Active Travel, Active Lives: A Public Health Perspective on School Commutes for Children

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1. National and global trends in commute mode to school
2. Socioecological influences on active commuting
3. Evidence from the Texas School Physical Activity and Nutrition (Texas SPAN) survey
4. Public health implications

FHWA NHTS

BRIEF

CHILDREN'S TRAVEL TO SCHOOL

2017 National Household Travel Survey

March 2019

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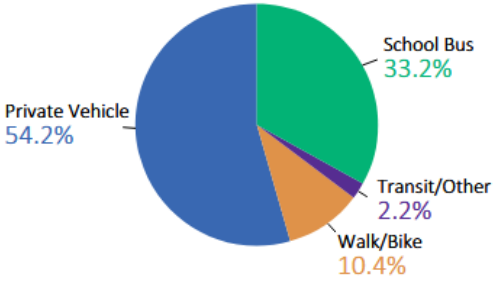

Figure 1. Means of travel from home to school in the United States for children ages 5–17 by percentage.[1]

The way that children travel to school varies considerably depending on the distance between their homes and schools (see figure 2). For example, according to 2017 NHTS data, 80.9% of children who live very close to school (i.e., a quarter mile or less) walk

About the NHTS

Conducted periodically since 1969 by the Federal Highway Administration, the NHTS collects travel data from a sample of U.S. households. The information is used to understand trends in the Nation's trip-making and miles of travel by mode, purpose, and time-of-day for use in policy, planning, and safety.

Data are collected for household members for each day of the year, yielding a rich demographic profile linked to daily travel and vehicle characteristics.

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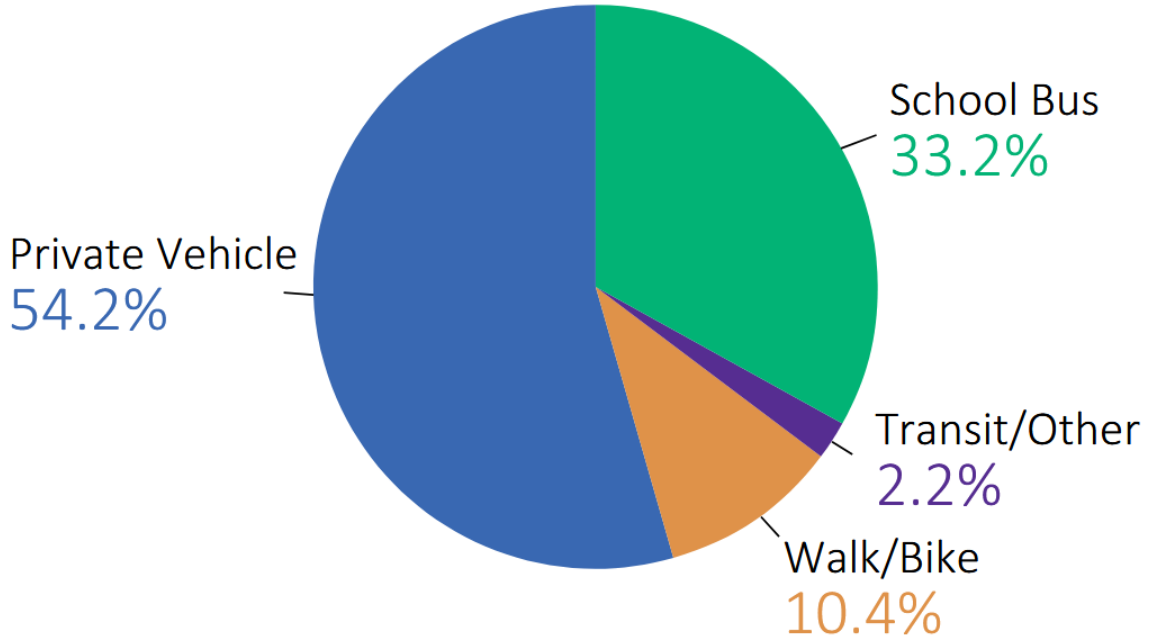

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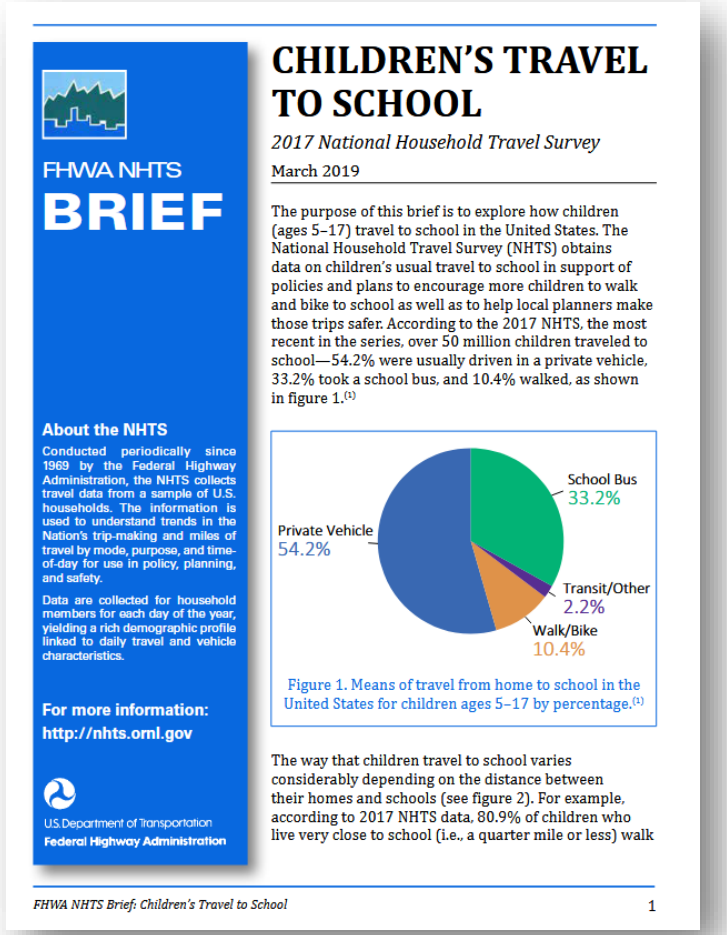

