


# Children's perspectives on neighbourhood barriers and enablers to active school travel: A participatory mapping study

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## Key Messages

- Children have meaningful insight to offer towards a better understanding of how their local environment influences active school travel behaviours.
- The use of participatory mapping and qualitative GIS methodology provides a unique opportunity for children to share their spatial knowledge.
- Furthering our understanding of how children's perceptions influence their journey to and from school will help to inform policy and practice supporting localized active school travel interventions.

*Children today are spending more sedentary time indoors than time playing and being active outdoors. The daily journey to and from school represents a valuable opportunity for children to be physically active through active school travel. The majority of research on children's active school travel omits children from the research process even though children interpret their environments in fundamentally different ways than adults. Our research uses innovative participatory mapping and qualitative GIS methods to examine how children's perceptions of their environments influence their school journey experiences. Through our thematic analysis of 25 map-based focus groups, we identified three main themes characterizing barriers and enablers to active school travel: safety-related, material, and affective features. By positioning children as experts of their environments in our participatory methodology, our findings provide an important counterpoint to the adultist privilege characterizing the majority of research on children's active school travel. Environmental features that mattered for children's school journeys took on multiple meanings in their eyes, demonstrating that children's perspectives must be engaged to inform interventions to promote active school travel. We thus argue that identifying barriers and enablers to active school travel for children requires engaging children's views.*

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### **Points de vue des enfants sur les obstacles et les facilitateurs du quartier pour un transport scolaire actif : une étude de cartographie participative**

*Les enfants passent aujourd'hui plus de temps à faire des activités sédentaires à l'intérieur qu'à jouer et à être actifs à l'extérieur. Les déplacements quotidiens aller-retour à l'école constituent une occasion idéale pour que les enfants soient physiquement actifs par le truchement du transport scolaire. La majorité des recherches sur le transport scolaire actif des enfants omettent les enfants dans le processus de recherche même si les enfants interprètent leurs environnements de manières fondamentalement différentes des adultes. Notre recherche utilise des méthodes innovatrices de cartographie participative et de SIG qualitatif pour examiner la façon dont les perceptions qu'ont les enfants de leurs environnements influencent leurs expériences de leurs trajets scolaires. Au moyen de notre analyse thématique de 25 groupes de discussion, nous avons recensé trois thèmes principaux caractérisant les obstacles et les facilitateurs d'un transport scolaire actif : les caractéristiques affectives, matérielles et reliées à la sécurité. En positionnant les enfants comme des experts de leurs environnements dans notre méthodologie participative, nos conclusions fournissent un contrepoint important aux privilèges des adultes caractérisant la majorité des recherches sur le transport scolaire actif des enfants. Les caractéristiques environnementales qui importaient pour les trajets scolaires des enfants ont pris plusieurs significations à leurs yeux, démontrant que les points de vue des enfants doivent être retenus afin de faire des interventions éclairées pour promouvoir un transport scolaire actif. Nous soutenons donc que l'identification des obstacles et des facilitateurs du transport scolaire actif des enfants nécessite que l'on retienne les points de vue des enfants.*

Mots clés : transport scolaire actif, enfants, recherche participative, SIG qualitatif, activité physique

### **Introduction**

Canadian guidelines recommend that children and youth (aged 5–17 years) engage in at least 60 minutes of moderate-to-vigorous physical activity daily to facilitate healthy development (Ramanathan et al. 2014; Statistics Canada 2015). There are numerous physical, psychological, emotional, and behavioural health benefits associated with children's regular physical activity (Sallis et al. 2000). Evidence points to outdoor activities and simple lifestyle-based interventions as ways to support children in developing active lifestyle habits (McCurdy et al. 2010). Behaviours and attitudes towards physical activity and overall health status established during childhood are likely to carry over into adulthood (Telama et al. 2005). It is thus critical to identify factors influencing the persistent decline of physical activity among Canadian children in order to develop interventions to improve physical activity rates and decrease sedentary behaviours. Walking is the most common form of physical activity for people of all ages (Saelens et al. 2003; Larsen et al. 2009; Larsen et al. 2012). Active forms of travel

include any type of self-propelled movement, such as walking, biking, skateboarding, and any other forms of non-motorized transportation. The US Centers for Disease Control and Prevention classifies both walking and biking as moderate-to-vigorous physical activity (CDC 2011).

Active school travel (AST) is one way that children can contribute to their recommended daily levels of moderate-to-vigorous physical activity. Research has shown that children who travel actively to school, compared to peers who are driven, tend to be more active throughout the day (Larouche et al. 2014; ParticipACTION 2015). Canadian children typically make a total of 10 trips to and from school during an average 5-day school week. The school journey represents a significant amount of time within a child's day; AST, therefore, represents a valuable and convenient opportunity for children to incorporate physical activity into their daily routine. Research indicates that the benefits of AST also reach other domains of health and wellbeing, including positively influencing children's mental health (Ramanathan et al. 2014), academic performance (Singh et al. 2012), fitness (Mendoza et al.

2011), and spatial and cognitive development (Oliver et al. 2011). Despite these well-known benefits, only 24% of Canadian children and youth typically walk or wheel to and from school (ParticipACTION 2016).

Decisions to participate in AST are complex and involve a range of factors across what Sallis et al. (2006) call the “socio-ecological” spheres of influence: intrapersonal, interpersonal, environmental, and policy. Carlson et al. (2014) found that children’s AST is shaped by varying features and that the most effective way to increase children’s AST is by targeting multiple levels of the socio-ecological framework. For children’s AST, the environmental level is particularly important because interventions focusing on the built environment can have wide-reaching population-level effects. A growing body of research indicates that specific elements of the built environment can influence walking behaviours and whether a child travels actively to and from school (McMillan 2007; Larsen et al. 2009; Giles-Corti et al. 2005; Van Loon and Frank 2011). The built environment comprises buildings, spaces, and products that are created and modified by people (e.g., urban design, transportation systems, land-use planning) (Bhugra and Minas 2007). While previous research has focused on the links between personal and/or social factors associated with children’s AST, little is known about the role of the built environment (Brug et al. 2006; Santos et al. 2008). Furthermore, there is even less known about children’s perceptions of the built environment as it pertains to AST; most research focuses on objectively measured features of the environment. Quantitative methods, which currently dominate the AST literature, perpetuate the assumption that the built environment is a fixed entity, void of the perceptions people relate to it (Fusco et al. 2012). Considering children’s perceptions is important because objective measures do not necessarily tell us about how environmental features operate in children’s worlds (Wilson et al. 2018). Understanding how environments afford opportunities for AST thus requires accounting for children’s perceptions (Chemero 2003). Our study looks beyond objective assessments of the built environment to examine children’s perceptions of their environments during their school journeys. Evidence about how children perceive specific features in their neighbourhoods and areas surrounding school can be used to adapt interventions and promote AST. In order to increase

AST, it is critical to understand children’s first-hand experiences of their school journeys.

The majority of research on children’s AST has been done *on* rather than *with* or *for* children (Sallis et al. 2000; Darbyshire et al. 2005; Fusco et al. 2013). Given that parents are often assumed to be gatekeepers, ultimately deciding whether or not children can walk to and from school (McMillan 2005), it is not surprising that the bulk of AST research has utilized adult and parent perspectives (McMillan 2005; Sirard and Slater 2008; Larsen et al. 2009). However, parents are not necessarily able to imagine children’s perceptions of their environments as children interpret and experience their environments in fundamentally different ways than adults (James 1990; Hyun 2005; Barker and Weller 2009). Examining how children’s lives, experiences, attitudes, and opportunities are socially and spatially structured is valuable for better understanding children’s AST behaviours. Critical perspectives in children’s geographies have cautioned that the majority of geographical research has historically focused on adult experiences, even when research is applicable to both children and adults (James 1990; Holloway 2014). We know that the way children and adults use, perceive, and experience space can be vastly different, even within the same environment (James 1990; Punch 2002). Taking children’s perspectives seriously is not simply about “letting” children speak; it is about investigating the specific contributions that children’s perspectives can provide to our understanding of and theorizing about the social world (James and Prout 1990).

