

The Effects of Roots of Empathy Program on Violent Injury in Youth

By

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## **Abstract:**

### **Background:**

Intentional interpersonal youth violence is a significant public health issue, causing acute and chronic health problems affecting individuals, families, and communities. Social emotional learning (SEL) programs, such as Roots of Empathy (ROE), delivered in schools decrease physical aggression and increase prosocial behaviours. These are risk and protective factors for later involvement in interpersonal violence. The purpose of this research is to study whether individuals who participated in ROE in childhood/early adolescence have a reduced risk of serious intentional interpersonal violent injury as youths between the ages of 16-24, and whether this relationship differs based on sex at birth (male/female) or grade level of exposure (K-3, 4-6, and 7-10).

### **Methods:**

This retrospective population-based cohort study uses data from Manitoba, Canada, relying on the linkable health and social databases through the Manitoba Center for Health Policy (MCHP). The participants in this study were born from 1986 to 2002; cases were identified as those who participated in the 2002-2007 Phase I and II ROE studies (n = 4,437). ROE youth were matched up to 10:1 to youth who did not participate in ROE (n = 44,254). Severe interpersonal violent injuries in youths ages 16-24 was defined as a serious injury requiring admission to hospital or death due to interpersonal violence inflicted by others. Hazard ratios (HR) were obtained using survival analysis.

### **Results:**

Youth in this study were followed for an average of 7.3 years (SD 1.8). The rates of intentional violent injury were 13.2 and 10.5 per 10,000 for the ROE and the control group, respectively (HR = 1.26; 95% CI 0.91-1.73). This was non-significant. The relationship did not vary for males (HR = 1.34; 95% CI 0.95-1.89) or females (HR = 0.90; 95% CI 0.39-2.10). Additionally, the relationship between exposure to ROE and interpersonal intentional violent injury was non-significant for those who participated in grades k-3 (HR = 1.27; 95% CI 0.7-2.40), grades 4-6 (HR = 1.19; 95% CI 0.75-1.90), and grades 7-10 (HR = 1.40; 95% CI 0.74-2.66).

### **Conclusion**

This study found that ROE is not effective at reducing the risk of youth violent injury leading to hospital admission and/or death.

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Thank you all for choosing to help me to realize my dream.

## **Dedication**

Every child matters. Every youth matters.

This thesis is dedicated to all the children and youth who were injured or killed by interpersonal violence.

This thesis is dedicated to all those who work to prevent and reduce youth violence and create a safer, more hopeful future for all of us.

Every child and youth has a right to be treasured and cared for. They have an inherent right to life, safety, and happiness.

It is up to all of us to help and support each child and youth to flourish and achieve their dreams.

Nicole Morris (Barrett)

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# **Effects of Roots of Empathy Program on Violent Injury in Youth**

## **Chapter 1: Introduction and Literature Review**

### ***Intentional Interpersonal Violence***

Interpersonal violent injury is an ever-growing problem globally,<sup>1,2</sup> and especially in Canada, where rates of violent outcomes have increased in the last decade.<sup>3-6</sup> This is especially true in Manitoba, which had the second highest homicide rate of the Canadian provinces in 2020 at 4.5/100,000 compared to the Canadian rate of 1.95 per 100,000 and is second only to Saskatchewan at 5.09/100,000.<sup>5,6</sup> Manitoba and Saskatchewan have the highest rates of violent crime, violent injury, and homicide per capita of all the 10 provinces, exceeded only by the three northern Territories.<sup>5,7</sup>

Winnipeg, Manitoba's largest city with a population of 749,607 in 2021,<sup>8</sup> had the highest homicide rate of all the Canadian cities with a population of more than 500,000, with a rate of 4.93 per 100,000.<sup>5</sup> As is frequently reported in literature on violent injury, many of these victims were youth between the ages of 12 and 24 years, the age group most likely to be affected by intentional interpersonal violent injury.<sup>1,2,4,7,9-13</sup> There are currently no health-related data on specific rates of youth interpersonal violent injury and homicide in Manitoba. Gang-related homicide mostly occurs in youth under the age of 25 years and can approximate the frequency of youth-on-youth interpersonal violence in large Metropolitan areas. Manitoba has significantly higher gang-related homicides at a rate of 0.74/100,000 compared to the next highest rate in Vancouver at 0.59/100,000, and most of Canada's large population areas, with rates of 0.40/100,000 or less.<sup>5</sup>

Homicide is currently the fourth most common cause of mortality in youth ages 15-24 years in Canada, and is superseded only by unintentional injury, suicide, and cancer.<sup>3,5,7,14,15</sup> In

the USA, between 1999-2020, violent injury was the second most common cause of death in this age group.<sup>16,17</sup> In Manitoba, 26% of homicide victims are youth, and 44% of persons committing homicide are youth.<sup>15</sup> Although homicide is already common among youth, for every youth who dies by violence, there are in addition, approximately 116 youth who attended emergency departments for their injuries, and 16 youth who are admitted to hospital for serious interpersonal violent injury.<sup>12,13,18</sup> In Canada, the rate of involvement in violence and violent victimisation reported by 15- to 24-year-olds in 2009 was 284 per 1,000 and was almost 15 times higher than the general population of all ages.<sup>19</sup> In a report by Snider et al. in 2016, more than 1000 youth attended Winnipeg's largest hospital, Health Sciences Centre, due to violent injury each year. This did not include the other hospitals in the city and province.<sup>15,18</sup>

Violent injury hospitalizations and justice system costs are very expensive to government and the population as a whole.<sup>1,20,21</sup> The annual cost of all interpersonal violent assault in the USA was 3.3% of the annual GDP in 2004 and it is believed to be even higher now.<sup>21</sup> Youth violence and violent injury costs an approximate US \$6.6 billion in direct and indirect costs to victims, not considering the costs to health and justice systems.<sup>21</sup> Costs to the health system in the USA from firearm-related violent injury alone, between the years of 2006-2014 cost ~ \$911 million (readmissions for the same injury included, but not including private insurance costs)/year. It is estimated that if the costs from the justice system, loss of quality of life, and loss of productivity costs were added, it would cost several billions of dollars a year.<sup>22</sup> There are limited recent data on the cost of assault-related injuries in Canada, but in 1999, based on data from the General Social Survey, the estimated lifetime direct and indirect costs for non-fatal assault victims was \$7.73 billion, amounting to ~\$72,000 per person injured by assault.<sup>20,23</sup> Based on data from the Department of Justice in Canada, in 2009, the estimated total cost of

homicide as a crime was \$3.7 billion and \$2.1 billion for assault as a crime.<sup>23–26</sup> These costs include: costs to the justice system (e.g., criminal justice system, civil justice system, and other); costs to victims (e.g., medical system costs and extended medical, loss of productivity, intangible costs and other); and costs to third parties (e.g., social services, employer losses, and other).<sup>24,26</sup>

Violence and gang involvement are frequent and are often associated with criminal activity.<sup>1,2,9,25,27–29</sup> Historically, violence was addressed by law enforcement and justice departments, as is the case in many Canadian and American cities.<sup>25,28</sup> The criminal justice approach is designed to investigate criminal acts, proceed through a legal process and end with the alleged perpetrator being found innocent or guilty of the wrong-doing, and being punished through restrictions on personal freedom, including incarceration. Over the last few decades, violence and its counterpart, violent injury, have become recognized as a major health issue, and violence is compared to a disease process.<sup>2,11,28,30–32</sup> Violent injury causes both acute and chronic health problems and affects individuals, families, communities, and the population, making violence a significant public health risk.<sup>1,2,7,10,30,33,34</sup>

### ***Medical Model of Violence Prevention***

The medical model of illness is an approach that postulates a disease should be defined and detected using various methods of observation to describe and differentiate said disease from others. This observation is undertaken in an organized fashion using standardized tests, examinations or sets of symptoms and differentials to identify and treat ailments.<sup>35–37</sup>

The Center for Disease Control (CDC) and the World Health Organization (WHO) adopted a public health approach to violence prevention. The CDC first started using this approach in 1992. In 1993 many health, community and school-based programs were developed to address violence through this approach, in an effort to implement a public health model to

address growing violence.<sup>38</sup> In 1996, the WHO named violence as one of the top global health issues, and subsequently published their “World Report on Violence and Health” in 2002,<sup>1,38</sup> created the Violence Prevention Alliance in 2004.<sup>39</sup>

