CLIMATE CHANGE AND ACTIVE TRAVEL

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SEARCH STRATEGY

Search Terms:

- impact OR effect
- environment OR neighbo* OR pollution OR sustainability
- active OR walk* OR bike OR cycl*
- travel OR transport* OR commut* OR trip

Databases Used

- Google Scholar
- Web of Science
- Scopus

THEMES

Total publications = 45

Themes:	Number of Articles Relating to the Theme	Number of Articles Within Theme Studying Children
Air pollution related to travel	5	2
Health effects of air pollution	11	10
School buses and air pollution	3	2
Policy/initiatives to increase active travel	5	0
Exposure to air pollution due to active travel	5	0
Vehicular emissions due to school commute	7	7
Environmental benefits of switching to AT	5	0

BACKGROUND - CHILDREN'S HEALTH AND AIR POLLUTION

In children, air pollution is related to;

- Suppressed lung function
- Asthma
- Increased insulin resistance (precursor to type 2 diabetes)
- Impaired cognitive function
- Elevated blood pressure
- Cancer

Royal College of Physicians (2016)

Air pollution near schools has been linked to;

- Lower scores on standardized tests
- Lower attendance
- Lower integration in key brain networks
- Slower cognitive development

Forns, Dadvand, Esnaola, Alvarez-Pedrerol, López-Vicente, Garcia-Esteban, … Sunyer (2017)

Pujol, Martínez-Vilavella, Macià, Fenoll, Alvarez-Pedrerol, Rivas, … Sunyer (2016)

CONTRIBUTORS OF AIR POLLUTION RELATED TO TRAVEL

General travel;

- Residents in rural areas have higher than average vehicular emissions
- Compared to residents in the low income group, residents classified to be high income produced on average 3.5 times more annual emissions

Brand & Boardman (2008)

School travel;

- Rural and/or affluent populations had the highest emissions
- More affluent populations tended to contribute high levels of CO2 emissions, traveled further, and had lower rates of AT
- Emissions increased with academic progression with changes occurring between educational stages
- Students enrolled in selective schools tended to travel longer distances

Singleton (2014)

VEHICULAR EMISSIONS RELATED TO SCHOOL TRAVEL

- Kiss and Ride programs increased emissions during the drop off period
  - Due to particulate resuspension, this increased particulate count can increase ambient concentrations throughout the day

Adams & Requia (2017)

- Increases in total miles driven and, as a result, emissions are associated with non-neighborhood school enrollment

Wilson, Wilson & Krizek (2007)

- Factors for children's exposure at school include the use of private vehicles during morning drop off and proximity of schools to traffic routes

Requia, Adams, Arain, & Ferguson (2017)

SCHOOL BUSES AND AIR POLLUTION

- Higher rates of particle emissions from school buses were found in March, possibly related to increased engine idling in cold weather

Li, Nguyen, Ryan, Lemasters, Spitz, Lobaugh, Glover, & Grinshpun (2009)

- Number of operating buses was positively associated with average PM2.5 concentration
- Concentration increase was noticed during morning drop off hours and again during pick up, although to a lesser degree
- High PM2.5 concentration was found inside the school near open door

Hochstetler, Yermakov, Reponen, Ryan, & Grinshpun (2011)

- School bus retrofits have been associated with reductions in:
  - Bronchitis
  - Asthma
  - Pneumonia

Beatty & Shimshack (2011)

EXPOSURE TO AIR POLLUTION DUE TO ACTIVE TRAVEL

- When compared to the benefits of cycling, concerns regarding air pollution exposure during cycling are unsupported

Rabl & De Nazelle (2011)

- The benefits of increased physical activity outweigh the risks from air pollution the the global average urban background PM2.5 concentration (22 µg/m3)
- Harms would exceed benefits after 1.5 hours of cycling or 10 hours of walking In areas with greater PM2.5 concentrations (100 µg/m3)

Tainio, De Nazelle, Götschi, Kahlmeier, Rojas-Rueda, Nieuwenhuijsen, … Woodcock, J. (2016)

In children commuting to and from school;

