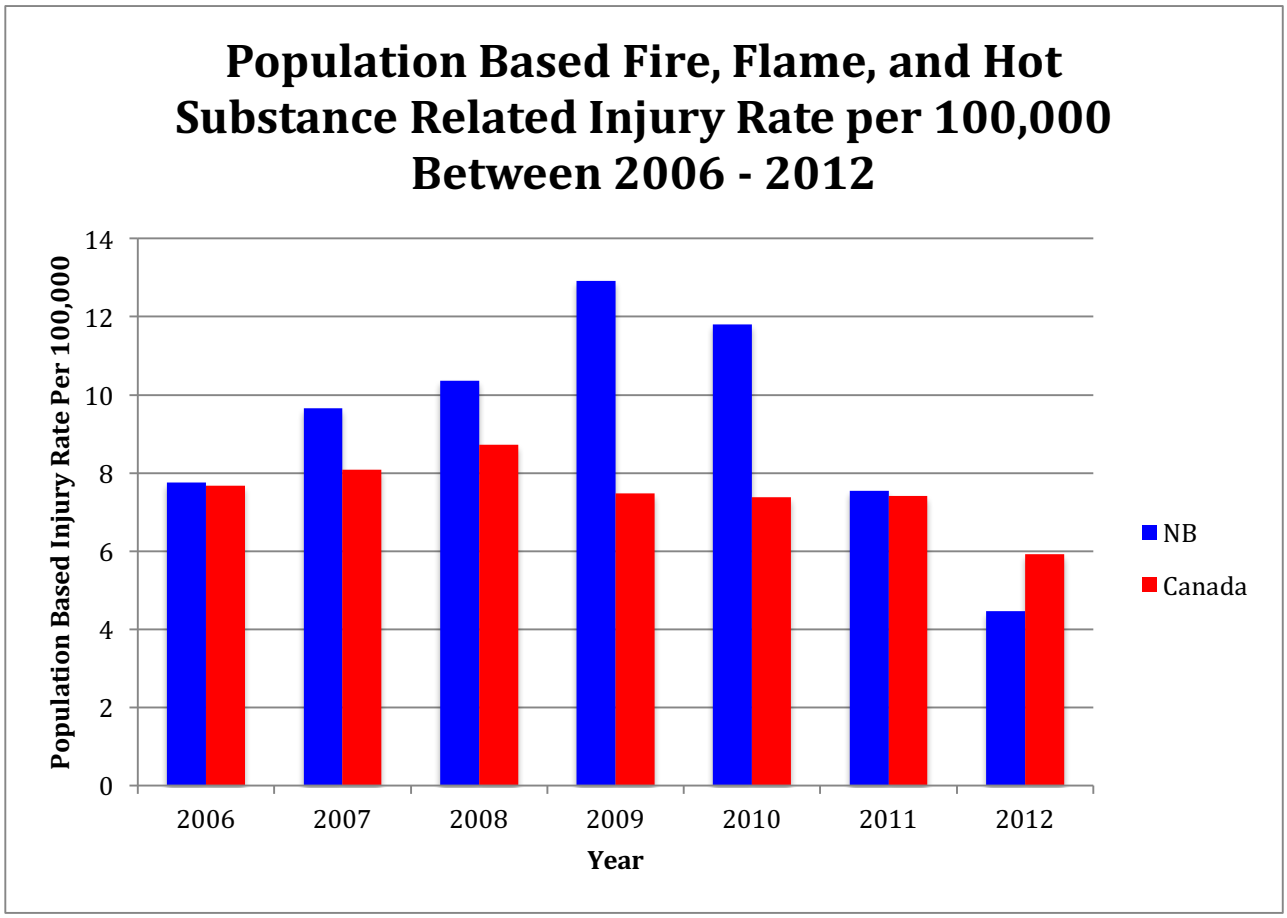

*Canadian average excludes Quebec

Figure 47: Newfoundland and Labrador: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



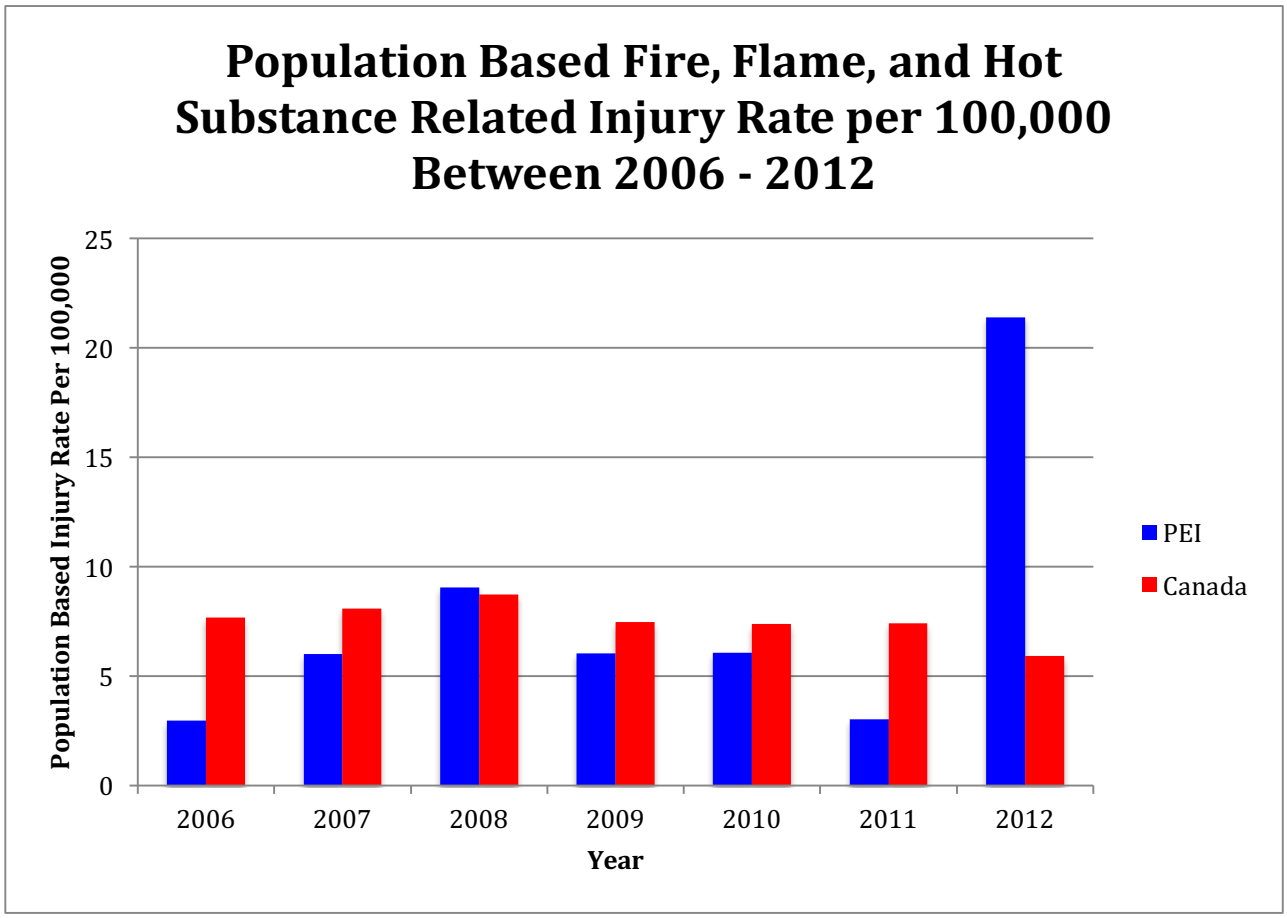

*Canadian average excludes Quebec

Figure 48: New Brunswick: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



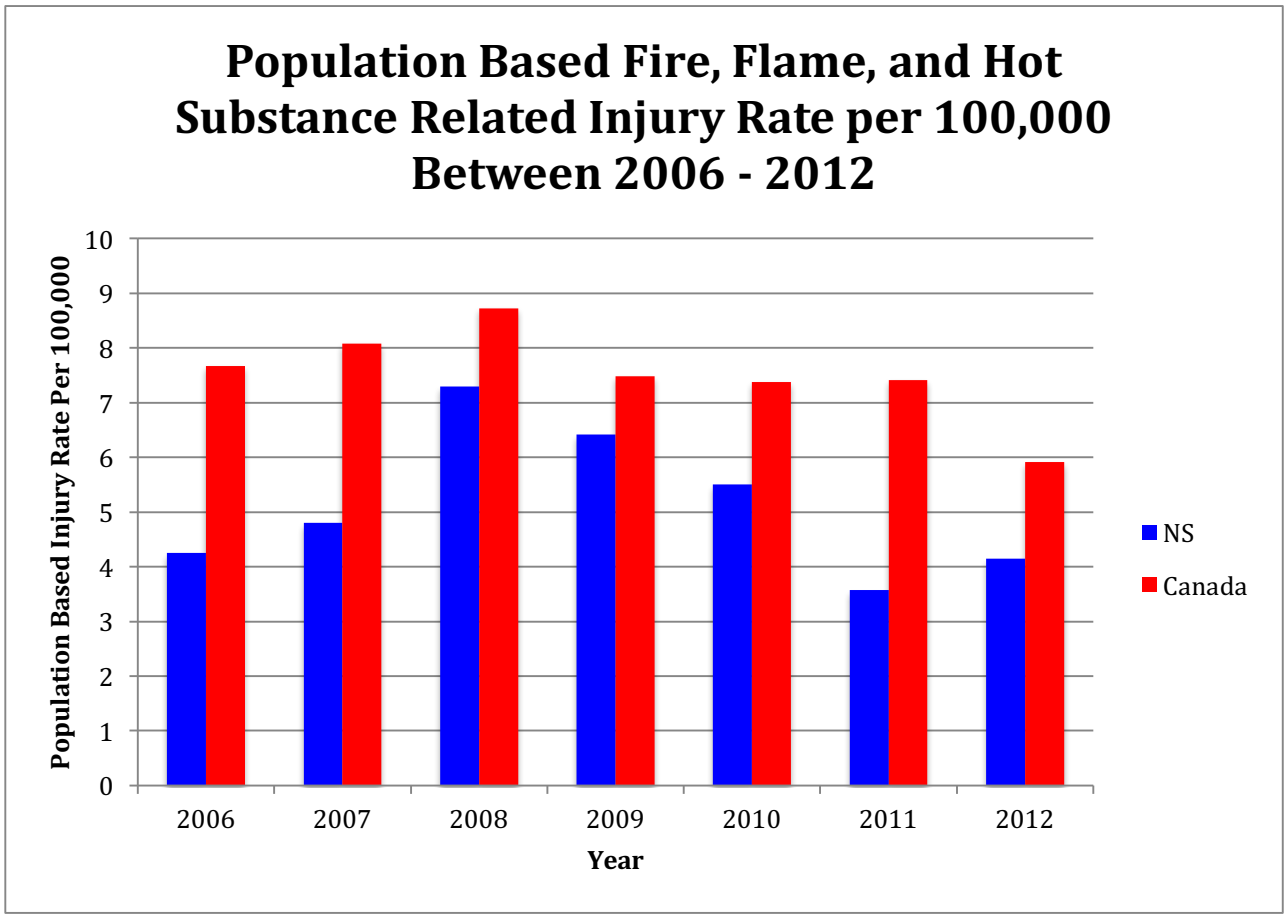

*Canadian average excludes Quebec

Figure 49: Prince Edward Island: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



