

# How do school travel planning stakeholders frame active school travel in Ontario, Canada?

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## Abstract

This is the abstract.

It consists of two paragraphs.

*Background:*

*Methods:*

*Results: Conclusions:*

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## 1. Introduction

### 1.1. School travel planning in Canada

Walking and bicycling to school, commonly known as active school travel or active school transportation (AST), has been declining in Canada and North America for decades (???), with levels much lower than other developed countries like The Netherlands (???) and Japan (???). This trend has prompted a multi-sector response to identify strategies to increase AST, the most popular of which is a growing interest in school travel planning across Canada.

School travel planning (STP) is a “school-specific” intervention led by a facilitator that brings together a committee of stakeholders from diverse sectors including education, planning, transportation, and public health (???). Parents and parent councils also typically have a role in supporting or implementing STP. The intervention encourages participation from the broader community and collaboration between involved stakeholders, who contribute their expertise to remove “school-specific” barriers to AST and to identify strategies for promoting and encouraging AST. STP may also involve other stakeholders including local advocacy groups or environmental organizations who are familiar with the state of AST at the community-level. Buliung et al. (???) piloted an STP intervention at 12 schools in 4 Canadian provinces and reported that it increased AST rates and led to a “mobilization of diverse community resources”. Since this seminal study, STP interventions have become increasingly popular and common at schools across Canada and have even attracted funding from provincial governments.

### 1.2. Correlates of active school travel

Factors that influence AST are typically conceptualized according to the socioecological model whereby children’s travel behaviour is understood within the context of their household, social, and built environments (see ???). At the individual level, older child age is often associated with AST (???; ???; ???). There is some evidence that gender is a determinant of AST (???; ???), although this is not a strong or consistent finding (???; ???). Distance between home and school is associated with AST (???; ???; ???; ???) with less AST reported among children who have to travel farther to school. Car ownership is an important household-level influence on AST (???; ???; ???), as is household income (???). Parental perceptions of the environment (???; ???) and children’s skills (???) also influence whether they allow their children to walk or cycle to school. Finally, many studies have found that the quality of the built environment (???; ???) and active travel infrastructure (???) facilitate AST. Concerns about traffic and strangers have been reported by parents who drive their children to school (???). The consensus is that all of these factors are interrelated and that interventions ought to target multiple factors in order to increase walking and bicycling levels to school.

### 1.3. Benefits of AST

The desire to increase AST is warranted - there is strong evidence that children who walk and bicycle to school accrue physical and mental health

benefits. Many studies and reviews have focused on the association between AST or CIM and physical activity (e.g., ???; ???; ???), with findings consistently demonstrating that children who travel by walking or bicycling to school are more active than their peers who do not use active travel. More recently, researchers have been exploring the link between transport and children’s wellbeing (???; ???), which has relevant applications to the study of school travel and satisfaction (see ???). CIM is also important for different domains of children’s health and wellbeing (???). It offers benefits such as increasing traffic and safety skills, boosting spatial awareness when navigating public spaces, and providing more opportunity for social interaction with peers (???).

#### *1.4. Encouraging adoption of active school travel*

To increase rates of walking and bicycling independently to school, Riazi et al. (???) state: “it will be vital for interventions to target modifiable factors, including children’s and parents’ perceptions of their social environment.” Parents play the important role of “gatekeeper” by either granting or restricting CIM licenses, meaning whether children can travel alone (???). For this reason, stakeholders involved in STP produce information targeted for both children and parents, and aim to involve the broader community in their efforts to increase the number of children walking and bicycling to school..

However, the ways in which interventions like STP are framed to their target audience can ultimately influence how they are received and whether they result in behaviour change. The correlates of AST are important knowledge for policymakers because they identify points of intervention and potential benefits that ought to be communicated to the public encourage adoption of AST and to build support for new planning paradigms. What is less clear is how CIM plays into the consideration of policymakers when they act on the objective of increasing AST.

Any goals for AST, and also CIM, ought to be clearly articulated and reflected in transportation plans and policies to guide initiatives. Presently, however, there has been no study to date that explores how Canadian municipalities and schools frame and discuss AST with the public. Content analysis is one method to analyze how particular issues are framed to groups of people, for instance parents or educators who might be inclined to support AST. It attempts to understand how information presented from a “communicator” leads the “receiver” to a desired response (???). In a recent paper (???), framing analysis was applied to review municipal policies addressing climate change in four western Canadian cities. Natural language processing (NLP) was used for a similar purpose to examine content in general plans from Californian cities (???). The way policy issues are framed is important to understand because it plays a role in either altering or preserving the existing social perceptions.

