Understanding Parent and Child Perceptions of Barriers and Enablers Influencing Active School Travel

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Graduate Program in Geography
A thesis submitted in partial fulfillment of the requirements for the degree in Master of Arts
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Abstract

Physical activity plays a fundamental role in developing and sustaining the health and well-being of children. Walking is the most common form of physical activity for people of all ages and the daily journey to and from school is a convenient opportunity for children to be physically active through the use of active school travel. This thesis uses a mixed methods approach, using: (a) parent and child surveys to examine how perceptions of barriers influence children’s active school travel; and (b) participatory mapping exercises and qualitative GIS to understand environmental influences on children’s journeys to and from school. Results suggest that parent and child perceptions of barriers vary greatly and are highly influenced by one’s individual environment. The overall aim of this research was to better understand features influencing children’s use of active school travel in order to improve interventions targeting increased physical activity. Findings from this thesis have implications for future research, urban planners, public health professionals, policy makers, educators, and parents.

Keywords

Children; active school travel; perceptions; mixed methods; participatory research; qualitative GIS; environments
Co-Authorship Statement

This thesis is presented in an integrated article format, with two independent but complimentary studies. Each integrated article within this thesis will be submitted for publication in peer-reviewed journals. Below are details of co-authorship for both integrated articles.

**Chapter 3:** Wilson, K., Clark, A.F., & Gilliland, J.A. (2017). Understanding Child and Parent Perceptions of Barriers Influencing Children’s Active School Travel.

Chapter 3 was written by Katherine Wilson with Dr. Jason Gilliland, and Dr. Andrew Clark. Katherine Wilson performed the analysis and is the primary author of the article. She was present for a portion of ASRTS data collection, but was not present during the STEAM South data collection period, this data was collected by other members of the HEAL. Dr. Gilliland is the principal investigator and conceived and designed the methodology for the ASRTS and STEAM studies. Dr. Gilliland and Dr. Clark were involved in the development of data collection procedures and data analysis, and contributed to editing the paper.

**Chapter 4:** Wilson, K., Coen, S., Piaskoski, A., & Gilliland, J.A. (2017). Mapping Children’s Perspectives on Neighbourhood Barriers and Enablers to Active School Travel.

Chapter 4 was written by Katherine Wilson with Dr. Jason Gilliland, Dr. Stephanie Coen, and Angela Piaskoski. Katherine Wilson performed all analysis and is the primary author of the article. Katherine Wilson and Dr. Gilliland co-developed the participatory mapping exercise guide. Angela Piaskoski assisted in the spatial analysis. Dr. Gilliland is the principal investigator, conceived, and designed the ASRTS study. Both Dr. Gilliland and Dr. Coen provided guidance and were involved in editing the final article.
Acknowledgments

This research would not have been possible without the graduate student support provided by the HEALab, Department of Geography, Children’s Health Research Institute and Children’s Health Foundation. Thank you to the ASRTS steering committee, the amazing public health nurses, and all of the principals, teachers, parents, community partners, volunteers, and most importantly the children who made this research possible.

To Dr. Jason Gilliland: Thank you for accepting me into this program and supporting me throughout the entire process. I am so thankful for discovering the HEAL as a naive undergraduate volunteer exposing me to this amazing area of research. I will be forever grateful for the opportunities you have given me.

To Dr. Andrew Clark and Dr. Stephanie Coen: This thesis would not be what it is without both of your guidance. Your collective knowledge is extraordinary and I thank you both for your patience, direction, and critical feedback throughout this entire process.

To the Department of Geography: Thank you to all the wonderful staff and students whose guidance, knowledge, and positivity have made this such an amazing grad school experience.

To the HEAL team: Sarah, Suzanne, Catherine, Sylvia, Brenton, Danielle, and Kate this experience would not have been the same without you all. I feel so lucky that we all began our different endeavors at the HEAL the same year and truly appreciate all of your friendships. A personal shout out to Christine Mitchell for constantly supporting me both academically and personally. Finally, to the rest of my fellow HEAL members who have put up with my hello kitty obsession for the past two years; it has been a pleasure working with you all.

To my friends: Near or far you have provided me with constant support (and distractions), no matter the time zone. All of your friendships mean more to me than I could ever express.

To my family: Lauren and Christian you always know the right time to check in and how to make me laugh. Thank you Mom and Dad for being my biggest fans, making me feel like what I am doing is important, and always making time to listen to it all.
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<th>Full Form</th>
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<tbody>
<tr>
<td>AT</td>
<td>Active Travel</td>
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<tr>
<td>AST</td>
<td>Active School Travel</td>
</tr>
<tr>
<td>ASRTS</td>
<td>Active and Safe Routes to School</td>
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<tr>
<td>BE</td>
<td>Built Environment</td>
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<tr>
<td>BMI</td>
<td>Body Mass Index</td>
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<tr>
<td>ELMO</td>
<td>Elgin London Middlesex Oxford</td>
</tr>
<tr>
<td>GAW</td>
<td>Geography Awareness Week</td>
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<tr>
<td>GCC</td>
<td>Green Communities Canada</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
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<tr>
<td>GPS</td>
<td>Global Positioning Systems</td>
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<tr>
<td>HEAL</td>
<td>Human Environments Analysis Laboratory</td>
</tr>
<tr>
<td>LDCSB</td>
<td>London District Catholic School Board</td>
</tr>
<tr>
<td>MOT</td>
<td>Mode(s) of Travel</td>
</tr>
<tr>
<td>MVPA</td>
<td>Moderate to Vigorous Physical Activity</td>
</tr>
<tr>
<td>NMREB</td>
<td>Non-Medical Research Ethics Board</td>
</tr>
<tr>
<td>OR</td>
<td>Odds Ratio</td>
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<tr>
<td>PA</td>
<td>Physical Activity</td>
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<tr>
<td>SEF</td>
<td>Socio-Ecological Framework</td>
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<tr>
<td>SES</td>
<td>Socio-Economic Status</td>
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<tr>
<td>STEAM</td>
<td>Spatial Temporal Environment and Activity Monitoring</td>
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<tr>
<td>STP</td>
<td>School Travel Planning</td>
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<tr>
<td>TVDSB</td>
<td>Thames Valley District School Board</td>
</tr>
<tr>
<td>UWO</td>
<td>University of Western Ontario</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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Chapter 1

1 Introduction

1.1 Research Context

Physical activity (PA) plays a crucial role in developing and sustaining the health and well-being of children (Strong et al., 2005). Research has shown that levels of obesity are reaching alarming rates worldwide, suggesting this epidemic is beginning in early childhood (Lobstein, Baur, & Uauy, 2004; Wang & Lobstein, 2006; World Health Organization, 2011). While increasing PA in children can help lower rising rates of childhood obesity, over the last two decades Canadian children have exhibited a decline in levels of PA (Tremblay, Colley, Saunders, Healy, & Owen, 2010; Tremblay, 2000). Children achieving recommended amounts of PA during childhood help to mitigate the risk factors associated with cardiovascular disease, including obesity, high cholesterol, and type 2 diabetes (Dietz, 1998; Janssen & Leblanc, 2010; Shaibi, Faulkner, Weigensberg, Fritschi, & Goran, 2008). There are numerous physical, psychological, emotional, and behavioural health benefits associated with regular PA in children (Sallis, Prochaska, & Taylor, 2000). Despite all of these known benefits, fewer than half of all Canadian children are active enough to experience the benefits associated with PA (Craig, Cameron, Russel, & Beaulieu, 2001). With the continually decreasing PA rates and increase in sedentary behaviour in children’s lifestyles, public health researchers and officials are seeking opportunities to alleviate pressures on the healthcare system caused by the rise in obesity levels. Research has found that behaviours developed during childhood are expected to persist into adulthood (Carlin et al., 1997; Telama et al., 2005); therefore, health promotion strategies should target child and youth populations to promote lifelong healthy lifestyles.

Previous intervention programs aimed at increasing children’s PA levels have targeted curricular and structured activities that children participate in on a regular basis. These forms of targeted interventions have focused on recess, physical education, team sports, and recreational facilities (Huberty, Dinkel, Coleman, Beighle, & Apenteng, 2012). More
recently, research has moved towards targeting non-curricular and unstructured activities that promote PA in children, such as independent play and active transportation to and from school (Oliver, Innvar, Lorenc, Woodman, & Thomas, 2014). Walking is the most common form of PA for people of all ages (Saelens, Sallis, & Frank, 2003) and the daily journey children take to and from school is a unique opportunity to be physically active. Active school travel (AST) is defined as any form of human-powered travel to get to and from school such as walking, cycling, or wheeling. In recent years, there has been a dramatic decrease of school aged children using this method of travel to and from school (Clark, Bent, & Gilliland, 2016). Unfortunately, over last 20 to 30 years, the proportion of Canadian children using AST has been in decline (Buliung, Mitra, & Faulkner, 2009). Over half of Canadian children aged 5 to 17 years use inactive modes of travel (MOT) to get to and from school (Buliung et al., 2009; Craig et al., 2001). A nationwide survey of children in the United States showed a drop in individuals using active transportation from 41% in 1969 to 13% in 2001 (McDonald, 2008). With these decreasing rates of AST, children are less likely to appreciate the many benefits of AST including weight gain prevention (Boarnet, Anderson, Day, McMillan, & Alfonzo, 2005), higher academic performance (Singh, Uijtdewilligen, Twisk, Mechelen, & Chinapaw, 2012), lower body mass index (BMI), (Lubans, Boreham, Kelly, & Foster, 2011), increased fitness (Mendoza et al., 2011), and improved spatial and cognitive development (Oliver, Badland, Schofield, & Shepherd, 2011).

There are many different factors that influence children’s AST and perceptions of these factors may act as predictors for walking or cycling to school. Research has largely discussed influencing factors on AST associated with features of children’s individual, social, and physical environments (Panter & Jones, 2010). Both the built and social environments play a vital role in the promotion of AST (Page, Cooper, Griew, & Jago, 2010). Children have extrinsic mobility restrictions that make them more vulnerable to their environments, such as the inability to drive and parental controls, hindering their ability to make healthy choices, including AST (Kyttä, 2004; Loebach & Gilliland, 2016). These restrictions limit younger population’s mobility, making them more influenced by the features in their local surroundings (Larsen et al., 2009; Larsen, Gilliland, & Hess, 2012). Studies examining children’s perceptions of their local
environments demonstrate that they possess meaningful and insightful contributions (Line, Chatterjee, & Lyons, 2010; Neuwelt & Kearns, 2006). Research also shows that children are extremely cognizant of the links among their health, PA, and AST (Fusco, Moola, Faulkner, Buliung, & Richichi, 2012; Holt, Spence, Sehn, & Cutumisu, 2008; Mitchell, Kearns, & Collins, 2007).

This thesis investigates how parents and children perceive features in their environments, how these perceptions differ, and how they influence children’s rates of AST. Furthermore, it will assess how children perceive different features and how these features influence their journey to and from school based on where they live relative to urban versus suburban environments. In doing so, this thesis provides insight into children’s AST and identifies key features to be targeted in future interventions with the aim to increase children’s PA levels.

1.2 Theoretical Framework

In research across disciplines, the explicit identification and inclusion of a theoretical framework is necessary to build, support, and guide studies (Grant & Osanloo, 2015). The decision to participate in AST is complex and research examining influencing factors on this decision is effectively guided by a socio-ecological framework. The socio-ecological framework was first introduced as a conceptual model in the 1970’s by Bronfenbrenner (1979) to understand human development. His work states that the entire ecological system in which growth occurs needs to be taken into account when attempting to understand human behaviour (Bronfenbrenner, 1979). This work has since been adopted various times by multiple health researchers. This thesis is framed using the adapted socio-ecological framework by Sallis and colleagues (2006) which builds upon the belief that health outcomes are affected by a number of factors at different levels. Research states that not only can behavioural influences come from the individual level, but also from people’s social and physical environments (Glanz, Rimer, & Lewis, 2008). This multi-level framework considers how health outcomes are influenced by factors at the intrapersonal, interpersonal, environmental, and policy level.
This framework highlights how features within each level can influence a specific outcome, in the case of this research, rates of AST (Sallis et al., 2006; Stokols, 1992). The socio-ecological framework allows for understanding how multi-level interventions that combine personal, social, environmental, and policy level factors can influence behavioural change (Sallis et al., 2016). One of the most complex tasks in conducting socio-ecologically framed research is knowing which of the possible interactions are most important (Glanz et al., 2008). Individuals’ perceptions of their environments are distinguished by both subjective and objective aspects of their environments (Sallis et al., 2006). The inclusion of features from each level of this framework avoids inferring
specious relationships, while recognizing that health outcomes, behaviours, attitudes, and perceptions have many influencers from varying levels of the socio-ecological framework (Krasner, 1980). Furthermore, this framework was chosen based on the aim of this research to influence change at the policy level. Literature supports that the most common way to influence policy, interventions, and programming is through research guided by a socio-ecological framework (Sallis et al., 2006). Research guided by a socio-ecological framework has the potential to have population-wide effects on PA behaviours, including AST.

1.3 Research Objectives and Questions

The overarching objective of this research is to contribute to the rapidly growing literature linking children’s health to their environments. This thesis was completed using data generated through research projects conducted by Dr. Jason Gilliland and his associates within the Human Environments Analysis Laboratory (HEAL). The primary objective of this thesis is to examine children’s perceptions of varying features experienced on their journey to and from school. This research aims to understand: (1) how perceptions of environments differ between children and their parents; (2) how perceptions of features differ between children in urban versus suburban areas; and (3) how these perceptions influence how children travel to and from school. Gaining a better understanding of the influence of child and parent perceptions on AST will help to inform policymakers and community stakeholders when deciding school policies, regulations, and infrastructure.

In order to meet these objectives, this research aims to answer the following research questions:

1. How do perceptions of barriers to active school travel differ between children and their parents?
2. How do child and parent perceptions of barriers to active school travel influence how children get to school?
3. What features do children from urban versus suburban environments perceive as barriers and enablers on their journey to and from school?
4. What improvements would students like to see on their journey between home and school to support increased participation in active school travel?

Research questions #1 and #2 will be answered using quantitative analysis of survey data collected from the Active and Safe Routes to School (ASRTS) project and the Spatial Temporal Environment and Activity Monitoring (STEAM) project. Both of these projects were conducted in Southwestern Ontario, Canada with children and parents from 48 elementary schools. Research questions #3 and 4 will be answered using qualitative analysis of data collected through participatory mapping exercises conducted with students in grades five and six in two schools in London, Ontario during Geography Awareness Week (GAW) 2016.

This thesis will add to the current body of literature through its use of a mixed method research design and participatory methodology. By exploring these concepts related to children’s perceptions of their environments, we will gain the knowledge necessary to inform decisions about future AST intervention methods and policy development.

1.4 The ASRTS Project

Active and Safe Routes to School (ASRTS) is an Ontario-wide program delivered by Canada Walks, a department of Green Communities Canada (GCC). GCC is a national association of community partners that helps people “go green”, and in the context of this research on the road and in the community (http://greencommunitiescanada.org/about-us/). ASRTS is a community-based program promoting the use of active transportation for children to and from school while also addressing health, PA, and safety issues. ASRTS began as a grassroots effort of concerned parents over their children’s health and safety while travelling to and from school. It has since evolved into a national movement in the past decade, supported by a vast network of Canadian organizations which believe that AST can improve overall health, happiness, and establish daily fitness habits in children (http://www.saferoutestoschool.ca/). The flagship program of ASRTS is the School Travel Plan (STP), which is a program that engages students, schools, and community stakeholders in identifying and addressing barriers to AST. When schools participate in the STP program, they are expected to develop a “living document” that is
used in a variety of ways to help facilitate AST at their school. The collaborative nature of this program involves key community partners including: city officials, police, public health nurses, community organizations, school boards, teachers, principals, parents, and children. Within the ASRTS organization exists the Elgin, London, Middlesex, and Oxford (ELMO) steering committee, which is comprised of many community group members, including researchers from the HEAL who have been a part of the committee since its inception.

In addition to the ELMO ASRTS steering committee, the HEAL is also a part of the STP working group. This expands the HEALs responsibilities to collecting and analyzing baseline data at all participating schools in the program. To do so, a HEAL representative acts as a co-facilitator in the distribution of family and child surveys in all schools. Once surveys are completed, the data is securely transferred to the HEAL for processing. Basic analysis of the data is conducted and major issues and trends are identified. Results are summarized and presented to the STP committee of each participating school for further use in the development and implementation of the action plan.

The research protocols for this project were approved by the Non-Medical Research Ethics Board (NMREB) at Western University (Active and Safe Routes to School Committee’s School Travel Planning Evaluation NMREB #: 105635) (see Appendix A). Furthermore, it has been reviewed and approved by the Research & Assessment Services departments of the Thames Valley District School Board and the London District Catholic School Board (see Appendix B and C).
1.4.1 Family and Child Surveys

The elementary schools selected for this project are based on self-interest in the program and looking to investigate AST at their school. The data used for this research comes from this ongoing four-year community collaborative research project which began in 2014. All children in grades four through eight in participating schools were eligible provided they obtained signed consent and gave child assent. Students in grades four to eight at the school receive oral presentations from a HEAL representative and a co-facilitator (most often the schools public health nurse) introducing the project and highlighting what will be required from each student. Students are then sent home with a letter of information, consent form, and family survey (see Appendices D, E, and F respectively). Students in grades junior kindergarten to three are not given presentations since they are not asked to complete child surveys, but are sent home with a letter of

Figure 1.2 Map of Study Areas
information and family survey. Consent forms and completed family surveys are then collected from the school and those students in grades four to eight who receive parental consent are invited to complete a child survey. All children with parental permission for participation sign a child assent form to participate in the study (see Appendix G). Versions of both the family and child surveys can be found in Appendices F and H.

In addition to the ASRTS data, surveys were also used from the STEAM project (further details of this mixed methods project are available at steamproject.ca; Mitchell, Clark, & Gilliland, 2016). The instruments used to collect data in both the ASRTS and STEAM projects ask the same questions, thus study 1 (Chapter 3) combines the two datasets for the purposes of analysis.

1.4.2 Participatory Mapping Exercises

The data for the second study included in this thesis was carried out under the larger umbrella of the ASRTS research project. This study called for participatory methods, which shaped the mapping exercises completed during this research. Participatory mapping exercises proved to be an effective method to gather data on how children perceive their environments. As a research method, it takes into consideration the complexities of youth participation, which can be best explained through Roger Hart’s theory on child participation (Hart, 1992). According to Hart’s Ladder of Participation, there are eight levels which can be seen in Figure 1.3. According to Hart, children need to be both genuinely and significantly involved in the research to produce meaningful and representative results. Hart argues that the successfulness of representation within projects corresponds to the ranking of research on this ladder.
Figure 1.3 Roger Hart’s Ladder of Participation (Adapted from Hart, 1992)

Involving the participants as co-researchers through participatory mapping exercises elevates this research to the sixth rung on Hart’s ladder of participation: *Adult-initiated shared decisions with children*. During this study, researchers brought forward a topic, however, the discussions are significantly child-led and directed. This method is dependent on the participants understanding the issue at hand, taking this issue seriously, assuming a leadership role, and determining the extent of their participation (Hart, 1992). James and Prout (1997) stated that giving a voice to children is not simply about letting children speak, it is about exploring the unique contribution children’s perspectives can provide to our understanding of our environments, which is what this participatory mapping research aims to do.

Both schools that participated in the activities for the mapping exercise were current or past participants in the larger ASRTS project. The two schools selected for further in-depth analysis of AST through participatory research methods were chosen based on the feedback received during baseline surveys and general interest in the research. Figures 1.4 and 1.5 exhibit the surrounding environments of the two participating schools and further information can be found on these neighbourhoods in Chapter 4.
The data for this study was collected through map-based focus groups structured around participatory mapping exercises during Geography Awareness Week (GAW) in November 2016. GAW is an annual geography education and public awareness program that is promoted by National Geographic and runs internationally every third week of November. At the two participating schools, presentations were given in all grades five and six classrooms, including the six classes that were all involved in the participatory mapping exercises. Children were sent home with a letter of information and consent form. Large-scale aerial photos were used for this research and mapping exercises were co-facilitated by a researcher and a member of the community. Members of the community who attended and assisted in the data collection included city planners, teachers, public health nurses, environmental and park planners, ecologists, community developers, operation technologists, and the mayor of the City of London. Figures 1.6 and 1.7 show students completing the participatory mapping exercises along with researchers and community partners.
1.5 Thesis Format

This thesis is prepared in an integrated article format, consisting of two separate studies. The two studies were completed independently of one another, under the overarching ASRTS project. However, both studies are complimentary in examining how perceptions influence children’s journeys to and from school. Both papers will serve the same overarching purpose of examining factors influencing children’s AST; however, they will address this objective through different methods and analysis. Different research methods have been used to provide both quantitative and qualitative analyses examining children’s AST, with the goal of informing future policy and research related to children’s active journeys to and from school. Each thesis chapter is described below.

Chapter 2 reviews the existing literature relating to children’s use of AST, using a scoping review format. This review explores the current literature on AST, factors associated with AST, differences between parent and child perceptions, past methods used for perception research (quantitative and qualitative), and identifies gaps and methodological limitations in the current body of literature to justify the need for further research.

Chapter 3 examines how perceptions of barriers to AST differ between children and their parents based on survey data. The secondary objective of this paper is to assess how parent and child perceptions of barriers to AST influence how children get to school,
while controlling for different variables at the intrapersonal, interpersonal, and environmental levels of the socio-ecological framework. The results from this study highlight the differences in perceived barriers to AST.

**Chapter 4** investigates features that children perceive as barriers and enablers on their journey to and from school and explores whether or not these experiences differ across varying urban and suburban environments. As well, this study examines what improvements students would like to see in their travels to school and the potential these improvements could have in fostering increased participation in AST. A novel participatory mapping exercise methodology was used to further involve children in the research process. The results from this study seek to inform policy and practice supporting localized targeted interventions to improve children’s journey to and from school.

**Chapter 5** synthesizes the findings from each of the studies and connects the results to draw a cohesive conclusion. This chapter identifies research limitations, offers opportunities for future research, and provides recommendations for policy and practice.
1.6 References


Chapter 2

2 Literature Review

Chapter 2 will build upon the foundation laid in the introduction and will summarize and discuss the current literature relating to children’s use of active school travel (AST). It will highlight the importance of the topic, previous methods used in research, and areas where research can be expanded. This chapter is divided into six overarching sections: Section 2.1 describes declining physical activity levels and rising childhood obesity rates; Section 2.2 explores the current literature on AST and its continuously declining rates; Section 2.3 examines associated factors previously discussed in AST research, broadly framed within the socio-ecological framework; Section 2.4 investigates the differences between parent and children’s perceptions of AST; Section 2.5 delves into methods previously used in studies examining perceptions of AST; Section 2.6 explores participatory research and the voice of children in research; Finally, section 2.7 concludes by reviewing gaps in the literature that this thesis aims to fill.

2.1 Overarching Problem: Decreasing Physical Activity and Increasing Obesity Rates

Obesity rates have risen significantly over the past 30 years, with childhood obesity and, consequently, physical inactivity being at the forefront of Canadian health concerns (Tremblay et al., 2010). In Canada, childhood obesity levels have tripled since 1979, with one in four children currently being overweight or obese (Public Health Agency of Canada, 2012). Overweight and obesity rates for children aged 2 to 17 have increased from 15% in 1979 to 26% in 2004 (Larsen et al., 2014; Shields, 2006). Obesity is associated with many chronic health issues, the most concerning outcomes being hypertension, type 2 diabetes, and coronary heart disease (Ball & McCargar, 2003; Birmingham, Muller, Palepu, Spinelli, & Anis, 1999). A rise in these health concerns presents an enormous challenge and burden on our health care system. In 1997, the total direct cost of obesity to the Canadian health care system exceeded $1.8 billion (Ball & McCargar, 2003). McCurdy and colleagues (2010) state that the universal shift towards an overall more sedentary lifestyle is one of the major contributors to the decline of
Research clearly shows that the inclusion of regular physical activity (PA) is a tool for the prevention of chronic diseases that come later in life (Sothern, Loftin, Suskind, Udall, & Blecker, 1999). Other contributing factors include genetics, dietary intake, and energy expenditure (Andersen, Schnorr, Schroll, & Hein, 2000; Larsen et al., 2014; Tremblay & Willms, 2003). High levels of inactivity in people of all ages is one factor influencing the recent population wide rise in obesity rates (Luke et al., 2004). Research suggests that pediatric health care providers should be recommending outdoor activities, as well as simple lifestyle-based interventions, to encourage children to break these sedentary lifestyle habits; researchers further explain that there needs to be greater attention to sustainable, long-term prevention methods that promote healthy lifestyle changes (McCurdy et al., 2010).

There is significant evidence demonstrating the detrimental health consequences of childhood obesity and the benefits of PA on children’s health and wellness. This evidence suggests that school-aged children and youth in Canada should be engaging in at least 60 minutes of moderate-to-vigorous intensity physical activity (MVPA) daily (Janssen & Leblanc, 2010; ParticipACTION, 2016). The World Health Organization (WHO) defines MVPA as requiring a moderate amount of effort and a noticeable acceleration of the heart rate, which can be achieved by brisk walking (2014). However, only 9% of 5 to 17 year old accumulate 60 minutes of MVPA (Statistics Canada, 2015).

Decreasing rates of childhood PA can, in part, be explained by children today choosing to spend more time indoors being sedentary than they do playing outside engaging in PA. Developing active lifestyles at an early age can establish PA patterns that persist into adulthood (Telama et al., 2005). Adopting good PA habits during childhood may therefore also decrease the risk of adult obesity (Telama, Yang, Laakso, & Viikari, 1997). In order to be impacted by the possible benefits from PA, examples of acceptable PA include brisk walking, bicycling, and active outdoor playing (Strong et al., 1998).

2.2 What is Active School Travel?

One way to increase children’s time spent engaging in PA is by creating a supportive environment for active travel (Davison & Lawson, 2006). School is a child’s primary
destination, with most children making a total of ten trips to and from school weekly. As a result, active school travel (AST) can contribute to a significant proportion of children’s daily PA (Faulkner, Buliuung, Flora, & Fusco, 2008). AST is any form of self-propelled movement, including, but not limited to walking, cycling, skateboarding, and any other form of non-motorized transportation. Substantial PA can be accumulated from a child’s active journey to and from school, which can help contribute to children reaching their recommended 60 minutes of MVPA (Sahlqvist, Song, & Ogilvie, 2012). In turn, changes in travel patterns from less active to active modes could help decrease the population’s high rates of inactivity and obesity. Sirard and colleagues (2008) found from their study of grade five students that children who walked to school average around 24 additional minutes of MVPA per day compared to their fellow non-walking students. This study also suggested that children could potentially reach nearly half of their recommended daily 60 minutes of MVPA if they walk to school. Although the journey to and from school most likely will not fulfill all of children’s recommended 60 minutes of MVPA, it presents a unique opportunity to encourage PA and increase levels of their daily PA.