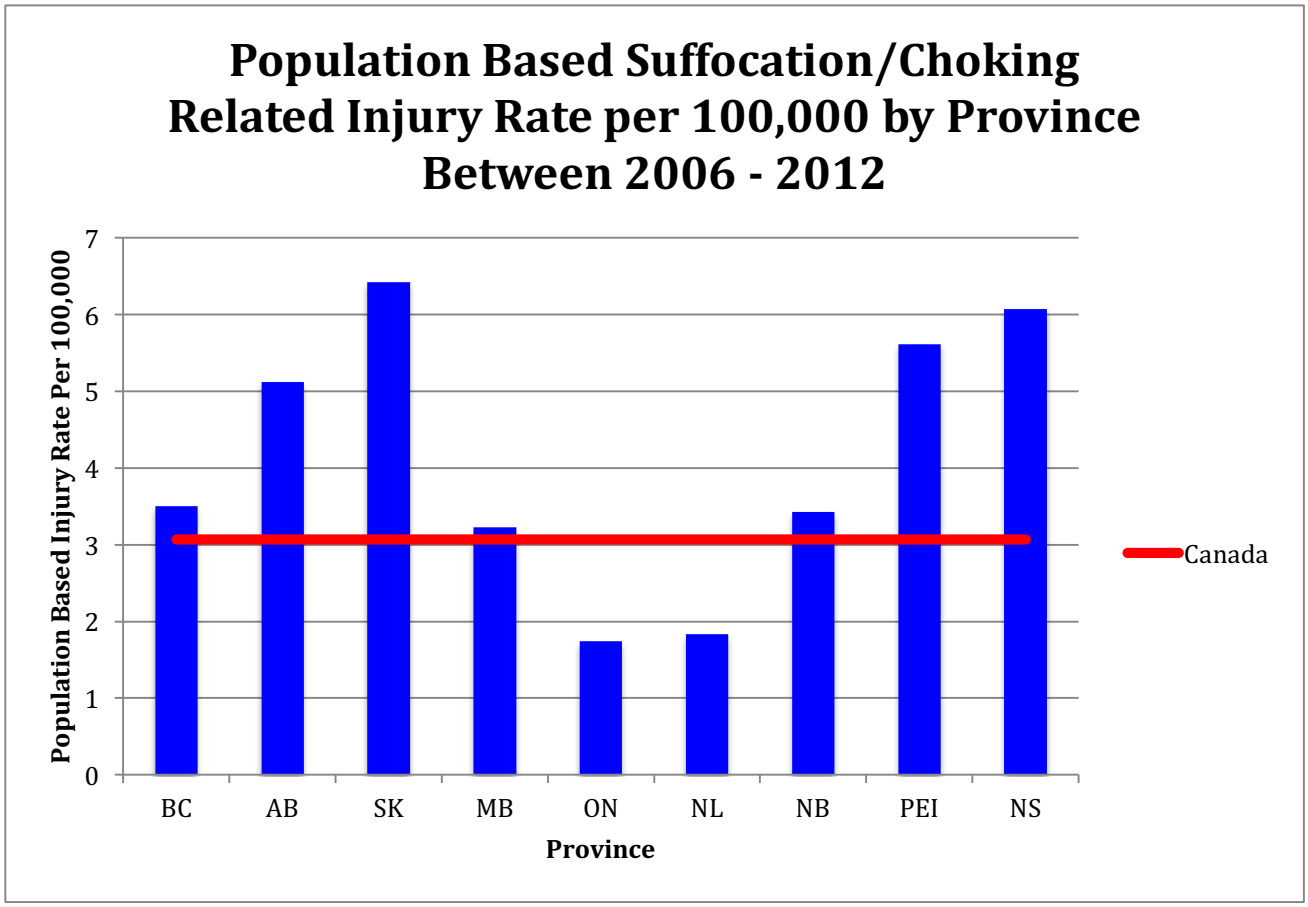

*Canadian average excludes Quebec

Figure 50: Nova Scotia: Population Based Fire, Flame, and Hot Substance Related Injury Rate per 100,000 Between 2006 – 2012



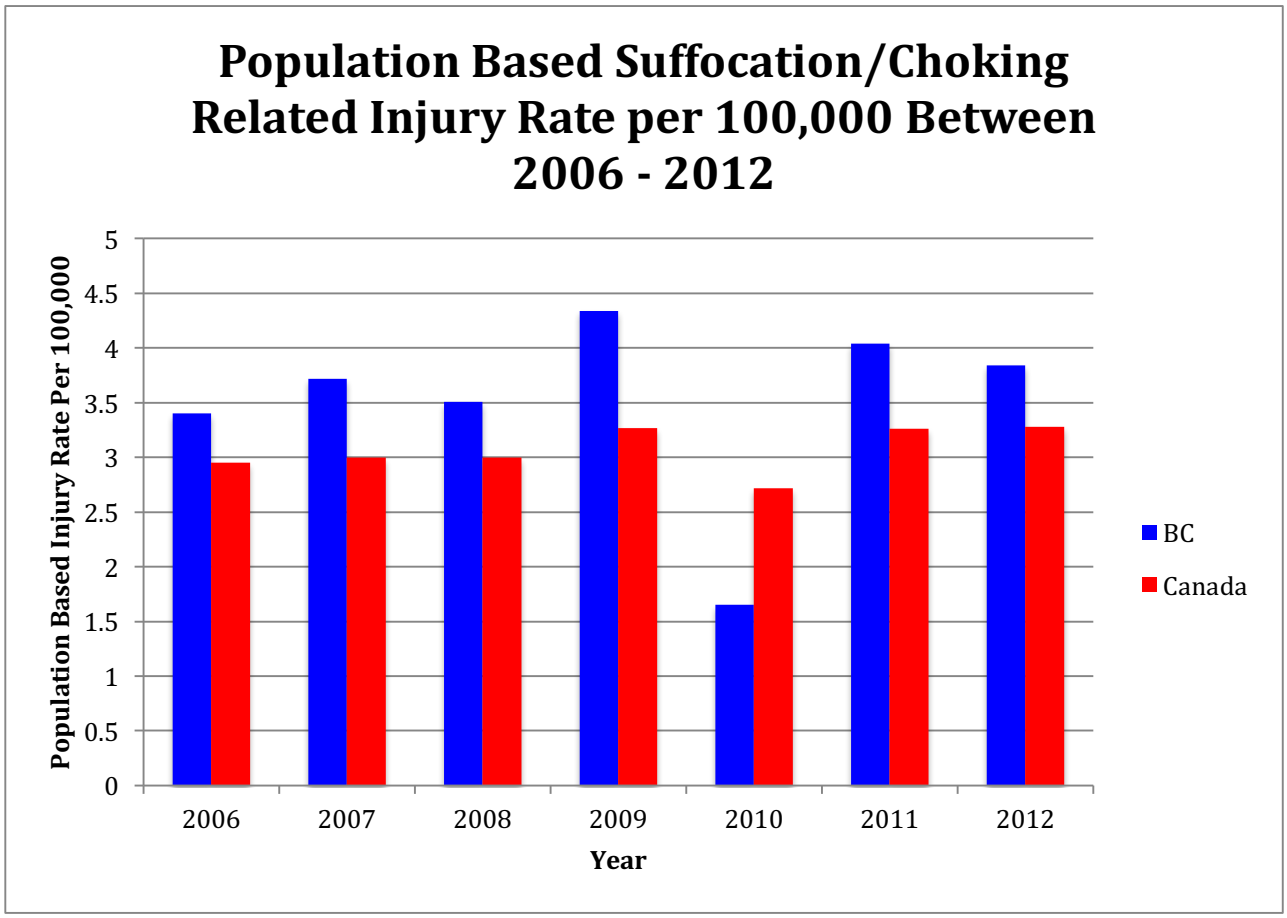

*Canadian average excludes Quebec

Figure 51: Population Based Suffocation/Choking Related Injury Rate per 100,000 by Canadian Province between 2006 – 2012



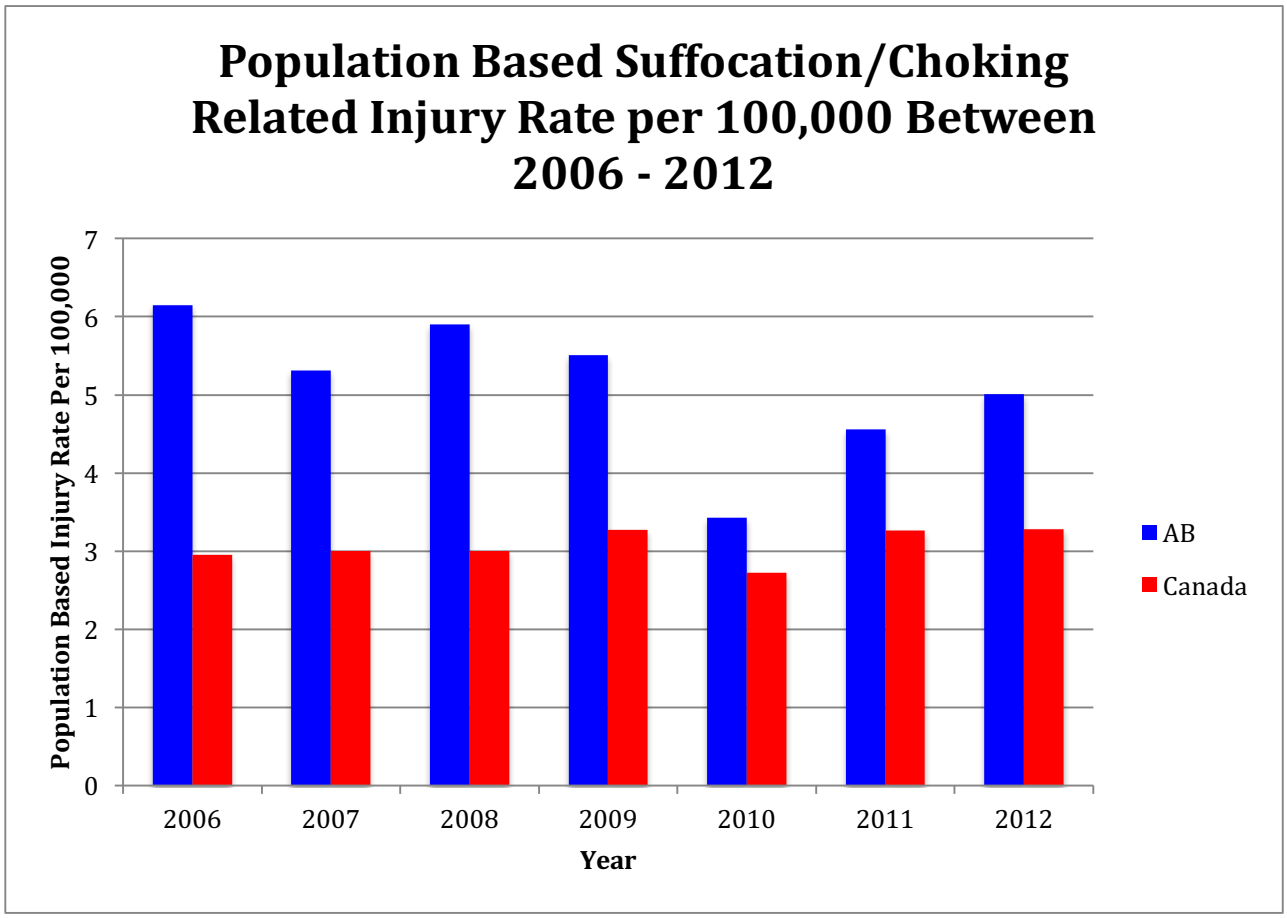

*Canadian average excludes Quebec

Figure 52: British Columbia: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