The public health approach, to address illnesses and injury as defined by the CDC, and the WHO has 4 main steps: “(1) Define and monitor the problem; (2) Identify risks and protective factors; (3) Develop and test prevention strategies; and (4) Assure widespread adoption.”<sup>39-42</sup>

In terms of violence prevention, the first step involves identifying who is being affected by, and who is perpetrating, the violence, the location, and the degree. This current study, and many other studies using a medical model and the public health approach, are looking to hospitals, clinics, and community service providers to track and analyze data to determine the scope of violence and how it is affecting individuals and communities. The second step assesses individual and community level factors that put individuals and communities at risk. It also looks at the protective factors that may help prevent violence or reduce its scope. The third step studies violence and uses the research to develop primary and secondary prevention programs, as well as tertiary treatment programs. The fourth step focusses on ensuring that any programs and/or initiatives developed to prevent violence are used and expanded. As violence is a contagious problem that continues to grow if left unchecked, this step also involves sharing programs with other areas affected by violence, to ensure the “infection” does not reinfect.<sup>2,38-41,43,44</sup>

The disease prevention and infection control framework consider violence an infectious disease.<sup>28,43</sup> Violence has many similar characteristics to a viral illness such as the Zika or the Covid-19 coronavirus. Violence clusters in areas where risk factors are highest. Many cities have

neighbourhoods and areas that are characteristically high in violent crimes.<sup>43,45</sup> Violence is also transmissible from person to person in that youth who hang out with other youth who perpetrate violence, are more likely to become involved in violence themselves.<sup>28,43,46</sup> Those who are victims of violence are also more likely to be both reinjured and perpetrate violence against others. This adds to the clustering affect, as groups of youth “spread” violence to other groups of youth, allowing the scope of violence to exponentially grow in a community.<sup>28,43</sup>

Violence also acts like a disease at the infection level. A person who is susceptible to disease will likely contract that disease if they are exposed to that disease. Likewise, a youth who is susceptible via risk factors to involvement in violence is more likely to become involved in violence. This is also true with youth previously exposed to violence in earlier childhood. As multiple risk factors interact, they lower a person’s resistance and ability to avoid involvement in violence.<sup>41,43</sup>

The disease prevention and infection control frameworks also provide scaffolds for violence to be treated like an infectious epidemic. These include early detection and prevention, and treating any ongoing or new infections; identifying those most likely to spread the disease to others, and specifically targeting them with prevention strategies; and changing any social behavioural and environmental conditions that lead to further spread of infection.<sup>40,43</sup>

One of the best ways to prevent widespread dissemination of a disease in a population, is to develop a vaccine that can be delivered at a population level to increase resistance to a disease and prevent the development of illness in most people. Though vaccines do not work for every individual, nor can they be delivered to every individual for various reasons, they allow a population to develop herd immunity.<sup>47,48</sup> In terms of violence, a primary prevention program might act as a behavioural vaccine, to provide widespread resistance to involvement in violence

and reduce susceptibility to violent injury.<sup>49–52</sup> If less people are involved in violence in the first place, then less people will be exposed to violence, thus reducing everyone’s risk.<sup>28,41,43</sup>

Interpersonal violence is a disease that affects youth disproportionately, compared to other ages of the population.<sup>7,10,40,41</sup> Many of the most successful secondary prevention programs have been hospital intervention programs and/or integrated programs involving hospitals and communities. These programs target severe interpersonal youth violence by addressing it from the perspective of reducing violent injury, i.e., treating it like any other health problem.<sup>13,18,40,44,53,54</sup>

Youth violence and intentional violent injury have long-term impacts on the youth’s health and life course, which is potentially preventable if targeted early, prior to first involvement in violence.<sup>7,10,21,30,34,41</sup> If the risk of violence is not addressed, the youth may miss out on many positive outcomes such as better mental health and well-being, higher level employment, job security and income, and positive connections within their communities.<sup>7,10,30,34,41,55</sup>

### ***Victim Perpetrator Overlap***

Multiple studies have demonstrated significant overlap between victims and perpetrators of youth violence.<sup>1,5,25,27,29,43,56–58</sup> Most youth seen by medical professionals for violent injury are themselves involved in violence and/or violent community conflicts, such as gang perpetrated violence.<sup>1,27,29,46,56–58</sup> It is more effective to track violence in youth by the number of violent injuries documented in health centres, such as hospitals and emergency departments, rather than relying on law enforcement reports and/or justice data, that are often incomplete.<sup>31,32,38,43,58–60</sup> There is gross under-reporting of injuries related to violence in health and justice systems, and

when injured youth attend health centres, including clinics and hospitals, they frequently do not disclose the reason for their injury.<sup>7,10,38,41,59,61,62</sup> This leads to an underestimation of the rates, extent, and cost of violence.<sup>7,59</sup>

Youth who perpetrate violence are frequently, but not always, involved in gangs and experience higher exposure to violent situations, leaving them vulnerable to violent injury.<sup>1,7,25,27,29,46,56,58</sup> Youth arrested for intentional interpersonal violence related offenses are up to 6 times more likely to sustain a violent injury than other youth.<sup>25</sup> Youth injured by violence are also more likely to be victims of repeat violent injury.<sup>10,15,56,58,62-64</sup> For example, in Winnipeg, Manitoba, 20% of all youth attending the emergency department with a violent injury are likely to return within the same year suffering from a second violent injury.<sup>15,53</sup>

### ***Health Outcomes, Risks, and Protective Factors for Youth Violence***

Youth violence and intentional violent injury continue to affect the youth long after the youth is involved in the perpetration or victimization by interpersonal violent injury.<sup>7,10,28,30,34,39,41</sup> Some of the long-term effects include decreased mental health and well-being; increased substance use; higher unemployment; decreased academic engagement and achievement; and future involvement in a variety of criminal activities.<sup>7,10,28,30,34,39,41,55</sup> Identifying risk factors and targeting those most likely to become involved in violence with secondary preventative programs also helps prevent the spread of violence.<sup>1,34,39,40,42,57</sup>

The population of youth affected by interpersonal violence, as perpetrators and/or victims of violence, are often negatively influenced by multiple intersecting risk factors including: low socioeconomic status (SES); high rates of personal and/or parental substance use; limited education and low graduation rates; family conflict; early childhood adversity and/or trauma;

gang involvement; involvement with Child Protective Services; high rates of mental illness; and high use of emergency medical services for violence related injuries.<sup>10,40,41,56,58,62,65,66</sup> Vulnerable youth often reside in neighbourhoods with low SES and face social and income inequality and low community efficacy.<sup>1,11,30,56,58,66,67</sup> Some protective factors that can mitigate the effects of the above risk factors are involvement and continued engagement in education, especially up to a minimum of grade 9, and efforts to increase community efficacy within neighborhoods and social groups.<sup>56,58,66</sup> A multilevel-multivariate analysis performed in 2014, by Snider et al. demonstrates that the strongest risk factors for youth sustaining violent injury are the following: male sex; criminal involvement; involvement with Child Protective Services; prior involvement with emergency departments for injury; low socioeconomic status; and high neighbourhood assault level. This study demonstrated involvement in school/education is one of the most protective factors for youth in preventing violent injury.<sup>66</sup>

Social Emotional Learning (SEL) programs, such as Roots of Empathy (ROE), are used to target numerous risk and protective factors as well as precursors that can lead to violence and/or help prevent violence.<sup>68-72</sup> Research has demonstrated their effectiveness and cost-effectiveness, based on their targeted outcomes by design, including bullying, aggression, and in a few cases, school-based fighting and violence.<sup>9,44,70-76</sup> If these programs could be effective at reducing violence, and serious violent injury, they would provide a cost-effective way to target violence at a population level and hopefully preventing it in the first place.

