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What Do We Know About Firearms in Canada?: A Systematic Scoping Review

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What Do We Know About Firearms in Canada?: A Systematic Scoping Review

Abstract:

Justin Trudeau, the Prime Minister of Canada, recently called for an examination on firearm legislation and for research evidence on best practices to curb gun violence. He also publicly discussed the need to look at the best available evidence to make decisions about firearms in Canada. In light of this, a systematic review of Canadian firearms research was initially attempted; however, searches yielded few results. Given this fruitless finding, a systematic scoping review was conducted of all peer-reviewed, empirical research on firearms in Canada from January 2000 to December 2018 to determine what is the nature and scope of the firearms literature in Canada, as well as what the research findings indicate. Results of the review revealed that the overall volume of peer-reviewed, empirical literature produced during this 18-year period was exceptionally low. In addition, we found significant gaps in the literature, which can impede any future 'evidence-based' approach to firearms in Canada. We discuss these gaps and propose directions for future research to produce better informed Canadian gun policy.

Keywords:

Firearms; Scoping Review; Firearm-related Suicide; Firearm-related Homicides; Gun Violence; Illicit Firearms, Gun Policy

What Do We Know About Firearms in Canada?: A Systematic Scoping Review

INTRODUCTION

Firearms are accessible — either legally or through illicit markets — in many countries worldwide, and in some, firearms have deep-seated cultural roots. The most prominent of which is the United States (U.S.), whose firearms culture derives its foundations from their constitution and history of nation-building. Today, fueled by the Second Amendment to the U.S. Constitution that provides American citizens with the constitutional right to “keep and bear arms” (Glantz and Annas 2009: 2360), there are over 300 million firearms in the U.S. (Esposito and Finley 2014; Jones and Stone 2015; Karp 2018). In contrast, Canada’s constitution does not provide for a right to bear arms. Rather, it delegates regulatory authority to the provinces for certain sovereign responsibilities that are relevant to gun ownership, as well as the rights and obligations that may arise from the purchase and possession of a firearm. The division of these responsibilities is delineated in ss. 91 and 92 of the *Constitution Act (1867)*, in which the former section outlines Federal regulatory authority and the latter outlines Provincial regulatory authority. The Canadian Charter of Rights and Freedoms is the citizen-facing component of Canadian constitutional law and omits any language that suggests an absolute right to bear arms. Ergo, the Canadian Government determines what classes of firearms and related components are permissible for sale, resale, possession, and use.

Despite the Government-controlled context of firearms in Canada which is employed as means to curtail firearm-related harms, the nation is not immune from such issues (Alpers & Rossetti, 2018; Santaella-Tenorio, Cerdá, Villaveces, & Galea, 2016). For example, concerning active and mass shootings, since 2010 there have been three major shootings at schools: the University of Alberta (Edmonton, AB; 2012), Les Racines de vie Montessori (Gatineau, QC;

2013), and La Loche Community School (La Loche, SK; 2016). The two most recent mass shootings were the Quebec City Mosque Shooting (Quebec City, QC; 2017) and the Danforth Avenue Shooting (Toronto, ON; 2018). Further, Statistics Canada reports that from 2013 to 2016 there was a 33% increase in firearm-related violent crime, which includes homicides, gang-related violence, mass shootings, and other violent firearm-related offences (Cotter 2018). In 2017, there was an additional seven percent increase in violent firearm crime in Canada – marking a third straight year of increases (Allen 2018).

Prior to writing this, we were approached by a Canadian firearms organization that asked us to voluntarily write a report on all Canadian firearms literature to assist with informing their future intervention/prevention strategies. However, when we began conducting searches, we found very little research. Given this, we were struck with several questions regarding the state of firearms research in Canada. Unpredictably, this paper also coincided at a time when Prime Minister Justin Trudeau called for “...an examination of a full ban on handguns and assault weapons in Canada, while not impeding the lawful use of firearms by Canadians” (Office of the Prime Minister 2018) and announced that he will be “...looking at the best evidence, the best data, to make the right decisions to make sure that we are ensuring our citizens, our communities are safe into the future” (Harris 2018). As such, this study presents the results from a systematic scoping review of all peer-reviewed, empirical Canadian firearms research. The purpose of this is to assist with informing next-steps for firearms research in Canada, as well as provide an overview of existing literature to help facilitate informed perceptions and pragmatic discourse on Canadian firearms and the related policies.

METHODS

Scoping reviews are akin to other review methodologies, such as systematic reviews, in that they require a replicable, systematic, and structured search for and the inclusion of literature. However, they differ by allowing the search criteria to be changed post-hoc as one becomes more familiar with the literature, and they do not include a formal assessment of literature quality. One may undertake a scoping review for (1) examining the extent, range, and nature of research activity; (2) determining the value of undertaking a full systematic review; (3) summarizing and disseminating research findings; and (4) for identifying research gaps in the existing literature (Arksey & O'Malley, 2005), making it suitable for this commentary. We utilized Arksey and O'Malley's (2005) five-step scoping review framework to systematically guide our search.

Stage one involves *Identifying the Research Question*. In this study, we address two broad, overarching questions: (1) what is the nature and scope of Canadian firearms literature? and (2) what does this literature tell us about firearms in Canada?

