School Travel Planning in Canada: A Holistic Examination of Program Impact on Active School Travel

by

George Mammen

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Graduate Department of Exercise Sciences
University of Toronto

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Abstract

School Travel Planning (STP) is an intervention designed to increase Active School Travel (AST) among elementary school children (i.e., age 6-14 years). With limited evidence on program effectiveness, the purpose of this dissertation was i) to determine if STP can increases AST levels in Canadian elementary schools and ii) to identify school contextual and program factors influencing STP implementation and AST change. These objectives were addressed through four distinct studies entailing varied methodological approaches. Studies 1 and 2 quantitatively examined predictors of AST change following one-year of implementation using a sample of 106 schools across Canada and different outcome measures. Study 3 qualitatively explored enablers and barriers to implementation among 34 pan-Canadian STP facilitators. Study 4 employed a multisite mixed-methods case study design to provide insight into the STP process and key factors influencing implementation and AST change in two downtown Toronto schools. Across studies, results revealed that STP can facilitate increases in AST after the first year of implementation, though the degree of change can vary according to contextual and program factors. Contextual factors found to influence implementation and mode change included the school's geographical location, distance from students' homes, socioeconomic status, and transportation policies. Program factors included the school-specific and systematic STP model,

multidisciplinary stakeholder involvement, designated facilitator, range of AST strategies, and length of implementation time. Overall, STP can promote increases in AST following one year of implementation. This dissertation informs future practice by identifying key factors to consider when implementing STP. The broader program of research also identifies the necessity of stakeholder involvement in initiatives promoting AST to help address a range of socio-ecological factors. Future evaluations should examine the sustainability of STP intervention impact and assess its cost-effectiveness.

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Abbreviations

AST: Active School Travel

BE: Built Environment

BMI: Body Mass Index

CDN: Canadian

CIP: Capital Improvement Project

CLASP: Coalition Linking Action and Science for Prevention

GCC: Green Communities Canada

GIS: Geographic Information System

GTHA: Greater Toronto and Hamilton Area

HAT: Health Action Team

IM: Independent Mobility

MVPA: Moderate to Vigorous Physical Activity

NGO: Non-Government Organization

PA: Physical Activity

SRTS: Safe Routes to School

STP: School Travel Planning

TCDSB: Toronto Catholic District School Board

TDSB: Toronto District School Board

TPB: Theory of Planned Behaviour

WHO: World Health Organization

WSB: Walking School Bus

WTSD: Walk to School Day

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Chapter 1

1 Introduction

1.1 The Issue: The Physical Inactivity Pandemic

Extensive research has documented the physical and psychosocial benefits of physical activity (PA) across the lifespan. Like adults, children can accrue a range of physiological, motor, cognitive and psycho-social benefits such as: reduced body fatness (Chung et al., 2012; Remmers et al., 2014); better bone health, motor skill development and performance (Baptista et al., 2012; Lopes et al., 2012; Morrison et al., 2012); increased cognitive functioning and academic achievement (Loprinzi et al., 2012; Singh et al., 2012); and improved mental health (Biddle & Asare, 2011; Calfas et al., 1994). To reap these benefits, the World Health Organization (WHO), along with many international health agencies (e.g., Canadian Society for Exercise Physiology) recommends children and youth (i.e., ages 5-17) engage in at least 60 minutes daily of moderate to vigorous physical activity (MVPA). However, international data from 15 countries show that children overall are not accumulating this amount of PA needed for improved health (Tremblay et al., 2014). Physical inactivity in this population is a pandemic with major implications for health and the economy.

In Canada, the direct (e.g., health care expenditure) and indirect (e.g., output loss) burden of physical inactivity is approximately CDN $7.0 billion annually (Janssen, 2012). It is reasonable to speculate a prospective increase in costs given the current prevalence of childhood inactivity across the country. New evidence from the 2012-2013 Canadian Health Measures Survey reveal that 91% of children (i.e., ages 5-17 years) fail to meet the PA guidelines (ParticipACTION, 2015). This is worrisome since physical inactivity is linked to several short and long-term adverse health effects including weight gain, poor mental health, injury, and the development of chronic diseases such as obesity, cancer, type II diabetes, and stroke (Janssen & Leblanc, 2010; Tremblay et al., 2003; Warburton et al., 2010).

In tandem with declining levels of PA has been an increase in sedentary behaviour. Sedentary behaviour can be defined as waking behaviours, such as sitting or lying down, that expend little energy (i.e., ≤1.5 metabolic equivalents; Sedentary Behaviour Research Network, 2012). New

and emerging technologies such as smartphones, 3-D televisions, laptop computers and gaming consoles have increased in accessibility and have increased the quantity of choices for sedentary entertainment. Colley and colleagues (2011) found Canadian children to spend almost 9 hours of their day sedentary. This is alarming considering that independent of PA levels, increases in sedentary behaviours are associated with detrimental health outcomes tied to body composition, fitness, self-esteem and academic achievement (Tremblay et al., 2011).

Motivated by the low levels of PA, high levels of sedentary behaviour, and the related health effects, PA researchers, practitioners, and decision-makers in Canada (and abroad) are trying to reverse these trends by advocating for holistic approaches to PA. For instance, combining structured (e.g., organized sports) with unstructured sources of PA (e.g., active play, active transportation) and engaging in a variety of PA intensities (e.g, light, moderate, vigorous) is recommended to help children accumulate greater overall PA (Active Healthy Kids Canada 2013; ParticipACTION, 2015; Subramaniam, 2011). Increasing active school travel (AST; e.g., walking, biking to/from school) — the focal interest of this dissertation— may be a population level strategy to help allay the inactivity crisis.

1.2 Active School Travel: A Promising Strategy?

AST refers to any non-motorized travel such as walking, biking, rollerblading, or skateboarding to/from school. This source of PA has been identified to help children attain PA guidelines (Faulkner at al., 2009; Larouche et al., 2014). For example, children who walk to/from school relative to those who are driven can gain an additional 2,200 steps and 15 to 45 minutes of daily PA (Larouche et al., 2014; Morency & Demers, 2010). This increased PA on the school journey has been found to lower BMI over time (Mendoza, 2014), improve cardiovascular health (Larouche et al, 2014), increase alertness and attention during the school day (Lambaise et al., 2010; Martinez-Gomez et al., 2011), and develop independent mobility (Carver et al., 2014). Non-motorized travel modes can also potentially protect the environment by reducing car use, traffic congestion, and the subsequent greenhouse gas emissions (Larouche, 2012; Wilson et al., 2007). When considering the frequency of trips travelling to/from school each year (i.e. approximately 10 of 12 months in Canada) and the viability of walking, for example, intervening on AST behaviour is a logical strategy to increase total PA in children.

Despite the multitude of benefits, evidence indicates a temporal decline in AST over the last five decades in several countries including Australia (van der Ploeg et al., 2008), New Zealand (Ministry of Transport, 2008), the UK (Pooley et al., 2005), Switzerland (Grize et al., 2010), Vietnam (Trang et al., 2012), Brazil (Coll et al., 2014) and the US (McDonald et al., 2007). In Canada, Buliung and colleagues (2009) found an approximate 10% decline between 1986 and 2006 for 11-13 years old (53% to 42%) and 14-15 year olds (39% to 31%) within Canada's largest metropolitan region: the Greater Toronto and Hamilton Area (GTHA). Reviews (Davison et al., 2008; Sirard & Slater, 2009) have highlighted the complex socio-ecological factors shaping school travel behaviour. These factors will be explored in detail in the following chapter.

In brief, there are five interacting levels of influence affecting AST behaviour. At the intrapersonal (i.e., child) and interpersonal (e.g., parent, family, peers) levels, a child's age, gender, ethnicity along with their parent's work schedule, socio-economic status (SES), and perceptions regarding AST safety can all influence AST behaviour (Ahlport et al., 2008; Carver et al., 2010; Loitz & Spencer-Cavaliere, 2013; McDonald, 2008b; Panter et al., 2013). At the organizational level (i.e., school), the school location, SES, ethnic composition, and openness of school staff to promote and adopt a PA culture can impact AST levels (Crawford & Garrard, 2011; McDonald, 2008a; Mitra and Buliung, 2014; Yang et al., 2012; Zhu & Lee, 2008). At the physical 'built environment' level, the spatial distance between the home and school environments, street density and connectivity, degree of pedestrian infrastructure, and environmental aesthetics have been shown to influence AST (Gropp et al., 2012; Handy et al., 2002; Larsen et al., 2009; McMillan, 2007; Panter et al., 2010; Schlossberg et al., 2006). Lastly, and at the political level, policies relating to school siting decisions, catchment areas, and transportation services have also been identified as influencing AST (Chriqui et al., 2012; Eyler et al., 2008; Loitz & Spencer-Cavaliere, 2013; Yang et al., 2012).

Hence, the broad range of factors influencing AST behaviours shows the complexity of the practice. It is then likely that interventions designed to increase AST may be more effective when addressing the multiple levels of influence. However, a systematic review of 14 AST interventions (Chillon et al., 2011) stressed the lack of programs aimed in tackling the multi-layered challenges of AST. The authors attribute the small effect sizes (0.1-0.4) across studies to the implementation of 'one-off' educational or encouragement initiatives without considering broader environmental factors that may be impeding AST. The review further emphasized the

value in addressing all ecological levels of influence by involving multidisciplinary stakeholders and implementing a combination of non-infrastructure (e.g., education initiatives, enforcement rules) and infrastructure (e.g., sidewalk/bike-rack implementation) strategies. In Canada, one such comprehensive intervention that is gaining practice and policy attention in addressing the multifaceted factors via stakeholder engagement is School Travel Planning (STP).

1.3 What is School Travel Planning?

The Canadian STP program is a multi-component, school-specific intervention designed to increase AST among elementary school children (i.e., ages 6-14; www.saferoutestoschool.ca). STP involves school-level committees comprised of a lead facilitator and stakeholders from a variety of sectors including health, education, safety, transportation, and planning. Collaboratively, these stakeholders assess, document and intervene on AST barriers by means of a 'school travel plan.' A more thorough description of the STP process is provided in Chapter 2.

Due to the school-specific focus of STP, strategy implementation varies according to a school's context and needs. Strategies, however, typically encompass a combination of the '5E' strategies (www.saferoutestoschool.ca) including education (e.g., AST workshop for children and parents), encouragement (e.g., designated AST days), enforcement (e.g., crossing-guard presence), engineering (e.g. sidewalk/signage installation) and evaluation (e.g., environmental audit). Though the comprehensive concept of STP may appear logical and intuitive, the evidence base on its effectiveness is limited.

1.4 Rationale for School Travel Planning Research & Dissertation Objectives

Prior to commencing with this dissertation research, only three published STP evaluations existed, which showed mixed results in increasing AST (Buliung et al., 2011; Hinckson et al., 2011; Rowland et al., 2003). As will be explained in-depth in the following chapter, the collective evidence is too limited and narrow in determining STP effectiveness. For instance, there is little indication of school related contextual factors associated with AST change following STP implementation. This can help determine where STP is best suited in terms of geographical location and school-level SES. Additionally, no studies have explored the intricacies of the comprehensive STP model. In doing so, insight can be gained on what works

and what doesn't work during a given implementation period and help address questions such as: Which STP strategies produce increases in AST? What roles and contributions do stakeholders play in implementation? What are the benefits and challenges of implementation? Hence, the aim of this dissertation is to contribute to the STP literature by providing a holistic evaluation of STP. This will be achieved by two overarching objectives:

i) To determine if STP can increase AST levels in Canadian elementary schools.
ii) To identify contextual (i.e., school) and program factors influencing STP implementation and AST change

1.5 Significance and Implications of the Dissertation Research

The evidence gained will be informative for the researchers, practitioners, and decision-makers involved with STP. Four independent studies with novel objectives and methodologies to evaluate STP emerge from this research, three of which have been published (Mammen et al., 2013; Mammen et al., 2014; Mammen et al., 2015). The findings overall can provide useful information for current and prospective users of STP (i.e., practitioners and decision-makers), particularly within a Canadian context. For instance, where STP is the most applied in Canada (i.e. GTHA), there are on-going discussions concerning the value and impact of STP between public health units (e.g., Toronto Public Health), non-government-organizations (NGO: e.g., Green Communities Canada, Cycling Toronto), school boards (e.g., Toronto Public and Catholic District School Board, York District School Board), municipalities (e.g., City of Hamilton, Region of Peel), and agencies (e.g., Government of Ontario Transportation Agency: Metrolinx) (Personal communication with the Director of Green Communities Canada Walks, the Transportation Manager of both Toronto School-Boards, and the Active School Travel Facilitator of York District School Board, 2014). Unlike the United States' (US) billion dollar Safe Routes to School (SRTS) initiative to increase national levels of AST (www.saferoutesinfo.org), STP in Canada continues to be NGO led by Green Communities Canada (GCC). Hence, STP interventions and evaluations are relatively scarce due to limited resources.

Beyond STP, the broader dissertation findings can also inform other AST interventions in terms of evaluative techniques and key factors to consider prior to and during implementation. Specifically, the study results can provide evidence for practitioners on effective implementation practices, practicality, and challenges pertaining to the STP process, which can be applied across AST interventions. Policy-makers can use the evidence to make informed decisions around, for example, the degree of sustained funding for STP programs or whether mandating the program in school boards is a worthwhile endeavour. With limited evidence and increasing political attention on STP, the time is now to critically evaluate this comprehensive intervention.

1.6 Overview of Dissertation

This chapter introduced the childhood physical inactivity crisis and how AST can contribute to the solution. More specifically, the content explained the rationale for conducting STP research, outlined the dissertation objectives, and provided the implications this research can have to research, practice, and policy. Chapter 2 of this dissertation will in greater depth review the literature to examine the health benefits of AST, temporal trends internationally, and socio-ecological factors influencing AST. Other components of the literature review include an updated systematic review of AST interventions and a broad methodological outline of the four dissertation studies that comprise chapters 4, 5, 6 and 7. Chapters 4 through 7 (i.e., studies 1-4) will be presented in manuscript form. Chapter 8 will conclude the dissertation with an overall discussion of the various study findings, limitations, and recommendations to professionals involved and interested in STP.

Chapter 2

2 Literature Review

Chapter 2 of this dissertation will be presented through three sections. The first section of the literature review will address the benefits, international temporal trends, and socio-ecological factors linked to AST. The second section will provide an updated systematic review of AST intervention studies published since Chillon et al.'s (2011) review. The last section of this chapter will cover STP's comprehensive implementation process, history, and evaluative evidence. To conclude, the dissertation aims and objectives will be revisited and a broad overview of the methodologies employed across the four distinct dissertation studies will be presented.

At this point, it is also important to inform the reader of the focus the chapter presents. Though AST is recognized as having trans-disciplinary benefits for education, environmental psychology, transportation planning, and urban design (Mitra, 2013), the emphasis of this chapter will primarily concentrate on AST's relevance in improving population-level PA levels and the health of children overall.

2.1 Health Benefits of AST

2.1.1 Physical Benefits

Several studies have shown AST to be associated with greater levels of PA (Faulkner et al., 2009; Larouche et al., 2014). As a result of the increased PA, children who engage in AST can gain physical health benefits. For instance, in their cross-sectional analysis, Pizarro et al. (2013) suggested that AST may benefit metabolic health and cholesterol levels in 10-12 year olds, independent of MVPA. The increased metabolism supports findings linking AST to lower weight and healthier body compositions (Lubans et al., 2011; Rosenberg et al., 2006; Xu et al., 2013). Two prospective studies showed that AST behaviour during the kindergarten years was predictive of a lower body mass index (BMI) in the second (Pabayo et al., 2010) and fifth grades (Mendoza & Liu, 2014). Evidence also associated AST with increased levels of cardiorespiratory fitness, particularly among children who cycle to/from school (Larouche et al., 2014; Lubans et al., 2011; Voss & Sandercock, 2009). Although some studies fail to find a link between AST and

BMI and health-related fitness (Heelan et al., 2005; Lubans et al., 2011), the evidence collectively suggests that AST can make a significant contribution to the overall level of PA children participate in.

2.1.2 Cognitive Benefits

Beyond the physical benefits, research indicates cognitive gains from AST. Two studies have shown AST to be associated with higher cognitive and academic performance in terms of attention and verbal, numeric, and reasoning abilities in preadolescent and adolescent children (Hillman et al., 2009; Martinez-Gomez et al., 2011). Lambaise and colleagues (2010) found that AST may improve mental health during the school day. In their study with 40 children (i.e, 10-14 years old), those who were assigned to a simulated AST group (i.e., treadmill walking) had lower perceived stress levels compared to children in the sedentary group (i.e., sitting) when confronted with a cognitive stressor.

Westman et al. (2013) revealed a higher degree of valence (unpleasantness-pleasantness) and activation (deactivation-activation) in children walking to school compared to those travelling by car. Similarly, in a national examination of 5,423 families in Canada, children who practiced AST self-reported more happiness, excitement and relaxation on the school journey than children using motorized forms of travel (Ramanathan et al., 2014). Fusco and colleagues (2012) found that the positive affect experienced while walking might be triggered by children's increased cognizance of visually stimulating aspects of the environment such as gardens, trees, and flowers. Although the majority of studies examining AST's effect on cognition have been cross-sectional in nature, the findings are nonetheless promising and stronger methodologies (e.g., longitudinal, controlled) will help clarify the relationship between AST, cognitive functioning, and mental health.

2.1.3 Psychosocial Development and Independent Mobility

Along with the physical and cognitive benefits, children can also develop a range of psychosocial skills, notably as a result of greater independent mobility (IM). IM is defined as actively commuting to a destination (e.g., to/from school) without adult supervision (Hillman, 1990). Children who engage in unsupervised AST can foster personal growth by developing emotional bonds with peers and the natural environment, and a sense of independent decision-

making (Brown et al., 2008; Prezza et al., 2001; Tranter & Whitleg, 1994). By navigating their own way to/from school, IM can also increase children's road and traffic safety skills, sense of community (Prezza & Pacilli, 2007), and acquisition, processing, and structuring of environmental knowledge (Davis & Jones, 1996; Horelli, 2001; Rissotto & Tonucci, 2002).

These psychosocial benefits, however, are not strictly limited to unescorted trips to schools. As Mammen et al. (2012) argue, even walking with supervision undoubtedly provides greater opportunities to reap the benefits of independent mobility compared to being escorted to school by car. Nevertheless, researchers have emphasized that gaining an IM 'license' from parents may be a prerequisite in generating greater AST levels (Hillman, 1990; Jago et al., 2009; Mitra et al., 2013). This is of concern when considering the decline in AST across the globe.

2.2 International Trends in AST

Despite the health benefits, international data show a decline in AST over the last several decades. This temporal trend has been found in various countries including Australia (van der Ploeg et al., 2008), New Zealand (Ministry of Transport, 2008), the UK (Pooley et al., 2005), Switzerland (Grize et al., 2010), Vietnam (Trang et al., 2012), Brazil (Coll et al., 2014) the US (McDonald et al., 2007) and Canada (Buliung et al., 2009). For example, in Australia, AST dropped 36% between 1971 and 2003 in children aged 5-14 (van der Ploeg et al., 2008). In the UK, between 1975-2001, AST decreased by 20% in 5-10 year olds and 10% in 11-16 year olds. Data from Brazil showed a 14% reduction in AST between 2005-2012 in 10-14 year olds (Coll et al., 2013). Similar trends have been observed in North America. McDonald and colleagues (2007) found a 28% AST decrease between 1969 and 2001 in 5-18 year olds residing in the US. In Canada, Buliung et al. (2009) found an approximate 10% decline between 1986 and 2006 in 11-15 year olds in the GTHA.

The data revealing the AST declines have also shown an accompanying increase in motorized travel (Buliung et al., 2009; Grize et al., 2010; McDonald et al., 2007). From a health perspective, these trends represent a loss of PA and a gain in sedentary behaviours, both of which are linked to adverse current and prospective health effects as explained in Chapter 1. In order for health professionals to help shift school travel behaviours towards active means, it is important to examine the various factors influencing AST. Prior to this, it is perhaps equally important to understand sociological conceptualizations around 'childhood' and notably how

childhood experiences vary between generations, geographies, families, genders, ethnicities and SES. Being cognizant of these concepts will help accomplish two goals for the purpose of this dissertation: i) to help understand why children in contemporary society engage in less AST and more motorized travel than previous generations; and ii) to set the stage for a subsequent sub-section, which addresses the complex ecological factors affecting AST, and highlights why some factors are more strongly related to AST than others.

2.3 A Sociological lens on Children's Mobility Practices

Of interest to this dissertation, one particular childhood construct that has drastically changed, even within a span of one generation, are children's mobility habits (Heywood, 1992; Thomsen, 2009). From a broader perspective, the changes can be attributed to the rapid economic, social, and technological change in modern society in what Alan Prout (2004) referred to as globalization. Overtime, globalization accelerated changes in the physical 'built' environment (e.g., greater sprawl), technology (e.g., motorized travel, media), parenting practices (e.g., supervised), and family structure (e.g., dual-income households), all of which directly or indirectly changed how children travel to prime destinations, such as schools. To add complexity, childhood mobility practices not only change over time, but also can vary according to ethnicities and social class. The following will briefly address each stated construct and its impact on childhood mobility.

2.3.1 The Physical Environment

The physical environment is one aspect of childhood that has significantly changed during the last century. The 'free' space and pedestrian friendly environments that children experienced during the agrarian evolution and pre-world war eras, for instance, transformed into greater industrial and residential space (Prout, 2004). With more large-scale locations, greater land sprawl, urbanization of businesses, and the subsequent suburbanization of residences of modernity, children's active means of mobility have been restricted. This has meant a significant increase in distance between the home and school environments and the necessity for motorized travel. Within the AST literature, these changes are a main reason why distance is the leading determinant of, and barrier to, AST (Martin et al., 2007; Mitra et al., 2010; Robertson-Wilson et al., 2008; Timperio et al., 2006; Wong et al., 2011). The changes in infrastructure from more pedestrian and horse-carriage friendly to a more automobile-centered environment has

manifested into a culture of motorized travel. Increased distances between the home and prime destinations (e.g., work, school) led to increases in automobile ownership, which has partially explained the temporal increases in car use. However, this increase in motorized transport can also be attributed to another leading barrier to AST: heightened societal fears around child safety.

2.3.2 Technology and its Impact on Societal Fears

Rapid technological advances in recent decades have significantly impacted the media's portrayal of child harm. Stories emerge and spread of child kidnappings or pedestrian accidents and fatalities en route to/from school. These stories are nonetheless frightening for children and adults alike. With children themselves having more access to news and constructing their own fears relating to strangers and bullies (Cozma et al., 2015), both children and parents have admitted that their mobility practices are influenced by incidents covered in the national media (Murray, 2009). However, what is often overlooked is that unfortunate incidences, such as kidnappings, have always existed. It is not that kidnapping, for example, only exist in today's society; it has always existed, but now in the 21st century, these dangers are frequently exposed due to the technological advances in news dissemination (e.g., twitter).

As Valentine (1997) explains, the increased exposure to media coverage of crime or accidents have reconstructed how a 'child' is perceived because of the moral panic it creates. This has significantly altered child-rearing and parenting practices to one that is more controlling and supervised (Fotel & Thomsen, 2004). For example, parents have curtailed children's ability to move freely within their own neighbourhoods and beyond and have become more adverse to risk (Thomsen, 2009). The controlling nature has become so contagious in our prevailing society that parents have admitted that they impose restrictions to avoid the judgments from other parents and carrying the stigma of a 'bad parent.' Thus, children are increasingly perceived as being too naive, irresponsible, and immature to recognize potential dangerous situations, and are totally dependent upon supervision (Lupton & Tulloch, 1999; Valentine, 1997). As Buliung and colleagues (2015) note, contemporary parents often fail to recognize that the perceived fear and increased supervision may be 'infantilizing' children, which undermines children's social, emotional and physical development and poses great threat to their future.

Parents' aversion to risk and parenting practices further appears to vary depending on a child's gender. Sex-stereotyping in terms of children's use of public space has been prevalent since the middle ages. It was customary for males to dominate the use of public spaces helping with outdoor tasks (e.g., collecting water) while females were indoors helping with domestic chores (Heywood, 1992). This gender difference in the use of space is still prevalent in modernity, supported by research showing a greater proportion of males independently traveling to school than females (Brown et al., 2008; Fyhri and Hjorthol, 2009; Hillman et al., 1990; Valentine and McKendrick, 1997). This may be due to stereotypical preconceptions of gender roles where girls are perceived as being weaker than boys and less able to protect themselves from threats from others such as 'strangers' (Bem, 1981). Hence, parents are more protective over females. Overall, more attention, resources, and energy are needed towards this issue of gender as it relates to PA, AST and independent mobility, especially since females are globally less active overall than males (Tremblay et al., 2014).

2.3.3 Changes in Family Dynamics

Relating to gender, changes in parenting familial roles have further explained the temporal decrease in AST and increase in motorized travel. Fathers were traditionally considered the sole source of family-income while mothers held more domestic responsibilities, one of which was helping children arrive to/from destinations. In modernity, however, more mothers are pursuing professional careers with some reports indicating that 40% of US households contain the female parent as the primary breadwinner, quadrupling rates from 1960 (Wang, 2013). This has impacted current AST habits since parent time-pressures and availability pertaining the trip to/from school affect travel options (Faulkner et al., 2010; McDonald, 2008b; Mitra, 2013). Parents have cited convenience and trip chaining, which refers to driving children to school on route to a subsequent destination (e.g., work), as primary reasons why children are driven to school (Faulkner et al, 2010), even if living less than 2 miles from school (McDonald & Aalborg, 2009). Thus, a family's inclination to use active modes of travel may be low due to incompatibility with lifestyle choices, which also contributes to the interrelated cultures of car-dependence and convenience (Ziniga, 2012).

2.3.4 Family Ethnicity and SES

In addition to the working dynamics among families, family characteristics such as ethnicity and SES have been found to further complex conceptualizations around childhood mobility experiences (Holloway and Valentine, 2000; Rudner, 2012). As an example, Holloway and Valentine explain that African children experience vastly different childhoods as their time to roam around is largely constrained by household and agricultural chores that are a custom in their culture. In comparison, children's access to public space in the U.S, England, and Australia are more constrained as parents have higher levels of environmental and safety concerns. As will be identified below, this may explain why visible minorities engage in greater levels of AST, perhaps since parents have a different meaning, value, and risk-perceptions relating to active travel (Murray, 2009).

Lastly, varying levels of family SES will yield different child mobility experiences. Children from wealthier families use car travel to/from school to a greater extent than their peers from poorer families (Timperio et al., 2006: Shokohi et al., 2012). Rudner (2012) explains that wealthier parents have greater access to resources that create 'appropriate' social relations for their children by enrolling their children in geographically dispersed private schools. Lower income families also tend to own fewer vehicles, thus requiring non-motorized travel out of necessity (McMillan, 2005).

In summary, conceptualizations around childhood mobility practices are complex as they are not only reconstructed over time, but vary between many factors such as geography, gender, ethnicity and social class. Child-related professions need to be aware that one child's childhood is unique and distinct from another, including relative to past generations. It would be beneficial to consider these concepts when designing and implementing AST interventions. It is further important to acknowledge that how a society views a 'child' will ultimately affect 'childhood' experiences. Children are extremely adaptable, and if society continues to view children as extremely vulnerable in a misperceived 'dangerous' society, children will continue to retreat indoors, spend a considerable amount of time engaged in sedentary behaviour, lose their independence, and not reap the health benefits associated with active travel.

2.4 Understanding AST through an Ecological Framework

The content above provided a brief sociological perspective on children's mobility. Additional factors also affect children's mobility habits, which further complicates understandings around AST behaviours. Thus, in order for researchers, practitioners, and decision-makers to strategize towards greater AST, it is imperative to consider the range of factors associated with AST. In providing a framework to understand AST's multilayered and interacting factors, a socio-ecological approach is warranted. Existing socio-ecological models suggest that multiple levels of influence are associated with the behaviour of interest (e.g., AST) spanning from intrapersonal (e.g., biological, psychological), to interpersonal (e.g., family dynamics and characteristics), to organizational (e.g., school culture), to environmental (e.g., built environment), and to political (e.g., transportation and school siting policies). Unlike the many other theories of behaviour change (e.g., Health Belief Model, Theory of Planned Behavior, Social Cognitive Theory, and Trans-theoretical Model), which target individuals and posit that behaviour is solely influenced by psychosocial variables (e.g., beliefs, self-efficacy, social support), socio-ecological models are advantageous in additionally directing attention to broader societal, environmental and political factors affecting the behaviour.

Urie Bronfenbrenner (1977) was the first scholar to propose an ecological framework for understanding human development and behaviour. In Brofenbrenner's model, multiple levels of influence, specifically the micro-, meso-, exo-, and macro-systems, are viewed as affecting behaviour. The microsystem is the complex interrelations between an individual and their immediate environment at one point in time (e.g., home, school, workplace) and can include family or peers. The mesosystem, which essentially is a 'system of microsystems,' addresses the relationships between the various aspects of an individual's microsystem (e.g, school microsystem + home microsystem) and how these dynamics influence behaviour. The exosystem, an extension of the mesosystem, takes into account the broader social system that can more indirectly influence individuals and their behaviours. These social structures can include the major institutions of society such as agencies of government, mass media, and transportation facilities/services. At the broadest level, Bronfenbrenner postulated that the macrosystem considers cultural beliefs and values, helping explain why certain behaviours are shaped by the dynamic nature of the economy, education systems, and the legal and political systems, for example.

Following Urie Bronfenbrenner's ecological model, many academics have applied similar frameworks to segment the many related factors related to a behaviour (e.g., AST) ranging between the micro and macro-systems. For instance, researchers have proposed a socio-ecological approach to examine health promotion programs (McLeroy et al., 1988), active living and environmental research (Sallis et al., 2006), and PA promotion (King et al., 2002; McMillan, 2005; Sirard & Slater, 2008). Specific to AST, frameworks have been developed to conceptualize correlates of AST as related to household demographics, safety perceptions and behaviour attitudes/norms, school and residential physical/social environments, and even broader domains of influence such as weather (McMillan, 2005; Mitra, 2013; Panter et al., 2008; Sirard and Slater, 2007). However, for the purpose of this dissertation and conceptualizing the various factors affecting AST, the following section will use a combination of socio-ecological levels operationalized by both McLeroy, Sallis, and their associates. Thus, factors affecting AST from the intrapersonal, interpersonal, organizational, environmental, and political levels of influence will now be presented.

2.5 Individual level Factors Influencing AST

2.5.1 Age, Gender, and Disability

At the individual level, AST can be influenced by a child's age. The age and AST relationship can be explained by an inverted-U. That is, a positive linear relationship is often found in the early elementary school years (e.g., 8-12; Bringolf-Isler et al., 2008; Martin et al., 2007; Sirard & Slater, 2008). However, this relationship transforms into a negative linear relationship as the child enters adolescence and high school (Cooper et al., 2012; Larouche et al., 2013; Pabayo et al., 2010). To illustrate, in their five-year longitudinal analysis of 7690 Canadian children, Pabayo and colleagues (2010) found that the likelihood of practicing AST increased from the age of 6 years, peaked at the age of 10 years, and then declined towards the age of 16.

The initial positive relationship may imply that as children age, parents feel increasingly confident in their child's cognitive capacity to navigate his/her way to school safely. For instance, children in the early elementary school years are at a higher risk when exposed to traffic situations (Macpherson et al., 1998) due to their attentional skills and their age-moderated appetite for risk taking (Connelly et al., 1998; Pitcairn & Edlmann, 2000). Additionally, parents may feel that an older child possesses a greater sense of agency, and is therefore more capable of

dealing with potential environmental dangers. A decline in AST as children transition to high school can be partially attributed to geographical changes in schools and attaining vehicular licenses. When transitioning to high schools, children typically attend schools that have larger catchment areas and are further in proximity from their homes relative to the closer 'neighborhood' elementary schools (Mitra & Buliung, 2014; Schlossberg et al., 2006). This is also a time period where some students enter the work force. Therefore, opportunities to travel actively decrease, resulting in a greater need to use other modes of travel. With car and motorcycle licenses starting to be obtained during adolescence, some students begin to travel to/from school by their own or their peers' vehicle.

Another often discussed factor influencing AST relates to gender. Many international studies from Canada (Larsen et al., 2009; Mitra & Buliung, 2014), the U.S (McDonald, 2012; Rosenberg et al., 2006), the UK (Panter et al., 2010) Ireland (Nelson et al., 2008), Australia (Leslie et al., 2010; Timperio et al., 2006) and New Zealand (Yelavich et al., 2008) have found a gendered effect with higher rates of AST in males. For example, a California study found that boys aged 10 and 11 were more likely to practice AST (i.e., walk, bike, skateboard) two to three days a week compared with their female counterparts (Rosenberg et al., 2006). In Australia, among 2961 Melbourne students (i.e., ages 10-14), Leslie and colleagues (2010) found that 22.4% of males biked to school whereas only 8.3% of females cycled. As explained previously, the gender gap in AST may be rooted in traditional and sociological views on travel independence, with greater territorial or home range given to boys than girls at an earlier age (Hillman et al., 1990; Mathews, 1992). This then may explain the interacting effect of age and gender on AST.

As McDonald (2012) notes, gender differences may be most detectable between the ages of 8 and 13, with supporting studies showing that boys gained more travel independence between the ages of 8 and 11 (Hart, 1979; Mathews, 1992). Hillman and colleagues (1990) also reported this age and gender interaction, with gender differences disappearing later in the high school years. McDonald further explains that gender effects may not be observed in children under 8, since most are not allowed to travel independently. Thus, overall, AST practitioners need to be attentive to these findings as they design and implement AST interventions. Certain schools with marked gender differences in rates of AST, for instance, may need to consider implementing specific strategies targeted at females and their parents.

Another factor influencing AST habits regards children's physical and cognitive abilities or disabilities. However, it is rare to locate AST literature that addresses children with disabilities. This is an important area to examine when considering that many children living with a disability will be navigating their respective communities independently in the future. Gaining a sense of active living principles during the early grade schools years, by strategically including children with disabilities in walking to/from school programs, can currently and prospectively benefit the child and their families. The National Centre for Safe Routes to School (2010) in the US provides strategies for creating an inclusive safe routes to school program, which can include inviting special education teachers, children with disabilities and their parents on walkability audits since they would jointly know best the major barriers impeding their AST opportunities. Overall, however, there are greater efforts and discussions required among researchers, practitioners, and decision makers in exploring how best to include children living with a variety of disabilities in AST initiatives.

2.5.2 Psychosocial Factors

The link between psychological factors and AST has also been discussed, though to a lesser extent than biological factors. Constructs connected to individual-level psychosocial theories, including Social Cognitive Theory (e.g., self-efficacy) and the Theory of Planned Behaviour (TPB; e.g., attitudes, subjective norms) have been examined in an AST context. Two recent studies have shown children's self-efficacy in terms of active travel to be associated with AST behaviour (Lu et al., 2015; Silva et al., 2014). Lu and colleagues, however, found that parents' self-efficacy ($\beta = 0.63$) regarding their child's AST capabilities had a stronger influence on AST behaviour than children's self-efficacy ($\beta = 0.16$). A comparable parental effect on AST has been supported in studies examining associations between TPB constructs and AST (McMinn et al., 2014; Murtagh et al., 2012). Murtagh et al.'s study found that school travel is not under complete volitional control and that neither child constructs of 'attitude' nor 'subjective norms' independently predicted intention and the consequent AST behaviour. Similarly, McMinn and colleagues found that in their study with over 1000 students from North West and South East Europe, intention did not translate into more AST, despite the high values found for child attitude, subjective norm, and perceived behaviour control.

The existing studies on psychological factors and AST suggest that intervening on children's psychological constructs alone will not bring about substantial behaviour change. As McMinn et al. (2014) explained, the influence of these constructs may be limited by the overriding influence of the parent. This claim has been supported by Faulkner and colleagues (2010), who showed parents to be the ultimate decision-makers regarding children's AST habits. These decision-making processes, however, can be mediated by specific factors associated with the family, in addition to broader organizational, environmental, and political factors.

2.6 Interpersonal Level Factors Influencing AST

2.6.1 Parent Perceptions Regarding AST Safety

As with many health behaviours (e.g., diet, exercise), parents have a significant influence on children's travel modes, particularly to/from school. Examining their effect on AST requires attention to parent-related perceptions on AST, past and current AST practices, and parent and household demographics. The AST literature has established negative parental safety perceptions as a leading barrier to AST. Fears and anxieties regarding stranger danger, child abduction, and molestation have limited AST internationally (Chillon et al., 2014; DiGuiseppi et al., 1998; Farah & Shani, 2015; Hillman et al., 1990; Lorenc et al., 2008). Likewise, negative perceptions regarding traffic danger and pedestrian injury have spurred parents to drive their children to school (Ahlport et al., 2008; Bringolf-Isler et al., 2008; Kerr et al., 2006; McMillan et al., 2006; Rothman et al., 2012), in conjunction to perceiving driving as the more 'convenient' option (Faulkner et al., 2010; McDonald & Aalborg, 2009; Schlossbery et al., 2006). Ironically, the decision to drive children to/from school contributes to increasing traffic volume.

Interestingly, Buliung and colleagues (2015) highlight various data sources indicating a greater proportion of children who are killed as passengers in four-wheeled vehicles compared to children walking to/from school. They also discuss the likelihood of encountering a 'stranger danger' situation to be slimmer than being injured in a car. However, it is important for professionals vested in AST to acknowledge that an element of risk is involved. Researchers have explored the relationship between AST and risk, showing that the risk of injury, notably during school transportation periods (Warsh et al., 2009), is heightened for non-motorized travel methods compared to motorized (Gropp et al., 2013; Rothman et al., 2012; Rothman et al., 2013). Hence, it is important for AST practitioners to account for parental safety concerns,

whether real or perceived, and collaborate with the necessary stakeholders (e.g., education, police, planners) to educate parents on the value and (mis)perceptions of AST while also mitigating pedestrian risk (e.g., crossing guard presence). In fact, a recent study showed that addressing parental safety concerns can increase AST behaviours by around 60% (Ermagun & Simimi, 2015). Since parents' negative perceptions will hinder programs designed to increase AST (e.g., STP), interventions must acknowledge the evidence by developing strategies to make AST a safer and convenient option.