- Highest PM2.5 exposure and cardiovascular effects were noticed in children who walked to school
- 6% of children's time was spent commuting
  - During this time, they obtained 20% of their daily black carbon dose
- Negative effects on working memory were observed with exposure to NO2, black carbon, and PM2.5
- Effects of PM2.5, black carbon, and NO2 were lower in females compared to males

Alvarez-Pedrerol, Rivas, Lopez-Vicente, Suades-Gonzalez, Donaire-Gonzalez, Cirach, M., … Sunyer, J. (2017)

ENVIRONMENTAL BENEFITS OF ACTIVE TRAVEL

- The major benefits of switching to AT is due to the increased levels of physical activity, followed by the benefits associated with reduced air pollution, and to a much lesser extent, from the reduction in risk of traffic accidents

Rojas-Rueda, De Nazelle, Teixidó & Nieuwenhuijsen (2012)

In schools;

- In an increased AT scenario, 19.0% of CO2 emissions were reduced
- In a scenario utilizing walking school buses, CO2 emissions were reduced by 13.2%

Bearman & Singleton (2014)

- Biking is a faster method of travel door to door for trips up to 5 kilometers.
- 100 kilograms of CO2 emissions could be reduced by eliminating 4 short car trips every week
- 1000 kilograms of CO2 emissions could be reduced by 9 families participating in a Walking School Bus through the school year

Ontario EcoSchools

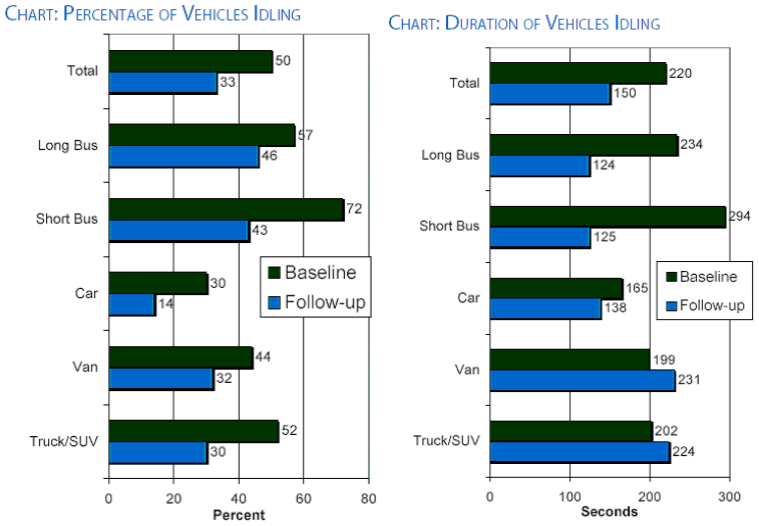
INITIATIVES TO INCREASE AT

- When cycling and walking increase to a "critical mass", others become aware that these are safe, enjoyable, and "perhaps even fashionable" activities
  - As a result, cultural shift towards AT may occur
- Additional walking and transit use is associated with land use mix
- Higher likelihoods of walking are associated with more and better-quality sidewalks
- Comprehensive multi-level interventions (including infrastructure improvements and promotional campaigns) have the greatest potential to increase AT

De Nazelle, Nieuwenhuijsen, Antó, Brauer, Briggs, Braun-Fahrlander, … Lebret (2011)

INITIATIVES TO REDUCE GHG EMISSIONS: ANTI-IDLING SUDBURY

- Spoke to motorists during morning drop off period over 2 days
  - Gave drivers information cards regarding the benefits of turning off the engine
  - Asked drivers to make a commitment to turning off their engines while parked
  - Gave drivers a sticker as reminder to turn of their engines and as a sign of their commitment to reduce engine idling
- Spoke with 591 motorists across 49 schools
- Comparing baseline and follow-up, the frequency and duration of idling decreased



National Resources Canada (2016)

GEORGE PRINGLE ELEMENTARY SCHOOL

- Took part in School Travel Planning
- Estimated that if 320 drivers avoided idling for 6 minutes per day, they would reduce 39 519 kilograms of GHG emissions per year
  - Each driver would contribute a reduction of 123 kilograms of GHG emissions per year
- 32.4 tonnes per year in GHG emissions could be reduced by increasing AT by 10% and avoiding idling by 50% of families