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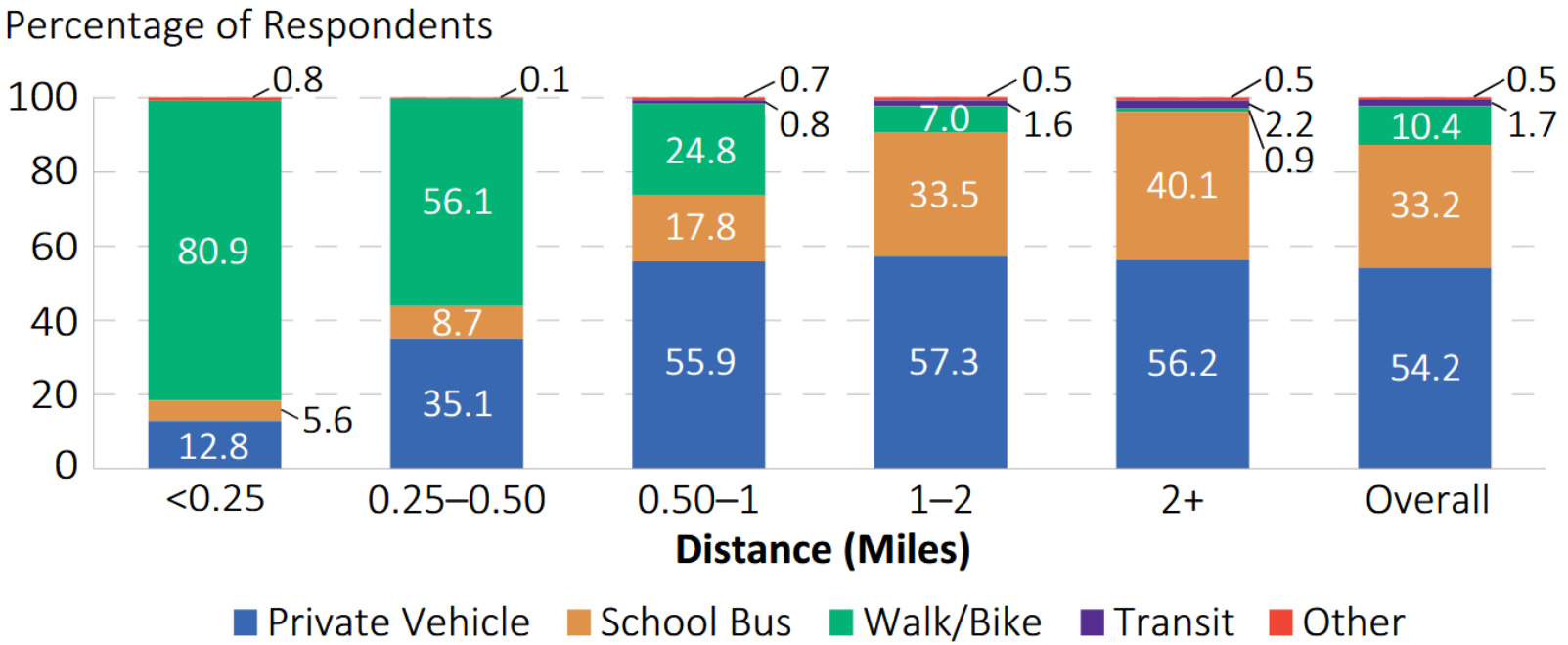
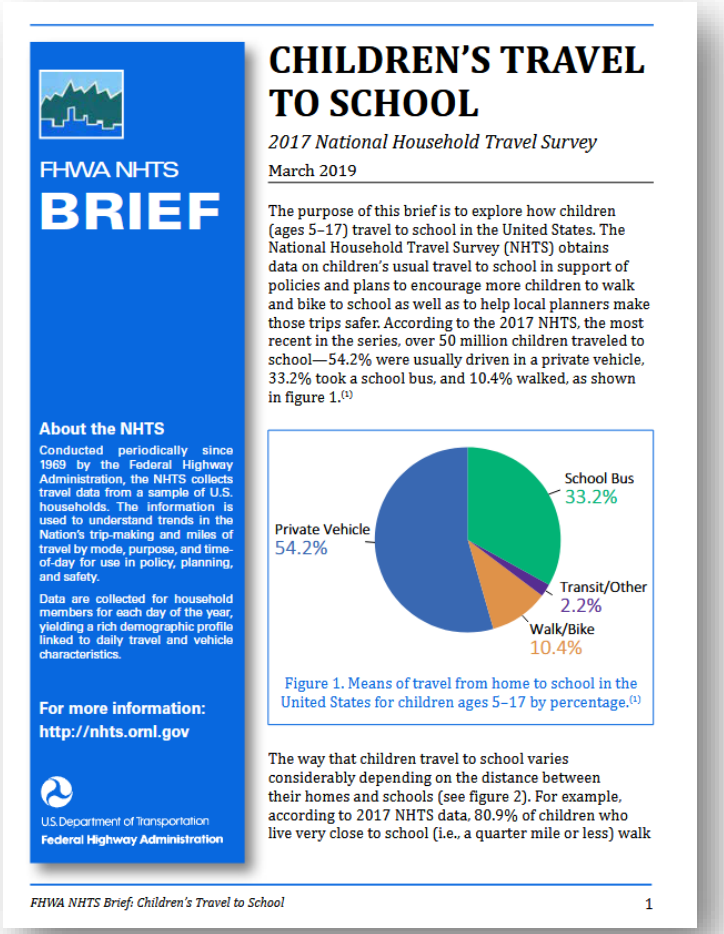


Figure 2. Means of travel from home to school by distance for children ages 5–17 by percentage.(1)



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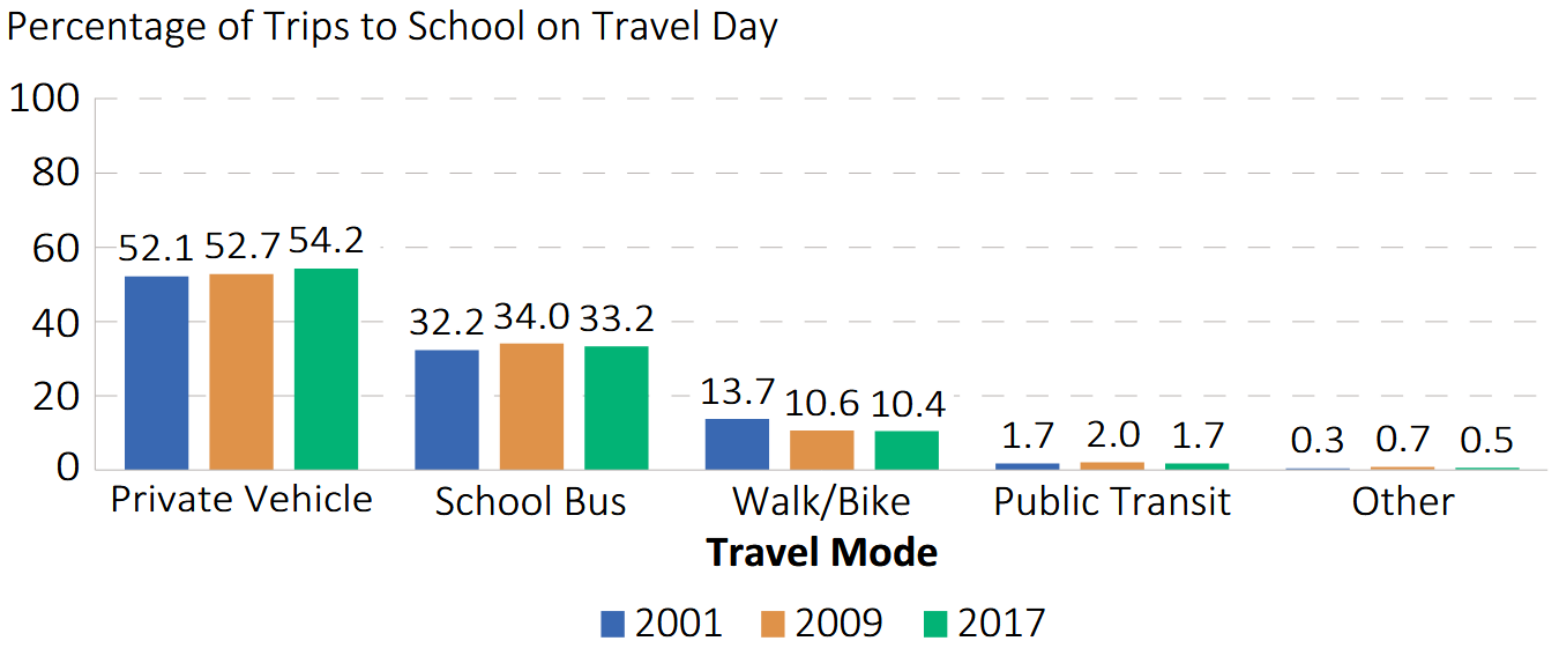

Figure 3. Means of travel to school for children ages 5–17 by NHTS year.(1–3)

Active Transportation to School

Trends Among U.S. Schoolchildren, 1969–2001

Noreen C. McDonald, PhD

Background: Rising rates of overweight children have focused attention on walking and biking to school as a means to increase children's physical activity levels. Despite this attention, there has been little documentation of trends in school travel over the past 30 years or analysis of what has caused the changes in mode choice for school trips.

Methods: This article analyzes data from the 1969, 1977, 1983, 1990, 1995, and 2001 National Personal Transportation Survey conducted by the U.S. Department of Transportation to document the proportion of students actively commuting to school in aggregate and by subgroups and analyze the relative influence of trip, child, and household characteristics across survey years. All analyses were done in 2006.

Results: The National Personal Transportation Survey data show that in 1969, 40.7% (95% confidence interval [CI]=37.9–43.5) of students walked or biked to school; by 2001, the proportion was 12.9% (95% CI=11.8–13.9). Distance to school has increased over time and may account for half of the decline in active transportation to school. It also has the strongest influence on the decision to walk or bike across survey years.

Conclusions: Declining rates of active transportation among school travelers represents a worrisome loss of physical activity. Policymakers should continue to support programs designed to encourage children to walk to school such as Safe Routes to School and the Centers for Disease Control and Prevention's KidsWalk. In addition, officials need to design policies that encourage schools to be placed within neighborhoods to ensure that the distance to school is not beyond an acceptable walking distance.