2.6.2 Parent Habits and Values Around Active Travel

Parental habits and values regarding active travel can further influence children's travel mode to/from school. Children whose parents practiced AST in childhood (Ridgewell & Buchanan, 2009), currently value AST (Badri et al., 2012; Mammen et al., 2012), and commute to work by active modes (McMillan, 2006) are likely to engage in AST. However, as alluded to previously, with greater families comprised of dual-income households relative to the traditional single-income families, children's AST opportunities are more limited than ever. Parent or caregiver availability regarding the trip to/from school can affect children's travel options (Mitra, 2013). As an example, in McDonald's (2008b) cross-sectional study of 8,231 US youth (i.e., 5-14 years old), children were less likely to walk to school when their mothers commuted to work. Other studies have suggested potential reasons for this relationship, as working parents often feel too rushed in the mornings (Ramanathan et al., 2014), thus 'trip-chaining,' which refers to driving children to school en route to a subsequent destination (Faulkner et al., 2010). Parental work schedules may partially explain why AST has been found to be higher in the afternoon than during the morning trip to school (Wong et al., 2011), since parent availability to transport children is more restricted in the afternoon (Mitra et al., 2014).

2.6.3 Family Characteristics

Certain parent, family, and household characteristics have also been identified as significant interpersonal correlates of AST. More notably, varying ethnicities and SES statuses among families have been associated with varying AST levels among children. Data have shown that AST levels are higher among non-Caucasian, visible minorities than affluent children (Braza et al., 2004; Pont et al., 2013). As explained earlier, this difference can be rooted in historical and sociological differences in children's mobility between cultures. Research also shows that

children from families of higher income are less likely to engage in AST than those from households with lower income (Green et al., 2004; Shokohi et al., 2012; Zhu & Lee, 2008). Households of 'higher' income generally own more vehicles than households of lower income, thus are more likely to use their vehicles as a travel method (Frank, 2004). Concurrently, families of higher SES have been found to enroll children in private, 'gifted' schools, for example, which typically contain large catchment areas and often require motorized travel (DiGuiseppi et al., 1998; Merom et al., 2006). Conversely, lower SES families may own fewer cars or have no vehicle, perhaps resulting in children traveling to school by foot out of necessity (Shokohi et al., 2012). Hence, it is critical for AST practitioners to acknowledge the differences in AST practices between ethnicities and SESs, and design strategies to promote AST accordingly.

2.7 Organization Level Factors Influencing AST

2.7.1 School Culture

Within an AST context, the organizational level of influence mainly refers to factors associated with the school itself. Factors related to the school culture and school demographics can influence PA levels, such as AST. First, the culture within the school pertaining to attitudes around PA promotion can determine the degree of PA adoption. A recent mixed methods evaluation of an AST program showed that implementing a program is easier when the school culture is open, accepting, and enthusiastic about the behaviour (Crawford & Gerrard, 2013). Generating a healthy school culture can be achieved via school champions (e.g., school staff, students, parents) who lead the encouragement and promotion of PA (Rickwood, 2013).

For instance, research shows student involvement in behaviour change programs to be a powerful interventional tool in eliciting norm, attitude and actual behaviour change (Valente et al., 2003). Consulting with children is critical given their varying perspectives relative to adults and since their needs and preferences are important in effectively tailoring programs (Evans et al., 2013; Holloway & Valentine, 2000). Further, parents are needed for consultation and in the design and delivery of AST initiatives to address their concerns (e.g., safety) and proposed solutions. Interventions including a parent engagement component have been shown to increase the likelihood of their children meeting PA guidelines (Haerens et al., 2007; Ornelas et al, 2007), by modeling and supporting PA behaviours and healthy environments for students (Michael et

al., 2007). Hence, it is prudent for school staff along with health promotion practitioners to invite and involve parents in the decision-making processes as they relate to AST adoption.

2.7.2 School Characteristics

School level characteristics such as student-body composition (e.g., ethnicity, enrolment), school type (i.e., public vs private) and SES status are also correlated with varying AST levels. In line with the literature around family ethnicity and AST explained above, schools with a higher proportion of visible minorities have been shown to have greater levels of AST relative to schools composed of largely of Caucasian students (McDonald, 2008a; Zhu & Lee, 2008). In terms of school type, research has found higher rates of AST in public schools compared to private schools (DiGuiseppi et al., 1998; Merom et al., 2006). The reasoning for this may reflect differences in catchment areas and travel distances, bussing policies, and socioeconomic demographics of the enrolled students (Mitra and Buliung, 2014; Yang et al., 2012). Lastly, in terms of school level SES, schools in the lower end of the spectrum are known to have higher rates of AST, but undesirable and unsafe pedestrian routes to school (Green et al., 2004; Mitra et al., 2010; Zhu & Lee, 2008). For instance, Zhu and Lee found that among 73 elementary schools in Austin, Texas, schools located in lower SES areas had greater 'neighbourhood-level walkability' (e.g., greater sidewalk networks, residential density) but poorer 'street-level walkability' (e.g., street aesthetics, higher traffic volume/crime). Though the literature shows greater AST levels in lower SES families and school-neighbourhoods, it is imperative to understand that the potential health benefits of AST may be undermined by the threats to personal safety. As Buliung et al. (2015) note, perhaps tax revenues and other finances should be spent more equitable across varying SES regions to provide children (and adults) with safe, aesthetically appealing, pedestrian friendly environments to support active living principles like AST.

Overall, this sub-section suggests that interventions aimed to increase AST must take into account the school culture and characteristics that have been found to differentiate AST levels. In examining the intra- and interpersonal correlates of AST, and the factors associated with the school, it is becoming increasingly clear that AST is a complex phenomenon and intervention strategies encompassing a 'one-size-fits-all' approach to increase AST will likely be ineffective. Rather, AST interventions should consist of school-specific strategies that reflect the needs of the

respective student-population and the SES location of the school. Moreover, interventions must also consider factors linked to a broader ecological level that can affect AST: the physical 'built environment.'

2.8 The Physical Environment Influences on AST

2.8.1 Distance and Other Aspects of the Built Environment

When discussing built environment (BE) features influencing AST, the proximity of school to children's respective homes is considered a prime factor. The actual (Mitra & Buliung, 2014) or perceived (Timperio et al., 2006) distance between home and school has been identified as the leading predictor and barrier to AST. This may partially explain why studies have shown greater AST in urban relative to outer suburban and rural areas (Martin et al., 2007; Mitra et al., 2010; Robertson-Wilson et al., 2007), given that urban locations contain BE characteristics supporting walking and cycling.

Different scholars have conceptualized specific characteristics of the BE. Handy and colleagues (2002) suggested five interrelated dimensions affecting AST; i) density and intensity of development; ii) land-use mix, including the use of different types of land such as residential, retail, offices, and parks in a specified area; iii) street connectivity, including the directness and availability of various routes; iv) scale of streets, including the three-dimensional space along a street as bounded by buildings or other features (e.g., trees or walls); and v) aesthetic qualities, reflecting the attractiveness or appeal of a place or route. Similarly, Cervero et al. (1997) framed BE features by the '3Ds' referring to density (e.g., households per acre, floor area ratio), diversity (e.g., land-use mix, presence of neighbourhood retail), and design (e.g., street connectivity indicators, road network density completeness of sidewalk networks). Lee and colleagues (2006) extended Cervero's BE dimensions by adding 'route' to the 3Ds. Thus, the 3Ds + R can serve as key components to examine neighbourhood walkability around the school, home, or routes to/from school.

In terms of the associations between the BE and AST, evidence shows mixed-findings aside from the effect of distance. Some research finds that children are more likely to practice AST in areas of greater density (Kerr et al., 2006; Lin and Chang, 2010; McDonald, 2008a; Panter et al., 2010), street connectivity (Handy et al., 2002; Schlossberg et al., 2006), land use mix (Larsen et

al., 2009; Lin and Chang, 2010; McMillan, 2007), sidewalk and bike route infrastructure (Boarnet et al., 2005; Ewing et al., 2004; Kerr et al., 2006; Martin et al., 2007), and more appealing environmental aesthetics (Gropp et al., 2012). Other evidence points to the opposite or null findings when relating AST to land use mix, completeness of sidewalks, and presence of a busy road on route to school (Ewing et al., 2004; Kerr et al., Larsen et al., 2009; McMillan et al., 2007; Mitra et al., 2010; Timperio et al., 2006; Yarlagadda and Srinivasan, 2008).

Researchers have suggested that the inconsistent findings may be related to; the limited GIS data availability for certain (e.g., sidewalk) measures of urban design (Handy et al, 2002); the heterogeneity and types of BE measures (e.g., objective vs. perceived) used across studies (Ding et al., 2011); and the range of other factors (e.g., age, gender, independent mobility) that may moderate the relationships between the BE and AST (Wong et al., 2011). Thus, from a research perspective, more studies are needed to account for these methodological issues and help clarify the relationships between various BE characteristics and AST. From a practice and policy perspective, it is important to acknowledge that not only can the surrounding school environments influence AST, but the environments surrounding residential neighbourhoods and on the routes to school are influential as well (Mitra et al., 2010; Mitra & Buliung, 2014). Mitra and colleagues (2010) showed the BE near residential areas to have a stronger correlation with mode choice compared to the BE near the school. Hence, vesting energy and resources to modify the BE around the school alone may not effectively facilitate mode change to more AST. These issues around the BE lends itself to a political discussion around school siting and other related policies influencing AST.

2.9 Policy Level Influences on AST

At the broadest ecological level of influence (McLeroy et al., 1988; Sallis et al., 2006), many policies (or a lack thereof) can indirectly (e.g., school siting) and directly (e.g., safe routes to school legislation) impact AST opportunities. Researchers and organizations have identified various school board, urban design, and transport planning policies affecting AST related to: school speed zones; drop-off policies; school start/dismissal times; transportation services; transportation infrastructure; school siting; school closure; no-transport zone; traffic calming; and crossing guards (Black et al., 2001; Chriqui et al., 2012; Ewing et al., 2004; Eyler et al., 2008; Metrolinx, 2013; Nova Scotia Ecology Action Centre, 2010; Yang et al., 2012). The

following, however, will touch on the effect of four policy-based decisions frequently discussed in the AST literature: school siting; school closure; school choice; and the SRTS legislation in the US.

2.9.1 School Siting & Closures

As discussed, certain characteristics of the BE can support or hinder AST. Therefore, the geographic locations where schools are sited can influence AST. This highlights the importance in ensuring that newer schools are not constructed in remote areas where land is cheaper, but rather where the routes to school have high street connectivity and carry low traffic volumes (Sirard and Slater, 2008). This is a pertinent and timely issue given that, in Canada (and internationally), economic constraints have led to several 'neighbourhood' school closures and increased enrolments in 'centralized' schools, resulting in greater catchments areas and decreased proximity of schools to residential areas (Davison et al., 2008; Ewing et al., 2004; Schlossberg et al., 2006; McDonald, 2007; Falb et al., 2007).

For example, in Toronto, Canada, there are growing pressures on school boards from the provincial government to shut down schools that are under 65% capacity, which represents 84 of the 473 elementary schools in the city (Globe and Mail, 2015). Though this motive is largely financial, it is also controversial as school-board trustees understand that schools are community hubs tied with broader benefits, and the closure of these schools can significantly impact students, families, and the wider-communities. From a health and AST perspective, this is worrisome since school closures would result in the relocation of students, likely to schools located further from home, leading to increased bussing services, costs, and reduced opportunities to engage in AST. As Mitra and Buliung (2013) recommend, "the potential impact of the economic rationalization of the school system on mode choice and children's physical activity levels should be the focus of some debate when governments and school boards contemplate school closures" (pg.3). Likewise, these debates should include health and environmental cost-benefit projections of the increased motorized transport (e.g., bus, car) and inactivity associated with increasing school closures.

2.9.2 School choice

Another policy with similar implications to school location relates to school choice (Yang et al., 2012). School choice is a policy enabling families to self-select schools located in any area of the respective region. This allows students to attend schools further than their neighborhood school, concurrently increasing the demand for motorised travel and limiting AST opportunities. Research supports these relationships which have found students registered in private schools are more likely to be driven to school than walking or cycle due to the increased travel times and distances (Wilson et al., 2007). Though scholars have acknowledged the value of school choice policies regarding societal education freedom rights and family-related goals, these policies, in conjunction with school closure decisions, may have unintended consequences in impeding interventions designed to increase AST, such as SRTS (Davison et al., 2008; Giles-Corti et al., 2011; Marshall et al., 2010; Yang et al., 2012).

2.9.3 Federal Safe Routes to School initiative

The SRTS initiative, a US based legislation led by the Federal Highway Administration, provides funding for State Departments of Transportation to i) enable and encourage children to walk and bicycle to school ii) make bicycling and walking to school a safer and more appealing transportation alternative and iii) facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools (www.saferoutesinfo.org). The passage of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) delivered more than $1 billon towards supporting AST programming (e.g., education, environment, encouragement) and infrastructure (e.g., engineering improvements) between 2005-2012. Though this legislation reformed in June 2012 to a new program entitled ‘Transportation Alternatives’ under the new transportation bill (i.e. MAP-21), $800 million per year is still devoted to walking and cycling initiatives.

These bills are prime examples of how specific policies can intentionally perpetuate AST behaviours. The SRTS National Partnership website (www.saferoutesinfo.org) cites several facts and success stories stemming from legislation. For example, as of June 2012, 13,300 schools and approximately 4.8 million children were benefiting from federal support. In Oak Ridge, Tennessee, an elementary school used approximately $240,000 in SRTS funding to build

sidewalks, curb cuts, and cross walks near the school following a pedestrian fatality of one of its students. In Eugene, Oregon, an elementary school invested $600,000 for a walking path, crosswalks, school zone signage and programming. In a small rural town in Saint Joe, Indianapolis, $250,000 was spent towards installing 1.5 miles of sidewalks that apparently would have taken 15 years to complete using local funds. Additionally, many annual SRTS reports have identified increases in AST and decreases in motorized travel among other outcomes. However, peer-reviewed studies with robust designs and analysis are needed in determining SRTS's effectiveness in achieving its primary goal: increases in AST. Thus, the following section of this literature review will examine findings from studies that evaluate SRTS interventions in the US, among other AST interventions globally designed to increase AST.

2.10 Interventions to increase AST

To this point, the literature review has explored AST's health benefits, international trends, and influential socio-ecological factors. Due to the benefits and the respective decline and increase in non-motorized and motorized travel, various interventions have been implemented with the aim of raising AST levels. A critical question remains as to whether interventions can increase AST. In 2011, Chillon and colleagues published the first systematic review examining AST intervention effectiveness. Since their review, there have been several more intervention studies aimed at assessing AST outcomes. Hence, the purpose of this literature review section is to conduct a systematic review of AST interventions that have been published since Chillon et al.'s. The following will present a summary of Chillon and colleagues' review and the specific objective of the updated review.

2.10.1 Summary of previous review

The primary purpose of Chillon et al.'s (2011) study was to examine the methodological quality of the intervention studies, effectiveness on AST outcomes, and overall, provide recommendations for future designs and evaluations. Their search strategy yielded 14 studies meeting the inclusion criteria, which included a focus on youth (i.e., age 6-18), containing an intervention, and using one or more outcomes of AST or PA. Over half of the studies (n=9) were located in the US, and two and three were conducted in the UK and Australia respectively. Most of the studies used a quasi-experimental design (n=9), three studies employed a randomized controlled trial, and two were observational evaluations.

The majority of interventions reported a positive impact, largely related to walking, although the degree of change varied between interventions (+3%-64%). However, for the majority of interventions, the effects sizes were trivial to small (0.1-0.4) and the methodological ratings were weak as related to selection bias, study design, and confounders, as examples. The authors attribute the small effect sizes to the majority of interventions focusing solely on education (e.g., classroom AST content) and/or encouragement initiatives (e.g., Walk to School Days) while not taking environmental and political factors into account. Overall, they urge AST interventions to consistently apply the range of factors known to influence AST (e.g., distance, pedestrian infrastructure) and involve stakeholders from the school and community levels in implementation.

In acknowledging Chillon et al.'s (2011) review as an important contribution to the AST literature, there is at least one gap. Though the study quantifies the number and types of AST strategies (e.g., education, encouragement, engineering) per intervention, information linking these strategies to AST outcomes was missing. Enhancing understanding of which types of interventions/strategies are more likely to facilitate increases in AST can provide useful knowledge for practitioners, in particular, in designing and implementing AST interventions. Hence, the following provides an updated search to build on the review reported by Chillon and colleagues. In doing so, an additional objective was to differentiate intervention characteristics between studies showing increases in AST to studies observing null effects. This will address a gap in Chillon et al.'s review by highlighting program factors indicative of AST change and, hence, providing researchers, practitioners, and decision-makers with information on *what works* and *what doesn't* with regards to AST intervention.

2.10.2 Search Strategy of Updated Review

A search was conducted used the same methods reported by Chillon et al. (2011), including the used databases, search terms, and inclusion criteria. The current search was restricted to studies published between Chillon et al.'s cut-off date, February 1, 2010, to June 17, 2015. Table 2.1 shows the yielded results from the previous review's search relative to the updated search. In total, the search generated 4,370 citations. All titles and/or abstracts were screened with 24 studies being identified as potentially eligible for inclusion. After a second revision process, 18 of the 24 studies met the inclusion criteria. For the purpose of this dissertation section, all four

Table 2.1- Search Strategy Data Bases and Yielded Results

Data Base	Chillon et al. (2011)	Updated search
PubMed	949	1814
Web of Science	807	1195
Cochrane	243	268
Sport Discus	2802	95
National Transportation Library	1510	998
	Included studies- 14	Included Studies- 18

STP intervention studies meeting inclusion criteria will be excluded to avoid redundancy since they will be discussed in a following subsection that leads to the dissertation objectives. Hence, the following text is based on 14 intervention studies.

2.10.3 Study Characteristics

Table 2.2 displays study characteristics for the 14 included studies. Twelve of the 14 studies were either implemented in the US (Buckley et al., 2013; Bungum et al., 2014; Gutierrez et al., 2014; Mendoza et al., 2011; McDonald et al., 2013; McDonald et al., 2014; Sayers et al., 2012; Stewart et al., 2014) or Europe (Christiansen et al., 2014; Ducheyne et al., 2014; McMinn et al., 2012; Vanwolleghem et al., 2014). One study was based in Australia (Crawford and Garrard, 2013) while the other used international data from British and Canadian schools (Hunter et al., 2015). All studies targeted primary and elementary school students ranging in ages from 5-14.

There was a mix of study designs including quasi-experimental (*n*=7; Bungum et al., 2014; Gutierrez et al., 2014; McDonald et al., 2013; McDonald et al., 2014; McMinn et al., 2012; Sayers et al., 2012; Stewart et al., 2014), randomized controlled trials (*n*=3; Christiansen et al., 2014; Ducheyne et al., 2014; Mendoza et al., 2011), mixed-methods (*n*=3; Buckley et al., 2013; Crawford & Garrard, 2013; Hunter et al., 2015) and observational studies (*n*=1; Vanwolleghem

et al., 2014). The majority of studies had evaluative time periods of one year or less; only four studies contained multi-year examinations in AST change (Christiansen et al., 2014; McDonald et al., 2013; McDonald et al., 2014; Stewart et al., 2014)

In terms of AST measures, the majority used child-reported data (*n*=7; Christiansen et al.,2014; Mendoza et al., 2011; McDonald et al., 2013; McDonald et al., 2014; McMinn et al., 2012; Stewart et al., 2014; Vanwolleghem et al., 2014), whereas the remaining used either more direct measures (i.e., accelerometry, observational counts; Buckley et al., 2013; Bungum et al., 2014; Gutierrez et al., 2014; Hunter et al., 2015; Sayers et al., 2012) or parent-reported data (Ducheyne et al., 2014).

2.10.4 Which interventions found increases in AST?

Among the 14 interventions, six showed positive impact on AST (Buckley et al., 2013; Mendoza et al., 2011; McDonald et al., 2013; McDonald et al. 2014; Stewart et al., 2014; Vanwolleghem et al., 2014), seven showed no impact (Bungum et al., 2014; Christiansen et al., 2014; Ducheyne et al., 2014; Gutierrez et al., 2014; Hunter et al., 2015; McMinn et al., 2012; Sayers et al., 2012) and two found mixed-findings (Crawford and Garrard, 2013; Hunter et al., 2015). What intervention characteristics differentiate AST outcomes in these studies? Addressing this question can provide insight into factors that may underpin or hinder favourable changes in AST.

2.10.4.1 Intervention Comprehensiveness

One common characteristic of most of the successful interventions was applying a comprehensive ecological approach in implementation. The federally funded SRTS initiative in the US is a prime example of an intervention designed to address a range of socio-ecological factors by combining both non-infrastructure (e.g., designated walk to school days) and infrastructure (e.g., signage or bicycle rack installation) strategies through a 5E strategy framework (i.e., education, encouragement, enforcement, engineering, evaluation; www.saferoutespartnership.org/local/getting-started-locally/5es). The evidence around its effectiveness on AST is compelling.

The updated review identified four studies associated with the SRTS program, all of which showed increased rates of AST (Buckley et al., 2013; McDonald et al., 2013; McDonald et al., 2014; Stewart et al., 2014). In their mixed-methods case study focusing solely on SRTS's

hallmark walk to school day in two Idaho schools, Buckley and colleagues found that relative to a control school, there was a two-fold increase in AST on event days, one day following the events, and two weeks following based on observational counts of travel modes. Secondary outcome measures also showed a three-fold increase in parent escorted trips and walking group sizes. This study was limited, however, in determining SRTS's effectiveness since only two schools were examined and there was a narrow focus on only one aspect of the comprehensive program (i.e., walk to school days). Three other SRTS evaluations have bridged this gap by assessing intervention impact on AST at a population-level and considering the range of 'E' strategies employed (e.g., education, engineering).

Evidence demonstrates a longitudinal shift in AST as a result of the SRTS program across numerous states and schools (McDonald et al., 2013; McDonald et al., 2014; Stewart et al., 2014). Using a sample of 53 schools from four US states, Stewart and colleagues' observational study found an increase in AST from 12.9% to 17.6% at five-year follow-up. Although encouraging, there was no indication of what aspects of SRTS facilitated changes in AST. Moreover, the observational nature limits any causal inferences regarding the intervention on mode change. McDonald et al.'s (2013) Oregon based study addressed these limitations, albeit with a smaller sample (i.e., 14 schools). Their quasi-experimental design found a 5-20 percentage point increase in AST (child-reported) in the seven intervention schools. Analysis further depicted combinations of educational and encouragement strategies to be associated with a 5% increase in biking, and augmenting these two E's with engineering changes (e.g., sidewalks, crosswalks, covered bike parking) over 4 years can increase overall AST by up to 20%.

By scaling up this study to 801 schools and assessing AST trends over five years and across four states (i.e., Oregon, Florida, Texas, District of Columbia), McDonald and colleagues (2014) found a temporal 13% increase in AST compared to control schools. Similar to their previous SRTS study (McDonald et al., 2013), engineering improvements were associated with an 18% relative increase in AST. From a sustainability standpoint, results further showed an absolute 1% increase in AST with each additional year of programming.

The other two interventions showing increases in AST, though not as comprehensive as the SRTS program, should be interpreted with caution as follow up assessments only occurred

during implementation. Mendoza et al.'s (2011) eight-week randomized control trial of 4 schools implementing a Walking School Bus (WSB; e.g., encouragement initiative only) revealed a 38% relative increase in AST (child-reported) relative to control subjects. However, without blinding participants, in conjunction with follow-up measures occurring during mid-intervention only (week 4 and 5), a reporting bias may have existed. Similarly, the positive effect (i.e., +2 AST trips/week) of a combined drop off zone (i.e., 500-800m from school) with AST campaigning in 2 schools in Vanwolleghem et al.'s (2014) study is likely the result of follow-up measures only being collected during implementation. Nonetheless, this study shared a main characteristic related to the SRTS interventions in that both non-infrastructure and infrastructure components were implemented. Hence, the comprehensiveness of AST interventions that include education, encouragement, in addition to physical environment changes appear to be effective in increasing AST. This assertion is supported by an examination of the nature of the interventions showing no change in AST.

To illustrate, the majority of the studies finding null effects on AST only focused on non-infrastructure strategies through either educational (Ducheyne et al, 2014; McMinn et al., 2012) or encouragement tactics (Bungum et al., 2014; Sayers et al., 2012; Hunter et al., 2015) without addressing environmental barriers. Ducheyne et al.'s (2014) randomized control trial examined the effect of a cycling training course on cycling behaviour, which showed no changes in AST at one week and five month follow-ups. A quasi-experiment cross-sectional study that assessed the impact of a one-week WSB on two schools and 77 students in Columbia, USA, also showed no effects on AST (Sayers et al., 2012). The Travelling Green project (McMinn et al., 2012) in Glasgow, Scotland, was a six-week intervention aimed to increase AST via teacher lesson plans (AST classes) and student packages (e.g., AST goals). This quasi-experiment using five schools also found no changes in AST post-implementation. Aside from differences in the types of strategies employed, the school-specificity of the interventions accompanied with stakeholder involvement may also indicate the degree of AST impact.

2.10.4.2 School Specificity and Stakeholder Involvement

As discussed in the previous section, AST can be influenced by a complex set of interrelated, multi-layered factors. This is likely to yield school-specific challenges that reflect, for example, a school's geographical location (e.g., inner suburb vs outer suburb) and/or demographics (e.g.,

SES, ethnicity). Thus, are interventions that are specific to a schools needs more effective than interventions delivering more generic types of strategies? The evidence stemming from this updated review appears to suggest so. Almost all successful interventions, such as the SRTS program, were designed to address school-specific barriers (Buckley et al., 2013; McDonald et al., 2013; McDonald et al., 2014; Stewart et al., 2014; Vanwolleghem et al., 2014). However, the interventions showing no changes in AST applied broader AST strategies that were not explicitly school-specific such as WSB schemes (Sayers et al., 2012), cycling training sessions (Ducheyne et al, 2014), AST classroom lessons (McMinn et al., 2012), and inter-school AST competitions (Hunter et al., 2015). As a further example, Christiansen et al.'s (2014) study was centred on improving non-curricular PA, one aspect being AST, which showed no impact. Chillon et al.'s review (2011) suggested that interventions will be more effective in increasing AST if it is specific to walking and cycling, and not overall PA.

Chillon's review also emphasized the importance of including a range of stakeholders in implementation to help assess school-specific barriers and deliver aligning strategies. The results from this updated review supports this by showing more stakeholder involvement within successful interventions (Buckley et al., 2013; McDonald et al., 2013; McDonald et al. 2014; Stewart et al., 2014; Vanwolleghem et al., 2014), relative to studies finding no changes in AST (Bungum et al., 2014; Christiansen et al., 2014; Ducheyne et al., 2014; Gutierrez et al., 2014; Hunter et al., 2015; McMinn et al., 2012; Sayers et al., 2012).

2.10.4.3 Timeframe of Evaluations

As stated, six of the 14 studies showed positive impact on AST (Buckley et al., 2013; Mendoza et al., 2011; McDonald et al., 2013; McDonald et al. 2014; Stewart et al., 2014; Vanwolleghem et al., 2014). An important question to address when discussing these findings is: are these changes sustainable over time? Answering this requires multi-year evaluation periods with multiple follow-up assessments. However, only three of these studies (McDonald et al., 2013; McDonald et al. 2014; Stewart et al., 2014) assessed mode change over multiple years, which showed sustainable increases in AST. Combined with Chillon et al.'s review (2011), among the 28 intervention studies, only seven interventions were evaluated across multiple years. Hence, more multi-year timeframe evaluations are needed among various interventions to determine sustainable, long term, changes in mode shift.

Table 2.2: Study Characteristics of Intervention Studies

Author, Country	Intervention	Methods	Effect on AST	Effects on other outcomes	4E strategies
Buckley et al., 2013 Idaho, USA	*Designated AST day*, aimed to encourage students and their families to practice AST on a specific day	Design: Multisite mixed methods Case Study|pre-3post (during, 1-day, 2-weeks) Sample: 3 schools Duration: Two designated AST days AST measure: observation counts	Fall event: increase in AST (101%) on the day; remained high one day following Spring event: increase in AST sustained at 2-week follow-up	Parent Escort: Increased (333%) on AST day- parent interviews confirmed this as an opportunistic time to spend with their child Walking groups: median group size increased from 2-3 and the maximum group size increased from 5-9	Safe Routes to School affiliated ~ Encouragement Education Engineering Enforcement
Bungum et al., 2014 Las Vegas, USA	*Designated AST day*, aimed to encourage students and their families to practice AST on a specific day	Design: Quasi-experiment|pre-2 post (during, 1-week) assessments Sample: 2 schools| 1336 students|ages 5-11 Duration: 1-day event AST measures: objective observation count	Increase in AST by 7.6% on the day of the event AST dropped to baseline rates at 1-week assessments	Traffic volume: no effect	Encouragement

Christiansen et al., 2014 Denmark	A comprehensive school-based intervention to improve non-curricular PA through changes of the physical and organizational environment supported by educational activities.	Design: RCT|pre-post (2-year) Sample: 14 schools|1014 students|ages 11-13 Duration: 2 years AST measure: Travel diary	No increases in AST	—	Encouragement Education Engineering
Crawford & Garrard, 2013 Victoria, Australia	The Ride2School Program, a comprehensive program aimed to increase AST primarily through non-infrastructure + infrastructure components	Design: Mixed Methods, Sequential Explanatory Design|pre-post (1-year) Sample: 15 schools|ages 10-13|1650 parents Duration: 1 year AST measure: multiple	Parent-reported data showed a significant increase in AST to school at least once a week, but student-reported data indicated no statistically significant change.	Qualitative data suggest that the program was easier to implement within a school that was smaller, more established, with a culture that was accepting and enthusiastic about active transport, in an area of higher density and lower car use, with greater use of infrastructure improvements and a more “hands-on” approach from the Coordinator.	Encouragement Education Engineering

Ducheyne et al., 2014 Belgium	*Cycling training*, aimed to increase cycling skills and behaviours	Design: RCT| pre-2post (1-week, 5-month) assessments Sample: 3 schools| 94 students | age 10 Duration: 4 sessions (45 min each) AST measure: parent reported	No increases in cycling	Cycling skills: increased skills in bike mounting, shoulder checks, hand signals, and cycling in a straight line	Encouragement Education
Gutierrez et al., 2014 Miami, **USA**	Implementation of crossing guards & AST awareness campaign	Design: Quasi-experiment |pre-post Sample: 58 intersections Duration: n/a AST measure: observation counts	No increases in AST	Safety: Increases in students utilized supervised routes Parent attitudes: no changes regarding AST safety following cross guard presence	Education Engineering
Hunter et al., 2015 London, England Reading, England Vancouver, Canada	International school competition, aimed to Increase AST via incentive-motivated approaches	Design: Observational Mixed-Methods|pre-post (4-week) Sample: 12 schools| 3817 Students|9-13 YO Duration: 4 weeks AST measures: Swipe card Technology (objective)	No increases in AST	Children's attitudes: Children perceived the intervention to help physical and mental health Adult attitudes: 91% of parents and 72% of teachers surveyed stated that they thought the competition had encouraged children to spend more time walking with their friends. This was	Encouragement

				confirmed with data from the focus groups.	
Mendoza et al., 2011 Texas, USA	*Walking School Bus*, aimed to increase AST via adult supervision and walking groups	Design: RCT|8 schools| Pre-2during (4^{th} & 5^{th} week of intervention) Sample: 8 schools|149 students|average age 10 Duration: 5 weeks AST measure: Child-report	Increases in AST from 23.8% to 54%	Parent outcome expectation had a significant influence on their children's AST	Encouragement
McDonald et al., 2013 Oregon, USA	*Safe Routes to School*, a comprehensive, federally-funded program in the US designed to increase AST through non-infrastructure and infrastructure tactics	Design: Quasi-experiment|pre-post (4-year) Sample: 14 schools Duration: 4 years AST measure: child-reported	Increase in AST by 5-20 percentage points	Education + encouragement associated with 5 percentage point increase in biking Augmenting education programs with engineering improvements was associated with increases in walking and biking of 5-20 percentage points	Encouragement Education Engineering Enforcement
McDonald et al., 2014 Florida,	*Safe Routes to School*, a comprehensive, federally-funded program in the US	Design: Quasi-experiment |pre-post (5-year) Sample: 801 schools| 65,289	Increases in walking and bicycling after schools implemented SRTS programs.	Engineering improvements associated with an 18% relative increase	Encouragement Education

Oregon, Texas, District of Columbia, USA	designed to increase AST through non-infrastructure and infrastructure tactics	students Duration: 5 years AST measure: Student report	AST increased with each year of SRTS participation baseline (18%), 1 year (20%), 4+ years (30%) Overall, after 5 years, increase in AST by 13 percentage points or relative change of 71%	in walking and biking Effects of education + encouragement is cumulative, with each additional year of programming associated with an absolute increase of 1% in the proportion of students walking and biking Over the course of 5 years, education + encouragement could lead to a 25% relative increase in AST	Engineering Enforcement
McMinn et al., 2012 Glasgow, Scotland	*Travelling Green*, a 6-week school based intervention aimed to increase AST via teacher handbooks (e.g., lesson plans), and student packs (e.g., material to set walking goals, record behaviour)	Design: Quasi-experiment | pre-post (5-days) assessments Sample: 5 schools|166 students |ages 8-9 Duration: 6 weeks AST Measure: Daily diary	No increase in daily steps MVPA, or AST	—	Education
Sayers et al., 2012 Columbia, USA	*Walking School Bus*, aimed to increase AST via adult supervision and walking groups	Design: Quasi-Experimental | cross-sectional Sample: 3 schools|77 students|ages 8-9	No increase in MVPA	—	Encouragement

		Duration: 1 week AST measure: accelerometers			
Stewart et al., 2014 Florida, Mississippi, Washington, Wisconsin, USA	*Safe Routes to School*, a comprehensive, federally-funded program in the US designed to increase AST through non-infrastructure and infrastructure tactics	Design: Observational|pre-post (5 years) Sample: 53 schools Duration: 5 years AST measure: in-class tallies or observation counts	AST increased from 12.9% to 17.6%; walking from 9.8% to 14.2%; cycling from 2.5%-3%.	—	Encouragement Education Engineering Enforcement
Vanwolleghem et al., 2014 West-Flanders, Belgium	*A drop-off spot* (500–800 m distance from school) was organized that included teacher supervision on the walk to/from the designated area	Design: Observational| Pre-during intervention assessments Sample: 2 schools|58 students|ages 6-12 Length: 1 week AST measure: daily diary	Increase in AST (+2 trips/week; $X^2 = 52.9$; $p < 0.001$)	Perception of intervention: positive by principals and parents, but teachers expressed doubts about future implementation	Encouragement Education Engineering

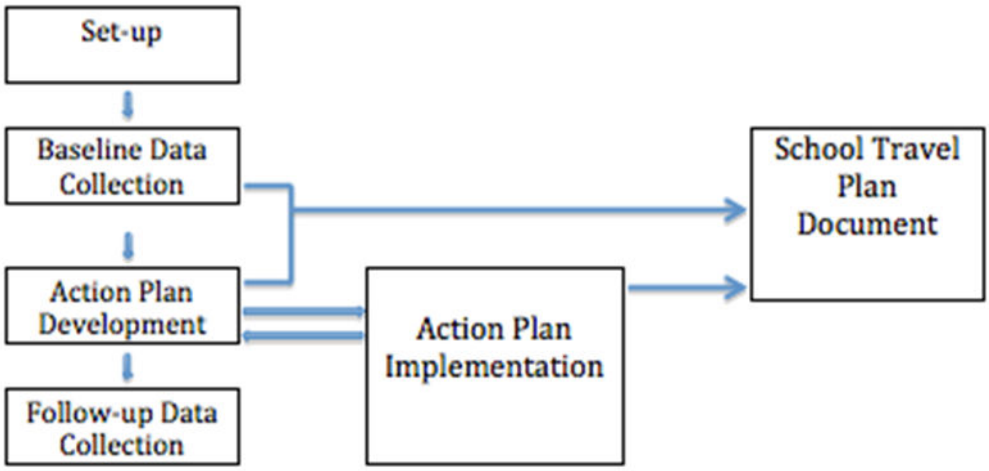
2.10.5 Summary of intervention review

This section of the dissertation provided an updated systematic review of AST interventions. Since the first review (Chillon et al. 2011), 14 studies have emerged on intervention effectiveness with regards to AST. An additional four studies were found evaluating STP and these will be discussed shortly. This updated review revealed program factors associated with AST change. Aligned with Chillon et al.'s findings and recommendations, the current review showed interventions to observe favourable changes in AST when designed to be comprehensive (e.g., range of 5Es, non infrastructure + infrastructure strategies) and involve stakeholders in implementation (e.g., parents, students, community stakeholders). Extending their findings, the results of this review also emphasized that interventions may be more effective when implemented based on school-specific challenges rather than delivering a one size fits all initiative (e.g., interschool competition, walking school bus). With the AST literature identifying AST as a complex issue influenced by a multitude of factors, it appears that interventions addressing this complexity through a range of strategies spanning non-infrastructure and infrastructure aspects and stakeholder involvement are effective in increasing AST. One such intervention—the predominate approach in increasing AST among Canadian children— is STP. Though STP is a comprehensive, stakeholder-driven program aimed to increase AST by a variety of strategies, the evidence around its effectiveness is limited.

2.11 Description of School Travel Planning

As introduced in Chapter 1, STP is a comprehensive intervention designed to help students practice AST regularly and safely in their communities. This school-specific intervention invites community-wide involvement by collaborating multidisciplinary stakeholders to help assess, document and intervene on AST barriers by means of a 'school travel plan.' The process and implementation of STP transpires through four steps (Figure 2.1).

Figure 2.1: The STP model



Led by a designated STP facilitator, step one involves the recruitment of schools and the formation of school-level STP committees. The stakeholders represent various sectors that can include safety (e.g., police officer), transportation (e.g., traffic engineer), planning (e.g., member of City Council), health (e.g., public health nurse) and education (school staff, students, parents). In step two, three sources of baseline data are collected by the facilitator: i) the family survey, which is a parent-reported survey of the eldest child's typical school travel mode along with child/family demographics; ii) the hands-up survey, which is a student-reported survey of their travel modes to/from over five consecutive days; and iii) the school profile form, which is a principal-reported item of school-level characteristics. After baseline measures are collected and analyzed, the first STP committee meeting occurs to discuss baseline results and conduct a school walkabout with the stakeholders. The school walkabout is an environmental scan that identifies built environment features that may pose barriers for AST.