#### *1.5. Study aim*

In 2017, the provincial government of Ontario in Canada issued funding to Green Communities Canada (GCC), a non-profit organization, to launch

the *Ontario Active School Travel* (OAST) program. The program provides funding for school and community-based initiatives and supports stakeholders in municipalities across the province to implement STP and other interventions aimed at increasing AST. As of 2021, OAST has funded  $X$  projects in Ontario. GCC continues has funded projects across Ontario led by collaborative groups involving school boards, municipal or regional governments, and regional transportation consortia. The latter are dedicated transportation bodies that deliver efficient and effective transportation services, which generally focus on providing the school busing service to families in their associated region.

The aim of this paper is to analyze how AST is framed by STP stakeholders in Ontario, Canada. We used topic modelling and qualitative content analysis to examine how the benefits and barriers of AST are presented to the public and which solutions for improving AST are identified in local policy documents from Ontario municipalities and school boards. We compared these documents to a selection of studies on AST to explore the extent to which research findings have trickled down to inform policy and planning for AST interventions.

## 2. Data

### 2.1. Data retrieval

#### 2.1.1. Policy documents

We then assembled a collection of publicly available documents that were sourced online from the main stakeholder groups involved in STP initiatives in Ontario: i) English school boards; ii) municipal government; and iii) transportation consortia. Non-profit organizations, police services, and advocacy groups are other stakeholders who may play a role in supporting AST and/or STP, but this study does not include any documents from these groups because they are not consistently participating in initiatives.

The search was guided first by a list of all English school boards across Ontario. The websites of each school board were searched for pages related to transportation or school travel. These pages were manually downloaded. Next, we collected documents by searching municipal government and transportation consortia websites. The latter were identified based on geographic area (i.e., the municipalities and/or transportation consortia who are in the same geographic area of each school board). Pages related to active transportation or school travel were manually downloaded. Webpages were included in the corpus if they were easy to find. This primary criteria was important since our analysis pertains to how such issues are framed to the public. Thus, these pages ought to be easy to find, which we defined as requiring no more than 2-4 separate links from the initial Google search.

The initial corpus of policy documents included 64 relevant webpages (i.e., one page or more) from all main stakeholder groups. It is important to note that school boards, municipalities, and transportation consortia may or may not publish information about their involvement in AST and STP efforts on their respective websites or in policy documents. Search results are summarized in Table 1.

Table 1: Search results from the main STP stakeholder groups.

Stakeholder	Total	Included
English school boards	62	31
Municipalities or regions	62	25
Transportation consortia	39	8

### 2.2.1. Academic papers

### 2.2. Data cleaning

A multi-step process was conducted to ensure that the analysis captured as much content as possible from both the policy documents ( $n = 64$ ) and academic papers ( $n = 233$ ). To begin, the webpages, which were manually downloaded in portable document format (PDF), were trimmed so that pages that only consisted of tables, figures, or references were removed. Many academic papers were in a two-column format, which is not ideal for conversion to `txt`. We adapted a procedure (<https://stackoverflow.com/questions/42541849/extract-text-from-two-column-pdf-with-r>) to read the two-column PDF documents so that they would be converted correctly. Four academic papers did not join sufficiently and were taken out of the corpus due to the substantial time required to manually correct their inconsistencies.

Next, we converted the trimmed PDF documents into `txt` files so that they could be imported in `R` for topic modelling. We then proceeded to a manual cleaning phase where we removed any remaining tables, figures, references, headers/footings, and captions that could not be trimmed. Manual corrections were also required for certain pages in academic papers that remained in two-column format after the conversion process. This typically occurred on pages that had a table or figure which disrupted the text. Finally, we reviewed all of the documents to remove hyphenation by line breaks and to keep hyphenated words together on the same line. Any ligatures (e.g., combinations of characters or letters that were not properly detected during the conversion process) were fixed by inserting the unicode sequence of character to replace the missing sequence of characters.

We also manually removed any extraneous material in the academic papers that did not pertain to AST specifically. This included footnotes, references, acknowledgments, and conflict of interest statements in the academic papers. We removed all phone numbers, inserted links to other webpages, personal names, and content not to specific to AST from the policy documents that were retrieved from the websites of school boards, municipalities, and transportation consortia.