(Am J Prev Med 2007;32(6):509–516)

Introduction

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Studies have found that active transportation to school (ATS) provides a substantial portion of children's physical activity[7] and is associated with higher levels of energy expenditure.[8] Associations between ATS and body mass index (BMI) and total physical activity are less clear. Studies of British primary-school children[9] and Nebraskan elementary students[10] showed positive associations between ATS and total physical activity. However, a study of 5-year-old British boys found no association between ATS and overall physical activity.[11] An association between lower BMI and ATS was found for fourth- and fifth-grade boys.[12] However, other research has shown no relationship[13] or a positive association.[10]

Despite the potential health benefits, several studies have reported a decline in walking and biking for schoolchildren in the United States between 1969 and the present.[14,15] However, little is known of the details of this decline. Previous studies have not looked at active commuting data during the intervening years to establish a trend definitively. In addition, there has been little study of the factors causing the decline in walking. Although existing research has identified distance to school, traffic, and stranger danger as the top barriers to walking to school,[14,16] there has been no analysis of longitudinal effects. This study fills the gap in the research by analyzing

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0749-3797/07/$–see front matter
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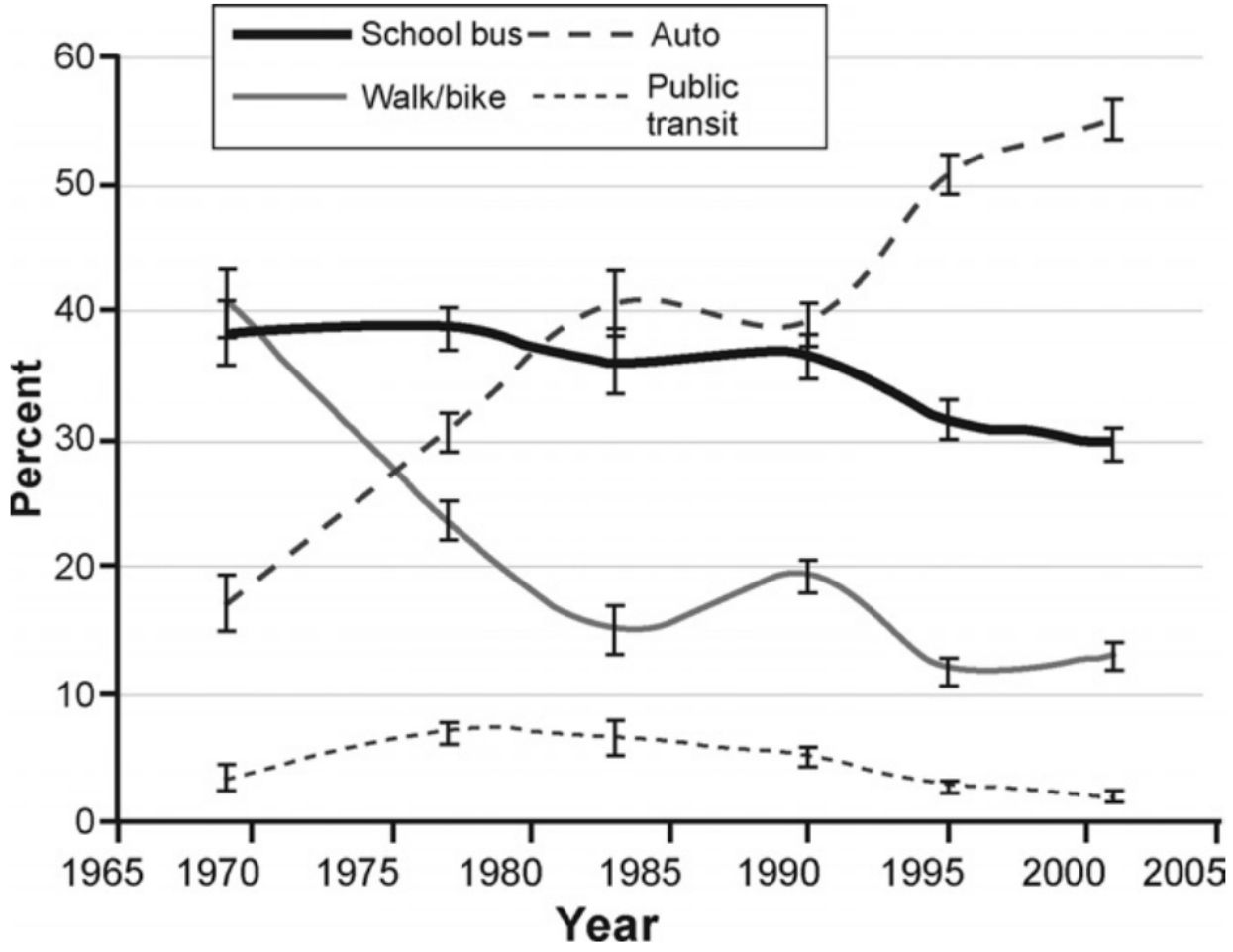

Figure 1. Standardized[a] mode shares for trips to school. [a]Standardized to 2001 age and race distribution. Error bars represent the 95% confidence interval.

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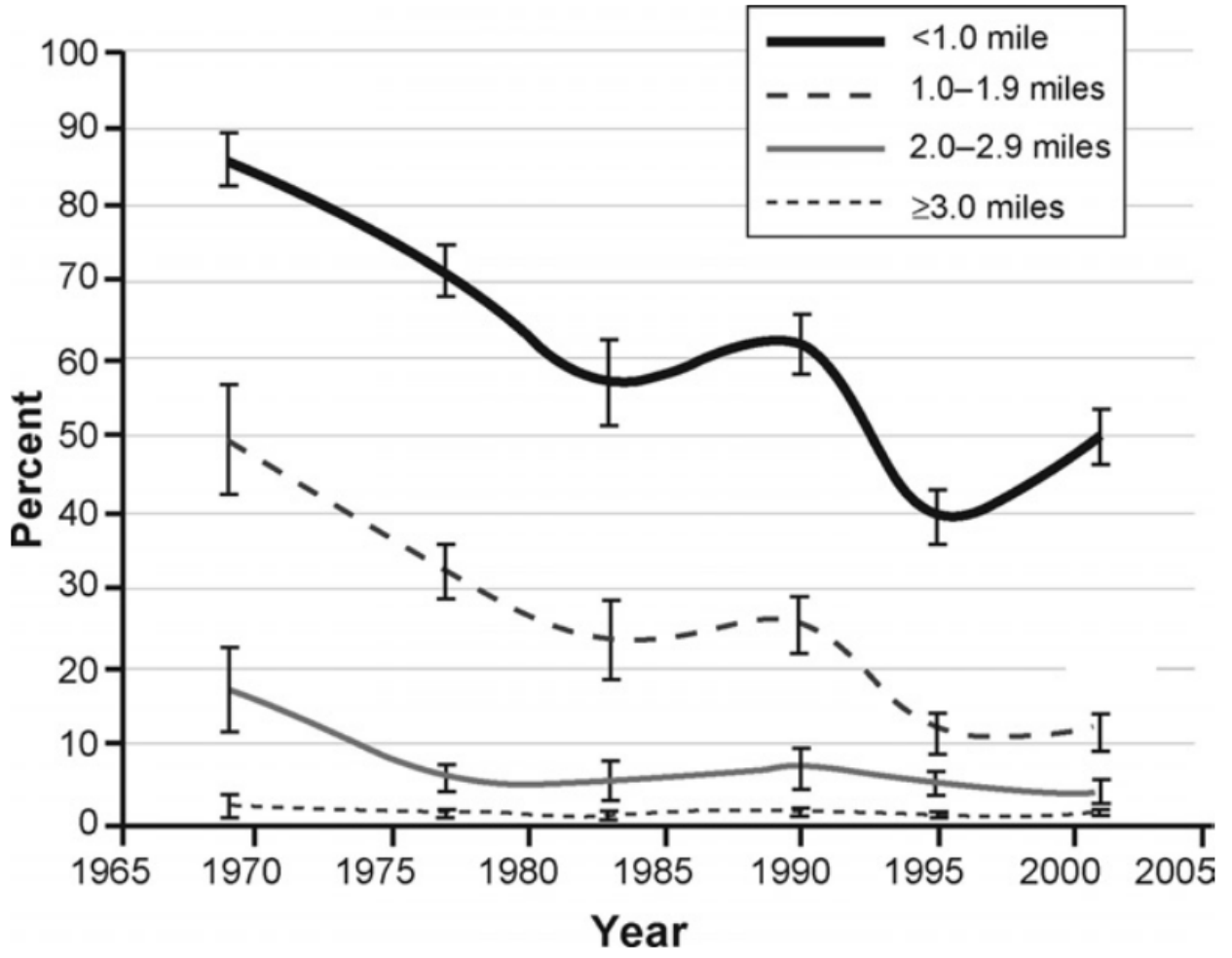

Figure 2. Walk/bike mode share by distance to school. Error bars represent the 95% confidence interval.