The information derived from the baseline measures and walkabout informs step three (action planning/implementation), whereby STP committees meet on multiple occasions to develop a written plan of action in alleviating AST barriers and strategizing towards greater AST levels. It is important to note that strategy implementation will likely vary by school since each possesses unique and varying degrees of challenges. However, the strategies implemented follow the SRTS approach in focusing on a range of evaluation, educational, encouragement, enforcement and engineering tactics (i.e. 5Es). Based on their expertise, stakeholders play a contributing role

towards the school travel plan. For example, students, teachers, parents, and public health officials may organize educational sessions or events to promote the benefits, awareness, safety, and practicality of AST. A traffic engineer may initiate the process of improving pedestrian infrastructure such as sidewalk and crosswalk implementation and traffic signal installation. A police officer may take the lead in recruiting and providing police or crossing guard services before and after school, helping with traffic calming concerns. The key function of these stakeholders is to collaboratively increase AST levels by alleviating barriers in a given school.

In the final step, follow-up measures of the parent and hands-up surveys are collected to monitor and evaluate program effectiveness. These data sources are requested to be collected annually following baseline assessment. Thus, the school travel plan is continuously updated and modified, acting as a living document that is referred to throughout the STP process.

2.12 History and Evidence Regarding School Travel Planning

The concept of STP was developed in the United Kingdom in 1997, led by the Department of Transport and Education. With significant capital and revenue funding, 81% of schools in England (primary, secondary) had a school travel plan in place by March 2009 (Atkins Limited, 2010). Rowland et al. (2003) evaluated STP in 21 of these schools using a randomized control trial and parent surveys (n= 1386) to measure children's AST levels (i.e., walk, bike, or public transport). Results revealed no changes in AST following the intervention. The authors partially attribute this finding to high baseline levels of AST (~70%).

New Zealand's Energy Efficiency and Conservation Authority followed the UK lead in 2001 by adopting STP into their existing toolkit for walking to school initiatives. By 2006-2007, approximately $7 Million was allocated for travel projects such as STP, and a benchmark was set to implement STP in every school in New Zealand's largest region, Auckland, by 2014 (Green Communities Canada, 2007). Hinckson and colleagues (2011) tracked AST trends (child-reported) over a four-year period in 56 Auckland elementary schools. Longitudinal analysis showed modest increases (3%) three years following STP implementation.

Unlike the government assistance the UK and New Zealand STP programs have received, STP in Canada has been led by a NGO in Green Communities Canada (GCC). This organization is a national advocate for sustainable modes of transportation to improve the health of communities,

conserve resources for future generations, and reduce air pollution (greencommunitiescanada.org). In 2007, GCC reviewed international best STP practices and subsequently developed recommendations for STP pilot testing between 2007-2009 in 12 schools across four provinces. Buliung et al.'s (2011) evaluation of these schools showed a 2% increase in AST (child-reported) while 13% of families reported 'less driving' as a result of STP following one year of implementation (parent-reported).

In early 2010, GCC received additional funding from the Canadian Partnership Against Cancer and the Public Health Agency of Canada to expand STP to over 100 schools in every province (except Quebec) and territory over a one-year implementation period (i.e., Fall 2010-Fall 2011). As a collaborative partner of GCC, the University of Toronto (i.e., Health and Exercise Psychology Unit, Department of Exercise Science) undertook the task to evaluate STP's impact on travel mode change on a national scale. The supervisor of this dissertation project was the principal investigator pertaining to the grant's evaluation component. Hence, in setting context for the remainder of the dissertation, all four studies are based on GCC's delivery of STP across Canadian elementary schools. The next section will detail the overall dissertation objectives and its rationale, along with the methodologies applied across four distinct STP studies (Chapters 3, 4, 5, 6).

2.13 Dissertation Aims and Objectives

As indicated, only three evaluative STP studies existed prior to commencing this doctoral research (Buliung et al., 2011; Hinckson et al., 2011; Rowlands et al., 2003). Observed increases in AST were inconsistent across studies. Collectively, the evidence was too limited, and narrowed in scope, to determine program impact. Addressing two notable research gaps will further help evaluate the effectiveness of STP. First, there is little indication of school-related contextual factors indicative of travel mode change. This can help answer questions regarding where STP is best suited in terms of geographical location and school-level SES. Second, no STP studies have explored the dynamics and intricacies of the multi-component implementation process. Addressing these gaps can help determine what works and doesn't work in terms of implementation and answer important questions such as: What types of STP strategies (e.g., educational, engineering) predict increases in AST? What aspects of STP should be emphasized and prioritized (e.g., student involvement)? What are the roles and contributions of various

stakeholders (e.g., students) in the STP process? What are co/intermediate benefits and key challenges of implementation?

As indicated by Crawford and Garrard (2013), though assessing mode change is important for any intervention aimed to increase AST, "it is also important to examine the program and contextual factors" (pg.1) shaping intervention effectiveness. Hence, the broader aim of this dissertation is to contribute to the STP literature by providing a holistic evaluation of program impact. This will be achieved by two overarching objectives as identified in Chapter 1:

i) To determine if STP can increase AST levels in Canadian elementary schools.

ii) To identify school contextual and program factors that influence STP implementation and AST change.

These two objectives will be applied across four distinct studies and achieved through the use of mixed-methods. Combining quantitative and qualitative data sources to evaluate STP will help fill a gap in the STP literature as all existing studies are quantitative in design. The last section of the literature review will present the methodologies employed in the dissertation studies. As stated in Chapter 1, each study (i.e., Chapters 4, 5, 6, 7) will be presented in manuscript form containing the respective detailed methods. Therefore, the remainder of this chapter will outline the broader methods applied over the four studies. It is, therefore, important to address the philosophical assumptions underpinning the selected methodologies and data collection procedures across the studies.

2.14 Philosophical Assumptions

Philosophical assumptions are based on a string of beliefs that shape the research process (Guba & Lincoln, 1994). In articulating my philosophical assumptions, it is helpful to reflect on the various elements (e.g., ontology, epistemology, methodology) associated with my particular worldview and relate these elements to the study methodologies. In doing so, I will follow Creswell and Clark's (2011) presentation of the concepts around philosophical assumptions to guide my rationale for the methodologies employed.

2.14.1 Worldviews

At the broadest level, Creswell and Clarke (2011) explain that an individual's worldview, which can also be referred to as a paradigm, or knowledge claim (Bloomberg & Volpe, 2012; Mayan, 2011), contains specific assumptions and beliefs about the nature of reality and how knowledge is acquired, produced, interpreted, and presented. Based on four overarching worldviews presented by Creswell and Clarke (2011), I situate myself within a pragmatist paradigm.

Pragmatism abandons the forced-choice dichotomy between quantitative and qualitative designs (Newman & Benz, 1998). A pragmatic worldview contains elements associated with positivist (typically associated with quantitative research) and constructivist (typically associated with qualitative research) paradigms (Mayan, 2011). This lens reflects my tendency to focus on a research question and simply ask myself the question: What is the best way (i.e., method) to address this specific research question? Thus, unlike positivists or constructivists who typically focus solely on their respective quantitative or qualitative approaches, I value employing either or a combined approach when the research question or objective necessitates the need.

As outlined by Onwuegbuzie and Leech (2005), a pragmatic approach offers three main research advantages. First, researchers will have more flexibility in their methodological techniques to address a range of quantitative and qualitative research questions. Second, pragmatism will enable greater collaboration among multidisciplinary researchers who abide to specific methodologies. As evident in the literature review, the factors influencing AST is multi-level and complex, thus requiring collaborative efforts between health, geography, and transportation researchers, for example. Thirdly, pragmatic researchers are advantaged in using various data sources to inform either the quantitative or qualitative portion of the study. When evaluating an AST intervention, such as STP, qualitative sources such as semi-structured interviews with recipients of the program (e.g., students, parents) can help explain the quantitative changes (or no changes) in AST following implementation.

2.14.2 Ontology

With regards to the elements associated with pragmatism, from an ontological perspective, I view the nature of reality, or the nature of being, as both singular and multiple. As Guba and

Lincoln (2005) explain, reality is constructed and shaped in different ways and multiple, subjective realities can exist. To illustrate, consider the temporal decline in AST internationally. To reverse this trend, there is not a single answer, or reality, or entity, but multiple realities stemming from variations in AST among genders, cultures, families, SESs, and geographies. However, when evaluating an AST intervention, one researcher may only be interested in a 'single' number or outcome (e.g., AST change) to determine program effectiveness. Another researcher may be interested in exploring 'multiple' perspectives, or realities, among practitioners to explore the varied perceived program factors that mediated AST change post-implementation. Thus, in addition to focusing on single realities (e.g., AST change), it is imperative to consider multiple realities (e.g., students, teachers, parents, etc.) in order to examine, understand, comprehend and interpret multi-level challenges and solutions of AST.

2.14.3 Epistemology

From an epistemological perspective, which concerns the relationship between the researcher and the phenomena of interest (Bloomberg & Volpe, 2012; e.g., STP), I adopt a dualist, objectivist position at times when conducting quantitative research and a subjectivist, transactional position when exploring qualitative objectives. The assumptions regarding the former hold that the researcher can study a phenomenon without influencing or being influenced by it since the researcher and phenomenon are independent identities (Sparkes & Smith, 2014). The assumptions regarding the latter holds that the researcher has an inter-dependent relationship with what is studied and the study findings are co-constructed by the interaction of the two. Within the context of this dissertation, an objectivist and subjectivist position are adopted to holistically evaluate STP by determining not only changes in AST (objective), but factors, from varied perspectives (subjective), that influence different outcomes in AST.

2.14.4 Methodology

The philosophical assumptions around ontology and epistemology influence decisions regarding the methodology. As Mayan (2011) explains, researchers should aim to achieve methodological congruence, which aligns ontological and epistemological concepts with a methodology. Within my pragmatic worldview, I appreciate the independent and concurrent use of quantitative and qualitative methods to achieve a research purpose. Hence, to gain a better understanding of how

the STP intervention functions and effects travel mode shift, it is logical to mix both quantitative and qualitative methodologies to evaluate STP comprehensively.

2.15 Overview of Dissertation Studies

Table 2.3 highlights an overview of each study's objectives and its aligned methodology. Studies 1 and 2 are longitudinal quantitative evaluations of STP. These studies were published in the journals of Preventive Medicine (Study 1; Mammen et al., 2013) and Transport and Health (Study 2; Mammen et al., 2014). The primary objective of study 1 was to examine student-reported changes in AST (dependent variable) one-year following STP initiation in 106 elementary schools across Canada. A secondary objective was to determine which STP strategies and school-level demographics (independent variables) predicted mode change. Using the same sample of schools but a different data source from study 1, the primary objective of study 2 was to examine parent-reported mode change from driving to AST (dependent variable) at one-year follow-up. This study also assessed school, child, and family-level demographics (independent variables) associated with mode change from driving to AST.

Studies 3 and 4 encompass a qualitative and mixed-method evaluation, respectively. In Study 3, which was published in the journal of Transport and Health (Mammen et al., 2015), semi-structured interviews were conducted with 34 facilitators who had led STP in the same pan-Canadian implementation from the previous two studies. The objectives of this study were to identify facilitators and barriers to effective STP implementation and recommendations to improve STP within a Canadian context. In the fourth and final study, a mixed-methods case study was performed in two downtown Toronto elementary schools implementing STP to primarily describe and evaluate the STP model. Over a one-year period, the study used multiple data sources to comprehensively evaluate the implementation process. Quantitative sources included student-reported measures of AST at baseline and one-year follow-up, two school profile forms, and student bus use. Qualitative sources included participant observation and field-notes, photographs, and semi-structured interviews with 20 STP committee stakeholders (i.e., 10 adults, 10 students) and 10 students not involved in assisting implementation.

2.16 Conclusion of Literature Review

This literature review detailed health benefits, international trends, and influential factors related to AST. The evidence suggests that despite the benefits linked with AST, the prevalence of children engaging in this behaviour has declined internationally from previous generations. A socio-ecological approach helped unravel the complex range of intersecting factors influencing AST. An updated systematic review was also conducted to examine the various AST interventions practiced internationally. Results from this review suggest for interventions to target all levels of influence (i.e., individual, interpersonal, organizational, environmental, political) to observe greater and sustained changes in AST. The last segment of this chapter briefly outlined the rationale for evaluating STP, the dissertation objectives and the broader methodologies applied across the four distinct studies. In manuscript form, the next four chapters will present each of the respective dissertation studies outlined above.

Table 2.3- Overview of Dissertation Studies

	Title	Study objective— Dissertation objective	Design	Sample	Publication Status
Study 1	Active school travel: An evaluation of the Canadian school travel planning intervention	To examine changes in AST and predictors of mode change—addresses objective I & II	Quantitative -- Longitudinal	106 elementary schools	Published Mammen et al., 2013
Study 2	School travel planning in Canada: Identifying child, family, and school-level characteristics associated with travel mode shift from driving to active school travel	To examine child, family, and school characteristics associated with mode change from driving to AST—addresses objectives I & II	Quantitative -- Cross-sectional, Retrospective	7827 parent surveys	Published Mammen et al., 2014
Study 3	"Putting school travel on the map": Facilitators and barriers to implementing school travel planning in Canada	To identify facilitators and barriers to effective School Travel Planning (STP) implementation—addresses objective II	Qualitative -- Retrospective	34 STP facilitators	Published Mammen et al., 2015
Study 4	Behind the scenes of school travel planning: A case study of STP implementation in two Toronto elementary schools	To describe and evaluate the process of STP implementation—addresses objective I & II	Mixed-Methods -- Longitudinal	2 elementary schools and 31 STP stakeholders	In Preparation

Chapter 3

3 Active School Travel: An Evaluation of the Canadian School Travel Planning Intervention

3.1 Abstract

Objective: Active school travel (AST) may provide a significant source of physical activity for children although rates of AST are declining in many countries. The objective of this study was to evaluate the Canadian School Travel Planning (STP) intervention by examining changes in school travel mode and predictors of mode change. **Methods**: Schools (n=106) across Canada participated between January 2010 and March 2012. STP committees implemented school-specific strategies to increase AST, which included educational strategies, activities and events, capital improvement projects and enforcement initiatives. Travel mode at each school was assessed by a hands-up survey and school travel plans were viewed for content. **Results**: Complete data were available for 53 schools. There was no increase in AST at follow-up after one year. There was, however, variation in mode change between schools. Only season of data collection predicted a decrease in AST in the morning (B= -5.36, p<.05). **Conclusion**: This Canadian STP evaluation showed no change in AST after one year. There was evidence of some localized success at nearly half of the participating schools. More robust monitoring and evaluation are needed to examine STP effectiveness.

3.2 Introduction

Physical inactivity in children and youth continues to be an international epidemic, with the potential of contributing to chronic disease in adulthood (Janssen and LeBlanc, 2010). Active School Travel (AST; e.g., walking, biking) can provide a significant source of physical activity for children (Faulkner et al., 2009). AST has also been associated with improved cardio-vascular health (Larouche et al., 2012), increased concentration (Martinez-Gomez et al., 2011), reduced stress (Lambiase et al., 2010), and reduced greenhouse gas emissions (Wilson et al., 2007). Despite these benefits, AST has declined internationally in recent decades with children's mode of travel to and from school increasingly shifting to inactive (car) modes (e.g., Grize et al., 2010; McDonald, 2007; van der Ploeg et al., 2008). In Canada, the proportion of 5- to 17-year-olds using only inactive modes of transportation (e.g., bus, train, car) to get to and from school has increased from 51% to 62% between 2000 and 2010 (Canadian Fitness and Lifestyle Research Institute, 2010). Reasons for this increase are complex but include the auto-centric nature of the ‘built environment’ and parental concerns about child safety (Carver et al., 2013; Panter et al., 2013). The decline has triggered the development of interventions to promote AST (Chillon et al., 2011). One intervention to promote AST is School Travel Planning (STP).

STP is a multi-disciplinary, multi-sectoral, school-specific intervention that engages key stakeholders (e.g., STP facilitator, public health, police officials, municipal planners and traffic engineers, school boards, parents, children, school administrators and teachers) in the survey and evaluation of school travel issues (Green Communities Canada, 2007). Subsequently, stakeholders develop and implement an action plan with the objective of increasing AST within a given school. The concept of STP was developed in the United Kingdom with a first pilot of the process in 1997/1998. With significant capital and revenue funding, 81% of schools in England (primary, secondary, special and independent) had an STP in place by March, 2009 (Atkins Limited, 2010). In Canada, school participation in STP is voluntary and the promotion of STP practice has been led by a Non-Governmental Organization, Green Communities Canada. In the fall of 2007, Green Communities Canada received a grant from the Public Health Agency of Canada to pilot an STP framework in 12 schools (see Buliung et al., 2011). This work identified four types of strategies typically emerging from action plans: educational strategies (e.g., hosting educational workshops to promote the awareness and benefits of AST); activities and events

(e.g., organizing AST supervision via walking school bus schemes); capital improvement projects (e.g., installing a sidewalk or bike rack); and enforcement initiatives (e.g., increased police presence or crossing guards). Although such interventions may be crucial in helping alleviate the inactivity epidemic at a population-level, further monitoring and evaluation are needed to examine STP effectiveness.

To the authors' knowledge, no STP evaluation has been conducted at a national level. In New Zealand, Hinckson et al. (2011) evaluated an STP intervention at a regional scale in the city of Auckland. They found a modest increase in AST after three years (40.5% to 42.2%). Funded by the Canadian Partnership against Cancer, Green Communities Canada led the implementation of a STP intervention across Canada (January 2010-March 2012), in nine provinces (excluding Quebec) and the Northwest Territories. In evaluating the Canadian intervention, we extend the work of Hinckson and colleagues in two ways. First, their study only examined differences in AST rates for the a.m. period. Previous research has identified temporal variations in rates of AST between the a.m. and p.m. periods; highlighting the importance of examining AST trends both to and from school (Buliung et al., 2009; Wong et al., 2011b). The STP process may have a differential impact on mode share during the trip to and from school. Second, their study did not report which components of the action plans (i.e., education, activities/ events, capital improvement projects, enforcement) were indicative of AST change post-intervention. This information might help identify which STP components are most critical for success. In evaluating the effectiveness of this population-level intervention in Canada, our objectives were to examine: 1) rates of AST at baseline and follow up in both the a.m. and p.m. periods; and 2) identify predictors of mode change such as the type of STP strategies implemented.

3.3 Methods

3.3.1 The School Travel Planning Process

The STP intervention engaged 106 public elementary schools (Kindergarten to Grade 8; ages from 6 to 14 years old) over a one-year period. As a brief overview, STP consisted of four steps. In step one (January 2010), the provincial or territorial organization and facilitator recruited stakeholders and selected schools. Each STP committee selected their schools based on prior relationships with municipalities and school boards. An honorarium of $1000 at completion of baseline and follow-up surveys was received by the schools, which could be used to support AST

initiatives at the school level. In step two, multiple sources of baseline data (September 2010) were collected including the school profile form (principal reported), take-home family survey (parent reported), hands-up classroom survey over five days (student-reported), and an environmental scan (i.e., walkabout). The goal of the walkabout is to identify intersections or features that may pose barriers for AST, and possible solutions. The information derived from step two informed step three (action planning), whereby stakeholder committees developed a written plan of action for dealing with school-specific issues and challenges for AST. In the final step, strategies were implemented and follow-up data was requested to be collected one year after baseline (September 2011). Further details of the school travel planning process are available elsewhere (Buliung et al., 2011). This paper focuses on data collected from the school profile form, hands-up classroom survey and the written plan of action.

3.3.2 Measures

3.3.2.1 Travel Mode

Using the identical travel mode measure as Hinckson et al. (2011), rates of AST (dependent variable) at each school were collected through a validated and reliable hands-up survey (de Wit et al., 2012). This approach entailed homeroom teachers asking students for five consecutive days, at both baseline and follow-up, how they got to school that morning and from school the previous afternoon. Travel mode choices were: walking, biking, school bus, car, and public transit. Children raised their hands accordingly while teachers recorded mode frequency on each day (Appendix A).

3.3.2.2 Predictors of AST Change

To examine which predictors may have been indicative of AST change at follow-up, this study included seven independent variables: STP strategies (frequency), region, socioeconomic status (SES), dwellings (era of development), school size, and season of data collection (Fall to Fall; or Fall to Winter). The STP strategies were obtained from all written action plans. All action items/ strategies were collated and classified into four main categories: i) education ii) activities and events iii) capital improvement projects iv) enforcement. Length of time between baseline and follow-up was calculated based on the dates that teachers recorded the hands-up data. For this analysis, region was categorized as East (Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick), Central (Ontario), and West (Manitoba, Saskatchewan, Alberta, British

Columbia, North West Territories). School location was categorized as urban, suburban or rural. Though objective classifications for geographical locations exist, as it relates to population density, for example, the school location for the current study was self-reported by each principal. Using 2006 Census of Canada data, the median household income of all dissemination areas (DA) within 1.6 km from each of the sampled schools was averaged to characterize neighbourhood level income (i.e., SES). Era of development is a proxy variable and is used to determine neighbourhood type based on the age the area was constructed. Differences in era of development are commonly associated with varying rates of AST and automobile use (Frumkin et al., 2004). The proportion of dwellings built (before 1945; 1946–1970; 1971–1980; 1981 +) in each era was then compiled for each school neighbourhood to represent era of development based on quartile distribution. School size was categorized as quartile 1 (<264 students), quartile 2 (265–367 students), quartile 3 (368–475 students) and quartile 4 (476+ students). Season was based on the official dates in which the teachers recorded the hands-up data at both time periods (i.e., fall — September to November and winter — December to March).

3.3.3 Statistical Analysis

To address objective one, AST mode share was calculated at each school during both baseline and follow-up periods by dividing the number of trips by AST mode (i.e., walking/biking) by total number of trips (i.e., all modes of transport). To address objective two, AST change (dependent variable) in the a.m. and p.m. time periods was calculated by subtracting baseline AST rates from follow-up AST rates. To examine which predictor variables were indicative of AST change at follow-up, a backward linear regression model was applied. This statistical technique was employed because travel mode was assessed at only one follow-up period; the calculated AST change, hence, was a continuous dependent measure. In addition, Field (2009) has recommended that the backward model is the most appropriate technique to conduct when the objective is tailored toward exploratory analysis, and not theoretical analysis in which the Enter method would be utilized. Statistical analysis was conducted using IBM SPSS statistics 19 (IBM, PASW Statistic). An alpha level of .05 was used for all statistical tests.

3.4 Results

Out of the 106 schools that participated in the intervention, 33 schools did not submit school travel plans and 20 schools did not complete follow-up data for reasons including: a teacher's

strike in British Columbia, mid-year change in school administration, and failure to submit data by the funding agency deadlines. Thus, data was available from a subsample of 53 schools.

Table 3.1 shows rates of AST in the morning and afternoon periods at both baseline and follow-up based on the predicting variables. At the national level, there was no significant increase in AST after one year. Baseline and follow-up data showed that 27% and 31% of children engaged in AST to and from school, respectively. However, there was considerable variation in AST at the school level. In total, there was an increase in AST in the a.m. period in 21 schools. There was a range in AST change post-intervention, from a decline of 26% to an increase of 23%. In the p.m. period, there was an increase in AST at 23 schools. During this period, AST ranged from a decline of 24% to an increase of 15% at follow-up.

Of the 448 strategies extracted from the written action plans, 35% were capital improvement projects, 33% were activities/events, 26% were educational initiatives, and 6% were enforcement based. Table 3.2 outlines the most frequently cited STP strategies identified in the school travel plans. Table 3.3 shows only one independent variable to predict AST change post-intervention in the morning period. Schools that collected baseline data in the Fall (i.e., September) and follow-up data in Winter (i.e., February) saw a decrease in AST of up to 5% ($B = -5.36$, $p < .05$).

Table 3.1- Rates of AST at Canadian schools at Both Baseline and Follow-up periods

Variables		Descriptives (Number of schools)	Baseline-AM	Follow-up-AM	Baseline-PM	Follow-up-PM
Region	Central	N=12, 22.6%	28.6%	30.0%	33.0%	34.1%
	East	N=21, 39.6%	21.7%	20.2%	24.8%	24.1%
	West	N=20, 37.7%	33.8%	33.8%	37.5%	37.6%
SES	Low	N=19, 35.8%	21.9%	21.1%	25.4%	25.3%
	Medium	N= 15, 28.3%	33.1%	32.2%	36.4%	36.0%
	High	N= 19, 35.8%	29.6%	30.3%	34.6%	34.0%
School Size	Quartile 1 (<264)	N=12, 22.6%	23.1%	21.0%	24.7%	24.0%
	Quartile 2 (265-367)	N=17, 32.1%	29.0%	28.9%	34.7%	33.2%
	Quartile 3 (368-475)	N=14, 26.4%	28.2%	31.0%	34.1%	35.1%
	Quartile 4 (476+)	N= 10, 18.9%	25.3%	28.5%	32.0%	32.6%
Dwellings	Development before 1945	N=13, 24.5%	26.9%	23.3%	28.3%	27.1%
	Development between 1946-1970	N=12, 22.6%	36.3%	38.8%	40.9%	41.9%
	Development between 1971-1980	N=18, 34.0%	24.0%	23.8%	27.5%	28.6%
	Development between 1981 +	N=10, 18.9%	25.8%	26.2%	30.7%	29.7%
School Location	Urban	N=27, 51.0%	27.6%	26.8%	31.4%	30.8%
	Suburban/rural	N=26, 49.0%	26.5%	26.7%	30.7%	30.6%
Season	Warm to Cold	N=9, 17.0%	29.1%	24.3%	33.0%	28.5%
	No change	N=44, 83.0%	27.6%	28.1%	31.6%	32.1%

Table 3.2- Frequent Examples of School-level STP Strategies

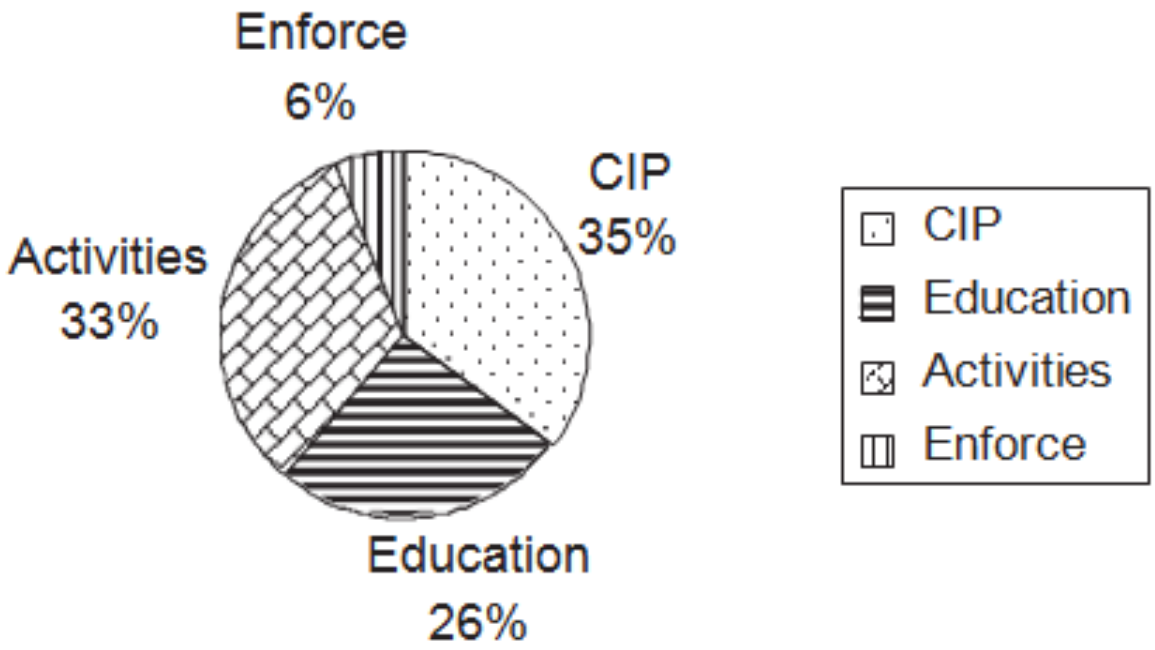
Educational Strategies
Parent and child safety education/workshop(s)
Best routes to school mapping
STP promotional materials/banners posted in and around the school setting
Activities/Events
Walk to school day(s) (e.g., International walk to school day, walking Wednesdays
Walking School Bus schemes
Interclass walking competitions
Capital Improvement plans
Signage relating to school zones, cross-walks, stop signs
Bike rack(s) implementation
Sidewalk implementation/improvements
Enforcement Strategies
Altered drop off/pick-up zones
Crossing-guard presence
Traffic/speed calming

Table 3.3- Predictors of AST Change Post-intervention in Canadian Schools

Variables		AM	*B*, SE *B*	PM	*B*, SE *B*
Action Plan Items	Activities/Events (0, >1)	-		-	
	Education (0,>1)	-		-	
	CIP (0, >1)	-		-	
	Enforce (0, >1)	-		-	
Region	Central	ref		ref	
	East	-		-	
	West	-		-	
SES	Low	ref		ref	
	Medium	-		-	
	High	-		-	
Dwellings	Development before 1945	ref		ref	
	Development b/t 1946-1970	-		-	
	Development between 1971-1980	-		-	
	Development between 1981 +	-		-	
School Size	Quartile 1 (<264)	ref		ref	
	Quartile 2 (263-367)	-		-	
	Quartile 3 (368-475)	-		-	
	Quartile 4 (476+)	-		-	
School Location	Urban	ref		ref	
	Suburban/Rural	-		-	
Season of data collection	No change	ref		ref	
	Warm (baseline) to Cold (Follow-up)	5%*	-5.36, 2.64	-	

Notes: All variables denoted with a '-' represents the variables entered in the analysis and excluded by the regression model
ref = reference category; R^2 for AM is .403; R^2 for PM is .186; *p<.05

Figure 3.1: Proportion of STP strategies Extracted from 53 School Action Plans



3.5 Discussion

There was no increase in AST at follow-up over the course of one year in the sampled schools. However, aggregating AST change at a national level is perhaps misleading given the school-specific nature of the STP intervention. Addressing localized challenges to AST is likely to be met with varying levels of success in such a short timeframe. For example, the STP analysis in Auckland, New Zealand (Hinckson et al., 2011) revealed AST rates to be similar after one year, with modest behaviour change from passive to active modes of school travel surfacing three years following implementation. A longer period of time may be required for action plans to be implemented and ingrained in the school community culture before a significant difference in AST rates are observed. This may explain why none of the four predominant strategies were associated with an AST increase at follow-up. However, there was an increase in AST in the present intervention of up to 1.5% post-intervention in the most populated province in Canada, Ontario (data not shown). This is promising relative to the New Zealand experience where there was only a 1.7% increase in AST after three years of implementation.

Although there was no change in AST at a national level in the sampled schools, our study showed variation between schools. In other words, there may be individual successes identifiable at a more local scale. Nearly half of the schools saw an increase in AST in the a.m. period. Although not significant, larger schools by enrolment (i.e., > 368) showed greater AST change at follow-up when compared to those schools with fewer students. In particular, the largest schools demonstrated the greatest increase in AST in the morning by 3.2%. When school locations were examined, these larger schools were mostly located in urban centres and neighbourhoods with high street connectivity and potentially higher levels of walkability, which have been found to be correlated with AST (Mitra and Buliung, 2012; Wong et al., 2011). Alternatively, given era of development was not a significant predictor of mode change, larger schools may have had a greater capacity to deliver a comprehensive STP intervention in terms of teacher availability and parent volunteers. A recent review found that the “quality of parent, school, and community involvement, as well as interaction among these groups, may be among the more influential components of AST interventions” (Chillon et al., 2011, p.14). An important implication of this finding suggests that STP models may be better suited for particular types of schools located in built environments conducive to AST. More comparative studies are needed between varying

contexts such as urban vs. rural and high enrollment schools vs. low enrollment to determine appropriate school selection criterion for STP implementation.

Unexpectedly, a number of schools showed decreased AST at follow-up during the a.m./p.m. periods. However, our analysis illustrated that the season of data collection likely explained this decrease — specifically, schools did not do their follow-up at the same time of year as their baseline measures. Schools that collected follow-up data during the winter months showed up to a 4.8% decrease in AST. One study has reported no significant variations in AST in Ontario schools based on seasonality (Robertson-Wilson et al., 2008) but nationally there is greater variation in weather conditions during winter. The timing in data collection was a proxy for seasonality in our study and due to funding timelines, some schools were pressured to collect data during winter months rather than waiting one year after collecting baseline data in the fall. However, in order to properly evaluate such a comprehensive intervention, future STP implementation needs to ensure consistency in the timing of travel mode assessment to allow meaningful comparison of baseline and follow-up rates.

3.5.1 Limitations

This is the first longitudinal evaluation of a national STP intervention. However, the STP process is largely a grassroots initiative in Canada (Buliung et al., 2011). Consequently, there are limited resources to support STP implementation and evaluation. Lack of control schools, convenience sampling, reliance on self-report data, and inconsistent timing of data collection are limitations. Additionally, degree of STP implementation was not assessed. Schools had approximately one year to form STP committees, collect baseline data, create action plans, implement action items, and administer follow-up data. Longitudinal follow-up is likely required to see shifts in AST stemming from action plan implementation. Uncontrollable factors also influenced implementation. For example, the teacher's strike in British Columbia meant that all ‘non-essential’ duties could not be completed in the 2011/2012 academic year. As a result, the STP intervention was not implemented in 12 schools in this province. Due to the limited timeframe, half of the schools (n = 53) also failed to submit complete data and could not be used for analysis. Together these issues reflect some of the challenges in implementing an intervention on a national scale with limited funding.

3.6 Conclusion

This national STP evaluation showed no change in AST in the sampled schools after one year. There was evidence of some localized success at nearly half of the participating schools. Coordinating a rigorous evaluation across a large number of schools nationally is likely to be prohibitively time and resource demanding. Future research should adopt a detailed case study approach in examining how the STP intervention may work in different settings.

3.7 Acknowledgments

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Chapter 4

4 School Travel Planning in Canada: Identifying Child, Family, and School-level Characteristics Associated with Travel Mode Shift from Driving to Active School Travel

4.1 Abstract

Objective: Active School Travel (AST) can significantly contribute to children's physical activity levels. The primary objective of this study was to evaluate a Canadian School Travel Planning (STP) intervention by examining child, family, and school-level characteristics associated with mode shift from driving to AST one year post-intervention. A secondary objective was to highlight which STP strategies were deemed effective by parents of those children who switched travel modes to AST. **Methods**: Schools (*n*=106) across Canada participated between January 2010 and March 2012. STP committees implemented strategies to overcome school-specific AST barriers. Mode shift and child/family demographics were assessed by a retrospective, cross-sectional parental survey (*n*=7827) one year after STP implementation. School level demographics were collected from school administrators. Binomial regression models were applied to examine child, family, and school-level characteristics related to mode shift from driving to AST. **Results**: Approximately 17% of the sample reported driving less at one-year follow-up both in the morning and afternoon periods. Among these, the majority switched to AST in the morning (*n*=1002) and afternoon periods (*n*=995). Results from the regression analyses showed that students in higher elementary grades, living less than 3km from school, attending urban and suburban schools, and attending schools situated in a medium income neighborhood were significantly more likely to change travel mode from driving to AST. Approximately 35% of parents reported that infrastructure improvements and safety education were the most effective STP strategies. **Conclusion**: The study findings highlight the potential of STP in promoting mode shift from driving to AST. The findings indicate the program may be more effective in some locations where conditions are conducive to mode change. This should inform the development of STP school-selection criteria that may maximize already limited resources by recruiting schools most responsive to STP.

4.2 Introduction

Active school travel (AST) can significantly contribute to children's physical activity levels (Faulkner et al., 2009; Larouche et al., 2014). Through non-motorized transport, such as walking and biking to school, AST may also positively enhance children's mental, physical, and psychosocial health (Bowler et al., 2010; Fusco et al., 2012). AST is also an affordable, convenient, and environmentally friendly means of travel. For example, reduced car use may limit greenhouse gas emissions and particulate air pollution around the school setting, which can subsequently decrease the risk of lung-disease (Wilson et al., 2007; Larouche et al., 2012).

Despite these potential health and environmental benefits, there has been a temporal decline in AST internationally (Buliung et al., 2009; McDonald, 2007; Witten et al., 2013). Predominant reasons for this decrease have been highlighted through multilevel, ecological barriers within the AST literature. For example, child and parent attitudes of AST being 'inconvenient' and their lack of motivation for AST have been cited as barriers (Ahlport et al., 2008; Loitz & Spencer-Cavaliere, 2013). The rise of the automobile oriented 'built environment' in many cities in the Global North has favoured funding and resources towards vehicle infrastructure relative to pedestrian infrastructure. This has led to greater urban sprawl and distances between the home and school environments, limiting opportunities for AST. The increased distances are also accompanied by heightened parental concerns regarding AST. Specifically, concerns around child abduction, bullying, and pedestrian injury are commonly reported barriers (Carver et al., 2010; Panter et al., 2013). More broadly, policies relating to school siting decisions, school catchment areas, and crossing guards have also been identified as AST barriers (Eyler et al., 2008).

The international AST decline has triggered interventional work to reverse these trends by addressing these many barriers. However, a recent review (Chillon et al., 2011) of AST interventions stressed the lack of interventions in addressing the multitude of factors limiting AST. The sole use of educational or promotional initiatives may only result in short-term changes in AST when employed as a 'one-off' strategy. Hence, the review emphasized the value in engaging multidisciplinary stakeholders to address AST's complex barriers through both non-infrastructure (e.g., education initiatives, safety education, walking school bus) and infrastructure (e.g., sidewalk/bike-rack implementation) strategies. Although acquiring buy-in from schools,

parents, and community-level stakeholders can be challenging, Chillon and colleagues note that this may be an essential component in the effectiveness and sustainability of AST interventions. In Canada, a uniquely comprehensive intervention that is gaining attention in addressing the many complex and interrelated barriers to AST via stakeholder collaboration is School Travel Planning (STP).

This school-specific intervention invites community-wide involvement by collaborating multidisciplinary stakeholders to help assess, document and intervene on AST barriers by means of a 'school travel plan.' Led by a facilitator, these stakeholders comprise a STP committee with representation from various sectors including safety (e.g., police officer), transportation (e.g., traffic engineer), municipal planning (e.g., member of City council) health (e.g., public health nurse) and education (school administration/teachers and parent/student representatives). Based on their expertise, the stakeholders play a contributing role in identifying strategies to alleviate school-specific barriers. For example, students, teachers, parents, and public health officials, could organize educational sessions to promote the awareness and benefits of AST. A traffic engineer may initiate a process to improve pedestrian infrastructure, by implementing sidewalks, crosswalks, and/or traffic signals. A police officer may take the lead in recruiting and providing police or crossing guard services before and after school, helping with traffic calming/speeding concerns. However, although STP interventions appear comprehensive and intuitively appealing, evidence is limited.

