



Encouraging active transportation to school: Lessons learned from implementing a walking school bus program in Northeastern Ontario

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ABSTRACT

Introduction: Few Canadian children meet physical activity guidelines. Active transportation to school may be a way to increase physical activity and walking school buses have shown promise; yet, few studies consider Northern settings.

Methods: Experiences of individuals and factors related to implementation of a walking school bus pilot in Northeastern Ontario were explored using semi-structured interviews (parents), and focus groups (students and conductors). Data were audio-recorded, transcribed verbatim, and categorized using thematic analyses.

Results: Six themes emerged from the data: (1) Health and Social Benefits; (2) Learning Safety Skills; (3) Participant Satisfaction; (4) Environmental Factors; (5) Implementation Challenges; and (6) Moving Forward. Taken together, an increase in physical activity, socializing and community participation, being outdoors, benefits to mental health, knowledge of road safety, and perceptions of environmental influences were revealed as positive outcomes. Although conductors and students were worried about distance, parents perceived the distance as acceptable. Despite initial challenges, participants generally agreed the pilot was well organized. University student volunteers played a large role in success.

Conclusions: In Northeastern environments, opportunities for active transportation to school and physical activity are influenced by many factors. Sustained initiatives are needed to improve upon the determinants of active transportation to school at the various ecological levels where they can be most effectively targeted.

1. Introduction

Physical inactivity in children and youth is a global public health concern (Colley et al., 2011; Hallal et al., 2012; Nader et al., 2008; Troiano et al., 2008). Less than 20% of children and youth worldwide meet the World Health Organization (Hallal et al., 2012) guideline of 60 min of daily moderate-to-vigorous physical activity. Canadians are no exception as only 35% of 5- to 17-year-olds

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(ParticipACTION, 2018) meet recommendations. The foundations of a physically active lifestyle are established at a young age (Telama, 2009; Telama et al., 2005; Tammelin et al., 2014). Childhood physical activity predicts adult physical activity (Telama et al., 2005; Telama, 2009), yet physical activity levels decline 70–90% between ages 8 and 19 (Nader et al., 2008; Troiano et al., 2008; Kimm et al., 2002). Concern is rooted in the association between low physical activity levels and negative health outcomes (Ebbeling et al., 2002; Hossain et al., 2007; Tremblay and Willms, 2000). School age is thus a necessary time to stress the importance of increasing physical activity (Davison et al., 2008; Ferreira et al., 2007).

It has been suggested that active transportation (Public Health Agency of Canada, 2017) is one of the easiest and most inexpensive way to increase physical activity in the daily lives of children and youth (Jones et al., 2019; Larouche et al., 2015; Ramanathan et al., 2014; Shephard, 2008). As one example, Stewart et al. (2017) reported adolescents who engaged in active transportation to school accumulated more moderate-to-vigorous physical activity and were more likely to meet recommendations than peers who transported passively. Benefits also include improving self-confidence, independence, and cognitive performance. Furthermore, a decreased likelihood of being overweight has been identified (Ramanathan et al., 2014; Salmon et al., 2005; Southward et al., 2012).

Despite the benefits, the rates of active transportation have demonstrated a decline across the globe (e.g., Chillon et al., 2013; McDonald, 2007), including in Canada (Buliung et al., 2009). Recent reports indicate that less than half of Canadian children and youth engage in active transportation to school. Parent- and self-report data indicate only 21% of 5- to 19-year-olds use active transportation; whereas 63% use inactive transportation, and 16% use a combination of active and inactive transportation (2014–2015 CANPLAY, CRLRI, c.f. ParticipACTION, 2018). Researchers have thus expressed the need for comprehensive national and international initiatives to tackle the decline (Pate et al., 2016).

Various interventions have been implemented, and systematic reviews report small, but positive effects on increasing active transportation to school (Buttazzoni et al., 2018; Chillon et al., 2011; Villa-Gonzalez et al., 2018). One prominent intervention, School Travel Planning, involves assembling community partners to develop context-specific strategies (Green Communities Canada, 2012; Hinkson and Faulkner, 2018). Context-specific interventions are beneficial due to consideration of features of children, families, schools, and neighbourhoods where they reside (Davison et al., 2008; Larouche et al., 2015; Lee et al., 2008); it has been argued that “social norms, environment, and policy” all contribute to active transport (Buttazzoni et al., 2018, p. 116). Yet, a systematic review of intervention methodologies in North America (Buttazzoni et al., 2018) identified that only one of four Canadian studies focused on a specific context (i.e., Toronto, Ontario; Faulkner et al., 2014).

To this end, the current study reports on lessons learned from one recommended action item put forth by a School Travel Planning committee in a mid-sized Northeastern Ontario community (population of 54,000; Statistics Canada, 2017). Specifically, the committee sought to establish a pilot-walking school bus program as a means to encourage active transportation to school (Kearns et al., 2003; Engwicht, 1992). Introduced to resolve problems with school traffic, Engwicht (1992) suggested that adults “walk a set route, much like a school bus collecting children along the route and deliver them safely to school” (p. 143). Although informal walking school buses, whereby adults take turns walking a group of neighbourhood children to school, are relatively common, literature has focused on more structured programs. Walking school buses have been implemented in several countries, including Canada, to address health (Heelan et al., 2009), safety (Mendoza et al., 2012), and social (Kingham and Ussher, 2007; Neuwelt and Kearns, 2006) outcomes (Victoria Transport Policy Institute, 2017). For example, a positive association was revealed between the number of walking school buses and the number of children walking to school. Children who engaged in walking school buses obtained increased levels of physical activity (Smith et al., 2015). Related literature has indicated parents are more likely to allow children to encourage walking to school on a walking school bus than individually, as many will not permit their child to walk without adult supervision (Collins and Kearns, 2010; Kearns et al., 2003; McDonald and Aalborg, 2009). Children have also reported a preference for walking school buses for reasons including, social enjoyment, appreciation of independence, health benefits, and feeling safer walking in groups (Neuwelt and Kearns, 2006; Smith et al., 2015).

Overall, walking school buses, and more general interventions intended to encourage walking to school, have shown both progress and promise. However, it can be argued that both research and policy-making around the implementation of these initiatives remain in their infancy (Nikitas et al., 2019; Smith et al., 2015). In particular, literature is currently limited to large urban settings and warm climates. Few studies have considered Northern settings.