International Journal of Environmental Research and Public Health

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Review

Active School Commuting in School Children: A Narrative Review of Current Evidence and Future Research Implications

Ho Yeung Lam *, Sisitha Jayasinghe, Kiran D. K. Ahuja and Andrew P. Hills

School of Health Sciences, College of Health and Medicine, University of Tasmania, Launceston, TAS 7250, Australia; sisitha.jayasinghe@utas.edu.au (S.J.); kiran.ahuja@utas.edu.au (K.D.K.A.); andrew.hills@utas.edu.au (A.P.H.)
* Correspondence: hoyeung.lam@utas.edu.au

Abstract: Active school commuting (ASC) has been proposed as a practical way to inculcate positive physical activity habits in children. This paper reviews the current evidence regarding ASC among children, highlights advances in research techniques and existing limitations in the field, and outlines future implications for research and promotion. A comprehensive literature search was conducted to identify English language studies on ASC among children aged 6–12 years, followed by a narrative review. ASC has witnessed a global decline, despite evidence of its contribution to physical activity levels. Context-dependent factors such as commuting distance and parental safety concerns are consistently identified as key determinants of ASC. Several promising interventions have been identified. Despite the limitations in intervention scope and quality, notable advancements in research techniques, such as multilevel regression and agent-based modelling, have been identified. Effective promotion of ASC to tackle childhood physical inactivity requires collaborative efforts among schools, parents, and the government, and should be tailored to address multilevel determinants within the local context. Future research should leverage recent advancements in research techniques to develop effective promotion strategies, while considering the context-dependent nature of ASC behaviours and addressing existing limitations, including the lack of standardised definitions and limited geographical and age coverage.

Keywords: active school commuting; physical activity; active transport; active travel; children; school; narrative review

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Citation: Lam, H.Y.; Jayasinghe, S.; Ahuja, K.D.K.; Hills, A.P. Active School Commuting in School Children: A Narrative Review of Current Evidence and Future Research Implications. *Int. J. Environ. Res. Public Health* **2023**, *20*, 6929. https://doi.org/10.3390/ijerph20206929

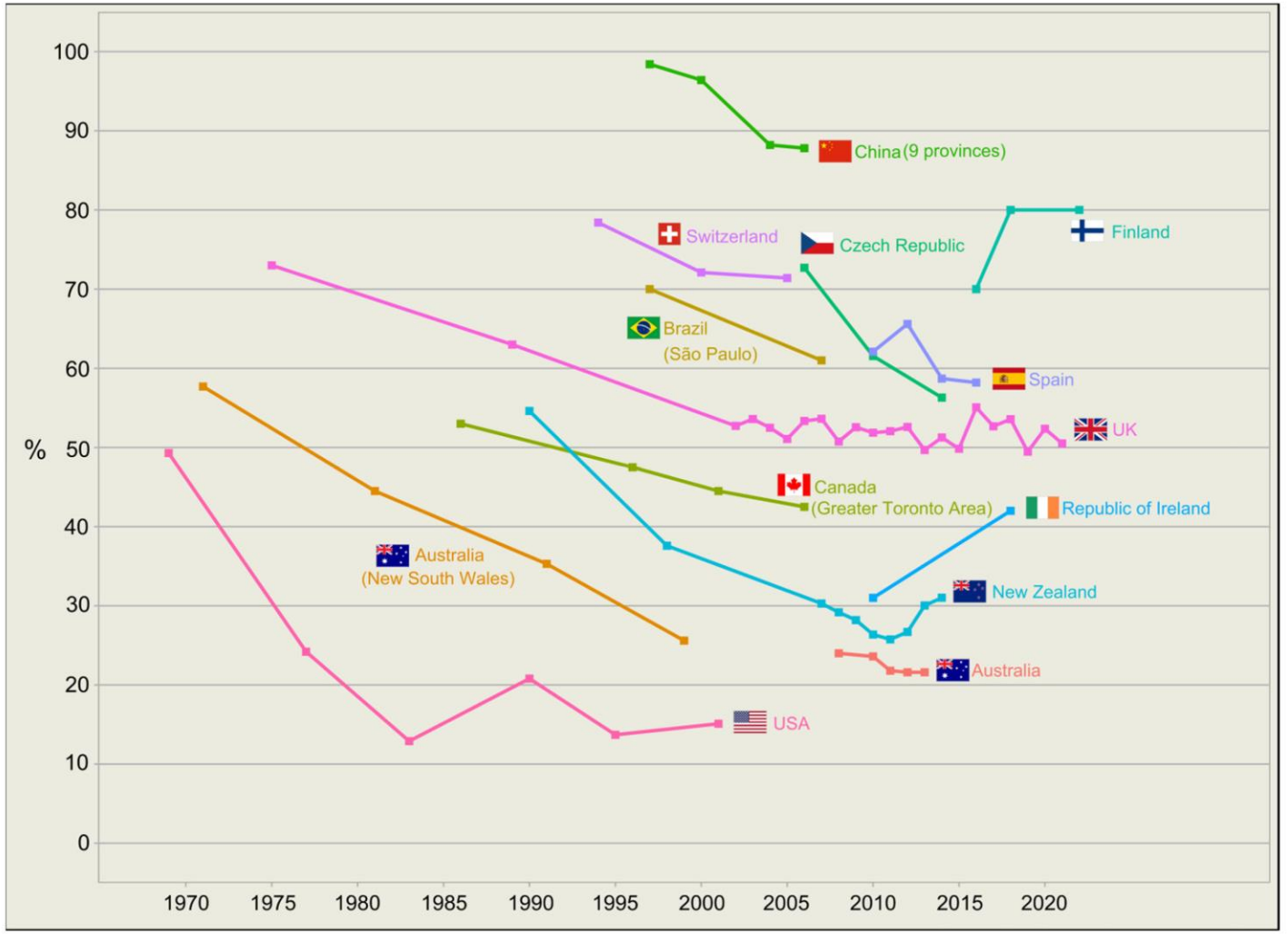
Academic Editor: Wojciech Kolanowski

Received: 11 September 2023
Revised: 6 October 2023
Accepted: 11 October 2023
Published: 16 October 2023

1. Introduction

Childhood physical inactivity continues to pose a significant public health challenge, with a majority of children and adolescents failing to meet the World Health Organization's physical activity recommendations [1]. Unfortunately, the COVID-19 pandemic has likely exacerbated this issue due to social distancing restrictions and reduced access to physical activity facilities such as school, sport clubs, and swimming pools [2]. Given the propensity for habits formed in early life to transition into adulthood [3–5], early and middle childhood provides an opportune window to inculcate positive physical activity habits that can potentially manifest into life-long health benefits [6].

Active school commuting (ASC) was first proposed in the early 2000s as a potential source of physical activity for school children beyond the school boundaries [7,8]. With each school child typically making 360–400 trips to and from school each year [9], these journeys present an excellent opportunity to integrate physical activity into their daily routines, especially through active modes of transportation such as walking, cycling, or using non-motorised vehicles [10]. The past two decades have witnessed ASC emerging as a key area of childhood physical activity research. Nevertheless, the fact that childhood physical inactivity remains entrenched [11] makes it imperative at this juncture to examine the roles of ASC in promoting physical activity and to identify strategies to maximise its contribution in fostering a healthier and more active childhood.



CHAPTER FOUR

Impact of active travel to school on children's health: an overview of systematic reviews

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Abstract

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What Are the Health Benefits of Active Trav Systematic Review of Trials and Cohort Stu

Lucinda E. Saunders[1], Judith M. Green[1], Mark P. Petticrew[1]*, Rebecca Steinbach
1 Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, United Kingdom, 2 General and Ad
of Child Health, London, United Kingdom

Abstract

Background: Increasing active travel (primarily walking and cycling) has been widely advocated f
and achieving other population health benefits. However, the strength of evidence underpinnin
This study aimed to assess the evidence that active travel has significant health benefits.

Methods: The study design was a systematic review of (i) non-randomised and randomised
prospective observational studies examining either (a) the effects of interventions to promote
association between active travel and health outcomes. Reports of studies were identified by
databases, websites, reference lists and papers identified by experts in the field. Prospective obser
studies measuring any health outcome of active travel in the general population were included.
were excluded.

Results: Twenty-four studies from 12 countries were included, of which six were studies cond
studies evaluated active travel interventions. Nineteen were prospective cohort studies which did
of a specific intervention. No studies were identified with obesity as an outcome in adults; one c
studies in children found an association between obesity and active travel. Small positive effects
were found in five intervention studies, but these were all at risk of selection bias. Modest
outcomes were identified in five prospective studies. There is suggestive evidence that active tr
effect on diabetes prevention, which may be an important area for future research.