Nancy Mora Castro, Regional Air Quality Coordinator for Regional District of Central Okanagan

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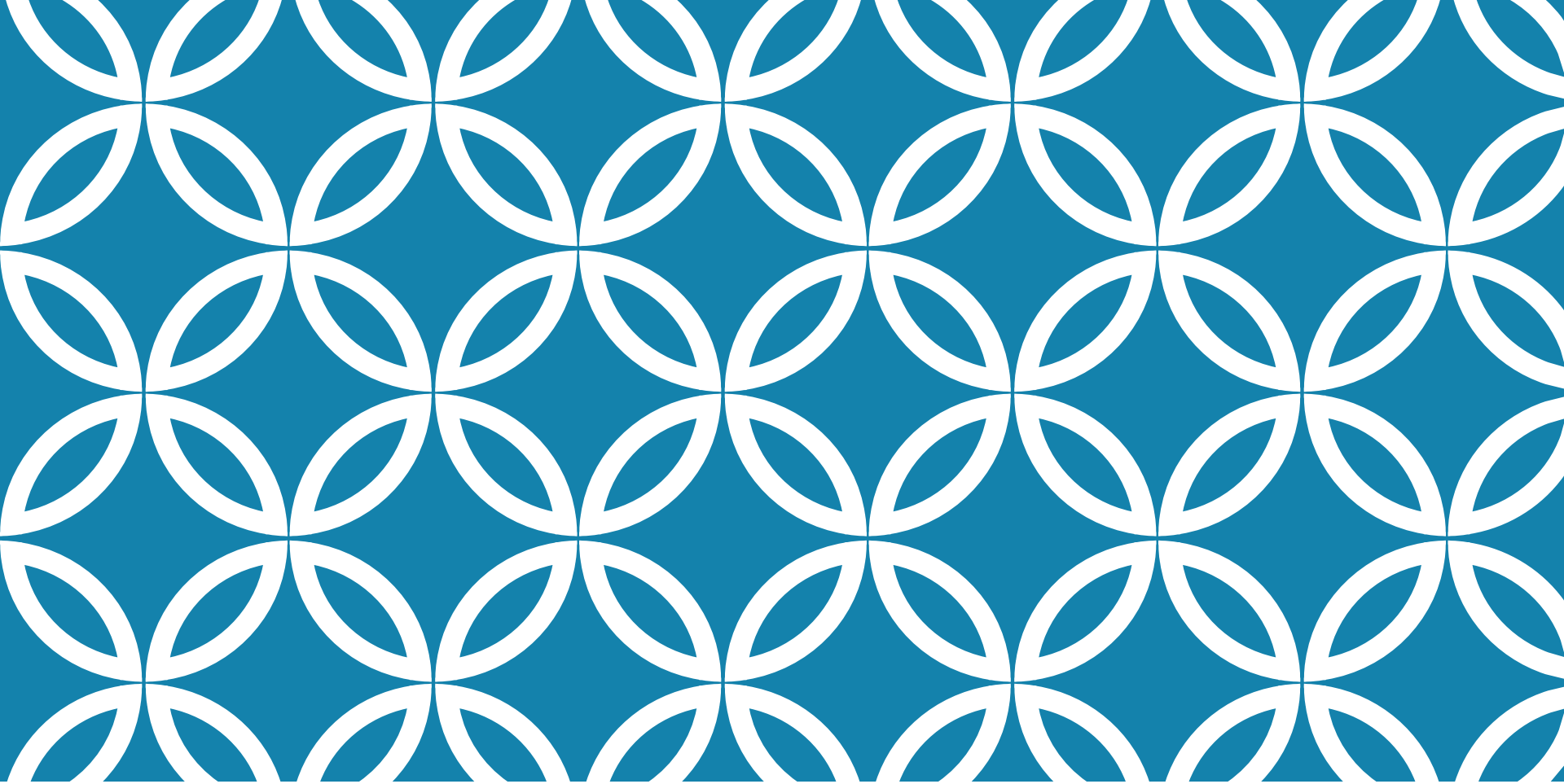

THANK YOU!