

# Safer & Healthier Streets for Children

The Possibilities of School Street Closures in Calgary, AB







## About Sustainable Calgary

Through research, engagement, prototyping and advocacy, Sustainable Calgary supports Calgarians to co-create healthier, more sustainable neighbourhoods. Our project work stems from needs identified in our State of our City reports, which showcase 40 indicators across 7 domains of sustainability: economy, governance, resource use, community, wellness, education and natural environment.

The bulk of our projects focus on co-designing cities for health and equity: we work with fellow Calgarians to imagine what change could look like. Together, we identify community priorities, dive into research, team up with incredible designers, prototype real life changes, and collect metrics of success. Then we amplify our impact by sharing key insights with decision-makers.

Our codesign work results in built projects ranging from low-cost prototypes to multi-million dollar capital projects: activating parking lots and train stations; prototyping precedent-setting road designs with kids; building more inviting bus stops and community spaces; and leveraging investment in new trails, parks and bridges. In parallel, we collaborate on academic research, municipal policy and engagement tools.

## About the Author

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April 2024



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# Definitions

## Active Travel

The utilization of human-powered transportation such as walking or wheeling to get from point A to point B.

## Independent Mobility

Where children are afforded the freedom to explore their environment independently without adult supervision.

## Long-Term Closure

A school street closure that is implemented through long-term infrastructure changes. These could include permanent changes like removing pavement, or less-permanent changes such as the addition of barriers.

## Pedestrianization

The act of giving street-space back to people. This typically involves the creation of a car-free environment through the implementation of a street closure.

## Play Street

A temporary street closure for the purpose of promoting children's outdoor free play. Play Streets typically take place on residential streets. Play Street programming may also take place within school street closures.

## School Street Closure

School street closures refers to any street closure adjacent to a school. This can include long-term closures or timed-recurring closures.

## Tactical Urbanism

An approach to urban design involving low-cost, temporary changes to the built environment such as pavement painting and barricades. Oftentimes, tactical urbanism is used to trial design projects before makin permanent changes.

## Timed–Recurring Closure

The traditional model for school street closures, where a length of street outside a school is made car-free temporarily at pick-up and drop-off times. Also known as “School Streets”.

## Urban Heat Island Effect

An environmental phenomenon where temperatures are elevated in more urbanized areas. This is due to the replacement of the natural environment with built elements made of heat-absorbent materials like concrete.



*Credit: Sustainable Calgary*

# Executive Summary

Most Calgarian children commute to and from school by personal motor vehicle; contributing to the mere 41% of Canadian children meeting Active Travel recommendations (Rothman et al., 2021; ParticipACTION, 2022). Interventions aimed at promoting Active School Travel (AST) can increase children's Physical Activity as well as improve the safety and air quality near schools. The built environment is most significantly linked to child pedestrian safety (Rothman, et al., 2014). As such, interventions to improve the health and safety of streets near schools should include infrastructure changes.

One emerging intervention is school street closures, which are the subject of this report. School street closures create a car-free space outside schools that may operate on a timed-recurring schedule during pick-up/drop-off or with long-term infrastructure (8-80 Cities, 2019). They have been associated with increased AST, Independent Mobility, reduced air pollution, safer streets, community connectedness, as well as environmental benefits. Successful school street closures involve collaboration, child involvement, and opportunities for programming (8-80 Cities, 2019; Envirocentre, 2024). School street closures may also be more successful when long-term solutions are utilized due to multiple volunteer-related limitations of the timed-recurring model (Envirocentre, 2024). While Calgary's current funding and intake processes require further consideration, the City's rich history of sustainable transportation strategies make it well situated to consider school street closures as an intervention.



# Introduction

With the health and wellbeing of Albertan children declining as a result of the COVID-19 pandemic, children's health is more important than ever (Government of Alberta, 2021). Calgary is the largest city in Alberta and one of the fastest growing cities in Canada (Statistics Canada, 2022). As of 2021, nearly 20% of Calgary's population was made up of children aged 0-14 (Statistics Canada, 2023). Thus, as the city continues to grow and urbanize, it is vital that the health of children be considered a priority.

One way of improving child health is through walking and biking to school. This can be supported in a number of ways such as education, regulation, or adapting local infrastructure to make walking safer and more appealing. The current report focuses on the latter, exploring one particular approach: school street closures. School street closures involve reprioritizing street space near schools into safe places for walking, wheeling, and gathering (8-80 Cities, 2019). Research suggests that these interventions lead to overall health benefits for children (8-80 Cities, 2019). As such, this report will explore the impact of school street closures as a strategy to improve the health and safety of Calgarian children. Canadian evidence will be prioritized and supplemented by global evidence where applicable.

The five sections included are as follows:

- (1) introduction to streets and children's health;
- (2) what are school street closures?;
- (3) the health impacts of school street closures;
- (4) lessons in implementation;
- (5) implementation in Calgary.

# Streets and Children's Health

Over the past 50 years North America has become increasingly reliant on motor vehicles for transportation (Rothman et al., 2018). This has greatly impacted children's trips to and from school, with research showing that 56% of Calgarian children are now driven in personal motor vehicles (Rothman et al., 2021). With consequent reductions in AST, Canadian children's overall Active Travel rates are low at 41% and less than 30% of children meet federal guidelines for Physical Activity and active play (ParticipACTION, 2022). Ample evidence has found that greater Physical Activity levels in children are associated with better physical health outcomes (increase in lung, heart, muscle, and bone health), as well as mental health (reduction in depression, improved brain function, and better academic outcomes; [Chaput et al., 2020]). Efforts should be made to provide Canadian children with more opportunities to engage in Physical Activity.



Percent of Canadian Children Meeting  
Active Travel Guidelines  
*Photo credit: Play Outside Guide*



Percent of Canadian Children Meeting  
Physical Activity Guidelines  
*Photo credit: Savvy Mom*

Traffic injuries are the leading cause of death among children in Canada (Yao et al., 2019). Every year approximately 43 child pedestrians are killed and 3,000 seriously injured in Canada (Transport Canada, 2021). Child pedestrians are at especially high risk due to their small stature and consequent vulnerability (Cloutier et al., 2021). Researchers in Montreal found that on average, collisions involving children occurred within 500 m of schools (Cloutier & Thouez, 2007). Understandably, many parents are uncomfortable with their children utilizing Active Travel due to high traffic volumes and unsafe driver behaviours near schools (Aranda-Balboa et al., 2020). Unintentional injuries are preventable and should be targeted in alignment with the City of Calgary's Vision Zero mission (Calgary Police Service, 2024).

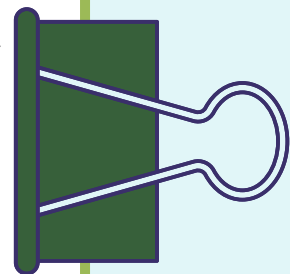
## Vision Zero in Calgary



*Credit: Calgary Police Service / City of Calgary*

Vision Zero is a widely recognized philosophy that advocates for a mobility system that is free from major road injuries and deaths.

Calgary's current Vision Zero target aims to reduce road-related deaths and major injuries by 25% between 2024 and 2028 (Calgary Police Service, 2024).



Alarming, air pollution near schools at pick up and drop off times exceeds the World Health Organization’s maximum daily and annual exposure averages (Pitt et al., 2023). Children’s short stature in relation to car exhaust pipes also means they are disproportionately affected by vehicle-related air pollutants (Etzel, 2020). Exposure to poor air quality during childhood is associated with a heightened risk for asthma, autism spectrum disorders, leukemia, obesity, hypertension, pneumonia, eczema, and child mortality (Liu et al., 2024). According to the World Health Organization (WHO, 2024), air pollution related deaths and illnesses are most closely linked to the transportation sector. Thus, interventions that protect children’s vulnerable health by reducing vehicle reliance and vehicle emissions should be prioritized by the City of Calgary and affiliate organizations.

Street design greatly influences the health and safety of school streets. Children are objectively safer when they are made visible to drivers, this can be achieved by improving sight-lines, raising crosswalks, adding lighting (National Association of City Transportation Officials [NATCO], 2016, 2019), or separating pedestrians from vehicles altogether. Lower traffic volumes and speeds also translate to safer streets for children (NATCO, 2019). Street design interventions are ever-evolving and can take many shapes, from speed reducing mechanisms such as lane narrowing and simple curb bump-outs, to traffic reducing interventions like street closures (NATCO, 2019). People are also more likely to engage in Active Travel when streets and paths are safe, attractive, and convenient (Tam, 2017). Ideally, interventions should aim to reduce vehicle emissions near schools, create safer streets, and promote AT. School street closures are a great evidence-backed example, with research demonstrating their ability to target all three (8-80 Cities, 2019).