Conclusions: Active travel may have positive effects on health outcomes, but there is little robus
effectiveness of active transport interventions for reducing obesity. Future evaluations of such int
an assessment of their impacts on obesity and other health outcomes.

Citation: Saunders LE, Green JM, Petticrew MP, Steinbach R, Roberts H (2013) What Are the Health Benefits of Active Travel? A
Cohort Studies. PLoS ONE 8(8): e69912. doi:10.1371/journal.pone.0069912

Editor: Jonatan R. Ruiz, University of Granada, Spain

Received January 31, 2013; **Accepted** June 13, 2013; **Published** August 15, 2013

Funding: This project was funded by the National Institute for Health Research Public Health Research programme (project nun
opinions expressed herein are those of the authors and do not necessarily reflect those of the Department of Health. The fu
conduct or reporting of project findings.

Competing Interests: The authors have declared that no competing interests exist.

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Background

The link between physical activity and health has long been known, with the scientific link established in Jerry Morris' seminal study of London bus drivers in the 1950s [1]. There is also good ecological evidence that obesity rates are increasing in countries and settings in which 'active travel' (primarily walking and cycling for the purpose of functional rather than leisure travel) is declining [2,3]. Given that transport is normally a necessity of everyday life, whereas leisure exercise such as going to a gym may be an additional burden, and is difficult to sustain long term, [4,5] encouraging 'active travel' may be a feasible approach to increasing levels of physical activity [6]. It is therefore plausible to assume that interventions aimed at increasing the amount of active travel within a population may have a positive impact on health. This has been the underlying rationale for recent public health interest in transport interventions aiming to address the obesity epidemic and a range of oth
[7]; for example, "*For most people, the physical activity are those that can be inco
include walking or cycling instead of th*
Active travel is seen by policy make
an important part of the solution to
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It has been recommended that
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activity reduces all-cause mortality,

children MDPI

Article

Association between Active Travel to School and Depressive Symptoms among Early Adolescents

Jiayi Gu [1,*] and Si-Tong Chen [2]
1 School of Physical Education and Sport, Shanghai Normal University, Shanghai 200234, China
2 Department of Physical Education, Shenzhen University, Shenzhen 518061, China; sitongchen@s
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Received: 2 March 2020; Accepted: 26 April 2020; Published: 2 May 2020

Abstract: Background: Although much evidence has demonstrated the positive relationship
school travel (AST) and physical health, little is known about the relationship of AST an
health indicators among early adolescents, especially in Chinese populations. Thus, th
aimed to investigate the relationship of AST with depressive symptoms and its sex as we
difference among early adolescents from Shanghai urban areas, China. Methods: 6478 ad
(mean age = 13.6) in urban area were recruited, of whom boys accounted for 46.2%. A self-
questionnaire in Chinese was used to collect data on AST and depressive symptoms, and othe
variables. Multivariable logistic regression analyses were used to explore the relationship
with depressive symptoms. Results: Of all included participants, 53.2% of adolescents report
active in AST without sex difference. The prevalence of depressive symptoms was 19.2%
sex difference. AST was associated with reporting no depressive symptoms in adolescents (
OR = 1.20, 95%CI: 1.06–1.36). However, the relationship was significant in boys (adjusted O
95%CI: 1.11–1.60), in those who were grade 8 (adjusted OR = 1.25, 95%CI: 1.01–1.55) and 9 (
OR = 1.29, 95%CI: 1.01–1.65) adolescents. Conclusions: AST may play an important role in pr
depressive symptoms among early adolescents. However, the relationship of AST with de
symptoms differed by sex and age. More research is encouraged to explore the mechanism
AST and depressive symptoms among adolescents, especially in different contexts.

Keywords: active school travel; adolescents; mental health; depressive symptoms; China

1. Introduction

Depressive symptoms are part of a type of emotional disorder, with typical symptoms i
feelings of sadness, sleep loss, and suicidal thoughts that have a significantly adverse impact on
health [1,2]. Globally, more than 264 million people of all ages suffer from depressive sy
so this has become an alarming mental health issue [2]. In China, data show that approxima
of Chinese children and adolescents exhibit depressive symptoms [3], and the proportions
region or city, in the range of 10%–50% [4]. Indeed, depressive symptoms are a serious hea
that has aroused the attention of policymakers in China. The Healthy China Blueprint 2
has engendered evidence-based information in an effort to alleviate the health burdens of de
symptoms and prevent them in children and adolescents [5]. A reduction in depressive sy
requires the need for joint efforts from multiple sectors. Within this framework, epidem
from physical activity (PA) behavior must play a vital role in preventing and decreasing de
symptoms in children and adolescents with the preventive effects from PA behaviors.

Well-established evidence demonstrated that increased PA can reduce the risk factors as
with depressive symptoms in young people [6–8]. For example, engaging in more PA was associ
lower depressive symptoms in Norwegian adolescents [9]. This finding was replicated among

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The tracking of active travel and i in UK adolescents

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ARTICLE INFO

Article history:
Received 7 January 2015
Received in revised form
25 September 2015
Accepted 29 September 2015
Available online 23 October 2015

Keywords:
Active travel
Body composition
Walking
Cycling
School
Adolescent

ABSTRA
Background:
mass index (
Methods: We
(ALSPAC). The
16 years, and
were calculat
using Genera
travel pattern
point), BMI, a
years. Analys
education wit
Results: Ther
32.3% of fem
active travel
β = −0.23; 9
compared to
Conclusions:
against the de
to school, pul
health in you

1. Introduction

Young people who are physically active are less lik
cardiovascular risk profile than their less active peers
sufficiently active to achieve these health benefits. For e
years achieve recommended daily levels of moderate
2012). In addition to generally low levels of physical acti
et al., 2013; Dumith et al., 2011).

Walking and cycling to school (active travel) may o
lives. Studies utilising objective measures of MVPA have found walking to school to contribute between 24.6 and 40.2% of daily MVPA (Southward et al., 2012; Van Sluijs et al., 2009a). In the UK, studies in primary school aged children have shown that over 1 year, children who changed from passive travel to walking to school increased MVPA by 12–16% (Cooper et al., 2012; Smith et al., 2011). Furthermore, there is emerging evidence of the health benefits of active travel. In children, some, but not all studies have shown walking and cycling to

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http://dx.doi.org/10.1016/j.jth.2015.09.005
2214-1405/

frontiers in Public Health

ORIGINAL RESEARCH
published: 15 December 2021
doi: 10.3389/fpubh.2021.719747

The Associations of Active Travel to School With Physical Activity and Screen Time Among Adolescents: Do Individual and Parental Characteristics Matter?

Caihong Huang[1]*, Aamir Raoof Memon*[2]*, Jin Yan*[3]*, Youliang Lin*[4] *and Si-Tong Chen*[5]
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OPEN ACCESS

Edited by:
Irena Valantine,
Lithuanian Sports University, Lithuania

Reviewed by:
Damir Sekulic,
University of Split, Croatia
Jiangmin Xu,
Winston-Salem State University, United States