Methodologically realizing child-centred approaches involves critically reflecting on the unequal power dynamics between child participants and researchers, as well as how research can be designed to mitigate children’s perceptions of research participation as intimidating or boring (Punch 2002; Barker and Weller 2009). Children may provide more engaged research input when they are interested in the topic and working with researchers who share their interests (Agar 2006). Hart’s (1992) theory of child participation claims that children need to be genuinely and significantly involved in research concerning them in order to produce meaningful results. Common features of participatory research with children include participants understanding the issue at hand, taking this issue seriously, assuming a leadership role, and/or determining the extent of their participation. While

adults may bring the topic forward, research needs to include components that are child-led and directed. Methods that take on participatory principles during data collection can illuminate nuances of children's perceptions of their environments. Research that engages children through the use of participatory methodology has been shown to be effective in furthering our understanding of children's environmental experiences (Loebach and Gilliland 2010).

In this study, we explore the environmental contexts of children's school journeys using participatory mapping and qualitative GIS techniques as a child-centred approach to engage children on the AST issues that matter to them. Specifically, we ask three questions:

- (1) What environmental features do children perceive to be barriers or enablers to using active travel on their school journeys?
- (2) How do children's perceptions of environmental barriers and enablers differ in urban versus suburban settings?
- (3) What improvements would children like to see in their local environments to support AST?

In doing so, we aim to contribute to the evidence informing solutions to make environments more supportive of children's AST.

## Methods

### Recruitment and sample

Participants were recruited from two elementary schools in southwestern Ontario, Canada that were completing a school travel planning intervention process. Given that the literature shows specific characteristics of environments influence walking (Saelens and Handy 2008), we chose one suburban school and one urban school to explore how diverse neighbourhoods might have different influences on children's school journeys. Letters of information and consent forms were given to children at both schools to bring home to parents. Postal codes were collected on the consent forms to allow us to group students who lived within the same neighbourhoods for the participatory mapping exercises. Participants were divided into map-based focus groups by postal code so that students

with similar neighbourhood settings, walking distance, and mode of travel could discuss these common features experienced on their journeys to and from school. The study protocol was approved by the Non-Medical Research Ethics Boards of the University of Western Ontario (NMREB #: 105635) and the Thames Valley District School Board Research and Assessment Services.

A total of 158 students across the two schools were invited to participate, with 123 children receiving parental consent (77.8% participation rate). Demographic characteristics, including gender, grade, and self-identified most common form of travel are shown in Table 1. Children were between the ages 10 to 12 years old (M=55.3% and F=44.7%) and in grades five (n=65) and six (n=58). Previous research shows that until a particular age, the decision about AST is most often made by parents or guardians (McMillan 2005; Fusco et al. 2012). Children within this age group are beginning to travel alone to school, developing independent perceptions of influences on their routes to and from school. Moreover, this is an age where children are able to substantially participate in qualitative research, providing valuable perceptions of their environments (Hart 1992; Loebach and Gilliland 2010). Nearly two-thirds (64.5%) of students from the suburban school typically used an active travel mode (walk or bike) to school in the morning, compared to only one-quarter (25.5%) from the urban school. Groups ranged in size from four to eight participants, as recommended for participatory focus groups in schools to allow for more meaningful conversation

**Table 1**

Demographic and travel mode characteristics of participants (n=123).

Variable	Suburban	Urban
<b>Gender, n (%)</b>		
Female	38 (50.0)	30 (63.8)
Male	38 (50.0)	17 (36.2)
<b>Grade, n (%)</b>		
5	40 (5.6)	25 (53.2)
6	36 (47.4)	22 (46.8)
<b>Mode of travel, n (%)</b>		
Walk	47 (61.8)	212 (25.5)
Bike	2 (2.6)	0 (0.0)
Bus	13 (17.1)	33 (70.2)
Car	14 (18.4)	2 (4.3)

while still being small enough for facilitation (Krueger and Casey 2000).

### Procedure

We adopted an innovative participatory methodology which directly involved both children and community collaborators who have a direct stake in the school travel planning process. A school travel plan is a tool used by schools to increase AST rates among students whereby school and community stakeholders collaborate to create and implement school-level action plans to systematically address barriers and incentives that enable children to walk to school. Schools participating in this research project were already involved with an active school travel planning program. We conducted 25 map-based focus groups structured around participatory mapping exercises during an annual geography education and public awareness program called Geography Awareness Week in November 2016. Geography Awareness Week is promoted internationally by organizations, such as the Canadian Association of Geographers, to celebrate geography as a discipline and as a part of everyday life, and to foster thinking, especially among youth, about the relationships between people and place (National Geographic Society n.d.). As a part of wider Geography Awareness Week activities, we engaged six elementary school classes in participatory mapping exercises embedded as research within our Geography Awareness Week activities.

Our research team has extensive experience conducting community-based research with children. The participatory mapping exercises were co-led by a researcher and a community stakeholder who held a position of decision-making authority related to children's journeys to and from school. Community members included city planners, engineers, teachers, public health nurses, environmental and park planners, ecologists, community developers, and the mayor. We engaged community stakeholders in order to provide children with the opportunity to speak directly to experts and policy makers about improvements they would like to see on their journeys to and from school. We acknowledge that the data collected is a product of the research context; however, given that this research occurred in a classroom setting where children are used to interacting with adults in learning activities, the presence of the researchers and community

partners was not out of place. The structure of the mapping exercise was flexible, allowing the children to lead conversations; however, co-facilitators were provided with an exercise guide and probing questions to prompt discussions if conversations between children paused. Students were encouraged to build off of each other's thoughts, creating engaged conversations in which short interjections were constant between students. Questions centred on children's neighbourhood environments and how they perceived the features within them in relation to their journey to and from school. Each mapping exercise lasted about 45 minutes, and was audio-recorded. Detailed notes were also taken. Aligning with our conceptual framing within the socio-ecological spheres of influence, involving community stakeholders in our research design was an effort to connect our qualitative research process with decision makers at the policy level early on. Literature indicates that the most common way to influence policy, interventions, and programming is through research guided by a socio-ecological framework (Sallis et al. 2006). We thus envisioned this active collaboration between researchers, policy makers, and knowledge users as a valuable component of integrated knowledge translation in our work, helping to set the stage for our research findings to resonate in practice or policy decisions (Kothari and Wathen 2013).

The maps used for the exercises were based on high resolution satellite imagery and printed in large format (122cm × 91cm) at a scale of 1:2500. In each group, the researcher and community member used the maps to guide the children through discussions covering: (1) places they enjoy/like on their journey to and from school; (2) places they dislike or that make them feel unsafe; and (3) places or areas they would like to see improved. For each of these topics, children were given different coloured stickers to place on the map and extensive notes were taken detailing what children chose to discuss at these locations.

We opted for two dimensional (2-D) mapping for multiple reasons. With this research coinciding with Geography Awareness Week, it was important that the process also provide educational benefits promoting geography as a discipline. The use of 2-D maps allowed students the opportunity to interact, read, and engage with maps of their local environments. As well, the participatory mapping exercise allowed a large number of students to

engage with the research process, which suited our classroom-based approach. Furthermore, past research using creative in-depth participatory methods, such as child-guided walks and group photo elicitation, recommends the addition of a component similar to our participatory mapping exercises, where children are provided the opportunity to visually record their neighbourhood experiences (Loebach and Gilliland 2010). Finally, this technique helped to include multiple voices through the visualization of children's spatial knowledge.