STP originated in the United Kingdom (UK), when in 2003 the Department for Transport and the Department for Education and Skills collaboratively launched an initiative to encourage all schools to develop and implement STP (Green Communities Canada, 2007). Rowland et al (2003) evaluated STP in 21 of these schools using a randomized control trial. Using a parent survey (n=1386) to measure children's AST levels (i.e., walk, bike, or public transport) the study found no AST increases following the STP intervention. This is likely due to high baseline AST (70%), and the timing of follow-up data collection, which occurred only two months post-intervention.

Building on the UK initiative, New Zealand's Energy Efficiency and Conservation Authority (EECA) adopted and implemented STP between 2003-2006, mostly in Auckland (Green Communities Canada, 2007). Hinckson and colleagues (2011) measured changes in AST (i.e.,

walking, biking, walking school bus, and scooter) in approximately 57,000 students from 56 elementary schools in Auckland using a classroom hands-up survey. Teachers tallied the number of students who raised their hands reflecting their school travel mode on a designated day. Travel modes were collected annually over the course of four years. Results revealed AST rates to be similar after two years, with modest increases (3%) surfacing only three years following STP implementation. The findings from Hinckson et al. and Rowland et al. (2003) highlights the longer periods of time needed to observe change, with previous research suggesting that school-based interventions may take up to two to three years to see behaviour change (Aarts et al., 1997; Harris et al., 2009; Sallis et al., 1997).

In Canada, STP has been led by Green Communities Canada (GCC), a non-government organization advocating for sustainable transportation. In 2007, GCC reviewed international best STP practices and subsequently developed recommendations for STP pilot testing in Canada (Green Communities Canada, 2007). STP was then pilot tested in 12 schools across four provinces between 2007-2009. Buliung and colleagues (2011) used classroom hands-up surveys and family surveys (n=1489) to evaluate STP's impact. One year after implementation, the hands-up survey showed a 2% increase in AST (i.e., walking, walking partway, and biking). The parent survey assessed perceptions of the effectiveness of selected STP strategies; parents deemed education strategies (e.g., AST presentation, route identification), special events (e.g., Winter walk day, pedometer challenge), and infrastructure improvements (e.g., cross-walk implementation, sidewalk repair) to be most effective in improving AST. Additionally, 13% of families reported that the STP intervention resulted in 'less driving.'

Building on the pilot STP, GCC received additional funding from the Canadian Partnership Against Cancer and the Public Health Agency of Canada to expand STP to over 100 schools in every province (except Quebec) and territory in Canada from 2010-2012. Measured by classroom hands-up surveys, Mammen et al. (2013) found no longitudinal changes in AST (i.e., walking/biking) after one year of implementation in 53 schools. There was some evidence of localized success, with nearly half of the participating schools demonstrating an increase in AST (1% - 23%). However, the authors note that the evaluation may be misrepresentative when considering that only 53 of the 106 participating schools were included in analysis as half of the school failed to submit complete data. Thus, examining a complementary data source (i.e.,

follow-up parent surveys) collected from all schools may provide a more accurate indication of STP effectiveness on a national scale.

In examining the evidence, the existing STP evaluations (Buliung et al., 2011; Hinckson et al., 2011; Mammen et al., 2013; Rowland et al., 2003) had primary objectives in determining longitudinal increases in AST. Although it is apparent that modest increases in AST may occur, the STP evidence provides little indication of children, family and schools characteristics associated with travel mode change from driving to AST post-intervention. Mode shift from motorized to AST is an important outcome measure that can help indicate those students, families, and schools that are more or less likely to respond behaviourally to STP. For instance, identifying the geographical location of schools (e.g., urban/suburban setting), and the 'appropriate' spatial distance between the home and school environment (e.g., < 2 km) that are most responsive to mode shift can guide focus for future STP efforts. With a recent Canadian report indicating STP as a relatively cost-effective intervention (Metrolinx, 2014), the knowledge gained could contribute to an important international policy-based research area by helping practitioners and decision-makers maximize the cost-effectiveness of STP intervention by applying it in schools where most appropriate.

By bridging a gap in the literature and building upon the more recent Canadian STP evaluation (Mammen et al, 2013), the study will analyze the parent surveys to: 1) examine the proportion of students who switched from driving to AST after one year of baseline measurement; 2) identify child, family and school-level demographics of this travel mode switch; and 3) highlight which STP strategies were deemed effective by parents of those children who switched travel modes.

4.3 Methods

4.3.1 The School Travel Planning Process

The STP intervention was led and implemented by GCC (www.saferoutestoschool.ca). The intervention occurred in 106 elementary schools (Kindergarten to grade 8) across all Canadian provinces (except Quebec) and Territories. As a brief overview, STP consisted of four steps. Led by a STP facilitator, step one involved the recruitment of schools and the formation of STP stakeholder committees at each participating school. Schools were recruited based on prior relationships with municipalities and school boards. Each school received an honorarium of

$1000 to be used for AST initiatives. In step two, each STP committee conducted school 'walkabouts' to identify factors that may pose barriers for AST. Subsequently, the committees initiated development of a 'school travel plan', documenting barriers and plausible solutions (action planning). Step two also consisted of collecting baseline parental data and classroom hands up data from children at participating schools. The information derived from the school walkabouts informed step three (implementation). It is important to note that strategy implementation varied by school since each school possessed unique challenges based on a variety of factors such as geographical location, school size, transportation policies, and socioeconomic status. However, strategies can include infrastructure changes, safety education, special walking events, and identification of best routes to school.

In the final step, strategy implementation commenced and follow-up measures were requested to be collected one year after baseline. Further details of the school travel planning process are available elsewhere (Buliung et al., 2011). This paper focuses solely on the follow-up parent survey data. The rationale for examining post-intervention data reflected the inability to compare data sets with baseline measures due to a lack of tracking participants over time (i.e., participant codes were not used). However, the follow-up survey was designed so that retrospective information could still be surveyed to inform outcomes related to STP effectiveness, such as travel mode change and parental perceptions of STP strategy effectiveness. In total, approximately 24,893 families were sent home the questionnaire. A total of 7,827 surveys were returned giving a response rate of 31.4%. Ethics from the University of Toronto Ethics Board was granted to conduct secondary data analysis on data collected by Green Communities Canada.

4.3.2 Measures

4.3.2.1 Objective One

To address objective one in reporting the proportion of students who changed travel mode, parents responded to an item which stated "In what ways have your family's school travel habits changed for the trip to/from school since the STP project began?" Response items included 'less driving,' 'not changed,' or 'more driving.' Since the outcome of interest in the present study pertained to AST, those who selected 'less driving' were targeted to explore the alternative travel modes practiced. This was obtained by asking families: 'If you are driving less for trips to/from

school, what are you/your child doing more of? Response items included ‘walking,’ ‘cycling,’ ‘transit,’ ‘carpooling’ (Appendix B). For all these variables, responses were solicited for both the morning (AM) and afternoon (PM) periods. Examining both time-frames stems from previous research that identified temporal variations in rates of AST between these periods, with higher AST rates typically reported for the trip home from school at the end of the school day (Buliung et al., 2009; Wong et al., 2011).

4.3.2.2 Objective Two

To address objective two in examining predictors of those who switched from driving to AST (i.e., walking and biking), a range of child, family and school-level demographics were collected. Child and family demographics were obtained through the parent survey which included child gender and age, and living distance from school (< 500 m, 0.5-1.5 km, 1.5-3 km, > 3 km). School-level demographics were collected by school administrators that included student enrollment (<264 students, 265-367, 368-475, 476+) and geographical location (urban, suburban, rural). Further school-level demographics were obtained using Geographical Information System (GIS) software, including school’s host neighborhood socioeconomic status. Using 2006 Census of Canada data, the median household income of all dissemination areas (DA) within 1.6km from each of the sampled schools was averaged to characterize neighbourhood level income (i.e., SES). Determined by tertile distributions, SES was categorized as low, medium and high.

4.3.2.3 Objective Three

To address objective three in highlighting which STP strategies were deemed effective among those who changed travel mode (i.e., driving to AST), parents were asked ‘Which STP activity do you feel has been most effective for your family?’ Selection items included ‘infrastructure improvements,’ ‘safety education,’ ‘special events,’ ‘special activities,’ ‘special weekly or monthly Walking Wednesdays,’ ‘Walking buddies,’ ‘Newsletter,’ ‘Identification of best routes to school.’

4.3.3 Statistical Analysis

To address objective one, a descriptive statistical analysis was conducted to examine student travel mode change post-intervention. Possible survey responses included: ‘less driving,’ ‘no change’, and ‘more driving’ at one year of follow-up. Those reporting ‘less driving’ were further

analyzed to examine the alternative travel mode chosen, including AST or public transit. To address objective two, binomial regression models were specified and estimated with a view to identify correlates of travel mode change from driving to AST relative to those reporting 'no change' and 'more driving.' Objective three was addressed by filtering the data to include only those families who changed travel mode from driving to AST and then providing frequencies of the STP strategies deemed most effective by parents. All statistical analyses were conducted using IBM SPSS statistics 19 (IBM, PASW Statistic). An alpha level of .05 was used for all statistical tests.

4.4 Results

4.4.1 Objective 1- How Many Students Changed Travel Habits After One Year?

Table 4.1 outlines the proportion of families and students who changed travel habits and modes at one year follow-up. Approximately 17% of the sample (AM: n=1188; PM: n=1211) reported driving less at one year follow-up both in the morning and afternoon periods; around 80% of the sample reported 'no change' in their travel habits and 3% reported driving more at one year of follow-up. Among the sample that reported 'no change,' approximately 27% were already engaging in AST, and 42% sustained their driving habits.

Of the 17% that reported driving less, a large majority (i.e., ~83%) switched to AST in the morning (n=1002) and afternoon periods (n=995). The second objective helps to elucidate what predictors were indicative of this behavior change from driving to AST.

Table 4.1- Proportion of Families Who Changed Travel Mode to AST at One Year Follow-up

	AM	PM
Δ Travel Habit	*n*=7107	*n*=7077
Less Driving	16.7% (*n*=1188)	17.1% (*n*=1211)
No Change	80.3% (*n*=5707)	80.2% (*n*=5676)
More Driving	3.0% (*n*=212)	2.7% (*n*= 190)
Δ Travel Mode	*n*=1188	*n*=1211
AST	84.3% (*n*=1002)	82.2% (*n*=995)
Public Transit	9.1% (*n*=108)	9.5% (*n*=115)
Other (e.g., carpooling)	6.6 % (*n*=78)	8.3% (*n*=101)

4.4.2 Objective 2- What Predictors Indicated Mode Shift to AST?

Table 4.2 highlights child, family and school-level demographics that predicted mode change from driving to AST in both the AM and PM periods. Results from the binomial regression analyses showed that the child's age was a significant predictor in the regression model; for every one year of age (AM: *OR*=1.08, *p*<.001; PM: *OR*=1.08, *p*<.001), children were more likely to change from being driven to AST in the AM and PM periods. Households less than 500m (AM: *OR*= 4.63, *p*<.001; PM: *OR*=5.63, *p*<.001), between 0.5-1.5 kilometers (AM: *OR*=4.70, *p*<.001; PM: *OR*= 5.85, *p*<.001), and between 1.5-3 kilometers (AM: *OR*=2.14, *p*<.001; PM: *OR*=2.74, *p*<.001) were significantly more likely to change from driving to AST in both the morning and afternoon periods. Students in urban (AM: *OR*=1.78, *p*<.001; PM: *OR*=1.85, *p*<.001) and suburban (AM: *OR*=2.54, *p*<.001; PM: *OR*=2.23, *p*<.001) schools were significantly more likely to change from driving to AST relative to those who go to schools in rural areas in both the morning and afternoon periods. Students attending schools situated in a middle class neighborhood (i.e, 'medium' SES; $51,021-$68,518) were significantly more likely to change from driving to AST relative to those attending low SES schools, in the AM period only (*OR*=1.32, *p*<.005). Significant or not, the parameter estimates for all variables in the PM period were generally higher, reflecting the greater proportion of children engaging in AST in the

afternoon period. The number of family vehicles owned, student enrollment, and gender revealed null effects.

Table 4.2- Correlates of Travel Mode Change from Driving to AST One Year Following STP Implementation.

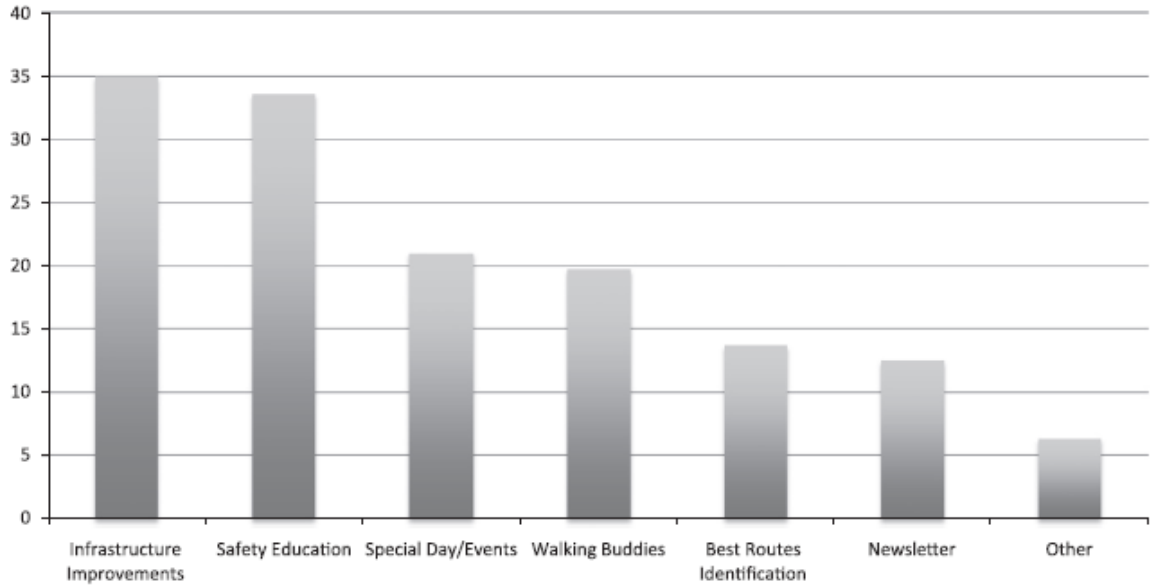
		AM PERIOD: B(SE), OR (95% CI interval)	**PM PERIOD**: B(SE), OR (95% CI interval)
Child age		.07(.02), 1.08(1.04-1.11)***	.07(.02), 1.08 (1.04-1.12)***
Gender (female)		.11(.08), 1.12(.95-1.32)	-.03(.08), .98(.83-1.15)
Distance (>3km)		Reference category	Reference category
	<500m	1.53 (.19), 4.63 (3.20-6.66)***	1.73 (.21), 5.63 (3.76-8.43)***
	0.5-1.5km	1.54 (.18), 4.70 (3.32-6.66)***	1.77 (.20), 5.85 (3.99-8.56)***
	1.5-3km	.76 (.20), 2.14 (1.45-3.13)***	1.01 (.21), 2.74 (1.81-4.14)***
Vehicles owned		.04(.05), 1.00 (.91-1.11)	.02(.05), 1.02(.92-1.12)
Number of students		.00(.00), 1.00 (1.00-1.01)	.000(.00), 1.00 (1.00-1.01)
Location Rural		Reference category	Reference category
	Urban	.58 (.23), 1.78 (1.13-2.81)**	.62 (.24), 1.85 (1.16-2.95)**
	Suburban	.80 (.23), 2.54 (1.41-3.53)***	.80 (.24), 2.23 (1.39-3.56)***
School SES	low	Reference category	Reference category
	medium	.27 (.11), 1.32 (1.05-1.64)*	.18(.11), 1.19(.95-1.50)
	high	.11(.14), 1.12 (.85-1.47)	.11(.14), 1.12(.85-1.48)

AM period: R^2=.112 (Cox & Snell), .173 (Nagelkerke). Model $x^2(1)$= 103.73, *p*=.000; PM period: R^2= .078 (Cox & Snell), .106 (Nagelkerke). Model $x^2(1)$=70.850, *p*=.000; *** denoted p<.001; **denoted p<.05

4.4.3 Objective 3- What Were Perceived as the Most Effective STP Strategies by Parents?

Figure 4.1 displays the most effective STP strategies reported by families who changed to AST. Approximately 35% of these families reported infrastructure improvements (e.g., bicycle rack) and safety education (e.g., information session/workshop) to be the most effective STP strategies implemented. Approximately 20% of these families also reported that special days/events (e.g., walking Wednesday) and walking buddies were effective strategies in facilitating AST increases.

Figure 4.1: Most effective STP strategies deemed by families who changed to active modes of travel



4.5 Discussion

The purpose of this study was to evaluate a national STP implementation by examining predictors of mode shift from driving to AST one-year post intervention. The first objective examined the proportion of families that switched mode shift from driving to AST. Results revealed that 17% of the sample reported less driving. Furthermore, out of the approximate 1200 students that changed travel modes, the majority (~82%) changed to active modes such as walking and biking. Overall, 14% of the sample surveyed, and 4% of the total amount of students enrolled at all schools (i.e., 24,893) changed to AST at follow-up. These results are promising given the short time-frame and are in line with findings from New Zealand (3% increase in AST; Hinckson et al., 2011). A novel objective of this study was to identify those students, families, and schools that are more or less likely to respond behaviorally to STP.

Results revealed that child age, home distance from school, and school location significantly predicted mode shift from driving to AST. The Canadian STP intervention focused on children ranging from Kindergarten (i.e., age 6) to grade 8 (i.e., age 14). Households with older children were more likely to switch to AST. This finding implies that parents may be more willing to allow their child to engage in AST when they are ‘older’ and when they have or are perceived to

possess the cognitive maturity and capacity to navigate their way to school. Previous literature has supported this claim, suggesting that younger children are at greater risk of injury when exposed to higher traffic volumes (Macpherson et al., 1998). This may be due to their attentional skills and their age-moderated appetite for risk taking (Connelly et al., 1998; Pitcairn & Edlmann, 2000). Collectively, the age-related findings may imply older elementary students and their parents to be more responsive to STP interventions. From a STP practitioner perspective, additional focus could be placed on solutions to increase AST among 'younger' elementary students via adult, peer, or sibling accompaniment.

Distance has consistently been identified as a significant barrier to AST (Su et al., 2013; Wong et al., 2011). In the current study, those who lived less than three kilometers from school were much more likely to change from driving to AST relative to those who lived greater than three kilometers from school. AST work has traditionally targeted the immediate school environment (Mitra et al., 2010). Accordingly, any impact of STP strategy implementation is likely to favour those living closer to school. In general, STP interventions may provide enough of a 'nudge' for households to reconsider their school transport options when located within a walkable distance from school. Targeting driving families living within reasonable walking distance, generally established to be within two kilometers from school (Nelson et al., 2008), appears a sensible focus for STP efforts. Schools where driving is not common among households within close proximity may not respond to STP interventions. As school distance from home continues to be a major predictor of AST, school boards must be cognizant of how siting decisions will impact travel modes habits and consequently the health of children.

School location also predicted change in travel mode from driving to AST. Students enrolled in schools located in urban and suburban areas were more likely to change to AST compared to those enrolled in rural-based locations. This parallels findings from the child hands-up data (Mammen et al., 2013), which showed greater AST trends in urban locations only. Together, these results may imply that comprehensive interventions such as STP may be more suitable for urban/ suburban communities that have increased density, mixed land use, street connectivity, and aesthetic qualities that are typically associated with urban regions and higher AST (Handy et al., 2002; Kemperman & Timmermans, 2012; Van Kann et al., 2014). Generally in rural locations, school travel distances are typically much longer, working against the uptake of active modes. Moreover, rural travel routes may often include road facilities without sidewalks,

unpaved shoulders, and relatively high speed limits. Schools located in rural areas, however, could consider strategies to encourage some AST in the context of busing. School bus drop-off/pick-up zones could be established further from the school site, however, traffic safety considerations and the availability of pedestrian supportive road infrastructure between a more distance drop-off and the school site would need to be considered.

School-level SES, another predictor of AST change, showed that those students enrolling at a school (i.e., medium SES) located in a middle class neighborhood (i.e., $51,021-$68,518) were more likely to change to AST relative to those enrolling at a 'low' or 'high' SES-based school. This may reflect differences in resources. The AST literature has shown car ownership to be a proxy measure for family SES status. Those owning more cars are more likely to be driven to school relative to those owning fewer cars (Mammen et al., 2012; Park et al., 2013). Conversely, lower SES children may have limited choice in their travel mode to school, and walk by necessity. As with other differences, these findings help demonstrate that STP is unlikely to be equally effective at all schools. The STP process needs to be tailored accordingly to address the different challenges faced by schools in different socioeconomic and built environments. In low SES schools, STP interventions may focus more on ensuring safety among those already actively travelling to school by improving the quality of AST routes.

The current study also examined differences in the AM and PM periods with the aforementioned predictor variables. Only one variable showed variation between the morning and afternoon periods. Students enrolling at a 'medium' SES located in a middle class neighborhood were more likely to switch from driving to walking at one year follow-up in the AM, but not during the PM period. The morning period may appear to be a target time period to intervene and help change travel habits from driving to AST. The before-school period may be more amenable to change since parent and child day-schedules get underway at approximately the same time. Furthermore, recent research reports higher rates of AST in the PM period (Buliung et al., 2009; Larsen et al., 2012; Mitra et al., 2010; Wong et al., 2011). These higher rates of AST, combined with the lower flexibility of parents/guardians to alter their after-school travel habits, may partially explain why there is less change in travel habits in the afternoon. More research is therefore needed in exploring strategies to facilitate behaviour change in the AM period. STP interventions may

strategically emphasize the morning as an opportunistic period to intervene and help increase AST levels.

The study's last objective was to highlight the most effective STP strategies by families who changed to active modes of travel at one year of follow-up. Approximately 35% of these families reported that infrastructure improvements and safety education were the top STP strategies. Similar parental perceptions were found in the STP evaluation conducted by Buliung and colleagues (2011). The most effective infrastructure strategies reported by parents were school-related signage and bicycle rack implementation. Importantly, such infrastructure changes may have a lasting impact that continues to facilitate AST in the future. Parent/child safety education and workshops, as well as best routes to school mapping, were viewed as the top safety education strategies. Future STP implementation practices can use this information to prioritize strategies, time, and resources into AST awareness and infrastructure improvements.

4.5.1 Strengths, Limitations & Future Research

This is the first STP study to examine how child, family, and school-level characteristics associate with mode shift from driving to AST following a STP implementation. Other strengths include its national scope, large sample size, and interventional nature. However, since STP is largely a grassroots initiative in Canada (Mammen et al., 2013), there were limited resources to support STP implementation and evaluation and thus the results should be interpreted with caution. First, the cross-sectional study design limits the ability to make causal inferences related to the STP intervention. Second, subjective surveys like the parent survey in the current study typically contain social desirability bias, i.e., parents may have felt inclined to report a change in travel mode. Third, there was no student and household tracking, or control schools, to allow for comparability. As Chillon et al. (2011) highlighted in their review of AST interventions, stronger methodologies, using control schools especially, will enable stronger evaluations.

Fourth, the dates and completion dates of specific interventions (e.g., infrastructure) were not consistently captured by the facilitators. For instance, in some cases, follow-up measures may have been collected prior to any infrastructure changes. Infrastructure changes in particular, such as sidewalk construction, may take several months or years to be implemented. Only one STP

evaluation (Hinckson et al., 2011) collected AST data for more than one year; STP evaluation could benefit from longer-term surveillance and monitoring of outcomes.

4.6 Conclusion

Of the 106 Canadian schools exposed to a STP intervention and 7,827 of parents who responded to our parental survey, approximately 17% reported driving less after one year of implementation. These results demonstrate the potential of the STP process in Canada in promoting a switch from driving to AST. By exploring and revealing factors facilitating greater mode shift following a school's implementation of STP, this study contributed to a key gap in the literature. Given that STP is still in its infancy and testing in Canada, our findings can inform the development of STP school-selection criteria that may maximize already limited resources by recruiting schools most responsive to STP. There is spatiotemporal complexity in school travel mode share (Mitra et al., 2010) across Canada and likely most developed countries. The STP process remains best suited to addressing this complexity. However, our findings demonstrate that perhaps it is not suited for every school. The study emphasizes STP's suitability for children in higher grades and for suburban and urban-based schools. Although these findings are aligned with the broader predictors of AST, our study confirms the issue of age, location and distance within the context of STP. Additionally, the evidence indicates that STP may be more effective for medium SES-schools and schools where a high proportion of households are within 'walkable' distance but children are driven. The study also examined parental perceptions of specific STP strategies that were perceived as most effective (i.e., changes in infrastructure). Overall, the findings from this study should inform future STP interventions by providing a clearer basis for appropriate school recruitment.

4.7 Acknowledgements

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Chapter 5

5 “Putting school travel on the map”: Facilitators and Barriers to Implementing School Travel Planning in Canada

5.1 Abstract

Objective: The objective of this study was to identify facilitators and barriers to effective School Travel Planning (STP) implementation. **Methods**: Interviews were conducted with 34 Canadian STP facilitators. Participants were interviewed regarding: i) perceptions of STP success; ii) facilitators and barriers to effective STP implementation; and iii) recommendations for improving STP. A thematic analysis was used to inductively code and categorize data units into themes. **Results**: Participants were predominantly female, worked within the health sector, and had implemented STP in the province of Ontario. All facilitators perceived STP to be successful although definitions of ‘success’ varied. Factors facilitating effective implementation included the well-designed STP model, collaboration between multidisciplinary stakeholders, and the facilitators’ leadership role. Conversely, the lack of stakeholder involvement from principals, parents, and students, was identified as a barrier to effective implementation. However, the primary factor that hindered implementation was the lack of time given by funding organizations to implement STP. To observe more effective and sustainable STP interventions in Canada, the facilitators acknowledged the pressing need for multi-level government funding to develop supporting infrastructure for AST, fund facilitators, and implement policies to foster greater AST. **Conclusion**: Overall, STP was considered successful in a variety of ways including increased awareness, rates of AST, multidisciplinary collaborations, and school-specific strategies to overcome AST barriers. The study points to a variety of factors affecting implementation. However, there was some evidence to suggest that the existing STP model is likely a short-term ‘band-aid’ solution to increase AST given the lack of time and sustained funding to support its implementation. Findings further call for greater investment in resources and capacity to support AST interventions like STP, particularly at the Canadian provincial and municipal levels.

5.2 Introduction

The World Health Organization recommends children (i.e., aged 5-17) engage in 60 minutes of daily moderate-vigorous physical activity (WHO, 2010). A recent study of global variation in physical activity (PA) in 15 countries (Tremblay et al., 2014) shows that, overall, children are not accumulating this amount of PA needed for optimal health. Physical inactivity among children is thus regarded as a global pandemic (Kohl et al., 2012). With a focus on Canada, a population-level analysis led by Colley and colleagues (2011) found that approximately 93% of children are not meeting PA guidelines. With low levels of PA in Canada (and internationally), more research, practice, and policy focus is required in adopting a holistic approach to PA. In addition to *structured* sources of PA (e.g., sports), helping increase *unstructured* sources of PA through active forms of living, such as Active School Travel (AST; e.g., walking and biking to/from school) could help children accumulate greater overall PA (Subramaniam, 2011).

Recent reviews demonstrate AST's contribution in increasing daily PA and helping children meet PA guidelines (Faulkner at al., 2009; Larouche et al., 2014). AST is also associated with decreased BMI over time (Mendoza, 2014), improved cardio-vascular health (Larouche et al, 2012), increased alertness and attention during the school day (Martinez-Gomez et al., 2011), greater independent mobility (Carver et al., 2014), reduced stress (Lambaise et al., 2010), and decreased risk of lung disease via reduced air pollution (Wilson et al., 2007; Larouche, 2012).

Despite health and environmental benefits, evidence indicates a temporal decline in AST in many countries over the last five decades (Active Healthy Kids Canada, 2014). The reasons for this decrease are complex. For instance, AST reviews (Garrard, 2011; Sirard and Slater, 2009) have identified factors associated with all socio-ecological levels of influence, including intrapersonal (e.g., age, attitudes), interpersonal (e.g., family demographics), organizational (e.g., school culture), social (e.g., culture of convenience), environmental (e.g., street density/connectivity), and political (e.g., transportation and school siting policies). Therefore, interventions designed to tackle these multiple levels of influence are more likely to facilitate greater changes in AST than interventions addressing only one or two levels of influence (Chillon et al., 2011). In Canada, one comprehensive intervention that is gaining practice and policy attention in addressing the multifaceted factors influencing AST is School Travel Planning (STP).

STP is a collaborative process involving multidisciplinary stakeholders to assess and intervene on AST barriers by means of a documented 'school travel plan.' These stakeholders comprise a STP committee with representation from various disciplines including safety (e.g., police officer), transportation (e.g., traffic engineer), municipal planning (e.g., member of City council), health (e.g., public health nurse), and education (e.g., school administration/teachers, student, and parent representatives). Based on their perspective, the stakeholders play a role in identifying strategies to alleviate school-specific barriers. A key component of the STP model is the designation of an individual as a STP 'facilitator'. These individuals lead the delivery of STP implementation in schools by: helping establish a school level STP committee; collaborating with multidisciplinary stakeholders invested in STP to increase AST levels; organizing monthly/bi-monthly STP committee meetings; developing and updating the written 'school travel plan' document; and assisting in solution identification. In Canada, a STP facilitator may work with a number of schools ranging from two to six. Though STP may appear as a comprehensive and promising approach to increase AST levels in children, evidence regarding its effectiveness is in its infancy.

To date, only five published STP evaluations have been conducted in three countries. In London, England, Rowland et al. (2003) evaluated STP in 21 schools using a randomized control design. Parent-reported surveys (n=1386) found no AST increases following the STP intervention one year post-intervention. Similarly, in Auckland, New Zealand, Hinckson and colleagues (2011) found no change in AST one year following STP implementation among approximately 57,000 students from 56 elementary schools. However, their study, which measured AST using student self-report, showed a modest increase (3%) three years after STP implementation. The findings from these two STP evaluations are aligned with previous research suggesting that school-based interventions may take up to two to three years to see shifts in behaviour (Harris et al., 2009; Sallis and Glanz, 2009).

In Canada, there have been three published studies regarding STP effectiveness. Green Communities Canada (GCC), a non-government organization advocating for sustainable transportation, has led the delivery of STP interventions across the nation. Between 2007 and 2009, STP was pilot tested by GCC in 12 schools across four provinces. Using data from these schools, Buliung et al. (2011) found a 2% increase (student-reported) in AST and a 13% reduction in driving (parent-reported) at one year follow-up. In 2009, the Canadian Partnership

Against Cancer organization and Public Health Agency of Canada granted GCC a Coalitions Linking Action and Science for Prevention (CLASP; www.partnershipagainstcanser.ca) project to build upon the pilot study and deliver STP to over 100 schools across Canada. Two STP evaluations have stemmed from this national project. Using student-reported data, Mammen et al. (2013) found some evidence of localized success (1-23% AST increase) in nearly half of the 53 included schools, but overall, there was no change in AST one year following implementation. However, the authors noted that this national evaluation might be misrepresentative when considering only 53 of the 106 participating schools had complete baseline and follow-up student reported data included in analysis. To provide an additional indication of STP effectiveness on a national scale, Mammen and colleagues (2014) subsequently used follow-up parent-reported data available for all 106 schools. This study showed more promise, with a 14% mode shift from driving to AST one year following STP implementation.

All five STP evaluations (Buliung et al., 2011; Hinckson et al., 2011; Mammen et al., 2013; Mammen et al., 2014; Rowland et al., 2003) had primary objectives in quantifying longitudinal changes in AST. Although quantitative changes in AST are of prime interest in any intervention designed to increase AST, it may be less than optimal to rely exclusively on a quantitative approach to evaluate STP efficacy. Instead, a qualitative approach can address study objectives that are difficult to explore through quantitative methods (Jones, 1995). For instance, within the context of STP, qualitative research can provide in-depth insight of the factors influencing effective implementation and the subsequent effect on AST change. Exploring the dynamics of the STP process can also shed light on reasons for AST variation shown in previous STP evaluations in Canada (Mammen et al., 2013, 2014). Though research has qualitatively examined facilitators and barriers to AST among practitioners, (Loitz and Spencer-Cavaliere, 2013), parents and students (Ahlport et al., 2008), minimal research has explored facilitators and barriers of specific interventions that may positively or negatively influence AST change. In support, Crawford and Garrard (2013) recently stated that although “implementing active transport to school initiatives and assessing their effectiveness in participating schools are important, it is also important to examine the program and contextual factors that shape the effectiveness of interventions (pg. 1).” This information can then lead to proposed modifications and recommendations to improve future STP practice.

The individuals who would arguably have the most in-depth insight into the STP process are the STP facilitators who initiate, coordinate and support STP development and implementation. Accordingly, for this study we sought the perspectives of facilitators directly involved in STP implementation across Canada. The study objectives were to: i) explore the perceived success of STP interventions; ii) identify factors facilitating or hindering STP implementation; and iii) provide recommendations for improving STP practices in Canada.

5.3 Methods

5.3.1 The School Travel Planning Process

Details on the STP process have been described previously by the co-authors (Buliung et al., 2011; Mammen et al.,2013; Mammen et al., 2014). However, as a brief overview, the delivery of the STP process occurs over a series of four steps (see Figure 2.1). Led by a STP facilitator, step one involves school recruitment and the formation of school-level stakeholder committees. Step two involves the collection of baseline data including student and parent reported travel mode, family and school-level characteristics, and a committee led school-level walkabout. The information derived from the baseline measures and walkabout informs step three (action planning), whereby STP committees develop a written plan of action for dealing with school-specific issues and challenges for AST. Step four involves strategy implementation and on-going follow-up evaluations. Hence, the 'school travel plan' is continuously updated and modified, acting as a living document referred throughout the STP process.

5.3.2 Data Collection

This qualitative study employed semi-structured interviews with STP facilitators across Canada. Participants were purposefully recruited with assistance from Green Communities Canada (GCC), who provided a list of STP facilitators who had experience in implementing STP since 2009. An email invitation outlining the study purpose, recruitment and data collection process, and study implications was sent to 48 facilitators. Of these, 34 STP facilitators responded to the invitation and volunteered to participate in the study. All but one of these facilitators were involved in the national CLASP STP project which formed the basis of earlier published evaluations (Mammen et al., 2013, 2014). A subsequent email was then sent to the confirmed participants for scheduling purposes. Due to the geographical spread of the facilitators, telephone

interviews were conducted. The use of telephone interviews has been accepted as a suitable mode of data collection and is cost-effective and beneficial in coordinating schedules (Lechuga, 2012; Hanna, 2012).

The interviewer followed an interview schedule to guide the conversation (Appendix C). Specific questions addressed: i) perceptions and definitions of STP success; ii) factors facilitating or hindering STP implementation; and iii) proposed recommendations for STP in Canada. All telephone interviews were conducted between September 2012 and June 2013. All stakeholders were sent an information sheet and a consent form to be reviewed prior to the scheduled interview. The document addressed the purpose of the study, reason for invitation, participation rights, risks and benefits of involvement, confidentiality, anonymity, and data security. All participants provided verbal consent to participate in the study and to be audio-recorded for post-interview transcription. Interviews lasted between 15-55 minutes and in total, approximately 975 minutes of audio were transcribed. Participants were sent their respective audio-transcription and were given the opportunity to review the content and change or add any content as they wished. The University of Toronto Ethics Research Board granted ethics approval for this work.

5.3.3 Data Analysis

Recorded interview sessions were transcribed verbatim and the raw data were analyzed using a thematic analytic approach. Thematic analysis is a process of induction involving the identification, coding, and organization of themes arising from the raw data with extracts serving as units of analysis (Coffey and Atkinson, 1996). Some key steps of this qualitative analysis included: i) preliminary exploration of the data by reading through the transcripts as a whole and taking notes; ii) coding data by segmenting and labeling texts; iii) using codes to develop themes; and iv) connecting and integrating themes. Text responses were coded according to the questions addressed and reviewed through a continuous process of comparing text segments across respondents, seeking similar or repeated ideas. Commonly occurring patterns of meaning across all participants' narratives were grouped together into categories. After refining main themes, the data were searched for the particular subcategories that give rise to themes, as well as broad inter-relationships among themes. Each respondent was assigned a pseudonym for anonymity and confidentiality. The pseudonyms contain where each facilitator implemented

STP, being in either Ontario (e.g., ON1, ON2), in provinces west of Ontario (e.g., W.ON1, W.ON2), or east of Ontario (e.g., E.ON1, E.ON2).

In terms of study trustworthiness (e.g., credibility, conformability and dependability), several methodological considerations and techniques were employed as suggested by qualitative researchers (Lietz et al., 2006; Shenton, 2004; Sparkes and Smith, 2014). For example, two forms of member checking were conducted, which according to Guba and Lincoln (1989) 'is the single most crucial technique for establishing credibility' (p.239), First, participants were given the opportunity to review their audio-recorded transcripts. Second, participants were sent the results section of the manuscript and asked to provide any feedback regarding the authors' interpretations. Five participants responded and all concurred with content accuracy and interpretations. Debriefing of the coding and categorization of themes occurred between the lead researcher and the senior author of the study (GF) on three separate occasions. This practice led to theme refinement and development. Lastly, the first author maintained a dependability and conformability audit trail containing the recruitment email, interview guide, original transcripts, and several iterations of analysis notes, which were the basis for the developing themes and subthemes in the study.

5.4 Results

5.4.1 Demographics of STP facilitators

Most facilitators delivered STP within the province of Ontario. However, there was provincial representation from all Canadian provinces/territories except Prince Edward Island, New Brunswick, and the North West Territories (i.e., Nunavut). The majority of facilitators were occupied within the health sector, female, and led STP implementation in either an urban or suburban setting (Table 5.1). The following results section is organized by the three study objectives.