In the final step before analysis, we removed all blank spaces, punctuation, capitalization, and numbers. English stop words, which are common words such as *and* or *the* as identified in a predetermined list by Lewis et al. (???) and other frequent terms in the documents like “school” and location names were removed from the corpora.

### 3. Methods

#### 3.1. Natural language processing

Natural language processing  
Silge and Robinson (???) is

We’ve been using the `unnest_tokens` function to tokenize by word, or sometimes by sentence, which is useful for the kinds of sentiment and frequency analyses we’ve been doing so far. But we can also use the function to tokenize into consecutive sequences of words, called n-grams. By seeing how often word X is followed by word Y, we can then build a model of the relationships between them.

We do this by adding the token = “ngrams” option to `unnest_tokens()`, and setting `n` to the number of words we wish to capture in each n-gram. When we set `n` to 2, we are examining pairs of two consecutive words, often called “bigrams”:

#### 3.2. Content analysis

Content analysis is a method to examine content from texts including the message itself, the sender(s) of the message, the recipients of the message, or the impact of the message (???). Words or phrases are the unit of analysis. *Qualitative* content analysis

#### 3.3. Reproducibility

This paper is an example of open and reproducible research that uses only open software. All data were obtained from publicly available sources and organized in the form of a data package. Following best practices in spatial data science (???), the code and data needed to reproduce or conduct a similar analysis for other regions in North America or elsewhere are available for download.

### 4. Results

#### 4.1. Word and document frequency

We analyzed word and document frequency for each corpus. Table 2 presents the most common terms found in the municipal, transportation consortia, school board, and academic documents.

#### 4.2. Bigrams and correlations

Bigrams for each policy corpora are shown in Figures ??, ??, and ??. These figures help to make further sense of the word frequencies reported above, and highlight the main ideas that are presented to the public in each of the policy corpora. Municipalities primarily discuss “physical activity” ( $n = 53$ ) and “public health” ( $n = 19$ ) in the context of active travel. In addition, “travel planning” ( $n = 19$ ), “bike lanes” ( $n = 16$ ), and “safe routes” ( $n = 14$ ) are also identified, conceivably as interventions and built environment factors that support AST. Key issues related to AST such as “traffic safety” ( $n = 10$ ), “air quality” ( $n = 9$ ),

Table 2: Top 25 terms identified in each corpora. Document frequencies are also indicated.

Municipalities			School Boards			Transportation Consortia			Academic Papers		
Term	Count (n)	Documents (n)	Term	Count (n)	Documents (n)	Term	Count (n)	Documents (n)	Term	Count (n)	Documents (n)
active	248	26	active	124	13	active	67	7	walking	5137	222
travel	126	20	bus	120	20	walking	55	8	parents	3946	211
walking	90	25	students	119	30	walk	49	8	distance	3271	205
bike	87	15	travel	103	11	travel	41	8	students	2960	173
cycling	78	22	student	93	25	students	39	9	cycling	2753	171
safety	71	21	information	65	21	safety	32	6	environment	2631	202
health	65	21	schools	61	19	help	29	9	activity	2371	209
physical	63	18	board	61	26	schools	25	9	traffic	2353	208
traffic	59	20	walking	57	17	children	25	6	choice	2299	169
road	56	13	walk	53	13	community	24	7	physical	2256	215
activity	55	14	district	50	23	bus	18	4	trips	2194	170
schools	52	14	weather	40	11	route	17	5	car	2148	195
children	47	15	safety	40	19	zone	16	6	safety	2140	204
plan	45	16	safe	39	19	resources	16	6	time	2101	218
students	44	14	services	37	17	day	16	4	factors	2101	216
walk	43	18	planning	37	7	safe	15	5	child	2085	187
public	39	15	parents	32	17	planning	15	4	walk	2008	200
will	38	15	sustainable	31	8	physical	15	7	public	1983	208
community	37	19	may	30	13	healthy	14	6	age	1783	211
safe	34	16	children	30	14	traffic	13	6	urban	1768	200
benefits	32	17	day	29	13	support	13	6	home	1715	199
play	31	2	child	29	12	families	13	5	social	1713	191
resources	30	13	cancellations	29	13	way	12	5	different	1713	215
healthy	29	16	routes	28	14	student	12	5	mobility	1659	138
routes	27	13	physical	28	11	region	12	4	significant	1650	208

Note:

<sup>a</sup> Count (n) refers to the total number of times the term is found in the corpora

<sup>b</sup> Documents (n) refers to the total number of documents that feature the term

and “greenhouse gases” (n = 9) are conveyed to the public but in fewer documents. Similar word bigrams are found in school board documents: “travel planning” (n = 33), “safe routes” (n = 15), “physical activity” (n = 10), and “public health” (n = 10) are among the most common bigrams. Unlike other STP stakeholders, school boards also consider “inclement weather” (n = 24) “bus cancellations” (n = 13). This is likely because many students in Ontario travel by school bus and this information is presented alongside AST. Finally, transportation consortia documents highlight “physical activity” (n = 10), “pedestrian safety” (n = 8), “crossing guards” (n = 6), “travel planning” (n = 6), and “walk zones” (n = 6). Bicycling is notably absent from transportation consortia documents.