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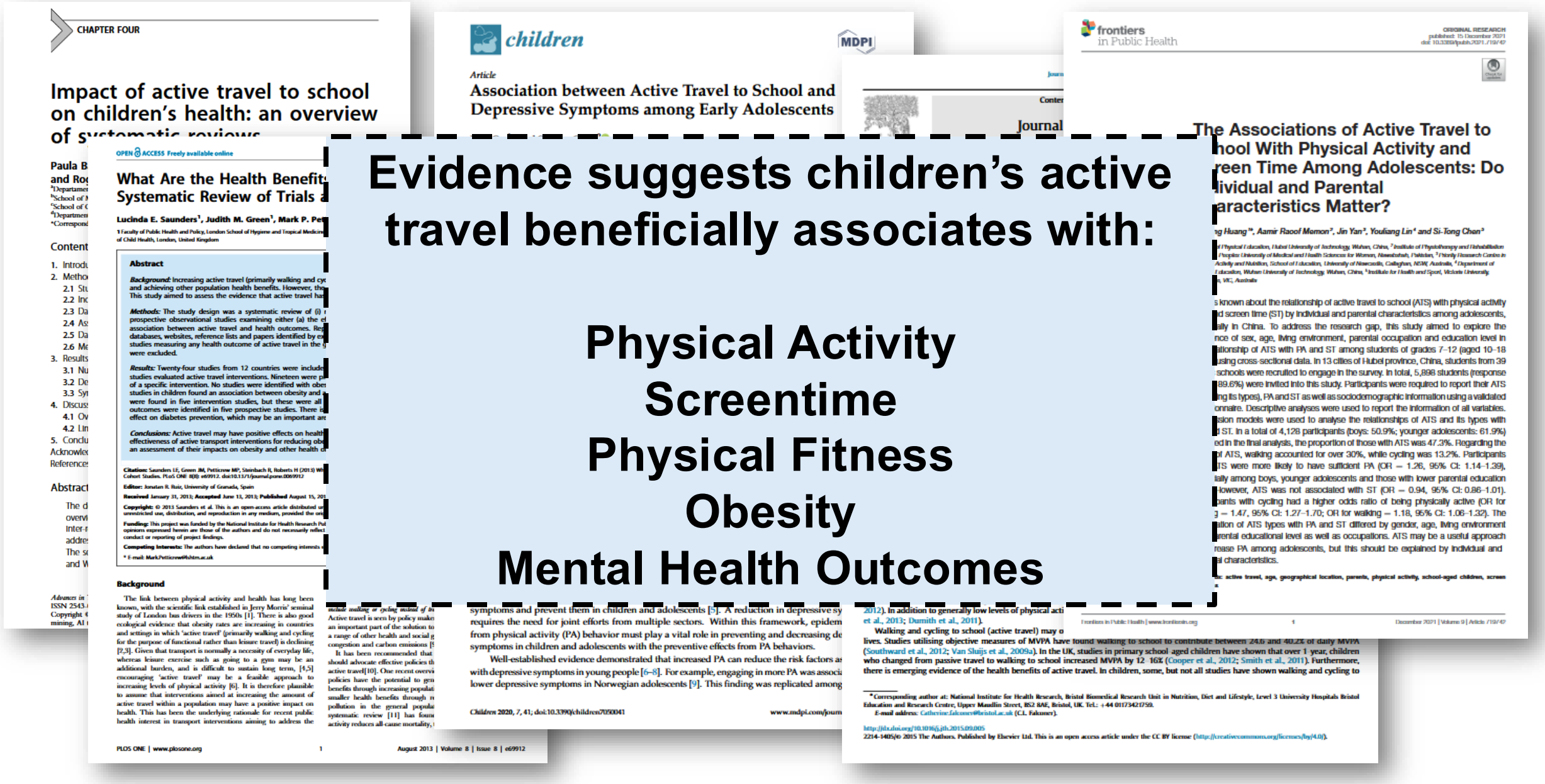
Specialty section:
This article was submitted to Children and Health, a section of the journal Frontiers in Public Health

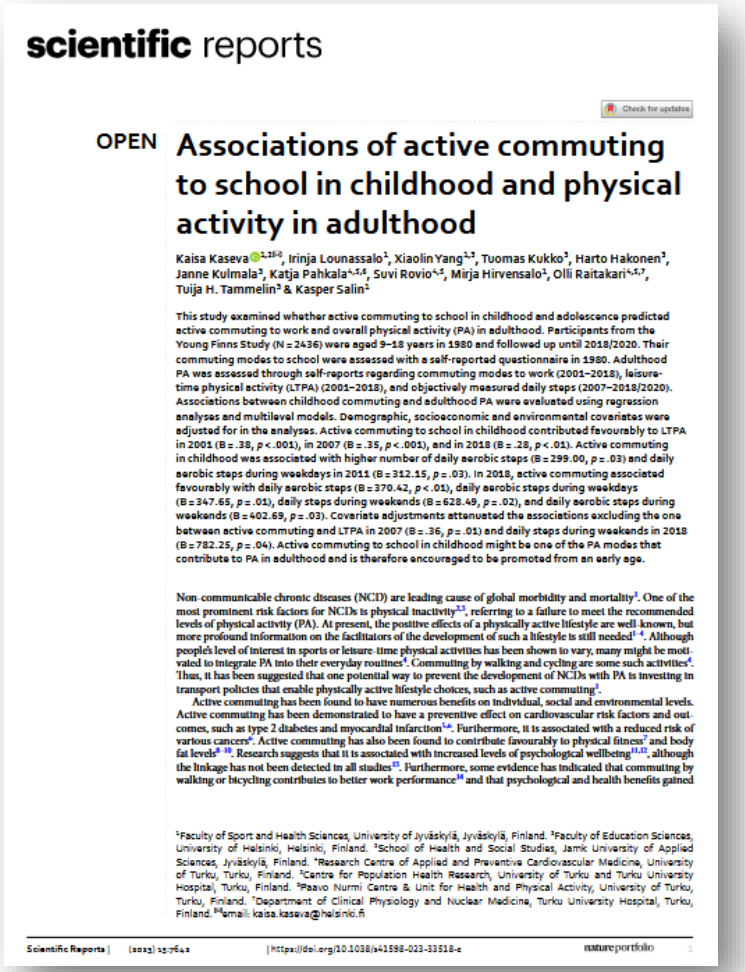
Received: 03 June 2021
Accepted: 19 November 2021
Published: 15 December 2021

Citation:
Huang C, Memon AR, Yan J, Lin Y and Chen S-T (2021) The Associations of Active Travel to School With Physical Activity and Screen Time Among Adolescents: Do Individual and Parental Characteristics Matter? Front. Public Health 9:719747. doi: 10.3389/fpubh.2021.719747

Little is known about the relationship of active travel to school (ATS) with physical activity (PA) and screen time (ST) by individual and parental characteristics among adolescents, especially in China. To address the research gap, this study aimed to explore the difference of sex, age, living environment, parental occupation and education level in the relationship of ATS with PA and ST among students of grades 7–12 (aged 10–18 years) using cross-sectional data. In 13 cities of Hubei province, China, students from 39 public schools were recruited to engage in the survey. In total, 5,898 students (response rate = 89.6%) were invited into this study. Participants were required to report their ATS (including its types), PA and ST as well as sociodemographic information using a validated questionnaire. Descriptive analyses were used to report the information of all variables. Regression models were used to analyse the relationships of ATS and its types with PA and ST. In a total of 4,128 participants (boys: 50.9%; younger adolescents: 61.9%) included in the final analysis, the proportion of those with ATS was 47.3%. Regarding the types of ATS, walking accounted for over 30%, while cycling was 13.2%. Participants with ATS were more likely to have sufficient PA (OR = 1.26, 95% CI: 1.14–1.39), especially among boys, younger adolescents and those with lower parental education level. However, ATS was not associated with ST (OR = 0.94, 95% CI: 0.86–1.01). Participants with cycling had a higher odds ratio of being physically active (OR for cycling = 1.47, 95% CI: 1.27–1.70; OR for walking = 1.18, 95% CI: 1.08–1.32). The association of ATS types with PA and ST differed by gender, age, living environment and parental educational level as well as occupations. ATS may be a useful approach to increase PA among adolescents, but this should be explained by individual and parental characteristics.

Keywords: active travel, age, geographical location, parents, physical activity, school-aged children, screen time, sex


CHAPTER FOUR
Impact of active travel to school on children's health: an overview of systematic reviews
children
MDPI
Article
Association between Active Travel to School and Depressive Symptoms among Early Adolescents
frontiers in Public Health
ORIGINAL RESEARCH
The Associations of Active Travel to School With Physical Activity and Screen Time Among Adolescents: Do Individual and Parental Characteristics Matter?
OPEN ACCESS Freely available online
What Are the Health Benefits? Systematic Review of Trials
Abstract
Background
Walking and cycling to school (active travel) may
Evidence suggests children's active travel beneficially associates with:
Physical Activity
Screentime
Physical Fitness
Obesity
Mental Health Outcomes



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Associations of active commuting to school in childhood and physical activity in adulthood

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This study examined whether active commuting to school in childhood and adolescence predicted active commuting to work and overall physical activity (PA) in adulthood. Participants from the Young Finns Study (N = 2436) were aged 9–18 years in 1980 and followed up until 2018/2020. Their commuting modes to school were assessed with a self-reported questionnaire in 1980. Adulthood PA was assessed through self-reports regarding commuting modes to work (2001–2018), leisure-time physical activity (LTPA) (2001–2018), and objectively measured daily steps (2007–2018/2020). Associations between childhood commuting and adulthood PA were evaluated using regression analyses and multilevel models. Demographic, socioeconomic and environmental covariates were adjusted for in the analyses. Active commuting to school in childhood contributed favourably to LTPA in 2001 (B = .38, $p < .001$), in 2007 (B = .35, $p < .001$), and in 2018 (B = .28, $p < .01$). Active commuting in childhood was associated with higher number of daily aerobic steps (B = 299.00, $p = .03$) and daily aerobic steps during weekdays in 2011 (B = 312.15, $p = .03$). In 2018, active commuting associated favourably with daily aerobic steps (B = 370.42, $p < .01$), daily aerobic steps during weekdays (B = 347.65, $p = .01$), daily steps during weekends (B = 628.49, $p = .02$), and daily aerobic steps during weekends (B = 402.69, $p = .03$). Covariate adjustments attenuated the associations excluding the one between active commuting and LTPA in 2007 (B = .36, $p = .01$) and daily steps during weekends in 2018 (B = 782.25, $p = .04$). Active commuting to school in childhood might be one of the PA modes that contribute to PA in adulthood and is therefore encouraged to be promoted from an early age.