Research has shown that children who travel actively to school, rather than their peers who are driven, are more active throughout the day (Larouche, Faulkner, Fortier, & Tremblay, 2014; ParticipACTION, 2015) and that children accustomed to being driven to school will likely not come to appreciate the full benefits of an active lifestyle as an adult (Hillman, 1993; Sleap, 1993; Tudor-Locke, Ainsworth, & Popkin, 2001). Beyond higher levels of daily PA, children who walk or bicycle to school benefit from increased energy expenditure and increased cardiovascular fitness when compared to their peers who do not actively commute to school (Davison, Werder, & Lawson, 2008; Timperio et al., 2006; Larouche, Saunders, Faulkner, Colley, & Tremblay, 2014). Other benefits of AST include improving children’s mental health, increasing positive emotions, and reducing greenhouse-gas emissions from personal vehicles (Ramanathan, Allison, Faulkner, & Dwyer, 2008; Ramanathan, O’Brien, Faulkner, & Stone, 2014; Woodcock et al., 2009). Furthermore, AST has also been linked to better academic performance through increased alertness and attention during the school day, as well as supportive towards healthy brain development (Hillman et al., 2009; Lambiase, Barry, & Roemmich, 2010; Martínez-Gómez et al., 2011). Finally, through increased AST a reduction in traffic volume within
school zones can help to enhance the safety, connectivity, and quality of life for the community (Hall & Hesse, 2012).

Despite the growing awareness, known benefits, and continued research on AST, AST rates are continuously declining with children relying on school bus services and being driven to destinations as their primary source of travel (McMillan, 2007). The 2016 participACTION report shows that only 24% of Canadian children aged 5 to 17, typically walk or wheel to and from school, while a significant 62% of students are typically driven. These continuously declining rates of AST make it critical to identify the causes and factors associated with this decline. As well, it is of equal importance to identify the possible features that can be modified to assist with increasing AST rates for school-aged children and adolescents. It can be challenging to identify these factors, as there are many interacting mechanisms that can influence a children’s decision to engage in AST; however, better understanding influences on children’s AST is vital if we want to prevent a further decline in this influential health behaviour.

2.3 Associated Factors with Active School Travel

As children’s AST rates continue to decline, it becomes imperative to understand the factors that influence children’s active commuting to school. The majority of existing AST research commonly adopts a socio-ecological framework. This framework is comprehensive for understanding the multi-level determinants of health behaviours that arises in school travel research (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996). AST is a complex process influenced by many factors at each of the intrapersonal, interpersonal, environmental, and policy level determinants (Sallis et al., 2006). There has been a focus in previous AST research on identifying the perceived AST barriers and enablers on a child’s route to school. Perceived barriers can be defined as a person’s estimated level of challenges associated with personal, social, environmental, and policy related obstacles to AST (Glasgow & Permanente, 2012; Lu et al., 2014). Existing research suggests that individual perceptions of their environment, compared to other objective factors, has a more direct relationship with children’s AST (McMillan, 2005).
2.3.1 Intrapersonal Level Factors

Among past research concerning intrapersonal level determinants of AST, demographic, physiological, and behavioral features are consistently identified as influential factors (Kerr, Frank, Sallis, & Chapman, 2007). Demographic correlates, such as gender, age, and attitude towards AST, can influence children’s perceptions of their journey to and from school. The literature has highlighted variations in rates of AST in groups that differ in ethnicity and socioeconomic status (SES). Research suggests that children of lower SES backgrounds will more frequently engage in AST than children from high SES backgrounds (Davison, Werder, & Lawson, 2008). The influence of SES as a determinant of AST behaviour is most commonly linked to the number of cars available to a family and whether parents are employed full time (Harten & Olds, 2004). Many studies have shown a connection between a child’s gender and rates of AST, with boys often using AST more than girls (Davison, Werder, & Lawson, 2008; Larsen, Gilliland, & Hess, 2012; Mitra, Buliung, & Roorda, 2010). Within the research supporting this finding, boys typically have higher rates of AST and are more often permitted by adults to travel independently without adult any supervision (Fyhri & Hjorthol, 2009; Mackett, Brown, Gong, Kitazawa, & Paskins, 2007). However, boys increased use of AST is not a consistent finding among all research. In general, research has found that boys are somewhat more likely to walk to and from school than girls, but the difference is often not statistically significant (McDonald, 2012). Age has also been found to be a positive correlate with AST, particularly when looking at distance travelled (Alparone & Pacilli,
2012; Easton & Ferrari, 2016; Mitra, Faulkner, Buliung, & Stone, 2014). As children get older, they are more likely to travel independently without any adult supervision. As well, a child’s preference to be driven to school is a personal-level factor that can influence how they get to and from school (Salmon, Salmon, Crawford, Hume, & Timperio, 2007). These intrapersonal level factors experienced alone or in combination, form the larger issue of barriers preventing children from actively commuting to and from school.

2.3.2 Interpersonal Level Factors

Factors at the interpersonal level, such as perceptions, parents’ behaviours, and peer influences, have been widely investigated: evidence has found that a child’s perceptions of their social environment can enabler or hinder their AST. Neighbourhood safety (Lee, Zhu, Yoon, & Varni, 2013; Trapp et al., 2011), “stranger danger” (i.e., a fear of strangers) (Zhu, Arch, & Lee, 2008), crime (Silva, Vasques, De Oliveira Martins, Williams, & Lopes, 2011), and no presence of other children/adults to walk with (Salmon et al., 2007) are among the top interpersonal level barriers preventing children from actively commuting to school. As mentioned previously, parents play an integral role in their children’s habits of AST; children are largely influenced by the context of their family (Ziviani, Scott, & Wadley, 2004). Behaviours are largely influenced by parental values, perceptions, and beliefs (Ziviani et al., 2004). Parents who value PA and actively commute to work will likely influence their children’s actions on how they get to school. Several studies suggest that parents can positively influence their children’s AST through supportive actions (Duncan, Spence, & Mummery, 2005; Kerr et al., 2006) and that children who have active parents, tend to be more active themselves (Garriguet, Colley, & Bushnik, 2017).

Peers also play a significant role, both positively and negatively, in social support correlations with AST (Duncan et al., 2005). Research has found that adolescent boys who perceived their neighbourhoods to have more peers are more likely to walk or cycle to school (Carver et al., 2005; Salmon et al., 2007). Conversely, falling prey to bullying during AST is a concern both parents and children share (Tudor-Locke & Myers, 2001). Social support from family and peers can have a strong positive or negative influence on AST. Walking is a means of transport, exercise, and leisure that is open to all age groups,
economic circumstances, and segments of society. Walking allows for the reduction of motor vehicle transportation, which can increase social interactions on neighbourhood streets and in turn, strengthen the community (Lopez & Hynes, 2006). AST includes social aspects of participation when children travel to school in groups, which encourages greater neighbourhood cohesion and sense of community (Kearns, 2004).

### 2.3.3 Environmental Level Factors

A healthy environment is an important determinant of population health and well-being ("World Health Organization Regional Office for Europe," n.d.). It is widely accepted that the environment people live in, both built and natural, can either encourage or hinder behaviour (Giles-Corti & Donovan, 2003; Hill, 2012; Saelens, Sallis, Black, & Chen, 2003). There is a growing body of evidence suggesting that built environment (BE) improvements supportive of PA (e.g., walking and cycling infrastructure, street connectivity, and mixed land use) influence the likelihood that people will chose active travel as their daily primary source of travel (Pucher, Buehler, Bassett, & Dannenberg, 2010). As cities have expanded, urban sprawl has grown, with greater distances to accessing non-residential spaces essential to everyday life (e.g., grocery store, retail space) and communities have become dependent on automobiles to access these spaces. This automobile dependency, in conjunction with the restructuring of the modern North American city, has caused the decentralization of cities and the development of suburbs (Gottdiener & Budd, 2005). The large sprawl often associated with suburbs negatively affects children’s independent travel, which in turn affects their AST. We now live in a culture that has created a dependency on adults capable of driving a vehicle (Hill, 2012).

The relationship between the BE and human behaviour, particularly in regards to urban design and transportation planning, has been a topic of interest for nearly twenty years (Handy, Boarnet, Ewing, & Killingsworth, 2002). The “built environment” can be defined as urban design, land use, and the transportation system that encompasses patterns of the constant changes of human activity with the physical environment (Handy et al., 2002). Children have extrinsic mobility restrictions, such as the inability to drive and parental controls, making them more vulnerable to their surrounding environments (Kyttä, 2004; Loebach & Gilliland, 2016). These restrictions, in turn, limit younger
population’s mobility, making them more influenced by the features in their local surroundings (Larsen et al., 2009; Larsen, Gilliland, & Hess, 2012). Children and youth populations are more influenced by the features of their local environments, therefore more likely to benefit from increased “walkability” of their local neighbourhood.

Walkability can be briefly defined as how friendly an area is to walking, in relation to health, environmental, and economic benefits (Talen & Koschinsky, 2013). In more recent years, research in the areas of public health and planning has shown that specific elements of children’s environment can directly influence whether or not they travel actively to and from school (Fitzpatrick, 2014; Giles-Corti et al., 2011; Larsen et al., 2009; McMillan, 2007). Neighbourhood design factors have been found to be significantly associated with children’s AST to and from school (Carver, Timperio, & Crawford, 2008).

Objective environmental factors most relevant to children’s AST include street connectedness, residential density, intersection density, and mixed-land-use (Bungum, Lounsbery, Moonie, & Gast, 2009; Frank, Kerr, Chapman, & Sallis, 2007). Other significant factors include the presence of sidewalks, tree densities, and distance from a child’s home to school. Children’s perceived neighbourhood safety (i.e., “stranger danger”, crime etc.) also affects choice of transportation mode to school (McMillan, 2007). There are many BE factors that can help to lower the risk of traffic dangers for children, such as sidewalks, routes that avoid main roads, safe terrains, short distance, crossing guards, pedestrian crossings, and sufficient traffic lights (Ahlport, Linnan, Vaughn, Evenson, & Ward, 2008; Hill, 2012). Distance from home to school stands out as the most common and influential environmental factor impacting children’s choices to use AST, both to and from school (Ewing, Schroeer, & Greene, 2004; Larsen et al., 2009; McMillan, 2005; Mitra & Buliung, 2012). Rates of AST are positively correlated with shorter home-to-school distances (Davison & Lawson, 2006; Ewing et al., 2004; Larsen et al., 2009; Panter, Jones, & Van Sluijs, 2008; Pont, Ziviani, Wadley, Bennett, & Abbott, 2009). This relationship is illustrated by higher rates of AST for children living in densely populated areas compared to children living in sparsely populated areas (Nelson et al., 2008). What is considered an acceptable distance to travel to get to school differs among individuals. However, if distance is perceived as too far by the child, rates of AST
will decrease. Correcting false perceptions of distance is an effective way to increase AST levels among children. Improving the lack of well-connected and safe infrastructure and altering urban form to make it more available and accessible for all is vital to promote residents choosing active travel as a viable form of transportation, particularly children choosing to walk to and from school.

2.3.4 Policy Level Factors

It is important to consider legislation and policy (for example, devising environmental modifications, grants and funding, school-level interventions), in discussions around AST, as individual-level interventions are unable to impact children at the population-level (Christie, Cairns, & Ward, 2004). A systematic review completed on active commuting to school suggests future research should include policy related barriers and enablers within their inquiries (Lu et al., 2014). School board and municipal planning are among the two most influential policy-level factors that have an influence on children’s AST. Policies on school travel and school location can have a significant impact on children’s mobility, social development, health, and safety within the context of AST (Christie et al., 2004).

The literature seldom examines participants (parent and child) perceptions on policy/regulatory barriers (Lu et al., 2014). In the past, there has been a focus on the perceptions at the personal, physical, and social environment level, therefore, leaving policy as an under researched area (Lu et al., 2014). An example of influential policy-level features is school siting locations, which influences what travel modes are considered to be viable options. Other policy level features influencing children’s AST include school busing policies (e.g., grade/age minimum) and policies requiring parents to designate their child as a walker or rider (Dellinger & Staunton, 1999; Eyler et al., 2008).

Influential AST safety policies, such as school speed zones and drop-off areas, are important when looking at understanding why children choose certain modes of travel (MOT). Infrastructure, crosswalks, and crossing guards are also typically managed and implemented by a governing organization and can have the opportunity to influence a
child’s route to school. No-transport zones are areas where bus service is not provided because children live too close to the school; these zones constrain the MOT choice for these children to AST or being driven in a personal vehicle (despite living close to the school). This constraint becomes particularly important for parents who may have concerns around the safety of AST. In these instances, their children are unable to take a school bus and so they rely on a personal vehicle as their MOT. A greater volume of personal vehicles increases congestion around the school – a potential hazard for those children who use AST. School siting is again an important policy to be considered within the research of AST. Traffic speeds, terrain surrounding the school, traffic congestion, and surrounding neighbourhoods are all prominent features that should be considered when a school’s location is decided. These factors should also be remembered when implementing AST interventions at the school. School start and dismissal times are an important consideration, particularly when compared against parents’ work schedules. These work schedules may dictate what parents perceive as the most convenient travel option for both themselves and their children. If these policy level features are neglected, AST interventions could be less effective because of them.

The identification of perceived barriers and enablers in relation to AST could eventually lead to policy changes that are supportive of AST behaviour. A further understanding of parents and child perceptions of barriers that children encounter on their routes to school is the first step of this process. Within the AST literature, perceived barriers are defined as a person’s estimated level of challenges related to intrapersonal, interpersonal, environmental, and policy obstacles to AST (Glasgow & Permanente, 2012; Lu et al., 2014). Perceptions are particularly important when understanding AST, because simply the presence of a supportive environment (e.g., short distance, policies aimed at reducing speed in school zones, well-connected streets) does not necessarily guarantee that every child will use AST. How children and parents perceive the school travel environments lends insight about what can truly be deemed a supportive environment – simply existing is not a good enough reason to deem an environment as “supportive”. Parent and child positive attitudes about AST, regular walking, and supportive peer influences are ways to increase levels of AST (Zhu & Lee, 2009).
2.4 Parents and Children Perceptions

Previous research about parent and child perceptions of AST has taken many different approaches. A common approach looks at both parent and children’s general perceptions of active travel (Kerr et al., 2006; Panter, Jones, Van Sluijs, & Griffin, 2010). Research suggests that a child’s positive perceptions of home and neighbourhood environments are associated with increased AST (Hume, Salmon, & Ball, 2004). However, the majority of research on children’s AST has focused on adult perspectives about their child’s travel to school; sometimes, research completely omitting children entirely (Sallis, Prochaska, & Taylor, 2000). This can become an issue since parent and children perceptions of their neighbourhood environments do not necessarily match. When examining parental barriers, research has found that abduction, traffic danger, crossing the roads, and lack of traffic lights are among the top fears (DiGuiseppi, Roberts, Li, & Allen, 1998; Timperio et al., 2006; Timperio, Crawford, Telford, & Salmon, 2004). Conversely, research has found that the top sources of fear for children include air pollutions, traffic danger, and “stranger danger” (Hugh Matthews & Limb, 1999). One of the most common limiting fears of AST in children is the perception of “stranger danger” (Carver et al., 2008; Timperio, Crawford, Telford, & Salmon, 2004). These parental perceptions can influence AST when a parent restricts their child from walking to school due to fear of their child experiencing “stranger danger” or abduction. Meanwhile, it has been estimated that the risk of an American child being kidnapped by a stranger is estimated to be 1:1,000,000 (Pinker, 2011). Findings in this area of research have shown that stranger abduction is the rarest abduction type, with parental abductions actually comprising the majority of abductions taken place (Shutt, Miller, Schreck, & Brown, 2004). Yet parents may still prevent their children from walking to/from school based on these perceived fears.

A wide range of approaches have been used to understand perceived barriers and enablers to AST. Often, literature examining perceived barriers and enablers to AST more generally considers parent and child awareness (Hume et al., 2009; Kerr et al., 2006; Panter et al., 2010), the decisions behind the mode they use to and from school (Faulkner, Richichi, Buliung, Fusco, & Moola, 2010; McMillan, Day, Boarnet, Alfonzo, & Anderson, 2006), physical activity levels among children who use AST (Carver et al.,
and/or how perceptions of AST relate to childhood obesity (Duncan, Johnson, Molnar, & Azrael, 2009; Galvez, Pearl, & Yen, 2010). Other research has delved more deeply to consider multiple levels of factors when looking at perceptions, an example being both individual- (Panter et al., 2010) and environment-level factors (Kerr et al., 2006; Page et al., 2010; Panter, Griffin, & Ogilvie, 2014). Distance to school has been shown to be the most influential and principal barrier to AST (Van Loon & Frank, 2011).

Although considering multiple levels of influence has become more common in the AST literature, some research remains focused only understanding factors at one level, such as distance, safety, or gender in relation to AST. Leslie and colleagues (2005) found that both objective (access to open space) and perceived (aesthetic) environmental attributes were associated with children achieving recommended walking levels. Similarly, there has been numerous studies that examine one level of influence, but within the context of different methodologies. For example, a study may examine how distance influences AST both objectively and subjectively to understand the relationship in a more nuanced way (Kerr et al., 2006; Panter et al., 2010; Santos, Page, Cooper, Ribeiro, & Mota, 2008; Timperio et al., 2006). While some associations have been found similar across the majority of studies (i.e., greater distance, greater safety concerns decrease AST), other associations are location-specific (e.g., perceptions, climate, environments) (Mandic et al., 2016).

2.5 Methods in Previous Literature Examining Perceptions of AST

Previous researchers have used a variety of methods to try and understand how parent and child perceptions influence children journey to school. Consequently, determining associations with AST across the evidence base can be challenging because heterogeneous measures and outcomes have been used, limiting the ability to aggregate and summarize the evidence.

Questionnaires and surveys are the most frequently used tools researchers use to understand parent and child perceptions (Carson, Kuhle, Spence, & Veugelers, 2010;
DeWeese, Yedidia, Tulloch, & Ohri-Vachaspati, 2013; Evenson, 2011; Napier, Brown, Werner, & Gallimore, 2011; Zhu & Lee, 2009). The types and number of questions asked on surveys varies greatly by study. It can be challenging to know the saturation point needed to fully understand how a participant’s perceptions impact the outcome being studied. Therefore, it is important that surveys ask the right questions to ensure accurate and quality information from the participant, without overburdening and frustrating the participant with lengthy surveys. It is also important to have a breadth of questions for each topic, as this allows the topic to have additional weight during the data analysis (Hill, 2012). However, researchers should be aware that keeping all related questions can cause multicollinearity when questions too similar in nature are used in a statistical model.

Interviews and focus groups, sometimes used in combination with surveys, have been the second most common method used in the literature (Eyler et al., 2008). Other methods have included more novel approaches, such as child-led neighbourhood walking tours, photovoice (using photographic technique to identify, represent, and enhance communities), and storytelling (sharing past experiences in small groups) (Fusco, Moola, Faulkner, Buliung, & Richichi, 2012; Loebach & Gilliland, 2010; Mitchell et al., 2007). These participatory methods often focus on the visual narratives of children’s transport geographies.

Rarely has AST research looked solely at children’s perceptions. Often parental perceptions are used in place, with the occasional study using a combination of both child and parent perceptions. It is important to note that, with the varying range of children’s ages included in the research, the younger the student’s age, the more often parents are included in the research. This may be because parental involvement in children’s AST decisions depends on the age and gender of the child, a well-documented area of research (Tinsley, Holtgrave, Reise, Erdley, & Cupp, 1995). As discussed earlier in this chapter, gender and age influence perceptions about AST differently. Yet, almost all studies on AST target both boys and girls with only a few studies have disaggregated findings by gender (Dollman & Lewis, 2007; Price, Pluto, Ogoussan, & Banda, 2011).
Sample size and children’s average age for participation in previous studies has varied greatly and is largely dependent on the chosen research method of the particular study. Sample size among research has varied as well and most often is representative of the research method used. Schoeppe and colleagues (2013) determined that the mean age of sample populations was between 10 to 13 years old, when reviewing literature focused on children’s independent mobility and active travel. Fewer studies focus on younger children (3 to 9 years) and adolescents (14 to 18 years) (Schoeppe et al., 2013). Darley and colleagues (1986) found a considerable difference among the decision making abilities of young children (aged 6 to 12 years) and adolescents (13 to 17 years). The average age of 10 to 13 years old is likely because children are at a point where they are able to begin travelling alone to school; however, they are still largely influenced by their parent’s perceptions and decisions.

There is an emergence about the cognitive and emotional impact that AST may have on childhood development. Research in this area has focused on the perceived emotional impact and overall well-being that AST can have on children. Research completed by Ramanathan and colleagues (2014) used questionnaires to examine parent’s perceived benefits of travel mode on their children’s dimensions of well-being and found that AST had the strongest association with positive emotions and well-being.

Research completed by Faulkner and colleagues (2010) reveals that MOT decision making processes can be influenced by perceptions of the physical and social environment, which consists of a combination of attitudes, beliefs, and perceptions of AST social norms. The research indicates that surveys are useful to identify AST correlates (i.e., demographics, individual and family factors, school factors, and social and physical environment factors). However implementing a qualitative approach is equally important to unravel the complexities of travel behaviour (Clifton & Handy, 2001; Faulkner et al., 2010).

Leslie and colleagues (2010) showed that combining data on parental attitudes and perceptions, as well as objectively measured factors relevant to the school route are important to include in future research. Kerr and colleagues (2006) suggested that the collection of objective measures on AST behaviours combined with children’s
perceptions of barriers, would improve findings within this area of research. Examining objective Geographical Information Systems (GIS)-measured BE attributes and their relationship with AST is becoming a more commonly used approach. This type of research is often analyzed using statistical methods with relatively few articles using spatial analysis methods to present findings. A systematic review completed by Wong and colleagues (2011) examined the relationships between objectively measured BE features and AST in children and the methodologies used to do so. Findings from this review concluded that distance to school is the only current association between GIS-measured aspects of the BE and AST. It is suggested that future GIS-measured research should include both objective and subjective measures of the BE, as well as report greater methodological details to facilitate replication and more consistence among the research. Recently there has been an integration of qualitative research using GIS (Cope & Elwood, 2009). Qualitative GIS is intended to provide information about the context and meaning of situations (Mennis, Mason, & Cao, 2013). The use of qualitative data associated with individuals’ locations and activities is becoming increasingly more recognized by researchers in the social and health sciences as being beneficial for investigating the influences environments have on human behaviour, such as AST (Mennis et al., 2013). Methods have emerged with research using a thematic analytic approach, which is one of the most common forms of qualitative GIS research analysis on text data in the social sciences (Guest, MacQueen, & Namey, 2012). Thematic analysis is a valuable tool that can be systematically used to identify patterns, themes, and meanings in the data (Braun & Clarke, 2006).

There are a variety of methods used, analyses conducted, and outcome variables examined in the literature examining child and parent perceptions of AST. Each method comes with particular strengths and weaknesses, but it is apparent that research examining perceptions of AST should look to integrate both subjective and objective measures to develop a more fulsome understanding. It is the aim of this thesis to use combinations of the strengths revealed above through a mixed methods approach to gain a better understanding on perceptions of barriers children encounter on their routes to school. A common weakness found in the literature is the exclusion of children from the research. This research aims to fill in this gap which has been seen as weaknesses within
the literature. The following section will describe the importance of including this population in this research.

### 2.6 Why do Children’s Voices Matter?

During the 1990s the sociology of childhood was only just beginning to emerge as a distinct sub-discipline (James & Prout, 1997). Since then, the concept of children as active researchers has become more common, in parallel with societies changing their perspectives about childhood (Alderson & Morrow, 2004; Hallett & Prout, 2003; James & Prout, 1997; Kellett, 2005). There has been an increase with the involvement of children as participants, co-researchers, and researchers (Hill, Thompson, & Williams, 1997; Sinclair, 2004). However, the predominant approach when researching children’s experiences, including children’s participation and perceptions, excludes the children themselves and is grounded in “research on” rather than “research with” children (Malet, McSherry, Larkin, & Robinson, 2010; Sallis et al., 2000). Conducting research on children may be a result of past research finding that parents are the ultimate gatekeepers, and assumed to make final decisions about whether their child can walk to school or not (Faulkner et al., 2010; McMillan, 2005). However, children's perceptions of their landscapes are not fully able to be imagined by adults and this provides the context to bring children into the narrative to gain their perspectives on what they believe influences their journeys to and from school. This inclusion of children within the research is an emergence that embraces the “sociology of children” (Mayall, 2002). Although specific ethical and methodological issues come into play when including children in research, it is important to include their perspectives in both the research and narrative. Children’s ability to recall their own PA, including AST, improves with age and is sufficiently reliable in children as young as ten years old (Sallis, Buono, Roby, Micale, & Nelson, 1993).

Children’s geography is an emerging field within the discipline of geography, but this sub-field has largely been forgotten in the AST research. Examining how children’s lives, experiences, attitudes, and opportunities are socially and spatially structured is valuable for better understand children’s AST behaviours. The field of children’s geographies grew out of the new sociology of childhood, with researchers identifying that the majority
of geographical research has focused on adult experiences, even when research is applicable to both subpopulations (Holloway, 2014; James, 1990). These researchers identified that this resulted from the assumption that spatial distribution of children is similar enough to the adult population and therefore a separate investigation of children spaces was forgone unnecessarily, specifically within the context of population-based GIS research. However, we know that this is untrue and the way children and adult’s use, perceive, and experience spaces can be vastly different, even within the same environment (James, 1990; Punch, 2002). Social scientists now understand that research with adults may not reflect the same results as research with child populations, largely because children interpret and experience their environments fundamentally differently than adults (Barker & Weller, 2009; Hyun, 2005; James, 1990).

Giving a voice to children is not simply letting children speak; it is about investigating the exclusive contribution to our understanding of and theorizing about the social world that children’s perspective can provide (James & Prout, 1997). Children as participants can provide better quality responses when they are engaged in the topic and working with researchers who share their interest (Agar, 2006). Furthermore, there needs to be a greater emphasis placed on the uniqueness of children as research subjects. Children’s unique socio-cultural relationships are worthy of independent study, separate from the perspectives and concerns of adults (James & Prout, 1997). There has been growth in the literature from the past two decades that aims to include a voice to the children participating (Barker & Weller, 2009; Holloway, 2014). Traditional methods such as surveys are an effective way to understand children’s perspectives. However, it is important to be aware of the unequal power relations with researchers or children perceiving participation as intimidating or boring (Barker & Weller, 2009; Punch, 2002). Qualitative methods, such as focus groups, are one way to address these potential methodological issues. Focus groups are able to present a more conversational setting with the children, who are then able to communicate their understanding and experiences. The methods used in Chapter 4 of this thesis support the growing expectations that research involving children needs to respect and value a child’s voice and that the research is framed with the children, not just on or for children (Mason & Watson, 2014; Matthews, 1998).
Within participatory research, there are complex considerations of child participation that must be taken into account. Roger Hart’s theory on children’s participation (1992) provides an excellent account for these considerations. According to Hart, children need to be genuinely and significantly involved in research concerning them in order to produce meaningful and representative results. Simply having children involved is insufficient in achieving full participation. Participatory research with children is entirely dependent on the participants understanding the issue at hand, taking this issue seriously, assuming a leadership role, and determining the extent of their participation. While adults may bring the topic forward, the research needs to be significantly child-led and directed.