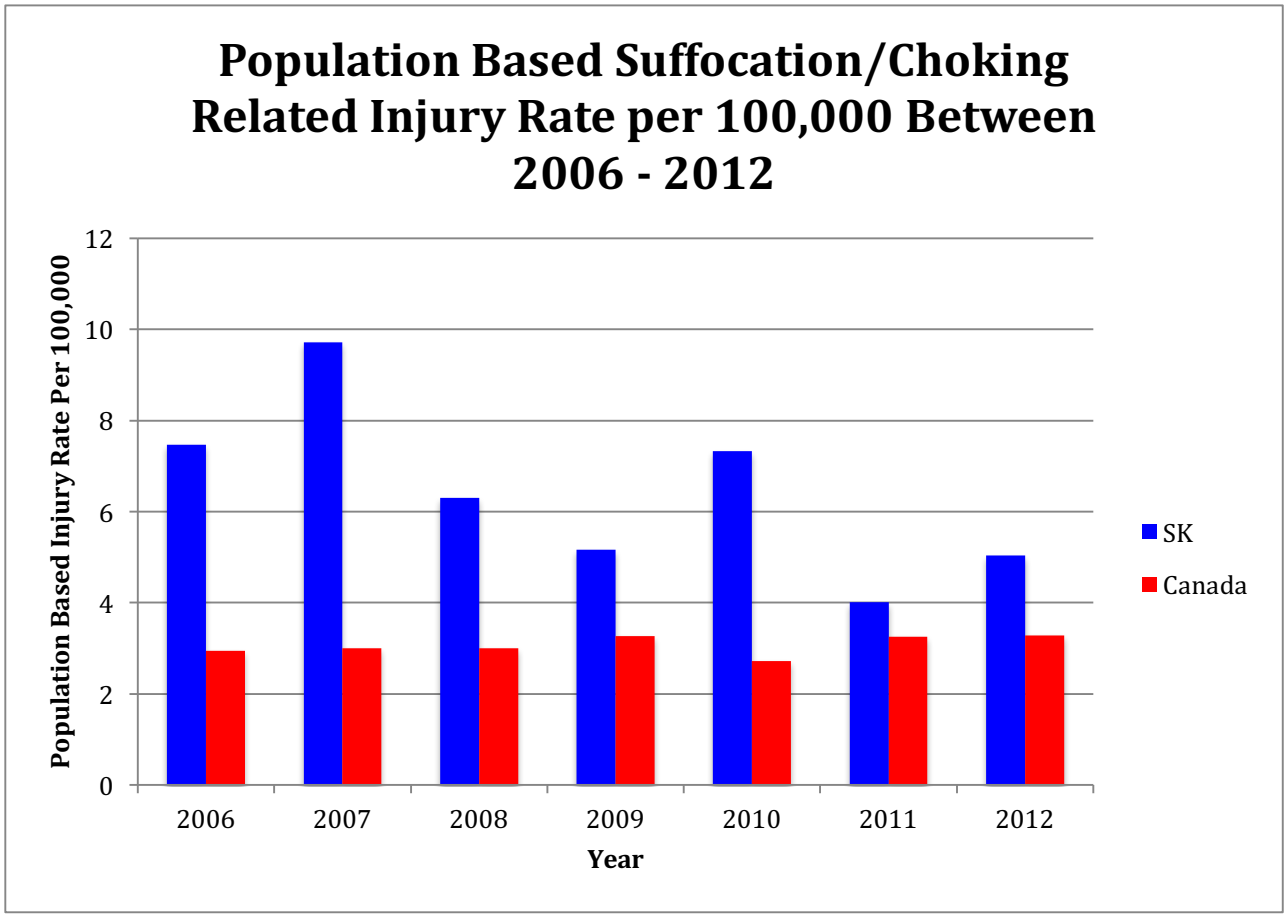

*Canadian average excludes Quebec

Figure 53: Alberta: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



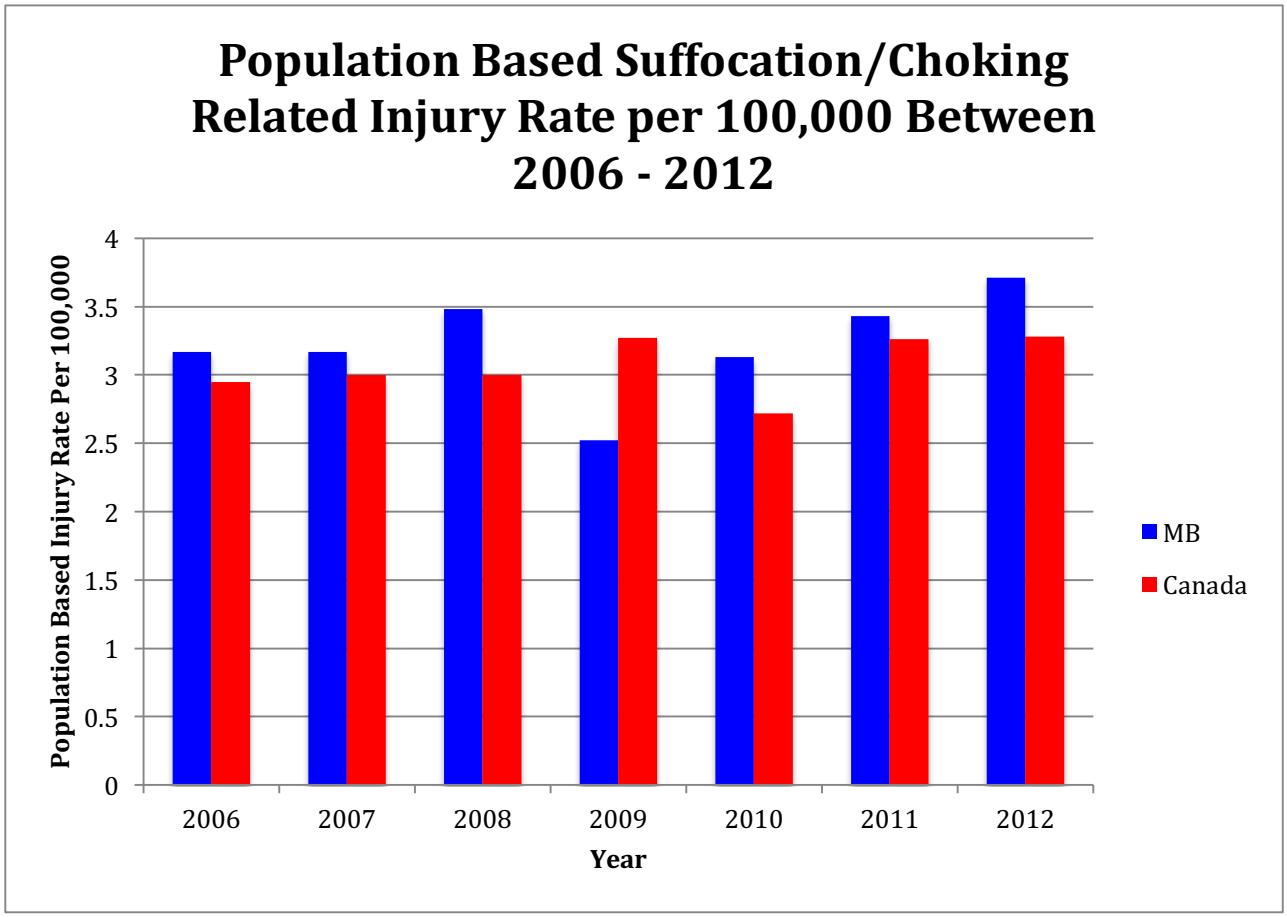

*Canadian average excludes Quebec

Figure 54: Saskatchewan: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



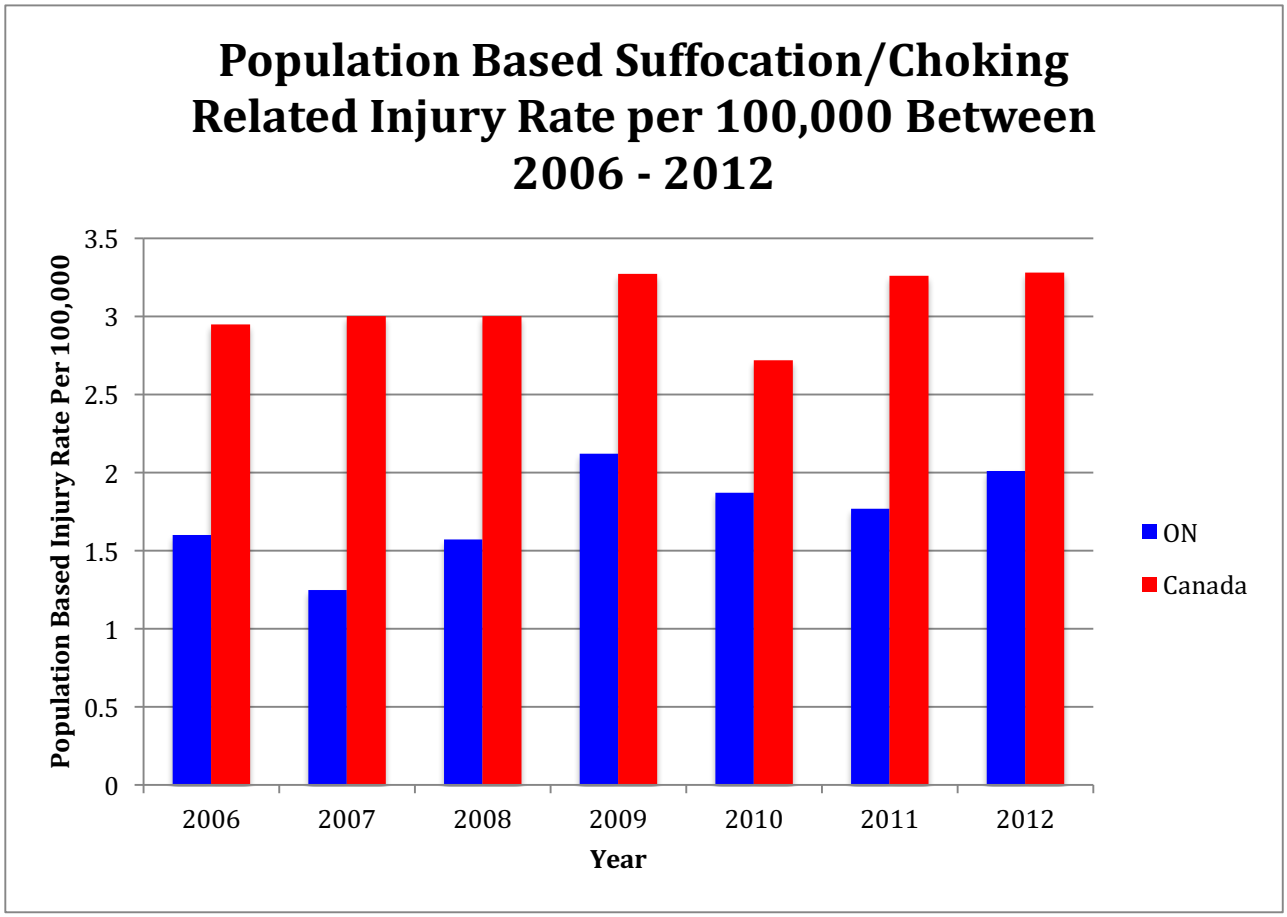

*Canadian average excludes Quebec