Generally, the Canadian climate influences opportunities for physical activity (Hickson et al., 2012), and thus active transportation to school. A systematic review (Tucker and Gilliland, 2007) describes ensuing effects of poor/extreme weather as a significant barrier to physical activity participation. Lewis et al. (2016), described an optimal temperature range between 20°C and 25°C for moderate-to-vigorous physical activity in Canada. As such, reduced physical activity levels (i.e., average daily steps and steps) have been reported in Canadian youth in winter months, particularly in Northern Ontario, and especially for young children (i.e., grade 3; Jaunzarins et al., 2014). Although two studies displayed no seasonal differences in active transportation to school across Ontario (Robertson-Wilson et al., 2008) and specifically in Toronto (Mittra and Faulkner, 2012), recent work (Larouche et al., 2019) in New Brunswick revealed the odds of using active transportation to school were significantly lower during winter months compared to fall.

Students in Northeastern Ontario face unique active transportation to school challenges. Not only are dwellings more disperse (Statistics Canada, 2017), and distances for school bus eligibility shorter (Near North District School Board, 2009; Toronto District School Board, 2014), but pedestrian infrastructure is sparse, and weather is more extreme (Government of Canada, 2019a) compared to more southern locations in Ontario (e.g., Toronto). Implementation of the pilot walking school bus in the current study was thus meant to help navigate these challenges as a means to encourage active transportation to school in the area. The present research explored the experiences of individuals (i.e., parents, students, and conductors) involved with the pilot walking school bus program to provide insights into the strengths, weaknesses, and lessons learned from the School Travel Planning initiative in Northeastern Ontario. Hypotheses were not appropriate, given the exploratory nature (Creswell and Clarke, 2017).

2. Methods

2.1. Trotibus walking school bus

The program was developed by the Canadian Cancer Society and originated in the province of Quebec. Around the same time the School Travel Planning intervention was being implemented in Northeastern Ontario, the Canadian Cancer Society received funding through a nation-wide competition (the Play Exchange) organized by the Public Health Agency of Canada to expand the Trotibus in other parts of Canada. Upon hearing of this funding, the third author approached the Canadian Cancer Society, and they agreed to provide conductor training, signage, and vests for the pilot walking school bus program.

The walking school bus was organized by a community health promoter with the Healthy Schools and Families team (third author) at the local public health unit and supported by the local school board. As a result, the school board assumed liability so long as organizers ensured that their risk management policies and guidelines were adhered to. Two elementary schools were selected as representative of the area and unique challenges. Furthermore, they were in a state of readiness to initiate a walking school bus. School 1 is a 'neighbourhood' elementary school with approximately 200 students. According to a School Travel Planning survey done at the start of the project, 50% of students were eligible for bus transportation (i.e., walking distance from where driveways meet road, following the shortest safe route along public roads and established, maintained walkways: >0.0 km for Junior/Senior Kindergarten, >1.0 km for grades 1–3, >1.6 km for grades 4–6; [Nipissing-Parry Sound Student Transportation Services, 2019](#)) and approximately 26% of students at this school used active modes of transportation to travel to and from school. The roads in the area are shaped in a Loops and Lollipops pattern and lack pedestrian infrastructure. School 2 is a French immersion circa 1970s downtown elementary school with approximately 500 students drawn from around the city, including rural outskirts. Most roads in the vicinity, shaped in a grid, have at least one sidewalk. Data from the School Travel Planning survey indicated 89% of students were eligible for bus transportation and 4% of students at the school used active modes of transportation to travel to school.

Volunteer walking school bus conductors were primarily university/college students who received course credit as a community placement and parents from the participating schools. Remaining conductors included teachers from the participating schools, seniors from nearby retirement residences, and university/college student volunteers who received no course credit. All obtained criminal background and vulnerable sector checks and completed an online training module developed by the Canadian Cancer Society. Each conductor provided their preferred routes, availability (i.e., specific day(s) of the week; morning or afternoon shift), and their desired commitment (i.e., number of shifts per week). The days of the week on which the walking school bus was offered was determined based on volunteer capacity and the ability to maintain a 6:1 student to conductor ratio.

Although every attempt was made to organize the walking school bus prior to the start of the school year in September (e.g., starting registration the preceding school year), the initiative commenced in October 2016. Students that "could" walk to school (i.e., those that lived within a 2 km radius) were targeted for the pilot program, as there are many instances where children fall just outside the range of being bussed, which results in their parents driving them to school. School 1 had three routes, once per week, with 14 registrants. School 2 had two routes, five days per week, with 25 registrants; however due to a holiday and professional development day, the walking school bus was offered four days for the first two weeks. Ninety-five percent of registrants were bus eligible (i.e., >0.0 km for Junior/Senior Kindergarten, >1.0 km for grades 1–3, >1.6 km for grades 4–6; [Nipissing-Parry Sound Student Transportation Services, 2019](#)). Attendance was tracked throughout the program ([Table 1](#)).

It is important to note that the key factor that allowed School 2 to have greater participation was related to volunteer recruitment. The participating schools are both part of the same school board. Given the student to conductor ratio of 6:1, combined with the availability of volunteer conductors, this resulted in a lower participation rate in school 1 compared to school 2.

It is also important to note that the pilot walking school bus program only lasted 5 weeks. This was done in consideration of historical weather patterns in the area, where winters are "typically cold, hard and longer than in more southerly locations" ([Great Lakes Integrated Sciences + Assessments, 2016](#), p. 1). When planning the pilot, there was a general consensus that it should be started when weather is good; therefore, affording time to demonstrate the potential, and ultimately make it an easier "sell" (i.e., garner support) when weather is not as optimal (i.e., during the winter).

Canadian Climate Normals (1981–2010) Station Data ([Government of Canada, 2019b](#)) report a daily average temperature of 6.2 °C in October (range: 2.0 to 10.3 °C), dropping to −0.8 °C in November (range: 4.4 °C to 2.8 °C), and −8.3 °C in December (range: 12.3 °C

Table 1
The walking school bus program.

Bus Routes	Number of Registrants	Student Grades	Range of Students	Average (SD) Number of Students
<i>School 1</i>	14			
Route 1	4	2–5	2 to 4	3.6 (0.9)
Route 2	7 + 3 ^a	SK-3	2 to 8	6.8 (2.7)
Route 3	3	1–4	2 to 4	3.4 (2.2)
<i>School 2</i>	25			
Route 1	16	SK-6	9 to 12	11.4 (0.9)
Route 2	9 ^b	SK-6	2 to 8	4.0 (1.8)

^a Note: 3 students who were not registered at the start of the program walked on occasion.