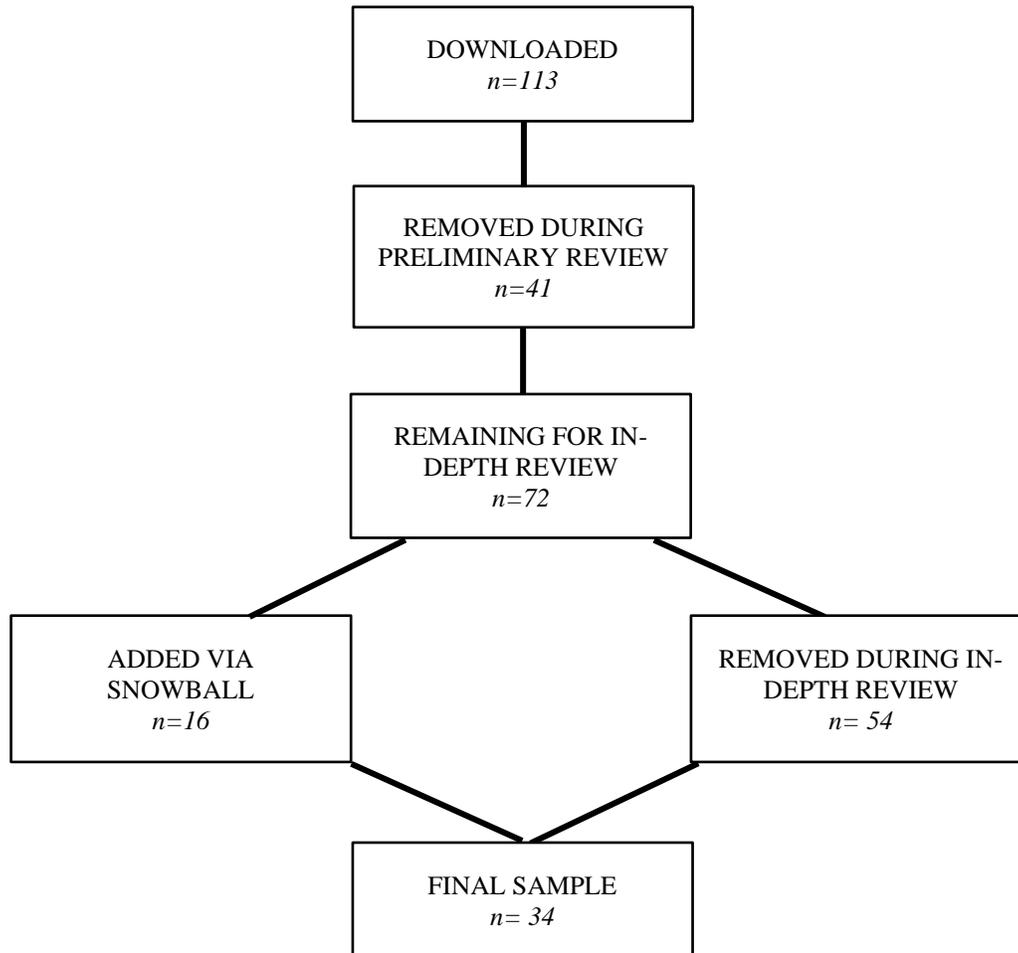
Stage two involves *Identifying Relevant Studies*. To select articles, we utilized an institutional library search engine – which is connected to 744 databases – as our primary tool. We also conducted searches within other databases, such as *Scholars Portal* and *ProQuest*; however, these did not provide us with any new literature. While searching, we used various combinations of our search terms to produce the greatest number of hits¹. Additionally, we snowball sampled by checking the reference lists of the literature selected.

Stage three focuses on *Study Selection*. Our focus of study selection was fairly broad as the literature must have: (1) been peer-reviewed and available via an academic journal; (2) be

¹ The following terms were combined with 'firearm' and 'gun' respectively: violence, legislation, control, regulation, gang, youth, trafficking, law, access, storage, injury, death, suicide, homicide, mental health, safety, awareness, mass shooting, registry, prevention, and intervention.

empirical (3) be published between January 1, 2000, and December 31, 2018; and (4) have Canada as its primary focus. Figure 1 displays how we arrived at our final sample.

Figure 1: Flow Chart of the Article Inclusion Process



Stage four, *Charting the Data*, “...describes a technique for synthesizing and interpreting qualitative data by sifting, charting and sorting material according to key issues and themes” (Arksey and O’Malley 2005: 26) While reading through our final sample, we charted our data within an *Excel* spreadsheet, noting several pieces of information about each article, such as author(s), publication year, topic(s), and key findings. This allows for the development of quantitative data (e.g., number of topics) and the thematic organization of data.

Finally, the following sections exemplify the last stage of Arksey and O'Malley's (2005) framework – *Collating, Summarizing, and Reporting the Results*. Specifically, we outline the nature and scope of Canadian firearms literature, which is followed by a review of research findings.

RESULTS

Nature and Scope

As suggested by the sample, the scope of research over the 18-year inclusion period is low, with only 34 peer-reviewed, empirical studies published. A large majority were issued before 2013 (i.e., more than five years ago), suggesting that Canadian firearms literature may be dated. To see if policy decisions impacted research generation, we compared the years of publication to years where legislative changes occurred; however, no notable trends were observable. Concerning the nature of the studies, of the methodological approaches employed in our sample, four were qualitative (i.e., interviews), 30 were quantitative (i.e., time-series analysis), and none utilized mixed methods. There is a lack of diverse and mixed methodology, statistical analysis techniques, multivariate approaches, and replication studies. Five studies used primary data collected by the author(s), whereas 29 drew on other sources such as Statistics Canada. Most studies were related to the public health field (i.e., accidents, homicides, and suicides), and very little came from other disciplines/perspectives (i.e., criminologists), which can influence empirics and assumptions.

Within these studies, 15 topics were discussed, with some covering multiple topics (see Table 1). Those most frequently represented within Canadian firearms literature include firearm legislation and its impact, firearm suicide, and firearm homicide. The least represented topics are stolen guns, youth firearm injury, and unintentional firearm deaths. These topics can be summarized as related to either firearm violence (i.e., suicide, criminal violence, and accidents)

and firearm non-violence (i.e., public opinion, political outcomes, and legal firearm behaviours such as ownership). To note, most articles tackle firearm-related violence as a research matter. Rarely do the included studies consider societal factors and changes (i.e., age structure of the population) and demographic characteristics (i.e., income), which is an unwavering criticism of firearms research in Canada since the 1990s (Carrington, 1999; Stack, 1998; Leenaars, Moksony, Lester & Wenckstern, 2003).

Table 1: Number of Publications Per Year

Years	n
2000	1
2001	3
2002	3
2003	2
2004	4
2005	2
2006	0
2007	2
2008	2
2009	1
2010	3
2011	0
2012	3
2013	1
2014	3
2015	0
2016	1
2017	2
2018	1
Total	34

It is evident that the majority of topics are under-represented. Even the most frequently represented topic, firearm legislation and its impact, only has 13 peer-reviewed, empirical studies generated over the last 18 years, despite numerous legislative changes occurring in Canada since 2000 and multiple news media articles reporting that the government is seeking to make provisions

to the current legislation². Additionally, gun-related violence is rising and has generated significant media interest, yet there are only three peer-reviewed, empirical studies that examine this topic.

What does this literature tell us about firearms in Canada?

As shown above, the existing research on firearms in Canada is limited in both breadth and depth. The following section details the key findings from our sample thematically.

Firearm Legislation and Its Impacts

Firearm Legislation

Hartnagel (2002) examined public attitudes on firearms legislation and found that Canadian attitudes on gun control legislation largely depended upon one's views regarding their effectiveness in lowering crime. That is, if one believes that gun control lowers crime, they are more likely to support gun control legislation compared to those who think that gun control is not able to lower crime.