### Analysis

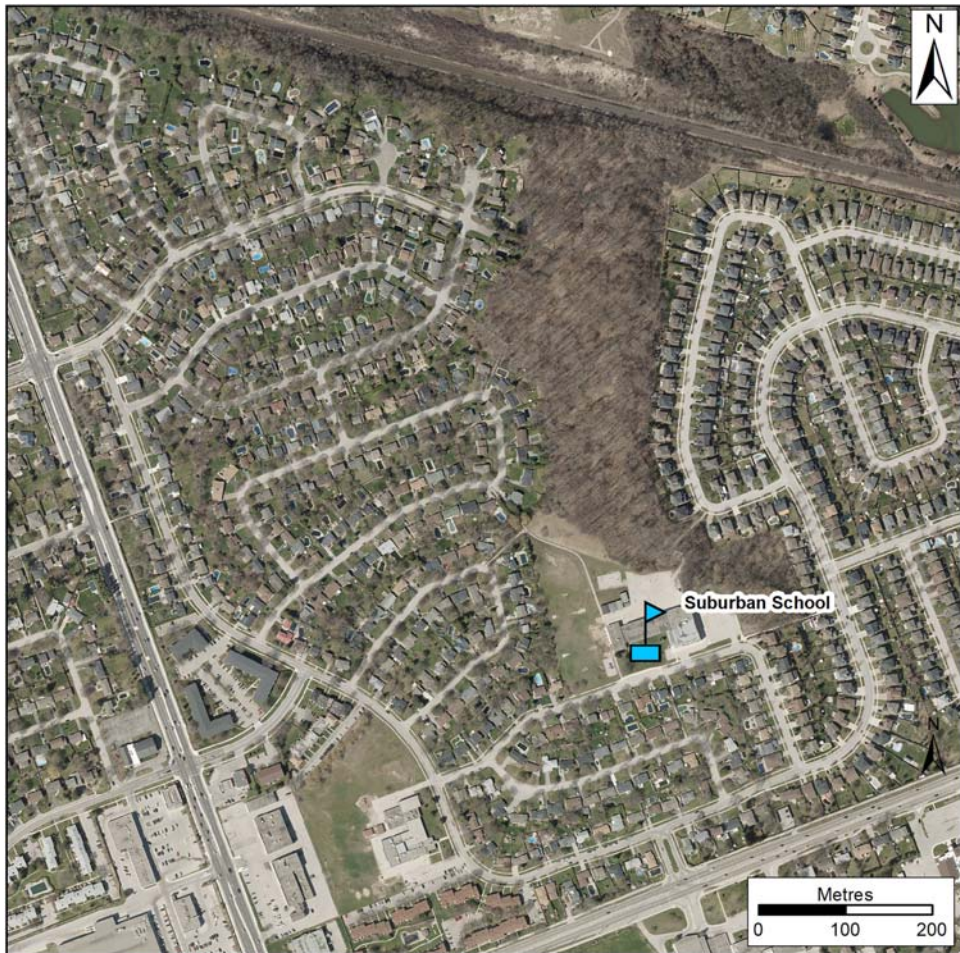
Analysis was completed using a thematic analytic approach to systematically identify patterns and themes in the data (Braun and Clarke 2006). Recordings were transcribed verbatim by one researcher and verified by an alternative research assistant present at the map-based focus groups to ensure accuracy. All 25 transcripts were entered into NVivo 11 Pro qualitative software for analysis. We followed a multi-step coding process (Braun and Clarke 2006). First, we separated data by school, to allow for consideration of urban and suburban differences. Next, we grouped data into categories based on environmental features that students "Like," "Dislike," "Want Improved," and "Stop," as well as tracking key quotes. We then used the coding stripes feature in NVivo to visually delineate dominant areas of interest within transcripts along with the "nodes most frequently coded" feature, to identify topics most frequently discussed. Through this process, we identified three main themes in the dataset that aligned with our study objectives to better understand children's perceptions of the features in their environments that are barriers/enablers along their school journeys.

This experiential data about children's school journeys was integrated with geospatial data using qualitative GIS techniques. We drew on Knigge and Cope's (2006) approach to visualization, which refers to methods that provide insight into geographic data through visual representation. Following our identification of frequently discussed topics through our textual thematic analysis, we geo-coded (i.e., matched geographic XY coordinates) all locations marked by participants with stickers on the large-scale satellite view aerial maps. Unique ID codes were created for each point and these were

then matched and joined in ArcMap 10.4 and connected with the children's own descriptions of and comments about these places. The points layer was added in ArcMap and then the kernel density function tool was used to calculate and display the density of features (enablers, barriers, and improvements) in the neighbourhoods surrounding the schools. Areas of high mention by students appear darker in colour and areas of no mention remain transparent. This spatial analysis reveals both high and low areas of interest to students at both school locations. The resultant hot spot maps allow visualization of key locations of interest, concern, and potential improvements for all participating schools. Key student quotes are reported in the results and have been linked (with corresponding letters) to their corresponding hotspots on the maps. These individual quotes are provided to be illustrative of the types of experiences children attached to these places, while the use of hot spot maps represents the overall collective nature of the map-based activities, foregrounding the group experience.

### Study schools: Neighbourhood characteristics

The two school neighbourhoods varied considerably in their environmental characteristics (Figures 1 and 2). Some of the key differences between these two contrasting school locations included street layout, surrounding green space, and built environment features. The surrounding neighbourhood at the suburban school contained many looping and non-connecting cul-de-sac streets (Figure 1). Cul-de-sac streets tend to promote lower traffic volume surrounding the school. Larger, busier intersections can be seen along the borders of the map. Another unique environmental feature of this school is the large forest located directly behind the school, which is attached to the schoolyard. The students at this school self-identified as being primarily walkers. On the other hand, the neighbourhood around the urban school (Figure 2) contains a grid-iron street typology, a largely non-hierarchical network associated with more evenly distributed traffic flow across streets throughout the area. Another distinct characteristic is close proximity to a set of train tracks and the downtown core. The students at this school identified as being predominantly bussers.



**Figure 1**  
School A: suburban neighbourhood.  
SOURCE: SWOOP (2015).

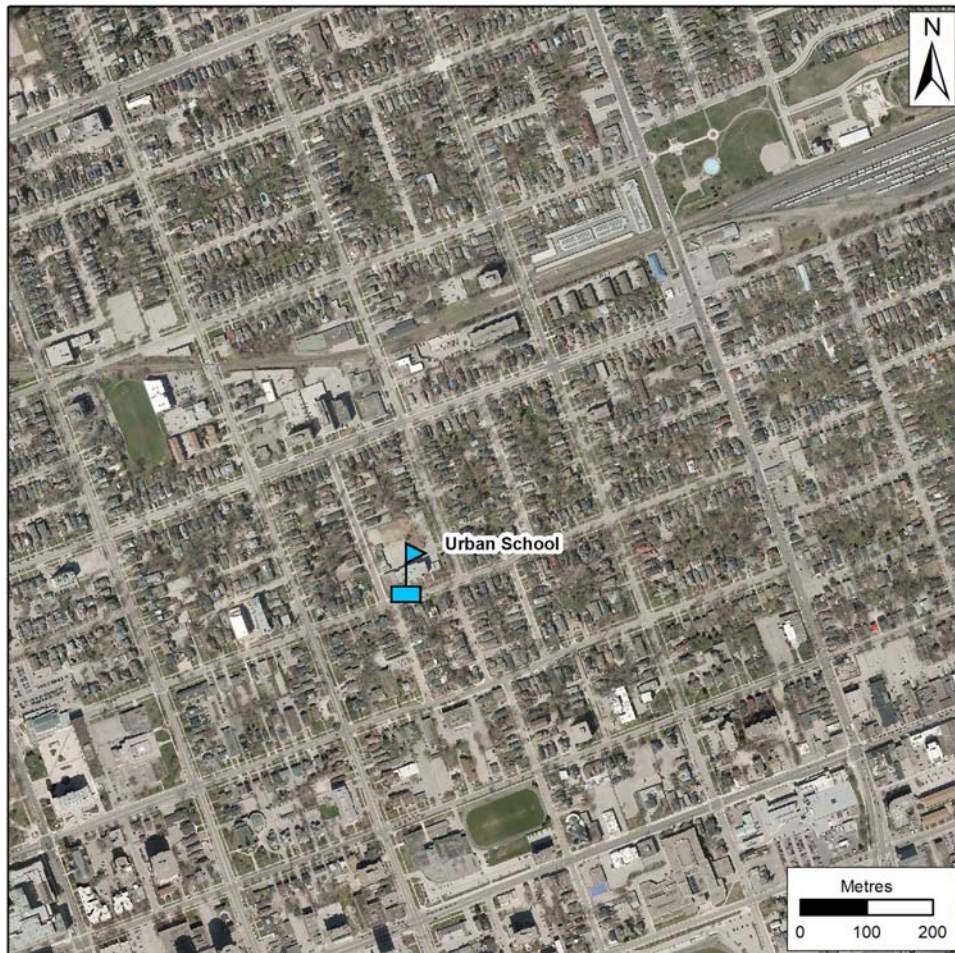
## Results

We identified three main themes: safety-related features, material features, and affective features. Our analysis revealed overlap between urban and suburban children's perceived barriers, enablers, and improvements on their journey to and from school. We thus report on the schools jointly, indicating which area selected quotes pertain to and drawing explicit attention to any differences between the urban and suburban locations. To illustrate our themes, we link directly to our

qualitative GIS integrating the participatory maps created by the students. We use examples of students' quotes linked to the geographical locations identified, tying their experiences to the hotspots of barriers, enablers, and improvements identified (see Figures 3 and 4).