There is a current gap in the literature on how children can best contribute their perceptions of AST barriers and enablers in their school neighbourhoods (Fitzpatrick, 2014). Developing methods with a focus on more contextually specific issues affecting children’s AST is needed. Methods that prioritize depth rather than breadth for data collection have the opportunity to more accurately portray the environments and perceptions of the children for whom active travel is being planned. Child directed research has been shown to be effective using participatory methods (Loebach & Gilliland, 2010). This thesis will use a combination of mixed methods with the intention both methodologies used provides a full spectrum of understanding the research and the area of interest.

2.7 Conclusions and Review of Gaps in the Literature

This chapter has examined academic literature pertaining to children’s use of AST. The overall purpose of this chapter was to provide an overview of previous AST research, especially pertaining to both parents and primarily children’s perceptions of AST, and the barriers they may experience on their journey to and from school. Although it appears from this literature review that there is no “golden rule” for defining AST, researchers should at the very least provide valid rationale for the use of specific definitions and measurements of AST (Lu et al., 2014). There are several gaps within the literature, many of which are addressed by this thesis research, such as the consideration of a range of factors influencing active commuting behaviours, including neighbourhood social networks and the physical environment. Although there is a growing body of research
examining child and parent perceptions of AST, the majority of this research is conducted on children, rather than with children. There is, therefore, a need for research genuinely and significantly involving children with research about AST barriers and enablers in their school neighbourhoods. It is the aim of this thesis and of both studies conducted for this thesis, to gain insight into how children’s perceptions influence their AST and overall journey to and from school. Further understanding will help to build upon the current literature, help identify key features that should be targeted by interventions, and influence programs and policies at multiple levels with the general ambition of increasing children’s use of AST, in turn increasing daily rates of PA.
2.8 References


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Chapter 3

3 Understanding Child and Parent Perceptions of Barriers Influencing Children’s Active School Travel

3.1 Introduction

It is widely accepted that physical activity (PA) is beneficial for children’s health. Walking is associated with greater moderate-to-vigorous physical activity (MVPA) and children who actively commute to school often attain a higher daily average of MVPA (Henne, Tandon, Frank, & Saelens, 2014; Mendoza et al., 2011). Regular PA lowers risk of chronic diseases such as obesity, coronary heart disease, Type 2 diabetes, and socio-psychological problems such as anxiety and depression (Figueroa-Muñoz, Chinn, & Rona, 2001; Janssen & Leblanc, 2010; Larsen, Gilliland, & Hess, 2012). With all of the known benefits of PA, few Canadian children achieve Canada’s recommended PA guidelines of at least 60 minutes of MVPA daily (Statistics Canada, 2015; Tremblay et al., 2011). A focus on active school travel (AST) is appropriate knowing that adequate participation in PA during childhood and adolescence could be critical to the prevention of chronic disease later in life (Faulkner, Buliung, Flora, & Fusco, 2009).

Walking is an inexpensive form of PA that does not require any special skills, facilities, or equipment that can help obtain all of the health benefits PA can provide (U.S. Department of Health and Human Services, 2015). Children who use AST tend to be more physically active and are more likely to meet daily recommendations of MVPA, rather than their peers using inactive modes (Faulkner, Buliung, Flora, & Fusco, 2009; Larouche, Saunders, et al., 2014; Voss, Winters, Frazer, & McKay, 2015). Children who use AST can receive as much as 45 additional minutes of MVPA per day (Larouche, Saunders, Faulkner, Colley, & Tremblay, 2014). Despite the known benefits of AST on children’s health, in recent decades there has been a steady decline in participation (Clark et al., 2016). Buliung and colleagues (2009) found that in recent years AST participation has dropped from 53.0% to 42.5% for 11 to 13 year old students. In order to reverse these declining trends of AST, it is crucial to identify the barriers preventing children from walking or biking to school (Lu et al., 2014). Previous research suggests that individual’s
perceptions of their environments have a stronger and more direct relationship with children’s AST, compared to objectively measured factors (McMillan, 2005). Research investigating the understanding on how to increase children’s independent mobility as a way to promote AST and PA has been suggested (Loebach & Gilliland, 2016; ParticipACTION, 2016). Further understanding of perceptions of barriers encountered on the journey to and from school is one way to do this. In the AST literature perceived barriers are defined as a person’s estimated level of challenges related to intrapersonal, interpersonal, environmental, and policy obstacles to AST (Glasgow & Permanente, 2012; Lu et al., 2014).

Studies examining children’s perceptions of their environments reveal that they possess meaningful and insightful contributions (Line et al., 2010; Neuwelt & Kearns, 2006). Other research has shown that children are extremely cognizant of the links between health, PA, and AST (Fusco, Moola, Faulkner, Buliung, & Richichi, 2012; Holt, Spence, Sehn, & Cutumisu, 2008; Mitchell, Kearns, & Collins, 2007). However, few studies have examined children’s perspectives on AST (Mitchell et al., 2007) and fewer studies have assessed the importance and comparison among both child and parent perceptions (Panter et al., 2010) and the influence these perceptions have on children’s AST (Timperio et al., 2004).

From the existing literature, we know that distance and safety are two key influential barriers on children’s AST. Children are more likely to use AST if their school is nearby and the route to get there is safe (Faulkner, Richichi, Buliung, Fusco, & Moola, 2010; Larouche, 2015; Larouche et al., 2014). Parents also play an important role in children’s AST decisions, with children whose parents use active transportation being more likely to do so (Carlson et al., 2014; Henne et al., 2014). There are few studies that have examined the impact varying socioeconomic status (SES) and different types of urbanicity (urban, suburban, rural) have on children’s AST (Faulkner et al., 2009). It has also been suggested in the literature that future research should include a wider range of personal, family, and social factors (Giles-Corti & Donovan, 2002; Timperio et al., 2006).
A socio-ecological approach that combines individual, interpersonal, and community factors may be the most beneficial form of research in this field of study (Eyler, Brownson, Bacak, & Housemann, 2003). AST is a complex behaviour and using a socio-ecological framework can help to explain how varying levels of features from intrapersonal, interpersonal, environmental, and policy levels influence children’s perceptions of features on their journey to and from school (Sallis, Owen, & Fisher, 2008; Stokols, 1996). Currently, there are inconsistencies in methodological approaches within AST research and it remains equivocal to further understand the factors influencing children’s AST (Oliver et al., 2014). It has also been suggested that future studies should examine parental perceptions and characteristics of the route to school (Larsen et al., 2009). A growing body of research conducted over the last decade, assesses the relationship between perceived barriers and rates of children’s active school travel. This research is vital for the development of strategies to improve the overall health and well-being of students, simply by increasing rates of PA.

This chapter aims to fill gaps in the current literature with the inclusion of both parent and child perceptions of barriers to AST and examining how these perceptions of barriers differ, while accounting for factors at the intrapersonal, interpersonal, and physical environment level. This study has two key objectives: (1) to evaluate how perceptions of barriers to active school travel differ between children and their parents; and (2) to analyze how child and parent perceptions of barriers to active school travel influence how children get to school, while controlling for age, gender, distance between home and school, family composition, and neighbourhood SES.

3.2 Methods

This study draws from two projects being conducted in the Human Environments Analysis Laboratory (HEAL): Active and Safe Routes to School (ASRTS) and Spatial Temporal Environment and Activity Monitoring (STEAM). ASRTS is an ongoing four-year community collaborative research project, which began in 2014 within 26 schools in Elgin, London Middlesex, and Oxford examining AST of elementary school children (further details can be found in Chapter 1 and at http://www.activesaferoutes.ca). This program aims to increase student’s AST participation through location specific targeted
interventions and schools are selected based on their interest in the program. Presentations are given in every classroom in participating schools and children are sent home with a letter of information and parent survey. Children in grades 4 to 8 are also provided a parental consent form to allow these older children the opportunity to complete a child survey. All older students with parental consent are asked to provide their assent and complete a child survey. The final sample includes data about 3,748 children (recruitment rate of 41.7%), with 1,660 completed child surveys and 3,613 completed parent surveys. ASRTS was approved by the Non-Medical Research Ethics Board at the Western University and the two local English school boards (NMREB #105635).

STEAM is a study that was conducted between 2010 and 2013 within 33 schools across Southwestern Ontario examining environmental influences on children’s health and well-being (further details of this mixed methods project are available at steamproject.ca; Mitchell, Clark, & Gilliland, 2016). Schools were randomly selected from stratified groups based on neighbourhood income, with 33 of the 63 schools (52.4%) that were contacted agreed to participate. Presentations were given in grade 5 to 7 classrooms at participating schools, and letters of information, parent surveys, and parental consent forms were distributed to students. All students with consent were asked to provide assent and complete the child survey. The final sample includes 932 children (recruitment rate of 66.9%), with 876 completed child surveys and 758 completed parent surveys. STEAM was approved by the Non-Medical Research Ethics Board at the Western University and all four local school boards (NMREB #17918S).

The instruments used to collect data in each of these projects ask the same questions, thus this study combines the two datasets for the purposes of this analysis. The development of the parent and child surveys for the ASRTS project progressed from earlier studies conducted by the HEAL. The parent survey includes questions about family socio-economic status, postal codes, modes of travel to and from school, and perceptions of barriers, home neighbourhood, and safety. The child survey includes questions about child and family demographics and perceptions of barriers, home neighbourhood, and safety. Parent and child surveys can be found in Appendices F and H.
3.2.1 Sample

The sample used in this study will combine data from the baseline survey of the ASRTS and STEAM projects (N=4,680) from 48 elementary schools across Southwestern Ontario, Canada. There are two exclusion criteria for this study. First, any observations that did not have both a parent and child survey completed were removed from the sample, which results in removing 2,501 children from the sample. Second, all children who were bus eligible, as defined by the school board as living more than 1.6 km network distance from school (Clark et al., 2016), were excluded from the sample. This exclusion removed an additional 883 observations from the sample. After applying the two exclusion criteria, the final sample includes 1,296 paired parents and children who live within 1.6 km of their school.

3.2.2 Measures

3.2.2.1 Dependent Variable

There is variation within the literature on consistency of definitions and measurements of AST used in research. A systematic review conducted by Lu and colleagues (2014) on AST states that although there is currently no “golden rule” for defining AST, it is necessary for researchers to provide a valid rationale for the use of chosen specific definitions and measurements used in their research on AST. The dependent variable for this analysis is parent-reported rates of AST from the parent surveys. Students were classified as an active traveler if they identified their mode of travel as an active mode to and from school greater than 50% of their total trips. Active modes reported by children include walking, bicycling, scootering, skateboarding, or rollerblading. Inactive modes included car or personal vehicle.

3.2.2.2 Independent Variables

Following the socio-ecological framework, this study uses three levels of independent variables that will be used as control variables in examining the influence of barriers on AST: intrapersonal; interpersonal; and the neighbourhood built environment (McLeroy, Bibeau, Steckler, & Glanz, 1988; Sallis & Owen, 2002). Policy is controlled for by excluding all children who live outside of the walk zone of each school.
Intrapersonal variables were collected on both the parent and child surveys. Answers primarily come from the child surveys, with answers from the parent surveys being used when responses were missing. The variables used in this study are measured for each child: gender (i.e., child self-identifying as a girl [0] or boy [1]); and age (i.e., continuous measure of age in years [range = 8 – 14]).

Interpersonal variables were collected from parent surveys, with missing answers supplemented from the child surveys when available. The variables used in this study are measured for each child and include:

- **Parent Education:** parents (mother and father) identified having no high school diploma (0), high school diploma (1), or post-secondary education (2). Completing any education past high school is considered post-secondary education;
- **Employment Status:** parents (mother and father) identified themselves as being unemployed (0) or employed (1). Being employed includes: employed full-time, employed part-time. Unemployed includes: at home with children, unemployed, or student;
- **Siblings:** child identifies the number of children living in their house including themselves, where one child represents no siblings (0) and any value greater than one represents the presence of siblings (1);
- **Number of Vehicles:** parent identified the number of motor vehicles in working order in their household, which are classified as not owning a vehicle (0), owning one vehicle (1), and owning 2 or more vehicles (2);
- **Median Family Income:** neighbourhood level median family income from the 2011 National Household Survey (Statistics Canada, 2011), as measured by the census dissemination area in which a child’s home is located.

Physical Environment was measured in two ways: Distance from home to school; and Level of urbanicity:

- **Distance from home to school:** the network distance between home (i.e., home postal code) and school (i.e., point at centre of building footprint) were measured
using the Network Analyst tool in ArcGIS 10.3 (ESRI, 2017). Distance is included as a continuous variable in all analyses (range = 0 and 1.6 km);

- **Level of urbanicity:** Urbanicity refers to the urban form in which each child’s home is located, including suburban (0), urban (1), and rural (2). Urban is defined as cities with a population greater than 100,000 which only includes the city of London in this sample. The London boundaries in 1961 were used in classifying the urban area, since after this date urban form began to suburbanize. Suburban is defined as the remaining area within the city of London. Rural includes all small towns and townships with a population under 100,000 (including agricultural land).

The rest of the independent variables used in this study are **perceptions of barriers to AST**, which are asked to both parents and children in our study using a 4-point Likert scale. The questions ask respondents to specify their level of agreement or disagreement on a symmetric agree-disagree scale (completely no, mostly no, mostly yes, and completely yes). Barriers were converted into binary variables for analysis: completely no and mostly no (0) and mostly yes and completely yes (1). Similar barriers and those which have agreement less than 10% from both parents and children were removed from the analysis to avoid multicollinearity, leaving 19 barrier variables to be analyzed. Barriers are categorized into 4 themes: physical environment, safety, social, and individual/family preferences (Table 3.1).
Table 3.1 Perceived Barriers to AST from Child Survey

<table>
<thead>
<tr>
<th>Physical Environment</th>
<th>Safety</th>
<th>Social</th>
<th>Individual/Family Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is too far or takes too much time</td>
<td>It feels unsafe due to traffic on the route</td>
<td>There is no one to walk or bike with</td>
<td>The route is too boring</td>
</tr>
<tr>
<td>There are not enough sidewalks</td>
<td>Most drivers go too fast while driving in our neighbourhood</td>
<td>I do not know a lot of people in my neighbourhood*</td>
<td>I get too hot and sweaty</td>
</tr>
<tr>
<td>There are not enough bike paths/lanes</td>
<td>There are too many busy streets to cross</td>
<td>I might get bullied/teased along the way</td>
<td>It is not fun</td>
</tr>
<tr>
<td>There is nowhere to safely leave a bike if I ride my bike to school</td>
<td>There is a lot of crime in our neighbourhood</td>
<td></td>
<td>I have too much stuff to carry</td>
</tr>
<tr>
<td>There are not a lot of trees along the streets in my neighbourhood*</td>
<td>It feels unsafe to walk by myself around my neighbourhood during the day</td>
<td></td>
<td>It is more difficult to walk than drive*</td>
</tr>
<tr>
<td></td>
<td>It feels unsafe to walk with friends or siblings in my neighbourhood during the day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Questions have been reversed

3.2.3 Statistical Analysis

Two analyses were completed as part of this study to achieve the chapter objectives: chi-square tests and logistic regression. To achieve objective 1, to evaluate how perceptions of barriers to active school travel differs between children and their parents, chi-square tests for independence were completed in IBM SPSS Statistics 24 (IBM Corp, 2016; Stata Corp, 2013) to explore the relationship between parent and child responses to questions about perceptions of barriers. A chi-square test is applied when there are two categorical variables from a single population (parent and child perceptions of individual barriers) and is used to determine if there is a significant association between the two variables.

To achieve objective 2, to analyze how parent and child perceptions of barriers to active school travel influence how children get to school, a series of logistic regression models were computed in STATA SE 13 64bit (IBM Corp, 2016; Stata Corp, 2013). Logistic
regression has been chosen as it is more robust and does not have the assumptions (e.g., normal distribution, equal variance) many other binary type analyses include (e.g., logit, probit) (Hosmer, Lemeshow, & Sturdivant, 2013). Further, logistic regression parameter estimates can be converted into odds ratios, which are interpreted as the odds of success of the outcome variable over its failure (Hilbe, 2011). All logistic regression models in this study included estimates for robust standard errors to account for clustering at the school level (Field, 2009). Logistic regression models were computed for both (a) to school AST and (b) from school AST using the following step-wise process following the stages of the socio-ecological framework: (1) Intrapersonal; (2) Model 1 + Interpersonal (3); Model 2 + Physical Environment; (4) Model 3 + univariate barriers; (5) Model 3 + all significant univariate barriers for parents; (6) Model 3 + all significant univariate barriers for children. Statistical significance is reported based on critical value cutoffs of 0.05 (p<0.05*, p<0.01**).

3.3 Results

3.3.1 Descriptive Statistics

Descriptive statistics about the study sample can be found in Table 3.2. The majority of participants were between the ages of 10 to 12 years (68.8%). Of the participants, 55.2% were girls and 44.8% boys. Most participants’ parents were employed, with 72.8% of mothers and 82.7% of fathers having some form of employment. As well, many of the participants’ parents held some form of post secondary education with 76.2% of mothers and 70.1% of fathers having completed an additional program after high school. Median distance from home to school was 900m. Most participants had a sibling (82.9%), had two or more family vehicles (61.7%), and the average median family income (in CAD) was $79,510 (City of London MFI $74,488 [City of London –Community Profile, 2016]).
Table 3.2 Descriptive Statistics of the study sample (n= 1,296)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active to School</strong></td>
<td>914</td>
<td>70.5</td>
</tr>
<tr>
<td><strong>Active from School</strong></td>
<td>984</td>
<td>75.9</td>
</tr>
<tr>
<td><strong>Intrapersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>716</td>
<td>55.2</td>
</tr>
<tr>
<td>Boy</td>
<td>580</td>
<td>44.8</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>1.5</td>
</tr>
<tr>
<td>9</td>
<td>210</td>
<td>16.2</td>
</tr>
<tr>
<td>10</td>
<td>263</td>
<td>20.3</td>
</tr>
<tr>
<td>11</td>
<td>343</td>
<td>26.5</td>
</tr>
<tr>
<td>12</td>
<td>285</td>
<td>22.0</td>
</tr>
<tr>
<td>13</td>
<td>158</td>
<td>12.2</td>
</tr>
<tr>
<td>14</td>
<td>17</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Interpersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Education Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No High School Diploma</td>
<td>48</td>
<td>3.7</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>229</td>
<td>17.7</td>
</tr>
<tr>
<td>Post Secondary Graduate</td>
<td>988</td>
<td>76.2</td>
</tr>
<tr>
<td>Father Education Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No High School Diploma</td>
<td>61</td>
<td>4.7</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>236</td>
<td>18.2</td>
</tr>
<tr>
<td>Post Secondary Graduate</td>
<td>908</td>
<td>70.1</td>
</tr>
<tr>
<td>Mother Occupation Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>295</td>
<td>22.8</td>
</tr>
<tr>
<td>Employed</td>
<td>943</td>
<td>72.8</td>
</tr>
<tr>
<td>Father Occupation Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>109</td>
<td>8.4</td>
</tr>
<tr>
<td>Employed</td>
<td>1072</td>
<td>82.7</td>
</tr>
<tr>
<td>Siblings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Siblings</td>
<td>211</td>
<td>16.3</td>
</tr>
<tr>
<td>Siblings</td>
<td>1074</td>
<td>82.9</td>
</tr>
<tr>
<td>Number of Vehicles in Family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>59</td>
<td>4.6</td>
</tr>
<tr>
<td>1</td>
<td>408</td>
<td>31.5</td>
</tr>
<tr>
<td>2 or more</td>
<td>799</td>
<td>61.7</td>
</tr>
<tr>
<td>Median family income in CAD (in thousands), Mean (SD)</td>
<td>-</td>
<td>79.51 (27.36)</td>
</tr>
<tr>
<td><strong>Physical Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance home to school (km), Mean (SD)</td>
<td>-</td>
<td>0.90 (0.395)</td>
</tr>
<tr>
<td>Urbanicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburban</td>
<td>753</td>
<td>58.1</td>
</tr>
<tr>
<td>Urban</td>
<td>125</td>
<td>9.6</td>
</tr>
<tr>
<td>Rural</td>
<td>418</td>
<td>32.3</td>
</tr>
</tbody>
</table>

*Note: numbers may not add to full sample size due to missing values*
3.3.2 Chi-Square Analysis

The chi-square analysis comparing parent and child perceptions found a statistically significant difference in the distribution of every barrier (Table 3.3). This shows that parents and children have different perceptions of barriers impacting a child’s journey to and from school, although it should be noted that there is still a high percentage of matching agreement or disagreement between parents and children (i.e., average of 77.3% of parents and children have matching agreement/disagreement). Trends of these varying perceptions can be seen within the four barrier themes, including physical environment, safety, social, and individual/family preferences.

Within the theme of physical environment perceptions of the barriers not enough bike paths and not enough trees on children’s routes to school have the largest differences of responses when looking at parent agree & child disagree and parent disagree & child agree. The majority of parents and children believe there are enough bike racks at the school and do not perceive this to be a barrier to AST. The remaining three themes saw larger discrepancies between child and parent perceptions of barriers. Parents perceived all safety related questions as barriers to their children’s AST, while children did not. The exception being the barrier unsafe for a child to walk with a friend, where parents and children held opposite responses compared to all other safety related barriers. Within the theme of social barriers, the largest variation of responses between parent and child perceptions was seen in bullying. Children did not see being bullied or teased on the journey to and from school as a barrier, while parents did. Finally, within the theme of individual/family preferences children perceived more of these as barriers to AST than their parents, with the exception being too much stuff to carry with parents perceiving this as more of a barrier to AST than children. These results demonstrate significant differences between parent and child perceptions of barriers, although, it is still unknown whether these perceived barriers influence the decision of children to use AST. As a result, further analysis is needed to compare how these barriers influence AST while controlling for known correlates of AST as they are hypothesized as part of the socio-ecological framework.
Table 3.3 Chi-square test for independence, parent and child perception of barriers

<table>
<thead>
<tr>
<th>Barriers to Active Transportation</th>
<th>$X^2$ (p)</th>
<th>Both Agree &amp; Disagree</th>
<th>Parent Agree &amp; Child Disagree</th>
<th>Child Agree, &amp; Parent Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too Far/takes too much Time</td>
<td>98.821</td>
<td>50 (4.1%)</td>
<td>998 (81.5%)</td>
<td>113 (9.2%)</td>
</tr>
<tr>
<td>Not enough sidewalks</td>
<td>74.701</td>
<td>71 (6.3%)</td>
<td>819 (73.2%)</td>
<td>127 (11.3%)</td>
</tr>
<tr>
<td>Not enough bike paths</td>
<td>32.325</td>
<td>134 (11.3%)</td>
<td>631 (53.2%)</td>
<td>290 (24.5%)</td>
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<tr>
<td>No bike rack</td>
<td>11.954</td>
<td>44 (3.7%)</td>
<td>868 (72.8%)</td>
<td>165 (13.8%)</td>
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<tr>
<td>Not a lot of trees</td>
<td>26.767</td>
<td>119 (9.7%)</td>
<td>700 (57.0%)</td>
<td>161 (13.1%)</td>
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<tr>
<td>Safety</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Route feels unsafe due to traffic</td>
<td>82.642</td>
<td>145 (12.0%)</td>
<td>662 (54.8%)</td>
<td>330 (27.3%)</td>
</tr>
<tr>
<td>Drivers speed on streets</td>
<td>54.774</td>
<td>289 (23.4%)</td>
<td>374 (30.2%)</td>
<td>500 (40.4%)</td>
</tr>
<tr>
<td>Too many busy streets</td>
<td>77.415</td>
<td>94 (7.8%)</td>
<td>806 (67.0%)</td>
<td>221 (18.4%)</td>
</tr>
<tr>
<td>Feels unsafe because of crime</td>
<td>39.975</td>
<td>33 (2.7%)</td>
<td>994 (81.7%)</td>
<td>127 (10.4%)</td>
</tr>
<tr>
<td>Unsafe for child to walk alone</td>
<td>27.063</td>
<td>64 (5.2%)</td>
<td>827 (67.4%)</td>
<td>255 (20.8%)</td>
</tr>
<tr>
<td>Unsafe for child to walk with friends</td>
<td>84.162</td>
<td>71 (5.8%)</td>
<td>911 (74.5%)</td>
<td>86 (7.0%)</td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No one to walk with</td>
<td>21.698</td>
<td>57 (4.8%)</td>
<td>851 (71.0%)</td>
<td>157 (13.1%)</td>
</tr>
<tr>
<td>I do not know people in my neighbourhood</td>
<td>53.527</td>
<td>141 (11.4%)</td>
<td>709 (57.3%)</td>
<td>224 (18.1%)</td>
</tr>
<tr>
<td>Might get bullied/teased</td>
<td>46.066</td>
<td>46 (3.8%)</td>
<td>920 (76.2%)</td>
<td>184 (15.2%)</td>
</tr>
<tr>
<td>Individual/Family Preferences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route is boring</td>
<td>15.367</td>
<td>27 (2.3%)</td>
<td>945 (78.8%)</td>
<td>56 (4.7%)</td>
</tr>
<tr>
<td>Get too hot/sweaty</td>
<td>21.137</td>
<td>28 (2.3%)</td>
<td>975 (81.3%)</td>
<td>73 (6.1%)</td>
</tr>
<tr>
<td>Not fun to walk</td>
<td>24.158</td>
<td>28 (2.3%)</td>
<td>973 (81.1%)</td>
<td>59 (4.9%)</td>
</tr>
<tr>
<td>Too much stuff to carry</td>
<td>29.217</td>
<td>66 (5.5%)</td>
<td>834 (69.4%)</td>
<td>186 (15.5%)</td>
</tr>
<tr>
<td>More difficult to walk than drive</td>
<td>134.404</td>
<td>198 (16.4%)</td>
<td>669 (55.4%)</td>
<td>163 (13.5%)</td>
</tr>
</tbody>
</table>

3.3.3 Model Specification

The results of the logistic regression models with robust standard errors are reported below. The initial set of models (1a, 2a, 3a, 1b, 2b, and 3b) show the step-wise modeling of how intrapersonal, interpersonal, and physical environment variables influence the decision of children to use AST to and from school (Table 3.4). The second set of models, illustrated in Table 3.5, show the results of the univariate models (4a and 4b), which compare children’s AST to and from school with each barrier (of parents and children) independently, while including all control variables. The final set of models (5a, 6a, 5b, and 6b), described in Table 3.6 and Table 3.7 present the results of the final multivariate models that examine how children’s and parents’ perceptions of barriers to AST work together to predict children’s AST to and from school, while again including
all control variables. Parent and child barriers were included in separate models due to the multi-collinear nature of the paired barriers.