^b Note: 1 student who was registered did not walk.

to 4.1 °C). The lowest temperatures (−12.5 °C) are reported in January (range: 17.4 °C to −7.6 °C), before increasing slightly (−10.4 °C) in February (range: 15.4 °C to −5.3 °C) and March (−4.5 °C, range: 9.6 °C to 0.6 °C). Extreme wind chill (i.e., how cold the weather feels to the average person) data were also considered (October: 17 °C, November: 35 °C, December: 49 °C, January: 52 °C, February: 47 °C, and March: 42 °C). It is important to note that extreme cold warnings are issued in Northeastern Ontario when the temperature or wind chill is expected to reach minus 40 °C for at least 2 h (Government of Canada, 2019a); however, there is a high risk of frostbite (i.e., exposed skin can freeze in 10–30 min) below −27 °C (Environment Canada, 2014). As such, wind chill is used to determine whether it is safe to go outdoors (Environment Canada, 2014). The School Travel Planning committee also considered historical snowfall data (Government of Canada, 2019b), as the size of snowbanks from plows in the winter, combined with the lack of sidewalks, which often results in children walking on the roads. Snowfall can begin as early as October (8.1 cm), and continues through November (38.0 cm), December (70.1 cm), January (65.3 cm), February (58.6 cm), March (39.5 cm), etc. Climate Normals indicate July and August are the only months without snowfall, although both June and September only see about 0.1 cm (Government of Canada, 2019b).

2.2. Evaluation

At the end of the walking school bus, all conductors, students and parents involved were invited to participate in the follow-up evaluation (i.e., student/conductor focus groups and one-on-one parent interviews) through e-mail, which included an electronic (i.e., SurveyMonkey) letter of information and consent form. Ethical approval was obtained from the institutional research ethics board and local school board. Written informed consent was obtained from adult participants and a parent/guardian of students, who also provided oral assent.

This qualitative inquiry was guided by a pragmatist framework (Martela, 2015), which considers the experiences of participants as an active process of exploration. Martela (2015) describes three components of the pragmatist approach for conducting research. First, research is conducted with awareness of objectives, or “ends-in-view” (p. 553). Second, the researcher must adopt a “fallible abductive process of inference” (p. 553) through the acquisition of new knowledge of the research question. Finally, the pragmatist approach considers science as a collective process (Martela, 2015).

Semi-structured interview guides surrounded the lived experiences of participants involved with the walking school bus and factors related to implementation. Conductor and parent guides focused on (a) the walking school bus route, (b) student walkers and volunteer conductors, (c) school and health unit involvement, (d) positive and negative elements, and (e) sustainability and promotion. Parents were asked specific details about their participating child (ren) and involvement (i.e., occasional walker, conductor); whereas conductors were asked details about their role. Guides used in student focus groups asked similar questions about participation, volunteer conductors, positive/negative elements, and sustainability. Data were audio-recorded and transcribed verbatim.

2.3. Participants

Data collection with 27 participants occurred between December 2016 and January 2017. Focus groups with five female conductors who were university-students (two contributed at both schools, one at School 1, and two others at School 2) and students were conducted. Of the 14 students registered for the walking school bus at School 1, three (2 male, average age = 7.00 ± 3.61), who all walked on the same route (i.e., Route 1) participated in Focus Group 1. Two focus groups were conducted at School 2. Of the 26 students registered for the walking school bus, 12 participated, with six students in each group. Focus Group 2 (group 1: 3 male, average age = 7.33 ± 1.75) had 1 student from Route 1 and 5 students from Route 2; whereas Focus Group 3 (2 male, average age = 6.50 ± 2.34) had 3 students from Routes 1 and 2. Seven telephone-interviews were also conducted with parents (1 male, 2 from school 1, 5 from school 2) who walked in different capacities. More specifically, two parents were conductors, two did not walk due to work conflicts, and the remaining walked occasionally. It is important to note that parents of six students who participated in focus groups, representing three different families, did not participate in interviews. While the sample size ($N = 27$) may seem small by standards, the sample size is considered appropriate given the nature of the topic, the scope of the study, and the purpose of the inquiry (Braun and Clarke, 2013).

2.4. Analysis

Thematic analyses were used to categorize the data into themes (Braun and Clarke, 2006). Transcripts were read, and initial codes were generated from the data by the first author. After all transcripts were coded, codes were used to identify key themes. NVivo (QSR International, 2015) software was used to organize data. A second researcher (the second author) independently reviewed transcripts to ensure accuracy (i.e., that codes and themes accurately reflected and appropriately grouped the topics emerging from conversations). Researchers met to discuss any potential discrepancies, and no issues were identified.

3. Results

Six areas of interest were revealed: (1) Health and Social Benefits; (2) Learning Safety Skills; (3) Participant Satisfaction; (4) Environmental Factors; (5) Implementation Challenges; and (6) Moving Forward. Within each theme, the perceptions of conductors, parents, and students were compared and contrasted to disentangle similarities and differences.

3.1. Health and social benefits

All our participants discussed social benefits and community involvement. Parents' discussions primarily focused around getting to know neighbours throughout the walking school bus program. Students similarly discussed making social connections; however, their comments were specific to other children in the program, and the enjoyment of walking with friends. Conductors commented on their excitement about watching student connections being formed throughout the walking school bus program. One conductor described:

...the camaraderie or whatever, they all seemed a little bit more close at the end of the time than they did at the beginning ... they all knew each other but they weren't exactly buddy-buddy, whereas at the end they were all fighting to be partners with each other ... (Conductor Focus Group).

Similar to parents, conductors also described the opportunity to make connections with individuals in the community, *"I felt more involved in the community ... getting to know people who lived in the area and just, getting to know more of [the city]"* (Conductor Focus Group).

Increasing physical activity and getting outdoors were discussed in similar regards by all participants. One conductor expressed, *"It was nice to get up and walk early in the morning, get your day started"* (Conductor Focus Group). Another added, *"but also to show the importance of physical activity is a big one for us"* (Conductor Focus Group). One student enjoyed walking, *"Because everything I did was not that I just had to sit down ... walk and get some energy in the morning"* (Student Focus Group 2). Parents similarly described, *"I think that lots of kids these days don't go outdoors enough, and I think that it's important"* (Parent 1).

Students recalled memorable moments, and parents highlighted mental health benefits. For example, one parent stated,

"...the second thing we really noticed was his mental – I don't know if mental health is the right word, but overall, general well-being and positivity about going to school. He was really excited about the walking school bus program." (Parent 3)

Another shared, *"It gave them better concentration because they were active in the morning. It made them enjoy the school day more because they just – their brains were sort of activated by the fresh air and the oxygen and their blood circulating."* (Parent 7).