Lavoie, Cardinal, Chapdelaine, and St-Laurent (2001), who examined compliance with regulations on the storage of household firearms in Quebec, discovered that 35% of participants with long guns stored in their homes failed to comply with firearm storage regulations, of which 6% improperly stored at least one long gun. As well, they found that the long guns were both accessible and operable, suggesting that rendering them inaccessible and/or inoperable may increase compliance.

The Impact of Firearm Legislation on Suicide Rates

Leenaars et al. (2003) examined the impact of Bill C-51 on suicide rates in Canada and noted that there appeared to be a significant reduction in the rates of firearm suicides after its implementation. The authors report that this had the most significant impact on males and suggest

² For example, see Tasker (2018) or Harris (2018).

that males displaced or switched to other methods of suicide. Similarly, Lester (2000) found that enactment of Bill C-51 led to decreases in suicide by firearm rates, while the use of other methods for suicide became more common.

Concerning Bill C-17, Bridges (2004) found that this legislation had a significant decreasing effect on suicides; whereas in a Quebec-specific context, Gagné, Robitallie, Hamel, and St. Laurent (2010) found that it resulted in a reduction of male suicides who were 15 years of age or older. Similarly, both Caron (2004) and Caron, Julien, and Huang (2008) found that while firearm suicides decreased, suicides involving other methods increased. In contrast, Caron et al. (2008) found that, despite the decrease in firearm-related suicides post-Bill C-17, this legislation did not significantly improve the pre-existing downward trend in firearm suicides. Finally, Burrows, Auger, Roy, and Alix (2010) hypothesize that the introduction of Bill C-17 and Bill C-68 may have influenced the low number of firearm suicides in their study, but that their categorization of methods of suicide (grouped as ‘other’) precludes conclusions and that their results cannot evaluate the impact of legislation.

The Impact of Firearm Legislation on Homicide Rates

Bridges (2004) compared rates of homicide pre-and post-Bill C-17 and found that the rate of homicide by firearm decreased from 0.69 to 0.57. The author suggests that stricter firearm laws may be associated with reduced overall homicide rates, but that it is likely that the reduction in homicides by firearm reflect the significant decreasing homicide rates overall. When analyzing Bill C-51, Leenaars and Lester (2001) found a similar trend: a decline in the homicide rate overall and a nonsignificant reduction in the homicide by firearm rate. The authors note that firearm legislation does appear to have an impact on homicide rates in Canada, suggesting that controlling access to lethal means may be an effective homicide prevention tactic.

Bridges and Kunselman (2004) report that the availability of firearms is positively associated with the rate of homicide by firearms, demonstrating that the use of firearms for homicide became less common after the introduction of Bill C-68 due to their reduced availability. Earlier, Bridges (2002) found the same – that the availability of guns in Canada was associated with a higher percentage of homicides. However, McPhedran and Mauser (2013) also examined the impact of Bill C-68, but instead on lethal firearm violence against women, and found that the legislation had no effect. The authors found pre-existing downward trends in female victimization for both spousal firearm homicides and firearm homicides in general. Thus, their results did not support the expectation that increasing firearms legislation will affect a reduced rate of firearm-related female domestic homicide victimization. Similarly, Langmann (2012), who assessed the effectiveness of Bills C-51, C-17, and C-68 on lethal firearm violence against women in Canada, found no effect. Additionally, the authors found no effect of the licensing implemented in 2001 and the registration of rifles and shotguns in 2003 on rates of spousal homicides.

The Impact of Firearm Legislation on Firearm-related Crime

Mauser and Maki (2003) evaluated the impact of Bill C-51 on robberies involving firearms between 1974 and 1992 and found that the legislation did not reduce these rates. Conversely, their analysis discovers that Bill C-51 actually increased the numbers of all classes of robberies.

Firearm Suicide

Sinyor, Schaffer, and Streiner (2014) found that the older the age, the higher proportion of violent suicide methods (81.6%), of which 7% involved firearms. Similarly, in a study of Ontarians who were 66 years-or-older, Juurlink, Herrman, Szalai, Kopp, and Redelmeier (2004) report that firearm suicide was "the single most frequent method, comprising over a quarter of all cases" (pp.

1181). However, Bridges (2002) found that the availability of firearms in Canada was associated with a higher percentage of firearm suicides except for those over 55 years of age.

Concerning sex/gender³, Skinner et al. (2016) found that males and females ranked differently when it came to suicide by firearm — 17.7% for males, and 1.7% for females. Similarly, Juurlink et al. (2004) found that in a sample of 370 firearm-related suicides, women only accounted for five of them. These two publications, however, find differences in which method of suicide completion was more common. Skinner et al. (2016) report that poisoning was second most common for females and both firearms and poisoning were most common for males; whereas Juurlink et al. (2004) note that firearms were the most frequently chosen method by men and the second to the least used method for females.

There appears to be a pre-existing downward trend for firearm suicides. Bridges and Kunselman (2004) report that the use of firearms for suicide has become less frequent over the years, while the use of other methods became more common following stricter gun control laws from 1974 to 1999. Skinner et al. (2016) also report an increase in other methods of suicide and a decrease in firearm suicides, but this finding pertained to the youth in their research.

Firearm Homicide

Bridges and Kunselman (2004) found that total firearm homicide rates decreased from 1.18 per 100,000 population in 1974 to 0.50 per 100,000 population in 1999. Further, MacPherson and Schull (2007) document that the overall gunshot wound mortality rate in Canada has declined since 1979. However, Bridges and Kunselman (2004) found that the relative availability of firearms and the average percentage of homicides using firearms were positively associated with the rate of murder by firearms. Further, they find that the relative availability of firearms and the average

³ ‘Sex’ and ‘gender’ were interchangeably conceptualized across several of the included studies.

percentage of homicides using firearms were not negatively associated with the rate of homicide by all other methods.

Moreover, a recent study by Pastia et al. (2017) established that shooting was the second most common cause of death, followed by stabbing. The authors examined homicide clearance times and the factors influencing the probability of clearance and found that firearm deaths took the longest to clear by more than a month, on average. This remained consistent when victim and incident characteristics (e.g., age, location, drug/gang relations) were examined separately. Reasons for this were not offered. Additionally, this study found that homicides related to the illegal drug trade or gangs took significantly longer to clear, with their median number of days being around 300 times higher than cases that were not drug- or gang-related.