Non-communicable chronic diseases (NCD) are leading cause of global morbidity and mortality[1]. One of the most prominent risk factors for NCDs is physical inactivity[2,3], referring to a failure to meet the recommended levels of physical activity (PA). At present, the positive effects of a physically active lifestyle are well-known, but more profound information on the facilitators of the development of such a lifestyle is still needed[1–4]. Although people's level of interest in sports or leisure-time physical activities has been shown to vary, many might be motivated to integrate PA into their everyday routines[4]. Commuting by walking and cycling are some such activities[4]. Thus, it has been suggested that one potential way to prevent the development of NCDs with PA is investing in transport policies that enable physically active lifestyle choices, such as active commuting[1].

Active commuting has been found to have numerous benefits on individual, social and environmental levels. Active commuting has been demonstrated to have a preventive effect on cardiovascular risk factors and outcomes, such as type 2 diabetes and myocardial infarction[5,6]. Furthermore, it is associated with a reduced risk of various cancers[6]. Active commuting has also been found to contribute favourably to physical fitness[7] and body fat levels[8–10]. Research suggests that it is associated with increased levels of psychological wellbeing[11,12], although the linkage has not been detected in all studies[13]. Furthermore, some evidence has indicated that commuting by walking or bicycling contributes to better work performance[14] and that psychological and health benefits gained

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OPEN ACCESS Freely available online

PLOS ONE

Active Commuting Throughout Adolescence and Central Fatness before Adulthood: Prospective Birth Cohort Study

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Abstract

Background: Active commuting is a good opportunity to accumulate physical activity (PA) across the lifespan that potentially might influence central body fat. We aimed to examine the prospective associations of active commuting at 11, 15 and 18 years of age with central body fat at 18 years.

Methods: Participants were part of a large birth cohort study in Pelotas, Brazil (n = 3,649 participants). Active commuting, leisure-time PA and income were self-reported at 11, 15 and 18 years. Waist circumference and trunk fat mass were collected at 18 years with the use of a 3-dimensional photonic scanner and dual-energy X-ray absorptiometry, respectively.

Results: Active commuting at 11 years was not prospectively associated with central body fat. However, we found that active commuting at 15 and 18 years were prospectively and cross-sectionally associated with central body fat variables, respectively, in boys but not in girls. Also, boys in the highest tertile of accumulated active commuting (i.e., average of active commuting at 11, 13 and 18 years) were associated with −2.09 cm (95%CI: −3.24; −0.94) of waist circumference and −1.11 kg (95%CI: −1.74; −0.48) of trunk fat mass compared to boys in the lowest tertile. Analyses on changes in tertiles of active commuting from 11 and 15 years to 18 years with central body fat variables at 18 years showed that boys who remained consistently in the highest tertile or moved to a higher tertile had lower levels of central body fat compared to those consistently in the lowest tertile.

Conclusions: Active commuting throughout adolescence in boys, especially during middle and late adolescence, is associated with lower levels in central fatness before adulthood.

Citation: Martinez-Gomez D, Mielke GI, Menezes AM, Gonçalves H, Barros FC, et al. (2014) Active Commuting Throughout Adolescence and Central Fatness before Adulthood: Prospective Birth Cohort Study. PLoS ONE 9(5): e96634. doi:10.1371/journal.pone.0096634

Editor: Jean-Pierre Després, Québec Heart and Lung Institute, Canada

Received January 29, 2014; **Accepted** April 9, 2014; **Published** May 2, 2014

Funding: DMG received a scholarship from the Santander Bank for a brief stay in the Federal University of Pelotas, Brazil. The cohort study is supported by the Wellcome Trust. The initial phases of the cohort were funded by the European Union and the Brazilian National Program for Centers of Excellence (PRONEX), National Research Council (CNPq), and Ministry of Health. None of these organizations influenced the study design; the collection, analysis, and interpretation of data; the writing of the report; or the decision to submit the manuscript for publication.

Competing Interests: The authors have declared that no competing interests exist.

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Introduction

Excess central body fat is both a clinical and public health problem in adulthood [1]. Adults with an elevated central body fat will likely have more visceral, liver, and ectopic fat, and therefore, a greater risk for premature mortality and obesity-related metabolic disorders such as hypertension, type 2 diabetes and hypercholesterolemia [1–3]. Since central body fat tracks at high levels from childhood to adulthood [4], public health interventions must be developed from early ages. Physical activity (PA) has many benefits on health and one of the most accepted is its protective effect against obesity because of its role in energy balance [5,6].

Active commuting is a good opportunity to accumulate PA and decrease prolonged sitting (i.e. sedentary behaviors) across the lifespan, which potentially might influence body fat as well as other health outcomes regardless of body fat [7]. The impact of active commuting, mainly active commuting to school, in childhood and adolescence on central body fat later in life may be yielded by several mechanisms. A first mechanism suggests that active commuting to school would have benefits in their current central body fat. To date, some studies examined this mechanism, but there is no convincing evidence to suggest that active commuting to school is associated with lower levels of central body fat in youth [7–10]. A second and unexplored mechanism would be that active commuting to school might be important whether it is accumulated over a long period of time to achieve their benefits on health. This fact would be particularly important during adolescence where there is large decreasing in PA [11,12]. Finally, a third and another unexplored mechanism is based on compelling evidence that active commuting in adulthood is positively associated with central body fat and other health outcomes [13–17], so that young

Preventive Medicine 59 (2014) 5–11

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Active commuting from youth to adulthood and as a predictor of physical activity in early midlife: The Young Finns Study

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ARTICLE INFO

Available online 4 November 2013

Keywords:
Walking
Cycling
Active commuting
Physical activity
Youth
Adulthood
Stability

ABSTRACT

Objective. The aims of the study were to describe the stability of active commuting (AC) behavior (i.e., walking and cycling) over 27 years and examine the relationship between AC and physical activity (PA) from youth to early midlife.

Methods. The mode and distance of travel were assessed using a self-reported questionnaire at five consecutive measurements between 1980 and 2007, when 2072 individuals were followed up from youth (9–18 years) to adulthood (30–45 years). PA was also measured using a questionnaire.

Results. The prevalence of AC declined sharply with age, particularly after 12 years, while AC distances to work or place of study increased substantially. AC was concurrently and prospectively associated with PA in both men and women. Maintained AC, whether walking or cycling and short or long distances, positively predicted adult PA over time. Compared with persistently passive commuters, persistently active commuters had higher adult PA after adjustment for potential covariates. Increasing AC was independently associated with high adult PA, particularly in young adulthood.

Conclusions. Walking and cycling to school/work should be encouraged, as regular AC is associated with higher levels of PA over 27 years of follow-up, and thus, may contribute to a healthy and active lifestyle through the various stages of life-course.

Introduction

Active commuting (AC) (i.e., walking and cycling) contributes to overall physical activity (PA) levels, and thus, may make an important contribution to the health benefit attributed to PA during childhood (Davison et al., 2008; Lubans et al., 2011; Sirard and Slater, 2008) and adulthood (Sisson and Tudor-Locke, 2008; Terzano and Morckel, 2011; Yang et al., 2012a). Cycling to school/work seems to be more effective in improving physical fitness and reducing cardiovascular risk factors than other means of transport in both children (Andersen et al., 2011; Cooper et al., 2008) and adults (Andersen et al., 2000; Oja et al., 1998). Children's AC to school has been in decline over time (Johansson et al., 2012; Sirard and Slater, 2008), and similar declining trends are observed in the UK (Department for Transport, 2012), the US (Brownson et al., 2005; McDonald et al., 2011), and Canada (Buliung et al., 2009). These declines are also seen in adulthood (Ilorodulin et al., 2008; Department for Transport, 2012). Only a few recent longitudinal studies have evaluated the effects of changes in mode of travel on PA in either children (Cooper et al., 2012; Smith et al., 2012) or adults (Sahlqvist et al., 2013), and none has shown whether these effects persist from childhood to adulthood. To the best of our knowledge, this is the first study to evaluate the longitudinal changes in mode of travel to school or work, in this instance, over a period of 27 years. The aims of the present study were to examine (1) whether AC affected PA over time, (2) whether changes in AC in youth and young adulthood predicted PA in early midlife, and (3) whether this relationship persisted when potential confounders were controlled for.