### ***Roots of Empathy Program***

ROE is an example of a SEL program. SEL programs are primary prevention programs, often delivered in classrooms and/or community settings, targeting various social, emotional and health related issues, frequently at a population level.<sup>9,49,69-71,77-82</sup> These classroom programs are

designed to increase positive well-being, social skills, social engagement, emotional regulation skills and behaviours.<sup>9,33,44,70,72,74,83–85</sup> These are skills and behaviours linked to a decrease in aggression, impulsivity and violence.<sup>70,71,86,87</sup> In addition, these programs frequently improve academic performance.<sup>33,71,84,85</sup> Many of these programs, including ROE, are evidence-based and have years of longitudinal research demonstrating long-term positive outcomes, including but not limited to, lower rates of criminal offenses and incarcerations, lower teen pregnancy rates, lower rates of mental illness, better mental health outcomes and self-assessed wellbeing, higher employment, higher graduation rates, better physical health outcomes, and higher future income.<sup>9,33,49,50,68,71,79–82,84,88</sup> As these programs are delivered at a population level, rather than an individual level, they frequently have a high degree of return-on-investment, with multiple dollars saved for each dollar spent.<sup>9,49,50,74,83,89,90</sup>

ROE addresses behaviours including physical aggression and school-based fighting, indirect aggression, and social withdrawal in both early and middle childhood, which are behavioural and psychological risk factors for later involvement in interpersonal violence.<sup>76,80,91</sup> Research demonstrates that increased perspective-taking, empathy, prosocial behaviour, and emotional competency, can reduce the risk of youth engaging in, or becoming a victim of, serious intentional interpersonal violence.<sup>1,9,70,71</sup> ROE in school classrooms may act as a primary prevention program and “behavioural vaccine”<sup>49,50</sup> to reduce youth involvement in interpersonal violence and criminal activity by “inoculating” them early, before these negative behaviours occur.

The ROE program is designed to teach children empathy and perspective-taking, in a structured 27-session curriculum in participating school classrooms. ROE is delivered by certified instructors in the classroom and focuses on visits by a parent and a newborn infant,

which occur once a month for 9 months. There are 9 pre-family and 9 post-family sessions. When the newborn is visiting the classroom, students learn from observing the parent-infant interaction and acquire knowledge about neurodevelopment, attachment, and emotional temperament. The children practice skills in reading emotional cues and expressing thoughts and feelings, as manifested through the baby's emotions and behaviours. The importance of social inclusion and emotional perspective-taking is highlighted throughout the program. The overall goal of ROE is to increase empathy and prosocial behaviours, and reduce physical, emotional, and psychological aggression and violence.<sup>49,69,78,80,81,90</sup>

ROE is currently used in over 8,000 K-8 classrooms in Australia, Canada, Isle of Man, Japan, New Zealand, Northern Ireland, Republic of Ireland, Scotland, Switzerland, , and the United States.<sup>49,77,80-82,90,92</sup> Within Canada, ROE and the early childhood literacy program, Seeds of Empathy, are implemented in both urban and rural communities, including many Indigenous communities across Canada.<sup>49,80</sup> In 2008, the National Assembly of First Nations made an official proclamation recognizing ROE as consistent with their traditional teachings and values.<sup>49</sup>

In Manitoba, ROE was first implemented by Healthy Child Manitoba Office (HCMO) in a pilot study in the Seine River school division during the 2001-2002 school year. After the pilot study, ROE was offered each year to all public, private, and Indigenous (including federally funded) schools in Manitoba who chose to train community ROE instructors and implement the program in classrooms of their choice. The pilot study was followed by a randomized controlled natural experiment in 2002-2003 (phase 1) throughout the province, involving four school divisions in the treatment group and four school divisions in the control group. The design of the study included cluster random assignment at the school division level and was stratified in 3

grades: Kindergarten, Grade 4, and Grade 8. Behavioural and social observations were recorded pre-and post-study. The study was replicated in 2003-2004 (phase 2). Results from this cluster RCT and replication study demonstrated that ROE has beneficial outcomes including reduced physical aggression, indirect aggression, and increased prosocial behavior amongst participating Manitoba children.<sup>49</sup> The benefits of ROE in terms of reduced physical aggression and indirect aggression were maintained years after the study. However, increased prosocial behavior was not maintained at the level observed immediately after the study.<sup>49</sup> Other studies on ROE have demonstrated similar results; many of the studies, including a meta-analysis from Northern Ireland, indicate that prosocial behaviour is not maintained.<sup>77,80,82,90</sup>

The Majority of the extant research on ROE is qualitative rather than quantitative, especially the research examining peripheral effects of the program, including increased emotional competency and emotional matching; reduced teen pregnancy; increased self-confidence; decrease in shaken baby syndrome; increased positive mental health; decreased suicide; and decreased reliance on psychotropic medications.<sup>77-79,81</sup> Outcomes from quantitative studies show increased empathy, increased perspective taking, increased understanding of infant crying, increased emotional and social competency, and reduced bullying and victimization.<sup>49,77,80,81,86,92</sup>

In terms of aggression and bullying, there are multiple quantitative and qualitative studies that demonstrate significant decreases in aggression and bullying in classrooms,<sup>49,77-81,92</sup> and outside of classrooms, with some outcomes being studied in community settings. The reduction in aggression and bullying was maintained in longitudinal studies up to 3 years after children were exposed to Roots of Empathy in their classrooms.<sup>49,80</sup> Many studies also demonstrated significant increases in prosocial behaviour when compared to controls, in teacher-rated, parent-

rated and independent observer-rated outcomes, although these results were not maintained longitudinally in some of the studies.<sup>49,77,80,81,90</sup> Many of these studies also demonstrated decreases in antisocial behaviour.<sup>49,80,90</sup> Based on reports from Manitoba and Northern Ireland,<sup>49,90</sup> ROE appears to be cost-effective at both provincial and national levels for improving social outcomes, overall well-being, and treating mental health problems in school-aged children.<sup>49,90</sup>

The above leads one to question: are primary prevention programs targeting precursors to violent injury and aggression in children, effective at reducing youth violence when administered in school classrooms? Could these programs reduce the overall rate of serious intentional interpersonal violent injury in youth, as well as subsequent adult rates of serious interpersonal violent injury. Could ROE, a school based SEL Prevention Program promoting prosocial behaviour, be protective and prevent serious intentional interpersonal violent injury among youth.

This study is amongst very few studies directly looking at the effects of a universal SEL program, as a potential primary prevention program for youth violent injury and homicide, perpetrated outside of the classroom/schoolyard. It also is one of the first studies looking at violent injury as an outcome to be targeted by an SEL program, as opposed to aggression, bullying and fighting/school-fight-related injury or aggressive and violent behaviours.<sup>4,9,44,71,73,74,93</sup> In addition, this study is one of the largest studies on Roots of Empathy as well as the study that currently has the longest follow-up on the effects of Roots of Empathy.<sup>49,77,79–82,90,92,94</sup>

### *Study objectives*

This study examines the relationship between participation in ROE in childhood/early adolescence (approximately between the ages of 5-13 years) and risk of serious intentional interpersonal violent injury in youth (between the ages of 16-24 years), and whether this relationship differs based on sex at birth (male/female) or grade level of exposure (K-3, 4-6, and 7-10).

*Primary Question:* What is the difference in rates and risk of serious intentional violent injury in Manitoba youth ages 16-24 years, between youth who participated in ROE and those who did not participate in ROE?

*Primary Hypothesis:* I hypothesize that Manitoba youth, ages 16-24 years, who participated in ROE will have lower rates and lower risk of sustaining a serious intentional interpersonal violent injury, than youth who did not participate in ROE.

*Secondary Question A:* Does the relationship between participation in ROE and rates and risk of serious intentional violent injury in Manitoba youth ages 16-24 years differ by sex at birth?

