**Collisions in Relation to School Safety Zones in Toronto**

ENVSOCTY 4GA3

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**CONTEXT**

Canada has shown an improvement in road and transport safety over the years as collision fatalities and injuries have exhibited a declining trend. Nevertheless, vehicular collisions remain a prominent threat to the lives, bodies, bank accounts, and general well-being of Canadians. In 2018, collisions resulted in 1500 fatalities and 152,847 injuries (Transport Canada, 2020). “On-road” collisions have been a majority source of child fatalities for many years in Canada, and despite the lowering rate, these collisions comprise 49% of fatalities affecting children aged 0-14 with only 13% of them occurring when the child is a passenger (Parachute, 2016). This outlines that child pedestrians are at risk of being fatally struck by vehicles. To counteract this, school zones are established to protect children in and around areas they frequently gather (i.e. schools). School zones are strips of road near schools or childcare areas, delineated by a lower maximum speed limit and an inability to pass in either lane. These zones have been shown to effectively reduce the number of fatal and injury inducing crashes by ~4% per a 1km/h decrease in speed limit (Sun et al., 2018, p. 1087).

School zones seem to be effective in idealized scenarios but concerns exist due to unequal zone states in which municipalities and drivers are responsible for creating. Municipalities establish school zones and determine their features (location, length, speed limit, etc) and in the end, drivers must make the effort to consciously follow the rules and make safe choices when in a zone. This is not guaranteed: on average in Toronto 21% of drivers speed while in school zones with percentages climbing as high as 85% in specific zones, which road safety advocates blame partially on infrastructure that promotes fast driving (ex. straightaways and four-lane traffic) (Rocha & Pelley, 2020). Speeding alone is not the only threat to school zone safety; illegal parking and distracted driving have both been identified as some of the most common unsafe behaviours demonstrated by drivers in school zones (CAA polling, 2019). If these actions are as common as they are reported to be, then are school zones not uniformly deterring drivers from unsafe behaviours?

In conclusion, school zones are effective, but are they effective unilaterally and are their features optimized for reducing the ever-present threat of collisions for younger generations? This study has value in that it provides a deeper understanding of the efficacy of school zones as it gives insight into the spatial distributions of crashes within them, potentially establishing zones with varying intensities, opposed to taking efficacy averages. Through this, hotspots and trends in school zone contained collisions can be developed, outlining regions that should be addressed.

**OBJECTIVE**

*Research Question:* Is there a relationship between motor vehicle collisions (strictly involving pedestrians), and school safety zones within the City of Toronto?

The goal of this project is to explore the relationships between motor vehicle collisions (strictly involving pedestrians), and school safety zones within Toronto. To draw conclusions, data from various sources have been acquired in order to establish trends from previous years. General trends on this relationship were determined before the data were further analyzed. Having an opportunity to examine these data allowed for some rough predictions to be made in terms of the reasons for these incidents occurring more and less frequently within specific areas of Toronto. For instance, the number of collisions in school safety zones should drop where the speed limit is lower. Further analysis is required to determine if this is the case.

Other cities such as New York, Chicago, Houston, and Los Angeles could have been used, although it was determined that the best alternative would be Toronto as it is the area closest to McMaster, and the one that the majority of McMaster students are familiar with. To determine the relationship between collisions and safety zones, sources from the City of Toronto along with transportation trends within the area are examined. Using R-Studio, these data will be plotted on maps and further analyzed to find common trends between the different datasets to determine a conclusion.

Since data variations occur over the years, more recent data will be used to be as accurate to current as possible. Some of the datasets date as far back as 2006 which could be of benefit to see if there were any improvements or decline over time. Multiple factors will be examined to determine our final conclusions. Quadrat analysis, kernel density analysis, buffer zones around the safety zones, and statistical tests will all be applied.

Looking further into the research, the number of motor vehicle collisions may not be the only factor that should be examined. The relevance to school safety zones is very important, although attributes such as the age group of fatalities along with the age group of people in the motor vehicles may be looked at to get a better understanding of why more collisions may occur. The relationship should show a lower fatality rate in school zones. Should new school safety zones be added within certain areas in order to try to reduce collisions, and will they actually have an impact that will change the outlook of this issue?

The goal is to find ways to reduce these incidents as injury and fatality rates are higher in some areas. If fines can be increased in these areas, along with adding additional traffic enforcement, these incidents may be prevented from occurring in the future. There are likely more conclusions and solutions that will be determined as the data is further analyzed as various other factors will be examined, supplementing this general outlook. Overall, having a better insight on this issue can help generate ideas on how to reduce motor collision incidents within school zones in the City of Toronto.

**DATA**

The data for this project is sourced from the City of Toronto Open Data website. The data on the school safety zones is provided by the Transportation Services department of the City of Toronto. This dataset displays points for where the school safety zone radars are located, the speed reading at which the device flashes, the speed limit, as well as other attributes. These school safety zones are used by the Watch Your Speed Program (WYSP). To compliment these data, a detailed count of speeds measured by the aforementioned radars is also used and is also provided by Transportation Services. To give geographical context as to where the schools in Toronto are located, a dataset featuring the location of schools is used. This dataset is provided by 311 Toronto and is collected by the Planning Division of the Toronto District School Board. The primary examination of this project is to analyze the effectiveness of school safety zones. To do this, a dataset featuring motor vehicle collisions is used. This dataset, provided by the Toronto Police Services, features the participants involved in the collision (pedestrians, cyclists, automobiles, etc.), when and where the collision occurred, as well as other key factors such as the visibility at the time of the collision. As previous studies have shown, school safety zones are effective at reducing the number of collisions in the zone. Analyzing the data for Toronto helps verify this notion and can also act as an incentive to improve the school safety zones in Toronto if they are deemed ineffective.