Figure 55: Manitoba: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



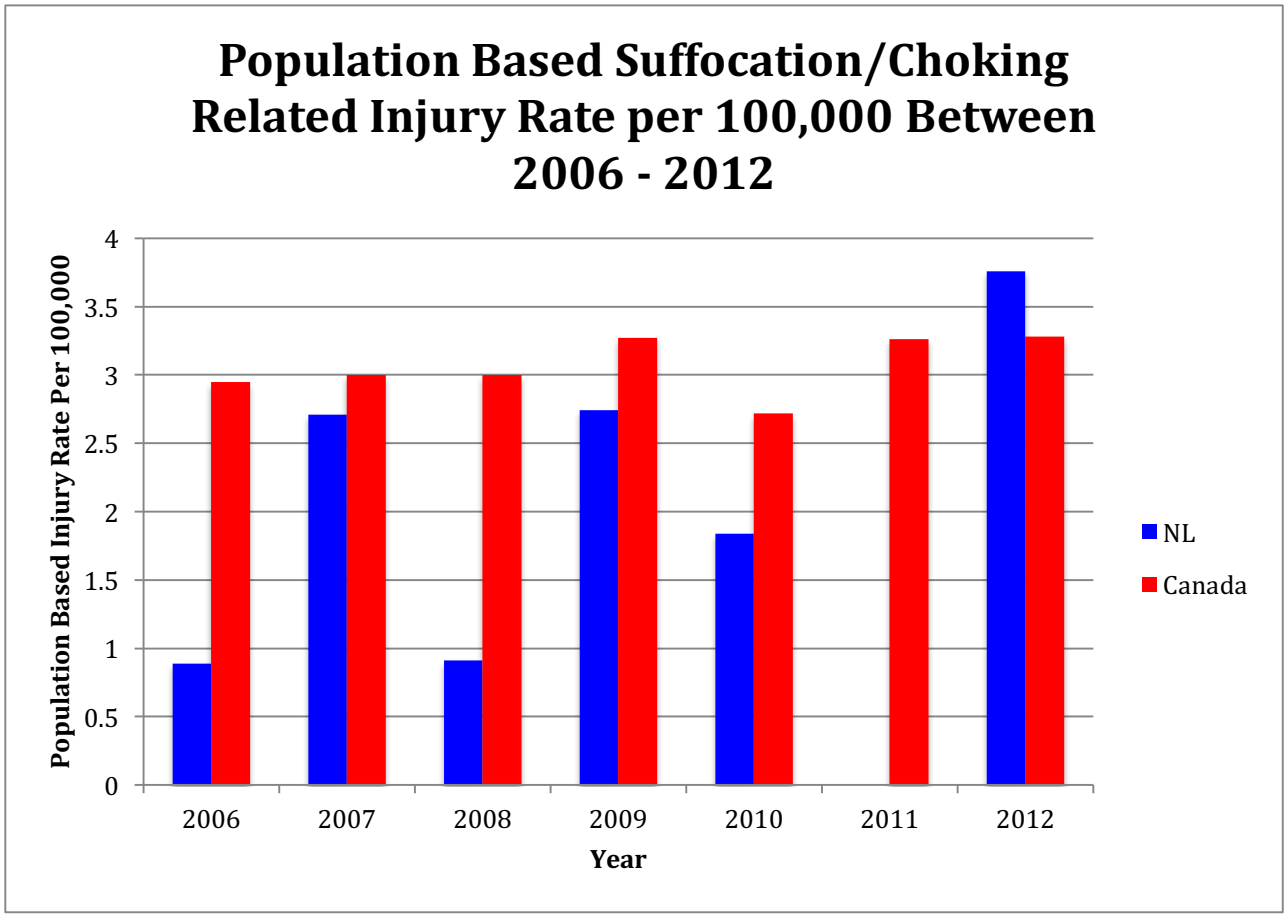

*Canadian average excludes Quebec

Figure 56: Ontario: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



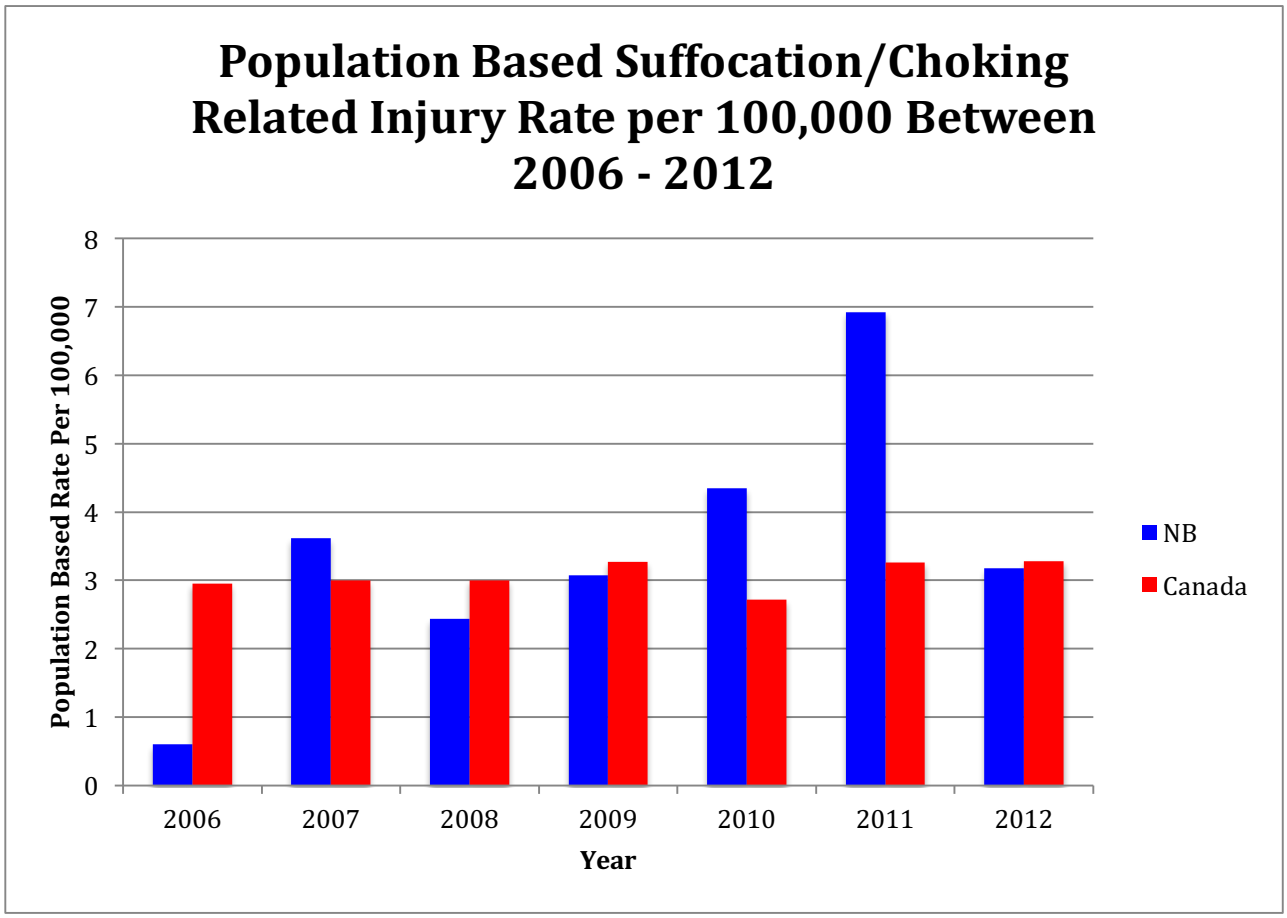

*Canadian average excludes Quebec

Figure 57: Newfoundland and Labrador: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