In almost all the research on youth violent injury, males are more at risk of sustaining a violent injury and having higher rates of violent injury,<sup>7,10,62,95,96</sup> and face more direct aggression and bullying than female children.<sup>44,58,68,95</sup> Male children in some SEL programs had increased positive outcomes of reduced direct aggression, compared to females. This includes a robust study from North Lanarkshire, Australia on ROE outcomes.<sup>44,50,68,92</sup> By comparison, females showed higher levels of reduced indirect aggression.<sup>49</sup> However, most of the research on SEL targeting precursors to youth violent injury and universal primary prevention programs targeting

violence, demonstrate no significant difference in outcomes between sexes.<sup>33,44,49,81,90</sup> In the immediate follow-up to the Manitoba study, ROE had robust immediate outcomes in male and female children. Though the increases in prosocial behaviour faded in the male children over the longitudinal three-year follow-up, the reduction in direct and indirect aggression was maintained or increased.<sup>49</sup>

*Secondary Hypothesis A:* I hypothesize that sex at birth will influence rates and risk of serious interpersonal violent injury in Manitoba youth ages 16-24, and on the magnitude of the impact of the ROE program on serious interpersonal violent injury. Given that male youth are at higher risk of injury,<sup>7,10,44,95</sup> it is predicted that male sex at birth will predict higher rates of serious intentional violent injury in youth. It is also predicted that the ROE program will have a stronger impact at reducing rates of serious intentional violent injury in youth who have male sex designation at birth compared to female sex at birth, as well as those who those who did not participate in the program.

*Secondary Question B:* Does the relationship between participation in ROE and rates and risk of serious intentional violent injury in Manitoba among youth ages 16-24 differ by grade level (K-3, 4-6, 7-10) of first exposure to ROE? In the Manitoba and North Lanarkshire, Australia ROE studies, children who were exposed to ROE at the younger grades showed more robust and longer lasting increases in positive behaviour, compared to those exposed in the later elementary/middle/high school grades.<sup>49,92</sup> There is some research demonstrating that SEL programs and primary prevention programs for aggression and/or violence have better outcomes when delivered to younger grades compared to older grades.<sup>33,71</sup> A systematic review found the largest effect sizes on reduced aggression and school-based violence amongst those who received

universal, classroom-based programs in pre-Kindergarten-grade one, as well as in more targeted classroom-based programs in high school (Grades 9-12).<sup>9</sup> However, results from most studies indicate no significant differences between grade/age at delivery and outcomes.<sup>33,81,90</sup> Other reports also indicate that the risk of violent injury in youth increases with age.<sup>7,9</sup>

*Secondary Hypothesis B:* Given that some SEL/universal primary prevention programs have increased positive outcomes when delivered at an earlier age/grade,<sup>7,9,49,92</sup> I hypothesize that there will be a difference in rates and risk of serious intentional interpersonal injury in Manitoba youth, ages 16-24 based on the grade level in which they first participated in the ROE program. It is predicted that participation in ROE in the earlier grade categories (K-3, 4-6) will have a stronger impact on reducing rates and risk of serious intentional violent injury, than the higher-grade category, when comparing those who participated in ROE to those who did not.

## **Chapter 2: Methods**

### ***Setting***

This study takes place in the western Canadian province of Manitoba, with a population of 1,366,086 based on quarterly demographic estimates (January 2022) from the Government of Manitoba.<sup>97</sup>

### ***Data***

Manitoba is unique amongst the Canadian provinces in terms of studying population-based health outcomes, as many linkable, de-identified health and social databases are available for research through the Manitoba Centre for Health Policy (MCHP). MCHP maintains the Population Health Research Data Repository, one of the most comprehensive repositories of individual-level and population-based data sets in Canada, including data on multiple health services, programs, and social services. Data housed at MCHP can be linked across data sets and over time -by using scrambled personal health information identification numbers (PHINs), which maintain the privacy and confidentiality of an individual person's data, while allowing research to be performed.<sup>98</sup>

The data for this project were obtained retrospectively through administrative data gathered over many years and housed at MCHP. The present study data are from four data sets accessed through the MCHP Repository: (1) Manitoba Health Insurance Registry, to obtain participant demographics including sex, postal codes/neighbourhood location, age/birth date, immigration/emigration to/from province; (2) Hospital Separation Abstracts, to obtain information about admissions to hospital and reasons for hospitalization; (3) Vital Statistics, to obtain information on mortality from violent injury/homicide; and (4) Manitoba Education, to obtain information on the year a youth attended the school, whether or not a child participated in

ROE and the grade in which they were enrolled when they were exposed to ROE.

The data from the Manitoba Health Insurance Registry were accessed to obtain demographic information about the participants in the study and were used for matching cases to controls. These data were also used to determine the age/birth year of the youth within the study; sex of the youth at birth -male/female (Manitoba currently does not have a system that reflects gender versus sex within health records); and residential location based on the first three characters of an individual's postal code.

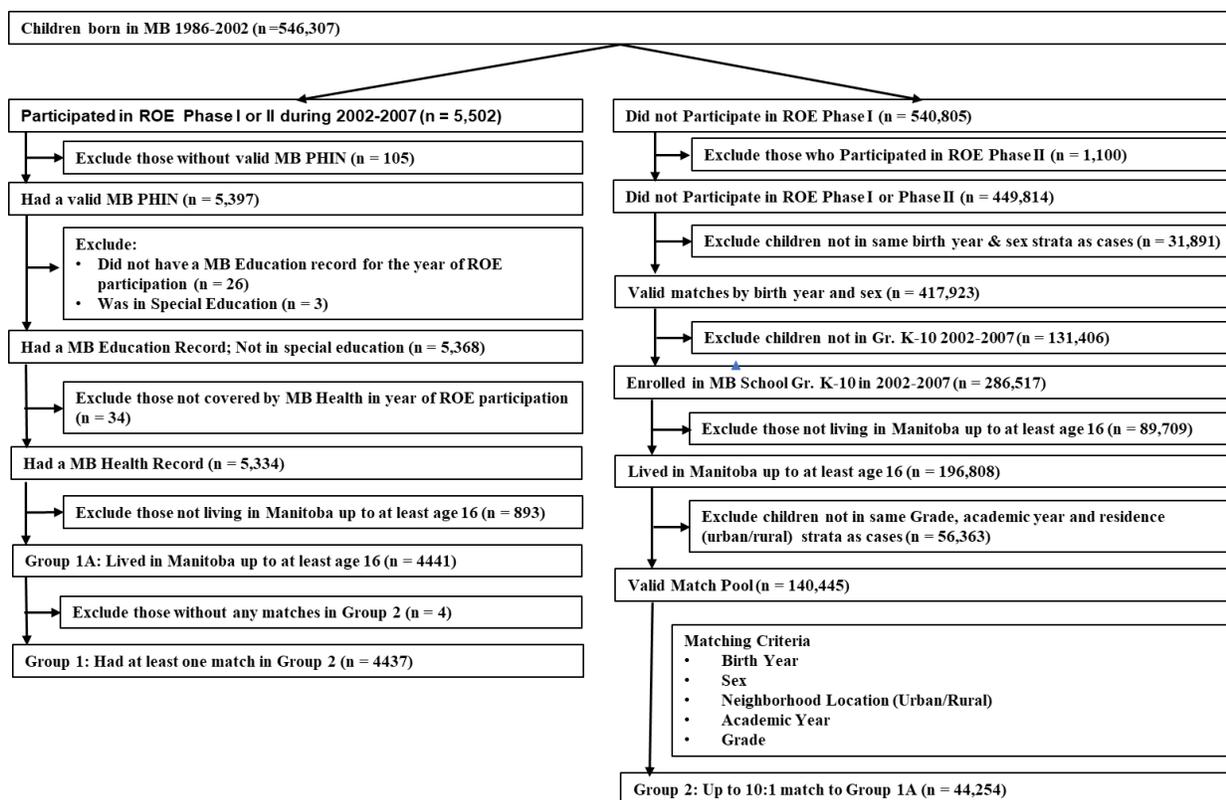
### ***Cohort***

Youth in the present study were selected from the Manitoba population of children born between the years 1986 and 2002 ( $N = 546,307$ ). Of these, 5502 were identified as having participated in ROE between 2002-2007.