The academic corpora includes several common bigrams that were also found in the policy documents including “physical activity” (n = 1566), which is the top bigram, “traffic safety” (n = 308), and “safe routes” (n = 268). However, many other factors relating to AST are identified in the research literature that are not presented to the public through policy documents. After “physical activity”, “built environment” (n = 1175), “independent mobility” (n = 774), and “urban form” (n = 352) are the most frequent pairs of consecutive words. Academic papers also often discuss “distance home” (n = 258), “car ownership” (n = 254), “household income” (n = 254), and “population density” (n = 205), which are factors that have been known to influence AST. It is evident that many papers investigate gender differences in AST given that “boys girls” (n = 211) is a common bigram. Finally, the presence of “statistically significant” on the list of top-25 bigrams underscores the importance of identifying factors that are not due to chance but that likely influence AST.

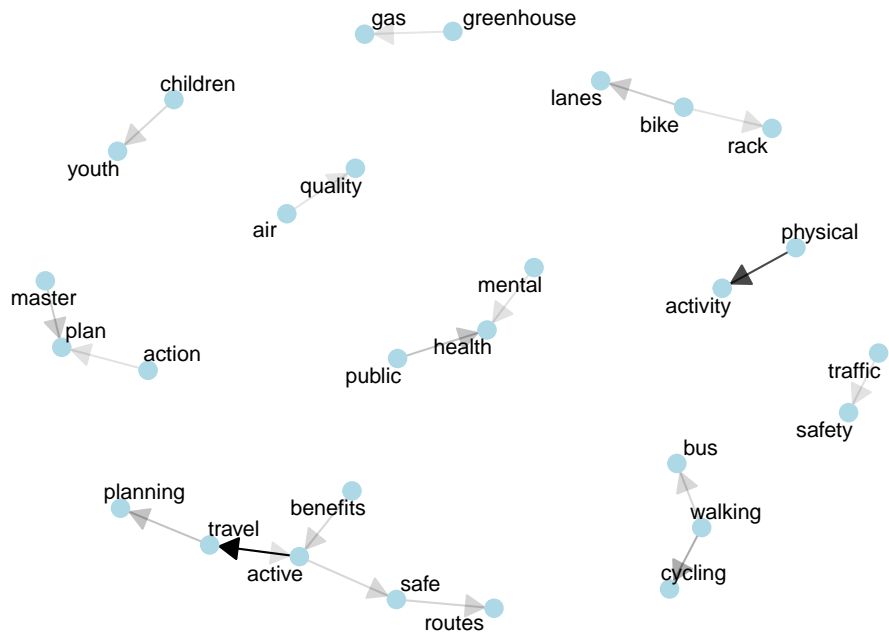


Figure 1: Most common bigrams found in the municipal or regional government documents.