3.2. Learning safety skills

Parents acknowledged the walking school bus provided a safe way to get to school, and highlighted the impact of their children 'aging out' of bus eligibility:

The one thing I really like about it was because for us, when my kids get to grade 4 they are going to have to walk. So for me that's one of the most important benefits, is them learning the safe route to school and learning walking street safety and you know, always learning to walk with somebody (Parent 4).

Although students agreed the walking school bus provided a means to learn *"everything about safety"* (Student Focus Group 2), older students expressed they *"already knew about it"* (Student Focus Group 2). One student discussed how he *"learned the neighbourhood a lot more"* (Student Focus Group 1). Similarly, conductors expressed *"they learn their road rules at an early age too. So, the little ones might not have known before we had started this, and now they're more aware of the rules of walking"* (Conductor Focus Group).

3.3. Participant satisfaction

The program was well organized, and parents valued the conductors. One parent acknowledged the organizers, stating that *"the lead volunteers that put it all together and got it organized – I thought it was excellent"* (Parent 7). Others discussed the efforts of the conductors, *"You know what I did like ... the girls really like having university students that volunteered to go as well. They really liked having young people, not just parents"* (Parent 1). Another expressed:

One of the biggest facilitators of the program going well was having the volunteers from [the] University to be the leaders, because as much as the parent community can help ..., I don't know, they're busy. (Parent 3).

Participants also commented on enjoyment. One conductor expressed that *"one of the kids that was walking wished that it went all year long, even in the winter, they loved to walk to school"* (Conductor Focus Group).

3.4. Environmental factors

One theme that emerged exclusively from perceptions of parents was related to the potential environmental impact of walking school bus program. Specifically, parents discussed reduced emissions and a better option for school transportation:

One of the other reasons we're passionate about it, was decreasing traffic congestion and reducing fossil fuel emissions ... I think it is a long way from, say you, actually reducing cars at the school or actually reducing buses. I don't know if it would ever get to that point. But like I think it is a really positive step in the right direction environmentally (Parent 3).

One parent stated: *"If it was something that was going to be taking place over a long period of time, for, you know, more days during the week, there could be an overall environmental impact as well"* (Parent 2). Another parent similarly commented: *"it's just a greener option having the kids walk"* (Parent 7).

3.5. Implementation challenges

Walking distance was a key topic for all participants, with differing perspectives of walking distance, and options for dealing with backpacks. One parent stated: *"I think it is appropriate. I mean for the walking school bus type thing. I would never send my kids alone to walk that distance. But, for the walking school bus I think is fine"* (Parent 4). Parents acknowledged backpack challenges, stating: *"I think they had a hard time at first. I think they had a hard time carrying their backpacks"* (Parent 5). Conductors acknowledged age-related differences: *"I know for our older kids it was fine, but for our [junior kindergarten] JK and [senior kindergarten] SKs they found it ... they would comment that they were tired by the end of it and stuff like that. So I think it depends on the age"* (Conductor Focus Group). Students suggested: *"Maybe we would bring this wagon, and we could put someone to carry it each day, and we could put all our bags in it"* (Student Focus Group 2).

Factors related to the built environment were of concern for both parents and conductors; however, children did not discuss concerns. One conductor expressed, *"the biggest issue there especially in that neighbourhood is the no sidewalks"* (Conductor Focus Group). Another shared that, *"Up at [School 1], no crosswalks, or no crossing guards"* (Conductor Focus Group). Parents agreed, and although some admitted they did not know the specific route, discussed that with supervision and awareness, the students would be fine.

All participants agreed that weather was an important issue to consider. One parent expressed:

I mean I think the only other challenge just became the weather. I know that one day I didn't walk the kids because it was raining ... and I mean they cut off the school bus before it got too cold. But certainly having them walk that far in full snowsuit – I mean it was starting to get pretty cold – they didn't want to walk anymore, it was cold ... I think weather was just a difficult one. (Parent 7)

Similarly, students agreed that they would not want to walk *"when it would be cold enough to be a snow day or indoor recess"* (Student Focus Group 3), or when there was *"lightning, thunder, and raining"* (Student Focus Group 3). One suggested, *"when it's really cold you could take the bus"* (Student Focus Group-2).

Finally, both parents and conductors agreed that initial challenges with logistics emerged, although acknowledging it was a pilot. One parent described: *"we had registered in the spring and then we weren't really sure when it was starting ... there's probably room for improvement in terms of timing of communication"* (Parent 2). Conductors expressed similar concerns: *"We had kids that didn't show up too, and so we'd walk mostly with one child, and we weren't sure with the communication with the office and stuff like that too"* (Conductor Focus Group). The need for more volunteers was evident, as one parent expressed, *"they had people lined up and then they had to drop out of the program and so I think they were kind of scrambling for volunteers"* (Parent 2).

3.6. Moving forward

Overall, all our participants agreed the program should continue in the future, with more involvement from within the school community and city. One parent expressed:

I think the future program, we just need more routes because I do know that there are kids that live past me and their parents would put them on the walking school bus but it is even further for them to get to the stop we are at. I understand because it was a pilot program, so I completely understand why there was only the one stop available to us. It's very important to me to sort of get this started and try it out and get my kids involved. I think we need more routes for more kids (Parent 7).

Parents and conductors described a supportive school community, such that *"the principal walked along, teachers came along, and encouraged kids to participate. So, I think it's a very supportive environment"* (Parent 2). One conductor also shared that *"the principal showed up to walk with us and that was pretty cool"* (Conductor Focus Group). Parents also expressed appreciation for the public health unit:

Having [Joe]¹ as the public health, as the overall coordinator is huge. And in terms of public health programming, I think that, that should really be prioritized and something that should remain in his portfolio because the potential for impact is amazing. It has a direct influence on children's physical activity in a day. So, I really hope that he would be supported to remain like a, a coordinator for it (Parent 3).

All of that said, conductors and parents agreed that the program requires better promotion to encourage growth. One parent expressed, *"Well I know our school had a meeting, but I know that's a challenge as well. I guess, you know, sending notes home and having reminders, emails, um. You know, I think a lot of that is in place already"* (Parent 1). Another expressed, *"It's a really positive program, and hopefully, at our school anyway, this was a pilot, and hopefully it can grow into something more stable"* (Parent 2).