### Safety-related features

Children emphasized safety as an important part of their school journey experience. Interactions with people while travelling to school were



**Figure 2**

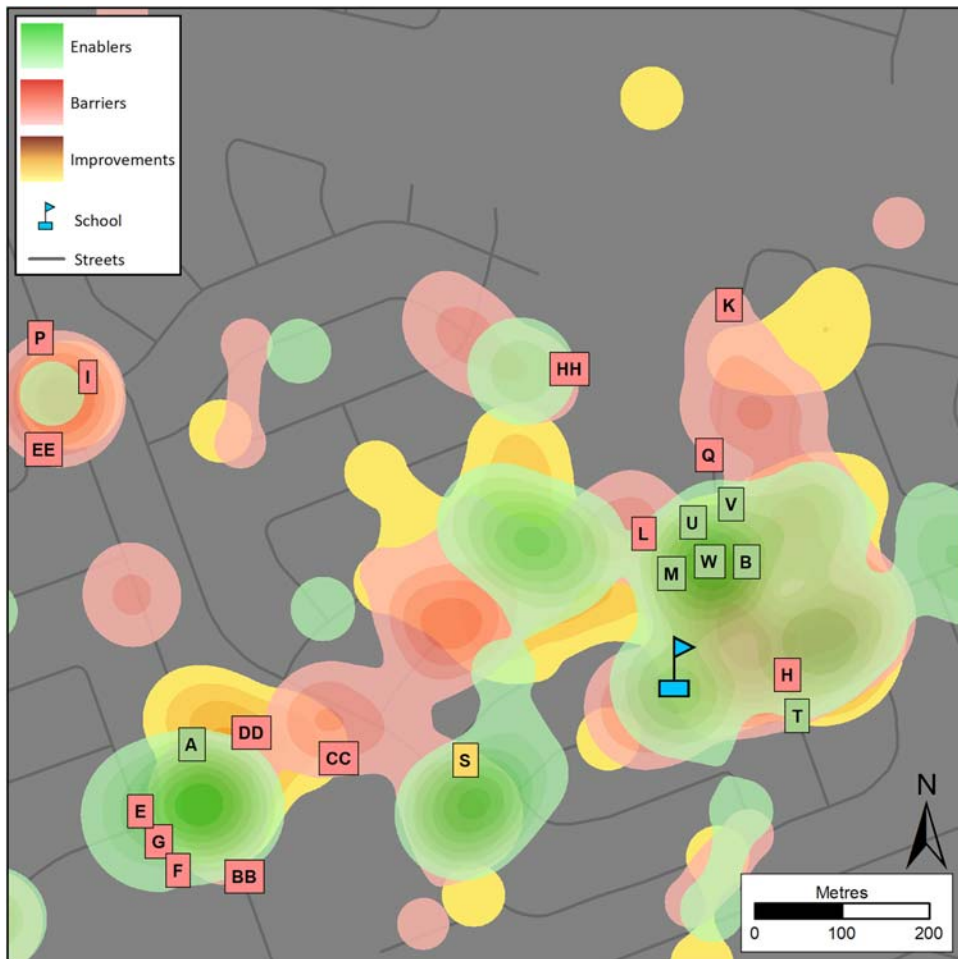
School B: urban neighbourhood.  
SOURCE: SWOOP (2015).

particularly important enabling features, especially the familiarity of people, travelling to school with friends, and walking with a sibling—as one student from the suburban school commented, “I feel more comfortable when my friends walk with me and talk and stuff” (Figure 3, A). Seeing familiar faces en route and stopping at a friend’s house to travel together were the two most common safety-supporting features identified. Many students consciously selected certain routes to encounter other students, including one child who liked their walking route to their suburban school

because “I feel safe going this way cuz like a lot of it’s in a row with like five kids that I know” (Figure 3, B). Crossing guards were another significant safety-supporting feature, as one student at the urban school put it, “I usually feel safer walking that way because there’s a crossing guard there” (Figure 4, C). Children perceived crossing guards’ presence and capacity to calm traffic along their route as beneficial.

Safety-related barriers included challenges crossing the road, traffic, and busy streets. Crossing the street, regardless of the neighbourhood





**Figure 3**

School A: suburban hotspots.\*

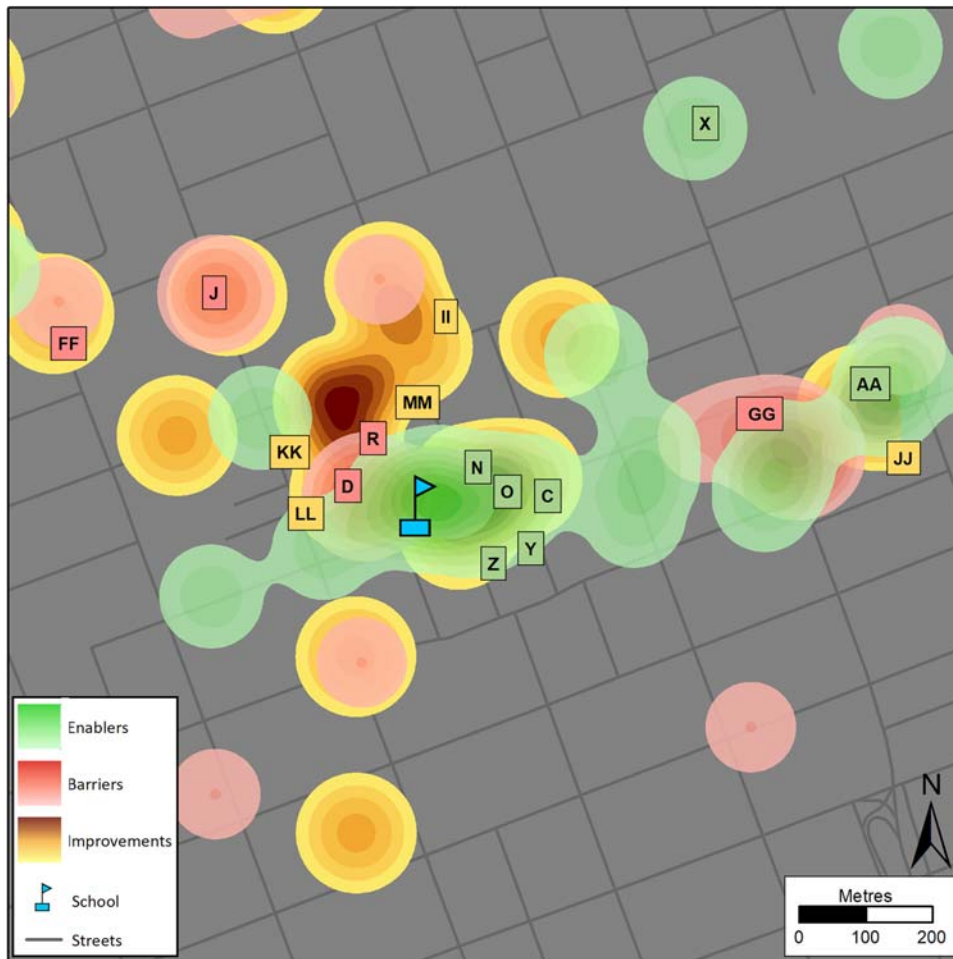
\*Note: Letters correspond with matching quotes linked throughout the results of this paper.