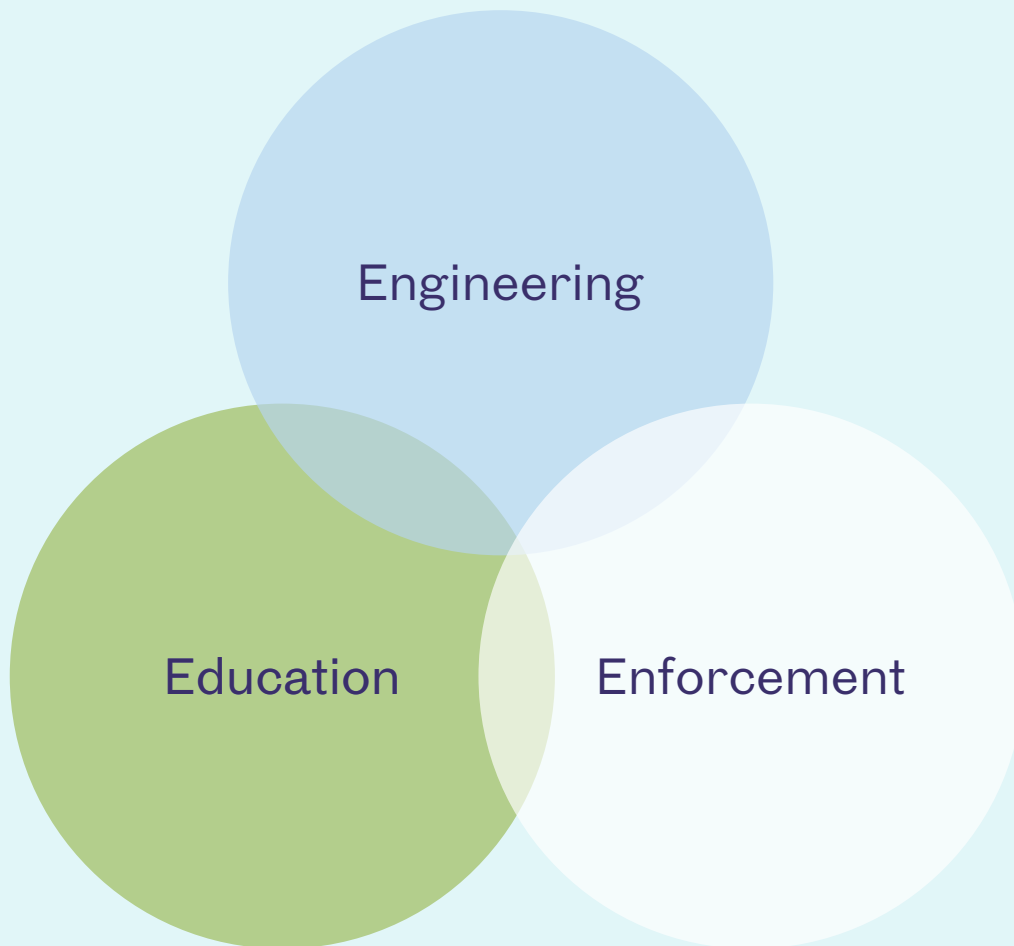
Traffic-calming curb. *Credit: City of Calgary*



Bike lane. *Credit: City of Calgary*

# Approaches to Safer, Healthier Streets

While the current report aims to explore school street closures in particular, it is important to note that a well-rounded approach to safer school streets should include components of the 3-E's: education, enforcement, and engineering (Pitt et al., 2023).



## Education

Educating children on safe travel practices can translate to higher Active Travel rates (Jacob et al., 2021). It is important to ensure children feel confident utilizing Active Travel by honing skills such as looking-both-ways before crossing; education can help children achieve these skills and ultimately reduce pedestrian injury rates (McLaughlin et al., 2019). Such interventions may be initiated by schools, parents, or communities. Importantly, education alone teaches children how to *cope* with unsafe environments rather than *creating* safer environments. Education based interventions should be used in conjunction with other strategies such as engineering or enforcement.

## Education in Calgary

The City of Calgary (2024a) website contains a Mobility Safety Education Toolkit. This resource is meant for caregivers of school-aged children to utilize for education in traffic safety. The Toolkit includes a guide for conversations around traffic safety, activity books highlighting safe practices, and video links to important traffic safety information such as safe crosswalk use (City of Calgary, 2024a).

## Enforcement

School commutes can be made safer and healthier through municipal enforcement and regulations. These strategies may include speed zone enforcement and road design standards.

## Enforcement in Calgary

In 2016, The City of Calgary (2017) replaced all school zones and playground zones with a single zone that is in effect from 7:30am-9:00pm, 365 days a year. The new zone led to a 33%



*Credit: Brian Burnett / CBC*

decrease in pedestrian collisions; a 70% decrease was observed between the hours of 5:30-9:00 p.m. Average traffic speeds also reduced from 36 km/h to 30 km/h. Additionally, 80% of those surveyed agreed that it is easier to remember the fixed zone times (City of Calgary, 2017).

# Engineering

Child safety issues arising from traffic exposure are most strongly associated with the built environment (Rothman, et al., 2014). As such, road safety interventions should include changes to the built environment. Infrastructure changes can take many forms and are often split into two categories: traffic calming interventions and street experiments.

**Traffic calming infrastructure** aims to reduce speeds, minimize accidents, and encourage driver awareness (NATCO, 2016). It includes street applications such as speed humps, pavement markings, curb extensions, roundabouts, and pedestrian signage (City of Calgary, 2024b; NATCO, 2016).



Speed hump. *Credit: City of Calgary*



Roundabout. *Credit: CityNews, Calgary*



Curb extension & pavement markings. *Credit: ActivateYYC*



Pedestrian signage. *Credit: City of Calgary*

## Engineering in Calgary

The City of Calgary (2024b) has pledged to install in-street crosswalk signs at all schools that include grade 6 and below by June of 2024. The initiative was rolled out following a pilot near 52 schools that compared the use of traffic calming curb extensions and in-street signage for increasing pedestrian



*Credit: City of Calgary*

safety at elementary schools. Both interventions resulted in slight reductions in vehicle speed. In further analysis, it was determined that the in-street signage was more effective at consistently reducing vehicle speeds. Neither intervention significantly changed the number of motorists or Active Travelers (City of Calgary, 2024b). This signifies a need for further interventions targeting Active Travel and traffic reduction.

The goal of **street experiments** is to alter a street's purpose (Bertolini, 2020). They are typically associated with the “streets for people” movement, involving elements of pedestrianization. Interventions of this kind may close an entire street or a section of street for a short time or permanently (Bertolini, 2020). Examples of these include street festivals, play streets, pavement to plazas, and school street closures (Bertolini, 2020; Clarke, 2022).



## Connaught Open Street: Calgary, Alberta

(Sustainable Calgary, n.d.; 2022)

In partnership with Sustainable Calgary, children from Connaught School were tasked with reimagining 10th street, which borders their school. They proposed a full street closure that could extend their playground, transforming it into a play space for the community. They envisioned more plants, play structures, and a pond. The Sustainable Calgary team finalized the proposal with furniture and ramps. In 2022 and 2023, the street was brought to life using concrete jersey barriers, furniture, colorfully painted pavement, along with programming. The project has been coined the Connaught Open Street; utilizing the positive phrase is a reminder that the space is an opening of the street to the people, rather than a closing of the street to cars. This initiative provides a space for community to gather, play, and travel safely. Permanent changes to the space are currently being considered.

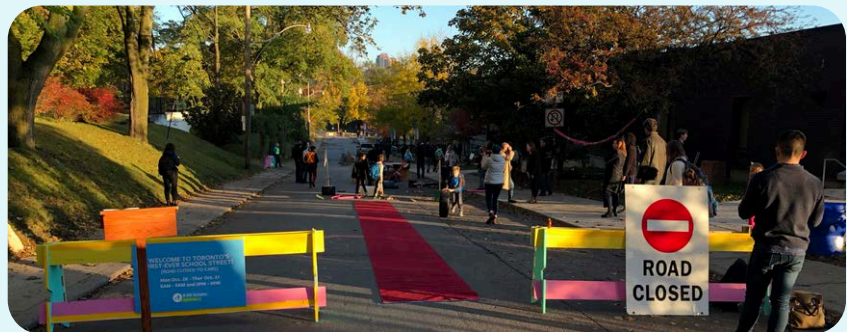


*Credit: Sustainable Calgary*

# What are School Street Closures?

School street closures are the restriction of motorized traffic on a street adjacent to a school. Traditionally, such closures are temporary, running at drop off and pick up times. However, some school street closures are permanently car-free (Clarke, 2022).