To compare the youth who were exposed to ROE during the years 2002-2007 to a control group of youth who were not exposed to ROE, the youth in the treatment group were matched on an up to 1:10 ratio to youth in the control group. Matching criteria of birth year; sex at birth (male/female); neighbourhood location (urban/rural); academic year; and grade were used. The control group also consisted of Manitoba youth born between the years 1986-2002, who resided in Manitoba at least until age 16 years. Youth who participated in ROE were excluded, as they were included in the treatment group. Youth who could not be matched to the same birth year and sex strata as the youth in the treatment group were excluded, as well as youth who were not enrolled in Kindergarten-Grade 10 between the years 2002-2007. Participants who could not be matched in terms of grade, academic year, and residence location (urban/rural), or who did not reside in the province at least until age 16 years, were also excluded

To link to other data within the MCHP Repository, 105 youth who did not have a valid Manitoba PHIN or had an incomplete Manitoba Health Record were excluded. Youth who did not have a valid record with Manitoba Education; youth in Special Education Programs (excluded only in the cases group as individuals in Special Education programs may not participate in ROE programs with their assigned classroom); and youth who did not live in Manitoba up to at least age 16 years, to ensure that they were in the province during the outcome period were excluded. Finally, any youth who could not be matched with any youth in the control group (not exposed to ROE during the years 2002-2007) were excluded, as there was no one with whom to compare them. This provided the study with a total of 4437 youth in the cases/treatment group who were exposed to ROE, and 44,254 youth in the control group. Thus, the total number of youth in the present study is 48,691 (see Figure 1).

**Figure 1.** Cohort Formation



Originally, the plan was to include Socioeconomic Factor Index, Version 2 (SEFI-2) scores from Canada Census data, through Statistics Canada accessed through MCHP, in the analysis, to control for confounding variables related to the nonmedical social determinants of health including: the unemployment rate at age 15+; average household income at age 15+; proportion of single-parent households; and proportion of population age 15+ without high school graduation.<sup>99</sup> However, as severe interpersonal violent injury resulting in admission and/or death is an uncommon outcome in Manitoba, adding SEFI-2 scores as a matching variable made it too difficult to obtain numbers of participants high enough to achieve adequate statistical power.

***Exposure: Roots of Empathy***

Exposure in the present study is whether youth were exposed to (received) ROE programming during kindergarten to Grade 10. ROE is administered over a full school year, to children and youth in grades K to 8.<sup>49,69,78,80,81,90</sup> In Manitoba, due to multi-grade classrooms (especially in rural areas), some of the youth who received ROE were in grades 9 and 10. Additionally, some students were exposed to ROE more than one time. The present study looked only at the youth's first exposure to ROE. Data from Manitoba Education were accessed to obtain information on the year that the study participants (cases/controls) attended school, and which year the youth in the cases group were exposed to ROE. The years of school attendance in the study are between 2002 and 2007. The years 2004 and 2008 are excluded. ROE was administered in schools across Manitoba during these 2 years, however, data were not consistently gathered in all parts of the province and thus were not submitted in the ROE database at MCHP. There is a remote possibility that some of the youth in the matched control group were exposed to ROE in 2004 or 2008. However, most of the schools participating in the ROE Program, ran the program

consistently and consecutively, and were unlikely to have started using the program in either of these years. In addition, there is also the possibility of immigration/emigration into or out of schools participating in ROE or not, during these 2 years. However, the chance of this happening was so low in the context of this study, that this was disregarded.

### ***Outcome: Interpersonal Violent Injury***

The outcome in the present study is the incident rate and number of severe interpersonal violent injuries in youth ages 16-24 years, defined as a serious injury requiring admission to hospital or death due to violence inflicted by others. This excludes intimate partner violence between two romantic partners and child abuse, where an adult in a position of authority such as a parent, teacher, or coach, injured the youth. These forms of violence include a different violence demographic, and the violence in this context is driven by different factors. These are excluded to remove confounding variables from this study. These types of violent injuries also have different ICD-10-CA codes. The ICD-10-CA codes for hospital admission for injuries will indicate that the youth was admitted/discharged from the hospital for one of the following codes: *Y00, Y01, Y02, Y03, Y04, Y08, Y09, Y87, X85, X86, X87, X88, X89, X90, X91, X92, X93, X94, X95, X99.*<sup>100</sup> Or, the Vital Statistics data indicating injury mortality, with primary cause of death listed as one of the following ICD-10-CA codes: *Y00, Y01, Y02, Y03, Y04, Y08, Y09, Y87, X85, X86, X87, X88, X89, X90, X91, X92, X93, X94, X95, X99.*<sup>100</sup>

### ***Analysis***

Survival analysis was used to investigate the relationship between exposure to ROE (Kindergarten to Grade 8, approximately ages 5-13 years) and having a violent injury as a youth (ages 16-24 years), (using PROC PHREG of SAS V.9.3; SAS Institute). Survival Analysis was selected to follow the youth for as long as possible during the years of the study (2002-2007) for

exposure to ROE, and up to 2020 for exposure to the risk of serious violent injury or death. This also allowed us to use data that was censored before the end of the study. Hazard ratios (HR) of <1.0 or >1.0 were considered significant if the 95% confidence intervals (CI) did not cross 1.0. Youth were followed for analysis starting at age 16 until an event occurred, they aged out of the study (>24yr), or the youth left the province/disappeared from follow-up. The number of overall injuries, injury incident rate for both the ROE group and their matches were analysed, and HRs comparing the ROE group to their matches were examined. The analysis was also stratified by sex at birth (male/female) and grade level at exposure to ROE (K-3, 4-6, 7-10) to examine whether there were differences in the relationship between ROE and violent injury based on these characteristics.

Grade at exposure is divided into 3 grade range categories of K-3, 4-6, and 7-10. This is to divide the exposure to ROE into early-middle, middle, and late childhood, to investigate if exposure to ROE at a certain age level might have differential effects on long-term outcomes related to the impact of ROE.

The additional variables stratified for their effects on the impact of the ROE program on serious violent injury, were each analysed separately. No interactions terms were included in the present study. Differential impacts between the two sexes and between grade categories at exposure were not analysed.

To test the proportional hazards assumption, I conducted an additional analysis that included an interaction term between the predictor (participated in ROE) and event time. The interaction term was not significant for any of these analyses, indicating that the proportional hazards assumption was not violated.<sup>101</sup>

### ***Ethical Considerations***

As this is a secondary analysis study, using a retrospective records review with all data de-identified by scrambled PHIN, privacy was maintained for all the records reviewed. This study focuses on youth and vulnerable status, and some of the participants were under age 18 years at the time of data collection. However, this is a retrospective (archival) study that did not manipulate and/or change any situation faced by the youth. Thus, individual youth in the study were not directly impacted by conducting this study and faced no personal risk by having their records accessed using de-identified information. This study was approved by the University of Manitoba Health Research Ethics Board (H2016:283), the Manitoba Health Information Privacy Committee, and the data providers of variables listed previously.

## **Chapter 3: Results**

### ***Overall results***

A total of 48,691 Manitoba youth were included in this study, of which 4,437 youth participated in ROE. The youth in the ROE treatment group were matched up to a 1:10 ratio with youth in the province having matching demographics, but with no exposure to the ROE program, resulting in 44,254 youth in the control group.

Starting from age 16 years, youth in this study were followed for an average time of 7.3 years with a standard deviation of 1.76 years, in terms of their exposure risk to intentional interpersonal violent injury. The minimum amount of time a youth was followed was 1 year and the maximum was 9 years. The total person-years that all the youth in the ROE group were followed was 32,346 years, and the total person-years that all the youth in the control group were followed was 323,827 years.

The youth in both the ROE and the control groups were similar on matched characteristics comparing percentages using visual inspection, and thus, the demographics of both groups were very similar (**Table 1**). In both the ROE and the control group, there were 52% male at birth, and 48% female at birth participants. Birth year was observed to determine the age at which the youth were exposed to and/or injured by interpersonal violent injury. Most of the youth in both groups in the study were born between 1994-1997. 2.7% of the youth were born between 1986-1989, 11.5% between 1990-1993, 53.5% between 1994-1997 and 32.3% between 1998-2002.