Table 5.1: Demographics of STP facilitators

Demographics	Number of facilitators
Gender	
Female	27
Male	7
Province	
Ontario	19
West of Ontario	10
East of Ontario	5
School Location Setting	
Urban/Suburban	31
Rural	3

5.4.2 Was STP implementation successful?

All facilitators perceived STP to be successful in their respective schools, but it was noted that it "*was only a first step towards success with more success to be had.*" (W. ON 1)

> *STP was really the seed that allowed us to grow the plant here and really allowed us to get the ball rolling. (ON1)*

Although all facilitators viewed STP as a success, there was variation in how each defined success. Increases in AST rates were mentioned by several of the facilitators, as *"a direction measurement for success." (ON2)* However, a predominant theme pertained to the cross-sector partnerships developed among a variety of stakeholders. For example, when probed into defining success, two participants responded:

> *I would say partially numbers, like definitely seeing how many more people are walking. But also just the involvement amongst the different stakeholders and partners…. it's definitely a better sign than just the sheer numbers. (ON3)*

> *It was beautiful to see the diversity around the table, and it created this nice little friendship between different sectors, and I think that's what we need this day and age to help improve physical activity. (ON4)*

In terms of the benefits of multidisciplinary collaboration, facilitators cited the advantages of "*creating awareness and enthusiasm in a school about walking*." (ON5)

> *I find it [STP] successful when people engage in discussing about AST and working towards solutions. The beauty of STP is you begin a dialogue. I am always amazed at, from the time we say 'hey we are doing this', that people think about this when it never even crossed their mind before. (W. ON2)*

> *Yeah, it was successful in terms of putting school travel on the map at least, just to even get the words out there and start a bit of dialogue, because before that I don't think people even realized what AST was, or that there were even any other [travel mode] options. (ON6)*

An additional theme that emerged when facilitators were defining success related to the completed 'action items'. For example, one facilitator explained how a school-specific barrier was overcome by STP:

> *One school was being impacted by road construction so this really got the conversation started on how they can better design the bus drop-off area… it was just very congested with that road being closed so with parent traffic, walkers, bikers, and buses all using the same entrance… we were able to redesign it so it's on the other side of the school which just makes it safer and less congested…so, I see that as a success story and a direct result of STP. (ON7)*

In summary, the facilitators defined STP success *in "multiple of ways"*(E. ON1):

> *I think it was quite successful for a number of reasons. One, it got the school admin, vice principal, and teachers more focused on the issues of AST. Two, it actually increased students walking to school. Three, we were able to provide cycling education at the school as part of the project. Four, we were able to do the community walkabout with the community partners and have discussions with them so now, it's on their radar. So, I would define all that as a success. (ON8)*

5.4.3 What were some factors influencing effective STP implementation?

The common factors cited that influenced the degree of STP success were the: i) nature of the STP model itself; ii) community and school-level stakeholder champions; iv) presence of the STP facilitator; and v) timing and length of implementation (Table 5.2).

5.4.3.1 STP model

Several facilitators mentioned the organized structure of the STP model as being "laid out" (ON6), which provides a "tidy system"(E. ON2) and a "blue print" (ON9) for success. More specifically, a major theme facilitating success related to the comprehensive process of STP:

> *The comprehensiveness was huge. It's not just a one time thing. It's asking the parents what they think, and involving the community partners within the school. (ON10)*
>
> *The STP process itself really clarified what the barriers and issues were. Whether they were perceived, whether it was infrastructure, or safety, and working through the creation of an action plan… you know it was really step by step and I think that is really good in a program.* (E. ON2)

5.4.3.2 Community-level stakeholder involvement

In line with how many defined success, a common factor described as facilitating success related to the collaboration among various multidisciplinary community stakeholders who were identified as being *"fundamental to the success of the program." (W. ON3)*

> *The main benefit [of STP] was getting the discussions between the police, the city, transportation leads, public health, school admin, and parents. So just getting everyone talking about how kids travel to school… are there safety issues? What CAN we do about this? Because before this, no one was really talking about it. (ON8)*
>
> *We all came together for the goodness of the project…. for the success of the project. I don't think without that commitment, it would have been as successful as it was. (ON11)*

The value in connecting various community stakeholders to enable greater AST was identified by several facilitators:

> *….in one school, we were able to establish that walking zone. There was a church a couple of blocks away, and one of the committee members spoke to the priest, and he allowed the parents to park there so the parents could walk their kids from that point. So that was a success. (ON12)*
>
> *In [location removed] we're considered the [nickname removed] and in some spots the branches go right to the ground. And during the walkabout, the children pointed out that many kids were smoking, doing drugs, even having sex under there, and this made them scared and uncomfortable. So with our partners from the City, we got them to trim the*

> *bottoms of the trees, and I think it makes a huge difference now. We also got a crossing guard from the police department. Another example of how community partners can help with this. (ON10)*

5.4.3.3 School-level stakeholder involvement

Not only are community partners instrumental to success, but *"having champions within the school population is definitely key."* (W.ON4) These school champions were identified as school principals, parents and students. One facilitator stressed the importance of having a committed principal, by differentiating between two schools where STP was implemented:

> *I definitely think it was more successful at one school than the other. In one school, the principal was completely engaged when we did some cycling education for the kids, she was there the whole time, she even rode with us and the kids in the community, so that whole role modeling piece is amazing. In the other school, the principal wasn't that keen and even though he took part, he just wasn't interested and you could tell from the start he wasn't going to make it a priority. (ON13)*

Parent support, and notably their lack of involvement, was also discussed as an influencing factor in shaping STP success since they "*ultimately make that decision* [to allow their child to walk to school or not]." (E.ON3)

> *There wasn't a big parent side to it. We can have all the pieces in place, but at the end of the day they still have to allow their kids to walk or cycle to and from school. (W.ON5)*

> *The other biggest hindrance are the parents. And the parents just didn't buy in to it.... their perception is it's more convenient to drive… even though we did our external observations, sent home newsletters, did activities with the children… the parents still continued to drop their children off, that live like four houses down from the school. (ON6)*

Lastly, in terms of school-level stakeholders, the level of *student* engagement in the STP process was acknowledged as an influential factor regarding STP success as students were seen as essential to "*drive the dynamics to help how the messages get communicated." (*ON13)

> *….student engagement helped big time, because students took it on their own… they have the best influence on their parents in terms of their decision making. (W.ON6)*

> *Hearing from students themselves contributed to success. Like during the walkabout, we brought students along with us and we asked them to walk the route they take. So when*

> *the city council, city transportation staff and police heard about that, and when they see that with their own eyes, they thought that these were some major issues that we do need to address… so having them [students] there just opens up everyone's eyes. (ON8)*

5.4.3.4 The facilitator's role

Also perceived as a key factor to STP success, participants described the role of the facilitator as a "*real advantage*," (E.ON1) since they were a '*liaison*' (ON14) between the community and school -level stakeholders, "a *dedicated person working with the school" (W.ON2),* and *"somebody on the ground, making sure things were moving forward all the time." (W.ON6)*

> *...having a STP facilitator was very important, rather just having everyone on the committee to come and pitch in, because everyone has responsibilities and busy jobs. So that was very important in moving forward you know, a coordinator for this. (ON15)*

5.4.3.5 Length of implementation time

In Canada, STP is recommended to be implemented over one and a half years (www.saferoutestoschool.ca). However, in the national CLASP project, it was requested for follow-up data to be collected one year following baseline measures. (e.g., Fall 2010 to Fall 2011). This "*short time frame*" (W. ON2) to identify barriers, implement action plans, and collect baseline and follow-up measures was identified as a main barrier to STP success. The insufficient time given to implement STP was considered as **"***one of the downsides of the project*" (W.ON5), leading to cases in which the "*action plans were implemented after follow-up data was collected."* (W. ON5)

> *In terms of time, it was too fast. There was a lot of pressure to just get it done. I really don't think from a behaviour change standpoint that it'll work like that. And it didn't work for us. Because it was too much too fast. (ON4)*

> *…when it comes to changing stop signs or pedestrian walkways, you can't do that in such a short time frame. Even just to get council support might take ten or twelve months. (ON7)*

Table 5.2- Factors facilitating and hindering STP implementation

Factors	Facilitator	Barrier
STP Model	*	
Community-level Stakeholders	*	
School-level Stakeholders	*	*
Principals/Teachers	*	*
Students	*	*
Parents	*	*
Role of Facilitator	*	
Length of Implementation		*

5.4.4 Next steps for STP in Canada?

A concluding question related to the facilitators' views of next steps needed for STP to be effective in Canada. A recurring theme linked to the pressing need for government (i.e., Federal, Provincial/Territorial, and Municipal) funding to develop the appropriate infrastructure needed to support STP interventions.

> *Well I don't think anything needs to be changed [with STP], but the biggest hindrance to me is money… I mean, we want sidewalks to change, but that's a money thing, and some of these things are so big that they are out of the control of our committee. It's a provincial government thing, or a federal government thing that needs to be addressed.(W.ON7)*

> *One of the biggest barriers we have is convincing government how important this is, and having them make it as important as someone travelling to work in their vehicles. Government has to recognize that this work is important and to fund it properly. So for me, this is the biggest barrier, in Canada, most of the Non-for profit organizations are running this type of thing, and this is not right. (ON11)*

Specific to funding, it was frequently noted that the role of a permanent funded facilitator is crucial if STP is to be sustained as an intervention practice across Canada.

> *I think the province really needs to step-up and look at how the facilitator's role could be something that's funded and offered. I think there's incredible value and return to the province in terms of savings in health care if they can get kids walking and cycling. (ON2)*

> *This is the position we need to fund. We need people to do this job. Having the facilitator, in the community, that one person you could go to as a point of contact and then their job is to bring together all of the stakeholders. You know if you don't have those two pieces, we know that it won't work because the school can't do it by themselves. (ON11)*

Hiring a full time funded facilitator was also discussed as a strategy to alleviate the major challenge of competing priorities within a school setting:

> *Even with the data collections, schools receive so many requests to do surveys and send information home to parents, it's almost like where does this fall within the agenda. A permanent funded facilitator would help with this issue. (W.ON8).*

External to funding, facilitators urged government officials to reassess, recreate and/or develop new policies that would support STP interventions and increase AST. For instance, policies around school transportation need to be reexamined so they do not exclude AST:

> *The single most significant barrier is that the Ontario Ministry of Education's definition of transportation only talks about bussing. We need the ministry to re-write policies around school transportation to actually make it a true transportation policy and not just a bussing policy. They simply do not recognize AST as a form of school transport, either in policy or funding, therefore the entire culture from the ministry, to the school board, down to the individual and school, is focused on bussing. So we need some percentage, out of the 800 million that the ministry is spending on bussing, that has to go towards supporting infrastructure for walking and biking and for initiatives such as STP. (ON1)*

Additionally, redeveloping policies and reallocation finances around school transportation was acknowledged as a needed next step. For instance, in many Canadian public school boards, elementary school students who live further than 1.6km from school are eligible for free bussing. Thus, it was suggested to "*push the 1.6km zone limit and reallocate those dollars to improve the walkability*" (ON16) if AST trends are to increase in Canada. Lastly, school siting decisions also need to be reexamined if STP interventions are to be successful in the future:

> *On the provincial level, there is a whole another debacle in my mind, in that they keep shutting down schools in small communities and placing them in the middle of nowhere… everyone has to get bussed and no one can walk. That's a policy issue at a provincial level if you want to talk about an important one. I think that needs to be addressed where they are putting schools in totally illogical places only because the land there is cheap, or only because it's a political decision. But it's stupid from an environmental perspective, and from a children's quality of life perspective, it's stupid. (E.ON2)*

5.5 Discussion

This was the first study to qualitatively explore facilitators and barriers of effective STP implementation and within the context of a national implementation. The first study objective was to explore the facilitators' perceptions of STP 'success.' All facilitators deemed STP to be successful in their respective schools, though the definitions of success varied. Increases in AST, multidisciplinary partnerships, completed infrastructure projects, planned events, and AST awareness were all seen as STP successes and important intermediate benefits of the intervention.

The varied meanings of success reflect the comprehensiveness of the STP model that has implications for future STP evaluations and practices. For instance, in addition to focusing on longitudinal AST change which has been the primary outcome of STP evaluations (Buliung et al., 2011; Hinckson et al., 2011; Mammen et al., 2013; Mammen et al., 2014; Rowlands et al., 2009), future work can evaluate STP more holistically by capturing the number of developed stakeholder partnerships, school-level infrastructure improvements, and changes in AST culture (e.g., attitudes among students, parents, and teachers) within the school. This can begin the development of a STP 'success checklist' that STP practitioners and researchers can use in the STP model to assess the degree of success at a particular school. The different perceived successes also point to the school-specificity of STP. Though the STP model (Figure 1) provides a broad framework for implementation, it is important to highlight that the processes of action planning and strategy implementation will depend on school-specific needs and challenges. Thus, STP does not encompass a 'one-size fits all' approach, but rather a flexible implementation process that addresses the specific AST barriers of a given school.

The second study objective was to identify factors influencing effective STP implementation. The current STP model was consistently valued by the facilitators as it provided a systematic guide to implement STP from baseline data collection, to solution identification and implementation, and then to follow-up data collection. Specific to the model, participants emphasized the importance of focusing on community and school-level stakeholder involvement. Engaging stakeholders from diverse disciplines, such as education (e.g., school board trustee, teachers, students), health (e.g., public health nurse), transportation (e.g., engineer), and safety

(e.g., police), was identified as the backbone of STP success and effective implementation. Specifically, facilitators appreciated the range of strategic ideas provided by the diverse stakeholders in alleviating AST barriers.

Recent qualitative studies have supported the importance of multidisciplinary collaboration in increasing AST (Crawford and Garrard, 2013; Loitz and Spencer-Cavaliere, 2013). In Loitz and Spencer-Cavaliere's study with 19 practitioners (e.g., health promoters, traffic engineers, police, etc.) from Alberta, Canada, focus groups revealed that partnerships among schools, community organizations, government agencies, and businesses are critical in encouraging, mobilizing, and sustaining AST initiatives. However, these types of community-based participatory strategies are lacking in the AST literature. In Chillon and colleagues' (2011) review of 14 AST interventions, the large majority of interventions employed promotional and educational 'one off' strategies to increase AST and these interventions were associated with small effect sizes. The reviewers argue that such small effects may reflect the ineffectiveness of one off strategies. Instead, they suggest that acquiring buy-in from community-level stakeholders, which is the basis of STP, may be the essential component in the effectiveness and sustainability of AST interventions. Previous interventions that have focused on developing community partnerships have shown the benefit and value in initiating behaviour change. For example, studies have shown the outcomes of multidisciplinary collaboration in PA initiatives including raised community awareness, development of bike lanes, and greater police officer involvement (Middleton et al, 2013; TenBrink et al., 2009; Kong et al., 2009). As Haggis et al. (2013) describe, multidisciplinary teams are advantageous in tackling complex PA issues by using the team's collective wisdom, expansive perspective, and a holistic, integrated approach.

Along with community-level involvement, the involvement of school champions (e.g., principals, parents, and students) in the STP process was considered critical to effective implementation. According to the facilitators, these champions were integral in building an AST culture within the school by increasing the awareness of AST, and assisting with the various promotional strategies. However, the school principals were considered as the anchor to the STP committee, as their commitment towards STP directly influenced the degree of implementation and success.

A recent mixed methods evaluation of an AST program in Victoria, Australia also showed that promoting and implementing an intervention is easier when the school culture is accepting and enthusiastic about AST (Crawford and Garrard, 2013). That study showed a 7.6% increase in AST in the pilot school relative to a comparison school over one year. Based on researcher observations and multiple semi-structured interviews with the program coordinator, evidence suggested that the increase was partially attributed to the highly motivated, committed, and energetic school staff that implemented the program. However, principals and teachers are typically faced with demanding daily schedules within the school setting, and thus, their involvement may not be consistent or existent. Hence, more research is required to understand how best to alleviate this challenge. One method may stem from greater student and parent involvement.

In the current study, participants cited the level of student involvement in the STP process as a facilitator of implementation. The students were believed to be an important agent in helping reverse the AST culture by increasing awareness and promoting the benefits not only to their peers, but to their parents as well. This is consistent with prior research showing that student involvement can serve as a powerful interventional tool in eliciting norm, attitude and behaviour change (Valente et al., 2003). Specifically, involving students in the STP committee walkabout was considered invaluable for the adult stakeholders to understand the trip to school through the eyes of children. It is important to gauge children's perceptions of their environments when pertaining to AST, since their experiences and observations with their natural surroundings will uniquely vary compared to adults' (Fusco et al., 2012). Thus, as part of the STP process, consulting children as to their needs and preferences is important to effectively tailor programs (Evans et al., 2013; Holloway and Valentine, 2000) such as STP.

Although community professionals, school staff, and students are important agents in helping increase AST in children, none may have greater influence than the parents. Notably, facilitators claimed that parents must believe in, and value, the benefits of AST if children are to consistently practice this behaviour. If not, STP may be viewed as a wasted effort, since parents are the ultimate decision makers when it comes to their children's school travel mode (Faulkner et al., 2010) and without their support, effectiveness of the program may be limited. As suggested in previous qualitative research on AST (Loitz and Spencer-Cavaliere, 2013), this

study further recommends future STP interventions and AST initiatives in general to facilitate parental participation in strategy development and implementation.

The aforementioned factors can shed some light on the variability in mode shift reported in the CLASP evaluations (Mammen et al., 2013; 2014). For instance, perhaps the schools showing greater AST change had greater buy-in, involvement, and commitment from diverse community- and school-level stakeholders to tackle the range of barriers impeding AST. Thus, this study recommends STP practitioners to recruit and engage all mentioned stakeholders given the study findings showing both community (e.g., education, health, transportation, safety) and school-level (e.g.. principal, teachers, students, parents) stakeholder to have an equally important role in implementation.

Funding agency timelines was the major barrier to effective STP implementation. For the national CLASP project, follow-up measures were requested to be collected one year following baseline (e.g., Fall 2010 to Fall 2011). This time frame could be too short to effectively implement STP. As an example, many participants noted that follow-up data collection occurred prior to any action plans being implemented. This may suggest why Mammen et al.'s (2013) CLASP evaluation, in addition to other STP evaluations (Hinckson et al., 2011; Rowlands et al., 2011), observed no change in AST after 12 months. As supported by the current findings, it may be unlikely to detect any mode change within a year when considering the insufficient time given to conduct baseline assessments, generate AST solutions, and implement all action items identified in the school travel plan. From a research perspective, the artificially compressed implementation time limits the ability to prospectively evaluate STP interventions more rigorously. The majority of STP evaluations have been based on one year evaluations without using control schools or tracking students and households longitudinally. More rigorously designed longitudinal interventions (e.g., 2-4 years) are needed to determine STP's long-term effectiveness.

The study's final objective was to provide recommendations for the sustainability and long-term success of the STP model in Canada. Since STP began practice in Canada in 2007, it has been led and advocated by GCC. Though GCC has made great strides in introducing STP to practitioners, policy-makers, researchers and schools across Canada, the challenges around

sustained funding remain its primary barrier to effectiveness according to study participants. For instance, lack of funding poses major obstacles in building the appropriate infrastructure needed to support AST and hiring full-time funded facilitators. Connecting the community and school-level stakeholders, by acting as a liaison, was acknowledged as an important role the facilitators had throughout the STP intervention and one that is needed if STP interventions are to be a sustainable practice in Canada. To a greater extent, however, the facilitator's role was viewed as essential in ensuring that the intervention was actually implemented. Without this role, it was reported that proper implementation would be extremely challenging given the time constraints of STP committee stakeholders in executing their primary work duties. Similarly in Loitz and Spencer-Cavaliere's (2013) Canadian study, the focus groups identified the need for financial and personnel support to promote and sustain AST programs. Participants described current AST initiatives in Canada transitioning only from grant to grant, with minimal sustained financial and capacity support personnel from organizations.

Broadly, our findings suggest that the STP model in its current form may have more of an influence on the micro (e.g., individual/parent attitudes) and meso (e.g., school culture) level settings of the ecological model (Bronfenbrenner, 1977). However, STP appears to have a less potential influence on broader macro-level barriers relating to the environment (e.g., sidewalk improvements) and policy (e.g., school siting, bus services) that may be more entrenched barriers to AST. From a critical perspective, STP could be considered more of a 'band-aid' solution to the pervasive barriers to AST that stem from the broader environmental and political climate. For STP to be successful in Canada, it must likely transition from being NGO-funded to government-funded. Many of the facilitators urged decision makers at various levels of government (e.g., federal, provincial/territorial, municipal) to coordinate intersectoral approaches to enhancing AST (e.g., transportation, health, education, safety), identify and implement policies that support AST (e.g., school siting, bussing eligibility), re-allocate funds to support full-time facilitators, and invest in resources to make environments more conducive to AST.

This government-led approach has been supported and effective through a similar intervention entitled Safe Routes to School (SRTS) in the US. Between 2005 and 2012, the US Congress enforced the SRTS program as part of the federal Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This provided $1.2 billion, and

as of 2010, departments of transportation in all 50 states had used portions of this funding to hire state-led coordinators, introduce sidewalk improvements, traffic calming, pedestrian/bicycling access and education programs to promote AST in 14,000 elementary and middle schools (National Center for Safe Routes to School, 2012, 2013a). Recent longitudinal and controlled evaluations of the SRTS program have shown population-level increases in AST (McDonald et al., 2013; McDonald et al., 2014; Stewart, et al., 2014), and decreased injuries near SRTS infrastructure improvements (DiMaggio and Li, 2013). In New York City alone, Muennig and colleagues (2014) found that SRTS is linked with an overall societal benefit of $230 million as well as 2,055 quality-adjusted life years gained. Further advocacy is needed with Canadian government officials across all levels to make the case that investing in AST initiatives are worthwhile from a health, environmental, and ultimately an economical perspective. However, in the meantime, continued efforts are needed at the micro and meso-level of influence to inform, educate, and promote AST among schools, students, and parents.

5.5.1 Strengths, Limitations, Future Research

This study contributes important knowledge to the STP literature. It is the first qualitative study to explore STP implementation. In doing so, it provides insight into what may be improved in future STP practices. A major strength of this study is the national scope of the participating sample. However, one limitation was the focus on the perspectives of one stakeholder group (i.e., STP facilitators). Thus, caution is required regarding the transferability of the findings for two reasons. First, it is important to acknowledge that these facilitators were paid over the duration of the intervention, and it was their primary role to ensure STP was implemented. Due to their status as ‘facilitator’ and their time involvement, they may have felt positively predisposed to STP. Second, these facilitators may have overlooked limitations or challenges of STP (e.g., time demand) that other stakeholders (e.g., principal, teachers) may emphasize. Future STP evaluations should extend the current study’s methodology by gaining the perspectives of other stakeholders (i.e., school and community-level) to provide a more comprehensive evaluation of STP’s benefits, challenges, and factors influencing implementation. For instance, a case study approach would provide a more in-depth and holistic assessment of the STP process by exploring the perspectives of all stakeholders involved. Additionally, the study participants were primarily based in urban and suburban locations and comparisons with rural schools were limited.

5.6 Conclusion

STP was considered primarily successful by starting a conversation about school travel among community and school-level stakeholders that lead to multidisciplinary consideration of potential solutions to promote AST. There were a variety of, but equally important, factors that contributed to success. Practitioners of not only STP, but various other AST interventions should take note and invite stakeholder participation from community organizations, teachers, parents, and students to help implement AST strategies. There was also some evidence to suggest that the existing STP model may be a short-term 'band-aid' solution to increase AST given the lack of time and sustained funding to support its implementation. Findings further call for greater investment in resources and capacity to support STP interventions across all levels of government in order to see increasing engagement in AST. However, the study findings should be interpreted with caution given the focus on STP facilitators. More rigorous assessments of STP are required in 'scaling up' evaluations to use control schools, tracking impact over multiple years, and seeking perspectives from a broader range of stakeholders.

5.7 Acknowledgements

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Chapter 6

6 Behind the Scenes of School Travel Planning: A Mixed-Methods Multisite Case Study of STP in Toronto, Canada.

6.1 Abstract

Objective: The study objective was to conduct a mixed-methods multisite case study of STP in two STP Toronto elementary schools to provide i) a detailed description of the implementation process over a one year period and ii) a comprehensive evaluation of STP to determine key factors (i.e., school contextual and program) influencing implementation and mode change. **Methods**: In holistically examining STP, the study used multiple data sources including classroom AST measures, school profile forms, student bus use tallies, photography, participant observation, and semi-structured interviews (n=31; STP committee members + non-members). **Results**: Quantitative data revealed increases in AST in both schools after one year of implementation (i.e., School Cycle- 4% increasing in biking; School Walk- 15% increase in walking). Qualitative data support the observed changes in AST and highlight why STP was effective in both schools, but to a greater degree in School B. Overall, key factors facilitating implementation and mode change included the urban environment, the school-specific model of STP, an inter-generational STP committee, a lead facilitator, and executing multiple AST strategies. The main barrier to implementation was the lack of parent involvement and the restricted one-year period. **Conclusion**: This case study showed successful STP practices and implementation in two Toronto schools and highlights a variety of factors affecting implementation and mode change. The insight gained may be useful for the practitioners introducing STP to schools in downtown Toronto. The study design can also serve as a model for future STP interventions to provide a comprehensive evaluation of its impact, benefits, and challenges.

6.2 Introduction

Active school travel (AST; e.g., walking or biking to/from school) can contribute to short and long- term physical (Faulkner et al. 2009; Larouche et al., 2012), psychosocial (Carver et al., 2014; Hillman, 1990 ; Martinez-Gomez et al., 2010; Mendoza, 2014), and environnemental benefits (Giles-Corti et al., 2010). These benefits have spurred increasing AST interventional work since the new millennium. For instance, between 2003-2011, there were 14 studies assessing intervention effectiveness (Chillon et al., 2011). From 2011-2015, at least 14 more peer-reviewed intervention evaluations have emerged (Buliung et al., 2011; Buckley et al., 2013; Bungum et al., 2014; Ducheyne et al., 2014; Hinckson et al., 2011; Mammen et al., 2013; Mammen et al., 2014; Mammen et al., 2015; McDonald et al., 2013; McDonald et al., 2014; McMinn et al., 2012; Mendoza et al., 2011; Sayers et al., 2012 ; Stewart et al., 2014; Vanwolleghem et al., 2014).

The collective findings from Chillon et al.'s (2011) review and the more recent evaluations have suggested that interventions may be more effective in increasing AST when adopting a comprehensive, ecological approach, particularly since the AST literature (Garrard, 2011; Sirard and Slater, 2009) has identified correlates from all socio-ecological levels of influence (Brofenbrenner, 1977; McLeroy et al., 1988; Sallis et al., 2006) including intrapersonal (e.g., demographics, attitudes), interpersonal (e.g., family and peer habits), organizational (e.g., school culture), environmental (e.g., street density/connectivity), and political (e.g., transportation and school siting policies). Several AST studies suggest that to be effective interventions must target as many of these levels as feasible (Chillon et al., 2011; Hinckson et al., 2011; Mammen et al., 2015; McDonald et al., 2013; McDonald et al., 2014).

In Canada, one such intervention that is designed and implemented with a comprehensive method is School Travel Planning (STP). A unique feature of STP is the formation of school-level STP committees who collaboratively identify school-specific AST levels, barriers, needs, and strategies. This committee is comprised of a lead STP facilitator along with school (e.g., principals, teachers, students, parents) and community-level stakeholders (e.g., public health nurse, police officers, school-board trustee, traffic engineer, members of City Council) who collectively help with implementation. Though the broader AST literature advocates for such multidisciplinary and comprehensive interventions, the evidence on STP is still in its infancy.

Only seven peer-reviewed STP evaluations exist from England (Rowland et al., 2003), New Zealand (Hinckson et al., 2011; Hickson, 2015) and Canada (Buliung et al., 2011; Mammen et al., 2013; Mammen et al., 2014; Mammen et al., 2015). Five are quantitative studies, and provide broader national or regional pre-post assessments of STP, with three studies showing no impact on AST after one year of implementation (Hinckson et al., 2011; Mammen et al., 2013; Rowlands et al., 2003) and two studies showing positive effect (Buliung et al., 2011; Mammen et al., 2014) after one year of implementation. Two recent qualitative studies explored challenges and facilitators to STP implementation (Mammen et al., 2015; semi-structured interviews with 34 pan-Canadian facilitators) and active travel (Hinckson, 2015; student focus groups in 15 Auckland based schools). Though these large-scale evaluations are important in assessing population-level changes in AST, there are three notable research gaps in this existing literature.

First, such evaluations may mask considerable heterogeneity in AST outcomes between schools. Given the school-specific nature of STP and variability in school travel mode across space (e.g., urban, suburban, rural), time (e.g., am versus pm), schools (e.g. private vs. public, enrollment) and populations (e.g., ethnicity, socioeconomic status), providing a more fine-grained STP evaluation for a select number of schools (e.g., 2) appears warranted (Mammen et al., 2013, 2014). Second, existing STP studies do not provide a, holistic, 'real-life' description of the STP implementation process. Observing and describing this process in real time can highlight how implementation varies based on different school contexts. Third, no STP evaluations have been assessed using mixed-methods. A mixed methods design might be advantageous in evaluating STP more comprehensively by using qualitative data sources (e.g., participant observation, interviews) to help identify key factors that may explain quantitative findings (e.g., changes in AST).

Creswell and Clarke (2011) support the concurrent use of quantitative and qualitative data sources as it increases the breadth of understanding about a phenomena (i.e., STP) by "finding the story behind the numbers" (Creswell (2011) pg. 7), triangulating data, and eliciting different perspectives on STP. For instance, our qualitative STP evaluation was beneficial in helping conceptualize various meanings of 'success' when referring to STP effectiveness, which included not only changes in AST, but developed partnerships, increased AST awareness, and completed infrastructure based action items. However, aside from including a broader range of stakeholders outside the STP facilitator, the study may have been strengthened if linked to

quantitative changes in AST to determine which factors facilitate or hinder mode change. Thus, gaining the perspectives of a broader range of STP committee members (e.g., principals, teachers, students, parents, community partners) and linking these findings to changes in AST will provide a comprehensive evaluation of program effectiveness.

Addressing these research gaps can be achieved through a case study approach since it is an in-depth description and process of inquiry about a phenomenon (i.e., STP) (Merriam, 1998; Stake, 2006), uses multiple data sources to ensure the phenomenon is explored through more than one lens (Baxter & Jack, 2008; Yin, 2003), and enables the researcher to answer the "how" and "why" type of research questions (Yin, 2003). Specifically, a *multisite descriptive case study* can detail the real-life context to allow analysis within and across settings and to understand similarities and differences between cases. This can highlight the impact of certain issues or factors (Stake, 2006; Yin, 2003), such as degree of teacher or student involvement in STP. Hence, the overarching objective was to conduct a mixed-methods multisite descriptive case study in two STP schools to provide i) a detailed description of the implementation process over a one year period and ii) a comprehensive evaluation of STP to determine school contextual and program factors influencing implementation and mode change.

6.3 Methods

6.3.1 Case Study Setting

This case study was conducted in the City of Toronto, Canada's largest city by population. With a population exceeding 2.5 million, Toronto is an ideal setting to study STP implementation since AST variability exists based on geographical location (Mitra et al., 2014), land use mix (e.g., Mitra & Buliung, 2012), and neighborhood aesthetics (Mitra et al., 2010). Beyond the impacts of the physical environments, differences in socio-economic status (SES) environments in Toronto have further explained varying levels of not only AST (Larsen et al., 2014), but also broader PA (Stone et al., 2014). The downtown area, which is the focus of this study, is predominately characterized by pre-World War II traditional neighborhoods where grid-based street networks dominate; intersections are denser and blocks typically short and straight; and higher building densities and mixed land use prevail (Hess, 2010; Hess and Sorrenson, 2015; Sewell, 1993).

Toronto is also of interest because of the growing practical and political discussion around active transportation across populations. Notably, AST among children continues to generate conversations between sectors (e.g., health, transportation, education) in Toronto and the surrounding areas, commonly referred to as the Greater Toronto and Hamilton Area (GTHA) (Metrolinx, 2015). Between 1986-2006, AST declined in the GTHA by approximately 10% among 11-15 year olds and was replaced with greater motorized travel (Buliung et al., 2009). Due to the detrimental health and environmental effects of increased motorized travel and congestion in the GTHA, efforts are underway among numerous sectors (e.g., health, education, safety, transportation, planning) to increase non-motorized travel. This study can therefore provide some local evidence for practitioners and decision makers on the potential of STP to increase AST, particularly within schools located in downtown Toronto.

6.3.2 Study Sample and Design

This study involves an in-depth examination of the STP model delivered in two elementary schools with students ranging in age from 6 (kindergarten) to 14 years (grade 8). Green Communities Canada (GCC), a non-government organization that leads STP advocacy and implementation across Canadian elementary schools (www.saferoutestoschool.ca), chose these schools. In the summer of 2013, GCC received funding from RioCan (www.riocan.com) and the Heart and Stroke Foundation of Canada (www.heartandstroke.com) to implement STP in two schools (i.e., *School Cycle* and *School Walk*) located in downtown Toronto. Further details on the school selection rationale and characteristics will be provided in Section I of the results.

This case study used a multiphase mixed-methods design. This design uses a combination of qualitative and quantitative data sources that are collected, analyzed, and presented both sequentially and concurrently over time and across phases (Creswell & Clarke, 2011; see Figure 2.1). Quantitative measures of travel modes (classroom hands-up survey) were collected both at baseline (Fall 2013) and follow-up (Fall 2014) to determine changes in AST following implementation. Between these periods, additional quantitative (student bus use tallying) and qualitative (active participant observation, photography) sources were collected to explore, for instance, how STP progressed over one year, school-specific AST barriers and strategies, and level of stakeholder involvement.

After the one year follow-up assessments of mode share, semi-structured interviews were sequentially completed with STP committee members (stakeholders) and non-committee members to reflect on the year of STP implementation and help ascertain what program and/or contextual factors can explain outcomes in AST. The following subsections provide further methodological details on each data source. The University of Toronto Research Ethics Board granted ethics approval for this work.

6.3.3 Qualitative Data Sources

6.3.3.1 Participant Observation

The lead author was invited by the director of GCC Walks to become a member of each school's STP committee and help assist with implementation and evaluation for a one year period (Fall 2013-Fall 2014). Due to this role, this case study used *active participant observation* as a key data source. This particular stance of participant observation requires the researcher to become a member of a group (e.g., STP committee) over an extended period of time (e.g., 1 year) and to fully embrace its responsibilities, commitments, and expectations (Gold, 1958; Kawulich, 2005). The aims of participant observation can further relate to: establishing rapport with group members; determining communication patterns within a group; gaining an intimate familiarity with how activities are organized and prioritized; and determining the length of time for planning and executing various activities (Mack et al., 2005; Sparkes & Smith 2014). This method enables a deeper understanding of the individuals (e.g., stakeholders, students), community (e.g., physical and social environment) or program (e.g., STP) of interest.

Specifically, the goal of active participant observation in this study was to explore the intricacies of the STP model as it related to: the roles, responsibilities, and level of involvement among school and community-level stakeholders; the purposes, outcomes, and verbal behavioural interactions at STP meetings; the range of AST strategies employed to address school-specific environmental and social concerns; how the process transpires over a 1-year implementation period and what goals, achievements, and challenges could be expected within the first year.

The observations were documented in field notes during and/or immediately after each STP component (e.g., meeting, event). The field notes helped chronologically capture and organize observations of specific components of implementation (e.g., meetings) and perceptions (e.g.,

challenges) regarding each component. Informal conversation with STP committee members and non-members (e.g., uninvolved students, teachers) were also recorded in the field notes. Analyses were conducted concurrently with writing of the field notes (DeWalt & DeWalt, 2010). As suggested by Mulhall (2003), data from the field notes were coded and used to support or contradict data from the other sources, mainly the semi-structured interviews. The notes further helped develop the interview guide questions and decisions around data presentation.

6.3.3.2 Semi-Structured Interviews

The researcher conducted 31 face-to-face semi-structured interviews with the director of GCC Walks, STP committee members (n= 20) and non-members (n=10). A convenience sample was recruited for 'adult' STP committee members who were present for at least three STP committee meetings during implementation. Only one committee member declined to be interviewed. In School Cycle, interviews were completed with 5 adult committee members including the principal, a parent, a school-board transportation manager, a funding representative from the Heart and Stroke Foundation of Canada, and the facilitator. In School Walk, interviews were completed with 5 STP committee members including the principal, two teachers, a parent, and the school's public health nurse.

The 'student' STP committee members and non-members were recruited by the principal at School Cycle and two teachers from School Walk. The student STP members were targeted from each of the schools' extracurricular health and environmental groups (i.e., School Cycle: Eco-club, School Walk: Health Action Team (HAT)). In total, 10 student STP committee members (5 male, 5 female) participated in this study, with five from each school. Ten student non-committee members (5 male, 5 female) were recruited by both school principals with an inclusion criterion of school attendance during the previous 2013/2014 academic year, with a view to ensuring capable reflection on STP implementation among students not directly involved in the intervention. All students interviewed ranged in age from 11-13 years (i.e., grades 5, 6, 7) who used various methods of travel on the journey to/from school (e.g., walk, car, bus, public transit).

All adult and student participants were sent an information sheet, a consent form, and the interview questions to be reviewed one week prior to the scheduled interview. All participants provided written consent to participate in the study and to be audio-recorded for post-interview

transcription. For adult and student STP committee members, the interview guide addressed their experiences and roles in helping implement STP, perceptions of STP's impact on mode change and factors facilitating or hindering implementation. For the student non-committee members at both schools, the interview schedule addressed student's overall awareness and perceptions of the STP intervention, perceptions of STP's impact on mode change, and student stakeholder impact on peer AST behaviours (Appendix D). Interviews were transcribed verbatim and the raw data were analyzed using a thematic analytic approach, identical to the process detailed in Mammen et al.'s (2015) study involving 34 pan-Canadian STP facilitators. Each respondent was assigned a pseudonym for anonymity and confidentiality. For adult participants, pseudonyms contain their occupation/title followed by the school in which they helped implement STP (e.g., Principal, School Cycle; Public Health Nurse, School Walk). For student participants, pseudonyms contain if they were a committee member (CM) or non-member (NM) and their respective school (e.g., Student 1, CM, School Cycle; e.g., Student 4, NM, School Walk).

6.3.3.3 Photography

This case study used photography as a visual method source. The photographs were either taken by the researcher, facilitator, or students. Being a STP committee member on both committees granted permission and access to all pictures associated with STP implementation. As per ethics approval by the University, all students photographed were approved by both school principals based on a legal parent/guardian signed waver indicating that their child could be photographed during school events, such as STP. All adult stakeholders also gave permission to be photographed.

Pictures were selected for presentation when they assisted in illustrating key points. This method provides a more vivid and lucid way to convey key points by making social actions visible (Sparkes and Smith, 2014; Yin, 2003). In this case, photographs were used to visually record 'real-life' outcomes of STP such as stakeholder involvement and specific AST strategies. By visually documenting, for example, student involvement in STP, readers can gain a better understanding of what 'involvement' can entail. Photographs were coded, categorized, and analyzed for content based on phase or component of STP (e.g., action planning, walkabout), subsequently informing where pictures would be situated within the results.