Firearm Injury

MacPherson and Schull (2007) found that firearm injuries accounted for only 4.7 per 100,000 injuries, compared to 319.8 for sharp-object/knife injuries. Of the 586 firearm injuries examined in their study, 419 were classified as unintentional/unknown, 46 were assault, and 121 were classified as self-inflicted. However, firearms caused more significant injuries than other methods. Specifically, 39.9% of firearm injuries were triaged as high intensity; whereas only 3.1% of knife-related injuries were triaged at the same level. Disparities were also found for hospital admission (25.7% vs. 3.7%) and in-hospital fatality (5% vs. 0.006%) (MacPherson & Schull, 2007).

Finley et al. (2008), on the other hand, found that significant firearm injuries were seen in 784 people, with a fatality rate of 40%, which is 10% higher than the US. The authors suggest this difference may be due to the higher proportion of self-inflicted injuries in Canada, or lower volumes of penetrating trauma treated in Canada. The majority of fatalities occurred within the

first 24 hours after an accident, which the authors note as the "golden hour" – a critical window of opportunity for improved survival chances if transported to a trauma centre (Finley et al., 2008).

Differences in age were found in both the above studies. MacPherson and Schull (2007) found that the 15- to 24-year-old age group had the highest rate of ED visits for firearm injuries and that the rates of injury for this age group were over two times higher than the corresponding rates among adults 25-to-64 years old. Finley et al. (2008) also report that the most at-risk group are persons aged 20-to-24 years old, noting that a higher percentage of firearm injuries occurred at home as people aged, whereas the relative percentage of assault-related firearm injuries decreased. For example, 70% of firearm injuries occurred at home and less than 10% on the street for persons aged 60 years and older – 100% of firearm injuries for those 75 or older stemmed from self-inflicted injuries. Contrastingly, 80% of gun injuries were due to assaults for the age group of 20 to 24 years old (Finley et al., 2008).

Sex/gender differences were evident as well. Finley et al. (2008) report that over 94% of injuries occurred to men, with the largest patient population being men aged 15 to 34 years old. Notably, the authors add that no other study has shown such a high rate of injury in males and that the Canadian male injury rates found are higher than the 87% observed in the US, which was attributed to young men's likelihood of participating in violent or crime-related activities, making them less likely to seek timely medical assistance. The predominance of men experiencing firearm injuries was also found in MacPherson and Schull's (2007) study, which reports that males accounted for 522 of the 586 patients visiting the ED for a firearm-related injury.

Unintentional Firearm Death

UFDs were only explored by Gabor, Roberts, Stein, and DiGiulio (2001). This research found that the Northwest Territories and the Yukon had the highest rates of mortality due to an

unintentional firearm-related injury (1.6 per 100,000 population) and that Ontario had the lowest rates (0.08 per 100,000 population). Gender was revealed as a significant factor in UFDs. Males (n=513) were reported as more than ten times as likely as females (n=41) to be victims of fatal gun accidents (Gabor et al. 2001). The explanation offered for this finding is that the disparity may be due to differential gun ownership levels as the ratio was found to be 7:1. The degree of association between UFD rates and ownership rates across Canada was exceptionally high in this study; however, it is reported that there is a lack of data to determine the strength of the association between UFD rates and firearm availability; thus, causal inference cannot be made.

Youth Firearm Suicide

Suicide by firearm is the most commonly discussed topic for youth firearm-related deaths, with many of the studies noting that suicide by firearm is a leading cause of mortality in Canada for the age groups of 10-to-14 and 15-to-19 (e.g., Shaw, Fernandes, & Rao, 2005; Skinner & McFaull, 2012). However, included studies show that rates of youth firearm suicide are decreasing, which were mostly attributed to legislation or displacement to other methods. Cheung and Dewa (2005) found that for adolescents 15-to-19 years of age, the rate of suicide by firearms dropped from 7 to 3 per 100,000 from 1983 to 1999. Skinner and McFaull (2012) reveal that rates of youth suicide by firearm decreased annually, regardless of age or sex and Pan, Desmeules, Morrison, Semenciw, Ugnat, Thompson, and Mao (2007) found that rates of suicides by firearm decreased from 6.6 in 1979 to 1.5 in 2003. On the other hand, Shaw et al. (2005) document only four suicides by firearm (12%), making it impossible to deduce trends. Although, they state that there are limitations in comparing their work to similar Canadian studies due to significant differences in sample sizes and regions covered.

Concerning suicide by firearm by sex/gender, Skinner and McFaull (2012) found that the rate for male adolescents aged 15-to-19 began to decline in 1992, with an average annual decrease of 6.7%; whereas for females of the same age, firearm suicides decreased by an average of 7.8%. Both groups, however, witnessed increases in suffocations, as did other age groups. Pan et al. (2007) suggest that one possible reason for the difference in self-inflicted injury rates for male and females may be the method of suicide. Notably, their data shows that males were more likely to use lethal methods for suicide, such as firearms, whereas females were more likely to use less lethal methods, such as drugs.

Regional differences may also play a role in youth firearm suicides. Pan et al. (2007) suggest there is a relationship between variability in gun ownership by region by stating that the higher firearm youth suicide rates could be linked to the higher gun ownership rates and resulting factors, such as ease of access.

Youth Firearm Injury

There was only one article that discussed firearm injuries in the context of youth, specifically immigrant youth. Saunders et al. (2017) conducted a population-based cohort study to examine rates of unintentional and assault-related firearm injuries of immigrant and non-immigrant youth aged 24 years and younger. They found that immigration was not associated with higher rates of assault-related firearm injuries overall and that immigration was linked to lower rates of unintentional firearm injury compared to non-immigrants. However, they note that immigration increases the risk of a firearm-related assault in specific subgroups. For example, refugees were found to have a 43% higher risk of an assault-related firearm injury compared with non-immigrants.

This study also highlighted that males, regardless of immigrant or non-immigrant status, are more likely than females to experience an unintentional or assault-related firearm injury; the region of origin for immigrants influenced a wide variation in firearm injury rates; that residence (rural or urban) influenced injury rates; that duration of residence in Canada affected the risk of unintentional and assault-related injuries; and that the predictors of firearm injury were comparable to other studies (i.e., males, low socioeconomic status, and those in late adolescence or young adulthood were associated with firearm injury).