**Table 1.** Cohort Characteristics

	<b>Participated in ROE (n = 4437)</b>	<b>Did not Participate in ROE (n = 44254)</b>
	<b>n (%)</b>	<b>n (%)</b>
<b>Sex</b>		
<i>Male</i>	2306 (51.97)	23034 (52.05)
<i>Female</i>	2313 (48.03)	21220 (47.95)
<b>Birth Year</b>		
<i>1986-1989</i>	120 (2.70)	1199 (2.71)
<i>1990-1993</i>	511 (11.52)	5078 (11.47)
<i>1994-1997</i>	2375 (53.53)	23675 (53.50)
<i>1998-2002</i>	1431 (32.35)	14302 (32.32)
<b>Grade Level</b>		
<i>K-3</i>	1449 (32.66)	14467 (32.69)
<i>4-6</i>	2343 (52.81)	23339 (52.74)
<i>7-10</i>	645 (14.54)	6448 (14.57)
<b>Year Student Attended the School</b>		
<i>2002</i>	342 (7.71)	3414 (7.71)
<i>2003</i>	220 (4.96)	2193 (4.96)
<i>2005</i>	1201 (27.07)	11994 (27.10)
<i>2006</i>	1624 (36.60)	16210 (36.63)
<i>2007</i>	1050 (23.66)	10443 (23.60)
<b>Neighborhood Location</b>		
<i>Urban</i>	2536 (57.76)	25570 (57.78)
<i>Rural</i>	1874 (42.24)	18684 (42.22)

The survival analysis compared rates of intentional interpersonal violent injury between the ROE and control group. There was no statistically significant difference in the overall rates of injuries between the ROE and control groups. There were 43 injuries in the ROE group, which corresponds with a rate of 13.2 injuries per 10,000 person years, and there were 341 injuries in the control group, which corresponds with a rate of 10.5 injuries per 10,000 person years (HR =1.26; 95% CI 0.91-1.73) (**Table 2**).

**Table 2.** Rates and Hazard Ratios of Interpersonal Violent Injury; Overall and Stratified by Sex and Grade at Exposure

	Had a serious intentional violent injury from ages 16-24		<i>Hazard Ratio (95% CI)</i>
	Participated in ROE (n = 4437); n (Rate*)	Did not Participate in ROE (n = 44254); n (Rate*)	
<b>Overall</b>	43 (13.2)	341 (10.5)	1.26 (0.91-1.73)
<b>Sex</b>			
<i>Male</i>	37 (22.14)	274 (16.32)	1.34 (0.95-1.89)
<i>Female</i>	6 (3.83)	67 (4.30)	0.90 (0.39-2.10)
<b>Grade at Exposure</b>			
<i>K-3</i>	11(13.40)	83 (10.07)	1.27 (0.70-2.40)
<i>4-6</i>	21 (11.33)	181 (9.78)	1.19 (0.75-1.90)
<i>7-10</i>	11 (19.71)	77(13.70)	1.40 (0.74-2.66)

\*a per 10,000 person years

#### ***Analysis Stratified by Sex at Birth***

In this study, males sustained more injuries and deaths than females, similar to most previous studies on violent injury studies on youth violent injury.<sup>7,9,10,41,44,56,66,96,102</sup> However, there were no statistically significant differences in injury rates between the ROE group and the control group for either sex. Amongst males, in the ROE group there were 37 injuries, corresponding with a rate of 22.14 injuries per 10,000 person years, and in the control group there were 274 injuries, corresponding with a rate of 16.32 injuries per 10,000 person years (HR = 1.34; 95% CI 0.95-1.89) (**Table 2**). Amongst females, in the ROE group there were 6 injuries, corresponding to a rate of 3.83 injuries per 10,000 person years, and in the control group there were 67 injuries, corresponding with a rate of 4.30 injuries per 10,000 person years (HR = 0.90; 95% CI 0.39-2.10) (**Table 2**).

#### ***Analysis Stratified by Grade at Exposure***

ROE did not statistically significantly reduce the risk of intentional interpersonal violent injury in any grade category. In the ROE group exposed during K-3, there were 11 injuries, corresponding to a rate of 13.40 injuries per 10,000 person years, and in the control group there were 83 injuries, corresponding to a rate of 10.07 injuries per 10,000 person years (HR = 1.27; 95% CI 0.7-2.40) (**Table 2**). In the ROE group exposed during grades 4-6, there were 21 injuries, corresponding to a rate of 11.33 injuries per 10,000 person years, and in the control group there were 181 injuries, corresponding with a rate of 9.78 injuries per 10,000 person years (HR = 1.19; 95% CI 0.75-1.90). Finally, in the ROE group exposed during grades 7-10, there were 11 injuries, corresponding with a rate of 19.71 injuries per 10,000 person years, and in the control group, there were 77 injuries corresponding with a rate of 13.70 injuries per 10,000 person years (HR = 1.40; 95% CI 0.74-2.66).

## **Chapter 4: Discussion**

This study's aim was to investigate if ROE, one of the universal school-based violence prevention programs with some of the most robust outcomes in reducing aggression and increasing prosocial behaviour,<sup>49,77,79-82,90,92</sup> would reduce violence in the community and for youth, especially in the years when youth are most at risk to both perpetrate and be victims of violence.<sup>7,25,27,54,58</sup> Based on evidence that other SEL programs increase positive outcomes such as increased well-being, health, mental wellness, graduation rates and employment, and reduce negative outcomes such as criminal involvement, incarceration, substance use and unemployment,<sup>8,30,51,58,59,72</sup> I hypothesized that the ROE program would reduce the risk of serious violent injury in youth and have longitudinal effects, following their exposure to the program. This hypothesis proved to have a null result in the present study. There was no statistically significant difference in the rates of violent injury between ROE and control groups.

There have been multiple studies on the ROE program and its effects on reducing bullying, aggression, and school-based violence.<sup>49,77,79-82,90,92</sup> Whereas bullying and school-based violence are demonstrated risk factors and predictors of future involvement in youth-on-youth interpersonal violence and the risk of sustaining interpersonal violent injury,<sup>75,87,91,93,103,104</sup> none of the previous studies on ROE analyzed its long-term effects on later youth involvement in violence, or whether positive ROE effects generalized to reduce violence outside of the school setting.<sup>49,77,79-82,90,92</sup> The present study is one of two studies that explored the longitudinal effects of ROE beyond three years.<sup>94</sup> It is the first study to investigate whether serious youth interpersonal violent injury can be mitigated by an SEL program acting as a universal primary violence prevention program, in this case ROE.

Previous qualitative and quantitative studies on ROE have demonstrated decreases in aggression in children exposed to ROE and an increase of aggression in control group children.<sup>49,77,79–82,90,92</sup> ROE might or might not address violence in the longer run, or outside of school settings and much more research is needed. These previous studies demonstrated that ROE's effects on increased prosocial behaviours were not consistently maintained at a significant level over a 3-year follow-up, especially in males, whereas ROE's effects on reduced physical and indirect aggression were maintained.<sup>49,81,82,90</sup> In studies on violence in general, as well as studies on secondary violence prevention programs, increased prosocial behaviour is strongly correlated with a reduction in violence and violent incidents. Aggression, both direct and indirect are potential precursors of violence. However, there are other personal, environmental and social factors that interact in the development of violence.<sup>45,66,70–73,75</sup> The present study looked at a longer time frame, averaging 7 years. Thus, the present null results suggest that the previous effects on aggression may not have been maintained longitudinally after 3 years.

Previous research on the ROE program's ability to decrease both direct and indirect aggression, bullying and in-class violence, and to increase prosocial behaviour and empathy, is robust and stretches across Canadian provinces and other countries. The measures of aggression-related behaviours as well as prosocial-related behaviours were observed by teacher-rated, student-rated, parent-rated, and independent observer-rated surveys, including direct video observation of the classroom.<sup>49,77,79–82,90,92</sup> The previous Manitoba study suggested an approximate 50% reduction in fighting amongst children at school.<sup>49</sup> This study focused on youth interpersonal violence, one of the results of children not learning empathy, prosocial approaches to adversity and how to consider the perspective of the other in a given situation and, rather, youth being involved in school bullying, fighting, damaging school property and victimizing

others. These children have not had the opportunity to learn and practice prosocial responses during their child to youth trajectories and are more at risk for youth interpersonal violence than those who have incorporated alternate prosocial responses into their daily lives.<sup>33,41,70-72,74</sup> Many universal violence prevention programs and SEL programs have been demonstrated to increase prosocial behaviours and empathy.<sup>9,44,49,71,72,78,80,87,92</sup> However, in the classroom, there is often positive social pressure to engage with a given program and display prosocial behaviours.<sup>50,68</sup> Outside of the classroom or school, especially when financial or social hierarchical peer pressure (including gangs) and impulsivity are present, empathy for others may not be enough to prevent violence.<sup>1,77,91,103</sup> This context-dependence of violence outcomes is important to consider in future ROE and violence prevention research.