6.3.4 Quantitative Data Sources

6.3.4.1 Travel Mode Share

School travel mode data were collected through a validated and reliable classroom 'hands-up survey' (de Wit et al., 2012). This entailed homeroom teachers asking students for five consecutive days, at both baseline and follow-up, how they arrived at school that morning and their planned travel mode for the journey home. Travel mode choices were: walking, biking, school bus, car, and public transit. Children raised their hands accordingly while teachers recorded mode frequency on each day. With analysis, AST mode share was calculated at each school for the AM/PM periods during both baseline and follow-up periods by dividing the number of trips of AST (i.e., walking, biking) by total number of trips (i.e., all modes of transport). AST change at 1-year follow-up was calculated by subtracting baseline AST rates from follow-up AST rates for both the morning and afternoon periods.

6.3.4.2 Student Bus Tally

Student bus use counts were collected in School Walk only (note: no students bused at School Cycle). The number of students arriving by school bus was tallied for three consecutive days (i.e., Tuesday, Wednesday, Thursday) a week for 7 months (i.e., February-June, September-October). In total, School Walk had 5 school buses that transported students to/from school. This data source was used to complement the qualitative data sources when referring to the effect of designated walk to school days in reducing bus use during and after the event.

6.3.5 Mixed-Methods Analysis and Presentation

As suggested by most mixed-methods researchers, each data source was initially treated and analyzed separately (Creswell & Clarke, 2011) by specific analytic techniques explained above. In line with the multiphase mixed methods approach, this study used a combination of concurrent (i.e., side-by-side analysis) and sequential (i.e., connected analysis) analytic techniques across the distinct phases of the one year STP implementation period. Side-by-side comparisons were used during the concurrent strands of the case study, leading to the combined presentation of quantitative and qualitative results in a specific STP model phase. For instance, within the strategy implementation phase, side-by side analyses were used when triangulating

attitudes on the effectiveness of designated walk to school days in reducing bus use with the student bus use tally.

In other phases of STP implementation, such as the follow-up mode share data collection, connected mixed method data analyses were conducted since the quantitative follow-up measures were discussed, or connected, in the sequential data collection of the semi-structured interviews. In this case study, the positive changes in AST informed some questions in the interviews such as, 'Do you think the change in AST can be attributed to STP implementation?' As Creswell and Clarke explain (2011), combining data sources helps draw inferences towards an overall objective, in this case, a holistic description and evaluation of the STP model.

The results are presented in three sections: i) Description of the STP model; ii) Factors influencing STP implementation and mode change; iii) Researcher perspectives on STP and study discussion. Using all five data sources, the first section will address the study's first objective by providing a detailed chronological description of the STP process. Describing how the intervention progresses through various STP phases and action items will provide insight into the intricacies of the process, for example, the multiple meetings, strategies, and stakeholders involved. This section is also meant to act as a 'real-life' STP implementation guide for users to help gain understandings around expectancies of implementation during the first year of implementation (e.g., number of meetings, types of strategies, target stakeholders). Using data from the semi-structured interviews, the second section begins to address the study's second objective in identifying key factors (i.e., school contextual and program) affecting implementation and mode change.

Using data primarily from participant observation, the third and final section further addresses objective two by determining factors influencing STP implementation and mode change. Distinct from section two, however, this section compares and contrasts implementation between the two schools which helps highlight the impact of certain factors in implementation, for example, teacher support. By examining similarities and differences across cases, a researcher's stance is provided regarding STP's overall benefits, challenges and potential in increasing AST. Due to the combined roles of the researcher as an author and participant observer, this section naturally acts as a summary of the results and is therefore presented concurrently as the study discussion. Therefore, links will be made here between findings and relevant research literature. A final

conclusion will provide a summary of key study findings, study strengths and limitations, and future research needs. A similar presentation structure combining the study results with discussion has been used in another AST intervention mixed-methods evaluation (Buckley et al., 2013).

6.3.6 Researcher Bias and Study Trustworthiness

As a participatory member on both STP committees, I was involved in STP implementation and had a pivotal role in the data collection process, analysis, and interpretations. Wolcott (1995) claims this as a great advantage for the research, but cautions about the issue of researcher bias. In addressing this, a focus on data neutrality is important as hidden researcher biases can influence data interpretation (Yin, 2003). As such, it was imperative to consider my own biases and views throughout the process in evaluating STP (Speziale and Carpenter, 2007).

Physical activity has been and is currently a strong habit of mine. I value any source of activity, such as AST, that can benefit an individual's physical or mental well-being. The importance I place on this behaviour could have impacted my role on each of the STP committees and the interpretations of study findings. For instance, my involvement with the STP committees could have increased my desire to see the intervention succeed in increasing AST levels and focusing more on the success stories than limitations. Furthermore, partaking in STP research could have produced social desirability biases during the semi-structured interviews, particularly among the adult and student committee members who were aware of my goal in evaluating STP. This could have impacted the types of knowledge or STP experiences shared during the interviews.

To account for these personal and participant biases and to enhance study trustworthiness (i.e., credibility, transferability, conformability and dependability), the following methodological techniques were employed as suggested by qualitative researchers (Lietz et al., 2006; Shenton, 2004; Sparkes & Smith, 2014):

i) The technique of reflexivity was practiced throughout the data collection procedures to consider the challenges and limitation of STP that other participants may overlook. As an emerging independent researcher, I am increasingly aware that critiquing and providing an unbiased lens of the case of interest (e.g., STP) is essential in producing trustworthy evidence to decision-makers and practitioners interested in adoption. In keeping this in mind, I maintained a

critical lens as suggested by my committee members to initially 'prove that STP does not work' and then subsequently build an argumentative case for STP.

ii) Member checking (or respondent validation), which according to Guba and Lincoln (1989) 'is the single most crucial technique for establishing credibility' (p.239). This study employed two forms of member checking. First, participants were given the opportunity to review their audio-recorded transcripts. Second, the adult stakeholders were sent the results section of the manuscript and asked to provide any feedback regarding the authors' interpretations. Four participants responded and all concurred with content accuracy and interpretations.

iii) Maximum variation allowed "for a greater range of application of the findings by consumers of the research" (Merriam, 2002, p. 31). Thus, interviewing a range of participants involved and not involved in STP allowed for greater diversity and a more holistic description and evaluation of STP.

iv) Triangulation is the use of multiple data sources to confirm study findings (Stake, 1995; Yin, 2009). As noted, this study involved five data sources for a comprehensive description and evaluation of STP.

v) Maintaining a dependability and conformability audit trail containing content from field notes, recruitment emails, interview guides, original transcripts, and several iterations of analysis notes, which were the basis for the study findings that follow.

6.4 Results

6.4.1 Section 1: Description of the STP Model

6.4.1.1 Phase 1: Set-up

School Recruitment. In the summer of 2013, GCC was approached by two private donors (i.e., RioCan, Heart & Stroke Foundation of Canada) to deliver STP in two elementary schools located downtown Toronto. The director of GCC Walks chose to recruit one school from each of the two Toronto District School Boards (TDSB) (i.e., Public, Catholic) with assistance from school boards trustees, superintendents and the transportation manager:

> *The optics of having one of each [school boards] is good because they both have different issues. The Catholic board in Toronto has fewer schools, therefore the catchment area is quite large. They have a lot more bussing… but the downtown private board schools are also located in lower SES neighborhoods.…I wanted to break down some barriers and show that you can do this in both boards.* (Director, GCC)

Schools were recruited based on their willingness to participate in STP. The first school (i.e., School Cycle), a TDSB school, was initially targeted based a number of students cycling and the high traffic volume around the school setting in the morning and afternoon periods. The GCC Walks director met with this school principal to discuss the goals of STP and what would transpire over a one-year implementation period.

> *Her response was absolutely positive. She said, 'parents have a lot of kids that cycle at this school… we've got a lot of kids coming on transit, we got some safety issues. And this is definitely something that would interest this community. So she was very keen.* (Director, GCC)

> *They said it'll be about how we can do a better and safer job of getting kids to and from school. I think most people are committed to making our society a bit better that way, and I've always been concerned with the fact that people are driving when they're three blocks away and that doesn't make sense to me …so I definitely had interest in it.* (Principal, School Cycle)

The second school (i.e., School Walk), a TCDSB school, was recommended by the board's transportation manager based on previous requests from the school principal to eliminate bussing services for students who live "a *7-minute walk away*" (Facilitator) from school. In providing context, a segment of School Walk was damaged by a fire in 2006. All students were consequently bussed to a different school during renovations:

> *For some strange reason there was a promise made to parents that when they returned to the new school for this site, there would be bussing for all kids. And children who were walking a few blocks were sitting on buses after school. I had to walk a kid home one day after school and we were there 15 minutes before the bus….when I seen the buses pulling in I thought 'ok this is a little crazy'… so the interest was always there.* (Principal, School Walk)

> *She [principal] was ecstatic. She was trying to do this [eliminate bussing] herself for years and she basically said, 'sign me up, where do I sign?'* (Director, GCC Walks)

It is important to note that the Principal of School Walk developed a policy regarding bus use for those students who she deemed should walk to/from school. Since the students returned to the original school following renovations, the principal systematically eliminated bussing services

for each grade one year at a time. In the case study year (2013-2014), no students from grades 5-8 used the bus although they were eligible to under the TCDSB. Due to the principal's motivation in further reducing bussing, in conjunction with STP implementation, she revised the school policy to further eliminate grade 4 students from bussing for the following academic year (2014-2015). Hence, her motivation for approving STP was to use it as a platform to help support the policy, ease the transition for those students shifting from passive (bus use) to active travel, and overall, create a school-wide culture around AST.

Stakeholder Recruitment. A unique feature of STP is the school-level STP committee composed of a lead facilitator and school and community-level stakeholders. First, a facilitator was contracted and trained by GCC to lead STP implementation at both schools during the 2013-2014 school year. School stakeholders were recruited by the respective school principals based on potential interest in assisting with STP. In School Cycle, one teacher and parent were recruited, along with five students from the school's co-curricular *Eco-Club*. In School Walk, two teachers, one parent, and five students from their school's co-curricular *HAT* were recruited. According to both principals, no individuals rejected the invite to contribute to STP implementation.

The director of GCC Walks also led the stakeholder recruitment for both schools. According to the director, community-level stakeholder recruitment was a smooth process due to pre-existing partnerships. All invited stakeholders agreed to participate in STP. From the stakeholders' perspective, the interviews revealed that all approved the concept of STP when initially recruited as it appeared to be a promising tactic given the focus on improving children's health through multi-coordinated actions. Two of the stakeholders admitted that their involvement in STP was further motivated by the potential professional gain:

> *I was also excited because I don't always get the opportunity to work so closely with a school and so many other community partners. It was a real great opportunity for me. I got to make great connections with city partners, planners…so that was really great on a professional level.* (Public Health Nurse, School Walk)

> *The advantage of STP is that it helps me do the bussing right. So, if I have no cars around the school, I can get my buses here and there much more efficiently from point A to B. If I can't get them from A to B fast enough, I have to add another bus so there is another $40,000 I don't have that I need to put into the system for no other reason than traffic*. (Transportation Manager, School Cycle & Walk)

Though STP appeared promising, a few of the school-level stakeholders acknowledged a shared concern prior to implementation:

> *The sustainability is the hardest thing to deal with in any project in the school. I think that everyone is always leery when a new program is introduced because it like 'well that sounds good but how is it going to work.' So I was cautiously optimistic when it started."* (Teacher 1, School Walk)

Table 6.1 outlines the range of stakeholders involved during the 1-year process.

Table 6.1-Multidisciplinary Stakeholder Involvement

School Cycle			School Walk		
Meeting-Date	# stakeholders	Representation (excluding facilitator)	Meeting-Date	# stakeholders	Representation (excluding facilitator)
1-Dec 19, 2013	12	Principal, parent, PHN, HSF, member of Councilor Ward's office, TMG, TDSB, HVRA, Parent, 2 Police, UofT	1-Dec 7, 2013	9	Principal, 2 teachers, PHN, TMG, MX, CA, TCDSB, CTTO, member of Councilor Ward's office
2-Jan 29, 2014	7	Principal, teacher, parent, HSF, PHN, 1 Police- UofT	2-Jan 22, 2014	10	Principal, 2 teachers, parent, PHN,2 police, 2 TCDSB, UofT
3-Apr 2, 2014	13	Principal, teacher, 3 students, parent, HSF PHN, 2 CYC, TSTG, CL, UofT	3-Mar 6, 2014	10	Principal, 2 teachers, 4 students, 2 police, UofT
4-June 17, 2014	7	Principal, 3 students, 2 PHN, UofT	4-April 16, 2014	8	2 teachers, 2 students, 2 CL, TCDSB, UofT
5-Sept 10, 2014	11	Principal, vice principal, 2 students, parent, PHN, 2 TDSB, 2 police, UofT	5-June 5, 2014	8	Principal, 2 teachers, 2 PHN, 2 TCDSB, UofT
			6-Sept 23, 2014	5	Principal, 2 Teachers, UofT

*PHN-Public Health Nurse *HSF- Heart & Stroke Foundation of Canada *TMG- Transportation Manager Group of Toronto District School Boards *TDSB- Toronto District School Board *HVRA- Harbord Village Resident Association*UofT- University of Toronto *CYC- Cabbagetown Youth Centre *CL- CultureLink *MX-Metrolinx *CA- constituency assistance-TCDSB- Toronto Catholic District School Board *CTTO-City of Toronto Traffic Operations

6.4.1.2 Phase 2: Baseline Data Collection

The second phase of the STP model involves collecting baseline measures of travel mode share along with school, child and family demographics. In Canada, three data sources are typically collected. The *school profile form* is a principal-reported survey of school-level characteristics. The *hands-up* survey is a student-reported survey of each student's travel mode to/from school over 5 consecutive days. Similarly, the third data source, the *family survey*, is a parent-reported survey of their eldest child's typical travel modes in addition to child and family characteristics, and parents' attitudes regarding AST. Additionally, an environmental audit of AST barriers is conducted at the first committee meeting, which will be described below. Due to the low response rates of the family surveys at both schools, the travel modes presented will focus on the hands-up survey data (de Wit et al., 2012).

Table 6.2 outlines school characteristics reported on the school profile. School Cycle is a TDSB school located west of the financial district. For the 2013-2014 academic year, the school had 440 enrolled students, ranging from junior-kindergarten to grade eight who are primarily from medium-high SES households and of Caucasian descent as reported by the principal. School Walk is a TCDSB school also located in the downtown area, but east of financial district. In the same academic year, the school had 625 enrolled students, primarily from lower SES households. According to the school principal, the majority of the students are from the Philippines.

Table 6.2- School Level Characteristics

	School Cycle	School Walk
School District	Toronto District School Board (TDSB)	Toronto Catholic District School Board (TCDSB)
Year Opened	1901	1910
Number of Students (2014-2015)	440	625
Grades	JK-8	JK-8
Description of Location	West Downtown Toronto	East Downtown Toronto
Socio-Economic Status of families	Med-high	Low
Primary Ethnicity	Canadian-Caucasian	Philippine

Table 6.3 shows the travel mode share for both schools at baseline. In School Cycle, among the 21 classes and 1,857 recorded trips to school, 35% of students walked in the morning, 24% arrived by car, 24% used Toronto public transit, and 3% cycled to school. In the afternoon period, based on 1,832 trips to school, slightly more students walked home from school (39%) and fewer students were driven by car (17%). Rates of public transit (25%) and cycling (3%) were similar on the journey home.

Table 6.3- Baseline Mode Share in the Morning (AM) and Afternoon (PM)

	SCHOOL A		SCHOOL B	
Travel Mode	**AM**	**PM**	**AM**	**PM**
Walking	35	39	59	60
Walked-part way	12	13	2	2
Cycling	3	3	0	0
School bus	0	0	28	30
Transit	24	25	3	3
Carpool	1	1	0	0
Car	24	18	8	4
Other	1	1	0	1

In School Walk, among the 22 classes and 2,213 recorded trips to school, 59% of students walked, 28% arrived by bus, 8% arrived by car, and 3% used Toronto public transit. In the afternoon period, based on 2,155 trips to school, similar rates appeared with 60% of students walking, 30% using the bus, 4% being driven, and 3% using public transit.

The baseline assessments just described are an important first step in informing the next phase of STP: action plan development and implementation. This process begins at the first STP committee meeting where baseline results are presented by the facilitator and discussed among the committee members prior to conducting the school-level walkabout.

6.4.1.3 Phase 3: Action Plan Development & Implementation

Initial STP Committee Meeting. The initial STP committee meeting is arguably the most productive aspect of the STP process because: i) the STP committee members meet; ii) baseline assessments are discussed; iii) a committee walkabout occurs around the school setting; and iv) the action planning and implementation begins.

In both schools, 12 (School Cycle) and 9 stakeholders (School Walk) were in attendance for the first STP committee meeting (Table 6.1). The committee members introduced themselves to explain their relation to STP and their potential contributions. As an observer, it was a unique experience to see stakeholders from diverse professional backgrounds collaborating and how AST was of shared interest. For instance, the presence of police officers in particular generated a heightened sense of importance around children's safety (Figure 6.1). All stakeholders also recognized the importance of this step in the STP model as it '*galvanizes a group*' (Principal, school Cycle), and '*gave us a sense of where we needed to go*' (Teacher 2, School Walk):

> *That first meeting people would say 'oh I can do this' or 'this is the piece I can own' and so in that way you get to know who can offer what. It's like laying your cards out on the table.* (Facilitator)

The facilitator shared results from the baseline surveys following introductions. In School Cycle, the principal explained that the 'lower' levels of walking (~37%) were reflected in the school's status as a 'gifted school,' which has no catchment area restriction for enrollment or bussing services. This results in students travelling from all areas of Toronto and as the principal stated in the meeting, it would be "the biggest challenge" in increasing school-wide AST. The principal subsequently claimed many of the students to own bicycles and thus, cycling, could be the focus of the school's travel plan. The committee mutually agreed that focusing on public transit use could also be a STP emphasis.

School Walk's STP committee's discussion regarding baseline assessments and proposed strategies had a varied scope. Though walking levels were fairly high at baseline (~60%), the principal was motivated to further increase this percentage given that many students who lived less than one kilometer from school were being bussed. The committee agreed that targeting and changing travel behaviours of these students would be the focus of the travel plan. During this conversation, I had raised the idea of a walking school bus in potentially facilitating greater AST among those living near the school. However, the principal did not believe this strategy would be effective based on a previous failed attempt to implement a WSB due to lack of parent engagement in helping sustain it.

After discussing the baseline results, the STP committees conducted a school-walkabout. A school walkabout is an environmental audit of AST barriers around the school setting. The Manager of the Student Transportation Group provided maps for both committees, depicting the

catchment areas and the residential neighborhoods where the majority of students were travelling from (Figure 6.2). At both schools, the committees split into two groups and were responsible for auditing predetermined routes, as suggested by each school principal. Based on my observations, the principals appeared to be the most important stakeholder on the walkabout. Both principals were the most vocal, likely since they have the best knowledge of students' arrival routes, 'hot spots' of traffic volume and speed, and real/perceived areas of danger reported by parents and students. For example, the principal of School Walk led the committee to the nearest major intersection to show the high level of traffic that the majority of students encountered daily on route to school. At this same intersection, a police officer noted that too many cars were 'turning right on a red' light when students and other pedestrians were given the right of way.

In School Cycle, the major perceived environmental barriers to AST related to traffic volume and congestion near school premises, and inadequate bicycle-racks (Figure 6.3) In School Walk, the key barrier identified was the high car and cyclist volume and speed by the nearest major intersection (Figure 6.4). Both schools were located in areas of high dwelling density and street connectivity, public transit stops, and bike lane presence. It was interesting to observe that though both schools' surrounding environments contained these aspects of the built environment known to facilitate walking, the issues that were limiting AST dealt with traffic safety concerns.

Figure 6.1- Multiple Police Officers Join the School Walkabout at School Cycle

Figure 6.1- Committee Members Look Over Typical AST Routes at School Walk

Figure 6.3- School Cycle Barrier- Inadequate Bicycle Rack

Figure 6.4- School Walk Barrier- High Traffic Volume at the Nearest Major Intersection

The interviewed stakeholders highly valued the school-walkabout. The walkabout was described as "*incredibly effective*," (Funding Representative, School Cycle), a "*big intervention*" (Teacher 2, School Walk) and an "*eye opening experience"* (Public Health Nurse, School Walk). Specifically, having various perspectives on the walkabout helped clarify which agency or organization to contact for a particular issue:

> *To be honest, out of anything we did, the walkabout was the most critical piece. You actually see the dangers or the issues in the neighborhood. You can look at a map all you want but it doesn't show you or tell you what the issues are.* (Transportation Manager, School Cycle & Walk)

> *We had different people from different sectors which was awesome. Like a crack on the sidewalk, someone said that's not accessible and it creates a barrier but then they also had the connection of WHO can help with that. Like 'WHO owns this sidewalk?.' Does it belong to this building, or does this belong to the city… things that I don't know. So I found that really great.* (Public Health Nurse, School Walk)

Following the walkabout, the committee members reconvened to brainstorm potential solutions to the barriers encountered on the walkabout and broader strategies to increase levels of AST. The proposed solutions and strategy implementation would be the focus of the subsequent STP committee meetings where the ideas would be discussed, refined, and solidified:

> *I was very optimistic after that first meeting and walkabout. I had a sense that this is something that we're going to have support with rather than take it on ourselves. I thought it was a great way to start.* (Teacher 1, School Walk)

Remaining STP committee meetings. In total, School Cycle and School Walk hosted 5 and 6 meetings, respectively. The STP committee meetings were an integral aspect of the action-planning phase. Located in each respective school during a weekday, all meetings were for one hour to discuss and plan AST strategies scheduled approximately 6 weeks apart. As School Cycle's principal claimed '*having meetings once a month would be too much but once in 2 months would be too little*,' thus, the 6 week gap between meetings appeared to be feasible. The primary STP objective of both schools was to broadly raise awareness of AST by, educating, encouraging, and promoting AST practices among its students. This objective, however, would be addressed differently in each of the schools. School Cycle focused their efforts on both cycling and walking, though greater emphasis was placed on cycling, whereas School Walk focused solely on walking. The multiple meetings, hence, acted as a forum to plan the delivery of the different AST strategies among the STP committee members.

The meetings in School Cycle concentrated on planning the following strategies to educate and encourage AST behaviours including 2 designated AST days, 1 Bike Rodeo, and student involvement in STP by participating in meetings, conducting student announcements and creating posters on AST's health and environmental benefits. Similarly, the committee meetings in School Walk concentrated on similar combinations of educational and encouragement strategies with student involvement but to a greater degree of implementation. As discussed, the principal's eagerness to support the school's bus use policy through STP led to 8 designated walk to school days (WTSD) and a student-led walkabout. The implementation of each school's strategies will be described and detailed in the following sub-sections.

Overall, stakeholders were pleased with the structure and outcomes of the STP committee meetings as "*the agenda was always well-laid out*" (Public Health Nurse, School Walk), providing "*constant checkpoints*" (Teacher 2, School Walk) for action items. A key reason for this, however, was due to the designated role of the STP facilitator.

> *The facilitator did a real good job of saying 'ok this is what I'm seeing, and this is what I'm hearing'… kind of summarizing and then taking down action items. When you have a big group and you have all these ideas, how do you put all these ideas down to action? Even with the follow-up emails, there were action items in between those meetings that had to happen so it was good to see that we were still moving forward with everything.* (Public Health Nurse, School Walk)

Though all stakeholders thought the meetings were productive and "*never wasting a minute*" (Parent, School Cycle), there were mixed-feelings regarding the time demands, with one community-level stakeholder stating: "*It's good but its time, a lot of time invested in it, and mind you, it might be good time invested*" (Transportation Manager, School Cycle & Walk). In agreement, a school-level stakeholder at School Walk noted that the meetings added to an already hectic school-agenda.

> *I would say moderate [time-demand], but it certainly goes in waves. Was it an inconvenience? Potentially, yes, because it's just one more thing to add into an already busy day. But did I mind it? No. Because it's something I support.* (Teacher 2, School Walk)

Interestingly, the attendance among community stakeholders, relative to school stakeholders, declined as the number of meetings progressed. This observation was a concern from a sustainability perspective and was addressed during the stakeholder interviews. However, the facilitator along with both school and community-level stakeholders explained that this was not a major issue for two reasons. First, as two stakeholders explained, "*as long as those stakeholders are still available for support*," (Heart & Stroke Funder, School Cycle) it was not a concern. Secondly, "*having them not sit around the table was not a bad thing*" because as the principal in School A stated: "*it [strategy implementation] will come down to what we [school staff] want to do anyway*" (Principal, School Cycle).

> *I see this all the time that the numbers start really big, but I don't think it really dwindles because I'm still connecting with them behind the scenes. Because I'll be having conversations with the Councilor's office by email, or talking to the police by phone. And the police are more likely to come out to an event or a meeting where we're talking about safety. So when you plan the meetings, it's like letting people know what it's about so they self-select when they think it's important for them to be there.* (Facilitator)

> *I didn't go to all the meetings but I was involved with the minutes and got the information to provide input back. Because the school [staff] is driving a lot of it, like the Walk to School Days, we don't need to always be there talking about and planning the same thing.* (Transportation Manager, School Cycle & Walk)

Student-involvement in STP. Both STP committees decided to involve student stakeholders (i.e., student committee members) in the action planning and implementation phases (Figure 6.5). Both committees had five student representatives involved in STP from their respective co-curricular health groups. The purpose of this was to gain a varied perspective regarding AST, to foster student leadership, and for them to lead the educational and encouragement activities.

Figure 6.5- School Walk's STP Committee Members in Attendance at a Meeting

Students reported feeling "*proud* and *excited*," (Student 1, School Walk, CM), to be involved in STP since "*it was a new experience*" (Student 2, School Walk, CM) and they were "*actually contributing*" (Student 3, School Cycle, CM) towards building an AST culture. Both students involved and uninvolved in the STP process agreed that student engagement can provide a unique lens for the STP committees and help "*encourage and inspire*" (Student 4, School Walk, NM) their peers to practice AST more regularly.

> *I think its good because they're also students in the school so they'll know what we like more. Like the adults, they would just 'think' what we like… they don't really know what we like.* (Student 5, School Walk, NM)

> *Well it's a new generation of people and each generation has new things. Adults will generally think, 'oh this would have worked 30 years ago' when they were kids, whereas with kids now, it may not work.* (Student 6, School Cycle, NM)

The adult stakeholders on both committees had similar views regarding student involvement. Notably, involving students was "*a great leadership opportunity*" (Facilitator), "*a turning point*" (Teacher 1, School Walk) in the STP intervention and "*really important for STP to hook into the life of the school*" (Parent, School Cycle). Not only was it deemed influential for their peers, but for their parents as well.

> *I think it's extremely important [to involve students], because ultimately they're the group of people we're trying to affect…this is where the culture shift happens…often kids come home and say 'mom I want to walk'. That's going to help shift the parents mind about it.* (Facilitator)

> *I think it's crucial, because if you can get the students excited about it, it can generate from within. Without them, it'd be a much bigger job for us [teachers] to do. Even if*

> *someone is away, it falls on us to pick up the slack… so the more students involved the better.* (Teacher 2, School Walk)

Aside from the attended meetings and assisting with AST strategy implementation, School Walk's STP committee employed one additional strategy to involve students in the action-planning phase: a student-led walkabout (Figure 6.6). Similar to the committee walkabouts described earlier, four student stakeholders led five committee members on their daily journey to/from school, representing the majority of the student population who travel from the same lower SES neighborhood. These students were also given two cameras by the school principal to capture AST barriers they encountered en route to/from school. The students described the walkabout as a "*fun experience*" (Student 2, School Walk, CM) because they "*know the neighborhood*" (Student 7, School Walk, CM) and were able to "*join the adults*" (Student, School Walk, CM) in identifying barriers limiting AST.

> *It was a fun experience, because you could see it through a kid's eye… we told them [adult stakeholders] we walk or wouldn't walk that route because there would be maybe 'something' there, or 'someone' there. So you could tell adults about it.* (Student 2, School Walk, CM)

> *They got to see how we walked to and from school. It's a good thing because we showed the bad things we don't like passing through when walking to school, and maybe like we can inform the government so the government can fix it and make it a cleaner place when walking.* (Student 1, School Walk, CM)

Figure 6.6- Four Students from the HAT Lead the Student-Walkabout

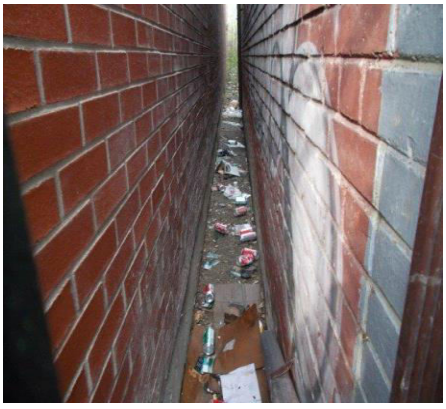


Figure 6.7- Student captures the unappealing aesthetics experienced en route to school

The adult-stakeholders were impressed by students' insight in determining areas deemed safe and unsafe by them and their peers. The experience also emphasized the value of having students as important stakeholders since adults and children have varied perspectives.

> *They told us things that we wouldn't have known otherwise. Like when we did our first walkabout we went and said 'oh here's how probably the kids walk' and then we talked with them during the student walkabout and they said 'we would never walk there, people sit there and yell things at us that's scary, we would never walk that way we walk this way'. It was important to hear that.* (Facilitator)

> *It opened my eyes to what their reality is and from their lens. To see what they see and what they experience and what they feel. For them to point things out…like I would never think about what was hiding under the playground. And the picture, the graffiti on the building (Figure 6.7), turned out to be a beautiful picture you know, it spoke to a lot of things, but I walk by there everyday and I never had seen that.* (Teacher 2, School Walk)

Thus far, Phase 3 of the STP model has described the action planning phase which was accomplished through multiple meetings, school walkabouts, and stakeholder involvement. Though these can be viewed as strategic components within the STP model, the following sections will describe the implementation of the specific strategies planned and executed by each committee. The strategies will be framed around GCC's 4E strategies in Education, Encouragement, Engineering and Enforcement (www.saferoutestoschool.com).

Education strategies. As a first step, committee members at both schools agreed to deliver educational strategies that would spread awareness of AST benefits within the schools. Student stakeholders delivered intercom *announcements* on numerous occasions regarding the benefits of AST. A stakeholder explained that having announcements pertaining to healthy behaviours, such as AST, is "*good for school morale*." (Teacher 1, School Walk) Students on the receiving end of the announcements also thought it was beneficial by "*making more people aware*" (Student 8, School Cycle, CM) of AST and "*encouraging kids to walk*" (Student 9, School Cycle, NM):

> *They [student stakeholders] told us if you walk to school you become less stressed and personally, my opinion with tests and all that, I become stressed with my tests…so then I thought that maybe if I start walking to school more I'll be less stressed for my tests*. (Student 9, School Cycle, NM)

Both schools also displayed posters "*that reflected more information and facts*" (Teacher 1, School Walk) about AST. Drawn by students in the Eco-Club, School Cycle placed one large poster in the school lobby. Similarly, School Walk posted a poster in the foyer (Figure 6.7) and had multiple posters displayed in the hallways, stemming from a student poster contest in which students were incentivized to produce a poster promoting AST. All posters were taped to the school walls and the winner of the contest received a $25 Wal-Mart gift certificate.

One participant expressed the passion involved*: "I had so much emotion with it, so I drew a lot on the poster"* (Student 10, School Walk, NM). These posters were seen as a way to "*promote the issues around walking*" (Teacher 2, School Walk), and "*encourage someone in their own way by drawing a picture.*" (Student 2, School Walk, CM)

Figure 6.8- AST Poster Displayed in School Walk's Foyer

Encouragement strategy (Bike Rodeo). In School Cycle, the major planned event was the Bike Rodeo. The purpose was to encourage the practice and provide bike safety education for students. Five sessions ran throughout the school-day event. In each 45-minute session, the students who brought bikes practiced cycling safety skills outside on the school running track (Figure 6.9). The facilitator and a parent volunteer led these sessions, both of whom had bike safety training certificates. Students rotated through a variety of stations including helmet (e.g., correct fit), road and traffic safety (e.g., head checks, hand-signals).

Meanwhile, in the school gymnasium, the students who had not brought their bikes were given an informal class, "*learning about bike safety*" (Student 6, School Cycle, CM). The school's public health nurse taught students about helmet safety while employees from a local bike shop taught them about bike maintenance (Figure 6.10) and the process of registering their bikes with

Toronto police. A partnership developed with a neighboring high school that has a *Bicycle Repair Class* meant that all bikes brought to school that day (*n*=75) were tuned up by the high school students and their course instructor.

Figure 6.9: Two Students Practicing Bike Safety

Figure 6.10: Students Learning About Bike Maintenance

Adult and student stakeholders viewed the Bike Rodeo as being effective since it developed cycling skills, and increased the awareness and habit of biking to/from school:

> *A girl who didn't know how to ride her bike, learned how to ride her bike that day…it took 10 minutes that day, it was amazing. So I was like, wow, this day is worth it, one more kid has learned how to ride her bike.* (Facilitator)

> *I think people really enjoyed it… it was really fun, and I saw a few kids that didn't bike before, started biking afterwards.* (Student 3, School Cycle, CM)

Encouragement Strategy (AST Assembly). In School Walk, the committee decided to launch a 'kick-off' assembly devoted to AST. The assembly aimed to build awareness around the benefits of AST and to increase the excitement and energy regarding the practice. Notably, a video was shown of students from England describing their joyful experiences when walking to school with

friends. This was followed by mini-presentations from three stakeholders (i.e., police officer, facilitator, public health nurse) pertaining to walking safety and the overall benefits of AST (Figure 6.11). Lastly, members of the HAT led a student-wide chant shouting "WALK TO SCHOOL! WALK TO SCHOOL! WALK TO SCHOOL!" (Figure 6.12)

Figure 6.11: A police officer discussing walking safety at School B's AST assembly

Figure 6.12: The HAT getting ready to lead the students on a walking chant

All committee and non-committee members perceived the assembly to be beneficial. From a student's perspective, "*it helped increase motivation*" (Student 10, School Walk, NM) to walk and from an adult perspective, student leaders "*seen themselves as ambassadors*" (Teacher 1, School Walk) for encouraging AST among their peers:

> *It was exciting to see that many kids get excited about it. Because it's a social norm with that assembly…this whole program is about culture shift. And so the social norm at the assembly said it was cool to walk so that was important and that's why you have an assembly.* (Facilitator)

> *Just talking about it [AST] at the assembly, it really spoke to the children because my kid came home and told me facts about walking. Even though I wasn't there, I knew it was effective because kids were talking about it.* (Parent, School Walk)

This assembly would act as the 'kick off' to the several upcoming designated walking to school days in School Walk.

Encouragement strategy- Designated Walk to School Days (WTSD). Both schools planned designated WTSDs throughout the school year, though they were a higher priority in School Walk. School Cycle had two designated AST days (February, October) whereas School Walk organized three AST days (February, March, April) and an AST week (5 days in June). The

students and parents were reminded via student announcements and school newsletters and encouraged to walk to school on these particular days. Students were given token incentives for walking on these designated days (e.g., hot chocolate, hats, stickers). For most of the WTSD at both schools, multiple stakeholders were present to "*applaud and cheer*" (Funding Representative, School Cycle) and give participating students the prizes.

Figure 6.13: Stakeholders Greet Students and Parents on the First WTSD

In terms of it's perceived effectiveness, all committee and non-committee members viewed them positively as it "*was a happy positive experience within the school that celebrated AST*" (Parent, School Cycle), "*got kids excited*" (Parent, School Walk), and "*brought attention to how simple and easy walking and biking is*" (Principal, School Cycle). Students particularly thought it was effective to provide incentives to participate since "*kids will do anything for prizes*" (Student 11, School Cycle, CM).

> *The energy of the walk to school days were really great. We had lots of the police department there and a number of school staff outside greeting the kids, talking to the parents. We had horns and noise makers, and the cheers, and we always gave away stickers, reflectors, badges… the kids loved to get anything. And it's neat to still see that on coats and things like that so I think the idea can perpetuate itself by that kind of stuff.* (Teacher 2, School Walk)

> *I was walking to school [on WTSD), and I seen many friends walking together, and I thought it was really nice because most people just hang at school and don't talk at first. So it got us to know each other by walking, and it showed us what it can do by helping nature and helping the world for less pollution from cars and buses, and just be together as one community.* (Student 4, School Walk, NM)

The committee and non-committee members also believed the AST rates to be higher during the WTSDs. One student stated: "*I think it was really effective, cause when I was coming to school, I saw people walk more, rather than usually taking the bus"* (Student 12, School Walk, NM). A teacher stakeholder in School Walk supported this by saying "*the biggest visual sign [of AST increases] was the empty busses that went by"* on the WTSDs. However, there was some skepticism from both adults and students about the sustainability of these AST increases and "*if that was maintained*" (Funding Representative, School Cycle) following the WTSD's.

> *The short-term effectiveness I think was great because everyone was walking to school. But after that, everyone is like 'oh lets just go back to our normal routine' so I don't think it was really effective in the long-run.* (Student 8, School Cycle, CM)

> *No I don't think it's effective [in getting more kids walk to school], because a lot of kids would walk to school , but then the next day they would take the bus. I think they should try to make a prize or something, and whoever walks the most gets a prize. Everyone wants a prize so I think they'll start walking to school*. (Student 5, School Cycle, NM)

Quantitative data for one WTSD event at each school supports the sustainability concern. In School Cycle, the hands-up survey was conducted two days prior to, during, and two days following the designated WTSD. Before the WTSD, 40% of students reported walking to school. This increased to 55% on the WTSD. However, rates of AST receded to 42% following the event (Figure 6.14). A similar pattern was shown in the afternoon period. This fluctuation was also shown using another data source in School Walk. Student bus tallying showed that, on average, 159 students arrived by bus for the three days prior to a scheduled WTSD. This decreased to 93 students on WTSD, but increased back to 161 students for the following three days. In the afternoon period, however, rates of AST did not change (Figure 6.15).