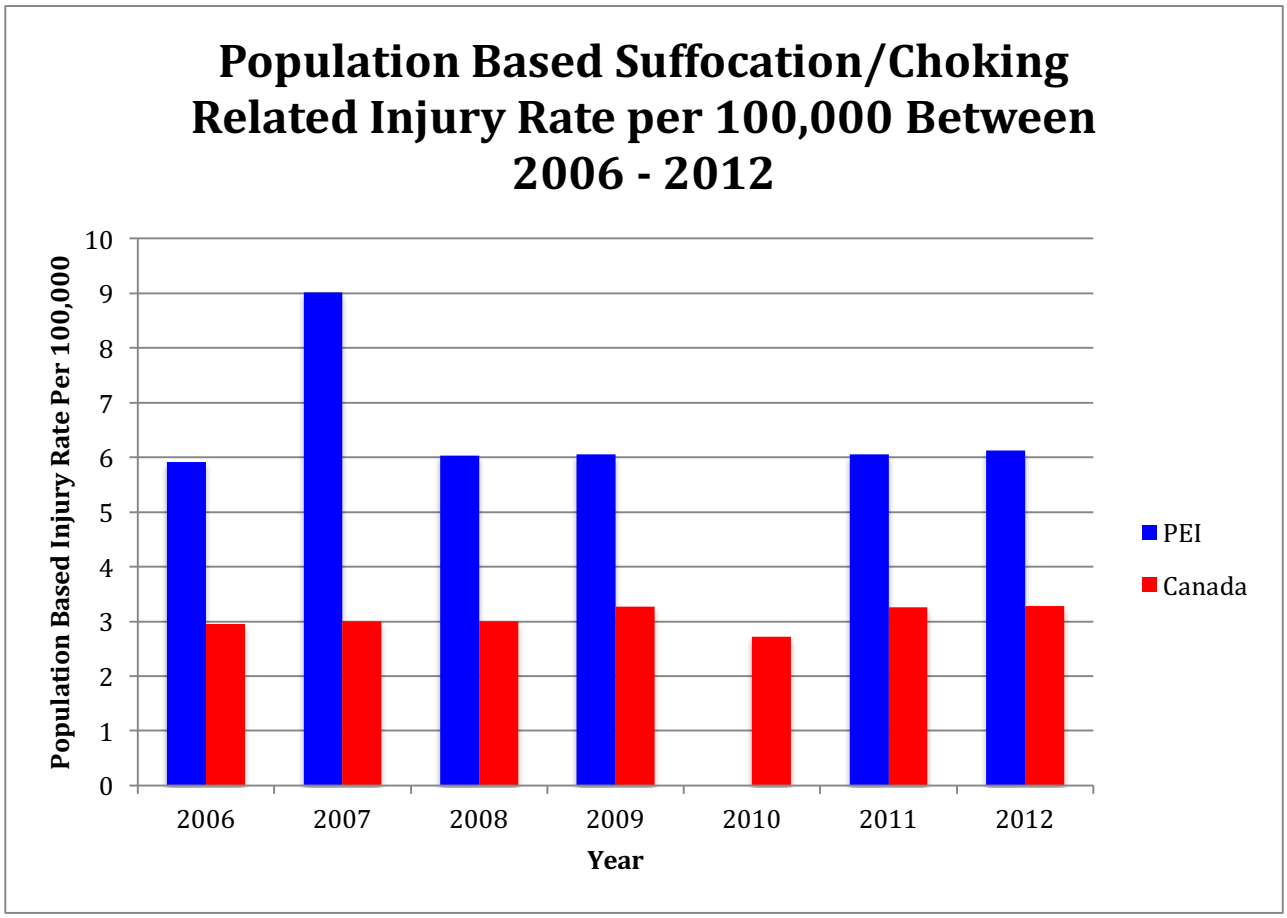

*Canadian average excludes Quebec

Figure 58: New Brunswick: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



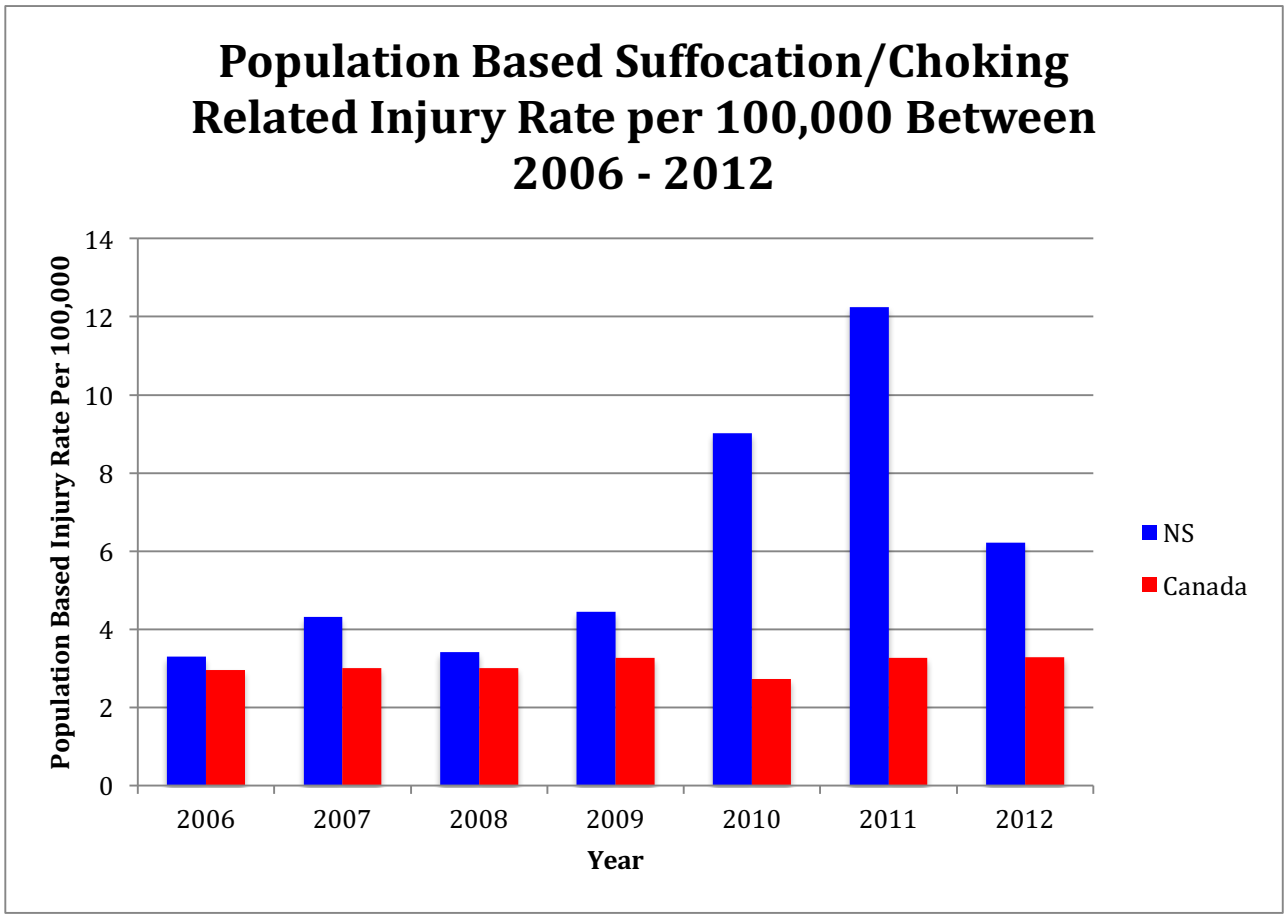

*Canadian average excludes Quebec

Figure 59: Prince Edward Island: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



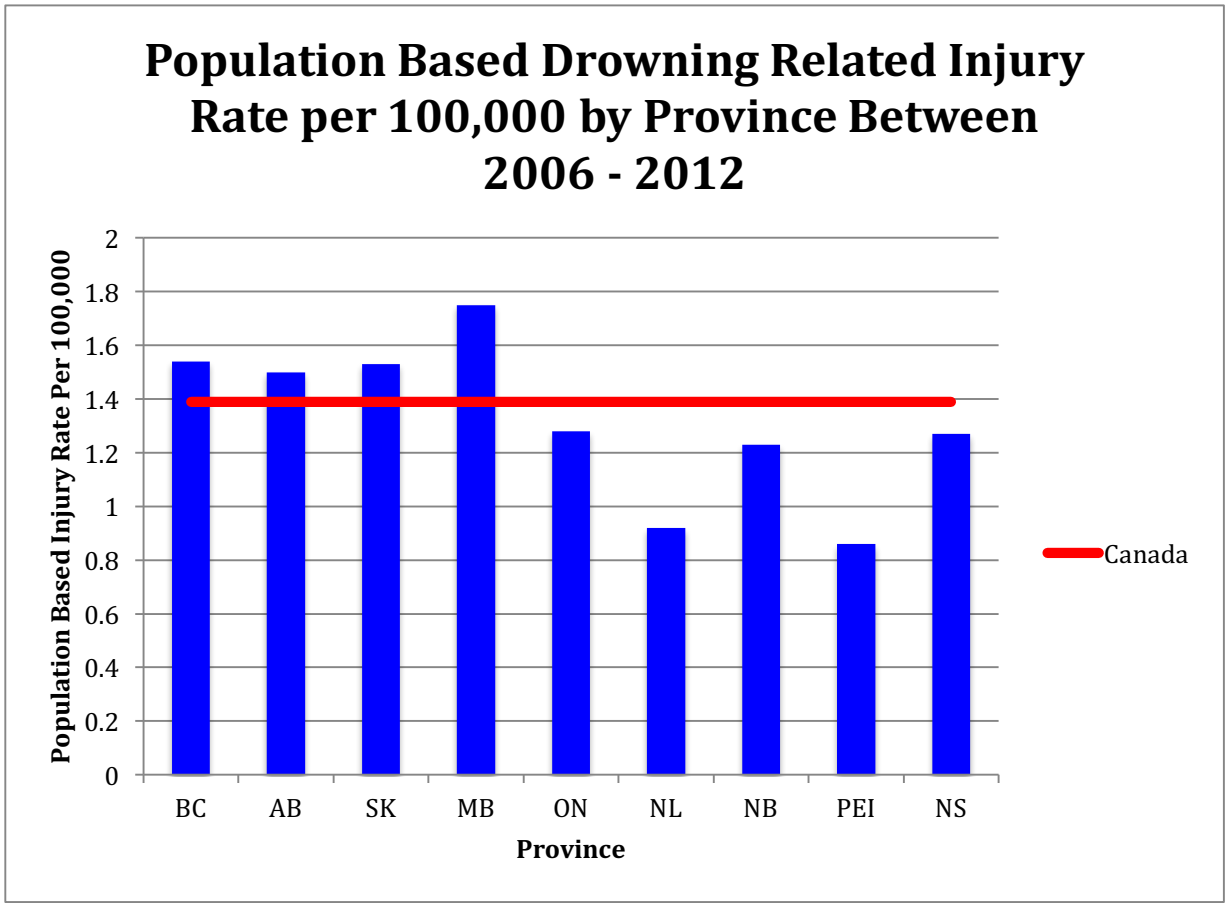

*Canadian average excludes Quebec

Figure 60: Nova Scotia: Population Based Suffocation/Choking Related Injury Rate per 100,000 Between 2006 – 2012