4. Discussion

The present study explored the experiences of individuals (i.e., parents, students, conductors) involved with a 5-week pilot walking school bus program in Northeastern Ontario to provide insights into the strengths, weaknesses, and lessons learned from the initiative. Six themes were revealed, including *health and social benefits, learning safety skills, participant satisfaction, environmental factors, implementation challenges, and considerations moving forward*. Many of these themes are in line with a review (Smith et al., 2015) and consistent with a qualitative report of parents' perspectives (Nikitas et al., 2019). Unique to the current research, findings also

¹ Name changed.

highlight factors specific to Northeastern Ontario. Therefore, not only does this research add to existing active transportation literature, but also offers practical, context-specific recommendations to help guide continued efforts with School Travel Planning.

It has been stated that a walking school bus programs must consider the values and needs of potential 'riders' (and of their families) to be successful (Yang et al., 2014). These values and needs were echoed in the experiences of our participants. Despite initial challenges, the walking school bus program was described as well-organized and enjoyable. Participants were impressed with the degree of organizational support from the school and public health unit. Similar to related literature (Collins and Kearns, 2010; Heelan et al., 2009; Kingham and Ussher, 2005, 2007; Kong et al., 2009; Sirard et al., 2008), participants discussed socializing, building a sense of community, and health benefits (Collins and Kearns, 2010; Kingham and Ussher, 2005; Smith et al., 2015). Parents also discussed the potential environmental impact of the walking school bus. Acknowledging that the walking school bus is merely 'a step in the right direction,' the notion that it could potentially contribute to a societal decrease in greenhouse gas emissions was important. Although beyond the scope of our inquiry, a decrease in car trips to school as a result of active transportation has been reported elsewhere in the literature (Collins and Kearns, 2005, 2010).

While experiences were generally positive, findings also offered important insights into concerns about current and future walking school bus programs. Although students and conductors did express concern over 'walkable' distances, particularly for younger students, parents generally agreed that the walking school bus routes were appropriate. That said, factors related to distance, which may have impacted perceptions of the experience, were also discussed. Specifically, participants described the challenges of walking with backpacks; however, students were the only ones to suggest a potential solution – a wagon. To our knowledge, the notion of incorporating a wagon into a walking school bus has not been discussed in the literature. To promote success, researchers have, however, encouraged implementing feasible walking route lengths for all participants (Kelly and Fu, 2014), and prompt arrival at 'bus stops' to increase walking speed (Yang et al., 2014).

Concerns about walking were also echoed in discussions around weather. As highlighted above, the walking school bus program commenced in October and only lasted 5 weeks. This was done in consideration of historical weather patterns in the area (i.e., longer, colder winters; Government of Canada, 2019b). Although researchers have discussed "decreased enthusiasm for walking in winter months" (Collins and Kearns, 2010, p. 3), it has also been argued that "seasonal climate and weekly weather conditions do not appear to be major influencing factors on choice of school travel mode" (Mitra and Faulkner, 2012, p. S38). It is important to note that the weather in Northeastern Ontario is more extreme than reported in previous literature. For example, Mitra and Faulkner (2012) report an average temperature in Toronto (Southern Ontario, September to January) of 5.08 °C (± 5.64), with a range from 2.52 °C (± 5.66) to 9.70 °C (± 5.91) between the 06h00-09h30 time interval. Recall that, while Canadian Climate Normals (Government of Canada, 2019b) may report a similar daily average in Northeastern Ontario in October (average: 6.2 °C, range: 2.0 to 10.3 °C), temperatures begin to drop below zero in November (average: 0.8 °C, range: 4.4 °C to 2.8 °C), and becoming increasingly cold into January (average: 12.5 °C, range: 17.4 °C to -7.6 °C). These averages do not consider wind chill. It is also important to note that this research did not consider snow fall and safety issues. As expressed earlier, the height of snowbanks is also a concern for pedestrians in Northeastern Ontario, particularly when existing sidewalks are not always cleared in a timely manner (i.e., before the commute to school).

In consideration of such extreme winter weather conditions, participants agreed that future programs in the area should only continue during the Fall and Spring, with passive transportation (e.g., bus, car) as a better option for children in the Winter months. As such, while the walking school bus could have started earlier in the school year (i.e., September), the program did end at an appropriate time. Overall, this supports the notion that context-specific inquiries and initiatives are essential to understand the perceptions of children, families, schools, and neighbourhoods (e.g., Larouche et al., 2015), but also the specific climate of the area.

Another reservation around the walking school bus was related to safety. Road safety concerns are noted in the literature as the most common barrier to walking school bus programs (Collins and Kearns, 2005, 2010; Sirard et al., 2008; Mendoza et al., 2011; Moodie et al., 2009), and findings from the current research were no different. Nevertheless, participants discussed the opportunity to teach road safety, and a safe walking route to school. This was particularly important for parents as distances for bus-eligibility increase with age; some children eventually age out and must walk to use school or rely on another mode of transportation. Together, participants agreed the walking school bus prepared these students to walk independently to school.

Overall, the present research revealed active transportation to school in Northeastern Ontario is influenced by many factors, many of which are consistent with reports in more southern climates. Adding to the literature is the notion that extreme winter weather is a major barrier to active transportation initiatives, and parents may not be willing to engage in a program (i.e., as a volunteer and/or allowing their children to participate), such as a walking school bus, during these months. That said, sustained initiatives are needed to improve upon the determinants of active transportation to school at the various ecological levels where they can be most effectively targeted.

Previous reports highlight recruitment as a common challenge (Mendoza et al., 2012; Sirard et al., 2008). For example, one study discussed only 50% of registrants were present for the walking school bus (Collins and Kearns, 2010). Our participants expressed the need for increased volunteer enrolment to increase routes. As discussed earlier, the number of participants in the walking school bus was limited due to challenges of recruiting volunteer conductors, the route preferences of volunteer conductors, and the 6:1 student to conductor ratio established by the participating school board. Furthermore, the program was only offered to two elementary schools, selected as representative of the area, and in a state of readiness to initiate a walking school bus. Although university students played a large role in the success of the current initiative, literature (Smith et al., 2015; Yang et al., 2014) has indicated a sustainable walking school bus program requires employees. Relying on university student volunteers is indeed likely to be more challenging in the Spring when many students either move home or obtain full-time employment.