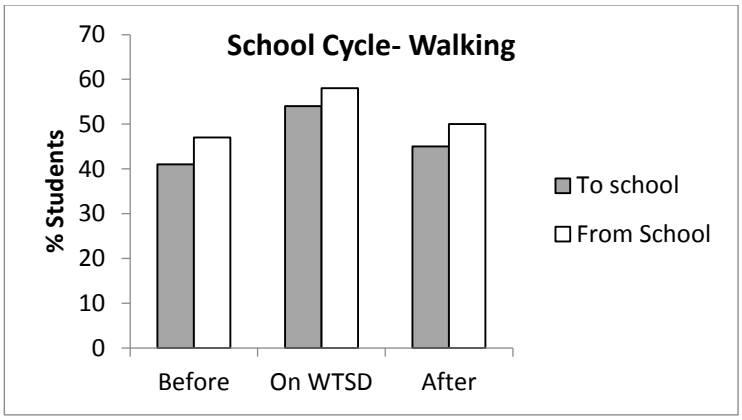


Figure 6.14: Rates of AST Before, During, and After a WTSD

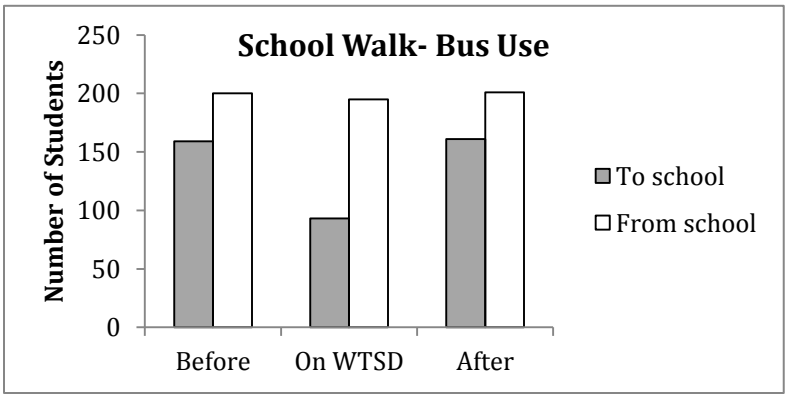


Figure 6.15: Tally of Bus Use Before, During, and After a WTSD

There was a consensus among stakeholders and non-stakeholders that designating more frequent WTSDs could help sustain increases as "*it would get more people in the habit of doing it [walking] more*" (Student 8, School Cycle, CM). In agreement, after observing multiple WTSDs, it appears feasible, and practical to designate multiple days (e.g., 1 per week or month,) throughout the school year as WTSDs. Repeated exposure to these days might encourage more sustained behavior change in conjunction with other educational, engineering and enforcement tactics.

Engineering and Enforcement Strategies. Identified during the school walkabouts, each school requested one infrastructure change. In School Cycle, it was decided to request TDSB funding for a bicycle rack to encourage more students to bike. However, at the time of one-year follow up measures (Fall 2014) the bicycle rack was yet to be installed. In School Walk, one request was sent to the City of Toronto to implement a 'no right turn on red' sign at the nearest and busiest intersection by the school. This sign was installed in spring 2014, approximately six months following baseline measures (Figure 6.16). As discussed, School B's committee aimed to educate and encourage AST to help support an existing school-level *enforcement* strategy around decreasing bus use.

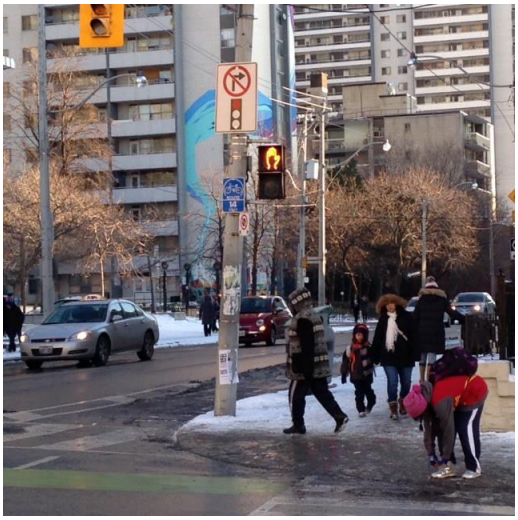


Figure 6.16: Photograph captures the implemented 'No right turn on red signal' as

6.4.1.4 Phase 4: Follow-up Data Collection

The hands-up survey was administered in Fall 2014 to determine changes in mode share approximately one year following baseline assessments. The students in both schools assisted with data collection. Figures 6.17 and 6.18 show the respective changes in travel modes at one-year follow-up. In School Cycle, among the 17 classes and 1,583 recorded trips to school at

follow-up, rates of walking slightly declined (1%) but there was a 3-4% increase in biking and a 1-2% increase in carpooling to/from school. In School Walk, based on the 25 classes surveyed and 2,176 recorded trips to school, there was a notable 12-15% increase in walking and 8-10% decrease in bus use at one year follow-up.

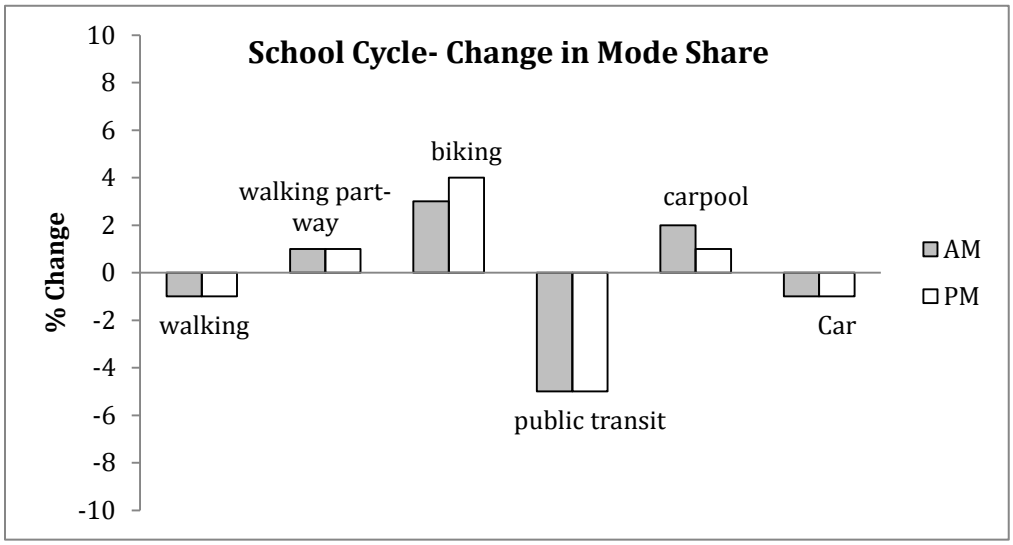


Figure 6.17: Change in Travel Modes after one year of STP in School Cycle

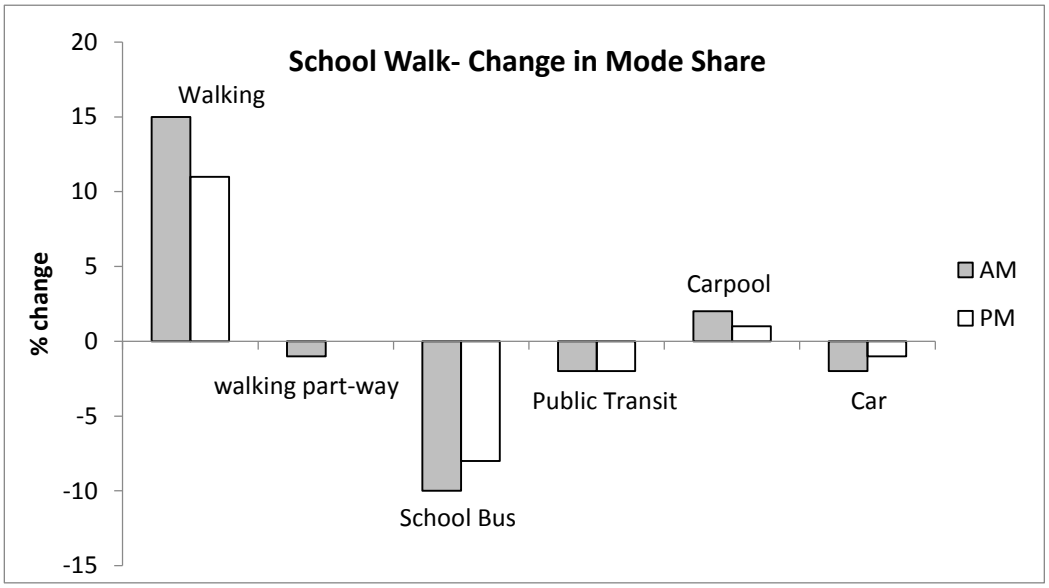


Figure 6.18: Change in Travel Modes after one year of STP in School Walk

Section I of the results has addressed objective 1 of the case study in providing a holistic, real-life description of the STP process in two schools with unique challenges and solutions. This section has used a variety of data sources to explain what STP implementation may entail over a one-year implementation period. From the accounts of STP committee members and non-members from each school, the following section of the results will begin to address objective 2 in identifying factors perceived to have influenced implementation and AST change at one-year follow-up.

6.4.2 Section II: Factors influencing implementation and travel mode change

According to committee and non-committee members at both schools, the increases in biking (School Cycle) and walking (School Walk), and decreases in bus use (School Walk), can be attributed to the STP intervention. As a teacher stakeholder stated: "*it's definitely a result of the work we have done*" (Teacher 2, School Walk). Adult stakeholders cited various STP factors that helped shift mode change towards more active means. The STP model was considered an influential factor, which enabled a "*natural progression*" (Funding Representative, School Cycle) through the "*concrete steps*" of the model (Parent, School Cycle). However, having a facilitator to lead the committee through the series of steps was identified as critical:

> *I'll be quite frank with you, if anyone asks me what makes STP successful, I say the facilitator. Without the facilitator, its volunteer led, and we know that it usually falters and fizzles out. The facilitator is the key to success.* (Funding Representative, School Cycle)

Many of the stakeholders also cited the "*holistic*," (Teacher 1, School Walk) "*multi-layered, multidisciplinary and comprehensive*" (Facilitator) approach of STP as a key factor that facilitated AST change in both schools. Notably, having the "*360 degree stakeholder model*" (Parent, School Cycle) that included "*giving voice to children*" (Parent, School Walk) was acknowledged as a contributing factor. According to students, student leadership within STP encouraged AST not only to their peers, but to the parents as well:

> *They [HAT] did help increase [AST], because I see more people walk now. Before, some of the grades 5, 6, and 7s take the bus. Now, I see them walking every day and when I see them at that corner with the lights, its packed with kids walking. And it makes me happy*

> *to see because it's been a big increase. It makes the parents notice 'what happens to our children when they do this,' and when they see we are having fun, doing something creative, and doing something good for our health. Can you keep this [STP] going? Because I would like to see one more person each day walking.* (Student 10, School Cycle, NM)

> *…I have a younger bro, and every time I go home from school, he always tells my mom 'oh can we walk to school?' Cause he usually takes the bus, but then he goes home and asks to walk to school because tomorrow is walk to school day… and I also have a little cousin at the school , she also asks her mom the same thing. So I think it helps because by the end of the year he [brother] was almost walking everyday*. (Student 9, School Walk, NM)

Furthermore, the intervention appeared to increase the "*culture of walking*" (Principal, School Walk) by "*making more people attentive about it" (*Student 3, School Cycle, CM)**,** "*persuading students to walk*" (Student 13, School Cycle, NM) and simply "*making people feel more comfortable in their decision doing that [walking]*" (Transportation Manager, School Cycle & Walk). The following three quotations illustrate the collective efforts of STP in increasing AST at both schools.

> *Well the increase [3-4% biking, School A] starts off with the bike rodeo because it made the students realize 'oh that distance wasn't so bad' or 'that was pretty safe' and the parents were ok with it. Anecdotally, I think there are more bikes this year as well… we're still waiting on those [bike] racks to come, but I feel like there are more kids riding together. Even in their minds it makes a difference… so they maybe think 'hey when I have kids I'm going to make sure that they are able to walk to school'… then that's a good thing right? Or even as they get older they may decide to live close to work so they can walk… its about attitude and education.* (Principal, School Cycle)

> *I think all the work that went into it, with all the partners, the assemblies, the announcements… it was all the things together that shifted behaviour [15% increases in walking, School B]. Like if we hadn't been there nothing would have moved the parents to think 'ok we're not going to take that bus instead we'll walk'. But what this process did was make that transition [from bus use to walking] smoother because there was no push back from parents.* (Public Health Nurse, School Walk)

> *Yea there was an increase [in AST] because the kids and teachers got inspired because of all the hard work that we have done to make kids walk to school everyday. Through the posters, and making videos, and showing photos, and doing an assembly. I think the kids were inspired to do this everyday.* (Student 1, School Walk, CM)

Converse to the factors that facilitated greater AST change, all adult stakeholders were asked to identify factors that challenged STP implementation. Two broad factors were identified at both schools: length of implementation time and infrastructure funding. The facilitator explained that

insufficient time (i.e. 1 year) at both schools limited the ability to address *all* of the action items in the school travel plan: *"…its more about the time…I don't think we got to everything we planned on. We tackled the things that were the low hanging fruit."* Another stakeholder mentioned that STP should be "*a multi-year program… a payoff for later down the road*" (Parent, School Cycle). In terms of funding for infrastructure to support AST, the Principal of School Cycle claimed that this barrier is significant and out of her control:

> *when I say 'I want a kiss n ride' and I want the sidewalk put in a bit so the cars can come in and out so it's not stopping traffic, that's financial…and I say I need more crossing guards, because we know there's only one at that very busy intersection by the school…we need at least 2 and I can't make that happen. I can't make it safer for kids to walk on that front.* (Principal, School Cycle)

Specific to school Cycle, stakeholders agreed that greater parent, and particularly teacher involvement would have perhaps led to greater improvements in AST culture and behaviour. Only one teacher was partially involved in the STP committee meetings and as the principal stated, having more teachers onboard is "*the way you make things [STP] grow*" (Principal, School Cycle) within the school. Stakeholders in School Walk cited school board transportation policies that hindered greater changes from being observed. For example: "*these school boards are making bussing the norm as opposed to making walking the norm. School boards can enforce their policies, and have people not eligible for buses if they live within 1 kilometer*" (Principal, School B).

Section II of the results has provided an array of perspectives on factors influencing implementation and mode change in each school. By extending this section, the following section will present a researcher's perspective on STP by comparing and contrasting implementation at both schools and summarizing the key factors underpinning and hindering implementation and AST change. The overall benefits, challenges, and potential of STP will also be discussed.

6.4.3 Section III: Researcher's perspective on STP and Study Discussion

As a participant observer, I believe STP was successful in each school for two reasons. One, STP appeared to positively impact its main outcome of interest: AST. Two, STP generated co-benefits and successes such as increased education and encouragement that increased AST awareness in both schools and, thus, helped achieve the overall STP objectives for each school. The following underpins key factors facilitating and hindering STP success and why I believe the intervention was not only successful in each school, but also more effective in School Walk.

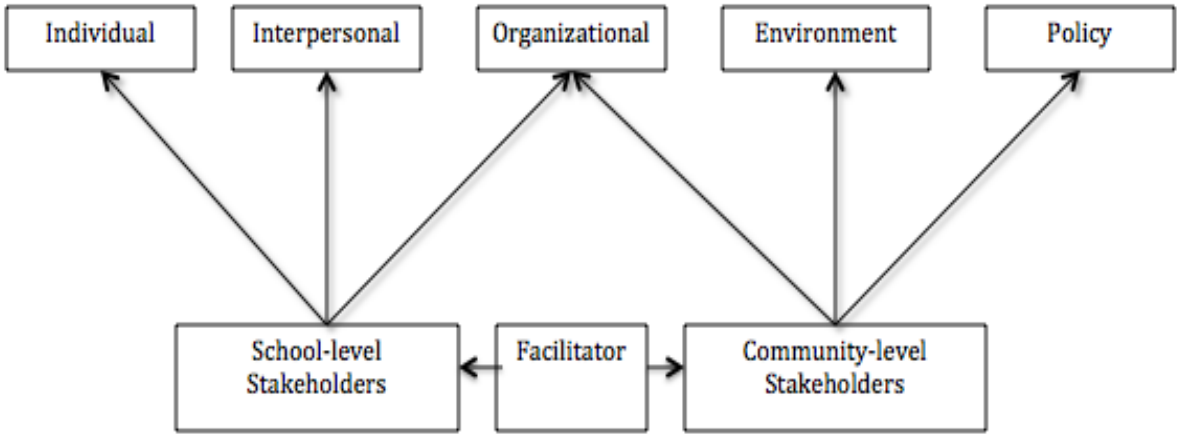
In terms of mode change, School Cycle showed a 4% increase in cycling while School Walk observed a 15% in walking. Contextually, one factor facilitating increases in AST could be attributed to the schools' geographical location in downtown Toronto, where physical environments are suggested to support walking and cycling behaviours such as high street connectivity and mixed-land use (Buliung et al. 2009; Mitra and Buliung, 2014). STP evaluations have also shown that mode shift towards more active means are more likely in urban settings (Mammen et al., 2013; Mammen et al., 2014). However, from a critical perspective, it is important to note that the higher level of AST change in School Walk was likely inflated by the school policy to eliminate school bus services for grade 4 students during the 2014-2015 academic year. Many of these students were likely bused during baseline measures (Fall 2013) but during follow-up assessments bussing choice was no longer an option. Thus, the 15% increase should be interpreted with caution. Nevertheless, along with the committee and non-committee members, I also believe many program factors helped ease the transition from motorized (bus) to non-motorized (walk) travel in School Walk and increase cycling levels in School Cycle.

Specific to the model and identified in our previous STP qualitative evaluation with 34-pan Canadian facilitators (Mammen et al., 2015), key program factors facilitating success in both schools broadly related to the systematic, comprehensive, stakeholder-driven approach. From the outset, each committee followed the step-by-step model that generated school-specific objectives and action plans. For instance, assessments (e.g., baseline mode share, school profile form, walkabout) and committee meetings in the model's early phases were instrumental in targeting within-school target populations and planning suitable AST strategies to be delivered. School Cycle's efforts focused on biking since their unique challenge, in being classified as a 'gifted

school,' resulted in the majority of students living greater than 3km from school. Conversely, School Walk's focus was on shifting behaviours from passive (i.e., school bus use) to active travel (i.e., walking) among the majority of the school population, who live less than 1km from school. Thus, it was likely the specific AST focus in cycling (School Cycle) and walking (School Walk) that facilitated the respective increases. More significantly, it was the collective efforts of key stakeholders who made STP effective by increasing an AST culture within the two schools.

After observing STP be implemented, I gained a better understanding of the value of school and community stakeholders along with a lead facilitator in implementation. To explain, consider the proposed 'STP Committee Contribution Model' (Figure 6.19)

Figure 6.19: STP Committee Contribution Model



The school stakeholders who are needed to effectively implement STP are the principal, teachers, students, and parents. Both school principals in this study were heavily involved in the STP process and as a result, their commitment was a key factor in facilitating implementation. Their knowledge regarding baseline mode share and school and family characteristics (baseline evaluation) was critical in informing the action plan, mainly in terms of which types of strategies (education, encouragement) could best influence the students, parents, and school-culture. Principals also have the authority to develop school policies (enforcement) supporting AST. As noted, a major reason for the 15% increase in School Walk was the principal's policy to eliminate bussing for grade 4s during the 2014-2015 year. However, to support the policy, the principal was dependent on teacher involvement to implement AST strategies planned by the committee.

As a result of teacher involvement, both interventions were successful in implementing a similar combination of educational (e.g., announcements, posters), and encouragement (e.g., designated WTSDs, bike rodeo) strategies. Combining these two E's have been effective in increasing AST by 5 percentage points with the SRTS initiative in Eugene, Oregon (McDonald et al., 2014), supporting our observed AST changes in both schools. However, one major difference I observed between both schools' implementation was the higher degree of teacher involvement in School Walk. I believe this difference to be a major reason why STP appeared more successful in strategy implementation. Having two dedicated teachers, compared to the sole "overworked" (Principal, School Cycle) teacher in School Cycle, enabled a higher quantity of education and encouragement strategies.

To illustrate, School Walk hosted an additional 'kick-off' AST assembly, a school-wide poster contest, and 6 more designated WTSDs than School Cycle. I believe the multiple WTSDs had a long-term impact and helped achieve increases in walking at one-year follow-up. The 8 WTSDs arguably helped make walking more habitual for some students, and as suggested by Buckley et al., (2013), designated AST days can change attitudes around parental and child awareness about walking's benefits, parent willingness to allow their child to engage in AST, and family learning about various routes to school. Hence, I believe it was the *cumulative* impact of each single strategy that helped lead to mode change in both schools, but in a higher degree in School Walk, which may indicate a dose-response relationship between the number of strategies implemented and increased AST change. These findings continue to build the literature in supporting that no single AST strategy can facilitate mode change, but rather a combination of strategies (Chillon et al., 2011).

Both committees were effective in involving students in implementation, another program factor facilitating success. Their involvement was valuable in helping brainstorm and implement the education and encouragement strategies, and overall, be a critical agent in the AST culture building process. Consulting with children is important given their varying perspectives relative to adults and since their needs and preferences are important in effectively tailoring programs (Evans et al., 2013; Holloway & Valentine, 2000) such as STP. Their value was evident in the student-led walkabout (School Walk) when they pointed out AST barriers (e.g., social fears) varying from factors discussed during the first walkabout (e.g., traffic volume). Perhaps most important, and aligned with interview data, they acted as role models and student ambassadors

for AST within the school by spreading the importance of AST to their peers. Research has shown the importance of student involvement in AST interventions by helping elicit norm, attitude and actual behaviour change (Chillon et al., 2011; Fesperman et al., 2008; Crawford & Garrard, 2013; Mammen et al., 2015). It was also apparent from the interviews that student involvement cannot only impact their peers' attitudes and behaviours, but their parents' attitudes and decisions around school travel.

It was disappointing, however, to observe the lack of parent involvement in the STP process at both schools (i.e., 1 per committee). This program factor hindered further success in implementation and was cited as a main barrier affecting STP implementation across Canadian schools (Mammen et al., 2015). Parents are commonly considered the primary decision makers of their child's behavior including decisions regarding school travel mode. If STP, or any AST intervention, wants to shift norms around AST, parent representation is needed to address the safety concerns common among parents (Faulkner et al., 2010). Their participation in the various STP activities could reduce the teacher burden and further help initiate and maintain a positive AST culture. Further research attention is needed as to how to effectively engage parents within STP interventions. Based on observations, STP may benefit from targeting parents on parent council, given their likely current involvement and support at that school.

Overall, it was apparent that the school principal, teachers, students, and parents were mutually dependent with distinct roles in STP. Research shows that involving all these agents helps create a culture conducive to supporting school-wide behavior change (Cefai et al., 2013; Horner et al. 2005). As shown in the stakeholder model, school stakeholders can collectively target the individual (e.g., student), interpersonal (e.g., peers, parents) and the organizational (school culture) levels of influence known to affect AST. However, what was further clear were the school stakeholders' role-authority limitation in impacting broader environmental and political factors limiting AST. This realization highlighted the dependency on, and value of, community stakeholders in the STP process.

Having community stakeholders involved in implementation is essential if broader environment or policy changes are needed to support AST in a given area. Their value in STP was in contributing to baseline evaluation (e.g. walkabout), and assisting with engineering and community-wide enforcement strategies. For example, the first walkabout in School Walk led to

a no right turn on red signal installation at the nearest and busiest intersection as a result of having a City Councilor attend. Though no pre-post AST assessments were conducted pertaining to the installation, a previous SRTS evaluation in California (Boarnet et al., 2005) showed greater AST increases from students who passed by engineering projects than children who did not. Irrespective of mode change, it is important to stress that without his attendance, the process to pinpoint *who* to contact, make the official request to City Council and have that be granted and implemented "*can be a multi-year process*" (Facilitator).

The second walkabout at School Walk with student members is what solidified the value I placed on community stakeholders in the STP process, especially in STP schools located in low SES neighborhoods. Though I believe STP was successful in School Walk, a contextual factor in neighborhood SES likely limited the degree of AST change. It was essential for the students to show us their daily childhood experiences on the journey to/from school through the unpleasant and *"scary"* (Student 2, CM, School Walk) aspects of the social environment (e.g. homeless individuals). For instance, the students showed us garbage bags draped over tree branches throughout the high-rise residential complex. In a small park area meant to attract children to play, one of the students took us underneath the playground-set to show us used condoms and other trash. Towards the end of the walkabout, one parent-stakeholder turned to me and stated, *"no wonder why these parents are letting their child use the school bus"* instead of walking to/from school.

Researchers have discussed that neighborhood incivilities and the social milieu are often greater concerns for children relative to the physical milieu (Banerjee et al. 2014; Rossen et al., 2011), though the built physical environment is often prioritized in an AST context. However, inequalities in children's social and physical environments are tied to deeper sociopolitical issues that historically have existed (Chaufman et al., 2015; Mitra and Buliung, 2014). Nevertheless, although these sociopolitical issues may continue to exist, I realized that STP interventions can bring these issues to the forefront by inviting community stakeholders (e.g., City Council representation) who work in organizations with the capacity and authority to help address environmental and political factors impacting AST. Promisingly, comprehensive school health interventions have been found to reduce inequalities in children's health (Vander Ploeg et al., 2014). Specific to AST, McDonald further notes that AST programs such as SRTS "will particularly benefit low-income" (pg.344) students given their higher rates of AST.

As revealed in a recent evaluation (Mammen et al., 2015), this study confirms the need of a designated and trained facilitator to guide implementation and act as a liaison between all stakeholders during the process. In terms of the community stakeholders, for instance, it was the facilitator who took the lead in contacting the school ward's City Council department regarding implementing the no right turn on red signal. The facilitator was also the designate to contact City Council and request for garbage removal in locations shown by the students. In terms of the school stakeholders, the facilitator was significant in acting as their chair by leading implementation, suggesting best AST practices, detailing action items, following up with community stakeholders, and perhaps most importantly, sustaining momentum and action throughout implementation. Without this role, I also believe that STP programs "*would fall flat on its face*" (Principal, School Cycle) since the other stakeholders have primary daily roles and duties to fulfill.

It is apparent that school and community stakeholders along with a lead facilitator are all mutually dependent to effectively implement STP. School stakeholders and the facilitator are dependent on community stakeholders to recognize environmental and policy barriers to AST and advocate for change within their organizations. To support the existing and prospective environmental changes that many municipalities are developing, community stakeholders are dependent on the facilitator and school stakeholders to educate and encourage a generation of children and their families to select walking or cycling as a viable form of travel. Hence, collectively, a STP committee has potential in addressing factors associated with all socio-ecological levels of influence.

The context above has mainly addressed why STP can work and what program or context factors influence its success. However, as a researcher involved in the process, I was cognizant in identifying challenges related to STP delivery. In fact, it was difficult to maintain a critical lens after observing what was achieved in both schools within a one-year timeframe. The main challenge the stakeholders and I perceived did not relate to the design of the STP model, but rather the insufficient time to complete implementation. This time based limitation remains a key factor limiting STP in Canada (Mammen et al., 2015). As observed, this limitation heavily influenced the quantity of action items fulfilled and quality of evaluation.

With regard to action items, School Cycle's committee had originally planned to make public transit (i.e., Toronto subway, bus, and street car use) a STP focus along with cycling. Focusing on public transit use would have further benefited the intervention since the majority of its students live greater than 3km from school and research is increasingly recognizing this travel mode as a viable option in contributing to daily PA (Owen et al., 2012; Pabayo et al., 2012; Voss et al., 2015) and an opportunity to develop social bonds with peers (Hinckson, 2015). In School Walk, the committee had planned for the student stakeholders to present their walkabout photographs and experiences to the Ward's City Council to show the nature of their neighborhood environments. This form of 'citizen science' (Bauman et al., 2012; Winter et al., 2013) in low-income neighborhoods has been shown to be an effective way to impact urban development (e.g., sidewalk implementation, community gardening) by building community partnerships and advocating for change with community decision-makers.

However, during the first year of implementation, there was only sufficient time to become aquatinted with the STP process by involving the relevant stakeholders (e.g., students), planning school-specific AST objectives, piloting education and encouragement strategies and, overall, initiating a school-wide culture in AST. As the facilitator stated when reflecting on STP's impact, "*this program is about culture shift*." Though STP was also considered successful by all stakeholders, "*there was more success to be had*" (Principal, School Cycle). It is easy to overlook that although funding was allotted for a 12-month duration, the 'real' time of implementation occurred over a maximum of 5 months when considering the time lapses between different STP phases, and the time lost during and immediately after school holidays (e.g., Christmas, Summer). Thus, it is important for funders and decision makers interested in STP to understand the increasing evidence suggesting that one year funding intervals can limit not only the actual implementation period of AST strategies but, in turn, the evaluative data as well (Mammen et al., 2013; Mammen et al., 2015).

The sole use of a one follow-up assessment significantly hinders the ability to determine STP effectiveness if, as discussed, all action items may not be completed. Moreover, it also limits determinability in sustainable mode shift. Though this case study showed favorable changes in AST at both schools, a question that lingers is: can these positive changes be sustained overtime? There is considerable need for STP evidence over a multi-year (e.g., 2-3) funding period to better accurately assess prospective and sustainable changes in AST, while using matched-control

schools and student tracking as we have previously argued (Buliung et al., 2011; Mammen et al., 2013; Mammen et al., 2014; Mammen et al., 2015). Only one STP evaluation (Hinckson et al. 2011) was multi-year based showing significant increases in AST only after the third year of implementation in Auckland, Zealand. In the U.S, across five states, McDonald and colleagues (2014) found that SRTS interventions that are multi-year show a dose-response relationship with mode change, with an increase in 1% points with each additional year (up to 5 years) of implementation. Therefore, funders need to acknowledge the limitations in 1-year funding intervals and instead consider providing multi-year funding to *fully* implement and evaluate such a comprehensive intervention such as STP.

6.5 Conclusion

This study described the successful STP practices and implementation in two Toronto schools. STP was successful in not only increasing AST in each school, but developing multidisciplinary partnerships, creating school-wide awareness and enthusiasm, and acting upon the identified environmental barriers around the schools. Key factors facilitating these successes included: the urban location of the schools; the systematic STP model; the multiple meetings; multidisciplinary stakeholder involvement; and the multiple of strategies delivered. The lack of parent involvement and the limited one-year implementation period were identified as barriers to implementation and greater AST change. The insight gained may be useful for STP practitioners introducing STP to similar schools in downtown Toronto in understanding what implementation may entail, specifically in the first year.

Using a multisite mixed-methods case study with five data sources highlights a study strength, which enabled a more holistic understanding of STP using multiple data sources. Another strength of our design enabled various perspectives (i.e., principal, teachers, students, parents, community stakeholders) of STP's impact on mode change. Despite these study strengths, this study contains limitations. As with all case study designs, the generalizability of our findings are limited (Creswell & Clarke, 2011) to schools located downtown Toronto with similar characteristics to the case study schools. Nonetheless, the TDSB and TCDSB combined represent approximately 800 schools, some of which may use the knowledge provided if recruited to implement STP. As a remaining limitation for STP evaluations, particularly in

Canada, more multi-year ‘scaled up’ assessments (e.g., control schools, student tracking) are needed to better accurately measure STP’s effectiveness over time.

Chapter 7

7 Discussion

The previous four chapters have collectively addressed the two overarching research objectives guiding this dissertation:

i) To determine if STP can increase AST levels in Canadian elementary schools.

ii) To identify school contextual and program factors influencing STP implementation and AST change.

These objectives were achieved using various methodological approaches through four distinct studies. Study 1 provided the first national quantitative STP evaluation using data from 53 pan-Canadian schools to determine if AST increased following one year of STP implementation (Objective I). That study used the hands-up survey as its primary outcome measure and integrated several factors (e.g., STP strategies, school size, school SES) into analyses in determining predictors of AST change (Objective II). Using a larger sample (106 schools) and a different outcome data source (i.e., family survey, n=7827), Study 2 examined the proportion of students shifting modes from being driven to AST following one year of STP (Objective I) and school, child, and family characteristics associated with mode shift (Objective II). Study 3 reported the first qualitative STP study, which explored STP facilitators' (n=34) perspectives on factors underpinning and hindering implementation (Objective II). These first three studies were conducted within a national context of STP implementation to over 100 schools delivered by GCC. With a more narrow focus, the fourth and final study provided the first STP evaluation to use either a mixed methods or multisite case study design in two schools implementing STP. This case study used five data sources to provide a comprehensive description and evaluation of the STP process to gain a better understanding of how STP is delivered, its impact on AST (Objective I) and key factors influencing implementation and mode change (Objective II).

All four studies were presented in manuscript form containing a discussion that included the respective strengths, limitations, and implications. Thus, the current and final chapter will: synthesize the key dissertation findings as per the dissertation objectives; address the broader dissertation limitations and future research needs; provide recommendations to GCC regarding implementation practices; and outline the dissertation contributions to research, practice and

policy. The dissertation concludes with my reflection on STP, particularly within a Canadian context, along with a final conclusion.

Table 7.1- Overview of Study Findings and Limitations

	Addressed Dissertation Objective	Key Findings	Key Limitations
Study 1	I & II	▪ no national-level change in AST ▪ school-level variations in AST change	▪ no control schools ▪ convenience sampling ▪ self-reported AST measure ▪ incomplete data for 53 of 106 schools
Study 2	I & II	▪ 14% of sample shifted to AST ▪ students more likely to shift if older, living <3km from school, and attending urban/suburban schools ▪ 35% of parents reported safety education and infrastructure improvements to be most effective STP strategies	▪ no control schools ▪ convenience sampling ▪ cross sectional survey ▪ parent reported AST measure ▪ no student/household tracking ▪ inability to determine AST change sustainability
Study 3	II	▪ factors facilitating effective implementation included: a well-designed STP model, collaboration between multidisciplinary stakeholders, and the facilitators' leadership role. ▪ factors hindering implementation included: insufficient implementation time and the lack of stakeholder	▪ sole focus on STP facilitator's perspectives

		involvement from principals, parents, and students	
Study 4	I & II	▪ 4% increase in cycling (School Cycle) and 15% increase in walking (School Walk) ▪ factors that facilitated AST increases included: school-specific AST objectives, school and community stakeholder involvement, the facilitator, and the quantity of AST strategies delivered ▪ factors hindering implementation included: lack of parent involvement and perception of insufficient time to effectively deliver STP	▪ limited generalizability of findings ▪ inability to determine AST change sustainability

7.1 Can STP Increase School-Wide AST?

The study findings suggest that STP can facilitate increases in AST following one year of implementation, though the degree of change will likely vary by school. Approximately half of the 53 schools in Study 1 showed increases in AST ranging from 1-23%. Study 2 revealed that 14% of the parents surveyed (n =7827) reported shifts in their child's travel mode from being driven to AST as a result of STP. The final case study revealed increases in cycling (4%, School Cycle) and walking (15%, School Walk). Overall, these findings are encouraging and contradictory relative to the previous STP studies. The prior STP studies showed zero (Rowland et al., 2003; Hinckson et al., 2011) to modest (2%; Buliung et al., 2011) changes in AST at one-year follow-up. Only one of these evaluations (Hinckson et al., 2011) conducted multiple follow-up assessments (i.e., 3 year) showing no change during the first two years of implementation but a significant 3% increase following the third year. Now, with three additional STP studies added to the literature as a result of this dissertation (Mammen et al., 2013; Mammen et al., 2014; Mammen et al., 2015), the current evidence base can then be considered mixed in terms of STP's impact on mode change after one year of implementation. However, to extend the STP literature, a novel objective of this dissertation research was to identify key factors influencing implementation and mode change, which may explain the variation in STP impact between schools.

7.2 What Factors Influence STP Implementation and Mode Change?

7.2.1 School Contextual Factors

The dissertation research found four consistent school contextual factors influencing implementation and mode change. All four studies provided indication that STP can facilitate increases in AST in schools located in either urban or suburban areas (subjective measures). For example, personal observations from Study 4 revealed some built environment characteristics conducive to AST behaviour such as high street connectivity and density. This relationship between school location and travel mode change favouring urban or suburban schools supplements ample research with similar findings (Martin et al., 2007; Mitra et al., 2010; Robertson-Wilson et al., 2007). These findings can help address decisions on where best to

implement STP. Given that STP is a relatively new practice in Canada and to maximize already limited resources by recruiting schools most responsive to STP, the findings suggest that practitioners and decision-makers could implement interventions in schools located in environments (i.e., urban/suburban) more supportive of AST behaviours. This is not to neglect rural-based schools when discussing STP. However, with all seven published STP evaluations (Buliung et al., 2011; Hinckson et al., 2011; Hinckson, 2015; Mammen et al., 2013; Mammen et al., 2014; Mammen et al., 2015; Rowland et al., 2003) predominately focusing on urban and suburban schools, more research is required in determining if STP can be applied effectively in rural schools.

Tied to school location and its effect on AST, the distance between a student's home and school was shown to impact implementation and AST change in Studies 2 (family reported) and 4 (personal observations). Distance is considered a leading predictor in the AST literature (Timperio et al., 2006; Wong et al., 2011). Study 2 found that students who lived further than 3km from school were less likely to shift to AST behaviours than those living below this distance. Study 4, interestingly, revealed how STP can benefit a school in which the majority of the students live greater than 3kms by narrowing the travel plan's focus towards promoting cycling. This case study highlighted how factors like distance can influence how STP is delivered within a school. Even though STP is school-specific, the intervention can be further specified among subpopulations within a school. Accordingly, different strategies may be employed for those living under 3km to school (e.g., walking buddies) compared to those who live further (e.g., cycling). Study 4 further showed that future AST interventions could also consider incorporating the use of public transit into the travel plan for students living further from school, as this emerging component of AST is becoming increasingly recognized as contributing to daily PA (Owen et al., 2012; Pabayo et al., 2012; Voss et al., 2015).

The third contextual factor appearing to influence STP pertained to a school's neighbourhood SES (principal reported). Mode change from driving to AST was more likely to occur for students attending high SES-neighborhood schools compared to low in Study 2. Contrary to this, Study 4 showed a greater degree of change in the lower SES school. This latter finding helped address a conference delegate's question following a presentation of Study 2: Does STP work better for the schools that are predisposed to greater finances, resources, and capacity? Based on these findings, it appears that STP can benefit schools with varying SES characteristics. It is

argued in Study 4 that comprehensive interventions involving community stakeholders like STP can reduce inequalities in children's health by being more attentive to local issues and challenges. Hence, STP appears transferable across different SES contexts.