**PREDICTIONS/ FINDINGS**

The research question asks if there is a direct relationship between collisions involving pedestrians and the presence of school safety zones. Due to the proven efficacy of safety zones, it is predicted that these areas will experience fewer collisions than areas without safety zones. Conversely, it is probable that areas that experience more collisions than others will be found to lack adequate safety features.

Several factors may affect the reliability and accuracy of the data analysis conducted. If a safety zone was recently established in an area, it is possible that a significant number of collisions occurred there to necessitate its creation, skewing the number of events in this zone. This is solved by comparing the zone implementation date to the collision event date, both of which are fields present in the collisions shapefile. As well, areas with a higher population density and greater traffic flow are more likely to have collisions. The active hours of a safety zone are also of relevance. Some safety signs are turned off after school hours, raising the speed limit to facilitate greater traffic flow. If collisions occurred at this time, this would give the appearance of greater collisions in a safety zone, when in fact the zone was not active. Fortunately, collision time and zone active hours are recorded in the collision and safety zone shapefiles, respectively, solving this issue. Finally, other roadway conditions play a role in collision frequency, such as lighting, road state (icy, dry, etc.), and visibility. If little correlation is found between safety zones and collisions, perhaps one of these fields will prove more significant.

**REFERENCES**

311 Toronto (2019). *Toronto District School Board Locations.* Retrieved from [https://open.toronto](https://open.toronto.ca/dataset/toronto-district-school-board-locations/)

[.ca/dataset/toronto-district-school-board-locations/](https://open.toronto.ca/dataset/toronto-district-school-board-locations/)

CAA polling (2019). *School Zone Safety Statistics*. CAA. [https://www.caa.ca/schoolzonesafety  
 /statistics/](https://www.caa.ca/schoolzonesafety/statistics/)

Information & Technology, City of Toronto (2021). *Address Points (Municipal) - Toronto One*

*Address Repository.* Retrieved from [https://open.toronto.ca/dataset/address-points](https://open.toronto.ca/dataset/address-points-municipal-toronto-one-address-repository/)

[-municipal-toronto-one-address-repository/](https://open.toronto.ca/dataset/address-points-municipal-toronto-one-address-repository/)

City Planning, City of Toronto (2021). Ward Profiles, 2014-2018 Wards. Retrieved  
 from <https://open.toronto.ca/dataset/ward-profiles-2014-2018-wards/>

Parachute (2016, June). *Unintentional Injury Trends for Canadian Children*. Retrieved from   
 <https://parachute.ca/wp-content/uploads/2019/06/SKW-Trend-Report.pdf>

Rocha, R., & Pelley, L. (2020, October 6). *Toronto drivers speeding near schools 21% of the   
 time, city data reveals*. CBC. [https://www.cbc.ca/news/canada/toronto/toronto-drivers  
 -speeding-near-schools-21-of-the-time-city-data-reveals-1.5751299](https://www.cbc.ca/news/canada/toronto/toronto-drivers-speeding-near-schools-21-of-the-time-city-data-reveals-1.5751299)

Sun, D., El-Basyouny, K., Ibrahim, S., & Kim, A. M. (2018). Are school zones effective in   
 reducing speeds and improving safety? *Canadian Journal of Civil Engineering*, *45*(12),  
 1084–1092. <https://doi.org/10.1139/cjce-2018-0060>

Toronto Police Services (2020). *Motor Vehicle Collisions involving Killed or Seriously Injured*

*Persons.* Retrieved from [https://open.toronto.ca/dataset/motor-vehicle-collisions -involving-killed-or-seriously-injured-persons/](https://open.toronto.ca/dataset/motor-vehicle-collisions-involving-killed-or-seriously-injured-persons/)

Transportation Services, City of Toronto (2020). *School Safety Zone Watch Your Speed  
 Program – Detailed Speed Counts.* Retreived from [https://open.toronto.ca/dataset  
 /school-safety-zone-watch-your-speed-program-detailed-speed-counts/](https://open.toronto.ca/dataset/school-safety-zone-watch-your-speed-program-detailed-speed-counts/)

Transportation Services, City of Toronto(2021). *School Safety Zone Watch Your Speed Program*

*– Locations.* Retrieved from [https://open.toronto.ca/dataset/school-safety-zone-watch  
 -your-speed-program-locations/](https://open.toronto.ca/dataset/school-safety-zone-watch-your-speed-program-locations/)

Transport Canada (2020, December 1). *Canadian Motor Vehicle Traffic Collision Statistics:   
 2018*. Government of Canada. [https://tc.canada.ca/en/road-transportation/motor-vehicle  
 -safety/canadian-motor-vehicle-traffic-collision-statistics-2018](https://tc.canada.ca/en/road-transportation/motor-vehicle-safety/canadian-motor-vehicle-traffic-collision-statistics-2018)