Timed-recurring school street closure



*Credit: Ontario Active School Travel*



*Credit: Global News, Calgary*

Long-term school street closure with tactical urbanism

Long-term school street closure with permanent changes

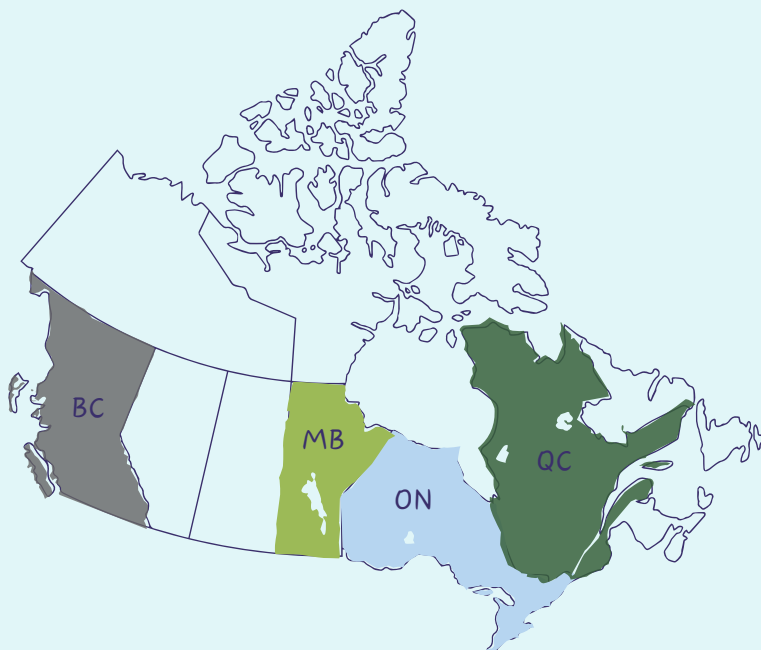


*Credit: Jesse Coburn*

# Timed-Recurring Closures

Timed recurring closures are the traditional model for school street closures, which originated in Italy as far back as 1989 (Clarke, 2022). These models have grown in prominence over the last decade, with the COVID-19 pandemic fueling a significant spike in implementation globally (Clarke, 2022). School street closures create a car-free street, typically operating for 30-60 minutes at pick-up and/or drop-off times. Most often, school street closures are patrolled by volunteers and enforced through moveable barriers and signage (Clarke, 2022); this is presently the case for all timed-recurring Canadian models (Envirocentre, 2024). International interventions have reduced their reliance on volunteers through the use of retractable bollards—in Belgium, Swinging gates—in France, and automated cameras—in the United Kingdom (Clarke, 2022).

Most traditional school street closures models allow exemptions for certain vehicles (when chaperoned by volunteers at a walking pace) which may include residents, emergency services, or people with disabilities (Clarke, 2022; Envirocentre, 2024).



Provinces that have documented timed-recurring school street closures

The length of closures in Canada varies from 40-450m, however the 450m model received backlash from the community and was later successfully reduced to 200m; suggesting that 40-200m is an optimal length for successful implementation in Canada, however further research is required to determine this (Envirocentre, 2024; 8-80 Cities, 2022).

# School Street Program: Kingston, Ontario

(City of Kingston, n.d.; 8-80 Cities, 2022)

In 2020, the Kingston Coalition for Active Transportation (KCAT) initiated a School Streets program in Kingston, Ontario. This was in response to high collision and fatality rates, along with safety concerns around school zones. While KCAT was the leader of the School Street—making them responsible for insurance, equipment, and all communications activities—they also received support from the Municipal government of Kingston.

## Running the program

The initial program ran for the whole 2021-2022 school year at Winston Churchill Public School, 5 days a week for 25 minutes at both pick up and drop off. The closure was implemented using light weight plastic A-frame barricades, road closure signs, and promotional signs.

Operations were supported by over 50 volunteers coming from various backgrounds (parents, retirees, university and high school students) and one paid volunteer coordinator. All volunteers received training and had to obtain a police check with a vulnerable sector search. Each shift had 3-4 volunteers on duty where they patrolled the barricades, wearing high visibility vests.

The School Street did not have additional programming (Play Streets, festivals, etc.), as advised by stakeholders. However, according to survey, the space was used for socialization and many parents suggested that the space would benefit from having activities. One exemption was made on the last week, when the finale party was thrown which included music and activities.

## Vehicle exemptions

Prior to the program's launch, all school staff and residents living within the school street route were given vehicle exemption passes, granting them access to the street at walking pace when chaperoned by a volunteer. Volunteers were also given whistles to alert pedestrians of any exempted vehicles entering the street.

Interestingly, the number of vehicles passing through was quite low. In the mornings, volunteers counted an average of 1.3 vehicles entering and 1 exiting the street; in the afternoon, typically less than 1 vehicle entered along with 3 exiting, which were mostly staff.



*Credit: Dr. Patricia Collins / Twitter*

### **The following year**

The Kingston community was overcome with grief in February of 2022 when a young girl was struck by a motorist outside of her school and tragically passed. This incident initiated the creation of a new working group: the Pedestrian Safety Working Group (PSWG). The PSWG presented recommendations to the City of Kingston which included an expansion of the school street program along with a new bylaw that would allow new school street programs to more easily obtain permits.

The school street program was expanded to one other school site—Central Public School—in the 2022-2023 school year. Unfortunately, KCAT had to step down from the School Street initiative due to the volunteer capacity needed. The program did not run in the 2023-2024 school year.

# Long-Term Closures

Long-term school street closures have been implemented sporadically around the globe (Clarke, 2022). While they are much less common than the timed recurring model, they have been cited as a hopeful way forward (Envirocentre, 2024). Long-term closures vary in their implementation but typically involve the semi-permanent or permanent pedestrianization of a street adjacent to a school. This may be done through tactical urbanism or landscape changes (Respire, 2024; Sustainable Calgary, 2023). Due to their more permanent infrastructure, vehicle exemptions are less common among these models. In many cases, long-term closures are initiated following the successful implementation of a timed-recurring closure (Clarke, 2022).

## Rues aux Ecoles: Paris, France

(City of Paris, 2023; Respire, 2024)

As part of the mayor's initiative to make Paris more walkable, the Rues aux Ecoles or street to school initiative closes school streets through permanent infrastructure. Goals of the program are to make schools safer and air cleaner. As of November 2023, nearly half of elementary and kindergarten schools have a school street (201 total). By 2026, the goal is to have 300 school streets.

The Paris model has two phases of development, as well as three alternative schemes which are implemented when phases one and two are not applicable.

Phase 1: also termed "undeveloped". This is a permanent road closure that involved pedestrianizing the street through adjustable barriers and street markings.



Phase 1 - Undeveloped. Credit: Respire

Phase 2: also termed “developed”. The street is relandscaped with lightly colored asphalt and greenery. The street is also made level with the sidewalk. Barriers are still removeable, and the street remains operational for emergency services and waste collection.



Phase 2 - Developed. *Credit: Christophe Belin / City of Paris*

Open pedestrian areas: streets where pedestrians have the right of way, but local services and resident traffic are allowed.

Meeting areas: traffic is limited to 20km/h, pedestrians are given priority, and simple signage is put up.

Timed school street closures: although not common in Paris, they are implemented on occasion.



Open pedestrian area. *Credit: Respire*



Meeting area. *Credit: Respire*

## Long-Term Closures: Montréal, Quebec

Montréal has a vast network of streets that have been transformed into public spaces called Pedestrian Streets; some Pedestrian Streets are permanent, while others operate seasonally (Montréal, 2024). Within this network, there are a variety of child-oriented street spaces nearby schools. Some examples include:



Place-école De Lanaudière. *Credit: Montréal*

- Place-école De Lanaudière - a street closure with the purpose of giving space back to the children. The space is complete with a bin of accessible toys (Montréal, 2023a).
- Parc-école Charles-Lemoyne – a street closure promoted as a place to relax (Montréal, 2021).
- L'île aux Volcans – a redeveloped intersection that encourages safe, accessible Active Travel and free play. The street was pedestrianized and the topography around the street was transformed into a “volcano island” which was co-designed with the children of the neighbourhood (Montréal, 2022).
- L'école Saint-Jean-de-la-Lande – a street closure complete with ramps where children have a space to practice wheeling safely (Montréal, 2023b).