3.3.4 Step-Wise Modeling

The first set of models (1a, 2a, 3a, 1b, 2b, and 3b) show how intrapersonal, interpersonal, and physical environment variables influence the decision of children to use AST to and from school through the use of step-wise modeling (Table 3.4). These step-wise regressions allow us to build a representative model of control variables to use in our final multivariate models. Model 3a shows results of the influence that these three levels of variables have on children’s use of AST to school in the morning. This final step-wise regression shows that age, siblings, mother’s employment, number of vehicles, network distance between home and school, and urbanicity all significantly influence the decision of children to use AST on the journey to school. Model 3b shows results of the influence that these three levels of variables have on children’s use of AST from school at the end of the school day. This final model shows that age, siblings, mother’s employment, number of vehicles, and network distance between home and school all significantly influence the decision of children to use AST on the journey from school.

3.3.5 Univariate Model Results

Each of the barrier variables were compared to AST to and from school using a series of logistic regression models, while including all control variables, to determine the individual association between each barrier and AST. This step was done independently for all parent and child barriers to and from school. On the journey to school parent’s perceptions of barriers explained AST more than children’s perceptions of barriers, particularly when examining safety and social influences. Parent’s perceptions of all safety and social barriers included in this univariate model were found to significantly impact children’s AST.

Perceptions of barriers on the journey home from school showed opposite outcomes, with children’s perceptions of barriers explaining AST more than parent’s perceptions of barriers. Children’s perceptions of all barriers included in the univariate model except not enough trees and route is boring showed statistical significance. Similar to results
examining perceptions of barriers to school, all odds ratios are less than one, indicating that as perceptions of these barriers increase children use of AST becomes less likely. The univariate analysis shows both parents and children perceive safety barriers as having the most impact on AST on both the journey to and from school.

3.3.6 Multivariate Model Results

All barriers that were found to be statistically significant in the univariate analysis were included in the multivariate models. Models were run for parent perceptions and child perceptions for both to and from school while accounting for all control variables. The results of these models are shown in Table 3.6 and Table 3.7.

3.3.6.1 Active Travel to School

At the intrapersonal level, age is related to an increase in AST behaviour on the journey to school (parent OR= 1.179, p= 0.008 & child OR= 1.405, p< 0.001). At the interpersonal level, results show that an increase in the number of vehicles owned by a family is related to a decrease in AST behaviours. Within the physical environment level, findings stay consistent with previous literature as distance between home and school is found to have an impact on AST behaviours. As the distance between home and school increases, children are less likely to use AST on their journey to school (parent OR= 0.381, p< 0.001 & child OR= 0.205, p< 0.001).

There is variation between parent and child perceptions of barriers on the journey to school and the impact they have on AST. From the physical environment barriers, parents perceive too far/takes too much time as a barrier that negatively impacts children’s use of AST on their journey to school (OR= 0.399, p=0.003). Children perceive the physical environment barrier there are not a lot of trees along the streets in my neighbourhood to have a negative impact on their AST behaviours. Parent’s perceptions of safety barriers are explaining AST more than children’s perceptions of safety barriers on the journey to school. The safety barrier drivers speeding on the streets positively impacts children’s use of AST (OR= 1.414, p=0.031). From the social barriers, parents perceive the barrier of their children having no one to walk with to negatively impact children’s AST (OR=0.523, p=0.001). Finally, both parents and children see the individual/preference
barrier more difficult to walk than drive as having a negative impact on AST (parent OR= 0.130, p< 0.001, child OR= 0.197, p< 0.001). In general, parents perceptions of barriers on the journey to school explain AST behaviours more than children’s perceptions of barriers.

3.3.6.2 Active Travel from School

Perceptions have a different impact on AST on the journey home from school. Age remains related to an increase in AST behaviour on the journey home from school (parent OR= 1.280, p< 0.001 & child OR= 1.536, p< 0.001). At the interpersonal level, results show that an increase in the number of vehicles owned by a family is related to a decrease in children’s AST behaviours on the journey home from school. Fathers having a post secondary education positively impacts children’s use of AST (OR=2.287, p=0.042). Median family income (MFI) is significantly related to AST behaviour. As MFI increases there is a negative impact on children’s AST behaviours (OR=0.904, p=0.041). At the physical environment level, results remain consistent with the journey to school. Parents and children believe distance between their home and school impacts AST. As the distance between home and school increases children are less likely to use AST on their journey home from school (parent OR= 0.316, p< 0.001 & child OR= 0.204, p< 0.001).

Within this final model, parents and children did not perceive any physical environment barriers to impact children’s AST on the journey home from school. It feels unsafe because of crime is a safety barrier that children believe to negatively impact use of AST (OR=0.446, p=0.014). From the social barriers, similar to the journey to school, parents perceive the barrier no one to walk with to negatively impact children’s AST (OR=0.517, p=0.018). Finally, from the individual/family preference barriers, parents perceive not fun to walk (OR=2.449, p=0.009) and too much stuff to carry (OR=0.551, p=0.014) to impact children’s use of AST on the journey home from school. As well, both parents and children see the barrier more difficult to walk than drive to have a negative impact on AST. Parents and children’s perceptions of barriers share similarities between the journey to and from school; however, more barriers are perceived to have an impact on AST on the journey home from school.
Table 3.4 Step-wise logistic regression to develop predictive models of AST based on socio-ecological framework variables

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Active Travel To School</td>
<td>Active Travel From School</td>
<td>Active Travel To School</td>
<td>Active Travel From School</td>
<td>Active Travel To School</td>
<td>Active Travel From School</td>
</tr>
<tr>
<td></td>
<td>OR (SE)</td>
<td>P</td>
<td>OR (SE)</td>
<td>P</td>
<td>OR (SE)</td>
<td>P</td>
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<td><strong>Intrapersonal</strong></td>
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<td></td>
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<tr>
<td>Boys (ref: girls)</td>
<td>1.181 (0.152) 0.197</td>
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<td>1.238 (0.179) 0.138</td>
<td></td>
<td>1.234 (0.185) 0.162</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1.377 (0.072) <strong>0.000</strong></td>
<td></td>
<td>1.384 (0.072) <strong>0.000</strong></td>
<td></td>
<td>1.394 (0.075) <strong>0.000</strong></td>
<td></td>
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<tr>
<td><strong>Interpersonal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ref: no high school diploma)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school diploma</td>
<td>1.204 (0.517) 0.666</td>
<td></td>
<td>1.106 (0.461) 0.810</td>
<td></td>
<td>1.337 (0.721) 0.590</td>
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<tr>
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<td>1.414 (0.566) 0.387</td>
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<td>2.478 (1.584) 0.156</td>
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<td>1.418 (1.288) 0.701</td>
<td></td>
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<tr>
<td>Fathers Education</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ref: no high school diploma)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school diploma</td>
<td>0.697 (0.307) 0.413</td>
<td></td>
<td>0.600 (0.245) 0.211</td>
<td></td>
<td>1.128 (0.406) 0.738</td>
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<tr>
<td>post secondary</td>
<td>1.151 (0.514) 0.753</td>
<td></td>
<td>0.900 (0.367) 0.797</td>
<td></td>
<td>2.055 (0.706) <strong>0.036</strong></td>
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</tr>
<tr>
<td>missing</td>
<td>1.182 (0.600) 0.742</td>
<td></td>
<td>0.912 (0.473) 0.859</td>
<td></td>
<td>1.625 (0.928) 0.396</td>
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</tr>
<tr>
<td>Siblings (ref: No Siblings)</td>
<td>0.986 (0.005) 0.008</td>
<td></td>
<td>0.988 (0.004) <strong>0.007</strong></td>
<td></td>
<td>0.989 (0.005) <strong>0.018</strong></td>
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<tr>
<td>Mothers Occupational Status</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ref: Unemployed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>employed</td>
<td>1.409 (0.229) <strong>0.035</strong></td>
<td></td>
<td>1.410 (0.226) <strong>0.032</strong></td>
<td></td>
<td>1.484 (0.267) <strong>0.029</strong></td>
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<tr>
<td>missing/prefer not to answer</td>
<td>1.097 (0.364) 0.780</td>
<td></td>
<td>1.082 (0.372) 0.818</td>
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<td>1.244 (0.493) 0.581</td>
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<td>Fathers Occupational Status</td>
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<td>(ref: Unemployed)</td>
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<tr>
<td>employed</td>
<td>1.330 (0.356) 0.288</td>
<td></td>
<td>1.412 (0.356) 0.170</td>
<td></td>
<td>1.326 (0.434) 0.389</td>
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<tr>
<td>missing/prefer not answer</td>
<td>1.087 (0.471) 0.848</td>
<td></td>
<td>1.151 (0.441) 0.714</td>
<td></td>
<td>1.272 (0.621) 0.622</td>
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</tr>
<tr>
<td>Number of Vehicles (ref: 0 vehicles)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>0.223 (0.118) <strong>0.005</strong></td>
<td></td>
<td>0.175 (0.092) <strong>0.001</strong></td>
<td></td>
<td>0.252 (0.144) <strong>0.016</strong></td>
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<tr>
<td>2 or more</td>
<td>0.140 (0.077) <strong>0.000</strong></td>
<td></td>
<td>0.105 (0.055) <strong>0.000</strong></td>
<td></td>
<td>0.162 (0.096) <strong>0.002</strong></td>
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<td>missing</td>
<td>0.286 (0.195) 0.067</td>
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<td>0.283 (0.191) 0.061</td>
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<td>0.317 (0.216) 0.091</td>
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<tr>
<td><strong>Physical Environment</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network distance between home and school (km)</td>
<td>0.163 (0.044) <strong>0.000</strong></td>
<td></td>
<td>0.167 (0.049) <strong>0.000</strong></td>
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<tr>
<td>Urbanicity (ref: Suburban Large City)</td>
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<td>Urban</td>
<td>0.589 (0.158) 0.048*</td>
<td></td>
<td>0.589 (0.158) 0.048*</td>
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<tr>
<td>Rural</td>
<td>0.845 (0.231) 0.538</td>
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<td>0.845 (0.231) 0.538</td>
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</tr>
<tr>
<td>Constant</td>
<td>0.070 (0.038) 0.000</td>
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<td>0.250 (0.244) 0.156</td>
<td></td>
<td>2.207 (1.998) 0.382</td>
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<td>1292</td>
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<td>1292</td>
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<tr>
<td>Pseudo R2</td>
<td>0.032</td>
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<td>0.064</td>
<td></td>
<td>0.135</td>
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<tr>
<td>Log Pseudolikelihood</td>
<td>-759.672</td>
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<td>-731.572</td>
<td></td>
<td>-676.545</td>
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</tr>
</tbody>
</table>
Table 3.5 Univariate logistic regression analysis to understand the impact perceived barriers have on AST behaviour while controlling for socio-ecological framework variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Models 4a: Influence on Active Travel To School while controlling for socio-ecological framework</th>
<th>Models 4b: Influence on Active Travel From School while controlling for socio-ecological framework</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parent Perceptions of Barriers</td>
<td>Child Perceptions of Barriers</td>
</tr>
<tr>
<td></td>
<td>OR (SE)</td>
<td>P</td>
</tr>
<tr>
<td>Physical Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too Far/takes too much Time</td>
<td>0.197 (0.046)</td>
<td>0.000**</td>
</tr>
<tr>
<td>Not enough sidewalks</td>
<td>0.773 (0.108)</td>
<td>0.066</td>
</tr>
<tr>
<td>Not enough bike paths</td>
<td>0.637 (0.078)</td>
<td>0.000**</td>
</tr>
<tr>
<td>No bike rack</td>
<td>0.709 (0.16)</td>
<td>0.126</td>
</tr>
<tr>
<td>Not lots of trees</td>
<td>0.963 (0.163)</td>
<td>0.825</td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route feels unsafe due to traffic</td>
<td>0.306 (0.043)</td>
<td>0.000**</td>
</tr>
<tr>
<td>Drivers speed on streets</td>
<td>0.751 (0.087)</td>
<td>0.014*</td>
</tr>
<tr>
<td>Too many busy streets</td>
<td>0.352 (0.058)</td>
<td>0.000**</td>
</tr>
<tr>
<td>Feels unsafe because of crime</td>
<td>0.49 (0.123)</td>
<td>0.005**</td>
</tr>
<tr>
<td>Unsafe for child to walk alone</td>
<td>0.372 (0.058)</td>
<td>0.000**</td>
</tr>
<tr>
<td>Unsafe for child to walk with friends</td>
<td>0.464 (0.102)</td>
<td>0.000**</td>
</tr>
<tr>
<td>Social</td>
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</tr>
<tr>
<td>No one to walk with</td>
<td>0.244 (0.032)</td>
<td>0.000**</td>
</tr>
<tr>
<td>I do not know people in my neighbourhood</td>
<td>0.723 (0.112)</td>
<td>0.036*</td>
</tr>
<tr>
<td>Might get bullied/teased</td>
<td>0.448 (0.08)</td>
<td>0.000**</td>
</tr>
<tr>
<td>Individual/Family Preferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route is boring</td>
<td>1.08 (0.268)</td>
<td>0.757</td>
</tr>
<tr>
<td>Get too hot/sweaty</td>
<td>0.708 (0.288)</td>
<td>0.395</td>
</tr>
<tr>
<td>Not fun to walk</td>
<td>0.602 (0.196)</td>
<td>0.119</td>
</tr>
<tr>
<td>Too much stuff to carry</td>
<td>0.362 (0.058)</td>
<td>0.000**</td>
</tr>
<tr>
<td>More difficult to walk than drive</td>
<td>0.099 (0.021)</td>
<td>0.000**</td>
</tr>
</tbody>
</table>
Table 3.6 Multivariate logistic regression analysis to understand the impact perceived barriers have on AST behaviour to school while controlling for socio-ecological framework variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 5a: Intrapersonal + Interpersonal + Physical + Parental Perceptions of Barriers</th>
<th>Model 6a: Intrapersonal + Interpersonal + Physical + Child Perceptions of Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent:</strong> Active Travel To School</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intrapersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys (ref: girls)</td>
<td>1.174 (0.241)</td>
<td>1.153 (0.206)</td>
</tr>
<tr>
<td>Age</td>
<td>1.179 (0.073)</td>
<td>1.405 (0.082)</td>
</tr>
<tr>
<td><strong>Interpersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers Education (ref: no high school diploma)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school diploma</td>
<td>0.577 (0.262)</td>
<td>1.157 (0.501)</td>
</tr>
<tr>
<td>post secondary</td>
<td>0.711 (0.303)</td>
<td>1.511 (0.654)</td>
</tr>
<tr>
<td>missing</td>
<td>2.952 (3.006)</td>
<td>5.834 (4.525)</td>
</tr>
<tr>
<td>Fathers Education (ref: no high school diploma)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school diploma</td>
<td>0.468 (0.279)</td>
<td>0.631 (0.274)</td>
</tr>
<tr>
<td>post secondary</td>
<td>0.774 (0.444)</td>
<td>0.98 (0.461)</td>
</tr>
<tr>
<td>missing</td>
<td>0.782 (0.600)</td>
<td>0.565 (0.345)</td>
</tr>
<tr>
<td>Siblings (ref: No Siblings)</td>
<td>0.987 (0.005)</td>
<td>0.994 (0.008)</td>
</tr>
<tr>
<td>Mothers Occupational Status (ref: Unemployed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>employed</td>
<td>0.987 (0.200)</td>
<td>1.324 (0.226)</td>
</tr>
<tr>
<td>missing/prefer not to answer</td>
<td>0.854 (0.381)</td>
<td>0.878 (0.348)</td>
</tr>
<tr>
<td>Fathers Occupational Status (ref: Unemployed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>employed</td>
<td>1.807 (0.624)</td>
<td>1.676 (0.479)</td>
</tr>
<tr>
<td>missing/prefer not answer</td>
<td>1.154 (0.577)</td>
<td>1.902 (0.887)</td>
</tr>
<tr>
<td>Number of Vehicles (ref: no vehicle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.074 (0.054)</td>
<td>0.131 (0.085)</td>
</tr>
<tr>
<td>2 or more</td>
<td>0.042 (0.031)</td>
<td>0.076 (0.051)</td>
</tr>
<tr>
<td>missing</td>
<td>0.345 (0.281)</td>
<td>0.414 (0.316)</td>
</tr>
<tr>
<td>Median Family Income (10,000 CAD)</td>
<td>0.935 (0.039)</td>
<td>0.932 (0.035)</td>
</tr>
<tr>
<td><strong>Physical Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urbanicity (ref: Suburban Large City)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>0.632 (0.223)</td>
<td>0.664 (0.148)</td>
</tr>
<tr>
<td>Rural</td>
<td>0.921 (0.257)</td>
<td>0.966 (0.224)</td>
</tr>
<tr>
<td>Network distance (km)</td>
<td>0.381 (0.087)</td>
<td>0.205 (0.054)</td>
</tr>
<tr>
<td><strong>Barriers: Physical Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too far/takes too much time</td>
<td>0.399 (0.125)</td>
<td>-</td>
</tr>
<tr>
<td>Not enough bike paths</td>
<td>1.159 (0.241)</td>
<td>0.942 (0.212)</td>
</tr>
<tr>
<td>Not enough sidewalks</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No bike rack</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No lots of trees</td>
<td>-</td>
<td>0.766 (0.103)</td>
</tr>
<tr>
<td><strong>Barriers: Safety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route feels unsafe due to traffic</td>
<td>0.590 (0.161)</td>
<td>1.034 (0.253)</td>
</tr>
<tr>
<td>Too many busy streets</td>
<td>0.779 (0.201)</td>
<td>1.134 (0.345)</td>
</tr>
<tr>
<td>Unsafe for child to walk alone</td>
<td>0.695 (0.156)</td>
<td>0.627 (0.151)</td>
</tr>
<tr>
<td>Unsafe for child to walk with friends</td>
<td>1.217 (0.423)</td>
<td>0.572</td>
</tr>
<tr>
<td>Drivers speed on streets</td>
<td>1.415 (0.228)</td>
<td>-</td>
</tr>
<tr>
<td>Feels unsafe because of crime</td>
<td>0.837 (0.323)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Barriers: Social</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No one to walk with</td>
<td>0.523 (0.103)</td>
<td>0.677 (0.146)</td>
</tr>
<tr>
<td>Might get bullied/teased</td>
<td>1.133 (0.263)</td>
<td>0.902 (0.220)</td>
</tr>
<tr>
<td>I do not know people in my neighbourhood</td>
<td>1.162 (0.200)</td>
<td>0.383</td>
</tr>
<tr>
<td><strong>Barriers: Individual/Family Preferences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More difficult to walk than drive</td>
<td>0.130 (0.030)</td>
<td>0.197 (0.034)</td>
</tr>
<tr>
<td>Too much stuff to carry</td>
<td>0.936 (0.247)</td>
<td>-</td>
</tr>
<tr>
<td>Get too hot/sweaty</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Not fun to walk</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>118.737 (166.830)</td>
<td>4.066 (4.891)</td>
</tr>
<tr>
<td><strong>Sample size (N)</strong></td>
<td>1169</td>
<td>1188</td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.333</td>
<td>0.233</td>
</tr>
<tr>
<td>Log Pseudolikelihood</td>
<td>-470.972</td>
<td>-547.689</td>
</tr>
</tbody>
</table>
Table 3.7 Multivariate logistic regression analysis to understand the impact perceived barriers have on AST behaviour from school while controlling for socio-ecological framework variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 5b: Intrapersonal + Interpersonal + Physical + Parental Perceptions of Barriers</th>
<th>Model 6b: Intrapersonal + Interpersonal + Physical + Child Perceptions of Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (SE)</td>
<td>P</td>
</tr>
<tr>
<td><strong>Intrapersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys (ref: girls)</td>
<td>0.994 (0.142)</td>
<td>0.967</td>
</tr>
<tr>
<td>Age</td>
<td>1.280 (0.097)</td>
<td><strong>0.001</strong></td>
</tr>
<tr>
<td><strong>Interpersonal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers Education (ref: no high school diploma)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school diploma</td>
<td>0.471 (0.284)</td>
<td>0.212</td>
</tr>
<tr>
<td>post secondary</td>
<td>0.383 (0.230)</td>
<td>0.111</td>
</tr>
<tr>
<td>missing</td>
<td>1.162 (1.614)</td>
<td>0.914</td>
</tr>
<tr>
<td>Fathers Education (ref: no high school diploma)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school diploma</td>
<td>1.211 (0.494)</td>
<td>0.639</td>
</tr>
<tr>
<td>post secondary</td>
<td>2.287 (0.929)</td>
<td><strong>0.042</strong></td>
</tr>
<tr>
<td>missing</td>
<td>1.599 (0.919)</td>
<td>0.413</td>
</tr>
<tr>
<td>Siblings (ref: No Siblings)</td>
<td>0.990 (0.009)</td>
<td>0.296</td>
</tr>
<tr>
<td>Mothers Occupational Status (ref: Unemployed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>employed</td>
<td>1.027 (0.229)</td>
<td>0.905</td>
</tr>
<tr>
<td>missing/prefer not to answer</td>
<td>0.851 (0.336)</td>
<td>0.682</td>
</tr>
<tr>
<td>Fathers Occupational Status (ref: Unemployed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>employed</td>
<td>1.642 (0.682)</td>
<td>0.232</td>
</tr>
<tr>
<td>missing/prefer not answer</td>
<td>1.471 (0.823)</td>
<td>0.490</td>
</tr>
<tr>
<td>Number of Vehicles (ref: no vehicle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.186 (0.138)</td>
<td><strong>0.024</strong></td>
</tr>
<tr>
<td>2 or more</td>
<td>0.123 (0.096)</td>
<td><strong>0.007</strong></td>
</tr>
<tr>
<td>missing</td>
<td>0.588 (0.515)</td>
<td>0.544</td>
</tr>
<tr>
<td>Median Family Income (10,000 CAD)</td>
<td>0.904 (0.044)</td>
<td><strong>0.041</strong></td>
</tr>
<tr>
<td><strong>Physical Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urbanicity (ref: Suburban Large City)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>1.053 (0.548)</td>
<td>0.920</td>
</tr>
<tr>
<td>Rural</td>
<td>0.746 (0.194)</td>
<td>0.260</td>
</tr>
<tr>
<td>Network distance (km)</td>
<td>0.316 (0.083)</td>
<td><strong>0.000</strong></td>
</tr>
<tr>
<td><strong>Barriers: Physical Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too far/takes too much time</td>
<td>0.577 (0.172)</td>
<td>0.064</td>
</tr>
<tr>
<td>Not enough bike paths</td>
<td>1.312 (0.282)</td>
<td>0.207</td>
</tr>
<tr>
<td>Not enough sidewalks</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No bike rack</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Not lots of trees</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Barriers: Safety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route feels unsafe due to traffic</td>
<td>0.906 (0.230)</td>
<td>0.697</td>
</tr>
<tr>
<td>Too many busy streets</td>
<td>0.589 (0.161)</td>
<td>0.054</td>
</tr>
<tr>
<td>Unsafe for child to walk alone</td>
<td>0.991 (0.211)</td>
<td>0.968</td>
</tr>
<tr>
<td>Unsafe for child to walk with friends</td>
<td>0.710 (0.178)</td>
<td>0.173</td>
</tr>
<tr>
<td>Drivers speed on streets</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Feels unsafe because of crime</td>
<td>0.638 (0.209)</td>
<td>0.171</td>
</tr>
<tr>
<td><strong>Barriers: Social</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No one to walk with</td>
<td>0.517 (0.144)</td>
<td><strong>0.018</strong></td>
</tr>
<tr>
<td>Might get bullied/teased</td>
<td>1.056 (0.282)</td>
<td>0.836</td>
</tr>
<tr>
<td>I do not know people in my neighbourhood</td>
<td>1.022 (0.201)</td>
<td>0.910</td>
</tr>
<tr>
<td><strong>Barriers: Individual/Family Preferences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More difficult to walk than drive</td>
<td>0.197 (0.047)</td>
<td><strong>0.000</strong></td>
</tr>
<tr>
<td>Too much stuff to carry</td>
<td>0.551 (0.133)</td>
<td><strong>0.014</strong></td>
</tr>
<tr>
<td>Get too hot/sweaty</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Not fun to walk</td>
<td>2.449 (0.839)</td>
<td><strong>0.009</strong></td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>35.781 (57.458)</td>
<td>0.026</td>
</tr>
<tr>
<td><strong>Sample size</strong></td>
<td>1156</td>
<td>1046</td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.310</td>
<td>0.255</td>
</tr>
<tr>
<td>Log Pseudolikelihood</td>
<td>-423.144</td>
<td>-419.026</td>
</tr>
</tbody>
</table>
3.4 Discussion

This study examined whether parent and child perceptions of barriers influence children’s AST while controlling for intrapersonal, interpersonal, and physical environment variables. Age, vehicle ownership, father’s education, median family income, and distance between home and school were control variables found to impact children’s use of AST. In general, parents perceive more barriers to impact AST than children, but the impact they have on AST differs. The results show differences between parent and child perception of barriers and the influence they have on children’s AST. As well, difference of barriers perceptions are seen between the journey to school and home from school. Interesting findings discussed are that neither parents nor children perceive any physical environment barriers to impact children’s AST on the journey home from school and that children do not perceive any social barriers to influence their use of AST both to and from school.

3.4.1 Intrapersonal Variables

Findings from the intrapersonal variables examined in the final models are similar to those in previous research, with some notable differences. Age is related to an increase in AST behaviour on the journey to and from school. Each year that a child gets older the more likely they are to choose AST. This finding is consistent with the literature and it remains significant in the final models examining the journeys both to and from school (Alparone & Pacilli, 2012; Lorenc, Brunton, Oliver, Oliver, & Oakley, 2008; Mitra, Faulkner, Buliung, & Stone, 2014; Rodríguez & Vogt, 2009). Gender was not found to have an impact on children’s AST. Within the AST literature, findings regarding gender are fairly inconclusive with many conflicting results (Faulkner, Buliung, Flora, & Fusco, 2008). Generally, research has found that boys are somewhat more likely to walk to and from school than girls, but the difference is often not statistically significant (McDonald, 2012), consistent with findings from this study.

3.4.2 Interpersonal Variables

Previous research shows that children are largely influenced by the context of their family (Ziviani, Scott, & Wadley, 2004). Similar findings for interpersonal variables are
shared between AST to and from school, the exceptions being MFI and father’s education. MFI was found to negatively impact children’s use of AST on the journey home from school. An increase in MFI suggests that higher income households may have only one parent working, or more flexible working hours, allowing a parent to pick up their children after school (Larsen et al., 2009). Number of vehicles owned within a family is another interpersonal variable with an impact on AST. Both parents and children view car ownership to influence children to use an inactive mode of travel. This variable remains significant when comparing both one and two or more vehicles to the reference of zero vehicles. These findings are reasonable in that if a family owns a car, children are more likely to receive rides to and from school, which is a finding consistent in the literature. A study completed on AST among U.S. schoolchildren found that living in a zero-vehicle household greatly increases the use of AST (McDonald, 2007). The concern of this finding is the issues that arise with increased children receiving drives to and from school. Typically, AST interventions view congestion and vehicle emissions as primary concerns in evaluations of planning and transportation decisions (De Nazelle et al., 2011). Both of these issues can simply be solved by having fewer children driven to school and more children walking. Siblings and parental employment were not seen to have a significant influence on children’s AST.