To encourage School Travel Planning initiatives, discussion surrounding information-sharing and promotion (e.g., newsletters and meetings) is common (Brunton et al., 2006; Collins and Kearns, 2010; Kingham and Ussher, 2005; Kong et al., 2009; Mendoza et al.,

2011; Smith et al., 2015). Promising short-term benefits of the walking school bus have been displayed here, and elsewhere; however, without the development of more sustainable models, evidence of long-term effectiveness is and will remain limited (Heelan et al., 2009; Kong et al., 2009; Mendoza et al., 2011). We thus echo the call for further research “on the effectiveness and sustainability of interventions to promote active transportation, such as school travel plans and walking school buses” (ParticipACTION, 2015, p. 24), with an emphasis on evaluating sustainable models such as the Ottawa Student Transportation Authority’s walking school bus program (Beaton, 2015).

During the 2000 International Walk to School Day, of 6369 Ontario students surveyed, 72.2% indicated they prefer active transportation to school (O’Brien, 2000). Recent work from Rutberg and Lindqvist (2018) investigated the experiences of children and teachers involved with an empowerment- and gamification-inspired program to encourage physical activity outside of school through active transportation. Findings were positive, revealing a successful, alternative method of promotion that students found enjoyable and, increased engagement, and altered parental perspectives of school transit (Rutberg and Lindqvist, 2018). It can thus be argued that walking school buses, as a sub-component of active transportation and a broader physical activity promotion strategy, enjoy high favourability and acceptability from stakeholders.

Overall, the results of this study highlight five key lessons: walking school buses (1) increase community involvement and sense of community; (2) require a diverse volunteer base (i.e., so not solely reliant on parent volunteers); (3) provide a pedestrian education component (beginning at an early age) and develop knowledge of safe routes to school (for those losing bus eligibility); (4) can be successful through community partnerships; and (5) must be implemented in consideration of the weather patterns in the area. The initiative emerged as a recommended action item from a larger School Travel Planning initiative, and was thus a combined effort of the school, school board, health unit, and university communities. Targeting physical activity in school-ages therefore represents an essential component of an upstream population health promotion approach, and schools will continue to be a critical setting for interventions.

The information gleaned from this work was instrumental in establishing a community-engaged partnership to explore the sustaining the walking school bus program and expanding it to other schools in the area. To this end, the local health unit used the findings and the established partnership from this work to obtain governmental funding to hire a dedicated school travel planning facilitator and to expand school travel planning initiatives to other school boards and schools within the area. The findings have also been used to refine the walking school bus registration process, and the schools have continued to offer the initiative in the fall and spring of the subsequent two school years with growing interest. A broader Active School Travel Partnership has been developed and is being spearheaded by the local health unit and currently includes representatives from the health unit, two additional school boards (3 in total), the school transportation consortium, the university, recreation providers (i.e. YMCA) and municipal leaders with an invitation extended to representatives in law enforcement. Overall, the pilot initiative can be considered a success!

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Author statement

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References

- Beaton, W., 2015. The Ottawa Walking School Bus Pilot Project. Grean Communities Canada, Ottawa, ON. Available from: <http://ontarioactiveschooltravel.ca/wp-content/uploads/2017/10/Ottawa-WSB-Pilot-Case-study-May-2015.pdf>.
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qual. Res. Psychol.* 3 (2), 77–101.
- Braun, V., Clarke, V., 2013. *Successful Qualitative Research: A Practical Guide for Beginners*. Sage publications, Los Angeles, California.
- Brunton, G., Oliver, S., Oliver, K., Lorenc, T., 2006. A Synthesis of Research Addressing Children’s, Young People’s and Parents Views of Walking and Cycling for Transport. EPPI-Centre, Social Science Research Unit, Institute of Education, University of London, London, England. Available from: <http://researchonline.lshtm.ac.uk/2605/1/A%20synthesis%20of%20research%20addressing%20children%20and%20young%20people%20and%20parents%20views%20of%20walking%20and%20cycling%20for%20transport.pdf>.
- Bullung, R.N., Mitra, R., Faulkner, G., 2009. Active school transportation in the Greater Toronto Area, Canada: an exploration of trends in space and time (1986–2006). *Prev. Med.* 48 (6), 507–512.
- Buttazzoni, A.N., Van Kesteren, E.S., Shah, T.L., Gilliland, J.A., 2018. Active school travel intervention methodologies in North America: a systematic review. *Am. J. Prev. Med.* 55 (1), 115–124.
- Chillón, P., Evenson, K.R., Vaughn, A., Ward, D.S., 2011. A systematic review of interventions for promoting active transportation to school. *Int. J. Behav. Nutr. Phys. Activ.* 8 (1), 10.
- Chillón, P., Martínez-Gómez, D., Ortega, F.B., Pérez-López, I.J., Díaz, L.E., Veses, A.M., et al., 2013. Six-year trend in active commuting to school in Spanish adolescents. *Int. J. Behav. Med.* 20 (4), 529–537.
- Colley, R.C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., Tremblay, M.S., 2011. Physical activity of Canadian children and youth: accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Health Rep.* 22 (1), 15.
- Collins, D.C., Kearns, R.A., 2005. Geographies of inequality: child pedestrian injury and walking school buses in Auckland, New Zealand. *Soc. Sci. Med.* 60 (1), 61–69.
- Collins, D., Kearns, R.A., 2010. Walking school buses in the Auckland region: a longitudinal assessment. *Transport Pol.* 17 (1), 1–8.
- Creswell, J.W., Clark, V.L.P., 2017. *Designing and Conducting Mixed Methods Research*. Sage publications, Los Angeles, California.
- Davison, K.K., Werder, J.L., Lawson, C.T., 2008. Peer reviewed: children’s active commuting to school: current knowledge and future directions. *Prev. Chronic Dis.* 5 (3).