Illicit Firearms

Acquiring Illicit Firearms

Morselli (2012) states that 55% of their participants reported firearm acquisitions were a result of unplanned offers. Many opportunities to obtain a firearm were identified in this study, such as the message of a gun for sale being passed around, being embedded in a criminal network, internet chat groups, and having solid connections. Incarcerated participants were more likely to report opportunistic acquisitions, especially those connected to crime groups and gangs; whereas nonincarcerated participants, who were primarily firearm collectors, were more likely to acquire a firearm after planned searches with little difficulty.

Morselli's (2002) earlier work found that acquiring an illicit firearm not only occurred in exchange for cash or illicit drugs but also occurred in a variety of specific circumstances. The results revealed that the strongest of social ties are not necessarily the most useful for obtaining a firearm or fostering an illegal transaction and that friends – those that are not the closest or best friends – are the most prominent sources. In general, it was revealed that having suitable contacts in the closest networks, friend networks, and useful social ties networks produced the most success in acquiring a gun, mostly due to trust and familiarity.

Locations of Illegal Firearms

The originating locations of illegal guns in Canada was discussed by Morselli and Blais (2014), who found that 86% of the 1929 guns seized by authorities during their study period were classified as crime guns, the majority of which originated in the US (n=1312) with the remaining originating from Canada or other nations. However, the mobility of crime guns is more likely linked to an individual level movement of guns. Thus, despite more than 80% of crime guns being sourced from the US, there is not a strong link in originating location.

Morselli (2012), who explored the source location of purchase, found that in the Montreal area, Indigenous reserves are suspected of operating and dealing with illegal firearms, especially those that are close to the city. Despite this assumption, there remains some ambiguity concerning access to these suppliers, their importance within the illegal market as sources, and the quality of their guns. For example, issues surrounding establishing contact and the general reliability of these suppliers are two of the documented problems discussed by the study's participants. The author states that although dealers have much attention within law enforcement and media circles, "it remains that, for the typical illegal firearm consumer, Native reserve dealers are neither common nor easily accessed suppliers" (Morselli, 2012, p. 147).

Illicit Gun Descriptions

Morselli and Blais (2014) briefly highlight the description of firearms found in their national data set. They reveal that for the type of gun, 65% of the illicit firearms were handguns and 35% were long-guns. Twenty-eight percent were non-restricted, while almost three-quarters (72%) were restricted or prohibited.

Time-to-Find

Morselli and Blais (2014) identified the time it roughly takes authorities to recover a stolen firearm is relatively short, averaging at 1,917 days. The most influential factor affecting time-to-find was the registration status of a gun, with non-registered crime guns taking longer to find. This study also discussed the time-to-crime — a reflection of firearm lifecycles that have no prior link to the illegal market and in which the emergence into the legal market was never reported to or known by the authorities — in their national data set and revealed that it was closer to an average of 13 years.

Gun Violence

Ezeonu (2010), the only article found that examined gun violence discussed how the Toronto Police Service framed the problem of gun violence in the city of Toronto between 1996 to 2004. Specifically, this article reports that from a law enforcement perspective, it appears that gun violence in Toronto was attributed to gangs, illicit drugs, illegal gun smuggling, the 'faulty' Canadian legal system, poverty, unemployment, social breakdown, and race.

Media Influence

Sinyor et al. (2018), who examined the harmful and protective content of suicide reporting in Toronto media, found that mentioning firearm suicide in a news headline or text was associated with increased suicides. The authors note that "reporting of firearm suicides, among the methods with the highest lethality, was associated with increased subsequent suicides, consistent with previous findings" (p. E903). While firearm suicides accounted for less than 5% of all death in Toronto, firearms were stated as a method of suicide in 13% of the media articles in this study.

Sheptycki (2009), who examined the reporting of gun-crime and its concerns projected in Canadian mass media, found that the media reportage of gun-crime risk among Canadian remained consistently dramatic and controversial over the years, despite crime statistics depicting an overall,

long-term downward trend. Specifically, it was found that "amid a long-term downward trend in homicide generally, murders committed with so-called 'long guns' (rifles and shotguns) declined quite precipitously. However, from about 1991, handguns surpassed long-guns in homicide statistics prevalence in Canada" (Sheptycki, 2009, p. 318). Notably, the author remarks that this decreasing trend originates in the mid-1970s, like the trend of total homicides. Using data available in 2006, it is shown that the gun-homicide rate decreased by 16%, roughly placing it at the same level as 20 years prior. In 2006, it was determined that 190 people (31% of homicide victims) were killed by a firearm, which is 33% less than the previous year. Thus, there is an established decreasing trend of firearm deaths, yet the reporting on firearm deaths in the media is higher than actually occurring.

Gun Ownership

Pare and Korosec (2014), who investigated and documented regional variations in methods of self-protection used by Canadians between 1999 and 2004, reports that 1.1% of Canadians engage in obtaining a gun for self-protection, with most residing in the Prairies and British Columbia. Men were found to be more likely to own guns compared to females (1.8% vs. 0.6%), who were also 66% less likely than men to own guns for protection. Victims are four times more likely to own guns and individuals who believe that they live in high-crime neighbourhoods are 44% more likely to own guns. Individuals that think the police are ineffective at controlling crime are 36% more likely to own guns. Individuals that discussed feeling concerned about their safety are 92% more likely to own guns. Lastly, those who have been arrested within the last year are 80% more likely to own guns for protection.

Place of residence is also associated with gun ownership for protection rates in this study. The higher proportion of rural residents partially explained higher levels of gun ownership in the

Prairies as respondents living in rural areas are 2.3 times more likely to own guns for protection. Rural residency is strongly associated with higher levels of gun ownership, which is suggested to occur due to guns being more versatile tools for rural life: hunting, act as protection against criminals, serve as protection against wild animals, and be used for entertainment (e.g., target shooting). Additionally, it is hypothesized that rural areas possess a pro-gun culture, where these attitudes are part of a long tradition.

DISCUSSION AND CONCLUSION

The present systematic scoping review identifies the nature and scope of Canadian firearms literature, as well as reviews the research findings. Our results suggest that there has been a low output of peer-reviewed, empirical research on firearms in Canada since the year 2000, which is also indicative of the topics covered in the literature: most topics have a low number of publications, while others are completely omitted. Furthermore, many of the included studies lacked diverse, rigorous methodological approaches. These limitations have resulted in significant literature gaps and an inability to draw definitive insights and strong conclusions.