### 3.4.3 Physical Environment Variables

At the physical environment level, distance between home and school was found have an impact on children’s AST both to and from school. Parents and children both saw an increase in distance between children’s home and school relating to a decrease in use of AST. This finding is consistent with the literature which has found that distance to school is the strongest predictor of children’s AST (Babey et al., 2009; Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Larsen et al., 2009; McDonald, 2007; Timperio et al., 2006).

Urbanicity shows no significant findings in the final models. Although not significant, results of urbanicity on the journey home from school shows trends. Children attending school in an urban environment and their parents perceive their environment to influence an increase in children’s use of AST compared to the reference group of suburban
students. Parents and children in a rural environment perceive their environment to influence a decrease in children’s use of AST compared to suburban children. These findings show us that local environments potentially have an influence on AST and should be examined further in future research. These findings show that at the physical environment level, distance has the largest impact and other variables are not seen to significantly influencing AST once children are within the 1.6 km cutoff.

3.4.4 Perception of Barriers

Findings show us that there is variation between parent and child perceptions of barriers on the journey to and from school and the impact they have on AST. In general, parents perceive more barriers to impact AST than children, but the impact they have on AST differs. The univariate analysis finds that parents perceptions of barriers explain AST more than children’s perceptions on the journey to school, while children’s perceptions of barriers are explaining AST more than parents perceptions for the journey home from school. A simple explanation of this finding can be that parents influence children’s travel modes in order to coordinate with parent’s work schedules (McDonald & Aalborg, 2017). Often parents are more involved with their child’s journey to school before or on their way to work, with dropping their child off at school as a part of their own getting to work route (Shaw, Watson, Frauendienst, Redecker, & Jones, 2013). Parents are then more likely to experience these barriers on the journey to school and form perceptions of them.

Physical environment barriers only showed significant findings on the journey to school. Results from the univariate analysis show that children perceive many physical environment features as barriers on the journey home from school; however, in the final model none of these variables were found to be significant. Parents perceive the barrier too far/takes too much time as significantly influential on decreasing children’s use of AST on the journey to school. Many parents go to work in the morning, so it is reasonable to assume that if they perceive their children’s journey as time consuming and do not believe their child can walk alone, then they will drive them in order to save time in the morning. Often when parents perceive the school as being too far away they see the time cost of driving outweighing the costs of walking (McDonald & Aalborg, 2017).
Kearns and colleagues (2003) highlight that children’s AST is often controlled by parental decisions and that parent’s perceptions may have considerable influence on decision making, which may be the case with this barrier. Children perceive not having lots of trees as a physical environment barrier on the journey to school that negatively impacts their AST. Although previous finding in the literature about tree densities have mixed findings, the majority of research suggests that trees are positively associated with an increase in walking and that the presence of street trees are positively associated with children’s AST (Larsen et al., 2009; McMillan, 2003). Trees encountered on their journey to school may provide children shade and contribute to the neighbourhoods aesthetics (Larsen, Gilliland, & Hess, 2012). These findings are consistent with Larsen and colleagues (2003) who found that trees only affected children’s journey to school, perhaps because the natural environment plays a larger role on the morning trip when there may be more options for mode of travel.

Barriers relating to safety had the most significant variables during the univariate analysis, therefore, a large amount were built into the final models, but few have significant influence on children’s AST. The only safety barrier parent’s perceived as significantly influencing children’s journey to school was drivers speed on streets. The results from this study show that parent’s perceptions of speeding positively influence children’s use of AST. Although initially this finding seems backwards, this perception may come from parents experiencing this issue first hand while travelling with their child on the journey to school. As previously discussed, parents are often more involved with the journey to school (Shaw et al., 2013). Furthermore past research has shown that drivers speeding is a potential barrier to walking found to be higher perceived by females (Clark, 2012). Because parents are likely experiencing this barrier while travelling with their child, this may be why the perception of drivers speeding on streets is related to an increased impact on children using AST.

From the social barriers examined, children did not perceive any of them to influence their journey to or from school; influences on AST were only seen from parent’s perceptions. Parents perceive their child having no one to walk with as a barrier to AST on both the journey to and from school. Zhu and Lee (2009) state that supportive peer
influences have been found to increase children’s AST. As stated above with the physical environment barriers parent’s perceptions largely influence children’s AST habits. Parents may feel uncomfortable allowing their child to walk alone; therefore, if they do not believe there is anyone for their child to walk with (e.g., friends, peers, and neighbours) they might not allow their child to walk to school. Multiple studies have found that girls who reported having friends in their neighbourhood were more likely to use AST (Carver et al., 2005; Panter, Jones, & Van Sluijs, 2008). As well, junior students’ use of AST is positively associated with friend support (Hohepa et al., 2007). Although we have classified this barrier as a social feature, when considering parent’s perceptions they may also see it as a safety barrier.

Individual/family preferences is the last theme of barriers examined in this research. Findings were consistent across parent and child opinions both to and from school, that the perception of more difficult to walk than drive negatively impacts children’s use of AST. This is an important perception to target when designing interventions aiming to increase rates of AST. Children using AST to and from school when they are able (i.e., live within walking distance) are missing out on the many benefits that come with this action. The PA that children are able to achieve while using AST can provide them with numerous physical, psychological, emotional, and behavioral health benefits (Sallis, Prochaska, & Taylor, 2000). Changing parental and child attitudes from perceiving AST as an inconvenience, to appreciating all of the potential benefits associated with it, should be the first step when targeting potential areas of interventions.

3.4.5 Policy and Practice

Findings from this study can be used to make recommendations for policy makers and practitioners. Findings show that parents and children perceive barriers on the journey to and from school differently, that there are multiple factors influencing how AST decisions are made, and that these perceptions of barriers influence children’s use of AST. This research supports previous literature with results demonstrating that distance from home to school has a significant influence of children’s AST (Davison et al., 2008), even for student’s living within walking distance (1.6 km). This reiterates the importance of school siting decisions made by school boards, city planners, and public health
professionals (Clark et al., 2016; Larsen et al., 2009). Shorter distance is a key influence on the mode children use to travel to and from school, and should be considered by all those who have an input in deciding school locations and boundaries.

This research expands on the literature acknowledging the role children play in making decisions related to AST. Children and their parents often have varying perceptions of safety and their environments (Mah et al., 2017; Timperio, Crawford, Telford, & Salmon, 2004). Children’s positive perceptions are often associated with an increase in PA (Rutten, Savelberg, Biddle, & Kremers, 2013), and this research demonstrates the same with respect to perceptions of barriers and AST. How children perceive features they experience on their journey to and from school affects their decision to use AST (Mah et al., 2017).

Successful interventions targeting levels of AST should consider influencers from all levels of the socio-ecological framework. Research with a sole focus on the built environment as an intervention strategy will be insufficient in increasing AST since there is a wide range of factors that influence children’s decisions about AST. Integrating AST as a part of children’s daily routines is likely the most efficient intervention to raise children’s level of PA. Along with the involvement of children and parents, interventions should engage community partners across multiple stakeholder levels, as suggested within the socio-ecological framework (Stokols, 1996). The use of school travel planning (STP) is a preeminent intervention being used to promote children’s AST through collaborative public health strategies (Buliung, Mitra, & Faulkner, 2009; Mammen et al., 2014; Pabayo, Gauvin, & Barnett, 2011). STP is a location specific, multi-sector intervention linking together key stakeholders with school communities to create safe environments in which more children can engage in AST (Active and Safe Routes to School, 2016). Findings from this research provide key barriers that STP interventions should consider in order to increase the successfulness of the intervention. This research demonstrates that neighbourhood environments and the perceptions parents and children have of them, matter within the context of AST. Healthy, pedestrian friendly environments and how they are perceived are an important part of supporting and increasing children’s AST (De Vries, Hopman-Rock, Bakker, Hirasing, & Van
Mechelen, 2010; Wong et al., 2011). Our study contributes to the growing body of literature on how perceptions of barriers within local environments can influence children’s AST.

3.4.6 Strengths, Limitations, and Future Directions

This study provides insightful findings on perceptions of barriers and the influence that they have on AST. Results from this study should only be interpreted as far as the data permits. The ASRTS and STEAM protocols provide rich data connecting children’s behaviours based on their environments. The large sample size created through the combinations of these two datasets increases the generalizability of findings to other locations and populations. Another strength of this study is the inclusion of both parent and children perceptions in the analysis. Often research is completed only using parent’s perspectives, which is reasonable considering the amount of daily influence parental perceptions have on children’s AST. With the inclusion of both parent and child perspectives, this research allows for comparison between the two. This study is novel in its inclusion of perceived measures of the environment with the inclusion of both parent and child perceptions of the journey to and from school. The inclusion of barriers to and from school allows these features to be explored based on trips made at different times of the day. The findings from this study add to the growing knowledge of understanding features influencing children’s AST.

A limitation of this study is the use of postal codes instead of exact home locations. This may cause slight variation within the estimations of the distance children travel from their home to school. However, previous studies indicate that postal codes are a reasonable proxy for home address in this region (Healy & Gilliland, 2012). In the future, studies should use actual home locations, as well as GPS tracking in order to evaluate findings based on the actual routes children travel to and from school. Another limitation of this study is the use of self-reported measures of AST and inability to verify response accuracy. The inclusion of matched parent and child surveys allows for some validity checks; however, a supplementary objective measure to avoid bias would be beneficial.
Future research should move beyond barriers and include perceptions of enablers experienced by children during AST in order to understand more features and the influence they may have on children’s journeys to and from school. As well, further research on perceptions of barriers to children’s AST needs to be completed using qualitative research methods. Although this study provides us with a deeper understanding of both parent and child perceptions of AST, a key finding is that there is a difference between these perceptions. The decision to use AST is a complex one and can be influenced by multiple factors. It is possible that children may have other perceived barriers not asked on the survey, thus providing justification for the need of individualized qualitative research in order to design effective interventions at schools.

3.5 Conclusions

This study makes multiple contributions to the literature on children’s AST. Further understanding of perceptions from children’s everyday experiences can help develop specialized intervention programs with the focus of increasing children’s use of AST and children’s overall PA. We found that a combination of perceptions on environmental, safety, social, and preference barriers influence children’s AST. Our findings suggest that interventions used to promote AST should focus on safety, as well as perceptions of distance to break through habits of routinely getting driven to school. Interventions aiming to increase AST should include both parents and children in the process. Results from this study, as well as others, highlight that the relationships between PA levels and transport modes may vary within and across different populations and that AST initiatives should be tailored accordingly (Duncan, Scott Duncan, & Schofield, 2008; Faulkner, Buliung, Flora, & Fusco, 2009). This study contributes to the growing body of research on how local environments can influence children’s AST. Results show the importance in acquiring children’s perspectives when researching a topic involving them, as varying opinions can be seen between parents and their children. The importance of children’s perceptions and opinions should be valued because creating a safe and accessible environment for children, is creating a healthy environment for all.
3.6 References


Chapter 4

4 Mapping Children’s Perspectives on Neighbourhood Barriers and Enablers to Active School Travel

4.1 Introduction

Canadian and international guidelines recommend children and youth (aged 5 to 17) engage in at least 60 minutes of moderate-to-vigorous physical activity (MVPA) daily to facilitate healthy development (Ramanathan et al., 2014; Statistics Canada, 2015; World Health Organization (WHO), 2012). Physical inactivity and sedentary behaviours increase the risk of adverse health conditions including insulin resistance, type 2 diabetes, hyperlipidemia, liver disease, and hypertension (Dietz, 1998; Lee et al., 2012). Behaviours and attitudes towards physical activity (PA) 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 PA among Canadian children in order to develop interventions to improve PA rates and decrease sedentary behaviours.

Walking is the most common form of PA for people of all ages (Larsen et al., 2009, 2012; Saelens, Sallis, & Frank, 2003). 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 classifies both walking and biking as a moderate-to-vigorous form of PA (2011). Active School Travel (AST) is one way that children can contribute to their daily recommended levels of MVPA. Research has shown that children who travel actively to school, compared to their peers who are driven, tend to be more active throughout the day (Larouche, Faulkner, Fortier, & Tremblay, 2014; ParticipACTION, 2015). Canadian children typically make a total of 10 trips to and from school during an average 5-day school week. The journey to and from school typically represents a significant amount of time within a child’s day and AST therefore represents a convenient opportunity for children to incorporate PA into their daily routine. Research indicates that the benefits of AST also reach other domains of health and well-being, including positively influencing children’s mental health.
Despite these well-known benefits, only 24% of Canadian children, aged 5 to 17, typically walk or wheel to and from school (ParticipACTION, 2016). Declining rates of AST make it critical to identify and modify factors associated with this decline. This paper aims to further understand the factors influencing children’s journeys to and from school. Furthermore this research aims to do so directly from children’s perspectives.

### 4.1.1 Built Environment

There is recognition in the literature that the environments people live in influence their activities, health, and well-being (Cummins, Curtis, Diez-Roux, & MacIntyre, 2007; Gilliland, 2010; Gilliland & Gauthier, 2006). A growing body of research indicates that specific elements of the built environment (BE) can influence walking behaviours and whether or not a child travels actively to and from school (Giles-Corti et al., 2011; Larsen et al., 2009; McMillan, 2007; Van Loon & Frank, 2011). The BE can be defined as encompassing all buildings, spaces, and products that are created and modified by people (i.e., urban design, transportation systems, and land-use planning) (Bhugra & Minas, 2007). Previous research has focused on the links between either personal and/or social factors with AST, with little known about perceptions of the physical environment or BE from a child’s perspective (Brug, Wammes, Kremers, Giskes, & Oenema, 2006; Santos et al., 2008). A common recommendation from the active travel (AT)/BE literature recommends a focus of future research be on specific behaviours in specific environments, as Owen and colleagues (2004, p. 72), say to “help identify the particular environmental attributes that might prompt and maintain habitual physical activities” (see also Giles-Corti, Timperio, Bull, & Pikora, 2005; Humpel, Owen, & Leslie, 2002; McCormack et al., 2004; Saelens & Handy, 2010). There has been a recent surge of research on the influence of the BE on PA; however, little is known about the influence it has on children. Furthermore, there is less known about children’s perceptions of the BE rather than objectively-measured features, particularly in regards to AST. Considering
children’s perceptions is important because objective measures do not necessarily inform us about how environmental features operate in children’s worlds. Take for example a traffic safety measure such as a pedestrian crosswalk: regardless of whether or not this BE feature exists, children may alter their route to school or mode of travel to avoid this feature if they believe it is located at an unsafe intersection. The present study looks beyond the focus of objective assessments on the BE to examine children’s perceptions of their environments during their travels to and from school. Evidence about how children perceive specific features in their neighbourhoods and areas surrounding school can be used to adapt interventions and to promote AST. In order to develop successful AST interventions, both the influences and determinants of a child’s home and school neighbourhood environment need to be better understood from children’s perspectives.

4.1.2 Environmental Influences through the Socio-Ecological Framework

Healthy behaviours are maximized when environments and policies support healthy choices (Glanz, Rimer, & Viswanath, 2008). A child’s decision to participate in AST is complex and involves a range of different influencing factors. For the purpose of this study, the variables influencing the choice to participate in AST will be examined using an adapted version of the socio-ecological framework of health behaviours, further expanded upon in Chapter 1 (Glanz et al., 2008; Sallis et al., 2006). This socio-ecological framework describes the four key domains of active living as intrapersonal, interpersonal, environmental, and policy (Sallis et al., 2006). Carlson et al. (2014) found that at least one variable from each level of the socio-ecological framework was associated with AST, after accounting for distance, and that strategies for improving AST within children may be most effective when targeting multiple levels of influence. We frame our research within the socio-ecological framework in order to provide both school and community stakeholders key features and priority areas identified by students to focus intervention efforts aiming to increase AST rates.
4.1.3 Measuring the Built Environment/ AST Relationship

As described above, a child’s decision to participate in AST is complex and involves a variety of different influencing factors. Given the complexity and range of factors influencing AST, both subjective and objective measures have been used in existing literature to better characterize the aspects of the BE hypothesized to influence AST. The BE can be objectively measured to quantify the BE/AST relationship through the use of environmental audits and Geographic Information Systems (GIS). Typically, these studies aim to understand the BE/AST relationship in terms of magnitude (e.g., density or mix of land uses) to identify modifiable environmental features that influence AST (Rivet, 2016). In contrast, those interested in understanding how perceptions of the environment may influence the BE/AST relationship may use diaries, questionnaires, or interviews to gather information about environmental perceptions (Saarloos, Kim, & Timmermans, 2009).

4.1.4 Children’s Participatory Research

The majority of research on children’s AST has focused largely on adult perspectives (Larsen et al., 2009). Often, research including children’s participation excludes the children themselves and research is done “on” rather than “with” or “for” children (Sallis, Prochaska, & Taylor, 2000). On most occasions, children are omitted from the research entirely, with research being undertaken with parents about their children. Parents are often assumed to be “gate-keepers”, ultimately deciding whether or not their child can walk to and from school; this belief may lend insight as to why children may be have previously been excluded from the narrative (McMillan, 2005). However, parents are not necessarily able to imagine children’s perceptions of their environments. Social scientists understand that research with adults may not reflect the same results as research with child populations. This is largely due to children interpreting and experiencing their environments in fundamentally different ways than adults (Barker & Weller, 2009; Hyun, 2005; James, 1990). This lack of understanding provides the context to bring children into the narrative to gain their perspectives about what they perceive to influence their journeys to and from school. Children’s voices have only partially been represented in this area of research (Fusco et al., 2012; Mitchell et al., 2007). Research by Alton and
colleagues (2007) suggests that there is an association between perceptions of the local neighbourhood environment and walking levels in children. However, there is a current gap in the literature about children’s perspectives on school travel (Fitzpatrick, 2014; Mitchell et al., 2007).

Self-report is a common, inexpensive method used to monitor children’s PA. Children’s ability to recall their physical activities, including AST, improves with age and is sufficiently reliable in children as young as ten years old (Sallis, Buono, Roby, Micale, & Nelson, 1993). This inclusion of children within research has expanded over the last two decades, giving children a stronger voice within research (Barker & Weller, 2009; Holloway & Valentine, 2000; Mayall, 2002). Although specific ethical and methodological issues come into play when conducting participatory research with children, it is nevertheless important to listen to these oft-forgotten perspectives. How children’s lives, experiences, attitudes, and opportunities are socially and spatially structured has traditionally been omitted from research within the discipline of geography. Instead, research has often chosen to focus on adult experiences, even when the research is relevant to both populations (Holloway, 2014; James, 1990). In the past, this was often based on the assumption that the spatial distributions of children and adults are similar enough that individual investigations of children’s space would be unnecessary. However, we now know more about the varying ways in which children and adults use and experience spaces, even within the same environment (James, 1990; Punch, 2002). Children experience the trip to school differently in different places (Fusco et al., 2012). Furthermore, according to Panter and colleagues (2008, p. 2) “understanding the characteristics of children who walk or cycle, and the reasons for choosing these travel modes, are important first steps in developing effective interventions to increase the number of children engaging in active travel.” Engaging children in research provides an opportunity to understand their first-hand experiences and perceptions influencing their daily journey to and from school. The methods of the current study support the movement towards completing research with children, framing objectives that privilege their voices (Mason & Watson, 2014; Matthews, 1998; Morgan, Gibbs, Maxwell, & Britten, 2002).
4.1.5 Study Objectives

In order to increase rates of AST, it is critical to identify the factors influencing how children make their decisions about school travel. This study aims to gain a deeper understanding of the factors influencing children’s journeys to and from school directly from children’s perspectives. This study adopts an innovative participatory methodology, which directly involves both children and community collaborators who have a direct stake in the school travel planning (STP) process. An STP 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 STP program. This research aims to fill a current gap in the literature regarding children’s perspectives of AST by attempting to answer the primary research question: what features do children from urban versus suburban environments perceive as barriers and enablers on their journey to and from school? Additionally, this study considers the secondary research question: what improvements would students like to see on their journey between home and school to support increased participations in active school travel?

4.2 Methods

4.2.1 Recruitment

Participants were recruited from two elementary schools in London, Ontario, Canada. Two schools from different neighbourhoods, one suburban and one urban, were chosen to allow us to explore how diverse neighbourhoods might have different influences on children’s journeys to and from school. Schools currently completing an STP intervention process through the Elgin London Middlesex and Oxford Active and Safe Routes to School (ELMO ASRTS) program were asked to participate in the research, since there was a pre-existing relationship with the schools. Letters of information and consent forms were given to children at both schools to bring home to parents (see Appendices I and J). Participants from both schools were divided into 25 separate map-based focus groups according to their home address postal codes. 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. This grouping was done 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 current Thames Valley District School Board (TVDSB) bussing policy uses a 1.6 km buffer to determine which elementary school students are considered to live within walking distance of their school. Students living beyond the 1.6 km buffer distance are eligible for school bus transportation (TVDSB, 2010). The study protocol was approved by the Non-Medical Research Ethics Boards of the University of Western Ontario (NMREB #: 105635) and the TVDSB Research and Assessment Services (see Appendices K and L).

4.2.2 Sample Characteristics

A total of 158 students across the two schools were invited to participate in this research, with 123 children receiving parental consent (77.8% participation rate). Demographic characteristics, including gender, grade, and self-identified most common form of travel of the participants, are shown in Table 4.1. Children were between the ages 10 to 12 years old and in grades 5 and 6. Participants were almost divided evenly between grades 5 and 6 (5= 65 and 6= 58) and by gender (M= 55 and F= 68). Nearly two-thirds (64.4%) of the students from the suburban school normally used an active mode travel (walk or bike) to school in the morning, compared to only one-quarter (25.5%) of students from the urban school. Groups ranged in size from 4 to 8 participants, as suggested by Kruger and Casey (2000) for participatory map-based focus groups, particularly when run in schools. These smaller groups are suggested to allow for more meaningful conversation while still being small enough for facilitation.
Table 4.1 Demographic Characteristics of Participants (n=123)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Suburban</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>38 (50.0)</td>
<td>30 (63.8)</td>
</tr>
<tr>
<td>Male</td>
<td>38 (50.0)</td>
<td>17 (36.2)</td>
</tr>
<tr>
<td><strong>Grade, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>40 (52.6)</td>
<td>25 (53.2)</td>
</tr>
<tr>
<td>6</td>
<td>36 (47.4)</td>
<td>22 (46.8)</td>
</tr>
<tr>
<td><strong>Mode of Travel, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>47 (61.8)</td>
<td>12 (25.5)</td>
</tr>
<tr>
<td>Bike</td>
<td>2 (2.6)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Bus</td>
<td>13 (17.1)</td>
<td>33 (70.2)</td>
</tr>
<tr>
<td>Car</td>
<td>14 (18.4)</td>
<td>2 (4.3)</td>
</tr>
</tbody>
</table>

4.2.3 Procedure

The data for this study was collected through map-based focus groups structured around participatory mapping exercises during an annual geography education and public awareness program called Geography Awareness Week (GAW) in November 2016. It is promoted internationally by organizations, such as the Canadian Association of Geographers, American Association of Geographers, and National Geographic to excite and celebrate geography both as a discipline and as a part of everyday life. GAW encourages citizens, specifically children, to think about the significance and effects of the cyclic relation between people and place (“Geography Awareness Week - National Geographic Society,” n.d.). As a part of wider GAW activities of the Human Environments Analysis Laboratory (HEAL) at Western University, we engaged six classes to consider how their surrounding environments affect different aspects of their everyday lives. Students with parental consent provided informed assent to participate in the days activities (see Appendix M). The participatory mapping exercises were embedded as research within our GAW activities and developed with the intention of initiating conversations among students about their journeys to and from school, allowing participants to describe personal and individualized experiences.

A total of 25 participatory mapping exercises, each lasting 45 minutes, were completed. As recommended by Krueger and Casey (2000), the participatory exercises were led by
pairs, consisting of a researcher and a community stakeholder. The presence of community members adds another layer of collaboration to this research, since many of the community participants hold positions where decisions can be made that influence children’s journeys to and from school. A researcher was teamed with a member of the community to co-facilitate the participatory mapping exercises and provide engagement with students during discussions. Community members included city planners, engineers, teachers, public health nurses, environmental and park planners, ecologists, community developers, and the mayor.

The structure of the participatory 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 (see Appendix N for the exercise guide). All mapping exercises were audio recorded and detailed notes were taken. Children were asked questions about their neighbourhood environments and features within them that they perceived as enablers, barriers, and in need of improvement in relation to their journey to and from school. The maps used for the exercises were based on high resolution satellite imagery and printed in large format (122cm x 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 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 then extensive notes on that location were recorded.

4.2.4 Analysis

Analysis was completed using a thematic analytic approach, which is commonly used with qualitative data (Guest et al., 2012). This form of analysis allows the researcher to interpret the data set with the ability to identify, analyze, and report patterns within the data (Boyatzis, 1998). Thematic analysis was used systematically to identify patterns, themes, and meanings in the children’s data. The procedure for analyzing this research data involved several phases of coding. Braun and Clarke (2006) state that the initial phase of this analysis begins during data collection, when preliminary patterns of
meaning and potential areas of interest in the data begin to be noticed. Braun and Clarke (2006) provide a guide to follow throughout the thematic analysis process which involves familiarizing yourself with the data, generating initial codes, searching for themes, reviewing themes, and defining and naming themes. It is also recognized that thematic analysis is a recursive process where the notion of flexibility should be applied (Patton, 1990).

All transcripts were audio recorded and 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 from the participatory mapping exercises were entered into NVivo Pro (Version 11) qualitative software for analysis (QSR International Pty Ltd., 2015). Following the systematic process recommended by Braun and Clarke (2006), “nodes” separated by school were set up in NVivo before coding was completed, as a first step of generating initial codes. Nodes were separated by school to allow for a comparison between urban and suburban settings. A node is a collection of references about a specific theme, place or quotations and is used to identify common themes and representative quotes from varying locations discussed during each mapping exercise. As the next step in the analysis, nodes were created based on prompting questions posed to students during the participatory mapping exercises and also topics identified as being frequently discussed within the transcripts. Nodes included Like, Dislike, Improve, Stop At, and Key Quotes which were set up for both the urban and suburban school, therefore keeping themes separated by school in order to see the topics most discussed at each individual location. “Coding stripes”, which are coloured bars displayed alongside transcriptions when working in NVivo allowing you to visually see how the content is coded, were then used to visually represent dominant areas of interest within the transcriptions. This feature along with “Nodes most frequently coded” within the NVivo analysis software, were then used to identify topics most frequently discussed within the transcripts to extract key themes and topics of discussions. Through this process, three main themes formed from the data set: safety, natural and built environment, and affective features. These themes align with our study objective to better understand children’s perceptions of the features in their environments that are barriers/enablers along their journeys to school. The thematic analysis revealed overlap in children’s
perceived barriers, enablers, and improvements on their journey to and from school across both the urban and suburban schools. We thus report on our themes jointly for both urban and suburban schools, indicating which area selected quotes pertain to and drawing explicit attention to any key differences between the urban and suburban themes in our results.