- Ebbeling, C.B., Pawlak, D.B., Ludwig, D.S., 2002. Childhood obesity: public-health crisis, common sense cure. *Lancet* 360 (9331), 473–482.
- Engwicht, D., 1992. *Towards an Eco-City: Calming the Traffic*. Envirobook, Sydney.
- Environment Canada, 2014. Wind Chill: the chilling facts. Available from: http://publications.gc.ca/collections/collection_2014/ec/En56-222-2-2014-eng.pdf.
- Faulkner, G., Zeglen, L., Leatherdale, S., Manske, S., Stone, M., 2014. The relationship between school physical activity policy and objectively measured physical activity of elementary school students: a multilevel model analysis. *Arch. Publ. Health* 72 (1), 20.
- Ferreira, I., Van Der Horst, K., Wendel-Vos, W., Kremers, S., Van Lenthe, F.J., Brug, J., 2007. Environmental correlates of physical activity in youth—a review and update. *Obes. Rev.* 8 (2), 129–154.
- Government of Canada, 2019a. Alerting parameters environment Canada uses for issuing and extreme cold warning. Available from: <https://www.canada.ca/en/environment-climate-change/services/types-weather-forecasts-use/public/criteria-alerts.html#extremeCold>.
- Government of Canada, 2019b. Canadian Climate Normals 1981–2010 Station Data. North Bay A. Ottawa, ON: Government of Canada. Available from: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProv=stnProvince=ON=txtCentrallatMin=0=txtCentrallatSec=0=txtCentrallongMin=0=txtCentrallongSec=0=stnID=4201=dispBack=0.
- Great Lakes Integrated Sciences + Assessments, 2016. Historical Climatology: North Bay, Ontario. Available from: http://glisa.umich.edu/media/files/NorthBayCN_Climatology.pdf.
- Green Communities Canada, Canadian School Travel Planning Facilitator Guide, 2012. Peterborough, ON: Green Communities Canada. Available from: http://www.tdsb.on.ca/Portals/0/AboutUs/Innovation/docs/STP-Guide-2017_update.pdf.
- Hallal, P.C., Andersen, L.B., Bull, F.C., Guthold, R., Haskell, W., Ekelund, U., Lancet Physical Activity Series Working Group, 2012. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet* 380 (9838), 247–257.
- Heelan, K.A., Abbey, B.M., Donnelly, J.E., Mayo, M.S., Welk, G.J., 2009. Evaluation of a walking school bus for promoting physical activity in youth. *J. Phys. Activ. Health* 6 (5), 560–567.
- Hickson, C., Robinson, D.B., Berg, S., Hall, N., 2012. Active in the north: school and community physical activity programming in Canada. *Int. J. Phys. Educ.* 4 (2), 16–30.
- Hinckson, E., Faulkner, G., 2018. School travel plans. *Child. Act. Transport.* 205–216.
- Hossain, P., Kavar, B., El Nahas, M., 2007. Obesity and diabetes in the developing world—a growing challenge. *N. Engl. J. Med.* 356, 213–215.
- Jaunzarins, B.J., Gauthier, A.P., King, K.D., Larivière, C., Dorman, S.C., 2014. Assessing the influence of season and time of day on physical activity levels during recess. *Global J. Health Educ. Promot.* 16 (1), 43–56.
- Jones, R.A., Blackburn, N.E., Woods, C., Byrne, M., van Nassau, F., Tully, M.A., 2019. Interventions promoting active transport to school in children: a systematic review and meta-analysis. *Prev. Med.* 123, 232–241.
- Kearns, R.A., Collins, D.C., Neuwelt, P.M., 2003. The walking school bus: extending children's geographies? *Area* 35 (3), 285–292.
- Kelly, J.A., Fu, M., 2014. Sustainable school commuting—understanding choices and identifying opportunities: a case study in Dublin, Ireland. *J. Transport Geogr.* 34, 221–230.
- Kimm, S.Y., Glynn, N.W., Kriska, A.M., Barton, B.A., Kronsberg, S.S., Daniels, S.R., et al., 2002. Decline in physical activity in black girls and white girls during adolescence. *N. Engl. J. Med.* 347 (10), 709–715.
- Kingham, S., Ussher, S., 2005. Ticket to a sustainable future: an evaluation of the long-term durability of the Walking School Bus programme in Christchurch, New Zealand. *Transport Pol.* 12 (4), 314–323.
- Kingham, S., Ussher, S., 2007. An assessment of the benefits of the walking school bus in Christchurch, New Zealand. *Transport. Res. Pol. Pract.* 41 (6), 502–510.
- Kong, A.S., Sussman, A.L., Negrete, S., Patterson, N., Mittleman, R., Hough, R., 2009. Implementation of a walking school bus: lessons learned. *J. Sch. Health* 79 (7), 319–325.
- Larouche, R., Sarmiento, O.L., Broyles, S.T., Denstel, K.D., Church, T.S., Barreira, T.V., et al., 2015. Are the correlates of active school transport context-specific? *Int. J. Obes. Suppl.* 5 (S2), S89.
- Larouche, R., Gunnell, K., Bélanger, M., 2019. Seasonal variations and changes in school travel mode from childhood to late adolescence: a prospective study in New Brunswick, Canada. *J. Transp. Health* 12, 371–378.
- Lee, M.C., Orenstein, M.R., Richardson, M.J., 2008. Systematic review of active commuting to school and children's physical activity and weight. *J. Phys. Activ. Health* 5 (6), 930–949.
- Lewis, L.K., Maher, C., Belanger, K., Tremblay, M., Chaput, J.P., Olds, T., 2016. At the mercy of the gods: associations between weather, physical activity, and sedentary time in children. *Pediatr. Exerc. Sci.* 28 (1), 152–163.
- Martela, F., 2015. Fallible inquiry with ethical ends-in-view: a pragmatist philosophy of science for organizational research. *Organ. Stud.* 36 (4), 537–563.
- McDonald, N.C., 2007. Active transportation to school: trends among US schoolchildren, 1969–2001. *Am. J. Prev. Med.* 32 (6), 509–516.
- McDonald, N.C., Aalborg, A.E., 2009. Why parents drive children to school: implications for safe routes to school programs. *J. Am. Plann. Assoc.* 75 (3), 331–342.
- Mendoza, J.A., Watson, K., Baranowski, T., Nicklas, T.A., Uscanga, D.K., Hanfling, M.J., 2011. The walking school bus and children's physical activity: a pilot cluster randomized controlled trial. *Pediatrics* 128 (3), e537–e544.
- Mendoza, J.A., Watson, K., Chen, T.A., Baranowski, T., Nicklas, T.A., Uscanga, D.K., Hanfling, M.J., 2012. Impact of a pilot walking school bus intervention on children's pedestrian safety behaviors: a pilot study. *Health Place* 18 (1), 24–30.
- Mitra, R., Faulkner, G., 2012. There's no such thing as bad weather, just the wrong clothing: climate, weather and active school transportation in Toronto, Canada. *Can. J. Public Health* 103 (3), S35–S41.
- Moodie, M., Haby, M., Galvin, L., Swinburn, B., Carter, R., 2009. Cost-effectiveness of active transport for primary school children-Walking School Bus program. *Int. J. Behav. Nutr. Phys. Activ.* 6 (1), 63.
- Nader, P.R., Bradley, R.H., Houts, R.M., McRitchie, S.L., O'Brien, M., 2008. Moderate-to-vigorous physical activity from ages 9 to 15 years. *Jama* 300 (3), 295–305.
- Near North District School Board, 2009. Transportation of pupils. Perry sound/north bay/huntsville/barrie: near North District school board. Available from: <https://www.nearnorthschools.ca/?s=Transportation+of+Pupils>.
- Neuwelt, P.M., Kearns, R.A., 2006. Health benefits of walking school buses in Auckland, New Zealand: perceptions of children and adults. *Child. Youth Environ.* 16 (1), 104–120.
- Nikitas, A., Wang, J.Y., Knamiller, C., 2019. Exploring parental perceptions about school travel and walking school buses: a thematic analysis approach. *Transport. Res. Pol. Pract.* 124, 468–487.
- Nipissing-Parry School Student Transportation Services, 2019. (Eligibility). Retrieved from: <http://www.npssts.ca/npssts/eligibility>.
- O'Brien, C., 2000. Ontario Walkability Study. York Centre for Applied Sustainability, Toronto, ON. Available from: https://kipdf.com/ontario-walkability-study-trip-to-school-children-s-experiences-and-aspirations_5ab32daa1723dd329c63c517.html.
- ParticipACTION, 2015. The biggest risk is keeping kids indoors: 2015 the ParticipACTION report card on physical activity for children and youth [Internet]. Toronto: ParticipACTION. Available from: https://www.participaction.com/sites/default/files/downloads/Participaction-2015ReportCard-FullReport_5.pdf.
- ParticipACTION, 2018. Canadian kids need to move more to boost their brain health: 2018 the ParticipACTION Report Card on Physical Activity for Children and Youth [Internet]. Toronto: ParticipACTION. Available from: https://participaction.cdn.prismic.io/participaction%2F38570bed-b325-4fc8-8855-f15c9aebac12_2018-participaction-report-card_-full-report_0.pdf.
- Pate, R.R., Flynn, J.I., Dowda, M., 2016. Policies for promotion of physical activity and prevention of obesity in adolescence. *J. Exerc. Sci. Fit.* 14 (2), 47–53.
- Public Health Agency of Canada, 2017. What Is Active Transportation? Government of Canada, Ottawa. Available from: <http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pa-ap/at-ta-eng.php>.
- QSR International, 2015. NVivo Qualitative Data Analysis Software. Pty Ltd.
- Ramanathan, S., O'Brien, C., Faulkner, G., Stone, M., 2014. Happiness in motion: emotions, well-being, and active school travel. *J. Sch. Health* 84 (8), 516–523.
- Robertson-Wilson, J.E., Leatherdale, S.T., Wong, S.L., 2008. Social-ecological correlates of active commuting to school among high school students. *J. Adolesc. Health* 42 (5), 486–495.