infrastructure, often raised safety concerns for students. These centred on negative experiences with specific traffic lights, distractedness and impatience of drivers, and simply not enjoying the act of crossing the street. One student explained crossing the street near the urban school as “super busy in the mornings. A lot of people—I actually almost got hit there. I had the right of way and someone came drifting. I think they could put a stop light there instead of having it as an intersection” (Figure 4, D). Another student shared similar feelings of aversion towards crossing the street while

actively travelling to their suburban school, explaining that,

It's the crosswalk right by my, um, house I don't like it because, um, cars, they, usually when I'm rollerblading to school, the cars don't, um, stop, and they don't look, so, um, I don't, I just don't feel safe when I'm going across, and, and when there's cars stopping, because they don't, some cars don't stop. (Figure 3, E)

The volume of cars, traffic speed, and noise generated by traffic made students feel unsafe and apprehensive on their journey, with many students



**Figure 4**

School B: urban hotspots.\*

\*Note: Letters correspond with matching quotes linked throughout the results of this paper.

making statements such as, “I’m scared of the traffic” (Figure 3, F); “I don’t like it here because there are usually a lot of cars” (Figure 3, G); and “It’s hazardous right here because there are tons of cars and a lot of kids walking” (Figure 3, H). Features that presented hazardous road scenarios created a sense of insecurity. One student summed up the general perception of most participants from both schools, when exclaiming, “Ya I don’t like crossing” (Figure 3, I).

While children deemed interactions with *familiar* people (e.g., neighbours, friends, siblings) to be enabling features of their school journeys, other

interactions piqued safety concerns. People on their journeys who they perceived as risky were unfamiliar people, teenagers, and bullies. The presence of “creepy”—a word several students used—people negatively influenced children’s perceptions of certain areas, decreasing feelings of safety. When asked to expand ideas about barriers to personal safety, statements such as “The creepy dude!” (Figure 4, J) were made, revealing that children qualified certain areas on their route by past interactions with people (Crawford et al. 2017). Some children at the suburban school explained

that they would avoid walking a particular route because they knew teenagers or bullies would be there and it made them feel scared: "I don't like that place right there because um, there's these teenagers that go there a lot" (Figure 3, K) and "We're always kind of cautious, there's a boy and his brother and one time we got really scared because they were standing behind the fence that's covered in leaves and they jumped out at us" (Figure 3, L).

In terms of improvement, many children identified the influence of parents over their travel as an area where they would like to see changes made. While many children expressed feelings of complete safety walking to school, they noted it was their parents' perspectives of safety stopping them from being able to walk to school. Also, many students felt as if their parents did not believe they were responsible or old enough to walk alone. Consequently, many of these children were either driven (car or bus), or had to walk with either a sibling or a friend.

### Material features

Children discussed pedestrian-friendly infrastructure such as sidewalks, stop signs, short travel distance, and short cuts as enablers on their journeys to school. Children also valued not having to cross the street to travel on a sidewalk, as opposed to streets with sidewalks on only one side of the road—as a student at the suburban school said, "I like how there is a sidewalk there" (Figure 3, M). Stop signs were also a positively viewed feature on children's journeys because of their role in decreasing traffic speed: one student commented, "I like how there is a stop sign right here because it slows down the cars" (Figure 4, N). Although these features often evoked feelings of safety, both sidewalks and stop signs are categorized as material feature enablers since they were largely discussed in relation to their physical presence in the environment rather than the feelings they facilitated when encountered by children. Short travel distance was discussed by students at both schools as an enabler to walking to school, especially by students who lived within close proximity to the school. When asked to explain their route to school one student's initial response at the urban school was, "Not that long, I just have to cross the street so it's pretty simple for me" (Figure 4, O). Finally, children cited shortcuts as

supportive of AST. At the suburban school, habits such as cutting through the forest, creating or following pathways in the woods, and hopping a fence to shorten the distance to school were among a few of the shortcuts students created and enjoyed using on their route to school. Similarly, students at the urban school would take detours and shortcuts through nearby parks.

Material barriers to AST related to sidewalks, weather, distance, terrain, drop-off zones, and trains. As per above, streets that lacked sidewalks, or only had sidewalks on one side of the street, were seen as barriers. In fact, any areas which required additional street crossing were viewed as unfavourable and areas lacking a sidewalk altogether made children feel as if there was no protection from vehicles. When sidewalks were not available, children were forced to travel on the roadside. One student at the suburban school stated, "I don't feel safe because there's no other sidewalks in this area" (Figure 3, P). Inclement weather also interfered with children's school journeys. Top weather-related barriers included rain (walking was uncomfortable), ice on stairs (fears of injury), and a lack of snow clearing on both pathways and sidewalks (fears of injury in conjunction with potentially limiting a route(s) to school). Distance was another barrier; the farther a student's house was from the school, the more it was prioritized as a barrier to AST. Hilly terrain further complicated the distance barrier; however, hills were mostly seen as a barrier to students biking to school, rather than those walking. As one student said, "we don't want to bike down because it's hard to go up so sometimes we'll just drop him [a friend] off at the top of the hill so we don't have to ride back up" (Figure 3, Q).

Drop-off zones and school parking lots were viewed by children as dangerous, chaotic, and hazardous, particularly in the morning due to the sheer volume of traffic. Those at the suburban school mentioned that many streets lacked proper lighting, which worsened in the winter months when the walk to and from school was very dark and could be hazardous, overlapping with the safety theme. Trains were an environmental barrier identified at both school locations; however, they were more frequently mentioned at the urban school, likely due to train crossings in close proximity to the school location. In fact, many students crossed the railroad tracks on their daily journey to school. Students also took issue with

the time it took for the crossing train to pass if they were stopped at the rail barrier, the speed at which trains travel, the inconvenience, and a general dislike—as one student simply stated, “I would like there not to be a train” (Figure 4, R).

The majority of improvements identified by students were to mitigate the aforementioned barriers; however, there were a few features not previously discussed. For one, children noted the need for a pathway in an area that did not have one or improvements to an existing pathway. One student at the suburban school explained, “I don’t feel like I’m safe, like it [the pathway] can get pretty crammed and sometimes if there’s strollers you have to walk around them” (Figure 3, S). Many students brought up ideas on how to improve their crossing of the train tracks, but most of these suggestions required large-scale infrastructure changes, such as the addition of a bridge or tunnel, or removal of the train tracks entirely.

#### Affective features

Children identified a series of affective features along their school journeys that influenced their moods, feelings, and attitudes in relation to their perceptions of their environments. Trees, parks, interactions with crossing guards, AST programs, and dogs were among the most common features discussed by children that evoked positive affective responses. Students enjoyed seeing trees lining the streets because “[i]t gives off a lot of shade” (Figure 3, T). Others found trees in the suburban neighbourhood to be aesthetically pleasing: “It has a big tree in front of it and it looks so beautiful and the leaves change colour and I just like to stop and stare” (Figure 3, U). The suburban school and its surrounding neighbourhoods are unique because of the large forest located directly behind the school. Many students altered their routes to “avoid the road so I cut through the forest” (Figure 3, V) and because they enjoyed it. As one student explained, “Um well we usually just like going in the woods because it’s nice and there’s lots of animals and stuff” (Figure 3, W). Around the urban school, with a high density of parks, a number of students made detours en route to school to walk through a park and make their journey more enjoyable: “[W]ell, sometimes I take detours. I’ll go there to the park and come out the back” (Figure 4, X).

Crossing guards also served an enabling role as positive affective features of the journey-to-school environment. Children at both the urban and suburban schools not only appreciated crossing guards for the safety reasons above, but also enjoyed the recognition and personal interactions with these familiar faces: “I like seeing the crossing guard because she’s nice” (Figure 4, Y). School-based programs, such as a walking school bus, were also seen as enablers: “[I] like the walking school bus, I like the people and I like where it goes (Figure 4, Z).” A few students also mentioned encountering dogs en route as a positive experience. One student at the urban school stated, “Sometimes I see this really cute little English Bull Dog on my way to school. It is usually on the other side of the street” (Figure 4, AA).