Children’s experiential data about their school journeys were integrated with geospatial data using a qualitative GIS approach. Visualization is a broad term used in the literature referring to methods which provide insight into geographic data through visual representation (Knigge & Cope, 2006). Visualization techniques were used in this research, allowing for a rich and flexible medium for data exploration in a way that is not oppressive or overly explorative (Knigge & Cope, 2006). Following the identification of frequently discussed topics in NVivo, all locations marked by participants on the large-scale satellite view aerial maps were geo-coded (i.e., identifying the geographic XY coordinates of the location) using Google maps. Unique ID codes were created for each point and these were then matched and joined in ArcMap (ESRI, 2017) and connected with the children’s own descriptions of and comments about these places. A 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 urban and suburban schools. A cell size of 3 was used to produce a smooth map. Finally, a “search radius” was run to automatically identify any points within a 100-metre extent. A default search radius is automatically calculated in ArcMap using an algorithm for each point file and an average of 100-metres was chosen for the final analysis to best represent the dataset. Colour scales were adjusted to match points. Areas of high mention by students appear darker in colour and areas of no mention remained transparent. This spatial analysis reveals both high and low areas of interest to students at both school locations. The resultant “hot spot” maps provide an effective method of visualizing key locations of interest, concern, and potential improvement for the schools that participated in this research. Key student quotes that are reported in the results have also been labeled with corresponding letters, which can be referenced on the hotspot maps.
4.2.5 Study Schools: Neighbourhood Characteristics

**Figures 4.1 and 4.2** School A Suburban Neighbourhood and School B Urban Neighbourhood

The two school neighbourhoods varied considerably in their environmental characteristics. The orthographic maps in Figures 4.1 and 4.2 show the neighbourhoods surrounding both the suburban and urban schools that participated in this study respectively. Traditionally, suburban areas are largely comprised of residential land uses and located outside of the downtown core, while urban areas are more central areas of high population for both living and working purposes (Berube, Katz, & Lang, 2006). Some of the key differences between these two contrasting school locations include street layout, surrounding green space, and BE features. As shown in Figure 4.1, the surrounding neighbourhood at the suburban school contains many looping and non-connecting cul-de-sac streets. Cul-de-sac street forms 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 4.2) 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 environmental characteristic of this urban school is its close proximity to a set of train tracks and the downtown core. The students at this school identified as being predominantly bussers.
4.3 Results

Our analysis yielded three main overarching themes: safety features, natural and built environment features, and affective features. 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 4.3 and 4.4).

Figure 4.3 School A Suburban Hotspots
Figure 4.4 School B Urban Hotspots

4.3.1 Safety Features

Children emphasized safety as an important part of their journey to school experience. Overwhelmingly, children identified environmental features that evoked feelings of safety as enabling on their routes to school. On the other hand, children pointed to features that elevated their perceptions of risk as barriers. Features that promoted insecurity among children typically involved some form of traffic or encountering unfamiliar people on their route to school. Improvements centered on perceptions of the influence that parents held over children’s journeys to and from school.

*Personal Safety Enablers.* Participants often discussed their interactions with people while travelling to school as contributing to their sense of safety. The familiarity of people, travelling to school with friends, and walking with a sibling were topics most discussed in relation to positive feelings of personal safety. Travelling to school with friends fostered secure feelings towards walking, as one student from the suburban school
commented, “I feel more comfortable when my friends walk with me and talk and stuff” (Figure 4.3, A). The reassuring of knowing people along the way while travelling to school frequently came up during discussions. A range of familiar people were listed by students when discussing this topic and included friends, classmates, siblings, and neighbours. The context of interactions varied among students. Seeing familiar faces as they walk and stopping at a friend’s house to pick them up and travel the remaining journey to school together were two of the most common interactions children related to feeling safer on their route to school. Recognizing other students along the journey was often seen as a personal safety enabler, with many students consciously selecting certain routes because of this feature. One child who walked to their suburban school liked their particular route because “I feel safe going this way because like a lot of it’s in a row with like five kids that I know” (Figure 4.3, B). Crossing guards were a dominant topic of discussion throughout the mapping exercises and played an important role in children’s perceptions of safety. Children perceived crossing guards’ presence and position to calm traffic along their route as beneficial. Most commonly, crossing guards were seen as helpful for crossing busy streets, as one student at the urban school put it, “I usually feel safer walking that way because there’s a crossing guard there” (Figure 4.4, C).

**Personal Safety Barriers.** Children perceived a wide range of features as barriers relating to their perception of safety on their journey to and from school. Physical features and the presence of unfamiliar people in the school’s surrounding area were among the two most common barriers discussed during the participatory mapping exercises at both schools. Features that fostered feelings of insecurity among children included crossing the road, traffic, and busy streets. Crossing the street, regardless of the neighbourhood infrastructure, often raised concerns of safety among students. Students shared personal concerns and experiences, ranging from specific traffic lights, distractedness of drivers while they cross, lack of patience from drivers, and simply not enjoying the act of crossing the street. One student explained the experience of crossing the street near the urban school as, “It is 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 4.4, D). Another student shared
similar feelings of aversion towards crossing the street while actively traveling 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 4.3, E).

These types of experiences related to crossing streets near schools brought up feelings of concerns of personal safety among these participants. One student summed up the general perception of concern amongst most participants from both schools, when exclaiming, “Ya I don’t like crossing” (Figure 4.3, F). Children frequently described feelings of aversion they experience while travelling along busy streets with heavy traffic congestion during their journey to and from school. The volume of cars, traffic speed, and noise generated by traffic makes students feel unsafe and apprehensive on their journey, with many students making statements such as, “I’m scared of the traffic” (Figure 4.3, G), “I don’t like it here because there are usually a lot of cars” (Figure 4.3, H), and “It’s hazardous right here because there are tons of cars and a lot of kids walking” (Figure 4.3, I).

While interactions with people (familiar people, friends, siblings, etc.) described above had a positive influence on children’s perception of personal safety on their school journeys, certain types of interactions could negatively influence children’s perceptions of travelling to school. Children discussed perceiving people encountered on their journey as risky, most commonly referencing unfamiliar people, teenagers, and bullies. The presence of unfamiliar—or as several students stated “creepy”—people influenced children’s perceptions of certain areas and decreased feelings of safety. When asked to expand on areas brought up as a barrier to personal safety, statements such as “The creepy dude!” (Figure 4.3, J) were made, revealing that children perceive certain areas based on past interactions they have had with people on previous journeys to school. Teenagers and bullies similarly raised feelings of being “scared” and are something that
children are cautious of while they walk to and from school. Some children at the urban school explained that they would avoid walking a particular route because they knew teenagers 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 4.4, K). Bullies were also a topic of discussion. Many students were hyper-aware of their surroundings, especially in areas where they experienced negative encounters in the past, as one student explained, “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 4.3, L).

Personal Safety Improvements. Many children viewed the influence that their parents held over their travel to and from school as an area for improvement. Although often seen in combination as a barrier, parental influence and trust were subject’s students raised as areas 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.

4.3.2 Natural and Built Environment Features

Characteristics of both the natural and built environment were dominant topics of discussion at both the urban and suburban schools during the participatory mapping exercises. Children often discussed pedestrian friendly infrastructure, such as sidewalks and stop signs, as enablers on their journey to school. On the contrary, children discussed inconvenient pedestrian infrastructure, such as trains, as barriers on their route to school. Children perceived that the addition of pedestrian friendly features to their schools surrounding neighbourhood would enhance their journey to and from school.

Natural and Built Environment Enablers. Sidewalks, stop signs, short travel distance, and short cuts were all considered environmental enablers by students. Having sidewalks on both sides of the street was reported as a beneficial feature. 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 4.3, M). Stop signs were also a positively viewed BE 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 4.3, N). Students perceived having their house within close proximity of their school as an enabler and a desirable built environment feature, especially those students who lived within close distance of their 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 4.4, O). Short travel distance was discussed by students at both schools as a benefit and perceived as an enabler to walking to school. Finally, shortcuts through many different areas often arose in discussions. 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, took, and enjoyed using on their route to school.

**Natural and Built Environment Barriers.** Participants reported barriers in the BE that discouraged the use of AST including lack of sidewalks, weather, distance, terrain, drop-off zones, and trains. Streets that lacked sidewalks, or only had sidewalks on one side of the street, were seen as barriers because they perceived heightened risk, possibly due to the additional need to cross the street to walk on a sidewalk. 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 4.3, P). Children mentioned different types of inclement weather that also interfered with their journey to and from school. Top weather related barriers included ice on stairs in the winter, rain, and a lack of snow clearing on both pathways and sidewalks during the winter. All of the above made AST more challenging in different ways: ice on the stairs in the winter increased fears of injury; rain made walking uncomfortable; and a lack of snow clearing both increased fears of injury in conjunction with potentially limiting a route(s) to school.
Distance was also seen as a barrier by students. The further 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: “D---- lives right at the bottom of the hill and we don’t want to bike down because it’s hard to go up so sometimes we’ll just drop him off at the top of the hill so we don’t have to ride back up” (Figure 4.3, Q). Drop-off zones and school parking lots were other significant BE features perceived as barriers by students; students viewed these areas as dangerous, chaotic, and hazardous, particularly in the morning. Students complained about the sheer volume of traffic that these areas hosted. Students attending the suburban school mentioned that many streets lacked proper lighting, which was worsened in the winter months when the walk to and from school can be very dark. Proper lighting was an environmental feature that shared overlap with the theme of safety, as children perceived it as important to increasing feelings of safety by illuminating the area children travel through and the potential hazards that they may encounter. Trains also came up as an environmental barrier at both school locations; however, they were more frequently mentioned at the urban school, likely due to train crossings being significantly closer in proximity to the school location. In fact, many students are required to cross the railroad tracks on their daily journey to and from school. Students also raised issues with the time it took for the crossing train to pass if they got stopped at the rail barrier, the speed at which trains travel, the inconvenience, and a general dislike. One student at the urban school simply stated, “I would like there not to be a train” (Figure 4.4, R).

**Natural and Built Environment Improvements.** The majority of improvements suggested by students arose as suggestions to mitigate the aforementioned barriers. However, there were a few features not previously discussed. BE features children would like to see improved on their journey to and from school included improvements to sidewalks, the school drop-off zone, street signs, street lights, trains, and pathways. Sidewalks, street signs, and street lights were all identified as missing features and the students felt that the addition of these would improve their journey by reducing concerns about safety. Improvements to pathways brought about two different discussions: children either identified the need for a pathway in an area that did not have one, or improving 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 4.3, 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 adding a bridge over or tunnel under, or removal of the train tracks entirely.

4.3.3 Affective Features

The affective environment encompasses features along the journey to school that influences children’s moods, feelings, and attitudes. Features that evoke particular emotional reactions can have a significant influence on children’s perceptions of their environments. Murray and Mand’s (2013) research on children’s mobile emotions discusses how children experiencing mobile space may invoke particular emotions at different scales. In their study, when examining children’s everyday travel, affective situations spanned a myriad of, sometimes, contrasting qualities like “the disgust of ‘dog poo’ on the way to school is experienced alongside the joy in finding a new short-cut” (Murray & Mand, 2013). Certain features that children experience on their journey to and from school elicit various emotions that participants shared during these mapping exercises.

Affective Feature Enablers. Trees, parks, interactions with crossing guards, AST programs, and dogs were among the most common features discussed by children that evoked some form of a positive affective response. Students enjoyed seeing trees lining the streets they walked along to school because “It gives off a lot of shade” (Figure 4.3, 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 4.3, U). The suburban school and its surrounding neighbourhoods are unique because of the large forest located directly behind the school. Many students would alter their routes to and from school so that they could travel through this forest, as one student at the suburban school explained, “Um well we usually just like going in the woods because it’s nice and there’s lots of animals and stuff” (Figure 4.3, V). Students expressed that they enjoy walking through the forest at the
suburban school more than travelling along the streets and would cut through the forest so they could avoid travelling near the roads: “I try to avoid the road so I cut through the forest” (Figure 4.3, W). They also enjoyed the short cuts they could create while walking through the forested area. The neighbourhood surrounding the urban school has a high density of parks in close proximity to the school. This was something that many children enjoyed, some students often making detours on their travels to school in order to walk through a park. “well, sometimes I take detours. I’ll go there to the park and come out the back” (Figure 4.4, X). As mentioned in previous sections, the presence of crossing guards was a very popular topic discussed during the participatory mapping exercises. Children at both the urban and suburban schools typically perceived the presence of crossing guards as an enabler on their journey. Children not only appreciated crossing guards for the safety reasons described above, but they also enjoyed the personal interactions with these individuals, as one student said, “I like seeing the crossing guard because she’s nice” (Figure 4.4, Y). The recognition and interaction with a familiar face was something that students enjoy as they travel to school. School based programs such as a Walking School Bus were also seen as enablers. A walking school bus can be as simple as a group of children walking to school with one or more adults and expand from there. Programs that encourage students to walk but allow them to be supervised were perceived as beneficial and fun by both students who use the program and those who don’t. “[I] like the walking school bus, I like the people and I like where is goes (Z).”

Another encounter that a few children perceived as a positive experience on their route to school was encountering dogs. Opinions about these encounters varied with some students enjoying the emotions they experienced in certain areas when seeing a dog. One student at the urban school stated, “Sometimes I see this really cute little English Bulldog on my way to school. It is usually on the other side of the street” (Figure 4.4, AA). This is something that they look forward to as they travel to school and will likely be remembered as a positive experience.

Affective Feature Barriers. There was consistency among students that particular features at certain locations induce 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 routes to school. Children only saw crossing guards, or lack thereof, as a barrier when the crossing guard did not assist the children across the street and when there was not one at areas of high traffic volume. This translated into children seeing the addition of a crossing guard in certain locations as an area of improvement on their journey to and from school. 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 both safer, faster, and more enjoyable. Although a somewhat contested feature, dogs were more commonly seen as a barrier by students when encountered on their journey to school and often produced negative emotional responses. Students at both schools shared similar feelings towards dogs they encounter along their routes. Often comments were made about dogs or dog owners that children were not familiar with, 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 4.3, 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 4.3, CC).

Children also experienced different emotional reactions to material aspects of their affective environments. Different forms of garbage children encountered on their journey to school and the emotions experienced because of these encounters negatively influenced children’s perceptions of their environments. Children disliked when owners did not properly clean up after their dog. “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 4.3, DD). Garbage was another feature that affected children’s perceptions of certain areas, particularly as a barrier. Children at the urban school often made comments about areas that contained a lot of litter, “There’s a lot of garbage that needs to be cleaned up” (Figure 4.4, EE). 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 4.3, FF). Comments about litter in surrounding neighbourhoods were discussed more during mapping exercises at the urban school, possibly because of the increased traffic that these streets and locations likely experience.
Finally, children disliked having to pass people smoking on their travels to school. Children often classified certain locations as designated smoking areas where people are often smoking cigarettes. Children perceived the presence of smokers as a barrier and would try to avoid these locations on their route to school. One of the designated areas at the urban school was the nearby river, “there’s a ton of people that smoke, and it smells like smoke and it looks deserted and it’s really dirty” (Figure 4.4, GG). Another aspect of smoking that evoked negative feelings while travelling to school was the littering of cigarette butts, “I don’t like the road because there’s so much cigarettes on them” (Figure 4.3, HH). These affective experiences led children to negatively categorize the areas where they occur, therefore causing children to perceive these locations and features as barriers on their route to school.

Affective Feature Improvements. Houses students passed and their perceptions of the appearance of these structures often provoked feelings of uncertainty along children’s route to school. More frequently discussed at the urban school, were houses in the school surrounding neighbourhood that appeared to be deteriorating. Comments surrounding the urban school’s area made by students, such as “There’s a place that looks pretty abandoned near my house” (Figure 4.4, II), “there’s a house that I think needs improvement” (Figure 4.4, JJ), and “Some of the houses here are messy and not nice” (Figure 4.4, KK) are just a few that stemmed from discussions about these areas frequently encountered by students. 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 4.4, LL). Another urban student explained the fear evoked by a particular house on their school journey, “I don’t like the houses over here because it is kind of creepy when you pass it and its all dark” (Figure 4.4, MM). Perceiving particular areas in a certain light solely based on their appearance often occurred throughout this research. 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 how they choose to travel to and from school.
4.4 Discussion

The purpose of this participatory study was to identify features that children perceived as barriers, enablers, and needing improvements on their journey to and from school. The results of our analysis from the participatory mapping exercises illuminate the factors involved in school travel experiences and decisions among fifth and sixth grade students in London, Ontario. The themes we identified—safety, the natural and built environment, and affective features—demonstrate that there are multiple levels of influence on AST decisions made by children. These can be understood in light of the socio-ecological framework (i.e., intrapersonal, interpersonal, environmental, and policy level themes) of health.

At the intra- and inter-personal level, the AST literature frequently cites parental fears of childhood abduction as a key barrier which stops children walking to and from school. However, the actual, objectively-measured, risk of abduction is substantially lower compared to other risks associates with school travel, such as automobile collisions, pedestrian injuries, and bicycle injuries (Ahlport, Linnan, Vaughn, Evenson, & Ward, 2008; Eichelberger, Gotschall, Feely, Harstad, & Bowman, 1990). In contrast with the literature, this study shows that when parental perceptions are removed, “stranger danger” is not a common theme mentioned by students; in fact, many map-based focus groups never brought up the topic during discussions. Although children did mention people they deemed to be “sketchy”, particularly students attending the urban school, children instead were more engaged with interactions with friends, crossing guards, and neighbours within an intra-/inter-personal level. Salmon, Crawford, Hume, and Timperio (2007) focused their research on parental barriers and found a key barrier for parents was when there were no other children for their child to walk to school with. When this occurred, parents were less likely to allow their child to walk or cycle to school. Parents feel their child is safer in the company of other children while travelling to school. Our research shows that from children’s perspectives, walking to school with other children and friends was an affective feature enabler. Children enjoyed both walking with and seeing other students on their journey to and from school, as well as programs such as the walking school bus – a program which organizes routes for groups of children to use to
walk together to or from school, accompanied by one or more adults – in order to promote safety and active travel for their students while teaching students proper pedestrian skills (Neuwelt & Kearns, 2006). This shows a contrast between parental and child perceptions. While both groups make mention of the same feature -- other children on their route to and from school -- parents perceive it through the lens of safety, while children view it as an affective enabler.

Another common interpersonal barrier identified by students was the level of influence their parents had on their MOT to school with discussions revolving around parental limitations put on their journey. Factors such as walking with siblings, not being allowed to walk alone, crossing the street alone, and trust were all common influencers. Children who faced these barriers of parental influence were also often limited in travel choice by parental work schedules and enrollment in before- and after-school programming. Finally, interpersonal connections with crossings guards influenced how children perceived their journey to and from school. Often students did not recount their interactions with the crossing guards in relation to the specific role they play in influencing their travel to school, just with general enjoyment of the daily interaction.

In terms of the environmental sphere of the socio-ecological framework, both the natural and BE were dominant aspects discussed throughout this research. Several modifiable aspects of the natural and BE surfaced during the participatory mapping exercises, such as sidewalks, drop-off zones, and lack of infrastructure (i.e., crosswalk, street lights, and stop signs). Children believed that improving the infrastructure in their schools’ surrounding neighbourhood would facilitate AST. Changes to the BE such as adding or improving sidewalks and installing traffic calming measures are attractive because they improve the neighbourhoods’ AST infrastructure. The addition of even one infrastructure change is shared between everyone and is an improvement towards fostering the schools surrounding neighbourhood to encourage and sustain active travel. Findings from this research 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 (i.e., paths, shortcuts, walkways, etc.) that allow children to avoid
travelling along major arterials and crossing busy intersections could also serve to facilitate increased walking (Clark et al., 2016).

Policy related topics was not a theme directly discussed by children, however many of the features discussed in relation to safety or affective feelings directly tie to policy procedures. Decisions at the school, municipal, provincial, or federal level can have both a direct and indirect effect on AST. Funding of infrastructure projects in support of increased crime prevention methods (interpersonal), positive school’s initiatives to promote AST (interpersonal and/ or environmental), and increased pedestrian use (environmental) are all potentially beneficial policy level projects. When policy related topics did come forward, they 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 enablers on their journey to and from school, in relation to safety and affective features. There are regulations on the locations and numbers of crossing guards within schools’ surrounding neighbourhoods. Students related having a crossing guard with helping to make their journey to and from school a more pleasant experience, as well as nurturing feelings of safety. Many students, at both school locations discussed their preference of having a crossing guard at an intersection rather than just a cross walk, which is something that should be considered when implementing new and reviewing old infrastructure surrounding schools. The lack of school crossing guards in certain locations was one of the most common concerns raised by students. Students at the suburban school noted the effectiveness of crossing guards in certain situations, for example, whether or not students were assisted the entire way across the street. As well, the lack of crossing guards at certain locations was often an area where many students at both schools would like to see improvements made. In the city of London, crossing guards fall under the jurisdiction of a private security company contracted out by the city’s roadway, lighting, and traffic control division, ruled 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 (City of London, 2016). Students mentioned that they tend to prefer crossing guards in comparison to
supportive BE features, such as crosswalks, when having to cross the street because they make them feel safer. 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).

School based programs such as a walking school bus was seen as enabling by students, particularly as an intervention program. A walking school bus is a pedestrian school bus and can be as simple as a group of children walking to school with one or more adults and expand from there. Similar to a regular school bus, established routes are followed. During the time of this research the walking school bus program was only being run at the urban school. Students are picked up and dropped off at planned stops. This program encourages students to walk but allows them to be supervised and was perceived as beneficial and fun by both students who use the program and by those who do not use it.

Drop-off zones are a unique issue within the context of AST. Many children spoke about aversions toward the volume of traffic and lack of safety within their school drop-off zone. Some children identified driving as a solution to this, as they would then avoid travelling through this busy area. Somewhat ironically, this could in turn create more traffic and increase the possibility for pedestrian injuries. Children also described feeling unsafe in the drop-off zone as a result of parents not adhering to proper drop-off zone protocols and procedures. For example, when parents do not stop in the proper drop-off zone, instead stopping on either side of the street to drop-off their children, they halt the flow of traffic, which can create chaos among both drivers and pedestrians, and therefore increase danger and the risk of injury. During before and after school hours, drop-off zones experience an increase in traffic, therefore opening this area up to opportunities for more incidents involving pedestrians and vehicles. Drop-off zones also fall under policy within the context of this research. The infrastructure of the drop-off zone largely influenced children’s perceptions of their journeys, particularly when they travelled through or past this area. Students disliked the volume of traffic within this area at both schools and the way that it functioned. 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. Although a feature of the BE, drop-off zones are discussed
during the building of schools and are limited by restrictions and guidelines that influence their infrastructure. Possible changes could include allowing for the designated drop-off zone to be moved further away from the school, actively supervising and enforcing regulations in the drop-off zone area, and continually encouraging AST. Decreasing the amount of vehicle traffic in the drop-off zone area, through the promotion of AST, is a fast, affordable, and convenient solution to a feature that is seen as a barrier by students.

School location was a larger issue at the urban school, with many students sharing a dislike of the downtown location. One student at the urban school stated: “We need to change the area around the school. It is not safe for kids. This area around the school is not safe at all for kids” (Figure 4.4, MM). Students attending the urban school in the downtown core more frequently discussed topics relating to fear of strangers, litter, and drugs that they often experience on their journey to and from school, which they may have been exposed to more than suburban students due to their school’s location.

The school policy category reflects the barriers, enablers, and improvements of children’s AST that are influenced at the organizational, community, and policy levels. These are features that are governed and regulated by different levels of organization within the city. Within the context of this research, discussions on policy level influencers were extremely beneficial because of the presence of community partners, such as city planners, co-facilitating the participatory mapping exercises. This allowed members from different regulating sectors of the community to see firsthand how these higher-level policy decisions are perceived by children at local elementary schools through their everyday travel experiences. A careful review of these schools’ practices related to AST could highlight potential policy changes supportive of AST, especially if completed with individualized specific school locations in mind.

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.

Many of the affective features discussed throughout the participatory mapping exercises appear in multiple levels of the socio-ecological framework. Affective features were considered environmental features connected with children’s emotions, which significantly influenced their perceptions of aspects of their school journeys. One affective feature with an interesting finding was trees. Trees were largely discussed as an enabler by the students at the suburban school, which fostered feelings of positivity along a child’s route to school. This topic was not as frequently discussed at the urban school; instead more negative affective features such as dogs and smoking were more common. An implication for this reality is urban design and how we as a community incorporate more features that positively affect children’s journeys to and from school. An example of this is Greenways, which aim to enhance the experience of walking and cycling for pedestrians by making improvements such as park expansions, increased landscaping, and drinking fountains (Ahern, 1995). These simple improvements made to a schools surrounding neighbourhood is a positive way to enhance children’s affective experiences along their routes to school.

Linking back to our sub-objective, to explore whether barriers and enablers to AST differ between urban and suburban environments, our findings show there does not appear to be any significant differences. Rather, there was a general overlap of themes discussed by children attending both schools. Acknowledging this overlap, there was one key difference brought up during discussions between these two environments. Children at the urban school focused more of their discussions around built environment features, specifically the train tracks within close proximity of their school surrounding neighbourhood. Children dominantly identified this feature as a barrier to AST, providing insight to policy makers that this feature should be avoided when considering future
school locations. For schools that do have this permanent built environment structure, considering interventions such as, lessons on proper train safety to make children more comfortable while travelling near this feature would be largely beneficial. This individual element is an example of a neighbourhood specific feature discussed by students.

When the scope is zoomed out from specific individual-level features, similarities between responses from students at the urban and suburban school occur across all three of the themes (safety, natural and built environment, and affective features). Interactions with people, infrastructure, and crossing guards were the most common shared topics of discussion, both as enablers and barriers, by students at both the urban and suburban schools. Children can perceive the issues within the neighbourhoods they travel through to get to school. They understand that improvement can be made that would help to improve their journey allowing them more opportunity to choose an active mode to use to get to school. Regardless of school location, urban or suburban, it becomes apparent that a general supportive environment, high in enabling features, has a positive influence on a children’s journey to and from school. This finding is consistent with the literature, that children are more likely to choose healthy behaviours, such as AST, when they are immersed in a supportive environment (Ball, Timperio, & Crawford, 2006; Panter et al., 2010; Strauss & Knight, 1999; World Health Organization (WHO), 2006).