### ***Sex at Birth***

In almost all previous studies on youth violent injury, as well as youth violence in general, males are at much higher risk of sustaining violent injury and tend to be more involved in youth violence, including being victims of aggression and violent bullying.

<sup>7,9,10,33,41,44,56,66,67,95,96,102</sup> Unsurprisingly, in the present study, there were many more injuries amongst male (at birth) youth, regardless of whether they were in the ROE or control group, with rates of serious violent injury and/or death ranging from 16.3- 22.1/10,000 youth, than there were in female (at birth) youth, with rates of 3.8-4.3/10,000 youth. However, the participation in ROE did not impact rates of violent injury for males or for females (at birth). Though a few other studies on SEL programs, including one study on ROE in Australia, demonstrated that programs seemed to have stronger effects in males,<sup>68,76,82,92</sup> most research to date has found no sex differences in increased positive or reduced negative outcomes for children participating in these programs.<sup>33,44,75,81,90,93,105</sup> Previous research on ROE demonstrated that the program had more

robust and sustained effects on prosocial behaviour as well as reduced indirect aggression in females, but there were no sex differences on the other outcomes immediately or longitudinally.<sup>49,77,82,90</sup> Thus, while contrary to my hypothesis, the lack of sex differences in the present study is consistent with some of the outcomes in other prior ROE and SEL programming research.

### ***Grade at Exposure***

In the present study there was no statistically significant difference in violent injury outcomes based on the grade level at which children/youth were exposed to the ROE program. Research on other similar programs demonstrated that programs administered at younger grades had more robust and longer lasting effects.<sup>87</sup> A systematic review demonstrated that beneficial effects on reducing aggression and school-based violence were strongest in universal classroom-based programs in pre-Kindergarten-/Grade 1 as well as in targeted classroom-based programs for high school (Grades 9-12).<sup>9</sup> Another study showed more robust reduction in aggressive and disruptive behaviour in the middle school grades versus the elementary grades,<sup>76</sup> and another study showed the most effects occurring in the older grades.<sup>93</sup> However, other studies indicated little or no effects of age/grade at delivery of these programs on outcomes.<sup>33,71,75,81,105</sup> The previous Manitoba ROE study indicated increased and sustained positive outcomes when the program was delivered to younger grades.<sup>49</sup> The results of the present Manitoba study suggest that these outcomes may not have been maintained over a longer (7 year) timeframe, contrary to what I hypothesized.

### ***Policy and Practice Implications***

The null results of the present study may be of interest to policymakers and practitioners. Further research in Manitoba and elsewhere is essential before drawing any definitive

conclusions about the long-term effects of ROE on later youth violence, let alone basing major decisions on any single study. The present study will hopefully be the first of many in this policy area. Future research will benefit from addressing the limitations of the present study.

There are other SEL and school-based primary and secondary prevention programs that target aggression and violence in school settings, as well as outside of school.<sup>10,34,45,51,69,72,73,77,87,108,109</sup> However, most related research looked at violence and aggression in school settings, with limited investigation of outcomes in the community, during or after program participation; of 44 clinical trials studied in meta-analyses, none looked at violent injury.<sup>9,33,44,71,72,93</sup> Two systematic reviews and two meta-analyses demonstrated that the SEL programs that were non-theory based, interactive, and action-based targeting prosocial behaviors were more effective at reducing aggression. These were compared to programs teaching youth to proactively delay or plan not to react when provoked.<sup>9,44,72,73,93</sup> The interactive programs were shown to reduce rates of violence and aggression in the classroom and other school settings and were also shown to be cost-effective, ranging between \$15-\$200 per student.<sup>9,44,73,83,85,89</sup>

In a meta-analysis of 26 randomized controlled trials on primary and secondary prevention programs for violence, the most effective programs for reducing violence in community settings (vs. school settings), focused on delivering programs to older students, in mixed gender settings, targeting those directly involved in and/or affected by violence, targeting the highest risk individuals, and employing violence intervention specialists who worked individually with the youth.<sup>93</sup> These targeted approaches are effective for those selected to receive them based on their social histories and behaviours. In contrast, ROE is a universal SEL school-based primary prevention program, provided to all students in the classroom, and to any

school that wishes to run the program, regardless of risk stratification and does not specifically focus on reducing the risk of involvement in violence.<sup>49,69,77–80,82,90,92</sup>

A systematic review of school-based primary prevention programs to reduce violence reported that, in their search for studies, they discovered a strong publication bias, where many studies of these programs with null results were never published nor reported. They tried to contact as many authors as possible and to search the grey literature for these null studies but were not able to find the results of many studies to include in their meta-analyses.<sup>44</sup> It is therefore important to publish and further investigate the null results of the present study, as it may provide some guidance for future research and program development, to better target violence overall, so that beneficial program outcomes may be maintained beyond the school years.

There are also secondary violence prevention programs with positive outcomes, delivered to youth most at risk of involvement in violence, delivered in schools, in communities, and in emergency departments.<sup>13,53,60,73,93,108–110</sup> Much research shows that targeted secondary prevention programs work better in addressing violence in the community.<sup>1,93,108,109</sup> Such programs engage with the highest risk youth and aim to address specific risks and situations that are more likely to lead to violence, but also promote prosocial behaviours and empathy. Most of these programs also focus on relationship building. However, these programs do not appear as cost-effective as primary prevention programs.<sup>9,33,60</sup> They may also miss many students; it is not possible to accurately identify every youth most at risk of being involved in violence or sustaining a violent injury.<sup>33,56,58,62</sup> The impact of risk factors on life outcomes of a youth are mitigated by interaction with protective factors. Given there is no perfect method for identifying youth who will benefit from secondary violence prevention programs, the risk of waiting until

youth are harmed by violence to provide prevention-based programs means students may sustain serious injury and/or death before ever being exposed to these programs.<sup>83,89,93,108,109,111.</sup>

Conceptualizing violent injury through the lens of a medical model and primary prevention approach versus the current justice-based approach focus on punishment and incarceration, needs to be considered. In the medical model, youth violence and violent injury are perceived to spread like an infection amongst youth, and, if not addressed at a primary level, there is a risk that more youth will become involved in violence than those who are originally identified as at risk. The violence follows the course of a contagious disease, spreading quickly and widely.<sup>28,38-41,43</sup>

There are multiple forms of violence that are related but not identical to each other. Behavioral aggression, especially in childhood, frequently develops into intentional violent actions later in life if left unchecked.<sup>1,8, 11,45,50,51,71,72,78,82,84,92.</sup> Violence at school and school yard fighting are directly correlated with community-based violence.<sup>1,7,10,56-58,76</sup> Youth who are exposed whether directly or indirectly to violence at home, school or in the community are more likely to become involved in gangs and other forms of organized violence.<sup>1,7,10,56-58</sup> With each step, there is an escalation of severity and frequency of violent perpetration but also increased risk of violent injury. This is very similar to how a virus mutates and creates variants.<sup>28,40,43,56-58,96,112</sup>

Identifying a primary prevention approach to youth violence would emulate other successful approaches. This could include cost-effective mass inoculation through exposure to effective primary prevention programs, prior to the emergence of violence and violent injury. More research would facilitate a better understanding of the course, duration, severity, and chronicity of interpersonal violence in a specified area or region. Ongoing monitoring of

mutations and variants would be required. As these are identified through research, monitoring and analysis on any differential effectiveness of the various approaches for these variants would be essential.