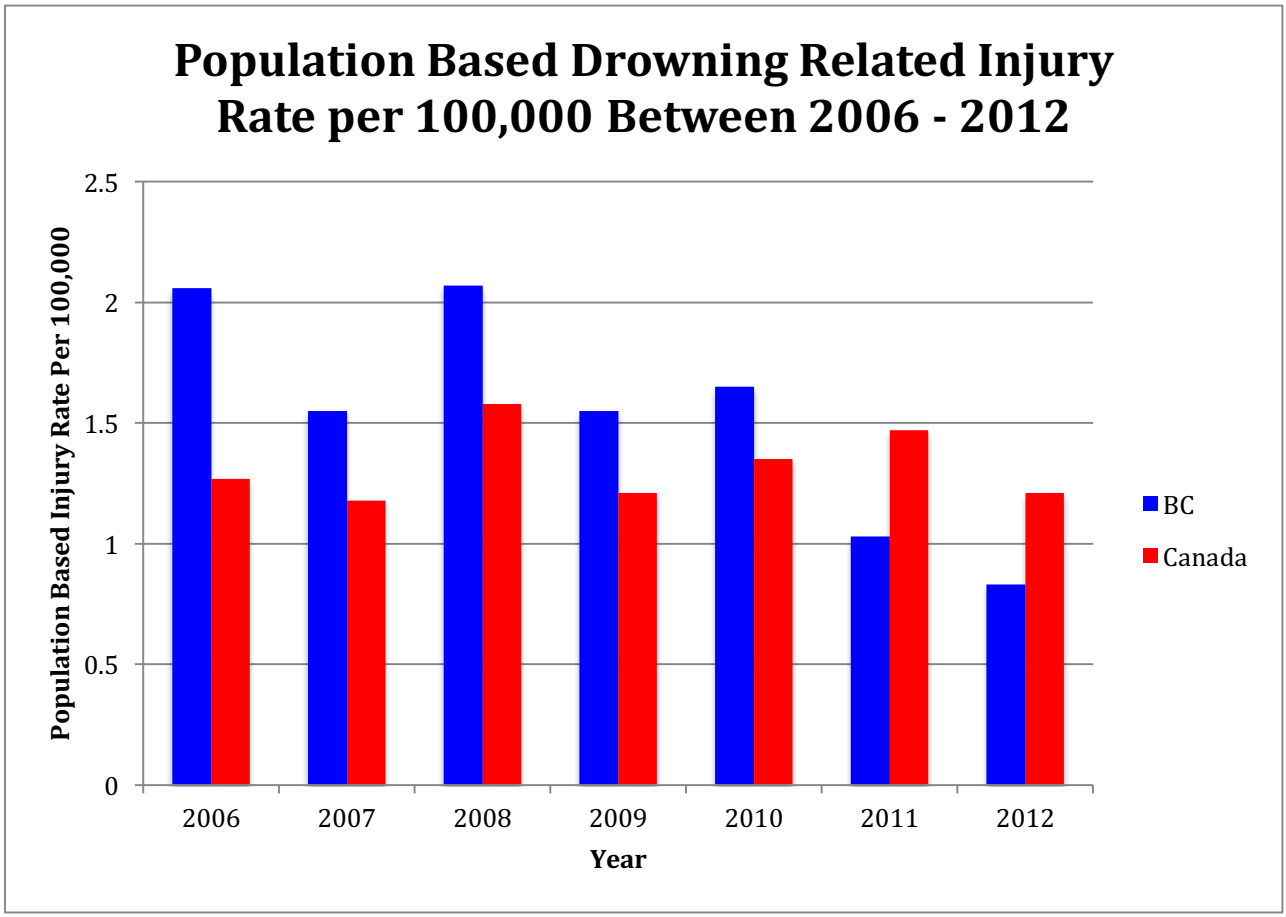

*Canadian average excludes Quebec

Figure 61: Population Based Drowning Related Injury Rate per 100,000 by Canadian Province between 2006 – 2012



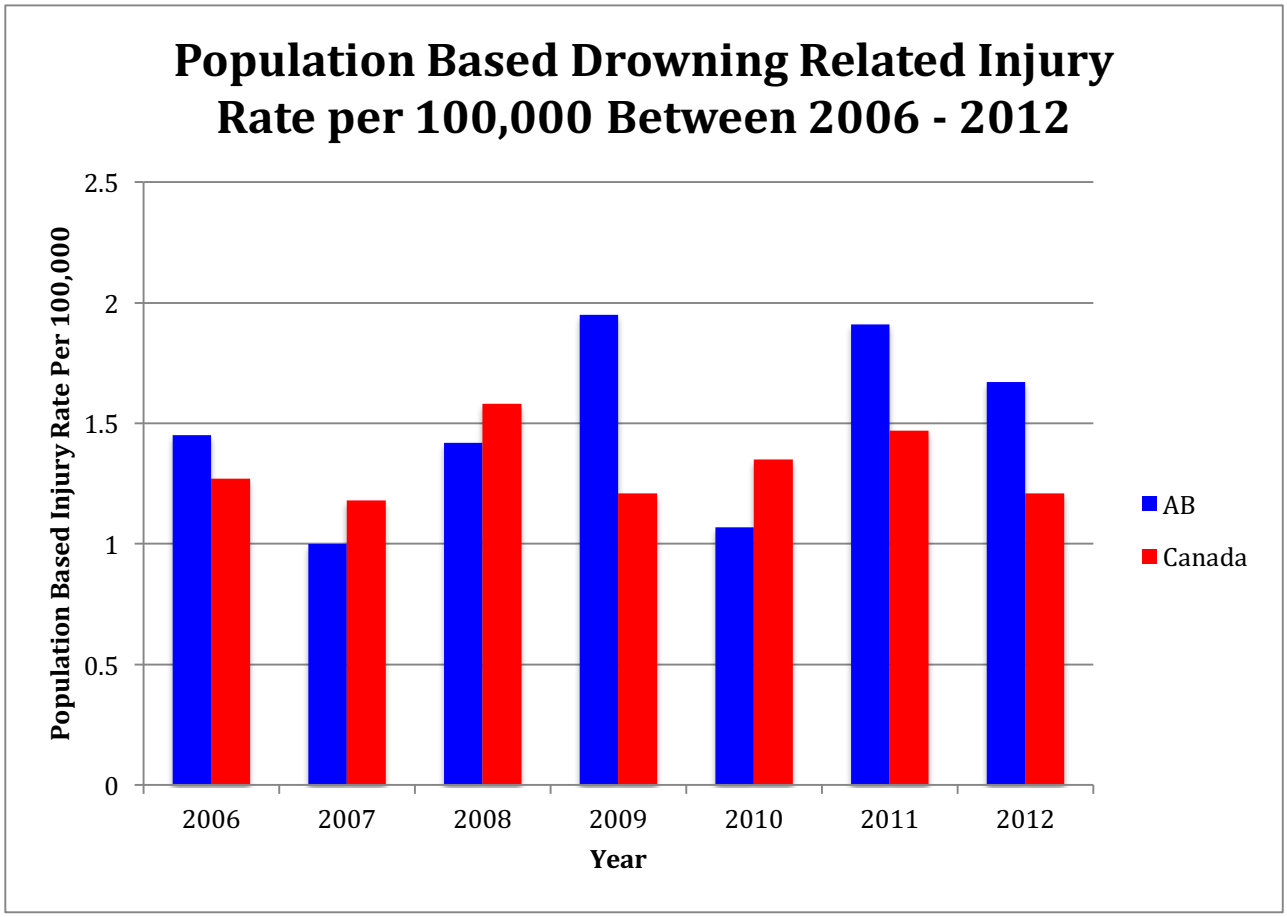

*Canadian average excludes Quebec

Figure 62: British Columbia: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



