Image: The Toronto Star

Installation of speed humps and pedestrian-motor vehicle collisions in Toronto, Canada: a quasi-experimental study

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BACKGROUND

- Speed is a major risk factor for MVC[1,2]
  - Probability of pedestrian survival: 50% at >45km/hr, 90% at <30 km/hr
- Traffic calming strategies are physical interventions designed to reduce speed in urban areas[3]
- 97% of traffic calming interventions are speed humps in Toronto
- Speed humps effectively reduce vehicle speeds and collisions
- Relationship between speed humps and pedestrian motor vehicle collisions (PMVCs) has been not definitely established
  - Cochrane systematic review of before-after studies found that pooled rate ratios of 14 studies specific to PMVCs were non-significant[3]

1. World Health Organization. World report on road traffic injury prevention, 2004. [3]
2. Organisation for Economic Co-operation and Development (OECD). Speed management, 2006.
3. Bunn F et. al., *Cochrane Database of Syst Rev*, 2009.

SPEED HUMP

- Gradual raised area
- Controls speed on low speed roadways
- Gentle rocking motion
- Slow to 15-20 mph

SPEED BUMP

- Abrupt raised area
- Control speed on low volume private roads and parking lots
- Slow to <5mph

CRITERIA FOR TRAFFIC CALMING[4]

- Public support
- Continuous sidewalks on at least one side of road
- Road grade under 9%
- No significant impact on emergency service vehicle
- No significant impact on public transit
- Speed must be at a minimum of 10% over the speed limit
- Traffic volume 1,000-8,000 vehicles/day (local roads), 2,500-8,000 (collector roads)
- Block length >120 metres

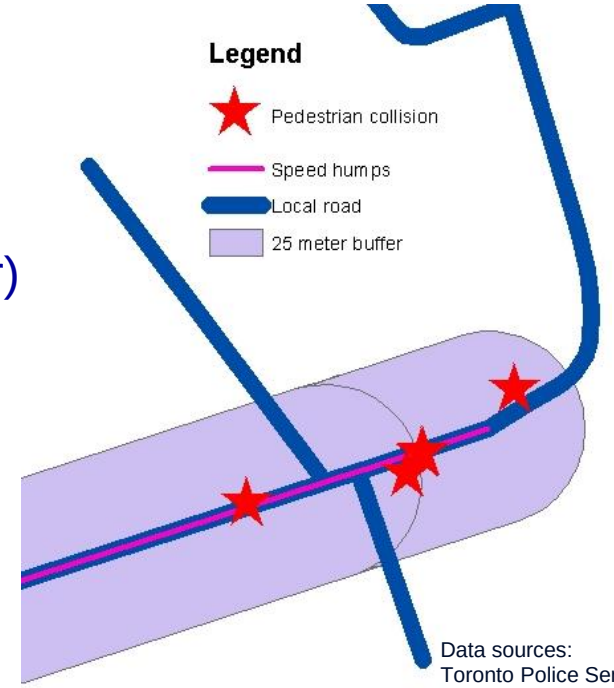
[4]City of Toronto, Transportation Services, Summary of Traffic Calming Policy, 2002

PURPOSE

- To determine the association between speed hump installation and changes in pedestrian-motor vehicle collisions rates (PMVC) in Toronto, Canada

METHODS

- Data Sources
  - City of Toronto, police-reported PMVC reports (2000-2011)
  - City of Toronto, Centreline Data- speed humps, road type
  - MPAC land use data- land use mix, entropy score
  - Census
- Unit of Analysis
  - Speed hump roadways-meter-month (25m buffer)
  - Mapped collisions and built environment features within buffer