In examining legislation and its impact on firearm suicide and homicide rates, the literature yielded mixed results: some studies report significant changes in rates after legislation implementation, some note rates were not significantly affected, whereas others reveal legislation is not associated and/or produces inverse effects. The availability of firearms was identified as influencing a reduction in suicide and homicide rates; however, most of the included studies were not able to definitively attribute the reductions to legislation. Thus, proposals for preventing these issues through legislation and controlling access to firearms cannot be supported, given the variance in findings. Additionally, the pre-existing downward trend of suicide and homicide rates, as well as increases in other methods of suicide post-legislation, suggests that there may be

confounding variables not considered by these studies and that may be beyond the context of firearms. These results are consistent with a systematic review conducted by Santaella-Tenorio et al. (2016), who report mixed findings on the influence of legislative changes on firearm homicides, a shift towards other methods, reduced firearm suicide rates, and no significant changes in overall suicide rates in Canada. Concerning the impact of firearm legislation on crime rates, there is not one independent, peer-reviewed, empirical study on Canadian firearm legislation that demonstrated a significant decreasing effect on firearm crime.

Notably, certain information highlighted in this paper, such as an increase in firearm-related violence, contradicts the suggestion that policy restricting firearm ownership may be the answer to curtail firearm-related harms. This is because many firearms used in these scenarios are already heavily restricted and/or banned, but yet these incidents still occur, nonetheless. What this represents is unclear as the current research on the association between the implementation of Canadian firearms legislation and rates of firearm-related harms does not offer any clear links. More research is needed to strengthen any conclusions drawn and to determine the effectiveness of the legislation. Future research would also benefit from exploring what other factors may be influencing reductions and/or increases in harms, such as social changes (e.g., the changing median age of the population or data collection changes) and social variables (e.g., offender and victim characteristics) (Kleck, 1993; Lott & Whitley, 2001; Langmann, 2012; Leenaars & Lester, 2001).

Regarding firearm suicide, included studies show that the overall firearm suicide rates are decreasing, the elderly and males (regardless of age) are more likely to use firearms for suicide, and that youth firearm suicide rates were highest in the territories and lowest in Ontario. Reasons suggested for the prevailing use of firearms for suicide were gun ownership, gun availability and legislation, the certainty of completion, and their lethality. Thus, mitigating firearm suicide,

specifically for youth, may be possible by adhering to proper storage techniques like storing ammunition and firearms separately and/or external to the home. However, effective tactics for reducing firearm suicides remain speculative at this time. Similarly, it is unclear why more males use firearms for suicide than females, why the highest number of firearm suicides occur in the elderly population, or why there are regional variations in suicide rates by firearm. To inform policymaking, future research may benefit from further exploring these factors associated with firearm suicide, the risk factors that may influence/lead to firearm suicide, and prevention and intervention strategies.

Rising illicit firearm use has prompted much media discussion, but there is a significant lack of research into this area in Canada. Research that examined how and where illicit firearms were obtained found that it is mostly the result of unplanned events, trustworthy relationships, and being embedded in a criminal network and/or having suitable contacts. As well, the originating locations of illegal guns in Canada were mostly from the U.S. and Canada, with the mobility of crime guns more likely linked to individual-level movements, suggesting that there is not a strong link in originating location. Concerning illicit firearm transactions, they were found to occur in a variety of settings, but mostly through already existing contacts, informal relational contexts, and multiple channels, and are often the result of unplanned, opportunistic sequences of events. This is consistent with previous research conducted across countries and cultural settings, such as Wright and Rossi's (1986), Koper and Reuters (1996), and Erickson and Butters (2006).

Problematically, little-to-no research examines illicit firearm channels or alternative channels for obtaining firearms, illicit firearm consumers, the 'law-abiding' illegal firearm acquirer, and solutions and interventions for tackling this problem. Moreover, Canadian media report that there is a problem with the smuggling and trafficking of firearms from the U.S., but no

research exists that verifies this as occurring and on the smuggling and trafficking of firearms into/across Canada. This warrants examination as, to name a few events, towards the end of 2017, Ottawa Police and the Ontario Provincial Police (OPP) arrested 13 people and seized 24 firearms in connection with trafficking, including ones modified using illegal components like bump stocks (Foote 2017); in mid-2018, Toronto Police arrested 75 people and seized over 78 firearms also in connection to trafficking (Boisvert 2018); and in late 2018 the OPP arrested and charged a group of 23 people for manufacturing untraceable firearms, components, and accessories in Toronto and seized 14 handguns, six long guns including a machine gun and assault rifle, silencers, grenades, a stun gun, and body armour (Draaisma 2018). The extent to which some of these firearms and their components can cause serious death and injury cannot be understated, and Canada's challenges with domestic manufacturing, trafficking, and smuggling of illicit firearms could face increased pressure by advances in technology, such as the use of the Internet for gun purchasing. There are no known techniques to prevent the smuggling and trafficking of firearms and to prevent them being used or on their uses (e.g., if and when they are), nor is there any research produced on where and when this is/may be occurring. Future research would benefit from addressing this gap to prevent them from contributing to increasing rates of violent firearm-related harms in Canada.

It would be inaccurate to conclude this review without simply stating that much more research is required on firearms in the Canadian context. This is especially true if the Government wishes to produce an informed, evidence-based national framework for protecting against, disarming, and recognizing symptoms and acts of gun violence in Canada. It has been unequivocally found that there are significant gaps in existing peer-reviewed, empirical research, and that much of it is limited in scope, dated, over-reaching, speculative and lacks concrete

findings backed by evidence. Very little Canadian research presents information that would be useful in defining and passing firearm laws; whereas the broader body of firearms literature – most of which comes from the U.S. – is grounded in an almost diametrically opposite history and rights-based policy. One must hesitantly note any conclusions offered as they are based on a very limited number of studies whose scientific rigor has not been evaluated. Ultimately, it is therefore impossible to state, in a Canadian-specific context, how the Government should regulate firearm ownership, what policies and legislation are effective, and what the research says to better inform Canadian gun policy.