- Rutberg, S., Lindqvist, A.K., 2018. Active school transportation is an investment in school health. *Health Behav. Pol. Rev.* 5 (2), 88–97.
- Salmon, J., Timperio, A., Cleland, V., Venn, A., 2005. Trends in children's physical activity and weight status in high and low socio-economic status areas of Melbourne, Victoria, 1985–2001. *Aust. N. Z. J. Publ. Health* 29 (4), 337–342.
- Shephard, R.J., 2008. Is active commuting the answer to population health? *Sports Med.* 38 (9), 751–758.
- Sirard, J.R., Alhassan, S., Spencer, T.R., Robinson, T.N., 2008. Changes in physical activity from walking to school. *J. Nutr. Educ. Behav.* 40 (5), 324–326.
- Smith, L., Norgate, S.H., Cherrett, T., Davies, N., Winstanley, C., Harding, M., 2015. Walking school buses as a form of active transportation for children—a review of the evidence. *J. Sch. Health* 85 (3), 197–210.
- Southward, E.F., Page, A.S., Wheeler, B.W., Cooper, A.R., 2012. Contribution of the school journey to daily physical activity in children aged 11–12 years. *Am. J. Prev. Med.* 43 (2), 201–204.
- Statistics Canada, 2017. Census agglomeration of north bay, Ontario. Ottawa, ON: statistics Canada. Available from: <https://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-cma-eng.cfm?LANG=Eng&GK=CMA&GC=575>.
- Stewart, T., Duncan, S., Schipperijn, J., 2017. Adolescents who engage in active school transport are also more active in other contexts: a space-time investigation. *Health Place* 43, 25–32.
- Tammelin, R., Yang, X., Leskinen, E., Kankaanpää, A., Hirvensalo, M., Tammelin, T., Raitakari, O.T., 2014. Tracking of physical activity from early childhood through youth into adulthood. *Med. Sci. Sports Exerc.* 46 (5), 955–962.
- Telama, R., 2009. Tracking of physical activity from childhood to adulthood: a review. *Obes. Facts* 2 (3), 187–195.
- Telama, R., Yang, X., Viikari, J., Välimäki, I., Wanne, O., Raitakari, O., 2005. Physical activity from childhood to adulthood: a 21-year tracking study. *Am. J. Prev. Med.* 28 (3), 267–273.
- Toronto District School Board, Eligibility for Student Transportation, 2014. Toronto Student Transportation Group, Toronto, ON. Available from: <http://www.tdsb.on.ca/EarlyYears/Kindergarten/Transportation/Eligibility.aspx>.
- Tremblay, M.S., Willms, J.D., 2000. Secular trends in the body mass index of Canadian children. *CMAJ (Can. Med. Assoc. J.)* 163 (11), 1429–1433.
- Troiano, R.P., Berrigan, D., Dodd, K.W., Masse, L.C., Tilert, T., McDowell, M., 2008. Physical activity in the United States measured by accelerometer. *Med. Sci. Sports Exerc.* 40 (1), 181–188.
- Tucker, P., Gilliland, J., 2007. The effect of season and weather on physical activity: a systematic review. *Publ. Health* 121 (12), 909–922.
- Victoria Transport Policy Institute, 2017. School Transport Management: Encouraging Alternatives to Driving to School. British Columbia: Victoria Transport Policy Institute. TDM Encyclopedia. Available from: <http://www.vtpi.org/tm/tm36.htm>.
- Villa-González, E., Barranco-Ruiz, Y., Evenson, K.R., Chillón, P., 2018. Systematic review of interventions for promoting active school transport. *Prev. Med.* 111, 115–134.
- Yang, Y., Diez-Roux, A., Evenson, K.R., Colabianchi, N., 2014. Examining the impact of the walking school bus with an agent-based model. *Am. J. Publ. Health* 104 (7), 1196–1203.