Students were clear about features at certain locations that induced negative feelings on their route to school. Absence of crossing guards and presence of dogs, garbage, and smoking were the top affective negative influences children encountered on their school journeys. Children only saw crossing guards, or lack thereof, as a barrier when the crossing guard did not assist in crossing the street and when one was not present at high-traffic areas. This translated into children seeing the addition of a crossing guard in certain locations as an area of improvement to their school journey. Students suggested several additional locations where they would like to have assistance crossing the street, with many students believing this addition would make their journey safer, faster, and more enjoyable. Although a somewhat contested feature, dogs were more commonly seen as a barrier by students and often produced negative emotional responses. Students at both schools shared similar feelings towards dogs, including comments such as, “There’s like dogs there and they’ve bitten people before so I don’t like taking that way and the owners don’t really take care of them” (Figure 3, BB) and “My neighbour, they have this, like, really crazy dog, it’s kind of creepy, it, like usually they keep it in their car sometimes” (Figure 3, CC).

Several material features contributed to the affective landscape of children’s school journeys. Garbage negatively influenced children’s perceptions of their environments. Participants discussed displaced garbage, such as dog waste and litter, as a negative feature that they have to encounter while travelling to and from school: “There’s a lot of garbage in the area and cigarette butts so like it’s not

very good for kids to be around" (Figure 3, DD) and "People don't clean up after their dogs and then there's just like everywhere dog poop everywhere because people don't clean up after their dogs" (Figure 3, EE). Children at the urban school in particular often made comments to the effect of "There's a lot of garbage that needs to be cleaned up" (Figure 4, FF). Finally, children disliked having to pass people smoking on their travels to school, often classifying certain locations as smoking areas where people were known to smoke cigarettes. Children would try to avoid these locations on their route to school, such as one near the river in the urban area—"there's a ton of people that smoke, and it smells like smoke and it looks deserted and it's really dirty" (Figure 4, GG). Likewise, a number of students noted that the littering of cigarette butts detracted from their school journey experience, "I don't like the road because there's so much cigarettes on them" (Figure 3, HH). These affective features led some students to negatively categorize certain segments of their school journeys.

When it came to improvements, students pointed to buildings along their journeys that provoked feelings of insecurity. Students at the urban school were more likely to speak of houses that appeared to be deteriorating, such as "There's a place that looks pretty abandoned near my house" (Figure 4, II) and "[T]here's a house that I think needs improvement" (Figure 4, JJ), and "Some of the houses here are messy and not nice" (Figure 4, KK). For some students these scenes elicited strong emotional reactions. For example, one student from the urban school said, "This one apartment is really sketchy. There are a lot of people there that aren't good and are dangerous. My parents don't like me walking by there" (Figure 4, LL). Another urban student explained the fear tied to a particular house on their school journey "because it is kind of creepy when you pass it and it's all dark" (Figure 4, MM). This reaffirms the notion that even though an area or feature might be objectively safe, if a child perceives it as a barrier it can influence the experience of their school journey and how they choose to travel.

## Discussion and conclusion

By positioning children as experts of their environments in our participatory methodology, our findings provide an important counterpoint to

the adultist privilege characterizing the majority of research on children's AST. The themes we identified—safety-related, material, and affective features—demonstrate that the barriers and enablers children experience on their school journeys are not only multi-layered, but have multiple meanings from children's perspectives. It became evident from our results that a physical feature in children's environments is simply not just that—children perceive that feature to have other meanings, implications, and influences on their journeys to and from school. The maps created through our qualitative GIS show the places that these students use every day and what they perceive to be important based on *their* spatial knowledge. We thus argue that identifying barriers and enablers to AST for children *requires* engaging children's views—otherwise opportunities for intervention will be missed. Take, for example, the role of crossing guards. Not only did crossing guards constitute an important safety-related feature, but they significantly coloured the affective landscape of children's school journeys.

Indeed, one of the unique findings of our study was the significance of affective features, both as enablers and barriers to AST. The diversity of affective encounters described by the children we spoke with echoes the research of Murray and Mand (2013) on children's mobile emotions in everyday travel. They reported that children's affective situations spanned a myriad of sometimes contrasting qualities, observing that "the disgust of 'dog poo' on the way to school is experienced alongside the joy in finding a new short-cut" (Murray and Mand 2013, 73). Interventions would benefit from taking into account this varied affective topography to incorporate features that support a positive affective landscape along children's school journeys.

In light of the socio-ecological framework, at the intra- and inter-personal levels our findings diverge in two ways from the AST literature that is based primarily on parental data. First, the AST literature frequently cites parental fears of child abduction as a key barrier for children walking to and from school, despite actual risk being lower compared to other risks such as automobile collisions, pedestrian injuries, and bicycle injuries (Eichelberger et al. 1990; Ahlport et al. 2008). In contrast, our study shows that from children's perspectives, "stranger danger" is not a common theme; in fact, many map-

based focus groups never brought up the topic. Although children, particularly the urban students, did mention people they deemed to be “sketchy,” the intra- and inter-personal factors children emphasized most were interactions with friends, crossing guards, and neighbours. Second, while walking to school with other children may alleviate parental concerns (Salmon et al. 2007), our research shows that from children’s perspectives, walking to school with other children and friends was an affective feature enabler.

In terms of the environmental sphere of the socio-ecological framework, both the natural and built environments were dominant aspects in our material features theme. Several modifiable environmental features surfaced during the participatory mapping exercises, such as sidewalks, drop-off zones, and pedestrian infrastructure (e.g., crosswalks, street lights, stop signs). Children believed that improving the infrastructure in the neighbourhoods surrounding their schools would facilitate AST. Our findings are consistent with those of Boarnet et al. (2005) who found that improvements to sidewalks and traffic control systems are promising in relation to impacting the propensity of children walking and biking to school. Creating or improving neighbourhood routes (e.g., paths, shortcuts, walkways) that allow children to avoid travelling along major arteries and crossing busy intersections could also serve to facilitate increased walking (Clark et al. 2016).

Several of the safety-related features raised by participants tie in with the policy sphere of the socio-ecological framework. These features largely related to the availability of crossing guards, school-based programs, drop-off zones, and school location. Crossing guards were an especially significant policy-relevant feature mentioned by many students as safety and affective enablers of their school journeys. Regulations determine the locations and numbers of crossing guards in school neighbourhoods. Students at both schools preferred having a crossing guard at an intersection rather than an unstaffed crosswalk. In the city this research was completed in, crossing guards fall under the jurisdiction of a private security company contracted out by the city’s roadway, lighting, and traffic control division, regulated under the provincial *Ontario Highway Traffic Act*. The city reviews other municipalities’ school crossing guard practices and uses a warrant system to evaluate all existing and new crossing guard locations. In the

future, when cities review past and present crossing guard locations, it would be a beneficial practice for them to discuss potential locations with students at the affected school(s). Likewise, drop-off zones, as discussed within our safety theme, are guided by policy. Many children raised concerns about the volume of traffic and lack of safety within their school drop-off zone. The infrastructure of the drop-off zone largely influenced children’s perceptions of their journeys, particularly when they travelled through or past this area. One student explained that an improvement could be made by changing this area to a one-way zone for traffic, in order to reduce the “chaos” of the drop-off zone.

Interventions aimed at increasing AST can be both informally driven by students or implemented at the organizational level. Many students mentioned that they would stop at friends’ houses on their way to school, pick them up, and then continue to walk to school together. Having students find a friend or classmate to walk to school with is an effective self-driven way to engage more students in AST. At an organizational level, schools could look to implement a walking school bus program (Kearns et al. 2003). Another organizational level intervention for adaptation could be the implementation of a Walk Safely to School Day campaign or iWalk day (Green Communities Canada 2010). Both of these are annual events hosted by schools on a specific day that promote AST and allow the school community to tailor an event to specific features of individual schools while encouraging AST to the entire school population.

One of the key contributions of our study is the novel participatory methodology we employed to elicit rich, in-depth insight into children’s perceptions about the environmental factors shaping their experiences of AST. This methodology embraces the understanding that young people possess expert knowledge about their environments. The maps created during our study show the places that these students use every day and what they perceive to be important based on their spatial knowledge. The collaborative nature of this research is a major strength of its design. This was an interactive program run during Geography Awareness Week, with equal attention given to educating the children about the importance of the research they were completing. The project went beyond simply being a research project and was used as an opportunity to educate grade five and six students about geography as a discipline and the daily influence of their

surrounding environments. Furthermore, it gave children the opportunity to speak directly to experts and policy makers about improvements they would like to see on their journeys to and from school.

