Do school crossing guards make crossing roads safer? An analysis of 27,827 pedestrian collisions

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BACKGROUND

- Much of children's exposure to traffic as pedestrians occurs during journey to school
- Half of child pedestrian motor vehicle collisions (<18) occurred during school travel times, and over 1/3 within 300 meters of a school in Toronto[1]
- However, many health and environmental benefits of walking to school

1. Warsh, et al. *Inj Prev,* 2009.

BACKGROUND

- School crossing guards have been associated with more walking and more pedestrian collisions in area level cross-sectional analyses[1,2]
- Are guards markers for more dangerous locations, or does cross-sectional data mask the effect?

1. Cloutier al. Revue de geographie et d'amenagement, 2008
2. Rothman L, et al. *Prev Med.* 2014

FACTORS CONSIDERED FOR IMPLEMENTATION[3]

SAFETY, NOT CONVENIENCE, MUST BE A PRIMARY MOTIVATOR

- Insufficient safe crossing gaps (i.e. insufficient traffic controls)
- Child or motorist visibility is impaired (e.g. obstructions, no sidewalks)
- 4 or more lanes of traffic and the speed limit is greater than 50 km/h
- High volume of turning traffic at crossing
- High collision location
- High volume of children crossing
- No alternate crossing site

[3]Toronto Police Services. Traffic Services, School crossing guard evaluation program, 2001

PURPOSE

To examine:

- The effect of newly implemented crossing guards on child pedestrian motor vehicle collision rates (PMVCs)
- The relationship between existing guards, school travel hours and child PMVCs throughout the City of Toronto

METHODS

- **Data Sources**
  - City of Toronto, police-reported PMVC reports (2000-2011)
  - Toronto Police Services, school crossing guards (implementation dates 2003-2011)
  - City of Toronto Centreline Data- road type
  - MPAC land use data-land use mix, entropy score
  - Canadian census – pre-1960 housing

- **Unit of Analysis**
  - Crossing guard-month (50m buffer)

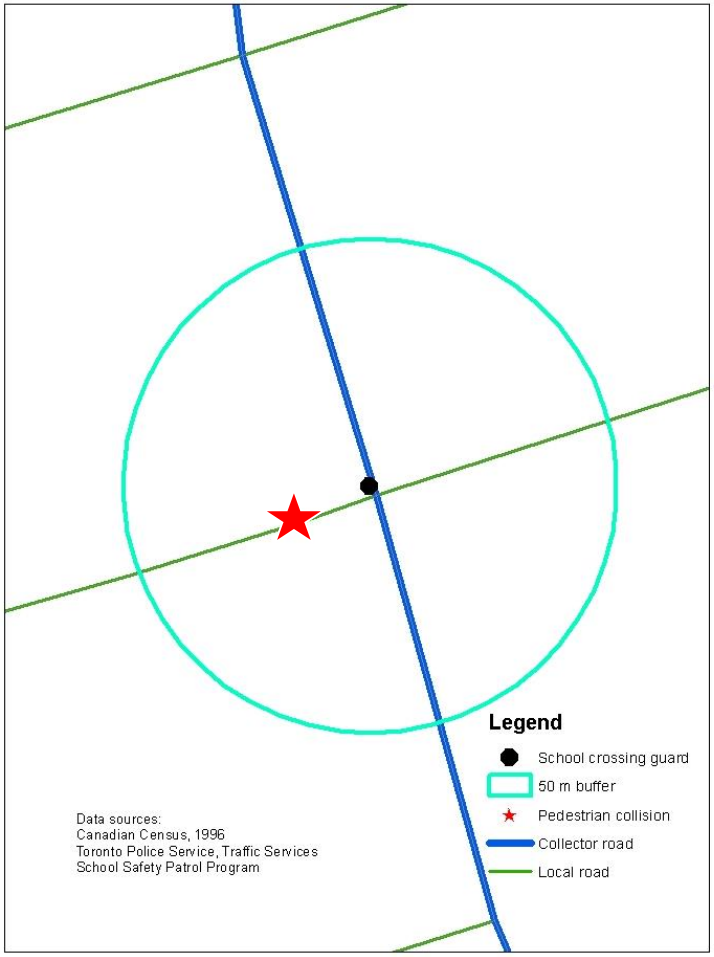
METHODS: ANALYSES

1. Quasi-experimental pre-post repeated measures design –newly implemented guards
   - Poisson regression, controlling for winter, road type, pre-1960 neighbourhoods, land use mix