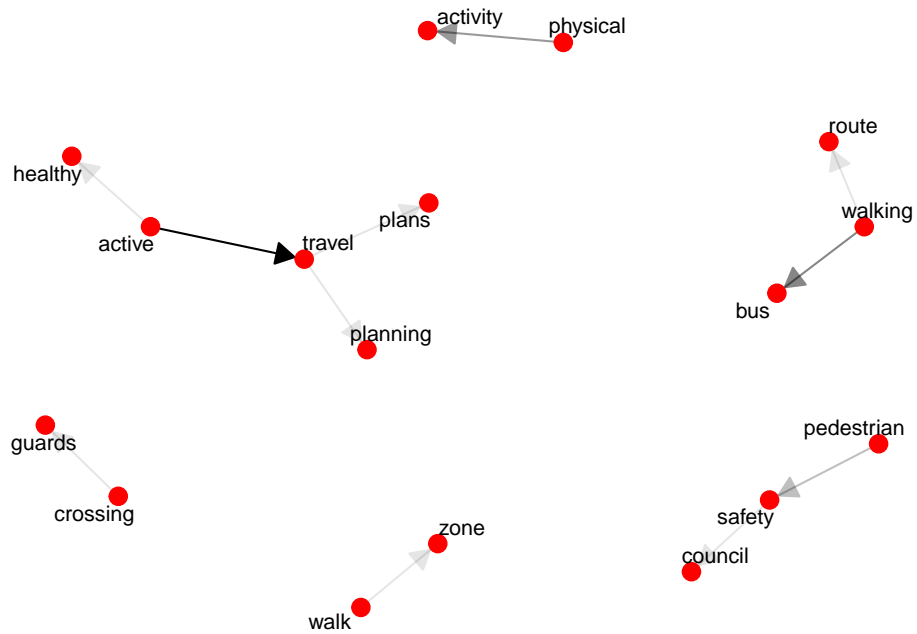


Figure 2: Most common bigrams found in the transportation consortia documents.



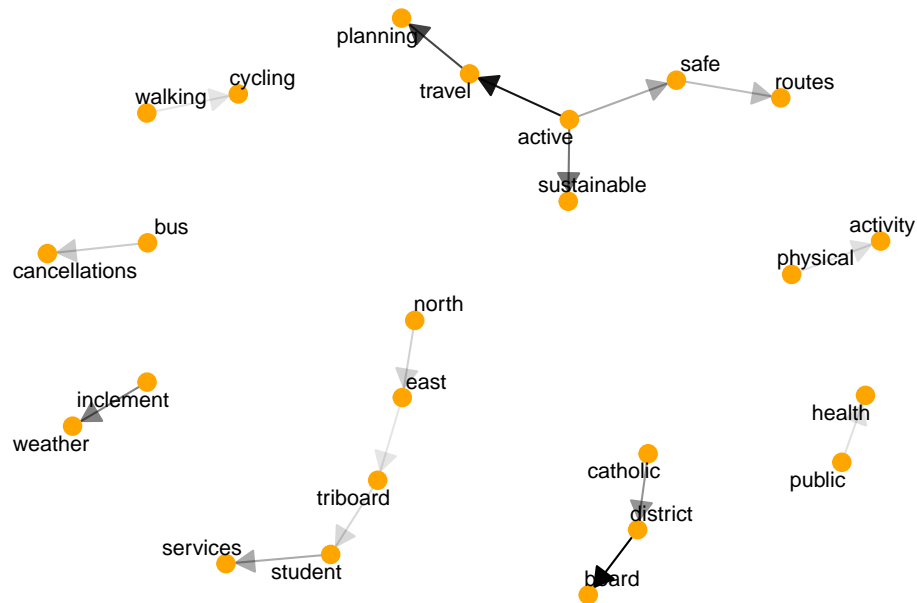


Figure 3: Most common bigrams found in the school board documents.

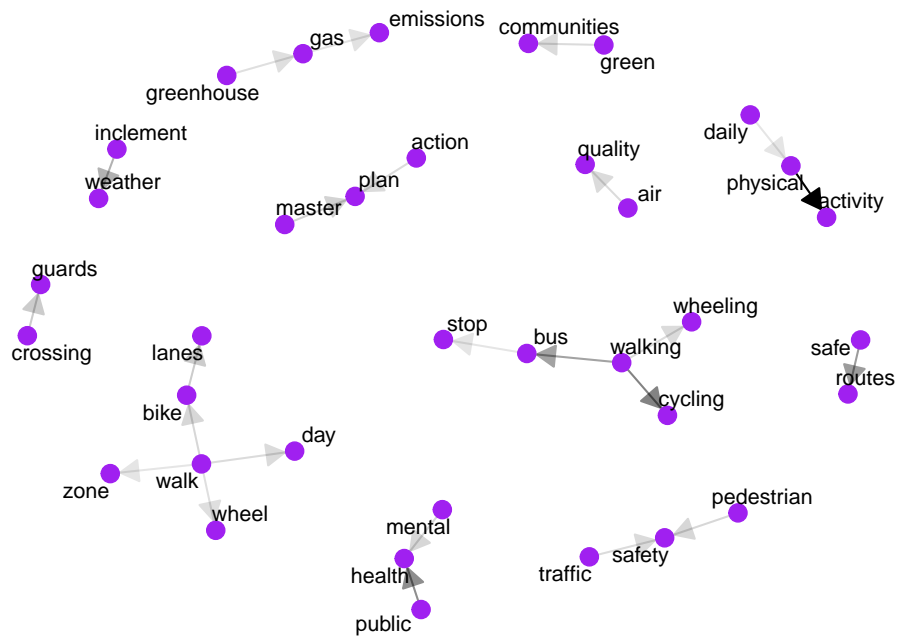


Figure 4: Most common bigrams found in all of the policy documents (i.e., school board, municipality, and transportation consortia combined).