The inclusion of community stakeholders in our research process provided the opportunity to engage decision makers in understanding children's perceptions of features influencing children's journey to and from school. We suggest this approach lays the groundwork for linking our qualitative findings to policy interventions down the road by offering community stakeholders first-hand—rather than abstract—engagement with children's perspectives and increases buy-in from an integrated knowledge translation perspective. The experience of “being in the room” while the mapping and discussion was ongoing offers a level of context to AST evidence that local policy stakeholders may not have otherwise been afforded. Our engagement with integrated knowledge translation in this research advances development of the necessary relationship between researchers and policy makers working collaboratively in mutually beneficial research toward changes in practices (Kothari and Wathen 2013). It is these types of research methods, amplifying children's voices, that can help to inform policy and practice supporting localized interventions aimed at increasing children's AST.

At the same time, moving forward, future research and interventions for AST must adopt an equity lens to ensure that we do not inadvertently exacerbate existing health and social inequities (Frohlich and Potvin 2008; Coen 2017). Our findings are an important starting point for bringing children's experiences into AST research; however, we recognize that children's independent mobilities, AST behaviours, and physical activity participation more broadly are characterized by gendered and other social disparities (McMillan et al. 2006; Janssen et al. 2011; Villanueva et al. 2013). We hold that the next steps in this line of inquiry are to explore the gendered dimensions of AST experiences, as well as how these intersect with other axes of social difference. This requires child-centred research designs that contend with children's first-hand perceptions of the structures (e.g., gender, ethnicity, SES, (dis)ability) at play in affording AST opportunities, as well as children's embodied experiences of AST. Creative methods, building on the participatory mapping approach we have taken here, can be a way forward to further recognize

children's agency and connect research findings to public health agendas from an integrated knowledge translation perspective (Parsons and Boydell 2012; Parsons et al. 2013; Coen 2017).

Several limitations qualify our findings. First, selection and recruitment of schools was based on the availability of the schools and their interest in the research. In the future, it would be valuable to explore a broader range of school neighbourhoods, including those in rural and remote settings. Children living in less densely populated areas are likely to have diverse influences on AST such as longer commuting distances, compared to children living in urban and suburban settings similar to the participants involved in this research (Dalton et al. 2011). Second, in order to encompass all of the children's voices in the research and understand their perspectives of their school neighbourhoods, findings were coded across all students, regardless of the mode of travel students use to get to and from school. During the mapping exercises children indicated their most common mode of travel, showing that half of the participants use a form of AST and half use a form of non-active travel. This shows that many children perceive similar features to influence active school journeys, regardless of how they personally travel to school. Third, and related to our equity discussion above, due to the collective classroom nature of our data collection strategy grouping students according to neighbourhood, we were not able to probe any differences in experiences along various dimensions of social difference. Although we recognize the role gender plays in children's independent mobility, the purpose of this research aimed to gain broad insight into children's environmental perceptions related to AST; our analysis therefore, did not explicitly query gendered aspects of these experiences. Rather, our study provided an overall basis of children's experiences with AST that provides a foundation for future work that will unpack gendered and other structures that also shape how children journey to and from school.

In conclusion, findings from our participatory mapping and qualitative GIS identified safety-related, material, and affective features of children's local environments as barriers and enablers to AST from children's perspectives. These barriers and enablers transected all four levels of the socio-ecological framework. Although the two schools varied in geographical setting, results from our

research show that there is a general overlap of features discussed by students in both urban and suburban areas. Environmental features that mattered for children's school journeys took on multiple meanings in their eyes, demonstrating that children's perspectives must be engaged to inform interventions to promote AST.

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## References

- Agar, M. 2006. An ethnography by any other name ... *Forum: Qualitative Social Research* 7(4): Article 36.
- Ahlport, K. N., L. Linnan, A. Vaughn, K. R. Evenson, and D. S. Ward. 2008. Barriers to and facilitators of walking and bicycling to school: Formative results from the non-motorized travel study. *Health Education & Behavior* 35(2): 221–244.
- Barker, J., and S. Weller. 2009. Is it fun? Developing children centred research methods. *International Journal of Sociology and Social Policy Qualitative Research*. 23(12): 33–58.
- Bhugra, D., and H. Minas. 2007. Mental health and the global movement of people. *The Lancet* 370(9593): 1109–1111.
- Boarnet, M. G., C. L. Anderson, K. Day, T. McMillan, and M. Alfonzo. 2005. Evaluation of the California safe routes to school legislation: Urban form changes and children's active transportation to school. *American Journal of Preventive Medicine* 28(2 Suppl. 2): 134–140.
- Braun, V., and V. Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3(2): 77–101.
- Brug, J., B. Wammes, S. Kremers, K. Giskes, and A. Oenema. 2006. Underestimation and overestimation of personal weight status: Associations with socio-demographic characteristics and weight maintenance intentions. *Journal of Human Nutrition and Dietetics* 19(4): 253–262.
- Carlson, J. A., J. F. Sallis, J. Kerr, T. L. Conway, K. Cain, L. D. Frank, and B. E. Saelens. 2014. Built environment characteristics and parent active transportation are associated with active travel to school in youth age 12–15. *British Journal of Sports Medicine* 48(22): 1634–1639.
- CDC (Centers for Disease Control and Prevention). 2011. Strategies to prevent obesity and other chronic diseases: The CDC guide to strategies to increase physical activity in the community. [https://www.cdc.gov/obesity/downloads/pa\\_2011\\_web.pdf](https://www.cdc.gov/obesity/downloads/pa_2011_web.pdf).
- Chemero, A. 2003. An outline of a theory of affordances. *Ecological Psychology* 15(2): 181–195.
- Clark, A. F., E. A. Bent, and J. Gilliland. 2016. Shortening the trip to school: Examining how children's active school travel is influenced by shortcuts. *Environment and Planning B: Planning and Design* 43(3): 499–514.
- Coen, S. E. 2017. Connecting qualitative research on exercise and environment to public health agendas requires an equity lens. *Health and Place*. doi:10.1016/j.healthplace.2017.09.005
- Crawford, S., S. Bennetts, N. Hackworth, J. Green, H. Graesser, A. Cooklin, J. Matthews, et al. 2017. Worries, 'weirdos', neighbourhoods and knowing people: A qualitative study with children and parents regarding children's independent mobility. *Health and Place* 45: 131–139.
- Dalton M. A., M. R. Longacre, K. M. Drake, L. Gibson, A. M. Adachi-Mejia, K. Swain, H. Xie, and P. M. Owens. 2011. Built environment predictors of active travel to school among rural adolescents. *American Journal of Preventive Medicine* 40(3): 312–319.
- Darbyshire, P., C. MacDougall, and W. Schiller. 2005. Multiple methods in qualitative research with children: More insight or just more? *Qualitative Research* 5(4): 417–436.
- Eichelberger, M., C. S. Gotschall, H. B. Feely, P. Harstad, and L. M. Bowman. 1990. Parental attitudes and knowledge of child safety: A national survey. *American Journal of Diseases of Children* 144(6): 714–720.
- Frohlich, K. L., and L. Potvin. 2008. Transcending the known in public health practice. The inequality paradox: the population approach and vulnerable populations. *American Journal of Public Health* 98(2): 216–221.
- Fusco, C., G. Faulkner, F. Moola, R. Buliung, and V. Richichi. 2013. Urban school travel: Exploring children's qualitative narratives about their trip to school. *Children, Youth & Environments* 23(3): 1–23.
- Fusco, C., F. Moola, G. Faulkner, R. Buliung, and V. Richichi. 2012. Toward an understanding of children's perceptions of their transport geographies: (Non)active school travel and visual representations of the built environment. *Journal of Transport Geography* 20(1): 62–70.
- Giles-Corti, B., A. Timperio, F. Bull, and T. Pikora. 2005. Understanding physical activity environmental correlates: Increased specificity for ecological models. *Exercise and Sport Sciences Reviews* 33(4): 175–181.
- Green Communities Canada. 2010. *Canadian school travel planning pilot final report*. Peterborough, ON: Green Communities Canada.
- Hart, R. 1992. *Children's participation—from tokenism to citizenship*. Florence: UNICEF International Child Development Centre.
- Holloway, S. L. 2014. Changing children's geographies. *Children's Geographies* 12(4): 377–392.
- Hyun, E. 2005. How is young children's intellectual culture of perceiving nature different from adults? *Environmental Education Research* 11(2): 199–214.
- James, S. 1990. Is there a "place" for children in geography? *The Royal Geographical Society (with the Institute of British Geographers)* 22(3): 278–283.
- James, A., and A. Prout. 1990. *Constructing and reconstructing childhood: Contemporary issues in the sociological study of childhood*. London: Falmer Press.
- Janssen, I., C. L. Craig, J. Clarke, and M. Tremblay. 2011. Physical activity of Canadian children and youth: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Health Reports* 22(1): 14–23.
- Kearns, R. A., D. C. A. Collins, and P. M. Neuwelt. 2003. The walking school bus: Extending children's geographies? *Area* 35(3): 285–292.
- Knigge, L., and M. Cope. 2006. Grounded visualization: Integrating the analysis of qualitative and quantitative data through grounded theory and visualization. *Environment and Planning A* 38(11): 2021–2037.