L'école Saint-Jean-de-la-Lande. *Credit: Montréal*



# Health Impacts of School Streets

Benefits of school street closures include (8-80 Cities, 2019):

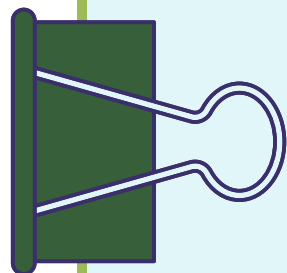
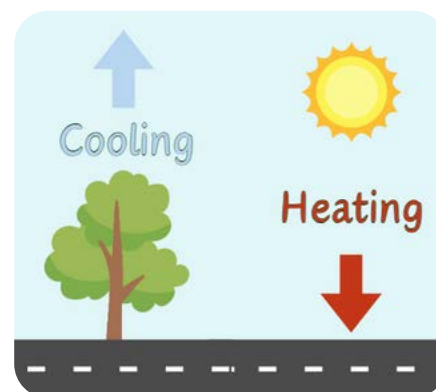
- Less traffic & safer streets
- Increased Independent Mobility
- Less vehicle-related air pollutants
- Increased Active School Travel rates
- Community and social connectedness

While research exploring the benefits of long-term closure models is sparse, it can be inferred that they are associated with similar benefits, and perhaps lead to more lasting change due to their permanence. Additionally, long-term closures have the potential to:

- Reduce traffic-related noise (StreetFilms, 2024, February 21)
- Reduce extreme heat related to the urban heat island effect (Clarke, 2022)

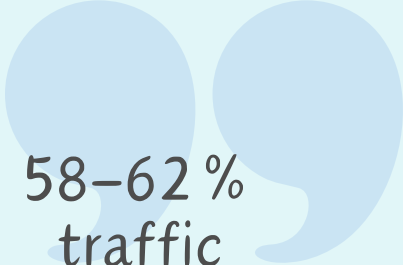
## The Urban Heat Island Effect

Urban materials such as dark pavement, metal, and brick, absorb and retain heat (Health Canada, 2020). Urban areas also typically lack natural cooling elements such as trees and other greenery. As a result, urban areas retain significant heat (Health Canada, 2020).




# Traffic & Road Safety

Lower traffic volume is objectively associated with less child pedestrian injuries (Amiour et al., 2022). As such, traffic volumes are important to consider in school street closure programs. High-level research from London, United Kingdom (UK) found evidence that streets nearby school street closures almost always had a reduction in motor vehicles (Davis, 2020). The authors also found evidence that the small amount of traffic displacement occurring was well dispersed and not associated with road safety issues (Davis, 2020). Similar trends were found in Canada where traffic was formally assessed: programs in Mississauga and Markham were associated with a 62% and 58% reduction in traffic on neighbouring streets, respectively (Envirocentre, 2024; The Centre for Active Transportation, 2022; 8-80 Cities, 2022). This evidence is supported by well-established research on “traffic evaporation”, referring to an adjacent reduction in traffic when roadspace is removed (Nello-Deakin, 2022; Parady et al., 2023)



58–62 %  
traffic  
reduction in  
Ontario



Feelings of safety  
increased from  
23 % before  
intervention to  
97 % during the  
intervention

Lower traffic volume is a major contributor to parents' perception of safety; this ultimately influences parents' decision on whether or not their children can utilize Active Travel (Amiour et al., 2022). Aligning with this, school street closure implementation has been associated with increased perceptions of safety (8-80 Cities, 2020; 8-80 Cities, 2022). At a school street closure in Kingston, Ontario, 44% of parents felt an increased sense of safety and nearly all children surveyed reported a greater sense of safety (8-80 Cities, 2022). Further, in Mountview, Ontario, parents and older students' feelings of safety increased from 23% before intervention to 97% during the intervention (8-80 Cities, 2020). By reducing traffic near schools, children are not only provided with an objectively safer environment, but are more likely to engage in AST due to an increase in perceived safety.

# Independent Mobility


Independent Mobility has been cited as a benefit of school street closure programs (8-80 Cities, 2022). Independent Mobility refers to a child's freedom to move around and explore their community without adult supervision (Hillman et al., 1990). It is critical to the development and well-being of children, as it provides opportunity to gain confidence, autonomy, and decision-making skills; it has also been linked to physical, social, psychological, and cognitive health (Frohlich & Collins, 2024). Recently, Independent Mobility has been identified as an enabler for children's AT; thus, successful Active Travel interventions must also include efforts to improve Independent Mobility (Frohlich & Collins, 2024). The built environment and parental perceptions are key factors for children's ability to engage in Independent Mobility (Frohlich & Collins, 2024). School street closure programs are ideal as they target both by increasing the physical and perceived safety of the built environment.

While the association between school street closures and Independent Mobility are promising and widely recognized, formal evidence of this is lacking. Thus, future implementors should seek data on Independent Mobility trends.

# Active School Travel

By engaging in regular Physical Activity from a young age, children build healthy habits that can translate to healthy lifestyles in adulthood (American Psychological Association, 2023). School street closures provide an excellent opportunity to make these healthy lifestyles the easy choice, as they are globally recognized for their ability to increase AST (Clarke, 2022).

A Canadian analysis shows that all school street closures resulted in increased AST (City of Kamloops, 2023; Envirocentre, 2024). The most significant increases in AST were observed during the school street closure interventions, while smaller increases were observed post-intervention (City of Kamloops, 2023; Envirocentre, 2024). This suggests that children receive more AST-related benefits when programs run consistently; however, the completion of a pilot can induce smaller benefits.




All school street closures resulted in increased AST

## Air Quality

Air quality improvement is often cited as a benefit of school street closures. The largest air quality impact assessment to date involved 18 school street closures throughout London, UK (Gellatly & Marner, 2021). The study, which yielded inconsistent results, tested Nitrous Oxide concentrations at school street closure sites and comparator sites. In some cases, the researchers found little to no difference in air quality at school street closure sites versus comparator sites. However, other site comparisons saw clear effects, the most significant comparison yielding a reduction of 34% Nitrous Oxide concentrations at morning drop-off (Gellatly & Marner, 2021). Reductions in pollutants have also been studied in Ontario school street closures, with sites finding 42-65% reduction in pollutants during the interventions (8-80 Cities, 2022). School street closures offer a promising solution that creates a designated space for children to travel free from direct vehicle emissions. Due to limited research, future school street closure programs should collect pre and post air quality data to enrich the evidence base.

Evidence shows that the air quality within motor vehicles is worse than the air quality where pedestrians walk or wheel along the same route (Panchal, 2022). Given the extensive traffic related air pollution and idling that occurs at school pick-up and drop-off (Pitt, 2023), children driven to school could be exposed to higher pollution levels than those that walk or wheel. Thus, school street closures provide opportunities to not only increase Physical Activity through AST, but may also contribute to less inhalation of in-car and outdoor pollutants.



42–65 % reduction in  
pollutants

## Community & Social Connectedness

Outdoor spaces, such as school street closures, not only provide Physical Activity opportunities, but opportunities for social connection as well (Wray et al., 2020). In childhood, social connection is associated with improved behavioural and mental health and outcomes (McPherson et al., 2014). Children also benefit when their parents have favourable social connections (McPherson et al., 2014). As such, interventions that provide opportunities for parents and children to connect are ideal in shaping healthy children.

School street closures are associated with enhanced community and social connectedness (8-80 Cities, 2019). The development of such initiatives requires collaboration and community buy-in, which can strengthen the presence of community connections (Envirocentre, 2024; 8-80 Cities, 2019). School street closures also create a space for members of the school community to gather and connect. Of the parents that were surveyed at the Kingston, Ontario school street closure, approximately half reported meeting other parents for the first time because of the school street closure (8-80 Cities, 2022). Similar trends were seen at other Ontario sites, however they were not formally surveyed (8-80 Cities, 2022). Further research is needed to properly understand the association between school street closures and social connectedness, particularly in children.

## Pavement-to-Plaza: Vancouver, BC

(Happy City, 2019)

The City of Vancouver's Pavement-to-Plaza program transforms underutilized streets into community spaces. In 2019, a wellbeing assessment took place exploring social interactions, community, and inclusion at three Pavement-to-Plaza sites. Compared to controls, Pavement-to-Plaza participants were:

- 30% more likely to choose the space as a meeting place with friends
- 30% more likely to agree the space reflects their community
- 12% more likely to feel welcome in the space



*Credit: Alison Boulier*

# Environmental Considerations

Children are more susceptible to heat-related illnesses—such as dehydration and heat stress—due to their large body surface area, which results in quicker heat absorption and poor body temperature regulation (Ramly et al., 2023). Moreover, with their cardiovascular and respiratory systems still developing, young children are less able to adapt to extreme heat (Ramly et al., 2023). Thus, programs that can reduce temperatures should be prioritised not only for our environment, but for the health of children.

Long-term school street closures have the added benefit of providing opportunities to increase greenspace (Clarke, 2022). This could be done through landscape changes such as removing sections of pavement to plant greenery or through a tactical urbanism approach with the addition of plant boxes (Respire, 2023; Sustainable Calgary, 2022). These approaches may bring more benefits by reducing the urban heat island effect, thus reducing the impact of extreme heat on children’s health (Clarke, 2022).



Lightly colored pavement & trees planted in Paris, France. *Credit: Respire*



Plant boxes in Calgary, Alberta. *Credit: Sustainable Calgary*

# Noise Pollution

A growing body of evidence shows that traffic-related noise pollution near schools can negatively impact children’s behaviour, cognition, and academic performance (Shukla & Tandel, 2024). Because long-term school street closures reduce traffic at all times, they could lead to an increase in children’s performance at school. The association between noise pollution and long-term closures has not been tested formally. However, researchers in Paris cite noise pollution reduction as a basis for their long-term closure model (StreetFilms, 2024, February 21).