At a broader level, policies regarding school transportation were found to hinder the effectiveness of STP. Study 3 emphasized the need to rewrite school transportation policies to include AST as a mode of school transport and not solely focus on bussing. By altering this policy, finances could be re-allocated to support AST behaviours with the needed infrastructure (e.g., sidewalks, bike lanes, bike racks). Study 4 highlighted a case where a school-board transportation policy was not being enforced as children living less than the serviced cut-off (i.e., <1.6) were being bussed. Ultimately, this school could have a higher level of children engaging in AST if the transportation policy was enforced. Thus, if AST program such as STP are to be effective in educating and encouraging children and their families to regularly practice AST, policies promoting and supporting this travel mode will likely be required.

7.2.2 Program Factors

Along with the school contextual factors identified above, the dissertation findings revealed STP program factors influencing its effectiveness in promoting and increasing AST. These STP factors were predominately discussed in Studies 3 and 4. One broad factor found to facilitate STPs performance is the nature and logic of the STP model itself. The model was viewed as a blueprint for success, given its sequential approach in implementation including baseline assessments (e.g., walkabout, mode share, student/school characteristics), action planning (e.g., meetings), implementation (e.g., 4Es), and follow-up measures. What appeared to be particularly effective with this approach was the development of school-specific STP objectives, particularly informed by the initial stages of the model through baseline assessments and multiple committee meetings. Though a broader STP model is followed, the intervention by no means possesses a *cookie cutter* or *one size fits all* method, as the intricacies that distinguish implementation are varied, dynamic, and complex, all reflecting the situation-specific nature of AST.

More specific to the model, two program factors perceived to facilitate implementation and AST change pertained to the comprehensive approach in strategy implementation and stakeholder involvement. Study 4 findings indicated a potential dose-response relationship between the number of strategies implemented and degree of mode change. The more strategies implemented

(e.g., education, encouragement, enforcement, engineering), the higher the likelihood of observing greater change in AST. Incorporating a wide range of strategies seems appropriate in addressing the array of socio-ecological factors affecting the individual, interpersonal, organizational, environmental, and political levels of influence (Chillon et al., 2011; Crawford and Garrard, 2013).

In helping allay the multifaceted barriers influencing AST, the second STP factor that facilitated effective implementation was multidisciplinary stakeholder involvement. A proposed STP committee contribution model from Study 4 emphasizes the value and mutual dependencies of a lead facilitator with community and school stakeholders to collaboratively address factors from all socio-ecological levels of influence. As a brief summary, school stakeholders such as the principals, teachers, students, and parents have a primary role in educating and encouraging children (i.e., intrapersonal), their peers and families (i.e., interpersonal), and the school (i.e., organizational) to adopt active living practices such as AST.

However, school stakeholders lack formal authority to affect AST factors associated with the environment and policy levels of influence. This role limitation then emphasizes the dependency on and value of community stakeholders in the STP process. It is important to note, however, that any proposed environment or policy changes (e.g., bike lane installation, bussing policies) required in some schools to facilitate mode change is not guaranteed. Nonetheless, STP functions to bring any broader social or physical environmental issues to the forefront by inviting community stakeholders across sectors (e.g., safety, health, education, transportation, planning) who work in organizations with the capacity and authority to help shape environments and policies conducive to AST. As discussed in Study 4, community stakeholders are likewise dependent on school stakeholders to promote and educate students and their families to engage in greater levels of AST and hence support any environment (physical or social) or policy changes made. Overall, these two levels of stakeholders were perceived to collectively contribute to STP by targeting factors associated from all levels of socio-ecological influence.

Identified as an essential component of STP in studies 3 and 4, the lead facilitator was deemed crucial in a multitude of roles including: familiarizing school and community stakeholders with STP; leading, advising, and guiding STP implementation; acting as a liaison between school and community stakeholders; building momentum in implementation throughout the school year; and

documenting all action items and outcomes of meetings and STP activities by means of a school travel plan. Both studies confirmed the need for a STP facilitator, as these tasks are too time-intensive for any other committee member holding a primary occupation. However, with STP in Canada being NGO-led (i.e. GCC), many financial and resource-related challenges hinder STP such as the lack of a sustained STP facilitator at either a municipal or school-level.

In terms of program factors hindering implementation and mode change, limited parental involvement during implementation was identified as a key barrier to STP in studies 3 and 4. As acknowledged throughout the dissertation, parents are the ultimate decision makers pertaining to children's travel behaviours to/from school. Parental safety concerns regarding stranger danger, bullying, and traffic, remain as a key hindrance to greater AST levels. Irrespective of the range of strategies employed during STP, it is crucial that parents understand the value, misperceptions, and risks associated with AST. Without their support and involvement to help allay common parental fears around AST, the impact of STP can be limited. Hence, to maximize STP effectiveness, future interventions should prioritize seeking parental involvement in the STP process (e.g., strategy development and implementation), perhaps by recruiting from school-parent councils.

A second key program factor hindering implementation and mode change pertained to the length of implementation. Interview data from Study 3 revealed the insufficient time given for program delivery as many planned action items were not addressed. Personal observations from Study 4 confirmed the one-year implementation period to be too time restrictive in delivering such a comprehensive intervention. For instance, particularly in the initial year of STP when implementation is novel, it took both STP committees in Study 4 approximately 3 months following the first STP committee meeting to deliver the first AST initiative. This then left only 5 months to implement the committees' strategies before school summer holidays commenced, as follow-up assessments were required upon returning in the fall. The additional time is moreover required to act upon the time intensive environmental (e.g., physical and social) and policy-related (e.g., school transportation) barriers identified in the early stage of the STP process. Furthermore, the shorter implementation period not only affects the degree of implementation but also limits the program's evaluation. The following will address the evaluative limitations of a one-year evaluation period along with other dissertation limitations in measurement and study design.

7.3 Limitations and Future Research Needs

One notable limitation of the dissertation results relates to the sustainability of the STP model; can the observed AST increases sustain over multiple years? Is a facilitator needed for the subsequent years or can student and parents groups eventually take ownership of the program? How does the program operate following year one? These questions could not be addressed as since the one-year time frame limits the determinability in sustainable AST change and program delivery in the subsequent years. As suggested across all studies, further research can help clarify if positive impacts of STP are sustainable using longer evaluation periods (e.g, 2-3 years), while also accounting for some limitations in outcome measurement and study design that the dissertation (Study 1, Study 2, Study 4) and previous STP studies have exposed.

Though studies have established the hands-up survey as a valid and reliable tool (de Wit et al., 2012; McDonald et al., 2011), the methods around its use need attention. For instance, both studies (Study 1, Study 4) using the hands-up survey conducted only one follow-up measure, which was one academic year later and without student tracking. Thus, samples were not consistent in pre and post measures and at any time point may have included an atypical sample of students (i.e., incoming new students, outgoing students) with a higher or lower degree of AST. Longitudinal studies tracking households would be ideal. The hands-up survey also does not capture demographic information for each child, such as gender, travel distance, adult accompaniment, or SES, all of which can influence levels of AST. As an example, the prevalence of AST is typically higher in males. Collecting information on gender on the hands-up survey and focusing on these results during the early phases of the STP model (e.g., initial STP committee meeting) could lead to more school-wide strategies in increasing female AST. Reducing the gender gap can then be viewed as another intermediate benefit and 'success' of a STP intervention, along with those identified in studies 3 and 4 such as established multidisciplinary partnerships and increased AST culture and awareness.

The other outcome measure of AST used in this dissertation (i.e., family survey), however, does include child (e.g, gender) and family characteristics (e.g, SES) but contains its own limitations. Study 2 showed greater impact of STP on mode change on a national scale compared to Study 1. One reason may reflect the greater sample used in Study 2, which involved students from 106 schools (relative to 53 schools) involved in the Pan-Canadian STP rollout. However, social

desirability biases linked with the self-reported parent survey may have exaggerated positive findings, such as the 14% of parents reporting that their child switched modes from being driven to AST as a result of STP. This difference in outcomes of AST reported between parent and child is not uncommon (Crawford and Garrard, 2013; Hunter et al., 2015). For instance, Crawford and Garrard's (2013) mixed-methods evaluation of the 'Ride2School' program in Victoria, Australia showed increases in AST stemming from the parent survey, but not the classroom hands-up survey. Our use of the family survey in Study 2 was cross-sectional in nature, limiting causal inferences between STP and mode change. Although this survey accounts for some limitations of the hands-up survey in including family and child demographics, these issues remain along with lower response rates (Study 4) compared to the hands-up survey, which is designed to capture every single student in a school.

Overall, there is a need for STP researchers and practitioners to generate novel evaluative techniques around AST measurement. Modifying the hands-up survey to at least include information on gender would extend the previous STP studies using this tool. Ideally, direction observation counts would provide a more direct measure of AST while also collecting information on gender and adult/peer escort. Lastly, as acknowledged across the dissertation studies, stronger designs using matched-control schools and assessing the cost-benefit of the program can further help determine STP's impact.

It is important to note that these limitations in evaluation and study design are largely a result of the nature of STP in Canada. With STP still mainly a grassroots initiative, the program continues to be led by GCC—a NGO with limited resources. As discussed in Study 3, it is unlikely that sustained strategy implementation and mode change will be observed if STP continues to be NGO led and implemented in one year time intervals. For STP to be a successful and sustained practice in Canada, it must likely transition from being NGO to government-funded in order to support full implementation and stronger evaluations. Once there is dedicated funding for continuous implementation periods (e.g., >2 years), more research can clarify the long-term impact of STP.

A prime example of a successful government-led approach in increasing children's non-motorized to/from school is the SRTS initiative in the U.S. This program, arguably the most similar to STP in concept, has been supported federally by the Safe, Accountable, Flexible,

Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) that has provided over $1 billion since 2003 to AST initiatives across all 50 states. The funds are allocated to fund state-led SRTS coordinators, support infrastructure and non-infrastructure strategies, and provide traffic calming (e.g., cross-guards) measures, reaching over 14,000 elementary and middle schools (National Center for Safe Routes to School, 2012, 2013a). Increasing evidence is showing the positive impact the federal policy has made in sustaining population-level increases in AST (McDonald et al., 2013; McDonald et al., 2014; Stewart, et al., 2014), decreasing injuries near SRTS infrastructure improvements (DiMaggio and Li, 2013), and providing societal and economic benefits (Muennig et al. 2014). Hence, decision-makers in Canada ought to consider this compelling evidence and understand that investing in comprehensive AST interventions (e.g., SRTS, STP) and broader infrastructure and policy approaches can be a worthwhile investment from a health, environment, and economic perspective.

7.4 Keys to Success: Recommendations For STP Implementation

Based on the overall dissertation findings and limitations, along with the knowledge gained from four years of AST research, the following outlines key recommendations to consider when implementing STP. Addressing the range of factors below can help maximize the impact of STP. The recommendations will be presented according to the distinct phases of the STP model.

Phase 1: Set-up (School & Stakeholder Recruitment)

- Target schools located in physical environments that support AST behaviours (e.g., sidewalk/bike lane presence, availability of public transit).
- Ensure the school principal is committed in supporting STP implementation.
- Consider schools from all SES levels.
- Aim for principal, teacher, student, and parent representation on STP committees (i.e., school stakeholders)

- Aim for cross-sectoral representation from education, transportation, health, safety, and planning, and aim for Municipal government representation (i.e., community stakeholders)

Phase 2: Baseline Data Collection

- When feasible, conduct observational counts to measure AST. Determine if the child is male/female, and accompanied/unaccompanied by an adult as part of the direct counts.
- When using the hands-up survey, additionally capture information on gender.
- If using the parent survey, track surveys (i.e., households) and provide incentives for families returning the surveys to maximize response rates.

Phase 3: Action Planning and Implementation

- During the initial STP committee meetings, review and discuss the baseline assessments of travel mode share. Pay particular attention to the following factors (Table 7.2) known to influence AST and strategize accordingly.

Table 7.1: Factors to Consider with STP Committees

Travel Distances	Consider tailored strategies for those living 'far'(e.g., >3km-biking, public transit) from school and those living 'close' to school (e.g., <3km-walking buddies)
Age	Consider tailored strategies for those in younger vs. older grades. Adult/peer accompaniment could be emphasized for younger students. Increasing independent mobility can be a focus for the older students.
Gender	Consider the proportion of males and females engaging in AST and brainstorm strategies to reduce the gender-gap if existing in that school.
Disability	Consider the proportion of students living with physical and cognitive disabilities and brainstorm strategies on how best to include them in STP.
AM/PM	Consider the proportion of students engaging in AST in the morning and afternoon periods. If higher rates exist in the PM as the literature shows, brainstorm strategies on how to increase AST in the AM period.

- Conduct separate ‘adult-led’ and ‘student-led’ walkabouts to identify physical or social environmental barriers of AST.
- Based on the baseline assessments and school-walkabouts, develop school-specific objectives and strategies.
- School stakeholders should aim on implementing *multiple* educational (e.g., student AST announcements, AST posters) and encouragement based strategies (e.g., AST assembly, multiple designated AST days) throughout the entire school year.
- Community stakeholders should aim on helping shape supportive policies (e.g., school transportation) and environments (e.g., pedestrian signage) conducive to AST behaviours.

Phase 4: Follow-up Data Collection

- Ensure the timing and season of data collection are similar to baseline assessments (e.g., Fall 2014 and Fall 2015).
- Solicit feedback from various stakeholders (e.g., principal, students, parents) on program impact and suggestions on how to improve and sustain implementation.

7.5 Dissertation Strengths and Contributions

This dissertation makes several contributions to research, practice and policy. In terms of research, the dissertation addressed key gaps in the STP literature and adds three published studies to the evidence base. Methodologically, the dissertation showed the value of using quantitative and qualitative data sources to gain a broader understanding of program impact. Study 4 particularly highlighted the benefit of aligning a comprehensive intervention with a comprehensive evaluation (i.e., mixed-methods). Theoretically, our findings confirm the application of the socio-ecological model when aiming to increase AST behaviour. The results recommend other AST interventions to consider a variety of factors from the individual/interpersonal (e.g., child and parent AST knowledge, family SES), environmental (e.g., urbanism, distance) and political levels of influence (e.g., school transportation).

Further, findings can extend frameworks specific to AST (McMillan, 2005; Mitra, 2013; Panter et al., 2008; Sirard and Slater, 2007). For instance, in line with the socio-ecological model, these frameworks outline the relationships between AST and various constructs such as household attitudes, norms, and demographics, school and residential neighborhood environments, independent mobility, safety perceptions, and external domains of influence (e.g., weather). However, a key finding from this dissertation linked to greater AST levels, but not explicitly considered in these AST frameworks, pertains to the level of school support and culture around promoting AST. Since AST frameworks are developed to inform the design of interventions, a distinct construct focused on personnel (e.g., principal, students, parents) to help implement the program and build a school-wide AST culture during appears warranted.

In terms of practice and policy, the dissertation findings outline key recommendations and factors to consider when implementing STP as identified in the previous section. These recommendations, along with the broader dissertation findings, are significant and timely given the on-going discussions concerning the practicality, value, and potential of STP between public health units, NGOs, school boards, municipalities, and transportation agencies across Canadian Municipalities. For instance, by invitation, the dissertation findings and recommendations were presented to the following national and municipal organizations.

i) National- **Green Communities Canada Walks** (September 23, 2014; http://www.saferoutestoschool.ca/blog/did-you-miss-successful-support-active-and-sustainable-school-travel-planning-webinar);
ii) Municipal- **Bike Brampton** (April 20, 2015; http://bikebrampton.ca/wp-content/uploads/2015/02/2015-04-20-Moving-Peel-Kids-Safely-School-Travel-Planning-Workshop-Results.pdf)
iii) Municipal- **STP Toronto** (June 8th, 2015, see Appendix E)
iv) Municipal- **Peel region Active Living Team** (July 30, 2015)
v) National- **Coalition Linking Action and Science for Prevention** (November 17, 2015, see Appendix F)

Based on my four years of conducting this research, disseminating the findings through various channels, and conversing with stakeholders on barriers and solutions to AST practices, the conclusion of this dissertation provides a personal reflection and stance on STP.

7.6 Looking Beyond the Data: A Personal Reflection on STP

Exploring the complex topic of AST yielded an insightful research experience during my doctoral studies. It was interesting to sense my stance on STP shift from one that was initially skeptical to a more convinced lens. My skepticism stemmed from the apparent time-intensive nature of STP. Though the concept of collaborating stakeholders through multiple meetings to increase AST levels is logical, the STP process did seem arduous. However, as I progressed through my PhD and expanded my knowledge around active travel, it became increasingly clear that increasing population levels of AST will indeed be a necessarily time-intensive process. As the temporal decline in AST was observed over several decades, one could speculate that it may take the same amount of time to reverse the rates, especially when considering the complex and interrelated factors hindering AST behaviours in modernity. However, I believe STP is an intervention designed to tackle AST's complexity based on its comprehensive and socio-ecological approach.

Additionally, as my deeper understanding of STP was evolving, I began to view STP as a contributor. First, I realized that STP contributes to the goals and objectives of international and national PA strategies. Increasing overall levels of PA has been acknowledged as an intersectoral and interdisciplinary responsibility. For example, the WHO's (2007) guiding principles for increasing population-level PA includes the need for stakeholder support, multiple strategies, and tailoring programs based on varying context, all features of STP. Similarly, the United States National Plan and Canada's Active Canada 20/20 initiative called on PA initiatives to leverage community partnerships across sectors and between all levels of government. Hence, defined by these measures, STP is a promising intervention as it adheres and contributes to health organizations' action plans in alleviating the child inactivity crisis.

Second, I discovered that STP has potential in contributing to the wider community. For example, if environmental changes occur as a result of a student-led STP walkabout in a low SES area (e.g., more aesthetically appealing routes and playgrounds) the benefits can exceed those in an AST context. Children can better utilize these renewed spaces and increase other sources of PA, such as active outdoor play. Furthermore, there is increasing attention in Canadian municipalities regarding the lack of quality infrastructure to support safe pedestrian or cycling behaviour, as evident in headlines frequented in national (e.g., Globe and Mail) and local

newspapers (e.g., Metro Toronto). Hence, there is increasing recognition on the value of active travel principles, as efforts are underway to concurrently combat existing health (e.g., inactivity) and environmental issues (e.g., traffic congestion). If varying levels of government are investing in pedestrian infrastructure, however, they will need assistance in allaying fears and amending attitudes among families toward active travel. This is why I believe STP makes sense, as it educates and encourages a generation of children and their families to adopt active living principles in the immediate and extended future. Keep in mind that children are not just society's future citizens; they are also future health professionals, urban designers, transportation engineers, and politicians, for example. Thus, educating children and their families now about the implications of various travel modes can shape a more health conscious and environment-friendly society.

7.7 Conclusion

Using a mixed-methods approach, this dissertation aimed to bridge a gap in the literature by providing a holistic evaluation of the Canadian STP model. Specifically, four studies were conducted to collectively assess changes in AST following implementation and identify factors influencing implementation and travel mode change. The findings of the study offer novel insight into the comprehensive intervention in addressing AST's multilayered challenges. Results reveal that STP can facilitate increases in AST after the first year of implementation, though the degree of change will likely vary according to certain school contextual and program factors. School-related contextual factors found to influence implementation and mode change included the school's geographical location, distance from students' homes, SES, and transportation policies. Influential program factors included the school-specific and systematic STP model, multidisciplinary stakeholder collaboration, designated facilitator, range of AST strategies, and length of implementation time. The dissertation's contributions, study limitations, and recommendations for researchers, practitioners, decision-makers involved with STP have been provided. In conclusion, STP has potential in changing AST behaviours with one year of STP implementation. However, with the evidence base only emerging, more studies with multiyear evaluations periods will further help determine STP's effectiveness and sustainability in increasing AST.

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Appendix A-Classroom Hands-up Survey

Please complete this survey, using hands-up, for the week of: < Day/Month to Day/Month of Year >

Grade: _____ Room/Class #: _____ # Students:_____

Teacher: _____ Dates: Mon. _____ to Fri. _____

Ask students: "How did you travel <u>to</u> school this morning?"

	Weather	Walked	Walked part-way*	Bicycle	School Bus	Public Transit	Carpool (2 or more families)	Car (Just my family)	Other?	Total
Mon	Example: Rainy/6C									
Tues										
Wed										
Thurs										
Fri										
Total										
Daily Avg=Total/5										

*Walked at least one entire block.

Ask students: "How will you travel <u>from</u> school today?"

	Weather	Walked	Walked part-way*	Bicycle	School Bus	Public Transit	Carpool (2 or more families)	Car (Just my family)	Other?	Total
Mon	Example: Sunny/25C									
Tues										
Wed										
Thurs										
Fri										
Total										
Daily Avg=Total/5										

*Walked at least one entire block.

Appendix B- Follow-up Family Survey

Dear Parent:

<School name> has made great progress with our School Travel Plan, which we launched in order to encourage more of our students to walk, cycle or otherwise use active travel for the school journey. We took part in this program to:

- Improve safety.
- Increase health and well-being.
- Cut pollution where our students play.
- Reduce traffic congestion at and around the school.

Now it is time to find out how successful we were, and your input is critical.

Please take 5 minutes to fill out the <survey online at **link** or the attached survey and return it by date> so we can compare our current performance to our performance before our plan was put into action.

If you have any questions, please contact:

<insert STP Facilitator's contact info>

Thank you,

<Principal name>

_____

To protect your privacy this survey does not require you to provide your name. *All information will be kept strictly confidential.*

School Travel Planning

Follow-up Family Survey

<Insert school name>

Please include the date (month/day/year) that you filled this survey out (e.g. October/1/2013):

_____/___/_____

Please answer the questions thinking about your eldest child attending this school. If more than one child brings a survey home, please complete one only.

1. Did you complete the first Family Transportation Survey in [insert month & year of 1st survey]? (Circle one)

YES NO NOT SURE

2a. How does your child usually get to and from school? (Choose one in each column. If he/she uses two, e.g. walking and bus, choose the one he/she spends the most time doing.)

	TO school from home	FROM school to home or after-school program
Walk	☐	☐
Walk part-way (at least one entire block)	☐	☐
Bicycle	☐	☐
School bus	☐	☐
Public transit (bus, subway, streetcar)	☐	☐
Carpool (2 or more families)	☐	☐
Car (just your family)	☐	☐
Other	☐	☐

If Other

(explain)_____

2b. If your child takes the school bus or public transit, how many minutes does he/she walk each day (i.e., to get to and from the stop)?

Number of minutes: _____

2c. Was the travel FROM school to an after-school program?

☐ Yes ☐ No

3a. Do you usually accompany your child to school?

☐ Yes ☐ No

3b. If yes, how do you usually feel on the trip to school? (Please circle one word).

- Relaxed
- Rushed
- Happy
- Frustrated
- Other (please describe) _____

4a. What is the age and sex of the child you are answering this survey for?

Age: _____ sex: ☐ Boy ☐ Girl

4b. How many of your children go to this school? _____

5. How far away from the school do you live? If you are not sure, check Google Maps https://maps.google.ca/

If you are unfamiliar with Google Maps instructions can be found at: http://bit.ly/gmaps_instructions.

☐ Less than 0.5 km ☐ 0.51 to 1.59 km ☐ 1.6 to 3 km ☐ Over 3 km

6. Our neighbourhood is safe for children to walk to and from school. (Please circle one answer).

STRONGLY AGREE AGREE DISAGREE STRONGLY DISAGREE

If your child is usually driven to or from school, please complete questions 7-9. If not, please skip to question 10.

7. What are the main reasons your child is usually driven to/from school? (Choose up to three).

☐ Distance from home too far

☐ Convenience/time pressures

☐ Traffic danger

☐ Personal safety issues (e.g. bullying, stranger danger, etc.)

☐ I'm on my way somewhere else (e.g. to work)

☐ Weather

☐ Other (explain)_____

8. I would allow my child to walk to school if… (choose up to three)

☐ He or she did not walk alone

☐ There was a safer or improved walking route

☐ There were reduced traffic dangers

☐ He or she were older

☐ He or she did not live so far from school

☐ Other (explain)_____

9. I would allow my child to cycle to school if… (choose up to three)

☐ He or she did not cycle alone

☐ There was a safer or improved cycling route

☐ There were reduced traffic dangers

☐ He or she were older

☐ He or she did not live so far from school

☐ He or she received bicycle safety training

☐ He or she could lock the bicycle in a safe place

☐ Other (explain)_____

Everyone continue at question 10 below.

10. The next question is for the ELDEST child who brought this survey home. Please ask your child the following question: What feeling do you have most of the time when you are travelling to school and from school? Please only circle one word in each column.

a) TO school:	b) FROM school:
Relaxed	Relaxed
Rushed	Rushed
Happy	Happy
Tired	Tired

11a. In what ways have your family's school travel habits changed for the TRIP TO SCHOOL, since the School Travel Planning project began?

☐ less driving (e.g. more carpooling, walking, cycling, taking public transit, etc.)

☐ not changed

☐ more driving

Comments:

_____

_____

_____

11b. If you are driving less for TRIPS TO SCHOOL, what are you/your child doing more of?

☐ Walking

☐ Cycling

☐ Transit

☐ Other: (explain):

_____

12a. In what ways have your family's school travel habits changed for the TRIP FROM SCHOOL, since the School Travel Planning Pilot Project began?

☐ less driving (e.g. more carpooling, walking, cycling, taking public transit, etc.)

☐ not changed

☐ more driving

Comments:

_____

_____

_____

12b. If you are driving less for TRIPS FROM SCHOOL, what are you/your child doing more of?

☐ Walking

☐ Cycling

☐ Transit

☐ Other: (explain):

_____

13. Has the volume of vehicle traffic outside this school changed since the School Travel Planning Pilot Project began?

☐ decreased ☐ not changed ☐ increased

Comments:

_____

_____

_____

14. Which school travel program activities do you feel have been most effective for your family?

    (Check all that apply.) FACILITATORS CUSTOMIZE AND ADD ANY RELEVANT ITEMS NOT ON THIS LIST.

    ☐ Infrastructure improvements, e.g. signage, crosswalk upgrades

    ☐ Safety education

    ☐ Annual community events, e.g. IWALK, Commuter Challenge

    ☐ School weekly or monthly events, e.g. Walking/Wheeling Wednesdays, Trekking Tuesdays

    ☐ Walking buddies

    ☐ Newsletter

    ☐ Identification of best routes to school

    ☐ Other

    _____

15. Please share any further comments about your child's journey to and from school.

    _____
    _____

    _____
    _____

    _____
    _____

    _____
    _____

16. 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

17. If you would like to help with School Travel Planning efforts at your school (for example, serve on the School Travel Planning Committee or help put STP plan ideas into action), please contact <insert school committee member or STP Facilitator contact info> or provide your name, telephone number and email below:

_____
_____

_____
_____

THANK YOU FOR YOUR TIME. PLEASE HAVE THIS SURVEY COMPLETED ONLINE OR

RETURNED TO THE SCHOOL BY <insert deadline>.

Appendix C-Study 3 Interview Guide

- Describe the nature and extent of your work associated with school travel.
- Has your job status changed since CLASP imitative finished? If so, do you mind me asking you what your current occupational role is now? How many schools did you facilitate during the intervention
- As a STP facilitator, do you think the CLASP STP project was successful in your region/province?
- How would you define success for the project?
- What factors contributed to successful STP implementation?
- What factors hindered successful STP implementation
- Have your schools sustained STP practice following the completion of the grant?
- If you were to facilitate STP again, and looking back on your experience, is there anything you would have done differently (i.e. lessons learned- what worked-what did not work)
- What do you think are the 'next steps' to help promote School Travel Planning and help it become a standard practice across Canada?
- Are there any more salient issues that need to be explored in order to help move the STP agenda forward?
- Is there anything further that you would like to add?

Appendix D-Study 4 Interview Guide

STP QUESTIONS FOR ADULT STAKEHOLERS

SET-UP

- Describe your experience when asked to join the STP committee at _____school?
    - What was told to you and required from you regarding STP
    - What was your initial thoughts of the idea of STP?

Baseline Data Collection/walkabout

- What were your thoughts of the baseline results (e.g., AST, parent perceptions)
- Describe your experience at the school walkabout? What were your thoughts on the walkabout? Do you think it was effective?

Action Plan Development & Implementation

- After the walkabout, we started an action plan to increase AST. What did you think of the plan? Did you think the strategies discussed addressed the barriers identified at the walkabout?
- What were your thoughts on the strategies that were implemented? Were they effective? What did they accomplish?
    - STP committee meetings
    - Walk to school days
    - School Assembly
    - Poster content
    - Bike Rodeo
    - Student involvement

Follow-up results

- What are your thoughts on the follow-up results?

STP Evaluation Questions
▪ We just discussed the STP model. So overall, do you think it is an effective model? Is there anything with the model you would change? ▪ Do you think STP was successful at _____school? How would you define success? ▪ What factors contributed to success? What worked? What didn't work? ▪ Do you think the STP model can be sustainable? ▪ What needs to be done for STP to become a successful, sustainable practice ▪ How much time did you devote to STP approximately? Was it too much work?

STP QUESTIONS FOR STUDENTS

Warm up/ Demographics

1. So how old are you /what grade are you in?
2. Gender (determined by researcher)

Active School Travel related questions

1. How do you usually get/to from school (Will probe into different methods such as walking, school bus, etc)
2. How long does it take to_____(walk, be driven, be bussed)? to/from school
3. What do and what don't you like about _____ (walking, being driven, being bussed) to/from school

School Travel Planning (STP) related questions

1. During last school year, so when you were in grade_____(previous grade year), there was a program called STP, in which the goal was to increase the number of kids walking to/from school. Do you remember from last year that the school had events planned to encourage walking? (will probe and remind them of 'Walk to school' Assembly, Walk to school days, student announcements on benefits of walking to/from school).
2. Some students were involved in helping with the STP program. Were you involved in helping in any way? If so, what did you do to help?

3. Do you think involving students more could help increase and encourage more students walking to/from school? Or do you think that it is the job of the principal and teachers to help increase walking? Why or why not
4. If yes, what roles can the students play in helping increase walking?
5. So during this fall (2014), the group of people that was helping with the STP program will no longer be available. One of the goals of STP was to start it at this school, with hoping that the teachers and students can keep it going. Can you think of any other ways that students, teachers, or even parents can help encourage and increase students walking to school?

Appendix E- Meeting Notes from STP Toronto Meeting

Attendees:

- Adam Brutto, Planning Technician, TCDSB Planning Services
- Richard Christie, Senior Manager, Sustainability Office, TDSB
- Armi De Francia, Toronto STP Facilitator, Green Communities Canada
- Kristen Evers, TDSB EcoSchools, Active Safe and Sustainable Transportation Lead
- Kevin Hodgkinson, Toronto Student Transportation Group
- Jacky Kennedy, Director, Canada Walks, Green Communities Canada
- Sheldon Koo, City of Toronto, Transportation Services (on phone)
- George Mammen, University of Toronto
- Jennifer McGowan, School Travel Advisor, Metrolinx
- Ben Morell, City of Toronto, Planning
- Linda Rothman, Sick Kids/York University
- Matthew Worona, Live Green Toronto
- Katie Wittmann, Toronto STP Facilitator, Green Communities Canada
- Mary Louise Yarema, Toronto Public Health

Regrets:

- David Fitzpatrick, City of Toronto, Planning
- Colleen Hill, Heart and Stroke Foundation
- Marg Metzger, Manager, Chronic Disease and Injury Prevention, Toronto Public Health
- Debbie Black, Toronto Student Transportation Group
- Gary Poole, Associate Director of Education, Toronto Catholic District School Board
- Jamie Stuckless, Executive Director, Share the Road
- John Volek, Senior Coordinator, Planning, Accountability and Admissions, TCDSB
- Edmond Wu, City of Toronto, Planning

Discussion:

Thanks to Adam for providing a meeting room for us and to Kevin for arranging the teleconference facility.

NOTE: All presentations and relevant documents referenced in these notes are available in the Dropbox folder 'Toronto STP Pilot' under sub-folder June 9, 2015 Meeting Documents (link/invitation provided via email).

1. Three presentations were provided:

- Linda Rothman, PhD: Child Pedestrian-Motor Vehicle Collisions and Walking to School in Toronto

  The research conducted to date shows strong links between the built environment through school neighbourhoods and child pedestrian collisions; not only should active school travel programs consider the health and environmental benefits but more attention needs to be paid to collision data. The research also indicates that we need more built environment interventions in school neighbourhoods, not just for children travelling to/from school but for children travelling at other times. One recommendation that should be noted is to include injury prevention targets into ASST policies and strategies.

  Some discussion around capital costs vs. operational costs, i.e. adult crossing guards are paid for out of operating budgets and is an ongoing cost, whereas traffic calming techniques like speed humps are paid for out of capital costs and are a one-time expense. Linda's team will be conducting further research into the effectiveness of adult crossing guards and the impact on child pedestrian collisions.

- George Mammen, UofT: Evidence on STP: Findings over 4 years of STP research

  George's research on the national School Travel Planning results provide some very useful data to support multi-year funding for STP at all levels of government.

- Matt Worona, City of Toronto, Environment and Energy Office: Art on the Street Projects and STP

  Some discussion about how the City could better accommodate these types of community-led projects that take place on residential streets; the Portland example cited has incorporated street artwork into their block party application process so it's much more streamlined and easy for neighbours to take on. Portland has also provided funds in their annual budget for street art, not just new projects but also to maintain existing ones.

Katie noted that St. Raphael is quite interested in pursuing a street art project but is encountering difficulties with city processes. Kevin backed this up.

Matt has provided a link to an article that recently appeared in Spacing magazine: MESLIN: Why don't we do it in the road? that highlights a Toronto example. Ottawa is also preparing Guidelines – Matt has the details.

- Armi and Katie provided status updates on the 10 schools/clusters:
  - For details on activities related to Safe Kids Week (May 4-8), Bike to School Week (May 25-29), and other spring school active travel events refer to the document Toronto STP Schools-Spring 2015 AST Activities in the Dropbox folder 'Toronto STP Pilot'.
  - School status re travel plans: full school details related to the progress of the STP process can be found in the recently updated STP Toronto Backgrounder located in the Dropbox folder 'Toronto STP Pilot'.
  - Jacky noted that Northlea PS in Leaside, which had been funded through the Heart & Stroke Foundation's private donation from RioCan, is now a Ministry of Education funded school. Katie will advise which of the other schools will be funded through HSF/RioCan.

- Other Business:
  - Kevin provided the matrix, which he asks all team members to complete with respect to what they are doing to support the eight general themes of ASST (download from the Dropbox folder and forward completed documents to Kevin or Jacky).
  - Kevin provided sampling of data that the Toronto Student Transportation Group has available to use to support ASST (attached).
  - Kevin asked that if other team members have other data points they would like to share please forward to me.

- Discussion:
  - We ran out of time so we skipped feedback/updates from team – if you have information you'd like to share with the group please forward to Jacky for distribution.
  - Since the meeting a second Ottawa pilot WSB video has been released: http://www.ottawaschoolbus.ca/. The WSB page has been updated following recent webinar: http://saferoutestoschool.ca/walking-school-bus.

Meeting adjourned at noon. Notes prepared by Jacky Kennedy.

Appendix F- CLASP Meeting Agenda

Coalitions Linking Action & Science for Prevention (CLASP)

Knowledge Exchange Meeting

Tuesday, November 17th and Wednesday, November 18th, 2015

Toronto, Ontario

One King West Hotel & Residence

Objectives of the Meeting:

Day 1:

1. To discuss strategies for utilizing program evaluation to inform program adaptation and sustainability actions
2. To learn from other CLASPs about progress to date, challenges, and what's working well in implementing CLASP evaluation plans
3. To share CLASP implementation materials and knowledge products
4. To learn how to utilize project evaluation to inform impactful and influential stories

Day 2:

5. To discuss how the evaluation data collected by the CLASPs feeds into the cross-CLASP evaluation framework
6. To identify the key policy change decision-makers to reach through CLASP KTE efforts
7. To identify the strengths, weaknesses, opportunities, and threats that will facilitate or pose challenges in reaching key decision-makers

Day 1 – Tuesday, November 17 2015

Time	Item/Speaker	Notes
8:15 – 9:00am	**Registration & Breakfast**	
9:00 - 9:15am	**Welcome and Opening Remarks** **Deb Keen,** *Director* Prevention & Research, Canadian Partnership Against Cancer **David Mowat,** *Senior Scientific Lead* Population Health, Canadian Partnership Against Cancer	• Acknowledge Jon's retirement • Introduce David Mowat as new SSL
9:15 – 10:05am	**Utilizing Results from Program Evaluation for Program Adaptation and Sustainability** **Session Chair: Deb Keen**, *Director* **Jacky Kennedy**, *Director* Canada Walks, Green Communities Canada & **George Mammen**, *PhD Candidate* University of Toronto **Barbara Dobson**, *Principal Researcher* Goodson Consulting Inc.	• Presentations (15 min): ○ Barb Dobson? ○ Jacky Kennedy? • Panel discussion/Q&A (20 minutes)
10:05 – 10:30am	**Break & Refreshments**	
10:30 – 11:45am	**CLASP Evaluation Update**	• Round-the-room speed dating format • 5 CLASPs x 15 minutes • Presentations on: eval framework,

Time	Item/Speaker	Notes
		tools, data collected so far
11:45am – 12:00pm	**Jon Farewell**	
12:00 – 12:30pm	**Lunch**	
12:30 – 2:00pm	**Marketplace**	
2:00 - 2:45pm	**Finding Your Narrative: Mining Evaluation Data for Impactful Stories** **Tim Keenleyside,** *Partner & Co-Creative Director* Fingerprint Communications	• Need to discuss this opportunity with Tim • WoW and NSC are doing this as well
2:45 – 3:00pm	**Break & Refreshments**	
3:00 – 4:15pm	**Break-out by Setting**	• Apply learnings from Tim's presentation? • Confirm breakout themes
4:15 – 4:30pm	**Review Day 2 Agenda** **Chris Politis**, *Program Manager* Prevention, Canadian Partnership Against Cancer	

Day 2 – Wednesday, November 18 2015

8:15 – 9:00am	**Breakfast**	
9:00 - 9:15am	**Welcome and Introductory Remarks** **Deb Keen,** *Director*	
9:15 – 9:45am	**Intersection of CLASP Evaluations with Cross-CLASP Evaluation Framework** **Chris Politis**, *Program Manager*	• Include focus on policy outcomes • Refresh on evaluation tools
9:45 – 10:30am	**Mapping Policy Change Decision-makers** **David Mowat**, *Senior Scientific Lead*	
10:30 – 11:00am	**Break & Check-Out**	
11:00am – 12:00pm	**Break-out by CLASP**	• SWOT/tool exercise • Breakout by CLASP?
12:00 -1:00pm	**Take-Away Lunch and Adjourn**	
1:00 – 4:00pm	**Intra-CLASP Meeting Time**	