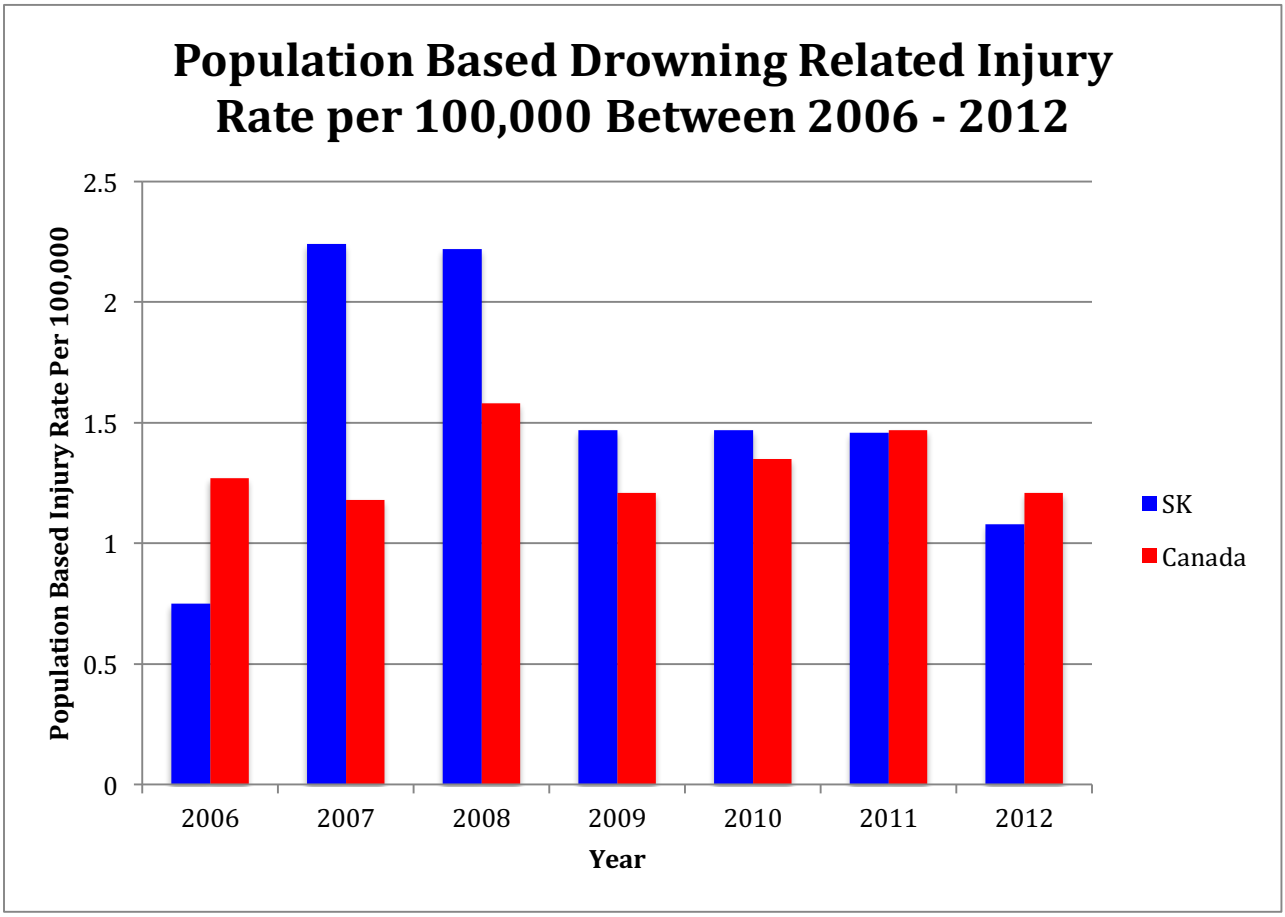

*Canadian average excludes Quebec

Figure 63: Alberta: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



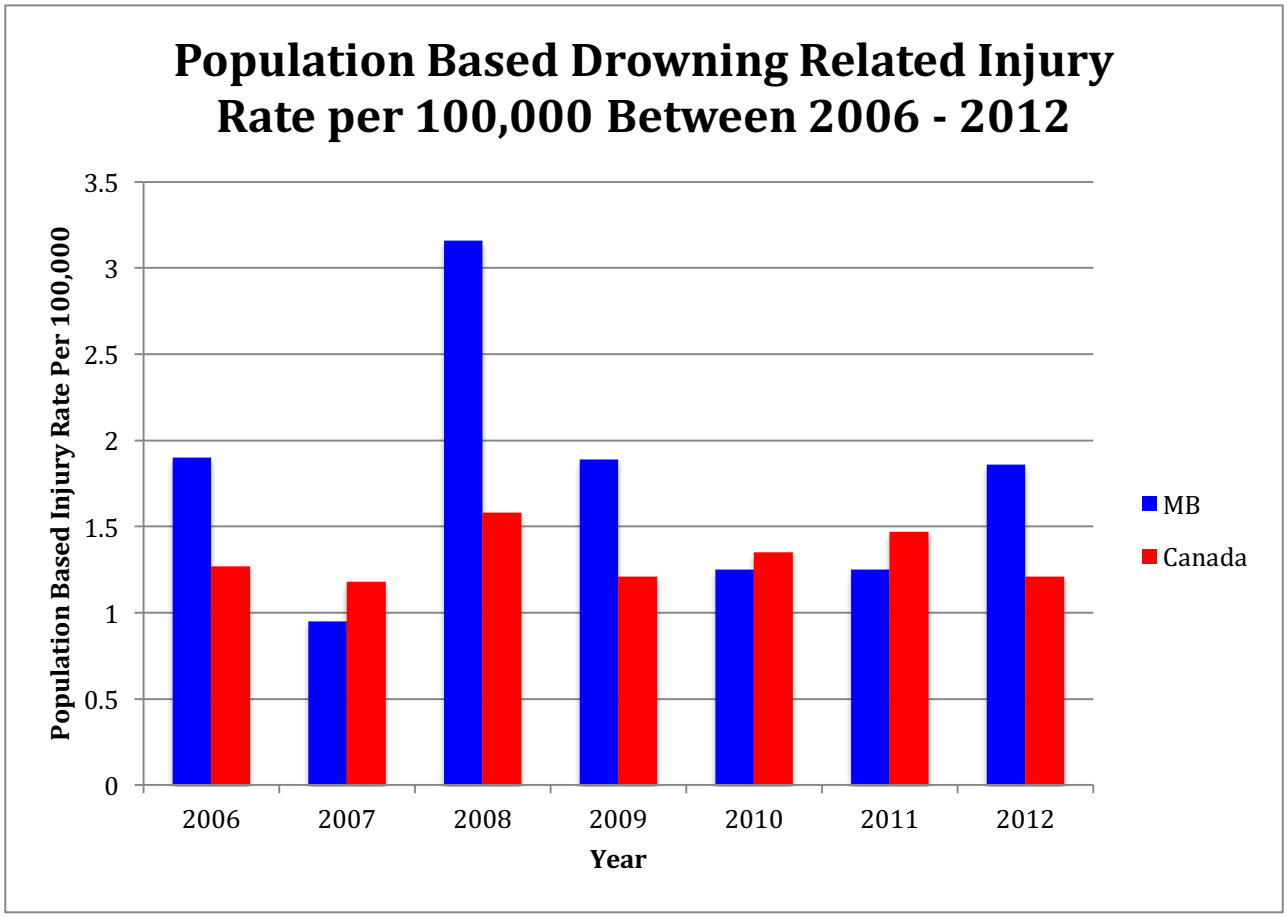

*Canadian average excludes Quebec

Figure 64: Saskatchewan: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



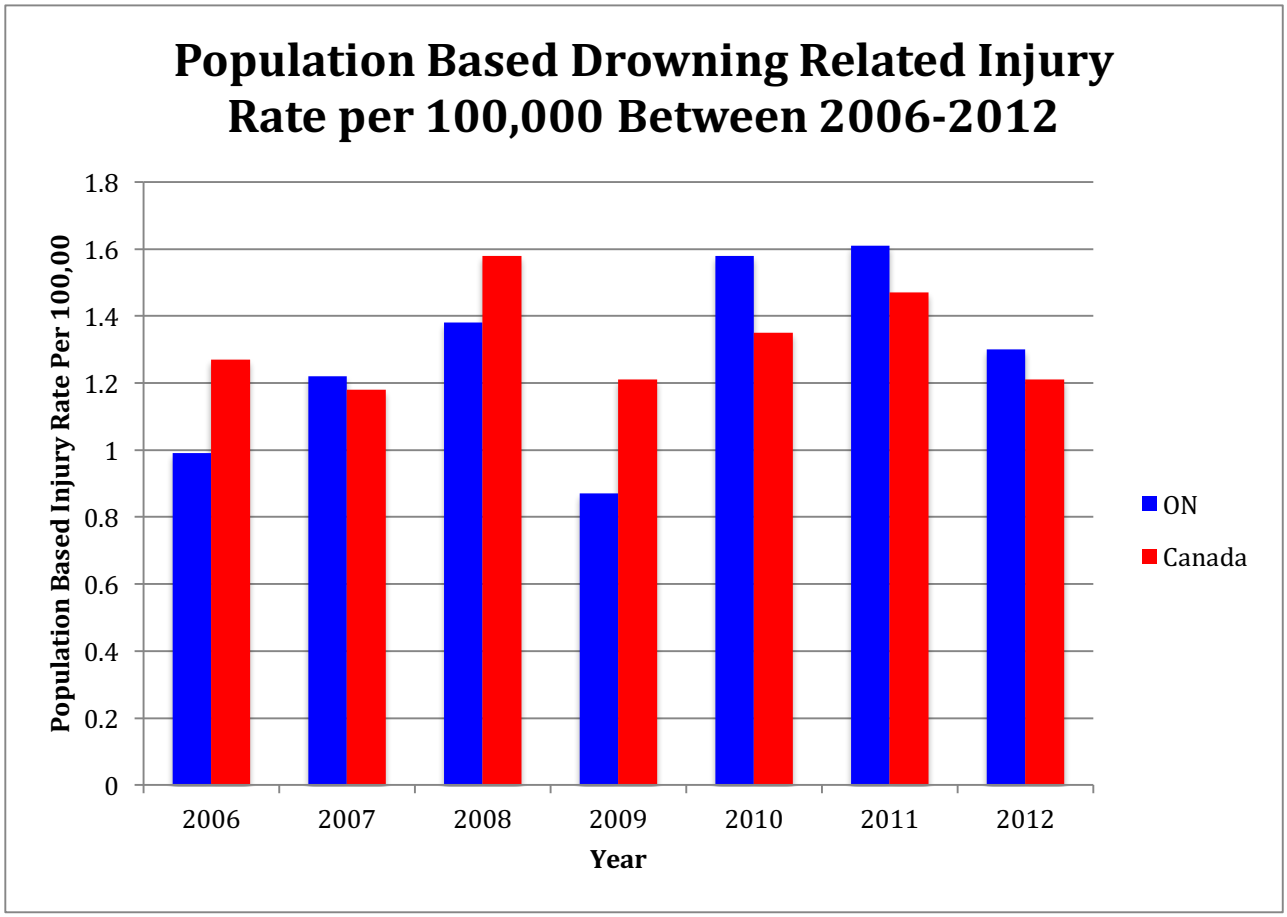

*Canadian average excludes Quebec

Figure 65: Manitoba: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



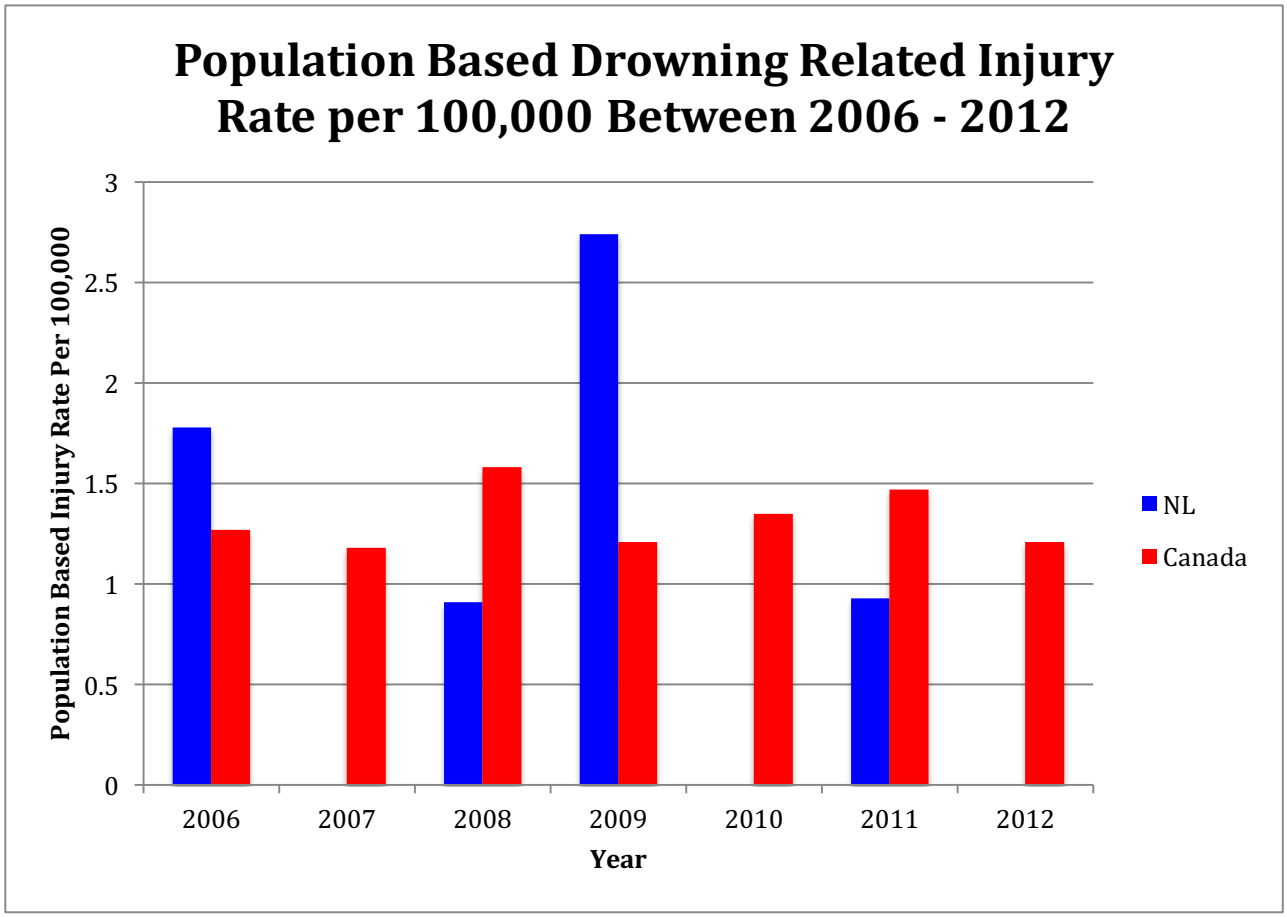

*Canadian average excludes Quebec

Figure 66: Ontario: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



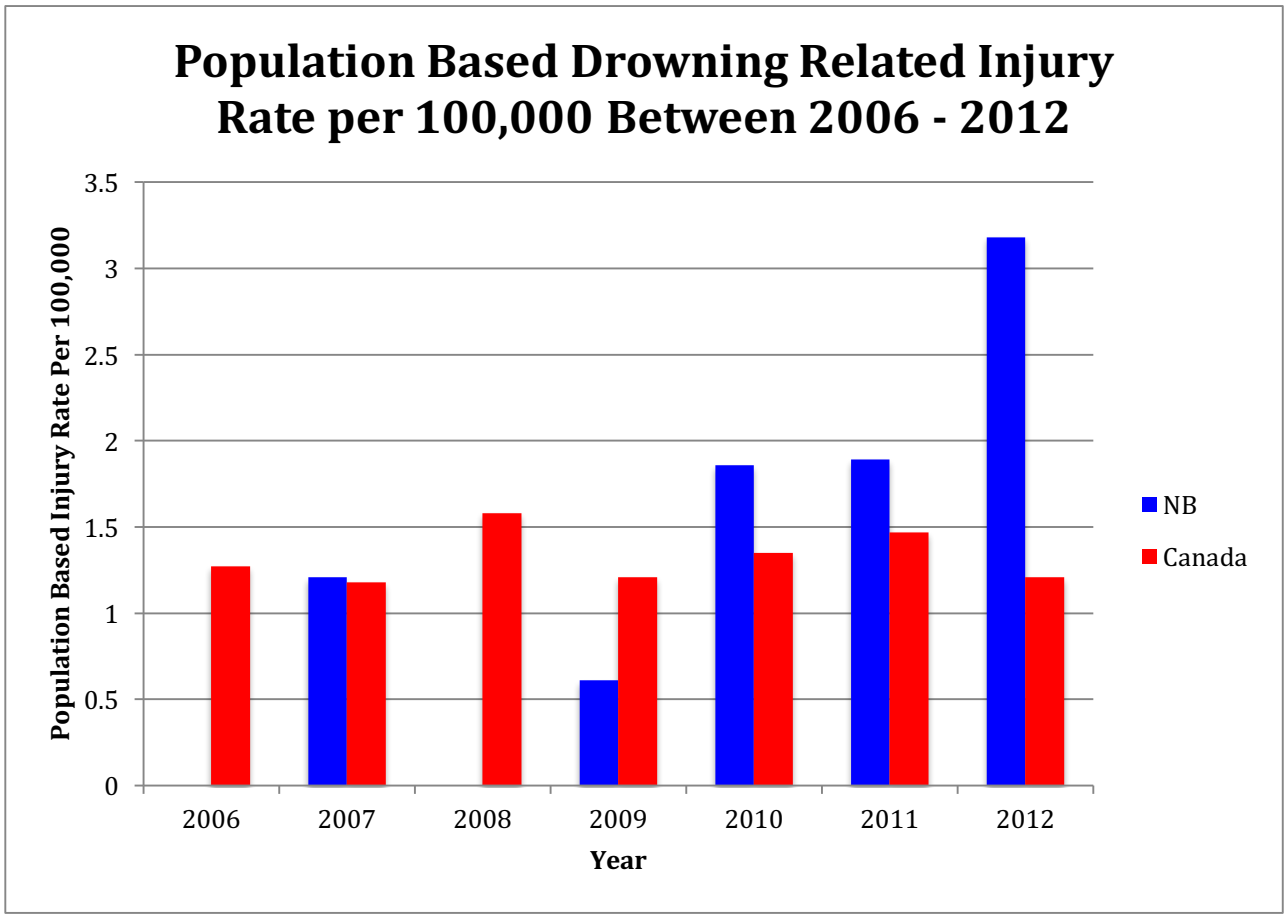