# Lessons in Implementation

Owing to their vast implementation, many lessons can be learned from previous school street closures in Canada. By considering these other iterations, we can make educated decisions regarding implementation of school street closures in Calgary.



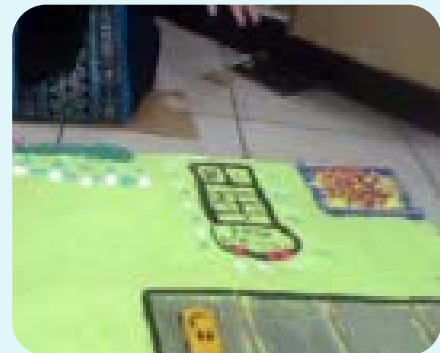
*Credit: Green Communities Canada*

# Success Factors

The main factors for a successful school street closure program centre around **community support, partnerships, and collaboration** (Envirocentre, 2024). In a comparison between two Canadian school street closures, researchers found that the ultimate reason for failure in one and success in the other was due to the presence of strong, clear partnerships among the school principal, municipality, and children (Smith et al., 2022).



*Credit: Sustainable Calgary*



*Credit: Sustainable Calgary*



*Credit: Sustainable Calgary*



*Credit: Sustainable Calgary*

When children are involved in the planning of school street closure interventions, there is more compulsion to follow through with implementation (Smith et al., 2022). Moreover, the **involvement of children** provides additional well-being benefits for the children involved, such as gaining an understanding of community development and the social world (Ataol et al., 2019; Smith et al., 2022). Children also have an opportunity for self-development, building on their sense of self through purpose, civic responsibility, and pride (Ataol et al., 2019). Thus, it is recommended that children be involved in all processes to some capacity, especially those who are marginalized. Children's involvement could include: asking them questions (where do they feel un/safe? What mode of transport do they use/prefer?), letting them help to install furniture, paint murals, or plant gardens; having them document their experience through photography, drawing, or journaling; or allowing them to co-create spaces using materials or technology such as Minecraft or SimCity (NATCO, 2019).



In Ontario, it was found that the community was more supportive of school street closures when elements of **Play Street programming** was also in place (8-80 Cities, 2022). Thus, including Play Street elements may lead to a more accepted, and ultimately more successful program.

## Play Street Activation: Vancouver, BC

(City of Vancouver, 2023; Society for Children and Youth BC, 2023)

The Vancouver School Street program was trialed in 2021, utilizing the timed-recurring model. The pilot's success led to continued implementation at multiple school sites throughout Vancouver, with 7 schools taking part in the 2022-2023 school year. In addition to the school street closures, The Society for Children and Youth of BC (SCY) activated the streets periodically using Play Streets programming in the 2021-2022 and 2022-2023 school years.

In Spring of 2023, four schools were activated through Play Street programming. Each of the schools were activated once per week which was supported by an extension of the normal School Street closure by 30 minutes, resulting in a 70-minute closure.

The types of equipment available were organized into three categories: low energy (chalk, connect four, reading, bean bag



*Credit: Society for Children and Youth of BC*

toss), medium energy (bubbles, playground blocks, hammocks), and high energy (bike courses, scooters, badminton). Individual schools also offered their supplies such as hula hoops, jump ropes, and hockey equipment.

Positive survey responses were obtained from children and adults at all four schools: 82% reported feeling a sense of connection with the community; 97% agreed that they were more physically active than normal because of the Play Street; 89% reported their energy levels as medium to high.

# Limitations to School Streets

Timed-recurring models may be more accepted by the community because they do not greatly impact **resident access** and often offer vehicle exemptions (Clarke, 2022). Conversely, long-term closures may be less easily accepted by the community. In these models, vehicle exemptions are more difficult to offer. The use of cement barriers such as in Calgary, AB, cannot allow exempted vehicles through; however some school street closures, like in the Paris, model allow local and service vehicles to travel through due to adjustable barriers (City of Paris, 2023).

Community members often worry that a school street closure will result in a shift of motor traffic to adjacent streets (Clarke, 2022; Envirocentre, 2024). However, the evidence does not back these concerns. In fact, traffic is typically *reduced* on nearby streets. As such, program organizers should make an effort to disperse this evidence to the public to mitigate **traffic displacement concerns**. To further safeguard from traffic displacement, many school street closures have included Drive to Five schemes, which are an evidence-backed intervention for traffic displacement (Clarke, 2022; Davis, 2022; 8-80 Cities, 2019).

## What is Drive to Five?

(Green Communities Canada, 2022)



Drive to Five programs provide caregivers with alternate parking suggestions within a short 5-10 minute walk to school. Children can then walk to school independently or accompanied by their caregiver. The alternate locations may be presented in a map, newsletter, or posters. Signage may also be posted near the alternate parking spots. This reduces congestion near the school and promotes Active Travel for those who want to try it out or live too far to walk the whole way.

Credit: EnviroCentre

Individuals who have extra **mobility needs** may be disproportionately impacted by street closures due to longer travel distances (Envirocentre, 2024). Strategies to reduce this effect include the availability of alternate entrances and vehicle exemptions for those with mobility needs (Clarke, 2022; Envirocentre, 2024).

School Streets that operate on a timed schedule are usually reliant on volunteers (Envirocentre, 2024). Unfortunately, **volunteer reliance** is associated with multiple limitations (Envirocentre, 2024):

- Retaining volunteer capacity is not realistic and unsustainable in the long-term. The success of a program cannot override the failure to retain volunteers, as exemplified in Kingston, Ontario (8-80 Cities, 2022).
- Volunteer reliance poses equity concerns, as school communities with the needed volunteer capacity are often located in higher income areas.
- A sufficient number of volunteers on each shift must be physically fit enough to move the barricades to and from their storage location.

To reduce volunteer reliance, alternate strategies should be explored such as retractable bollards, swinging gates, camera enforcement, or infrastructure changes including permanent or long-term closures (Envirocentre, 2024).



Camera Enforcement. *Credit: Twitter*



Retractable bollards. *Credit: Bollard Security*



Swinging gate. *Credit: Mayer Brown*

## Location Characteristics

Also integral to the success of school street closure programs is location choice. Programs should not be implemented on important bus or emergency routes without the presence of alternate routes (Clarke, 2022). Alternate parking for visitors should also be available at a reasonably close distance for those who choose to continue using motor transportation. Ideally, pre-intervention traffic volumes should be low-medium to safeguard from any traffic displacement. And importantly, those who reside within the school street closure route should be minimally restricted (Clarke, 2022).

Moreover, evidence shows that school street closure programs may be more successful when implemented in locations where Active Travel is already a well utilized mode of transportation (Smith et al., 2022; Envirocentre, 2024). Additionally, the presence of a school Active Travel plan points to a more successful program (Clarke, 2022). Ideally, greater than 50% of children should live within the school's walk zone, and less than 30% should take the bus (Envirocentre, 2024). Lastly, areas where safety or pollution are pertinent concerns make ideal locations for school street closures (Clarke, 2022).



## Permitting Processes

In their quintessential 2024 report, Envirocentre explored the regulatory experiences of Canadian school street closure implementers. The authors found that street closure permits are typically required under municipal bylaws (Envirocentre, 2024). In some cases, school street closure programs fit—albeit loosely—under an existing city bylaw (Envirocentre, 2024). However, this is not always the case, as seen in Kingston, Ontario, where a new bylaw was passed to support the expansion of their program (8-80 Cities, 2022).

To obtain the required permits, a submission must be made to the city's transportation service outlining the street closure and traffic management plans (Envirocentre, 2024).

Importantly, all school street closure programs require liability insurance (Envirocentre, 2024). The liable body differs depending on the leadership structure; NGOs running school street closures maintain liability and must apply for insurance (if such insurance is not already held); in cases of municipal run programs, the city maintains liability; lastly, in one case of a school board led program, the city maintained liability (Envirocentre, 2024).

# The Importance of Pilots

It is recommended that temporary pilots be used as a tool to gain community support prior to the initiation of long-term closures (Envirocentre, 2024). In Canadian pilots, school street closures led to a steep increase in AT. As such, pilots provide an optimal opportunity to collect supportive data for the program which may help support the further implementation of long-term programs. Key data to collect includes: traffic counts on adjacent streets, number of active travellers, as well as community perceptions collected through surveys (8-80 Cities, 2019). Where possible, data should also be collected to fill information-gaps identified within this report including air quality and IM rates. Pilots can also generate excitement and educate the community about school street closures (Envirocentre, 2024). This provides the community a chance to voice their opinions, which could be taken into consideration if and when long-term programs ensue.