A population-level primary prevention program targeting youth violence/youth violent injury is critical to reducing the growing epidemic of youth injuries and deaths.<sup>40-4271</sup> Longitudinal research on ROE and similar SEL programs is needed, using wider parameters than this current study, including looking at more years of data and/or using a larger sample size; looking at more commonly seen outcomes related to violent injury; looking at data from other provinces and countries; investigating if specific programs impact different types of violent injuries(e.g., gun shot wounds vs blunt trauma vs stabbings); considering differences in program delivery; and research combinations of primary and secondary prevention programs. It is important also to research the possibility of implementing secondary prevention programs for youth identified to be most at risk of involvement with violence, after participation in a program such as ROE.<sup>13,22,73,110</sup> Ideally, a primary prevention program such as ROE, would provide children/youth with the skills and real-world practice to avoid unnecessary reactivity and involvement in violence,<sup>49,69,71,72,78,80</sup> and, for children who would benefit, a subsequent secondary prevention program would target at-risk behaviours that intersect with family, community, and other external risk factors, that specifically increase risk of sustaining a violent injury.<sup>33,73,93,108</sup> Further research will be needed to study if this two-phased approach would reduce youth interpersonal violence and if this model is a cost-effective model.

The present study also offers a scaffold for future longitudinal research at a population level to further study the effects of ROE and other similar programs on outcomes such as youth violence, future employment, future physical and mental health outcomes, using cross-linked

data from population-wide databases. Specifically with ROE, there is qualitative research on other effects of ROE, including increased emotional competency and emotional matching; reduced teen pregnancy; increased self-confidence; decreased Shaken Baby Syndrome; decreased suicide; and increased positive mental health outcomes.<sup>78-80,90</sup> Using this scaffold, where population-level administrative data may be available to represent the outcomes, it may be possible to complement these qualitative studies with further quantitative studies.

### ***Strengths, Limitations and Future Research***

The present study has strengths. It is one of the largest population-based studies on the ROE program to date, with a total of 48,701 participants, 4437 having participated in ROE. This study's timeframe has one of the longest follow up periods looking at a primary, universal, school-based, violence prevention program and its longitudinal effects. This longitudinal retrospective cohort study also has the longest follow-up (averaging 7 years) for the ROE program to date. Most previous longitudinal research on ROE had follow-up periods of 1-3 years after participation in the program.<sup>49,77,80,90</sup>

The present study also had limited scope because it only considered data on serious violent injury and death. While these outcomes are the most feared outcomes of youth violence, they are also relatively rare events in the population. However, for every youth who dies, there are 16 youth who are admitted to hospital for serious violent injury, and for every youth admitted to hospital there are approximately 116 youth who attended emergency departments for interpersonal violent injuries.<sup>12,13,18</sup> Using data regarding the latter group would have increased the statistical power of the present study, but this was not pursued due to issues and limitations in the available emergency department data (described further below). Youth who seek medical assistance from general practitioners and walk-in clinics, and youth who do not seek medical

attention for injury sustained by violence were also not included in the data. Therefore, this study underrepresents the number of violent injuries amongst youth in Manitoba and does not address repeat violent injury,<sup>13,15,54,63,104,110,113,114</sup> and is focused on relatively rarer outcomes, thereby making it more difficult to detect statistically significant effects of program on outcome. Furthermore, the effects of ROE on the wider array of youth violence outcomes continue to remain unknown and merit further study.

Repeat violent injury is a frequent outcome of youth sustaining an injury through violence, with 20% of Canadian youth who sustained a violent injury, returning to the emergency department within 12 months.<sup>13,15,18,53,54,63,104,110,113,114</sup> This study looked only at the first incidence of violent injury in a youth admitted to the hospital (and in turn used Hazard Analysis as the main statistical analysis). Serious violent injury resulting in hospital admission is a far more severe outcome than an emergency department visit, or an injury that can be treated in the community. It is possible that ROE may have been effective at preventing repeat injuries or these less severe youth injury outcomes, and in the future, it would be useful to empirically explore these possibilities.

To analyze interpersonal violent injury within the emergency departments in Manitoba, the analysis of hospital Emergency Department abstracts would be needed, which was beyond the scope of this study. There are limitations to using these abstracts as much of the data is incomplete and/or unclear. Without performing chart reviews of the records of youth attending the emergency department for a violent injury it can be difficult to determine the source of the injury. The ICD-10-CA codes do not always reflect the nature of the violent injury. For example, it can be very difficult to determine the difference between self-sustained violent injury, intimate partner violence, child abuse and/or accidental injury based on the codes in the emergency

department abstracts despite these forms of injury having different ICD-10-CA codes.<sup>62,114</sup>

Though the effects of ROE could potentially have an impact on these other forms of injury, the precipitants of these other forms of injury and the risk factors behind them are not identical to youth violent interpersonal injury.<sup>1,2,7,10</sup> This would create confounding variables when trying to specifically target and analyse interpersonal youth violent injury. Violent injury is used in the study as a proxy for youth involvement in, and perpetration of, violence, due to the vast overlap between youth who sustain violent injuries, and those perpetrating the violence. However, not every youth who was involved in perpetrating violence will sustain a violent injury.<sup>25,27,62,63</sup> This study did not capture youth who do not have crossover between injury and violence perpetration and although violent injury is a very good proxy for youth violence, it may slightly underestimate the true scope of violence in an area. Thus, this study did not investigate if ROE may have impacted violence perpetrated by youth that did not end in serious violent injury or death.

A limitation to this study is that youth in the ROE group and control group were not matched on sociodemographic factors. These could create confounding variables in terms of risks and protective factors related to interpersonal violent injury, such as socio-economic status, highest grade of attendance at school, SEFI-2 scores<sup>99</sup> etc. Many adverse sociodemographic conditions put youth at higher risk of sustaining a violent injury and becoming involved in violence<sup>45</sup>.<sup>1,8,11,12,29,31,35,41,42,56,57,59,63,66-68</sup> However, previous studies found that youth who had experienced multiple adverse early life conditions, maltreatment and trauma, experienced stronger effects and even more positive outcomes from universal prevention programs.<sup>9,33,75,89,93,108</sup> Incorporating these composite risk variables represent promising future ROE research using the scaffold of this study with MCHP data.

In Manitoba, and in other communities, the factors that put a youth at highest risk of violent injury are male gender; previous violent injury; previous involvement with the criminal justice system; involvement with Child and Family Services; quitting school prior to grade 9; low neighborhood socioeconomic status.<sup>7,9,15,33,63,66</sup>

It is important for future research to look at the effects of social risk stratification on the effectiveness of both primary and secondary violence prevention programs, possibly using SEFI-2 scores<sup>99</sup> as well as other measures. Currently, there are not many studies that look specifically at the outcome of violent injury.<sup>9,33,44,71,72,93</sup> Additionally, this study considered investigating if there was a difference in the effects of the ROE program on youth violent injury in rural versus urban areas. This was out of scope of the current study. Looking at the differences in longitudinal effects of these school-based primary prevention programs in urban versus rural settings, is a pertinent area for future study.

### ***Conclusion***

This study looked at the association between the effects of a universal SEL program, Roots of Empathy, and youth serious violent injury. This study also looked at whether sex at birth or Grade at Exposure for ROE would impact how the program might affect serious violent injury. This is a novel study looking the real world, longitudinal impacts of a universal, classroom-based prevention program delivered in Manitoba's rural, remote, Indigenous, Northern, and urban schools. This study investigated an outcome that ROE was not specifically designed to target,<sup>49,69,78-80</sup> but based on the program's positive impacts on prosocial behaviour and reduction in bullying and aggression, I hypothesized that the ROE program would have longitudinal positive effects and would reduce the risk of serious interpersonal youth violent injury and death. However, my hypothesis had a null result.

This study has the longest follow-up period on the ROE program and is also one of the largest studies. It is one of very few studies to investigate the impacts of a primary prevention SEL program on violence from a medical/ population health and disease prevention approach as opposed to using a social services-based framework or targeting school-based violence and

aggression or justice related outcomes. It is also one of the first studies on SEL programs to look at serious violent injury as an outcome.<sup>33,44,71,72,93</sup>

This study provides an excellent scaffold for researchers, policymakers, and practitioners to further investigate ROE, other SEL programs as well as other classroom-based interventions and their impacts on a variety of outcomes. It is hoped that future researchers will build on this study on how to best reduce the increasing epidemic of youth violence. Perhaps developing an even more robust database or using a larger sample size from more years of data would determine if the effects of the ROE program might have significant results. Additionally, using an outcome that is much more common than injury resulting in admission to hospital or death, such as emergency room visits, clinic visits, and community treatment, might provide a broader picture of whether ROE, and perhaps other SEL primary prevention programs, can be an effective tool in an universal approach to reducing youth violence.

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