*Canadian average excludes Quebec

Figure 67: Newfoundland and Labrador: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



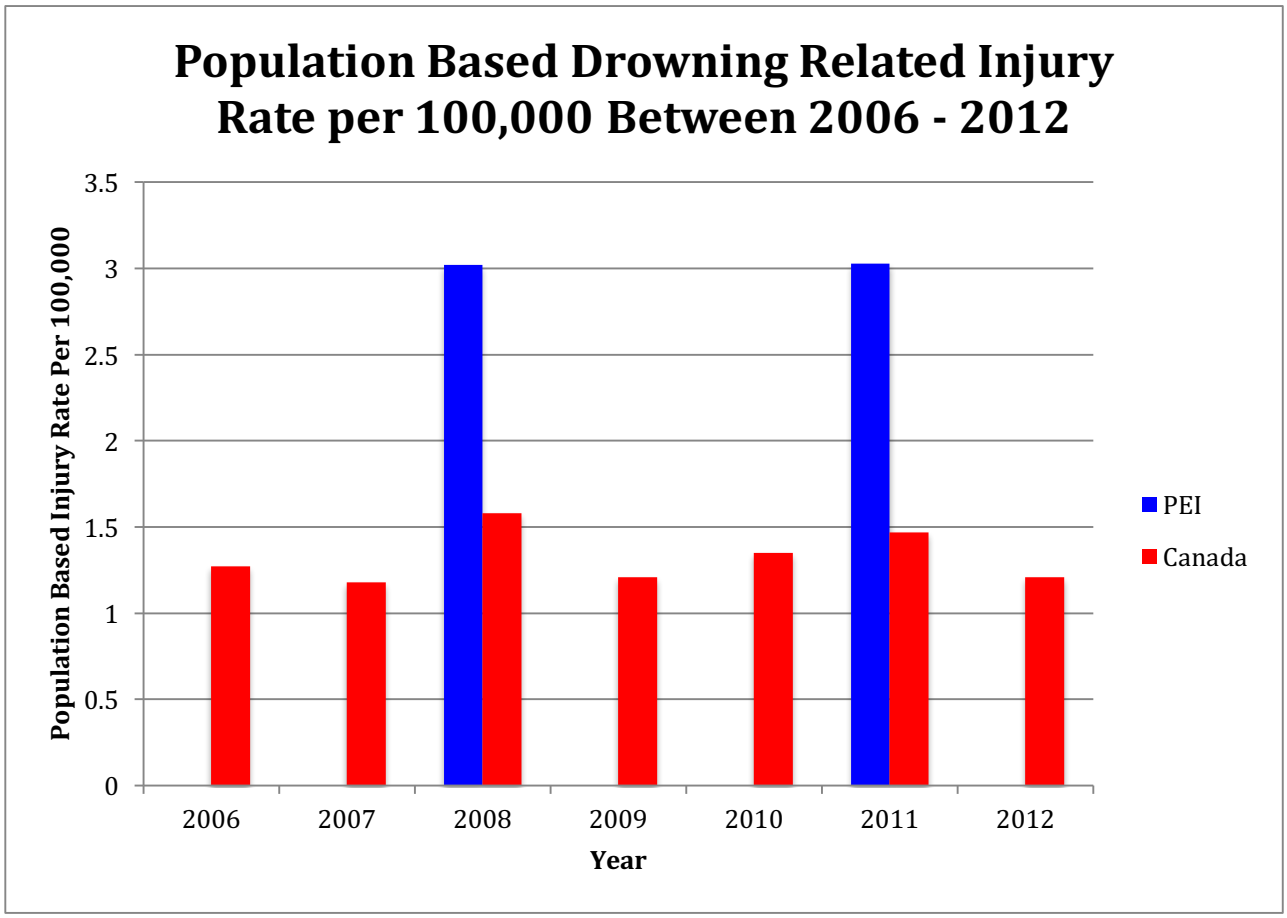

*Canadian average excludes Quebec

Figure 68: New Brunswick: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012



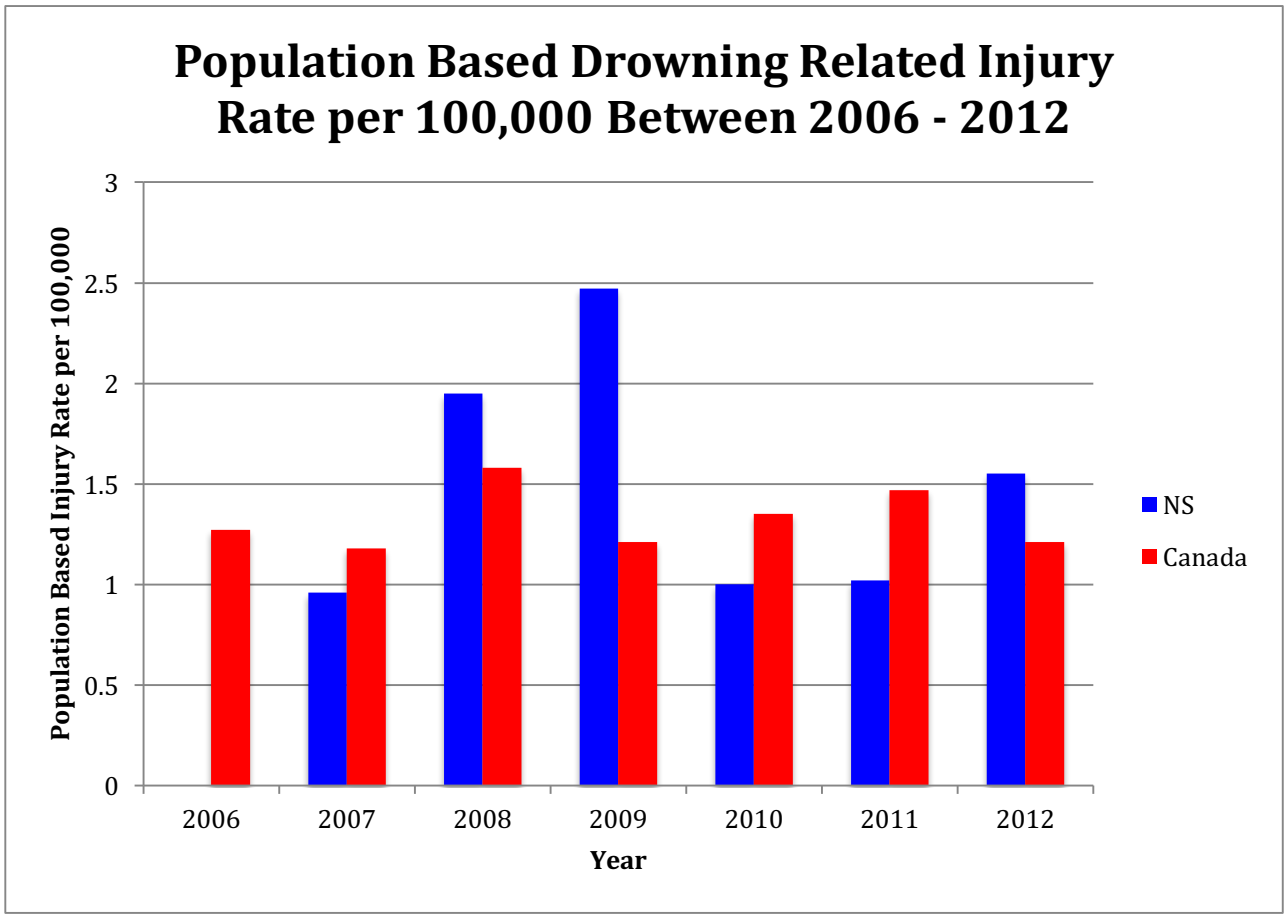

*Canadian average excludes Quebec

Figure 69: Prince Edward Island: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012




*Canadian average excludes Quebec

Figure 70: Nova Scotia: Population Based Drowning Related Injury Rate per 100,000 Between 2006 – 2012




*Canadian average excludes Quebec