*Credit: City of Mississauga*



*Credit: City of Vancouver*

# Implementation in Calgary

This section will explore three elements of implementation of school street closures in Calgary: (1) policy and strategic alignment, (2) funding possibilities, and (3) intake and permitting processes.

## Calgary's Play Charter

(City of Calgary, 2024c)

The Calgary Play Charter was signed by 36 organizations in Calgary including The City of Calgary, the Calgary Board of Education, and the Calgary Police Service. The Charter states: "Calgary is committed to promoting play, providing play opportunities, and educating all Calgarians of the importance of play to our community." Signatories of the Charter



*Credit: City of Calgary*

understand that risky play is valuable and should be promoted; children should be involved in decisions that affect them; outdoor play should be encouraged year-round; and environments should be created that children can control, evoking curiosity.

# Policy & Strategic Alignment

Since the establishment of Calgary’s long-term sustainability plan, ImagineCALGARY, pedestrians and cyclists have become progressively more prominent in municipal transportation strategies. Calgary now has a rich history in strategies aiming to reduce vehicles on the road and increase sustainable travel.

In recent years, there has been a clear shift to prioritize school street safety. This is evidenced with the emergence of the fixed school-playground zone, Active and Safe Routes to School Program, and the rollout of in-street crosswalk sign.

The Calgary Transportation Plan and Municipal Development Plan offer policies that could support school street closures, especially aligning with long-term models. The various policies strive for increased connectivity, sustainable transportation, pedestrian comfort and safety, accessibility of healthy community spaces, and reductions in air pollution (The City of Calgary 2021a, 2021b).

The Neighbourhood Streets Policy also offers supportive remarks relevant to school street closures, advocating for children's mobility and fun street environments (City of Calgary, 2022).

With these advancement in mind, The City of Calgary’s vision is well aligned to support the implementation of school street closures. However, in order for a synergistic, successful approach to these strategies, policies and funding availability must align.



# Funding Possibilities

While Calgary’s vision for sustainability aligns with the benefits of school street closures—promotion of Active Travel, motor vehicle reduction, and community connectedness—there is currently no clear funding structure for school street closures in Calgary. However, funding partnerships could be explored with existing municipal programs such as the Always Available for All Ages and Abilities pathway and bikeway network (5A Network) and the Active and Safe Routes to School program



## Active & Safe Routes to School

Active and Safe Routes to School (ASRS) programs use School Travel Planning to enhance Active Travel by bringing together elements of education, incentivization, enforcement, and infrastructure changes (Ontario Active School Travel, 2018). Calgary’s ASRS program exists as a partnership between the City of Calgary and Ever Active Schools (City of Calgary, 2024d). The program began as a three-year pilot in 2019, involving 30 schools (Ever Active Schools, 2024). The program has since expanded, servicing a total of 52 schools (City of Calgary 2024b). For 2023-2026 operations, the program received \$1.5M in capital funding and \$75k in annual operating costs (Wilcock, 2020).



## Calgary’s 5A Network

The 5A Network aims to create a well-connected city through equitable access to pathways and bikeways. In 2022, the Calgary Council approved the 5A Network for \$40M in funding for connectivity improvements; \$39.1M of this has been committed to new infrastructure near schools (City of Calgary, 2023a). Their aim with this funding is to increase school-to-home connectivity through equitable and safe travel infrastructure (City of Calgary, 2023a).



# Intake & Permitting Process

A street use permit must be obtained in order to close any City street to traffic (City of Calgary 2024e), these can be applied for online. Permits are issued by a Traffic Engineer, in consultation with the Streets Bylaw 20M88 (City of Calgary, 2024e). School street closures could fall under “s-PARKS”, which are described as street closures for the purpose of recreation (City of Calgary, 2023b). The Bylaw indicates that s-PARKS are closures spanning “extended periods of time” (City of Calgary, 2023b). Beyond that, public information about s-Parks is not available, including the rules and decision-making process used by Transportation Engineers to permit s-PARKS, who can apply for street use permits, and for what lengths of time. If this is a preferred route for obtaining street permits for road closures, publicizing clear guidelines would make the process more approachable and streamlined for communities. By making requirements clear at the outset, risks are reduced for those investing time and money into street closures. Along with a street use permit, Temporary Traffic Control Plans may be required; these plans must be developed professionally and approved by City Mobility (City of Calgary, 2024e), at an additional cost. Street use permits can also be secured through two community-led processes: Block Party and Play Street Permits, and Calgary’s Paint the Pavement Program.

## Block Party & Play Street Permits

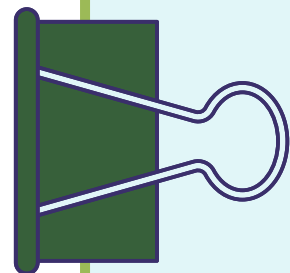
(City of Calgary, 2024f)

The City of Calgary has a set process for obtaining street use permits for block parties and play streets. These events are community-led and require two items: (1) a signed petition



*Credit: City of Edmonton*

including signatures from a significant majority of affected residents and (2) a map highlighting the location of the proposed event. The permit application includes key information including approved traffic control devices and banned activities.



# Calgary's Paint the Pavement

(City of Calgary, 2019)

Paint the Pavement is a community-led initiative where citizens can come together and paint a section of a residential street. This encourages placemaking and fosters a sense of community. The application process involves the submission of the proposed location, along with a street use permit application, designing the artwork within Paint the Pavement requirements, petitioning residents, obtaining insurance, and completing liability waivers.



*Credit: ActivateYYC*



*Credit: James Young, CBC*



*Credit: City of Calgary*



*Credit: Highland Park Community Association*



*Credit: ActivateYYC*

# Edmonton's Approach to Street Closures

(City of Edmonton, n.d., 2024)

The City of Edmonton has publicly available resources that provide guidance on implementing both Play Streets and permanent road closures.

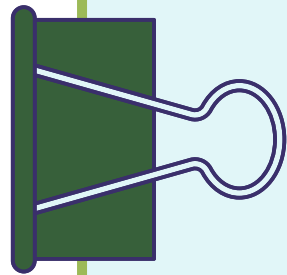
The Neighbourhood Play Street How-to-Guide is a wealth of information, outlining key aspects of **Play Streets** in general and within the Edmonton context. The guide includes the benefits of Play Streets, how to plan them, where to rent equipment, ideal locations, traffic control information, permitting applications, and approximate timelines for



*Credit: City of Edmonton*

planning and implementation. The document is complete with sample promotional materials including surveys and invites, as well as direction on where to go with further questions about Play Streets.

The City of Edmonton website outlines the process for initiating **permanent street closures**. It includes a link to the permit application with instructions, a document describing the costs and fee schedules, and a process flowchart highlighting the necessary steps leading up to the closure. Contact information is also clearly stated for those who require further information on the process for permanent road closures.



# Conclusion

School street closures offer an innovative way to give Calgary's streets back to the people. They create safer, healthier routes to school for children by mitigating air pollution and traffic safety concerns, as well as increasing Active School Travel, Independent Mobility, and community connectedness. Long-term closures may also contribute to lessening the Urban Heat Island effect and reducing noise pollution. Despite unsubstantial funding and permitting processes, Calgary's vision for sustainability aligns with the principles of school street closures, especially long-term models given their additional environmental benefits and permanence. Implementation of school street closures should be piloted in Calgary to better the health of our children and safeguard our planet as we continue to strive for sustainability.

# References

American Psychological Association. (2023). *Diet and exercise for kids: Tips for acting boldly to create change*. Retrieved from <https://www.apa.org/topics/children/healthy-eating>

Amiour, Y., Waygood, E. O. D., & van den Berg, P. E. (2022). Objective and perceived traffic safety for children: A systematic literature review of traffic and built environment characteristics related to safe travel. *International Journal of Environmental Research and Public Health*, 19(5), 2641. <https://doi.org/10.3390/ijerph19052641>

Ataol, O., Krishnamurthy, S., & Van Wesemael, P. (2019). Children's participation in urban Planning and Design: A Systematic Review. *Children, Youth and Environments*, 29(2), 27. <https://doi.org/10.7721/chilyoutenvi.29.2.0027>

Aranda-Balboa, M. J., Huertas-Delgado, F. J., Herrador-Colmenero, M., Cardon, G., & Chillón, P. (2020). Parental barriers to active transport to school: A systematic review. *International Journal of Public Health*, 65(1), 87–98. <https://doi.org/10.1007/s00038-019-01313-1>

Bertolini, L. (2020). From “streets for traffic” to “streets for people”: Can street experiments transform urban mobility? *Transport Reviews*, 40(6), 734–753. <https://doi.org/10.1080/01441647.2020.1729384>

Calgary Police Service. (2024). *Safety in motion: Calgary safer mobility plan 2024-2028*. Retrieved from <https://www.calgarypolicecommission.ca/wp-content/uploads/2024/03/Mar-2024-CPC-5.1-Traffic-Safety-Plan-2024-2028.pdf>