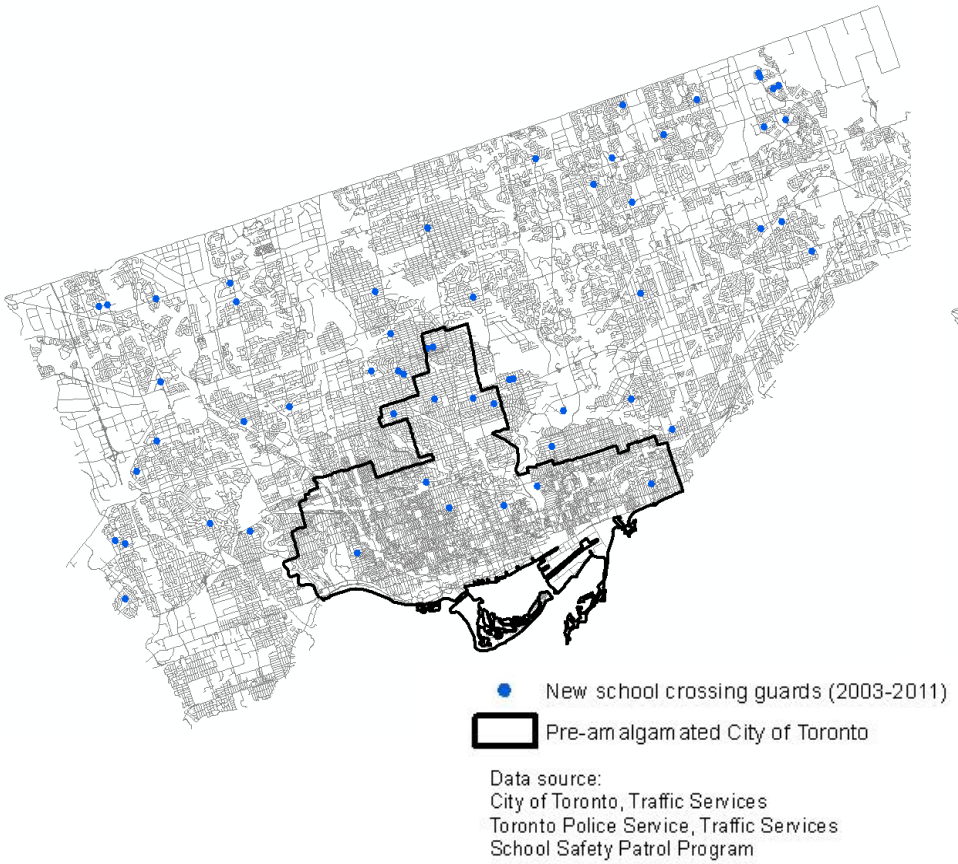
2. Descriptive analysis of a retrospective cohort of all pedestrian collisions near all existing guards