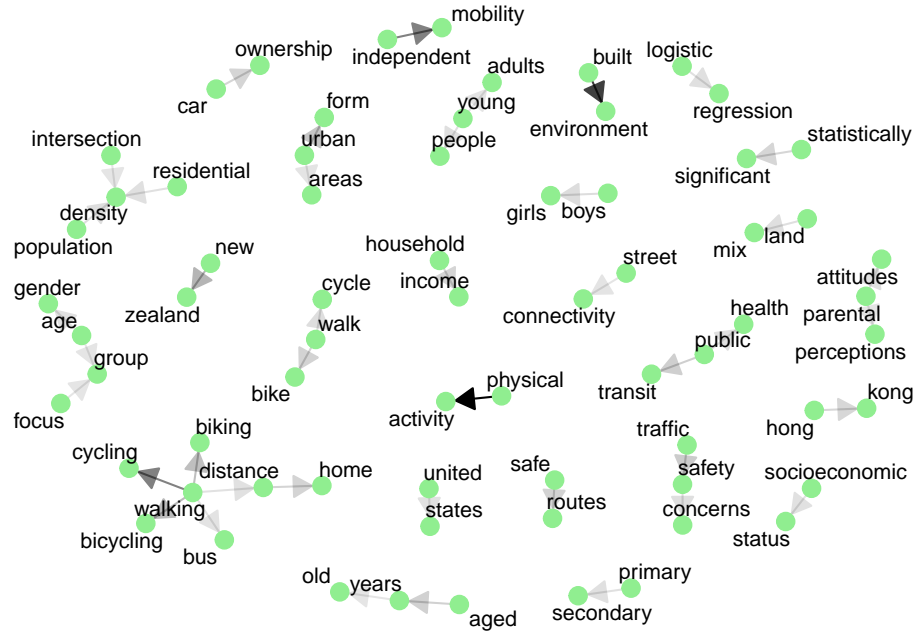


Figure 5: Most common bigrams found in the academic papers.

#### 4.3. Qualitative findings of policy documents

We used the most common bigrams from the policy corpus (see Figure 4), which includes all documents from municipalities, transportation consortia, and school boards, as categories of codes for qualitative content analysis. This means that we interpreted the bigrams to represent the main ideas that STP stakeholders are communicating to the public about AST.

## 5. Discussion

### 5.1. Framing of AST in policy documents

The presence of “travel planning” among the top pairs of consecutive words for municipalities, school boards, and transportation consortia reflects the

### 5.2. Framing of AST in academic papers

Notably absent from the policy corpora is children’s independent mobility (CIM). AST is one of the most common opportunities for children to travel without adult supervision on a regular basis, yet STP stakeholders do not discuss this topic. CIM was first described by Hillman et al. (???) as the freedom of children to travel and play within their neighborhood and city without the presence of adults. The ability of children to reach destinations such as school or local parks by walking or bicycling on their own is a growing area of research that is related to and often overlaps with the body of literature on AST.

In a study conducted in multiple Canadian cities, Riazi et al. (???) found that a range of factors such as child grade, car ownership, and parental perceptions of safety and environment were associated with CIM. Parental perceptions of children’s autonomy also influences CIM (???). In addition to independent trips to school, children also travel by walking or bicycling on their own to other non-school destinations such as outdoor spaces (i.e., parks, playgrounds), the homes of family members or friends, shopping places, and libraries, to name a few (???; ???).

### *5.3. Implications for School Travel Planning*

School boards and educators are an influential contributor to AST and STP efforts in Canada.

### *5.4. Limitations*

## **6.1. Conclusion**

### *6.1. Future research*

## **Acknowledgments**

This research was completed using open software, and the authors wish to acknowledge the developers of the following R packages: dplyr (???), ggraph (???), ggplot2 (???), igraph (???), pdftools (???), readr (???), reshape2 (???), stringr (???), text2vec (???), textdata (???), tidyr (???), tidytext (???), tm (???), tools (???), topicmodels (???), widyr (???), word2vec (???), wordcloud (???), DiagrammeR (???), and kableextra (???).

## **References**