Clarke, R. (2022). *School streets: Putting children and the planet first*. Child Health Initiative Advocacy Hub. Retrieved from <https://www.childhealthinitiative.org/media/792262/school-streets-globally.pdf>

City of Calgary. (2021a). *Municipal Development Plan 2020*. Retrieved from <https://www.calgary.ca/planning/municipal-development-plan.html>

City of Calgary. (2021b). *Calgary Transportation Plan 2020*. Retrieved from <https://www.calgary.ca/planning/transportation.html?redirect=/ctp>

City of Calgary. (2017). *Review of school and playground zone harmonization in Calgary* [Cover Report]. Retrieved from <https://www.calgary.ca/roads/safety/playground-zones.html>

City of Calgary. (2022). *Neighbourhood Streets Policy*. Retrieved from <https://www.calgary.ca/planning/transportation/neighbourhood-streets-policy.html>

City of Calgary. (2019). *Paint the pavement guidelines and requirements*. Retrieved from <https://www.calgary.ca/content/dam/www/transportation/roads/documents/traffic/paint-the-pavement-guidelines-and-requirements.pdf>

City of Calgary. (2024d). *Active & safe routes to school*. Retrieved from <https://www.calgary.ca/roads/safety/active-school-routes.html>

City of Calgary. (2024c). *Calgary play charter*. Retrieved from <https://www.calgary.ca/parks-rec-programs/play-charter.html>

City of Calgary (2024f). *Block party and play street permit*. Retrieved from <https://www.calgary.ca/roads/permits/block-parties.html>

City of Calgary. (2024b). *Traffic safety study at Calgary elementary schools*. Retrieved from <https://www.calgary.ca/roads/safety/elementary-schools-traffic-study.html>

City of Calgary. (2024e). *Street use permit*. Retrieved from <https://www.calgary.ca/roads/permits/street-use.html>

City of Calgary. (2024a). *Mobility safety education toolkit*. Retrieved from <https://www.calgary.ca/roads/safety/school-education.html>

City of Calgary. (2023a). *Calgary's pathway and bikeway network (5A) program*. Retrieved from <https://www.calgary.ca/planning/transportation/pathway-bikeway-plan.html?redirect=/pathwaybikeway>

City of Calgary. (2023b). *Bylaw No 20M88, Street Bylaw*. Retrieved from <https://publicaccess.calgary.ca/lldm01/livelink.exe?func=ccpa.general&msgID=CyAcqyqyKI&msgAction=Download>

City of Edmonton. (n.d.). *Neighbourhood play street: A how-to-guide for organizing a successful play street*. <https://www.edmonton.ca/sites/default/files/public-files/assets/Neighbourhoods/NeighbourhoodPlayStreetsManual.pdf?ref=density.dad>

City of Edmonton. (2024). *Road closure*. [https://www.edmonton.ca/business\\_economy/permanent-closure-of-a-roadway](https://www.edmonton.ca/business_economy/permanent-closure-of-a-roadway)

City of Kamloops. (2023). *Safer school street report*. Retrieved from [https://www.sd73.bc.ca/en/resources/Links/TRAN\\_SafeSchoolStreets\\_Report\\_Dec2023.pdf](https://www.sd73.bc.ca/en/resources/Links/TRAN_SafeSchoolStreets_Report_Dec2023.pdf)

City of Kingston. (n.d.). *School street playbook: A guidebook on how to run a successful school street pilot in Kingston*. Retrieved from [https://www.cityofkingston.ca/documents/10180/15058/Transportation\\_SchoolStreetsPlaybook.pdf/c7283774-fa6b-e800-5c36-1b93fb1c6403?t=1692129646649](https://www.cityofkingston.ca/documents/10180/15058/Transportation_SchoolStreetsPlaybook.pdf/c7283774-fa6b-e800-5c36-1b93fb1c6403?t=1692129646649)

City of Paris. (2023). *Plus de 200 « rues aux écoles » dans Paris*. Retrieved from <https://www.paris.fr/pages/57-nouvelles-rues-aux-ecoles-dans-paris-8197>

City of Vancouver. (2023). *School streets program report*. Retrieved from <https://vancouver.ca/files/cov/school-streets-report-2023.pdf>

Cloutier, M. S., Beaulieu, E., Fridman, L., Macpherson, A. K., Hagel, B. E., Howard, A. W., ... & Rothman, L. (2021). State-of-the-art review: preventing child and youth pedestrian motor vehicle collisions: critical issues and future directions. *Injury prevention*, 27(1), 77–84. <https://doi.org/10.1136/injuryprev-2020-043945>

Cloutier, A. M., & Thouez, J.-P. (2007). GIS-based spatial analysis of child pedestrian accidents near primary schools in Montreal, Canada. *Applied GIS*, 3(4), 1–18. <https://doi.org/10.4225/03/57E9B71457976>

Chaput, J.-P., Willumsen, J., Bull, F., Chou, R., Ekelund, U., Firth, J., ... & Katzmarzyk, P. T. (2020). 2020 WHO guidelines on physical activity and sedentary behaviour for children and adolescents aged 5–17 years: Summary of the evidence. *International Journal of Behavioral Nutrition and Physical Activity*, 17(1), 141. <https://doi.org/10.1186/s12966-020-01037-z>

Davis, A. (2020). *School street closures and traffic displacement project: A literature review with semi-structured interviews*. Transport Research Institute, Edinburgh Napier University. Retrieved from <https://www.napier.ac.uk/~media/images/news/school-street-closures/school-streets-closure-traffic-displacement-literature-review-final2.pdf>

Envirocentre. (2024). *Ottawa school streets feasibility study*. <https://www.envirocentre.ca/wp-content/uploads/2024/02/Ottawa-School-Streets-Feasibility-Study.pdf>

Etzel, R. A. (2020). The special vulnerability of children. *International Journal of Hygiene and Environmental Health*, 227, 113516. <https://doi.org/10.1016/j.ijheh.2020.113516>

Ever Active Schools. (2024). *Active and safe routes to school - Calgary*. <https://everactive.org/projects/ast/active-safe-routes-to-school-calgary/>

Frohlich, K. L., & Collins, P. A. (2024). Children's right to the city and their independent mobility: why it matters for public health. *Journal of Epidemiology and Community Health*, 78(1), 66-68. <https://doi.org/10.1136/jech-2023-221067>

Gellatly, R., & Marner, B. (2021). *A quality monitoring study: London school streets*. Air Quality Consultants. Retrieved from [https://www.london.gov.uk/sites/default/files/school\\_streets\\_monitoring\\_study\\_march21.pdf](https://www.london.gov.uk/sites/default/files/school_streets_monitoring_study_march21.pdf)

Government of Alberta. (2021). *Child and youth well-being review [Final Report]*. <https://open.alberta.ca/dataset/147b587f-5d12-48e1-9366-0dfce192e794/resource/b7f863bf-43af-44ec-8897-b0dafc341665/download/cs-child-youth-well-being-review-final-report-2021-12.pdf>

Green Communities Canada. (2022). *Drive to 5*. Retrieved from <https://schooltravel.ca/activity/drive-to-5/>

Happy City. (2019). *Well-being assessment: Pavement-to-plaza program*. Retrieved from <https://vancouver.ca/files/cov/viva-vancouver-research-happy-city-well-being-assessment.pdf>

Health Canada. (2020). Reducing urban heat islands to protect health in Canada. <https://www.canada.ca/content/dam/hc-sc/documents/services/health/publications/healthy-living/reducing-urban-heat-islands-protect-health-canada/Reducing-Urban-Heat-EN.pdf>



Hillman, M., Adams, J., & Whitelegg, J. (1990). *One False Move: A Study of Children's Independent Mobility*. Policy Studies Institute, London, UK.