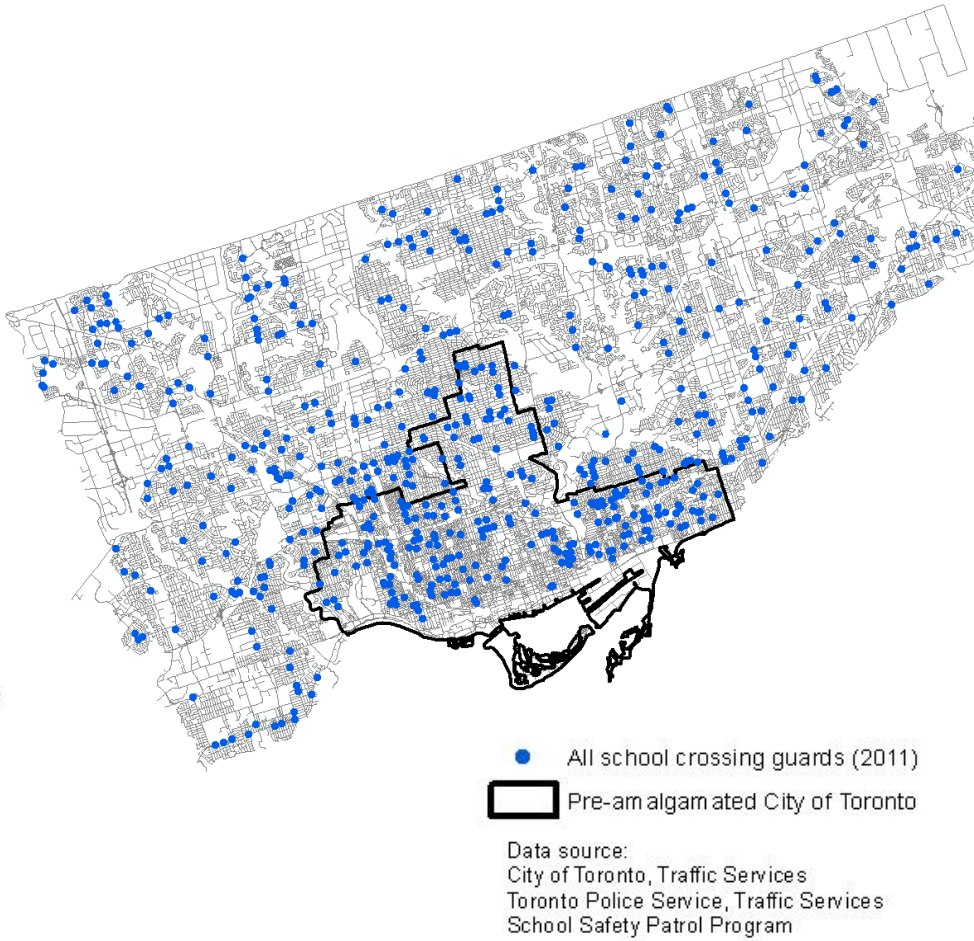
METHODS

- Collision assignment to a school crossing guard



SCHOOL CROSSING GUARDS IN THE CITY OF TORONTO





- 58 newly implemented guards
- 260 PMVCs

- 568 existing guards city-wide
- 2,573 PMVCs

RESULTS: ANALYSIS 1

Frequency and adjusted incidence rate ratios with 95% confidence intervals of collisions by implementation, season and crossing guard location characteristics

	N (%)	Adjusted IRR (95% CI)
Collision Characteristics:		
School crossing guard implementation		
Pre implementation	176	1.00
Post implementation	84	**1.02 (0.74, 1.40)**
Season:		
Non-winter	102 (39.2%)	1.00
Winter	158 (60.8%)	1.56 (1.15, 2.11)
Land Use Mix:		
Mean Entropy score	0.71 (SD±0.14)	16.11 (5.00, 52.07)
Neighborhood Age:		
Post 1960 neighborhood	39 (66%)	1.00
Pre 1960	19 (33%)	0.46 (0.31, 0.69)
School Crossing Guard Location Characteristics:		
Road type		
Intersections:		
Major/Major	15 (26%)	1.00
Local/local	7 (12%)	0.03 (0.01, 0.15)
Major/local	9 (16%)	0.42 (0.29, 0.62)
Collector/Collector	2 (4%)	0.03 (0.00, 0.29)
Collector/Local	19 (33%)	0.06 (0.03, 0.12)
Midblock locations:		
Collector	6 (10%)	0.13 (0.06, 0.28)

- Collision rates remained unchanged at guard locations after implementation

RESULTS: ANALYSIS 2

Proportion of collisions occurring at a guard location during school travel time compared to non-school travel time (n = 1850)

	Non-school travel time			School travel time		
	N	SCG location	Not at SCG location	N	SCG location	Not at SCG location
Children (4 – 12)	1155 (62%)	138 (12%)	1017 (88%)	695 (38%)	95 (13.7%)	600 (86.3%)

- High burden of child PMVCs outside school travel times and not at crossing guard locations

STRENGTHS

- Pre-post study design allows for the control of non-time-dependent covariates, temporal and seasonal effects
- Generalizability of the study results
- Active involvement of stakeholders
- Real-world policy implications
  - Toronto Universities, Hospitals, City of Toronto Traffic Planning, other Municipal and Provincial Government Departments, Toronto Police Services, Toronto District and Toronto Catholic District School Boards, Public Health, CAA, Walk to School advocates etc.

LIMITATIONS

- Collisions are a rare outcome
- Small guard sample size for pre-post
- Lack of traffic volume and pedestrian exposure data
- Non-randomized
- Police reported data
- Other concurrent interventions to increase road safety were not considered

DISCUSSION

- More definitive interventions necessary to address high burden of child PMVCs occurring outside school travel times and away from guard locations
- No obvious safety effect; **HOWEVER**, likely increased walking where guards implemented
- Guards may have an overall positive effect, but not demonstrable without measurement of pedestrian volume (walking exposure)
  - New TPS data source
- Guards are a simple roadway modification to increase walking to school without detrimental safety effects

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