Data sources:
Toronto Police Services
City of Toronto, Centreline Data

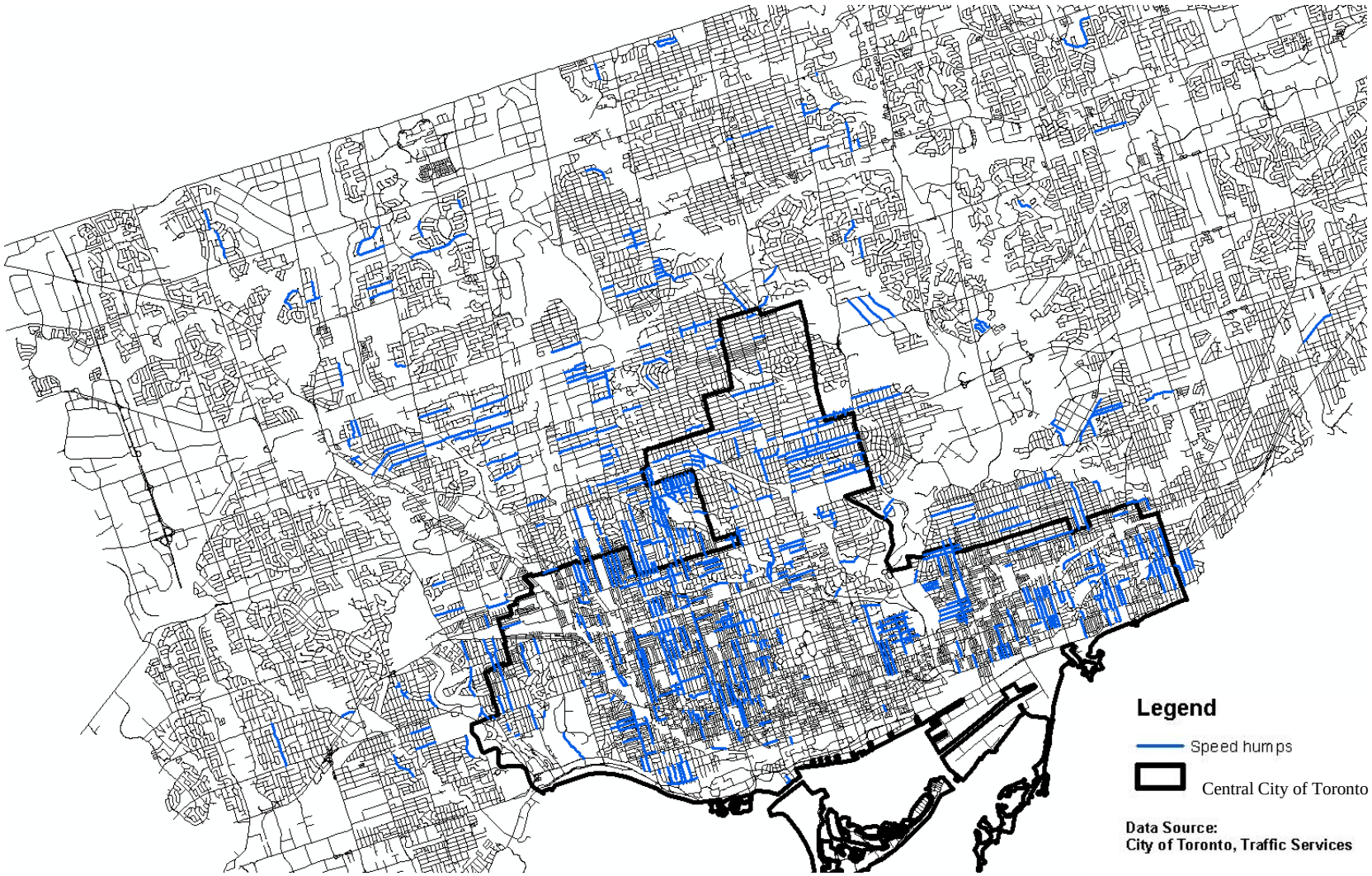
METHODS- ANALYSIS

- Quasi-experimental repeated measure pre-post design (by speed hump roadway)
- Poisson regression, controlling for season, road type, older central City of Toronto, land use mix
- Number of collisions prevented = preventive fraction of installation (1-IRR)

    * # roadways where speed humps installed

- Sub-analyses by local roads, age, severity

SPEED HUMPS



- 1,344 collisions along 409 roadways with speed humps

RESULTS

Frequency and adjusted incident rate ratios of PMVCs with 95% CI by speed hump installation (pre, post), season and roadway characteristics

	N	Adjusted IRR (95% CI)
Collision characteristics (n = 1344):		
Speed hump implementation		
Pre implementation	594 (44.2%)	1.00
Post implementation	750 (55.8%)	0.78 (0.66, 0.91)
Season (month of collision)		
Non-winter	596 (44.3%)	1.00
Winter	748 (55.7%)	1.26 (1.12, 1.42)
Speed hump roadway characteristics (n = 404):		
Road type:		
Local	344 (84.1%)	1.00
Collector	60 (14.7%)	1.56 (1.18 ,2.08)
Neighbourhood:		
Inner suburbs	159 (39.4%)	1.00
Preamalgamated City of Toronto	245 (60.6%)	1.63 (1.23, 2.14)
Land Use Mix (Speed Hump Roadway)		
Mean entropy score	0.26 (SD±0.21)	2.48 (1.42, 4.34)

- **22% reduction in collisions after installation**
- **296 PMVCs prevented collisions**

RESULTS

- **Local roads**
  - 26% reduction
  - 552 PMVCs prevented

- **Age**
  - 43% reduction in children
  - 296 collisions prevented

- **Severity**
  - ~20% reduction no/minor/minimal injury
  - 34% reduction in severe/fatal but not significant

STRENGTHS

- Pre-post study design allows for the control of non-time-dependent covariates, temporal and seasonal effects
- Generalizability of the study results
- Multidisciplinary collaborations
- Real-world policy implications
  - Committees directed at improving school traffic safety, including representatives from:
    - 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
- Lack of traffic and pedestrian exposure, traffic speed data
- Non-randomized
- Police reported data

DISCUSSION

- Speed humps effective in reducing PMVC rates after controlling for the built environment
- Greatest positive effect of speed humps in children
- More speed hump installation on local roads has the potential to further decrease PMVCs
- However, some controversy regarding speed humps
  - overuse, noise, impact on emergency vehicles, displacement of traffic and collisions to other roadways

ROAD SAFETY

Speed humps: effective speed control or just political meddling?

DAVID MENZIES

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City of Toronto, Traffic Calming Policy, 2010

•Other types of traffic calming need to be explored in Toronto e.g. medians, traffic circles, road narrowing etc

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