Jacob, V., Chattopadhyay, S. K., Reynolds, J. A., Hopkins, D. P., Morgan, J. A., Brown, D. R., Kochtitzky, C. S., Cuellar, A. E., Kumanyika, S. K., & Community Preventive Services Task Force (2021). Economics of interventions to increase active travel to school: A community guide systematic review. *American Journal of Preventive Medicine*, 60(1), e27–e40. <https://doi.org/10.1016/j.amepre.2020.08.002>

Liu, K., Zhang, H., Bo, Y., Chen, Y., Zhang, P., Huang, C., Yu, Z., & Gao, Z. (2024). Ambient air pollution and Children's health: An umbrella review. *Atmospheric Pollution Research*, 15(6). <https://doi.org/10.1016/j.apr.2024.102108>

McLaughlin, C. M., Barry, W. E., Barin, E. N., Mert, M., Lowery, C., Upperman, J. S., ... & Arbogast, H. (2019). Interactive education is associated with lower incidence of pedestrian-related injury in children. *Journal of Surgical Research*, 244, 57-62. <https://doi.org/10.1016/j.jss.2019.06.015>

Montréal. (2024). *Pedestrian streets*. Retrieved from <https://montreal.ca/en/topics/pedestrian-streets>

Montréal. (2023a). *Place-école De Lanaudière*. Retrieved from <https://montreal.ca/lieux/place-ecole-de-lanaudiere>

Montréal. (2023b). *La 9e Avenue, à pédales et à roulettes!* Retrieved from <https://montreal.ca/articles/la-9e-avenue-pedales-et-roulettes-28782>

Montréal. (2021). *Parc-école Charles-Lemoyne*. Retrieved from <https://montreal.ca/lieux/parc-ecole-charles-lemoyne>

Montréal. (2022). *Place publique pour enfants / L'île aux volcans*. Retrieved from <https://www.realisonsmtl.ca/placedesenfants>

National Association of City Transportation Officials. (2019). *Designing streets for kids*. Retrieved from <https://globaldesigningcities.org/publication/designing-streets-for-kids/>

National Association of City Transportation Officials. (2016). *Global street design guide*. Retrieved from <https://globaldesigningcities.org/publication/global-street-design-guide/>

Nello-Deakin, S. (2022). Exploring traffic evaporation: Findings from tactical urbanism interventions in Barcelona. *Case Studies on Transport Policy*, 10(4), 2430-2442. <https://doi.org/10.1016/j.cstp.2022.11.003>

Ontario Active School Travel. (2018). *Overview of school travel planning*. Retrieved from <https://ontarioactiveschooltravel.ca/wp-content/uploads/2018/05/Overview-of-School-Travel-Planning-2018-En..pdf>

Panchal, R., Panagi, M., May, H. R., Obszynska, J. A., Evans, M. S., Hansell, A. L., ... & Hey, J. D. V. (2022). Personal air pollution exposure during morning commute car and active transport journeys. *Journal of Transport & Health*, *26*, 101365. <https://doi.org/10.1016/j.jth.2022.101365>

Parady, G., Chikaraishi, M., & Oyama, Y. (2023). *A Walker's paradise ain't a driver's hell: Evaluating the causal effect of temporary road pedestrianization on traffic conditions of surrounding roads*. Preprint, version 1. <http://dx.doi.org/10.21203/rs.3.rs-3752743/v1>

ParticipACTION. (2022). *2022 ParticipACTION Report Card on Physical Activity for Children and Youth*. Retrieved from <https://www.activehealthykids.org/wp-content/uploads/2022/10/Canada-report-card-long-form-2022-en.pdf>

Pitt, T. M., Rowe, B. H., & Hicks, A. (2023). You exhaust me! Air pollution exposure near schools during pick-up and drop-off times. *Paediatrics & Child Health*, *28*(5), 275–277. <https://doi.org/10.1093/pch/pxac113>

Ramly, N., Hod, R., Hassan, M. R., Jaafar, M. H., Isa, Z., & Ismail, R. (2023). Identifying Vulnerable Population in Urban Heat Island: A Literature Review. *International Journal of Public Health Research*, *13*(2). <https://spaj.ukm.my/ijphr/index.php/ijphr/article/view/422>

Respire. (2024). *Tout ce que vous voulez savoir sur les “rues aux écoles”*. Retrieved from <https://respire-asso.org/tout-ce-que-vous-voulez-savoir-sur-les-rues-aux-ecoles/>

Rothman, L., Macarthur, C., To, T., Buliung, R., & Howard, A. (2014). Motor vehicle-pedestrian collisions and walking to school: The role of the built environment. *Pediatrics*, *133*(5), 776–784. <https://doi.org/10.1542/peds.2013-2317>

Rothman, L., Macpherson, A. K., Ross, T., & Buliung, R. N. (2018). The decline in active school transportation (AST): A systematic review of the factors related to AST and changes in school transport over time in North America. *Preventive Medicine*, *111*, 314–322. <https://doi.org/10.1016/j.ypmed.2017.11.018>

Rothman, L., Cloutier, M. S., Ling, R., Desrosiers-Gaudette, L., Hubka, T., Howard, A., Macpherson, A., Fuselli, P., Hagel, B., Nettel-Aguirre, A., McCormack, G., Rancourt, M., & Winters, M. (2021). *A comparison of active school transportation (AST) across Canadian urban/suburban areas*. Retrieved from <https://carsp.ca/wp-content/uploads/2021/09/1A-Rothman-Comparison.pdf>

Shukla, A., & Tandel, B. N. (2024). Association of road traffic noise exposure and school children's cognition: A structural equation model approach. *Environmental Research*, 240, 117388. <https://doi.org/10.1016/j.envres.2023.117388>

Smith, L. E., Gosselin, V., Collins, P., & Frohlich, K. L. (2022). A tale of two cities: Unpacking the success and failure of school street interventions in two Canadian cities. *International Journal of Environmental Research and Public Health*, 19(18), 11555. <https://doi.org/10.3390/ijerph191811555>

Society for Children and Youth of BC. (2023). *School street - play streets: Program report 2023*. Retrieved from <https://scyofbc.org/wp-content/uploads/2023/08/FINAL-SCY-COV-School-Street-Play-Streets-2023-Report-As-Submitted-to-City-of-Vancouver.pdf>

Statistics Canada. (2022). *Canada's fastest growing and decreasing municipalities from 2016 to 2021*. Retrieved from <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021001/98-200-x2021001-eng.cfm>

Statistics Canada. (2023). *Census profile, 2021 census of population*. Retrieved from <https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&GENDERlist=1&STATISTIClist=1&HEADERlist=0&DGUIDlist=2021A00054806016>

StreetFilms. (2024, February 21). *Paris school streets: Safe for children, safe for everyone* [Video]. YouTube. Retrieved from <https://www.youtube.com/watch?v=ezPzocuqKPc>

Sustainable Calgary. (n.d.). *The Connaught open street is back!* Retrieved from <https://www.sustainablecalgary.org/#new-page-22>

Sustainable Calgary. (2022). *Kids reimagine school streets*. Retrieved from <https://www.sustainablecalgary.org/publications-1/2022/4/13/kids-reimagine-school-streets>

Tam, T. (2017). *Designing healthy living: The chief public health officer's report on the state of public health in Canada*. Retrieved from [https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/chief-public-health-officer-reports-state-public-health-canada/2017-designing-healthy-living/PHAC\\_CPHO-2017\\_Report\\_E.pdf](https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/chief-public-health-officer-reports-state-public-health-canada/2017-designing-healthy-living/PHAC_CPHO-2017_Report_E.pdf)

The Centre for Active Transportation (2022). *Markham school streets program final report*. Retrieved from <https://www.tcat.ca/wp-content/uploads/2023/02/School-Streets-Report-Final.pdf>

Transport Canada. (2021). *National collisions database online 1.0*. Retrieved from <https://wwwapps2.tc.gc.ca/Saf-Sec-Sur/7/NCDB-BNDC/p.aspx?l=en&l=en>

Wilcock, C. (2020). *Expanded active and safe routes to school program* [Transportation Report to Infrastructure and Planning Committee]. Retrieved from <https://pub-calgary.escribemeetings.com/filestream.ashx?DocumentId=215600>

World Health Organization. (2024). *Environment, climate change, and health*. Retrieved from <https://www.who.int/teams/environment-climate-change-and-health/healthy-urban-environments/transport/health-risks>

Wray, A., Martin, G., Ostermeier, E., Medeiros, A., Little, M., Reilly, K., & Gilliland, J. (2020). Physical activity and social connectedness interventions in outdoor spaces among children and youth: A rapid review. *Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice*, 40(4), 104. <https://doi.org/10.24095/hpcdp.40.4.02>

Yao, X., Skinner, R., McFaul, S., & Thompson, W. (2019). At-a-glance - 2015 injury deaths in Canada. *Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice*, 39(6-7), 225–231. <https://doi.org/10.24095/hpcdp.39.6/7.03>

8-80 Cities. (2022). *Ontario school street pilot summary report*. Retrieved from [https://www.8-80cities.org/wp-content/uploads/2022/12/OSSP-Summary-Report\\_Updated\\_.pdf](https://www.8-80cities.org/wp-content/uploads/2022/12/OSSP-Summary-Report_Updated_.pdf)

8-80 Cities. (2020). *Mountview: Summary report*. <https://880cities.org/wp-content/uploads/2020/06/8-80-Streets-Mountview-Summary-Report.pdf>

8-80 Cities. (2019). *School street guidebook*. Retrieved from <https://880cities.org/wp-content/uploads/2019/11/school-streets-guidebook-2019.pdf>

**Special thanks to those who helped guide this project:**

Brent Hagel, Celia Lee, David Kowel, Fran Motta, Jen Malzer, Kourtney Penner, Noel Keough, Ryan Martinson, Sarah Parchewsky, Stefania Bertazzon, Tona Pitt, Tony Churchill, Tracey Coutts, Victoria Fast





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