4.5 Strengths and Limitations

The principle strength of this study is its participatory study design. The participatory methodology embraces that the student population possesses expert knowledge about their environments. The maps created during this study show the places that these students use every day and what they, as a community, perceive to be important based on their spatial knowledge. The second strength of this research is the novel methodology used to provide insight into the collection of rich, in-depth perceptions from the children as participants. In relation to existing research, these methods aim to counter the adultist privilege typically characterizing other research completed on children’s AST perceptions. The qualitative nature and use of semi-structured group mapping exercises delves into rich details enabling an exploration of the determinants of AST. Finally, 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. This 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, this 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 participatory mapping exercises conducted in this study have a few noteworthy limitations. Selection and recruitment of the schools was based on the availability of the schools and their interest in the research. In the future, it would be valuable to have the participation of additional schools to allow for fuller comparisons between schools with similar surrounding neighbourhood environments. Additionally, it would also be informative to expand the research into other classifications of school neighbourhoods such as those in rural and remote settings. Another limitation was that all mapping exercises were completed in the same room, with two classes simultaneously, at each school. This affected the sound quality of some recordings and limits the ability to recall and identify specific participants from one another in the audio recording. As well, because multiple mapping exercises were completed at the same time to accommodate the school schedules, multiple researchers conducted the exercises. Acknowledging that it is recommended to use one facilitator (Baxter & Eyles, 1997) as each individual has their own style of phrasing questions, potentially influencing how questions are asked and interpreted, all facilitators were provided with the same training and instructions to promote consistency. Although mapping groups were created based on home location, past research has shown that not all students living within walking distance (1.6 km) of their school use AST. As well, in order to encompass all of the children’s voices in the research and truly understand perspectives of their schools surrounding neighbourhoods, findings were coded across all students, regardless of the MOT students use to get to and from school. However, children did provide their most common mode of travel during the mapping exercises, revealing that half of the research participants used a form of AST to and from school and half used a form of non-active travel.
4.6 Conclusions and Opportunities for Future Research

In conclusion, these participatory mapping exercises help to identify key barriers, enablers, and improvements within neighbourhood environments encountered on the journey to and from school from children’s perspectives. The most frequently mentioned barriers, enablers, and improvements fell within all four levels of the socio-ecological framework. Although the two schools varied in geographical setting, results from this research show that there is a general overlap of features discussed by students at both schools. Regardless of the school’s neighbourhood (i.e., urban, suburban) children attending both schools shared similar perspectives on shared features, with the same type of features discussed between all students. This research also shows that children are able to extensively categorize the neighbourhoods surrounding their school according to their personal perceptions and their individualized experiences, demonstrating that children have profound insight to understanding their environments.

There are several implications for future research based on these findings. In order to expand on the findings from this research, future studies should explore experiences with both younger children and older adolescents. Entire student populations (including younger elementary school students, middle school, and high school students) should be involved so that perspectives from students of all ages are included. Grade five and six is typically when students begin having the autonomy to make independent decisions about how they travel to and from school, being less constrained by their parents’ influence (Active and Safe Routes to School, 2016; Davison et al., 2008). Younger students, however, are more constrained by their parents’ decisions and do not always have the same level of self-determination in how they travel to and from school.

This research has significant implications for city planners, policy makers, health professionals, school officials, and parents to promote and support AST. This study found that neighbourhood school environments have a strong influence on how children experience travelling to and from school. Using participatory mapping as a research tool lends support to the growing efforts promoting community engagement while reflecting community values and perceptions. Information gathered from this research could help improve the development of population health interventions, such as municipal STP.
programs. When executed properly, these types of interventions have the ability to improve mental, physical, and emotional well-being of children. The results from this research suggest that multilevel intervention strategies, such as an STP that focuses on different influencers from all levels of the socio-ecological framework, are needed in order to increase children’s use of AST. Such interventions may increase PA rates, which has been linked to reducing the risk of becoming overweight and obese, thereby encouraging children to live more healthy lifestyles. This research provides a contribution to the literature through its novel participatory methods, with the potential to inform local policies which could ultimately help to increase the number of children choosing to walk to school.
4.7 References


Chapter 5

5 Synthesis

5.1 Summary of Studies

The two original studies in this thesis examined various features influencing children’s active school travel (AST). The overall aim of this research was to better understand children’s choices of AST in order to improve interventions promoting increased physical activity (PA). Through the use of mixed methods, research objectives were investigated in two different but complimentary quantitative and qualitative studies. Both studies examined perceived barriers to AST through different approaches to better understand how these features affect children’s AST.

The first study (Chapter 3) used quantitative research methods to evaluate the differences between parent and child perceptions of barriers to AST. This study examined the effects perceptions of barriers have on explaining children’s AST decisions. As well, perceptions of barriers while controlling for multiple levels of the socio-ecological framework were evaluated. Matched parent and child surveys for 1,296 participants were used in the analysis, including information on demographics, socio-economic status, postal codes, mode of travel, and perceptions of barriers. Only children living within 1.6 km of their schools were included in the analysis. A chi-square analysis was used to determine whether there were significant differences between parent and child perceptions of barriers. Statistical analysis used logistic regression to explore how perceptions of barriers from parents and children influenced the outcome of AST to and from school, while controlling for multiple variables from the socio-ecological framework. Findings from this study show that parents and children have varying perceptions of barriers which influence children’s AST. As well, multiple factors influence how AST decisions are made. Specifically, barriers significantly influence the odds of children using AST to travel both to and from school. From the univariate analysis, significant barriers were identified. Parents and children had different perceptions, which impact AST on both the journey to school and from school. Significant relationships were seen with at least one variable at the intrapersonal, interpersonal, and physical environment level. However,
neither parents nor children perceived any barriers of the physical environment to impact children’s AST on the journey home from school. Findings support that a combination of factors including perceptions of environmental, safety, social, and preference barriers impact children’s AST differently on the journey to and from school. These results highlight, through the differences in parent and child perceptions, the important role that children play in decision making related to AST.

The findings from study 1 provide justification for the need of the second empirical study within this thesis. Study 2 (Chapter 4) aims to gain a deeper understanding of the features influencing children’s journey to and from school, directly from children’s perspectives. This study uses innovative methodology through the use of a combination of participatory mapping and focus groups. Twenty-five mapping exercises were completed with a total of 123 grade 5 and 6 students. This study was completed as a part of a larger community collaborative effort during Geography Awareness Week 2016 at one urban and one suburban elementary school in London, Ontario. Beyond the research, this project was used to further educate students about geography as a discipline and the influence their local environments have on their everyday lives. The study’s use of primarily child-led discussions allow children’s voices to be truly represented, while also attempting to soften the existing dominating role often seen when research is facilitated by an adult researcher (Sallis, Prochaska, & Taylor, 2000). These methods allowed children to discuss anything that they believed to be relevant to their journey to and from school. The findings from this study demonstrate that children have profound insights into understanding how their environments influence their use of AST. Children are able to extensively categorize their neighbourhoods based on their personal perceptions and individualized experiences. Children brought forth discussions on many enablers, barriers, and improvements that promote and hinder their use of AST on the journey to and from school. In general, findings were consistent at both schools revealing that many barriers to AST occur across all school neighbourhood surrounding areas regardless of location. Further understanding of the influencing factors affecting children’s AST is beneficial for creating impactful interventions aimed to increase children’s use of AST. Having an in-depth understanding of children’s environments allows policy makers and practitioners fundamental knowledge on how to best intervene and successfully increase
the amount of children choosing to walk to school. Increasing children’s use of AST is a targeted way to increase children’s daily levels of physical activity (PA).

5.2 Research Contributions

The findings from this thesis align with and expand upon previous research concerning how children’s environments influence their AST. More specifically, perceptions of features and how they influence children’s journey’s to and from school. Both studies found that multiple factors from all levels of the socio-ecological framework influence children’s AST. This finding reaffirms the importance of using a socio-ecological framework with research in this field in order to consider the many factors at multiple levels that influence children’s health outcomes.

This research contributes to both the fields of geography and children’s health by expanding on previous literature and adding rich quantitative and qualitative data on child AST. These studies improve upon the literature through the involvement of children in the research process. Often research examining barriers to AST is completed with only parents since it has been considered that parents have the final say in the way their children travel to and from school (McMillan, 2005). This research shows that parents and children have varying perceptions of barriers impacting AST, therefore adding evidence to the literature that it is important to gain both parent and child perceptions in the research process. Study 1 expands upon this area of research in three ways. First, as identified in the literature review (Chapter 2) this study fills gaps by addressing a range of factors influencing AST through the use of the socio-ecological framework. Intrapersonal, interpersonal, physical environment, and perceptions of barriers are all examined during the analysis of this study. The use of this framework allows for investigation on children’s AST from a multi-level approach. The analysis of these features beginning at the individual level and then through multiple analyses (i.e., chi-square, step-wise logistic regression, linear regression) generate findings not previously discussed within the current literature. Second, the inclusion of both parents and children in the analysis allows for a comparison between the impacts these perceptions have on AST. This way, instead of relying on parent responses to be representative of their children, we are able to see both parent and child perceptions individually. Finally, the
large sample size (n=1,296) through the combination of two datasets increases the generalizability of the findings from this study to other populations and locations. As well, having a large sample size allows researchers to narrow the margin of error within a study.

Study 2 shares many of the same contributions as study 1, through the use of qualitative research methods. This chapter adds to the literature through its innovative participatory methodology. This study embraces that student populations possess the expert knowledge about their environments and the influence it has on AST. This methodology is a valuable tool for providing researchers with contextually rich information from children’s lived experiences. Participatory mapping adds context to conventional GIS analysis researching children’s environments and through the use of visualization techniques provides individualized hot spot analysis maps identifying key locations in the schools surrounding environments. This form of research provides a comprehensive understanding of how children perceive their environments. The second contribution this study makes stems from its collaborative nature between research and the community. Co-facilitators of the mapping exercises involved invested community stakeholders with an interest in children’s AST (i.e., city planners, teachers, public health nurses, environmental and park planners, ecologists, community developers, operation technologists, and the mayor). A broader goal of this research was for these key decision and policy makers within the community to be able hear first hand perspectives from children on their daily environments, with the aim to translate findings from this research to action. Summaries from the research were sent to the participating schools after the completion of this research to provide the schools with the knowledge that was translated through this study. This research fills a gap in the literature where few studies have examined how children would change their journey to and from school if given the opportunity (Mitchell, Kearns, & Collins, 2007). It does so by providing children with an opportunity to share their spatial knowledge and perceptions of the barriers and enablers they experience on their journey to and from school, as well as share features in which they would like to see improvements made. Further understanding these areas of improvements provides schools and community stakeholders with specific locations in which to target AST interventions.
Study 1 and 2 share many of the same beneficial research contributions. The first major contributions that both studies make are the involvement of children in the research. These studies largely contribute to the field of children’s geographies with the focus on the places and spaces in children’s lives. These findings add to research by critically examining the ways in which children’s lives, attitudes, experiences, and opportunities are socially and spatially constructed (James, 1990). This research shows that children have meaningful insight to offer towards a better understanding of their AST behaviours. These findings accurately represent and expand on the literature to further the understanding that children need to be genuinely and significantly involved in the research in order to produce meaningful and representative research (Hart, 1992). As well, both of these studies investigate primary school-aged children perspectives, another area that few studies have been completed on in the past (Mitchell, Kearns, & Collins, 2007). Study 1 includes children in grades 4 to 8 and study 2 includes children in grades 5 to 6. The literature suggests children around the age of 10 are fully capable to walk to school by themselves, providing justification for the inclusion criteria of these studies being grades 4 to 8 (Metrolinx, 2011). Finally, the use of mixed methods framed by a socio-ecological framework provides the intention that both methodologies used provides a full spectrum of understanding the research and this area of interest. These findings support the inclusion of research with not on children and aims to remove the stigma often excluding children themselves from research (Sallis, Prochaska, & Taylor, 2000). Findings support that children’s AST is a key area for intervention in which to increase children PA and emphasizes the need to further understand the relationship between children’s environments and AST.

5.3 Limitations

With any research there are limitations that need to be considered during the interpretation of results before making recommendations based on them. The limitations within these studies are a combination of influences and shortcomings that could not be controlled for. While conducting this research, steps were closely and methodically followed to maintain the quality of the data along with the analysis, however it is imperative to understand the limitations that do exist within the research.
Study 1 provides rich data with a large sample size through the combination of two datasets. With data being collected in the form of surveys all information comes from self-reported data, which should be taken at face value as it may contain areas of bias such as selective memory or exaggeration (Aguinis & Edwards, 2014). Another limitation that arises from the use of surveys is related to the questions asked, specifically barrier questions. Although these questions ask about a wide range of features that children experience on their journey to and from school it is limited to the specific barriers asked on the surveys. Children may experience barriers that exist beyond the questions asked within the designated survey questions. To alleviate this issue a blank space was left at the bottom of the barriers questions, however the majority of parents and students left this option blank. With the overall objective of this research aimed to better understand children’s environments it would also be beneficial to ask questions to further our understanding of features children perceive as enabling on their journey’s to and from school. Finally, the use of postal codes used for calculating children’s walking distance instead of their exact home locations is a limitation of this research. Although this technique has often been used in the research because of ethical issues that arise when completing research with children, this may cause slight variations in calculated distance from children’s home to school (Healy & Gilliland, 2012).

Study 2 attempts to address many of the limitations found in study 1 through the use of qualitative research methods. This methodology recognizes that often children find surveys intimidating or boring (Barker & Weller, 2009; Smith & Barker, 2000). However, in doing so researchers must be aware that studies they perceive to be child-friendly and empowering, children may view as adult centered (Oakley, 1994). The participatory design of the mapping exercises attempts to increase the involvement of children in the research beyond other qualitative research (i.e., interviews). The uses of these participatory methods do have some noteworthy limitations. In order to fully immerse children in the research process, facilitators were simply present to engage students throughout the process if they need prompting, making audio transcriptions a somewhat chaotic process. It was nearly impossible to make distinctions between children during the conversations, therefore much of the analysis was unable to evaluate based on participant’s gender. As well, with the participatory nature of this study all
children with consent were included in the analysis, regardless of the mode of travel (MOT) they use to get to and from school (i.e., active or non-active). Therefore findings are not categorized based on children’s MOT. Although this is a limitation of this study, it is also a benefit since it is inclusive of all children’s perceptions of their local environments.

5.4 Implications for Policy and Practice

The use of a socio-ecological framework allows for multi-level interventions that use a combination of intrapersonal, interpersonal, environmental, and policy level factors to have the greatest impact on behaviour change (Sallis & Owen, 2002; Sallis et al., 2006). The application of results from this research through the use of a socio-ecological framework allows for impacts on environments to be made through public health promotions and policy development on a multitude of levels such as planning, education, and programming interventions (Hill, 2012). The decision to use AST is a complex one and can be influenced by multiple factors. A multi-faceted approach is able to target interventions through promotion, education, community stakeholders, and policy change, reaffirming the importance of considering all aspects involved when implementing AST promotion.

The broadest aim of this thesis was to allow findings to help support existing knowledge to provide further evidence demonstrating the beneficial effects children’s perceptions of their environments can have on AST and children’s overall health. There are numerous physical, psychological, emotional, and behavioural health benefits associated with AST and regular PA in children (Sallis, Prochaska, & Taylor, 2000). AST can provide children with many benefits including overweight prevention, higher academic performance, lower body mass index (BMI), increased fitness, and improved spatial and cognitive development (Boarnet, Anderson, Day, McMillan, & Alfonzo, 2005; Lubans, Boreham, Kelly, & Foster, 2011; Mendoza et al., 2011; Oliver, Badland, Schofield, & Shepherd, 2011; Singh, Twisk, Mechelen, Chinapaw, & Central, 2012). Health promotion strategies at the policy level need to prioritize targeting children’s local environments as an opportunity to increase daily rates of PA.
Findings from this research identify areas and features within children’s environments that school boards and public health promotion should target to facilitate the promotion of increasing children’s AST and improving their overall health outcomes. Currently, a wide scope of intervention methods are practiced across school boards with the aim of increasing children’s AST. A few of the most commonly used interventions are the use of school travel planning (STP), walking school busses, and International Walk to School Day. An STP is a commonly used tool used by schools and community stakeholders through collaboration to create and implement school-level action plans that systematically address barriers preventing and incentives enabling children to walk to school. An STP program typically runs for two to three years and primarily targets transportation and traffic safety issues to increase the number of students using AST (Green Communities Canada, 2010). Another commonly used intervention at an organizational level is the implementation of a walking school bus program. A walking school bus is achieved through adult supervision of children’s group travel, and informal forms of road safety knowledge (Kearns et al., 2003). This program is beneficial for increasing AST along with promoting individual and community well-being through safe pedestrian use of the streets. The final organizational level intervention often seen is the implementation of a Walk Safely to School Day campaign or iWalk day within schools (Green Communities Canada, 2010). Both of these are nationally recognized annual events hosted by schools on a specific day to promote and bring awareness to AST. This form of intervention allows school communities to tailor events to specific features of their schools environments while encouraging AST to the school population and community.

From the policy perspective, schools boards, planners, and municipal stakeholders have the means to make infrastructure decisions and implementations that can foster children’s environments encouraging AST. A benefit of this research is that the findings are able to be used for policy and practice within the local community. General findings from study 1 demonstrate that a combination of perceptions of environmental, safety, social, and preference barriers impact children’s AST. As well, our findings suggest that interventions, such as the ones previously mentioned (i.e., STP, walking school bus) should focus on safety, as well as changing false perceptions of distance. Findings from
study 2 suggest that interactions with people, infrastructure, and crossing guards are the most common topics of discussion relating to AST across children from varying school environments. A general supportive environment has a positive influence on children’s journeys to and from school. This finding is consistent with the literature in that children are more likely to choose healthy behaviours, such as AST, when they are surrounded by a supportive environment (Ball, Timperio, & Crawford, 2006; Panter, Jones, Van Sluijs, & Griffin, 2010; Strauss & Knight, 1999; World Health Organization [WHO], 2006).

These findings reiterate the importance of school siting decisions made by school boards, city planners, and public health professionals (Larsen et al., 2009). Shorter distance is a key influence on the mode children use to travel to and from school and should be considered by all those who have an input in deciding these school locations and boundaries. As well, the physical and social infrastructure surrounding the school has a large influence on children’s journeys to and from school and should be consistently evaluated to make sure it is supportive to the children attending these schools.

The involvement of children in the decision-making process provides the benefits of their spatial perceptions which are invaluable and should be considered before implementing any interventions. Results show how important it is to acquire children’s perceptions when researching a topic related to them and developing evidence-based interventions. Continued consultation of children in the development of intervention programs and policies is essential (Barker & Weller, 2009). This thesis supports the findings that there is not a one size fits all solution to AST. Although many schools’ surrounding areas share similar issues that need to be addressed, what is right for one school may not be right for another based on the features of the school’s surrounding environment. Taking the time to talk directly to the students and understanding their perceptions of influences that enable or impede their use of AST should always be considered when possible before implementing new interventions, policies, or procedures. As well, it is important when evaluating AST interventions that they are not assessed solely on the success of behaviour change, it is also vital that they are sustainable (Kohl et al., 2012; Serpas et al., 2013).
5.5 Future Research

Although this thesis provides explanations about how children’s perceptions of their environments impact their AST, future research could expand on these findings.

Study 1 shows us that local environments and children’s perceptions of these environments impact their use of AST. Future research should expand on this study by completing similar research in diverse environments. Implementing this research in different size cities, with different infrastructures, would allow for further comparisons between different environments. Expanding this research into different areas would allow these regions to see what local parents and children perceive to be barriers influencing their AST, and provide these areas with localized suggestions to focus intervention methods on. Another area this research could expand on is the effect the climate we live in has on children’s AST. The majority of research completed in this area does not take into account seasonality when examining children’s AST.

Study 2 looks at the comparison of two local environments and the differences and similarities their neighbourhood context has on children’s AST. Future research can move beyond evaluating perceptions of children within these different environments and examine if location has an influence on AST and children’s measureable physical health findings. Furthermore, this study focused on two schools and the comparison between their urban and suburban school environments. The next step is to compare this data to a school in a rural environment, since many of these students would have diverse perceptions of barriers and enablers on their journey to and from school based on their localized environment. This comparison would allow for a better understanding of the urban and suburban environments already evaluated, as well as add to the lack of qualitative and general research on rural children’s perceptions of their environments (POWER UP, 2016). Finally, expanding this research beyond elementary school students is a potential next step. Middle and high school students are at different stages in their childhood, therefore, having different influencing factors and diverse perceptions of features within their local environments. The addition of these populations would help to expand on current findings and see how AST habits change with age.
The decision for children to participate in AST is a complex behaviour, so it is important to evaluate many different influences on this behaviour to fully understand the factors influencing children’s AST. There are countless reasons why children may choose to use AST based on their perceptions, and these studies are only able to evaluate a select few. The schools involved with the ASRTS program are all a part of a STP process. Results from this thesis identify areas which interventions should target in order to decrease children’s negative perceptions of barriers with the hope that this will increase children’s use of AST. After the baseline data collected for this thesis was completed, the schools then spend two or three years implementing school specific interventions. After this time, follow-up surveys occur, a process which has recently begun being collected over the last year. A comparison of baseline and follow-up data for these schools post intervention would provide invaluable insight into this form of AST intervention. As well, further research examining the evaluation of these intervention programs undertaken at these schools would provide valuable findings. Research completed with the stakeholders, community members, public health nurses, and school staff helping to implement these STP programs within the schools would provide powerful insight into the success, issues, and possibility of intervention strategy replication within different schools.

5.6 Conclusion

The purpose of this research was to investigate how parents and children perceive features in their environments and how these perceptions impact children’s AST. Assessing perceptions of features and how they influence school travel is the first step in understanding how to increase children’s use of AST. Furthermore, it assesses how children perceive different features of their local environments and how these features influence their journey to and from school based on where they live (i.e., urban versus suburban). In doing so, this thesis provides insight into children’s AST and identifies key features to target through future interventions. This research aligns with the overall aim of increasing children’s PA, and in turn, improving children’s overall well-being. Findings show that children have an invaluable depth of understanding their local environments. Both studies within this thesis highlight the importance children’s perceptions of features in their local environments have on children’s decisions to use
AST. With obesity rates rising and inactivity being at the forefront of Canadian health concerns, AST provides a unique opportunity to encourage and increase children’s daily levels of PA. One of the most efficient ways to increase children’s PA is through the influence of a supportive environment. By furthering our understanding of concepts related to children’s perceptions of their environments, we gain the knowledge necessary to inform decisions about AST intervention methods and policy development. Findings from these studies are useful for policy makers, educators, planners, and health professionals who have a vested interest in children’s overall health and well-being.
5.7 References


Appendices

Appendix A Research Ethics Approval Form and use of Human Participants

ASRTS (redacted)
January 8, 2016

Dear Dr. Gilland:

The continuation of your project, entitled "London and Area School Travel Plan Pilot" has been approved by Learning Support Services at the Thames Valley District School Board. You are welcome to begin data collection for your study. Please ensure that all members of your research team who will be assisting with data collection involving students have an up-to-date criminal record check.

The continued willingness of our faculty to participate in research studies is greatly enhanced by pertinent feedback of findings. Please find attached the Thames Valley District School Board Study Completion Form. Once you have completed your research in our board, please complete this form and submit it to Dr. Steve Killip. This form should be submitted within two years of receiving approval. It is also suggested that direct feedback be provided to the school(s), staff, students, and/or families involved in the study.

All the best with your research. Please feel free to contact me if I can be of further assistance.

Sincerely,

Steve Killip, Ph.D.
Manager - Research and Assessment Services
Thames Valley District School Board

/cc: M. Deman, Superintendent of Student Achievement
Appendix C London District Catholic School Board Approval Form ASRTS
(redacted)

December 7, 2015

Dr. Andrew Clark
Human Environments Analysis Laboratory
Department of Geography, Western University

Dear Andrew:

Re: Approval of Active and Safe Routes To School Project Ref. # 201308

Please consider this letter as formal written approval of the London District Catholic School Board’s participation in the Active & Safe Schools Route research project.

The project aims to provide a better understanding of what barriers exist that impede active travel to school, and address the identified barriers through the creation and implementation of a comprehensive travel plan for each school by a team of relevant stakeholders from within the school and wider community.

The research proposal was reviewed and approved by the Board’s Research Advisory Committee. Approval was originally provided in the spring of November 2013 via an email correspondence, as well as in a telephone conversation to Diane Szoller who at the time served as a Co-chair ELMO ASRTS Steering Committee.

Please let me know if you require any additional information at this time.

Sincerely

Terry Spencer
Research and Evaluation Officer
London District Catholic School Board

Board Office
Cell
Email
Website www.ldcsb.on.ca
Appendix D Parent Letter of Information ASRTS (redacted)

Dear parent or guardian,

Dr. Jason Gilliland and his research team from Western University invite you and your child to participate in a study aimed at understanding how School Travel Planning may impact your child’s use of active transportation to and from school. The study involves students from grades 4 through 8 at participating elementary schools across the counties of Elgin, Middlesex, Oxford, and the cities of London and St. Thomas.

What is being studied?
Our team is studying the barriers to active transportation to and from school, and the effectiveness of the School Travel Planning program in increasing the number of children and their families who choose active transportation. Through the distribution of family and youth surveys, we aim to learn what concerns you and your child(ren) have with the journey to and from school, and how that journey changes after action is taken to address identified concerns.

What will happen in this study?
If your child agrees to participate in our project, your child will be asked to:

Complete the School Travel Planning Youth Survey. Only children in grades 4 through 8 are invited to participate in the Youth Survey. This survey primarily asks children about the nature of, and how they feel about their travel to and from school. Surveys usually take about 15-20 minutes to fill out and will be done in their classroom at a time decided by their teacher. (Note: students not filling out the survey will be given quiet activities by their teacher to do at their desks).

As the child’s parent/guardian, you will be asked to:

Complete the School Travel Planning Family Survey. The survey asks many of the same questions as the Youth survey, as well as questions about your household and your child’s physical activity schedule. It usually takes about 10-15 minutes to fill out. The Parent Survey is completely voluntary – your child can still join the study themselves even if you decide not to fill out the Parent Survey. However, as the survey gives us critical information from the point of view of parents, we would really appreciate your participation. Family surveys will be sent home with each child in grade 4-8 and the youngest (or oldest) child in JK-Grade 3. If you receive more than one family survey, fill out a survey for each child in Grade 4-8, and only fill out a survey for your child(ren) in JK-Grade 3 if the walk to and from school is different from your child(ren) in Grade 4-8.

Do we have to participate in this study?
Your participation in this study is completely voluntary. You and your child do not have to
participate. You can each refuse to answer any survey questions, and can choose to leave the study at any time.

**What are the benefits and risks if my child participates?**

Research shows physical activity through active transportation to and from school can; improve physical and mental health, improve traffic and safety around your school, improve air quality and help the environment, have students arrive at school alert and ready to learn, and increase community connectivity. This study will help us to better understand the barriers of active transportation to and from school. The results will allow your School Travel Planning committee to develop an action plan to remove existing barriers to active transportation.