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Appendix 1: Charting the Data

Firearm Legislation and Its Impacts			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Bridges (2004)	To assess the effect that Bill C-17 had on the use of firearms for suicide and homicide.	Time Series Analysis	Following the implementation of Bill C-17 suicides and homicides involving firearms dropped significantly.
Bridges & Kunselman (2004)	Examining the associations between the availability of firearms and their use for homicide and suicide in Canada for the period of 1970 to 1995.	Reliability check of Lester's (2000) 1970-1995 time series.	Availability of firearms was positively associated with the rate of murder by firearms, the rate of homicide by firearms, and the rate of suicide by firearms. The use of firearms for suicide and homicide became less common, while the use of other methods became more common, indicating that people may have changed their methods for suicide after the introduction of Bill C-68.
Burrows, Auger, Roy, & Alix (2010)	Investigating patterns in suicide attempts and suicide mortality according to material deprivation in Quebec.	Gender- and age-specific suicide and mortality rates were calculated. Absolute and relative measures of inequality were calculated. Examined commonly used suicide methods.	Firearm legislation may have reduced inequalities in suicide mortality related material deprivation in Quebec. The results cannot be used to evaluate the impact of Bill C-17.
Caron (2004)	To assess the effect that 'Safe Storage' legislation had on firearm suicides in Canada.	Chi-Square and Likelihood Ratio Tests	Following the implementation of safe storage legislation, firearm suicides dropped considerably.

			However, during the same time period, suicides using other methods, such as hanging or poisoning, increased.
Caron, Julien, & Huang (2008)	To assess the effect that 'Safe Storage' legislation had on firearm suicides in Canada.	Linear Regression and Time Series Analyses	Following the implementation of safe storage legislation, firearm suicides dropped. However, during the same time period, suicides using other methods increased. Bill C-17 did not improve the downward in firearm suicide (which had begun before the law was enacted).
Gagné, Robitaille, Hamel, & St. Laurent (2010)	To assess whether stronger firearm legislation enacted in 1991 resulted in changes to the male suicide rate.	Joinpoint Regression Models and Pre-Post Analyses	Quebec male firearm suicide rates declined following the introduction of restrictive firearms regulations in Canada.
Hartnagel (2002)	Assesses attitudes towards gun control in Canada.	Telephone Survey	Agreement with gun control legislation largely depends on one's views regarding the effectiveness of gun control in lowering crime - if one believes gun control lowers crime, they are more likely to support gun control than one who does not believe gun control lowers crime.
Langmann (2012)	To assess the effect that Bills C-51 (1977), C-17 (1991), and C-68 (1995) had on homicide and	Time Series Analysis, ARIMA, and Joinpoint Analysis	Bills C-51 and C-17 had no significant effects on spousal firearm homicide, whereas Bill C-68 had

	spousal homicide in Canada from 1974 to 2008.		a beneficial effect on spousal firearm homicide in one year only (1998), this is likely explained by other factors beyond Bill C-68.
Lavoie, Cardinal, Chapdelaine, & St-Laurent (2001)	Examining survey on firearm storage practices in Quebec to provide an estimate of the level of compliance with firearms regulations after the legislation came into effect.	Survey	35% of participants failed to comply with firearm storage regulations. 6% of these participants improperly stored at least one long gun.
Leenaars & Lester (2001)	Assesses the effect that Bill C-51 had on homicide in Canada.	Time Series Analysis	After controlling for certain social variables (e.g., unemployment rates, the proportion of young males in the population, etc.), Bill C-51 appears to have been followed by a significant reduction in the firearm homicide rate.
Leenaars, Moksony, Lester, & Wenckstern (2003)	Two studies to assess the effect that Bill C-51 has on the commission of suicide in Canada: A time-series analysis, and a multiple regression analysis which controls for some social variables.	Time Series Analysis	Study 1: Bill C-51 had a beneficial impact on both the total suicide rate in Canada and the firearm suicide rate. Study 2: After controlling for certain social variables (e.g., unemployment rates, the proportion of young males in the population, etc.), Bill C-51 appears to have been followed by a significant reduction in the firearm suicide rate.

Lester (2000)	To assess the effect that Bill C-51 had on the use of firearms for suicide and homicide.	Time Series Analysis	Following the implementation of Bill C-51 suicides and homicides involving firearms dropped.
Mauser & Maki (2003)	Assessed the 1977 Canadian firearm legislation and its effect on robbery rates.	Pooled Cross-Section, Time Series Analysis	The 1977 Canadian Firearm Legislation did not reduce robbery involving a firearm (correcting for heteroscedasticity and autocorrelation the authors find that the legislation increased robberies involving a firearm).
McPhedran & Mauser (2013)	Assesses the effect that Bill C-68 had on female firearm homicide victimization rates.	Autoregressive Integrated Moving Average (ARIMA) Modelling and the Zivot-Andrews (ZA) Structural Breakpoint Tests.	Little evidence to suggest that increased firearms legislation in Canada had a significant impact on pre-existing downward trends in lethal firearm violence against women in Canada.
Firearm Suicides			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Bridges (2002)	Exploring the relationship between gun availability and use of guns for murder and suicide in Canada.	Replicating Lester's (2001) study and added the years of 1996-1998.	The rate of accidental death from firearms had a positive relationship with the percentage of homicide victims killed by firearms. The rate of accidental deaths from firearms was positively associated with the percentage of suicides using firearms.

<p>Bridges & Kunselman (2004)</p>	<p>Examining the associations between the availability of firearms and their use for homicide and suicide in Canada for the period of 1970 to 1995.</p>	<p>Reliability check of Lester's (2000) 1970-1995 time series.</p>	<p>Availability of firearms was positively associated with the rate of murder by firearms, the rate of homicide by firearms, and the rate of suicide by firearms. The use of firearms for suicide and homicide became less common, while the use of other methods became more common, indicating that people may have changed their methods for suicide after the introduction of Bill C-68.</p>
<p>Juurlink, Herrmann, Szalai, Kopp, & Redelmeier (2004)</p>	<p>Exploring the relationship between the treatment for several illnesses and the risk of suicide in elderly patients by comparing prescription records.</p>	<p>Population-based case-control study. Conditional logistic regression. Contingency tables. Logistic regression. Sensitivity analyses.</p>	<p>Most common mechanism for elderly patients committing suicide involved firearms (28%).</p>
<p>Macpherson & Schull (2007)</p>	<p>Describing the epidemiology of emergency department (ED) visits for firearm-related and knife-related penetrating trauma.</p>	<p>Using the Canadian Emergency Department Triage and Acuity Scale (CTAS) to categorize. Using SAS software to analyze rates.</p>	<p>Only 1.5% of penetrating trauma injuries were caused by firearms. 151 hospitalizations were related to firearms, whereas 1455 were related to knives/sharp objects.</p>
<p>Pastia, Davies & Wu (2017)</p>	<p>Addressing a gap in the literature by focusing on the circumstances affecting the time taken to solve homicides.</p>	<p>Kaplan-Meier survival analysis and Cox regression.</p>	<p>Shooting deaths took the longest to clear.</p>

Sinyor, Schaffer, & Streiner (2014)	Exploring whether people have died from suicide in a large epidemiologic sample from clusters based on demographic, clinical, and psychosocial factors.	Coroner's chart review and cluster analysis.	Cluster 2, the oldest aged category (mean age 55.6 years; 31.6% aged 65 years and older), involved in the highest proportion of violent suicide methods with 7% being firearm deaths.
Skinner, McFaull, Draca, Frechette, Kaur, Pearson & Thompson (2016)	Describing trends and patterns of self-inflicted injuries.	Retrospective observational study using Canadian administrative data.	Among males, firearms as a method of suicide ranked in equal proportion with poisoning (18%), making it the second mechanism for suicide, whereas firearms only accounted for 2% in females. There was a decrease in the use of firearms as a method of suicide from 1980 to 2008.