- Kothari, A., and C. N. Wathen. 2013. A critical second look at integrated knowledge translation. *Health Policy* 109(2): 187–191.
- Krueger, R. A., and M. A. Casey. 2000. *Focus groups: A practical guide for applied research*. Thousand Oaks, CA: Sage Publications.
- Larouche, R., G. E. J. Faulkner, M. Fortier, and M. Tremblay. 2014. Active transportation and adolescents' health: the Canadian Health Measures Survey. *American Journal of Preventive Medicine* 46(5): 507–515.
- Larsen, K., J. Gilliland, and P. M. Hess. 2012. Route-based analysis to capture the environmental influences on a child's mode of travel between home and school. *Annals of the Association of American Geographers* 102(6): 1348–1365.
- Larsen, K., J. Gilliland, P. Hess, P. Tucker, J. Irwin, and M. He. 2009. The influence of the physical environment and sociodemographic characteristics on children's mode of travel to and from school. *American Journal of Public Health* 99(3): 520–526.
- Loebach, J., and J. Gilliland. 2010. Child-led tours to uncover children's perceptions and use of neighborhood environments. *Children, Youth and Environments* 20(1): 52–90.
- McCurdy, L. E., K. E. Winterbottom, S. S. Mehta, and J.R. Roberts. 2010. Using nature and outdoor activity to improve children's health. *Current Problems in Pediatric and Adolescent Health Care* 40(5): 102–117.
- McMillan, T. E. 2005. Urban form and a child's trip to school: The current literature and a framework for future research. *Journal of Planning Literature* 19(4): 440–456.
- . 2007. The relative influence of urban form on a child's travel mode to school. *Transportation Research Part A: Policy and Practice* 41(1): 69–79.
- McMillan, T., K. Day, M. Boarnet, M. Alfonso, and C. Anderson. 2006. Johnny walks to school—does Jane? Sex differences in children's active travel to school. *Children, Youth and Environments* 16(1): 75–89.
- Mendoza, J. A., K. Watson, N. Nguyen, E. Cerin, T. Baranowski, and T. A. Nicklas. 2011. Active commuting to school and association with physical activity and adiposity among US youth. *Journal of Physical Activity and Health* 8(4): 488–495.
- Murray, L., and K. Mand. 2013. Travelling near and far: Placing children's mobile emotions. *Emotion, Space and Society* 9: 72–79.
- National Geographic Society. n.d. *Geography Awareness Week*. <https://www.nationalgeographic.org/education/programs/geographyawarenessweek/>
- Oliver, M., H. M. Badland, G. M. Schofield, and J. Shepherd. 2011. Identification of accelerometer nonwear time and sedentary behavior. *Research Quarterly for Exercise & Sport* 82(4): 779–783.
- Parsons, J. A., and K. M. Boydell. 2012. Arts-based research and knowledge translation: Some key concerns for health-care professionals. *Journal of Interprofessional Care* 26(3): 170–172.
- Parsons, J., L. Heus, and C. Moravac. 2013. Seeing voices of health disparity: Evaluating arts projects as influence processes. *Evaluation of Program Planning* 36(1): 165–171.
- ParticipACTION. 2015. *The biggest risk is keeping kids indoors: The 2015 ParticipACTION report card on physical activity for children and youth*. Toronto, ON: ParticipACTION.
- . 2016. *Are Canadian kids too tired to move? The 2016 ParticipACTION report card on physical activity for children and youth*. Toronto, ON: ParticipACTION.
- Punch, S. 2002. Research with children: The same or different from research with adults? *Childhood* 9(3): 321–341.
- Ramanathan, S., C. O'Brien, G. Faulkner, and M. Stone. 2014. Happiness in motion: Emotions, well-being, and active school travel. *Journal of School Health* 84(8): 516–523.
- Saelens, B. E., J. F. Sallis, and L. D. Frank. 2003. Environmental correlates of walking and cycling: Findings from the transportation, urban design, and planning literatures. *Annals of Behavioral Medicine* 25(2): 80–91.
- Saelens, B. E., and S. L. Handy. 2008. Built environment correlates of walking: A review. *Medicine and Science in Sports and Exercise* 40(7 Suppl): S550–S566.
- Sallis, J. F., R. B. Cervero, W. Ascher, K. A. Henderson, M. K. Kraft, and J. Kerr. 2006. An ecological approach to creating active living communities. *Annual Review of Public Health* 27(1): 297–322.
- Sallis, J. F., J. J. Prochaska, and W. C. Taylor. 2000. A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise* 32(5): 963–975.
- Salmon, J., L. Salmon, D. A. Crawford, C. Hume, and A. Timperio. 2007. Associations among individual, social, and environmental barriers and children's walking or cycling to school. *The Science of Health Promotion* 22(2): 107–113.
- Santos, M. P., A. S. Page, A. R. Cooper, J. C. Ribeiro, and J. Mota. 2008. Perceptions of the built environment in relation to physical activity in Portuguese adolescents. *Health & Place* 15(2): 548–552.
- Singh, A., J. W. R. Twisk, W. V. Mechelen, M. J. M. Chinapaw, and C. Central. 2012. Physical activity and performance at school. *Archives of Pediatrics and Adolescent Medicine* 166(1): 49–55.
- Sirard, J. R., and M. Slater. 2008. Walking and bicycling to school: A review. *American Journal of Lifestyle Medicine* 2(5): 372–396.
- Statistics Canada. 2015. *Directly measured physical activity of children and youth, 2012 and 2013: Results from the Canadian Health Measures Survey*. <https://www150.statcan.gc.ca/n1/daily-quotidien/150218/dq150218c-eng.htm>.
- SWOOP (Southwestern Ontario Orthophotography Project). 2015. Lidar [computer file]. Peterborough, ON: Land Information Ontario, Ontario Ministry of Natural Resources and Forestry.
- Telama, R., X. Yang, J. Viikari, I. Välimäki, O. Wanne, and O. Raitakari. 2005. Physical activity from childhood to adulthood: A 21-year tracking study. *American Journal of Preventive Medicine* 28(3): 267–273.
- Van Loon, J., and L. Frank. 2011. Urban form relationships with youth physical activity: Implications for research and practice. *Journal of Planning and Literature* 26(3): 280–308.
- Villanueva, K., B. Giles-Corti, M. Bulsara, A. Timperio, G. McCormack, B. Beesley, G. Trapp, and N. Middleton. 2013. Where do children travel to and what local opportunities are available? The relationship between neighborhood destinations and children's independent mobility. *Environment and Behavior* 45(6): 679–705.
- Wilson, K., A. F. Clark, and J. A. Gilliland. 2018. Understanding child and parent perceptions of barriers influencing children's active school travel. *BMC Public Health* 18(1): 1053.