Association between parent perception of traffic danger, walking to school and the built environment

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• Why examine parent perceptions of dangerous traffic?
BACKGROUND

- Decreases in child pedestrian collisions\(^1\)
  - 1994-2004: \(\downarrow\) 52%, in Canada
- Are there fewer collisions because children walking less?\(^2\)
  - 1986: 53%  2006: 43%
- Only 38% of Canadian children use any active school transportation (2013)\(^3\)
- Walking to school is an important source of physical activity
  - Parents are the key decision makers
  - Parent perceptions of traffic safety a key factor\(^4\)
    - Poorly understood

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1. Canadian Institutes of Health Information. 2007.
OBJECTIVES

• Objective 1
To determine if parent perceptions of traffic danger en route to school and/or at the school site during morning drop-off are related to walking to school

• Objective 2
To examine the relationship between features of the built environment and parent-perceived traffic danger
METHODS

• 20 primary schools randomly selected
• 10 each from the older center of Toronto versus newer inner ring suburbs
• Within each of these geographic strata, 2 schools from every ATLICO quintiles were randomly selected to control for SES
• Written questionnaires from parents of children in grades 4-6, and observational counts of proportions walking in Spring 2011
METHODS: Outcomes

• Reported walking to school
  • Dichotomized
  • Frequent walking to school (4-5 times/weekly), versus walks 0-3 times/weekly

• 2 measures of parent perception of traffic danger
  • “How dangerous is the traffic for your child…
    1. Between your home and your child’s school? (ROUTE)
    2. Around the school during drop-off time?” (SITE)
  • Visual analogue scales, from 1 (none) to 7 (extreme) dichotomized
    • 4+ indicating high danger perception, versus low
METHODS: COVARIATES

- Data Sources
  - School site surveys
  - School web sites
  - City of Toronto Databases
  - MPAC land use database
  - Canadian census
  - Police-reported collision data
- Built environment data mapped onto school attendance boundaries
METHODS: COVARIATES

• Built environment classified according to 3 D’s\textsuperscript{5}
  • Density: Child population, multi-dwelling density
  • Diversity: Land use mix, proportions of residential, recreational etc
  • Design:
    • Route: flashing beacons, crossing guards, road type, dead ends, trails, sidewalks, traffic controls
    • School site: double parking, school crossing guard, traffic congestion

\textsuperscript{5} Cervero R, Kockelman K. Trans Res Part D., 1997
METHODS: ANALYSIS

Objective 1: High *route and site perceptions of traffic danger and walking to school*

- 2 logistic regression models (route, site), with repeated-measures to account for clustering by school
- Controlling for grade, sex, reported distance to school and vehicle access

Objective 2: *The built environment and high parent-perceived traffic danger*

- Logistic regression model with repeated measures to account for clustering by school
RESULTS

FREQUENCY OF WALKING TO SCHOOL

Number of times weekly

% 0 1 2 3 4 5

17 5 7 10 14 48

Frequent walking (62%)
RESULTS

ROUTE AND SITE DANGER PERCEPTION

Traffic Danger Perception

High (45% route, 36% site)
## RESULTS

- Response rate 38% (n=733 surveys)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance to school ( \leq 1 \text{ km} )</td>
<td>188 (74.3%)</td>
</tr>
<tr>
<td>Access to car</td>
<td>587 (82.4%)</td>
</tr>
<tr>
<td>Frequent walker (4-5 times weekly)</td>
<td>407 (61.5%)</td>
</tr>
<tr>
<td>High dangerous route perception</td>
<td>332 (45.4%)</td>
</tr>
<tr>
<td>High dangerous site perception</td>
<td>259 (36.4%)</td>
</tr>
</tbody>
</table>
RESULTS

• Strong correlation between reported walking and observed walking (SRCC = 0.77)
• Moderate correlation between dangerous route and site (Pearson’s r = 0.43)
• No relationship between dangerous site perception and walking to school
• Therefore, focus on dangerous route perception
## RESULTS

### Correlates of frequent walking to school (walking 4-5 times/week)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Adjusted Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>Frequent walker (walking 4-5 times/week)</td>
<td></td>
</tr>
<tr>
<td>High dangerous route perception</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
</tr>
<tr>
<td>Yes</td>
<td><strong>0.53 (0.37, 0.76)</strong></td>
</tr>
<tr>
<td>Distance far</td>
<td></td>
</tr>
<tr>
<td>&lt; 1 km</td>
<td>1.00</td>
</tr>
<tr>
<td>&gt;= 1 km</td>
<td><strong>0.17 (0.12, 0.26)</strong></td>
</tr>
<tr>
<td>Access to car</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
</tr>
<tr>
<td>Yes</td>
<td><strong>0.18 (0.10, 0.33)</strong></td>
</tr>
</tbody>
</table>

- Dangerous route perception was associated with a 47% less likelihood of frequently walking to school
## RESULTS

### Built environment correlates of perception of dangerous route

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>High perception route danger (y/n)</td>
<td></td>
</tr>
<tr>
<td><strong>BUILT ENVIRONMENT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Features related to high danger perception</strong></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td></td>
</tr>
<tr>
<td>Flashing beacons (#)/km roads</td>
<td>1.31 (1.10, 1.56)</td>
</tr>
<tr>
<td>Dangerous midblock crossings observed</td>
<td>1.97 (1.52, 2.57)</td>
</tr>
<tr>
<td><strong>Features related to low danger perception</strong></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td></td>
</tr>
<tr>
<td>Dead-end (#)/ 10 km roads</td>
<td>0.70 (0.62, 0.79)</td>
</tr>
<tr>
<td>Crossing guard (#)/10km roads</td>
<td>0.80 (0.68, 0.94)</td>
</tr>
<tr>
<td>Collector roads km/10 km roads</td>
<td>0.81 (0.72, 0.92)</td>
</tr>
<tr>
<td>Traffic light #/10km roads</td>
<td>0.86 (0.82, 0.90)</td>
</tr>
</tbody>
</table>
STRENGTHS AND LIMITATIONS

• Strengths
  • Multivariate modeling controlling for
    • clustering by school
    • geographic location
    • SES

• Limitations
  • Only elementary schools, spring
  • Low response rate and possibility of selection bias
  • Collision data – over 10 years, Danger perception – 2011
  • Cross sectional data
DISCUSSION

- High dangerous route perceptions were negatively associated with frequent walking.
- No association between high dangerous site perceptions and frequent walking.
- High route danger perceptions were not associated with:
  - Population density
  - Land use diversity
  - Actual collision rates
- High route danger perceptions were associated with:
  - Dangerous midblock crossing, higher speed roadways
  - Flashing lights
- Parents perceptions of traffic danger may not accurately represent actual traffic risks.
DISCUSSION

• The location of perceived danger matters
  • focused en-route rather than the school site

• To influence walking, the safety of the built environment along the school route must be considered

• However, contrary to what parents may perceive, safety interventions must also focus immediately surrounding schools

• Issues regarding the built environment must be addressed to influence
  • parent perceptions of safety to promote walking AND
  • ensure the safety of children on their trips to school
ACKNOWLEDGEMENTS

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  • City of Toronto, Transportation Services

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  • Hospital for Sick Children
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    • *Doctoral Research Award*
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