Firearm Injury

Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Finley, Hemenway, Clifton, Brown, Simons, & Hameed (2008)	Evaluating demographic and causal factors of in-hospital mortality for significant firearm-related injuries in Canadian trauma centers.	Univariate and bivariate analysis adjusting for ISS, as well as multivariate logistic regression.	Men are predominantly intentionally injured with handguns. Older patients suffer self-inflicted injuries with long guns.
Macpherson & Schull (2007)	Describing the epidemiology of emergency department (ED) visits for firearm-related and knife-related penetrating trauma.	Using the Canadian Emergency Department Triage and Acuity Scale (CTAS) to categorize. Using SAS software to analyze rates.	Only 1.5% of penetrating trauma injuries were caused by firearms. 151 hospitalizations were related to firearms, whereas 1455 were related to knives/sharp objects.

Unintentional Firearm Death

Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
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<p>Cheung & Dewa (2005)</p>	<p>Examining trends in youth suicide from 1979-1999 and the association with changes in the firearms act (Bill C-17) in 1991.</p>	<p>Population-based study and time series analyses.</p>	<p>Substantial change in methods of suicide used. Possible association between changes in firearms act and the methods used by youth to complete suicide.</p>
<p>Gabor, Roberts, Stein & DiGiulio (2001)</p>	<p>Examining the link between firearm ownership levels and unintentional firearm deaths across Canadian provinces and regions.</p>	<p>Pearson and Spearman rank-order correlation coefficients.</p>	<p>Strong, positive correlations between household firearm ownership levels and unintentional, firearm-related mortality rates across Canadian provinces and regions.</p>
<p>Pan, Desmeules, Morrison, Semenciw, Ugnat, Thompson, & Mao (2007)</p>	<p>Understanding the magnitude and the national trends of mortality and hospitalization due to injuries among Canadian adolescents aged 15-19 years.</p>	<p>Vital Statistical System and the Hospital Morbidity Database data were obtained.</p>	<p>The main causes of injury death were MVT-related injuries, firearm, suffocation, poisoning, drowning, fall, and burning. Rates of firearm injury death decreased. Males had higher mortality rates from firearms than females. Firearms were the second main cause of injury death for males. Firearms were the third main cause of injury death for females. Rates of suicides by firearms decreased.</p>
<p>Shaw, Fernandes, & Rao (2005)</p>	<p>Reviewing all pediatric cases referred to the Hamilton Regional Forensic Pathology Unit from 1993 to 2002 to study suicide in children and adolescents.</p>	<p>Retrospective study of autopsy files and Two-sided Fisher exact test.</p>	<p>Firearms are the second most common method of suicide.</p>

Skinner & McFaull (2012)	Examining suicide patterns among Canadian children and adolescents.	Retrospective analysis and temporal trends. Quantified annual trends by calculating the average annual percent change (AAPC).	Decrease in suicides involving firearms during the study period.
Youth Firearm Injury			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Saunders, Lee, Macpherson, Guan, & Guttman (2017)	Testing the association of immigrant characteristics with firearm injuries among children and youth.	Population-based cohort study and Poisson regression models with Generalized Estimating Equations.	Immigrant children and youth had a lower risk of unintentional firearm injury. Risk of assault-related firearm injury was higher among refugees and immigrants from Central America and Africa.
Illicit Firearms			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Morselli (2002)	To understand the dynamics of illegal firearms transactions.	Interviews.	Illicit firearm transactions involve cash and/or narcotics and tend to occur in business-like circumstances, spur-of-the-moment trades, or lend-outs. They can involve a range of individuals who are relational with the buyer, to those more distant and unknown to the buyer. Most participants identified as being relational with the individual they purchased from.

Morselli (2012)	Identify patterns of acquiring illicit firearms from 20 non-incarcerated and incarcerated consumers in Quebec.	Survey.	Acquisition of an illegal firearm often originates from an informal (albeit trusted) source/seller/contact such as family and friends, multiple channels and intermediaries are often available to facilitate these transactions, acquisition often occurs opportunistically and unplanned, and the informality of these transactions attract many consumer types, not just offenders and organized crime members.
Morselli and Blais (2014)	Proposes two new measures; 1) time to find a stolen firearm and subsequent recovery by police, and 2) distance the firearm travels between initial theft and subsequent recovery by police.	Data analysis using national data collected at the Federal level and data from Quebec at the provincial level.	Registration is an important factor for time to seizure data collection, divergent results between time-to-crime resulting for handguns and restricted firearms, unregistered crime-used firearms stayed in circulation for much longer and are much harder to detect.
Gun Violence			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Ezeonu (2010)	Discussing how the Toronto Police Service has constructed the problem of gun violence in the city.	Semi-structured interviews.	The dominant frame traced gun violence to the proliferation of gangs, illegal gun smuggling, and illicit drug trafficking. The second frame blamed several structural

			factors such as poverty, unemployment, disintegrated neighbourhoods and (black) families, as well as lenient legal and criminal justice systems.
Media Influence			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Sheptycki (2009)	Uses information from news reporting and statistics to examine concerns over increasing rates of gun violence.	Comparison and analysis of the differences between crime reporting and officially captured statistics.	Canada is not a comparatively weaponized society, although youth are the most at risk of becoming a weaponized subgroup.
Sinyor et al. (2018)	Whether suicide reporting by Toronto media is leading to suicide contagion.	Observational study of news.	No association between a reduction of youth suicide and media news reporting from the publishers that were analysed.
Gun Ownership			
Author(s) (Year)	Aims of Study	Methodology	Key Findings/Results
Pare and Korosec (2014)	Examine the regional variations in self-protection.	Multinomial logistic modeling.	The Prairies and British Columbia had the highest rates of individuals obtaining firearms for self-protection.