There is little risk to your child if he/she participates in this study, but there is a slight chance that you or your child may be uncomfortable sharing details of your family, such as economic status, to the researchers, which may be seen by your child’s teacher while the survey is being collected. This is being minimized as follows. You or your child will not be personally identified or identifiable by name in any of the documents related to the study. All of the information collected in this study is kept strictly confidential. You and your child will be assigned a unique identification code – your name will not appear on any materials or data files except for this consent form. We will also be collecting postal codes to estimate the path your child(ren) take to and from school. The postal codes will be stored separate from other survey data. Furthermore, materials and data files will ONLY be viewed by members of the research team and will be stored in a locked filing cabinet until transferred onto a password protected computer in a secure facility at the University of Western Ontario. The results of this study will only be presented for groups so that children will never be individually identifiable.

If you or your child decides to leave the study at any time (even up to 30 days AFTER the study has been completed), any data collected from you or your child will be immediately destroyed and excluded from the analysis.

You do not waive any of the legal rights you would otherwise have as a participant in a research study.

**Who do I contact if I have any other questions?**

Should you have any questions or concerns about participating in this project, you can contact the lead researcher, Dr. Jason Gilliland, at the University of Western Ontario. Phone: [redacted]

If you have any further questions regarding your rights as a study participant, please contact the Office of Research Ethics at [redacted]

This letter is for you to keep. Please complete the research registration section on the School Travel Planning Consent form for you and your child(ren).
Appendix E Parent Consent ASRTS (redacted)
Appendix F Family Survey ASRTS

School Travel Planning: Family Survey

We need your help to make the School Travel Planning a success and to learn how to make your neighbourhood safer for walking. Your honest answers to the items in this survey are very important to us. This will not take long to complete.

A. Household Information

Please provide the following information for each child attending this school.

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2. What is your relationship to the child (taking part in the study)?
   - Mother
   - Father
   - Primary caregiver/Guardian
   - Other: ____________

3. Postal code of your child's primary home: _________ - _________
   a. How many days a week do they live at this address?
      - 1
      - 2
      - 3
      - 4
      - 5
      - 6
      - 7

4. Postal code of your child's secondary home (if applicable): _________ - _________

5. How many motor vehicles in working order (cars, vans, trucks, and motorcycles) are there at your household?
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

6. Do any of your children have any medical or physical limitation which prevents them from engaging in physical activity?
   - Yes
   - No

B. Additional Household Information

1. Please select the highest level of education the child's mother has completed.
   - Grade: ____________
   - College/University
   - Graduate School
   - Not applicable

2. Please select the highest level of education the child's father has completed.
   - Grade: ____________
   - College/University
   - Graduate School
   - Not applicable
3. Which of the following best describes the current work status of the child’s mother?
   - Employed full-time
   - Employed part-time
   - At home with children
   - Unemployed
   - Student
   - Other ________________
   - I prefer not to answer
   - Not applicable

4. Which of the following best describes the current work status of the child’s father?
   - Employed full-time
   - Employed part-time
   - At home with children
   - Unemployed
   - Student
   - Other ________________
   - I prefer not to answer
   - Not applicable

C. School Travel Planning

1. Do you support ongoing School Travel Planning efforts to make the school area safer, healthier and better connected to the community, by focusing on ways to reduce the number of children travelling to and from school by car?
   - Yes
   - No

D. Your Child’s Trip To and From School

The following questions are about how your child gets to and from school each day. Please check the best answer for your child and his/her school.

1. Does your child live within walking distance of their school (from their primary residence)?
   - Yes
   - No

2. Is your child eligible to take a school bus to and from school (i.e., live in an area with a school bus)?
   - Yes
   - No
3. Number of days per week your child usually travels to school by:

For example, if your child always rides a school bus to school, check the 5 box in the row "School Bus."

<table>
<thead>
<tr>
<th>Walking</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle/Scooter</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Skateboard/Rollerblades</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Car/personal vehicle</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>School Bus</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>City Bus</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

a. When your child travels to school (or the bus stop if bused), who do they travel with (Check all that apply)?

○ Nobody □ Parent(s)
○ Brother(s) or Sister(s) □ Other Adult(s)
○ Friend(s) □ Other Student

b. If your child is bused, how does your child get to the bus stop (Check all that apply)?

○ Not Bused
○ Walking
○ Car/personal vehicle
○ Other (Please specify): ______________________

c. If you drive your child to school, where do you go after you drop them off?

○ Not driven
○ Go to work
○ Go home
○ Go to other destinations (please specify): ______________________
4. Number of days per week your child _usually_ travels _from_ school by:

   For example, if your child always rides a school bus from school, check the 5 box in the row 'School Bus.'

<table>
<thead>
<tr>
<th>Mode</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle/Scooter</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Skateboard/Rollerblades</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car/personal vehicle</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Bus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City Bus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. When your child travels home _from_ school (or the bus stop if bused), who do they travel with (Check all that apply)?

   - [ ] Nobody
   - [ ] Parent(s)
   - [ ] Brother(s) or Sister(s)
   - [ ] Other Adult(s)
   - [ ] Friend(s)
   - [ ] Other Student

b. If _your child is bused_, how does he/she travel home _from_ the bus stop (Check ALL that apply)?

   - [ ] Not Bused
   - [ ] Walking
   - [ ] Car/personal vehicle
   - [ ] Other (Please specify): ________________

c. If you _drive your child home_ from school, where are you coming _from_ before you pick them up?

   - [ ] Not driven
   - [ ] Go to work
   - [ ] Go home
   - [ ] Go to other destinations (please specify): ________________
d. If you **drive your child home** from school, where do you go after you **pick them up**?
   - Home
   - After school activities
   - Go to other destinations (please specify): 

5. If your child walks or bikes to or from school, how long does it **usually** take him/her (one way)?
   - Between 1 and 10 minutes
   - Between 11 to 20 minutes
   - More than 20 minutes
   - **My child does not walk/bike to/from school**

6. How long does it **usually** take your child to get to/from school each day (one way)?
   - Between 1 and 10 minutes
   - Between 11 to 20 minutes
   - More than 20 minutes

7. If you had your ideal choice, how would you most like your child to get to and from school each day?
   - Walk
   - Driven in a car
   - Ride bicycle or scooter
   - Take school bus
   - Ride skateboard or rollerblades
   - Take city bus

8. When you were a child, how did you typically travel to school?
   - Walk
   - Driven in a car
   - Ride bicycle or scooter
   - Take school bus
   - Ride skateboard or rollerblades
   - Take city bus

**E. Barriers to walking and biking to school**

1. Is your child allowed to walk to/from school (some or all days)?
   - Yes
   - No
2. Is your child allowed to bike to/from school (some or all days)?
   - O Yes
   - O No

<table>
<thead>
<tr>
<th>It is difficult for my child to walk or bike to school or their bus stop because...</th>
<th>I strongly disagree</th>
<th>I disagree a little bit</th>
<th>I agree a little bit</th>
<th>I strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. It is too far or takes too much time</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4. There are not enough sidewalks</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>5. There are not enough bike paths / lanes</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>6. The route is boring</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>7. It feels unsafe due to traffic on the route</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>8. There are too many busy streets to cross</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>9. They get too hot and sweaty</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>10. There is no one to walk with</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>11. It's not fun for them to walk</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>12. They have too much stuff to carry</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>13. It is easier to drive them there</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>14. It feels unsafe because of crime (example: strangers, gangs, drugs)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>15. They might get bullied or teased along the way</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>16. There is nowhere to leave a bike safely at school</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>17. They are too young to walk/bike to school</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>18. They don't have cycling skills to ride a bike safely on the street</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>19. Other reason:</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
### F. Streets in our neighbourhood

<table>
<thead>
<tr>
<th>Please check the answer that best applies to you and your neighbourhood</th>
<th>I strongly disagree</th>
<th>I disagree a little bit</th>
<th>I agree a little bit</th>
<th>I strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There are enough sidewalks on the streets in our neighbourhood</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. There are walking trails in or near our neighbourhood that are easy to get to</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. There are bicycle lanes or trails in or near our neighbourhood that are easy to get to</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. There are lots of trees along the streets in our neighbourhood</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. We know a lot of people in our neighbourhood</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### G. Neighbourhood Safety

<table>
<thead>
<tr>
<th>Please check the answer that best applies to you and your neighbourhood</th>
<th>I strongly disagree</th>
<th>I disagree a little bit</th>
<th>I agree a little bit</th>
<th>I strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is so much traffic along the street we live on that it makes it difficult or unpleasant for my child to walk</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. There is so much traffic along other streets near our home that it makes it difficult or unpleasant for my child to ride their bike or play on the streets in our neighbourhood.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Most drivers go too fast while driving in our neighbourhood.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. There is a lot of crime in our neighbourhood.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. I feel unsafe to let my child walk alone around our neighbourhood during the day</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. It feels unsafe to let my child walk around with friends or siblings in our neighbourhood during the day</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7. I am worried about my child being or walking alone in my neighbourhood and local streets because I am afraid of him/her being taken or hurt by a stranger.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Appendix G Child Assent Form ASRTS

How Do You Get To School?

Hello! We are researchers from Western University and we are doing a study in your school. We need students in Grades 4 through 8, like you, to help us learn how to make it easier to choose active transportation to and from school.

What are we going to study?
We all know that active transportation is great for the environment and your health. We’d like to know how you get to school or your bus stop and what is making traveling actively difficult in your neighbourhood.

What would you have to do?
If you agree to be in the study, we would like you to fill out a short survey on how you get to and from school, what you like about the journey, and what you would change about it. You will fill out the survey during class time with your peers. It takes about 15-20 minutes to finish but you can take as much time as you need.

Do you have to join this project?
No – you only join if you want to. You can also decide at any time that you would like to stop. We will never share your information with anyone else, even your parents, but you can ask to see it at any time. You can ALWAYS talk to your teacher or the researchers if you have any questions or worries.

I want to participate in this study!
If you would like to join this study, choose one of the following two options:

☐ I want to participate in the study

First and Last Name ________________________________

Sign your name _______________________________ Date ________________

Signature of Teacher ___________________________ Date ________________
Appendix H Child Survey ASRTS

School Travel Planning: Youth Survey

We need your help to better understand how to make your neighborhood safer and encourage active travel (e.g., walking and bicycling). Your honest answers to the items in this survey are very important to us. This will not take long to complete. Remember:

- We want to know what you think,
- There are no right or wrong answers, and
- Everything you tell us will be kept strictly confidential (secret).
- Try to answer all the questions.

Please answer these questions thinking about the house and neighborhood that you live in the most.

A. General Information

1. I am a O Girl O Boy

2. How old are you?  0  1  2  3  4  5  6  7

3. What grade are you currently in?  0  1  2  3  4  5  6

4. How many people live (including yourself) in your main home?  0  1  2  3  4  5  6

5. How many children (including yourself) live in your main home?  0  1  2  3  4  5

6. Postal code at your main home (or closest main intersection): _____ _____ _____ _____

7. How many days a week do you live in your main home?  0  1  2  3  4  5  6

8. If you have a second home (where you sleep some nights), what is the postal code (or closest main intersection): _____ _____ _____ _____

9. Do you have asthma or regularly have breathing problems? O Yes O No
   a. If yes, do you use an inhaler? O Yes O No
10. Do you have a dog?  O Yes  O No  
   a. If yes, on how many days last week did YOU walk your dog?  
      1  2  3  4  5  6  7  8  9  10 

11. Have you and your family moved within the last 2 years?  O Yes  O No  

B. Your Trip To and From School  
The following questions are about how you get to and from school each day. Please check the best answer.  
1. Do you own a bike?  O Yes  O No  
2. Do you live within walking distance of your school?  O Yes  O No  
3. How often in a normal week do you travel TO SCHOOL by:  

<table>
<thead>
<tr>
<th></th>
<th>Never (0 Days)</th>
<th>Almost never (1 or 2 days per month)</th>
<th>Sometimes (1 to 2 days per week)</th>
<th>Frequently (3 to 4 days per week)</th>
<th>Always (5 days per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Bicycle/Scooter</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Skateboard/Rollerblades</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Car/Personal Vehicle</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>School Bus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>City Bus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

a. When you travel from home TO SCHOOL (or the bus stop if you bused), who do you usually travel with (Check ALL that apply)?  
   O Nobody  O Parent(s)  O Brother(s) or Sister(s)  O Other Adult(s)  O Friend(s)  O Other Student(s)  

b. Do you usually stop on the way to school?  
   O No  
   O Yes: Please specify (i.e., friend’s house, variety store, before school activities)
4. How often in a normal week do you travel **FROM SCHOOL** by:

<table>
<thead>
<tr>
<th></th>
<th>Never (0 Days)</th>
<th>Almost never (1 or 2 days per month)</th>
<th>Sometimes (1 to 2 days per week)</th>
<th>Frequently (3 to 4 days per week)</th>
<th>Always (5 days per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Bicycle/Scooter</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<td>O</td>
</tr>
<tr>
<td>Skateboard/Rollerblades</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Car/Personal Vehicle</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>School Bus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>City Bus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

a. When you travel **FROM SCHOOL** (or the bus stop if your bused) to home, who do you usually travel with (Check ALL that apply)?

- [ ] Nobody
- [ ] Parent(s)
- [ ] Brother(s) or Sister(s)
- [ ] Other Adult(s)
- [ ] Friend(s)
- [ ] Other Student(s)

b. Do you usually stop on the way home from school?

- [ ] No
- [ ] Yes: Please specify (i.e., friend’s house, variety store, afterschool activities)

5. If you walk or bike to or from school, how long does it **USUALLY** take you (one way)?

- [ ] Between 1 and 10 minutes
- [ ] Between 11 to 20 minutes
- [ ] More than 20 minutes
- [ ] I don’t usually walk/bike to or from school

6. If you had **YOUR** ideal choice, how would you **MOST** like to get to school each day (Choose 1)?

- [ ] Walk
- [ ] Ride bicycle or scooter
- [ ] Drive skateboard or rollerblades
- [ ] Driven in a car
- [ ] Take school bus
- [ ] Take city bus
C. Barriers to walking and biking to school

1. Are you allowed to walk to school (some or all days)?  ○ Yes  ○ No
2. Are you allowed to bike to school (some or all days)?  ○ Yes  ○ No

<table>
<thead>
<tr>
<th>Does this stop you from walking/biking to school or to your bus stop?</th>
<th>Always No</th>
<th>Usually No</th>
<th>Usually Yes</th>
<th>Always Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. It is too far or takes too much time</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4. There are not enough sidewalks</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5. There are not enough bike paths / lanes</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6. The route is too boring</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7. It feels unsafe due to traffic on the route</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>8. There are too many busy streets to cross</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>9. I get too hot and sweaty</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>10. There is no one to walk or bike with</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>11. It is not fun</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>12. I have too much stuff to carry</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>13. It is easier for someone to drive me</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>14. It feels unsafe because of crime (e.g., strangers, gangs, drugs)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>15. I might get bullied / teased along the way</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>16. There is nowhere to safely leave a bike if I ride my bike to school</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>17. I don't think I have the skills to ride my bike safely</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>18. Other reason: __________________________</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
D. Streets in Your Neighbourhood

<table>
<thead>
<tr>
<th>Please tell us about your neighbourhood streets.</th>
<th>Completely No</th>
<th>Mostly No</th>
<th>Mostly Yes</th>
<th>Completely Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There are enough sidewalks on the streets in my neighbourhood</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2. There are walking trails in or near my neighbourhood that are easy to get to</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3. There are bicycle lanes or trails in or near my neighbourhood that are easy to get to</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4. There are lots of trees along the streets in my neighbourhood</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5. I know a lot of people in my neighbourhood</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

E. Neighbourhood Safety

<table>
<thead>
<tr>
<th>Please tell us about your neighbourhood’s safety.</th>
<th>Completely No</th>
<th>Mostly No</th>
<th>Mostly Yes</th>
<th>Completely Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is so much traffic along the streets we live that it is difficult or unpleasant to walk</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2. There is so much traffic along other streets near my home that it makes it difficult to ride my bike or play on the street</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3. Most drivers go too fast while driving in our neighborhood</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4. There is a lot of crime in my neighbourhood</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5. It feels unsafe to walk by myself around my neighbourhood during the day</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6. It feels unsafe to walk with friends or siblings in my neighbourhood during the day</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7. I am worried about being alone or walking by myself in my neighbourhood and local streets because I am afraid of being taken or hurt by a stranger</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

You're finished! Thank you for all your help!
Appendix I Participatory Mapping Exercise Letter of Information (redacted)

Dear Parents/Guardians,

Dr. Jason Gilliland and his research team from Western University invite your child to participate in a brief research project related to the School Travel Planning (STP) process already ongoing at your child's school.

What is being studied?

Our team wishes to learn more about children's perceptions and experiences of their neighbourhood environment during a walk around the school. This brief research activity will help us to improve the STP process and program effectiveness at your school by helping us to understand your child's perceptions of the 'walkability' of the neighbourhood surrounding their school. Gaining this knowledge from your child's perspective will help the STP program make known barriers and enable them to influence the number of children and their families who choose active transportation.

What will happen in this study?

Your child will be asked to participate in a 30-minute walking group with his/her classmates. The walking groups will consist of 12-4 students along with a research assistant from Western University and the school's public health nurse. Children will be asked to lead a walking tour of the neighbourhood around the school and the areas that they would typically use on their journey to and from school daily. During the walking tour, children will be asked to discuss neighborhood features around the school that support or hinder walking. The walking groups will be audio recorded, however, only non-identified quotes will be used.

As the child's parent/guardian, you will be asked to:

- Please complete and return to school the attached consent form if you would like your child to participate in the walking group. This consent form will ask you for your postal code, this information is necessary for us to know how far your child lives from his/her school. The walking groups will discuss different topics depending on whether the children in the group are able to walk/bike to school.

Do I have to participate in this study?

Your child's participation in the discussion is completely voluntary. They do not have to participate. They can refuse to answer any questions and can choose to leave the study at any time. If they choose to leave the study during the walking group, then they will be escorted back to the school where other Geography Awareness Week activities are taking place.

What are the benefits and risks of participating?

Research shows that physical activity through walking/biking to and from school can improve physical and mental health, improve traffic and safety around your school, improve air quality and help the environment, have students arrive at school alert and ready to learn, and increase community connectivity. This study will allow researchers to understand the children's perspectives and subjective experiences of active travel. The results from this research will help to improve the STP program at your child's school by furthering our understanding of what the children experience while travelling to and from school daily.

There is little risk for your child to participate in this study, but there is a small chance that they may be uncomfortable sharing details of their journey to and from school. This is being minimized as follows. They will

28/09/2016
information collected in this study is kept strictly confidential. Their name will not appear on any materials or data files except for this consent form. Furthermore, materials and data files will ONLY be viewed by members of the research team and will be stored in a locked filing cabinet until transferred onto a password protected computer in a secure facility at Western University.

**Who do I contact if I have any other questions?**

Should you have any questions or concerns about participating in this project, you can contact the lead researcher, Dr. Jason Gilliland, at Western University. 

If you have any further questions regarding your rights as a study participant, please contact the Office of Research Ethics at
Appendix J Participatory Mapping Consent Form (redacted)
Appendix K Research Ethics Amendment Approval Form for use of Human Participants ASRTS Participatory Mapping Exercise (redacted)
Appendix L Thames Valley District School Board Approval Form ASRTS
Participatory Mapping Exercise (redacted)

10 Nov 2016

Dear Dr. Clark:

The amendment to your previously approved project, entitled "Active and Safe Routes to School Committee's School Travel Planning Evaluation" has been approved by Learning Support Services at the Thames Valley District School Board. You are welcome to begin data collection for your study. Please ensure that all members of your research team who will be assisting with data collection involving students have an up-to-date criminal record check.

The continued willingness of our families and staff to participate in research studies is greatly enhanced by pertinent feedback of findings. It is suggested that direct feedback be provided to the school(s), staff, students, and/or families involved in the study. Please find attached the Thames Valley District School Board Study Completion Form. Once you have completed your research in our board, please complete this form and submit it to Research and Assessment Services. This form should be submitted within two years of receiving approval. If the study is not completed within two years of the date on this letter, please submit a study extension request to Dr. Sarah Folino.

All the best with your research. Please feel free to contact me if I can be of further assistance.

Sincerely,

Sarah Folino, Ph.D.
Research and Assessment Services
Thames Valley District School Board
Email: [redacted]

/sd

cc: M. Deman, Superintendent of Student Achievement

We build each student's tomorrow, every day.
Appendix M Participatory Mapping Exercise Child Assent (redacted)

Letter of Assent: Student

Principal Investigator:
Dr. Jason Gilliland, Department of Geography, University of Western Ontario
Phone: [redacted]

Hello! We are researchers from the University of Western Ontario and we are doing a study in your school! We need students in Grades 5-6, like you, to help us with this project.

What are we going to study?
We all know that getting lots of exercise and eating the right foods can help keep us healthy. Did you know that walking or biking to school is also a great way to keep us active and healthy? Every day when you come to school you travel the same route. We’d like to know your thoughts about the environment around your school that you pass everyday and if these places in your neighbourhood also help to keep you healthy. You will not be tested! We want to collect this information so we can share our results with you and others who can help make your environments healthier.

What would you have to do?
If you agree to be in this study we will ask you to participate in a walking group around your school’s neighbourhood. You will get to choose where we go! You and a group of friends will be leading a research assistant and your school nurse around your schools neighbourhood. During this walk we are interested in hearing your thoughts and opinions on the areas you would pass on your journey to and from school.

This will take place at your school. We would like to audio record our walk. All group walks are audio-recorded and transcribed word for word, as it is not possible to audio-record some participants and not others. If you do not want to be audio recorded you can participate in another activity.

Do you have to join this project?
No—you will only join if you would like to. You can also decide at any time that you would like to stop. We will never share your information with anyone else, even your parents, but you can ask to see it at any time. You can ALWAYS talk to your teacher or the researchers if you have any questions or worries.

This letter is yours to keep for future reference.
I want to participate in this study!

If you would like to participate in the study please write your first and last name, age and date.

_________________________  __________________  __________________
Print First and Last Name                      Age                      Date

_________________________  __________________
Signature of Person Obtaining Assent                      Date
Appendix N Participatory Mapping Exercise Guide

Part I: Mapping Exercise

1. Introduction of exercise
2. When ready to get started have all the children in your group write their first names, grade and age in the bottom corner of the sheet.
3. If facilitating a group with consent turn on recorder for the mapping exercise (should be recording and taking notes). For groups without consent notes should still be taken in case walking-tours are reined out and students need notes to present their maps to the class.
4. Have each student locate their home on the map (with a star sticker); then have each student to draw the route they take from home to school and write somewhere on the line how they usually travel (e.g. walk, bike, bus, drive) with different coloured markers so we can distinguish one route from the other.
   - They may need help locating their house on the map- try not to point it out directly but work to help them pinpoint its location
   - For children whose home is located off the map, write on the side of the map postal code (street name if unknown) and highlight streets around the school they do travel on
5. We will then proceed to guide the entire group through a series of questions that will allow them to mark different issues/perceptions relating to active travel on the map with different coloured stickers. Groups will be given about 7-10 minutes per topic- facilitators should try to make sure that all children in the group have a chance to contribute...perhaps taking turns to put down a sticker.
   a. For each sticker placed, write a sequential number on it, then use the recording sheets to record the child’s comments. Record the location under that colour/number. Facilitators should record comments verbatim whenever possible; if the comment belongs to just one child, put their first initial in front of the number. E.g. A1 on a red sticker refers to a location that ‘Amy’ is scared of/ uncomfortable in and on the recording sheet an A1 will be listed in the RED section followed by Amy’s explanation
6. Different sticker colours will represent different issues:
   a. GREEN- favourite places on your journey to and from school (can be a specific place, or a path/trail/road they like- BUT don’t necessarily limit to outdoor places only). Use probing questions to keep conversation and ideas flowing. Try to have students mark a place for each probing question.

Probing Questions:
   • What do you like about your walk to school?
   • Do you enjoy walking to school?
   • Do you think that it is fun?
   • If you could choose, what mode of travel would you choose to and from school?
   • Do you walk with anyone? Who? Where do you meet them?
   • Do you ride your bike to school? Do you think you have the skill and know proper bike safety?
   b. RED- places during their journey to school they dislike, feel unsafe or uncomfortable (open ended prompt them to think about any reasons for feeling
unsafe/uncomfortable - crime, scary people, too many people, bullies, traffic, abandoned places, other scary reasons - parents reactions)

Probing Questions:
- Is there too much traffic/ cars on your walk to school?
- Are the streets you cross on your way to school busy? What streets?
- Do you think that you live too far away from school to walk?
- Approximately how long does your walk to school take every day? Do you think it takes too much time?
- Do you ever feel unsafe on your walk to school?

c. YELLOW - places/things on their journey to and from school they would like to see improved - made safer, more interesting, more fun to play at/ visit, easier to get to, more beautiful, cleaner, etc.

Probing Questions:
- Do you think that the route you walk on your way to school is boring? Yes/ No. If yes what is boring about it?
- What would make your journey to school more enjoyable? Where?

d. BLUE - other places in the neighbourhood they regularly visit - on their own, with friends, or with family - e.g. Library, video store, church, convenience store, grocery store, etc. This will help us to get an idea of both their understanding of the neighbourhood, the size of their neighbourhood domain, AND their use/ interaction of the places/services in the community (could also have them note in comments whether they usually walk/ bike or drive)

Probing Questions:
- Do you ever stop on your walk to and from school? Where? Why?

MAKE SURE RECORDER IS ON. Take written notes/ observations when needed.
Curriculum Vitae

Name: Katherine Wilson

Post-secondary Education and Degrees:
The University of Western Ontario
London, Ontario, Canada
2011-2015 B.A. (Honours) Kinesiology and Geography

The University of Western Ontario
London, Ontario, Canada
2015-2017 M.A. Geography

Honours and Awards:
The E.G. Pleva Fellowship Fund
2016

Related Work Experience:
Teaching Assistant
The University of Western Ontario
2015-2017

Research Associate
Human Environments Analysis Laboratory
2015-Current

Conference Presentations:
Oral Presentation
Wilson, K., & Gilliland, J.A. Mapping Children’s Perspectives on Neighbourhood Barriers and Enablers to Active School Travel.
Annual meeting of the Canadian Associations of Geographers
York University, June 2, 2017

Poster Presentation
Wilson, K., Piaskoski, A., & Gilliland, J.A. Understanding Barriers and Enablers Influencing Children’s Active School Travel.
Children’s Health and Environment Workshop & Symposium
Western University, June 26, 2017

Oral Presentation
Wilson, K., Coen, S., Piaskoski, A., & Gilliland, J.A. Mapping Children’s Perspectives on Neighbourhood Barriers and Enablers to Active School Travel.
GIS in Education and Research Conference
University of Toronto, October 11, 2017