Methods

Study population

The Young Finns Study (Raitakari et al., 2008) is an ongoing longitudinal population-based study consisting of a series of six surveys of six cohorts born in 1962, 1965, 1968, 1971, 1974 and 1977. The participants were 3, 6, 9, 12, 15 and 18 years of age at the beginning of the study in 1980. All were randomly selected (N = 3596) from the five Finnish university cities with medical schools (Helsinki, Kuopio, Oulu, Tampere and Turku) and their surrounding communities at baseline. Follow-ups were conducted in 1983, 1986, 2001, and 2007 with 2380 (66.2%), 2384 (66.3%), 2443 (67.9%), and 2178 (60.6%)

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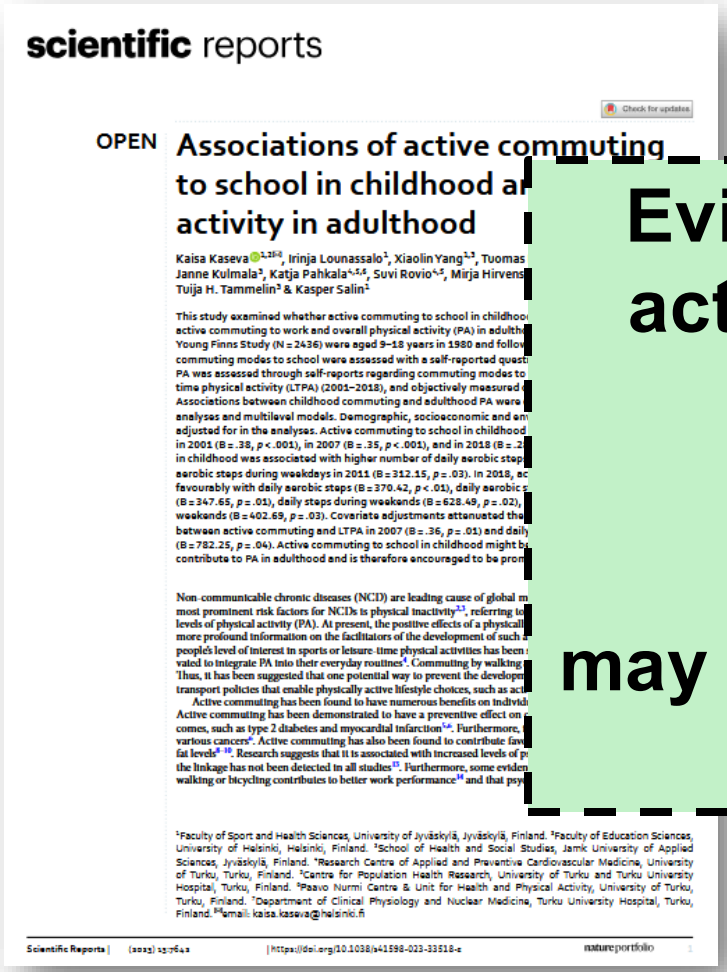
http://dx.doi.org/10.1016/j.ypmed.2013.10.019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Associations of active commuting to school in childhood and activity in adulthood

Kaisa Kaseva, Irinja Lounassalo, Xiaolin Yang, Tuomas Janne Kulmala, Katja Pahkala, Suvi Rovio, Mirja Hirvens Tuija H. Tammelin & Kasper Salin

This study examined whether active commuting to school in childhood active commuting to work and overall physical activity (PA) in adulth Young Finns Study (N = 2436) were aged 9–18 years in 1980 and follow commuting modes to school were assessed with a self-reported questi PA was assessed through self-reports regarding commuting modes to time physical activity (LTPA) (2001–2018), and objectively measured Associations between childhood commuting and adulthood PA were analyses and multilevel models. Demographic, socioeconomic and en adjusted for in the analyses. Active commuting to school in childhood in 2001 (B = .38, p < .001), in 2007 (B = .35, p < .001), and in 2018 (B = .2 in childhood was associated with higher number of daily aerobic step aerobic steps during weekdays in 2011 (B = 312.15, p = .03). In 2018, ac favourably with daily aerobic steps (B = 370.42, p < .01), daily aerobic s (B = 347.65, p = .01), daily steps during weekends (B = 628.49, p = .02), weekends (B = 402.69, p = .03). Covariate adjustments attenuated the between active commuting and LTPA in 2007 (B = .36, p = .01) and daily (B = 782.25, p = .04). Active commuting to school in childhood might b contribute to PA in adulthood and is therefore encouraged to be pron

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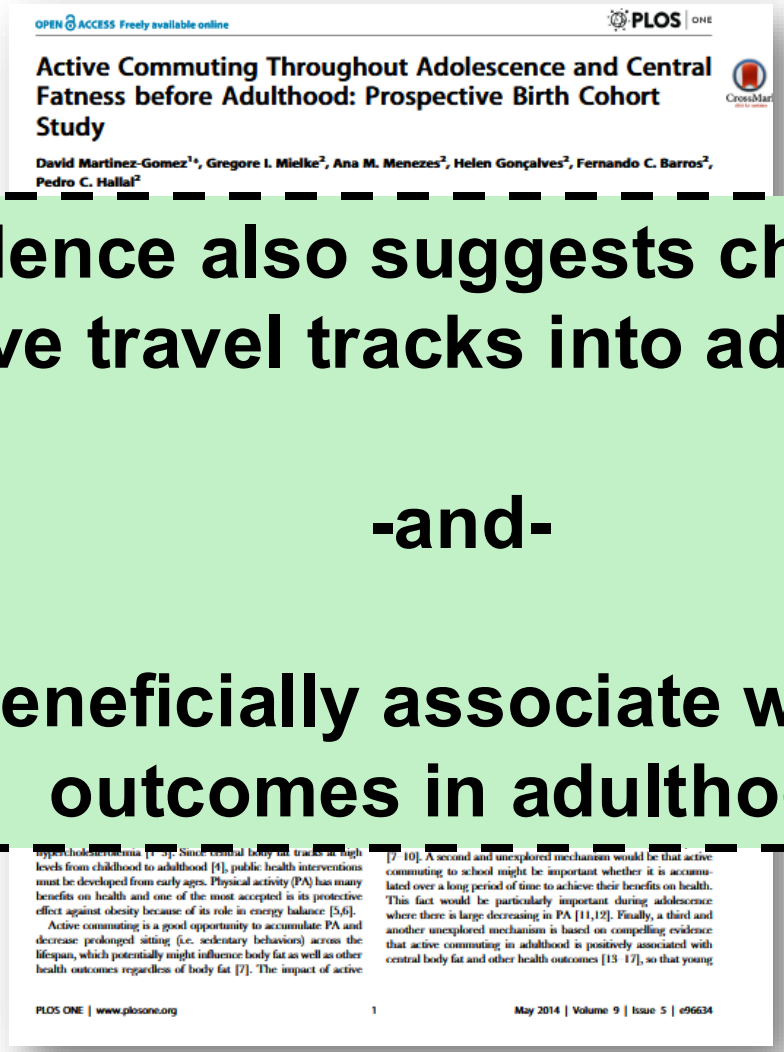
[1]Faculty of Sport and Health Sciences, University of Jyväskylä, Jyväskylä, Finland. [2]Faculty of Education Sciences, University of Helsinki, Helsinki, Finland. [3]School of Health and Social Studies, Jamk University of Applied Sciences, Jyväskylä, Finland. [4]Research Centre of Applied and Preventive Cardiovascular Medicine, University of Turku, Turku, Finland. [5]Centre for Population Health Research, University of Turku and Turku University Hospital, Turku, Finland. [6]Paavo Nurmi Centre & Unit for Health and Physical Activity, University of Turku, Turku, Finland. [7]Department of Clinical Physiology and Nuclear Medicine, Turku University Hospital, Turku, Finland. [8]email: kaisa.kaseva@helsinki.fi

Scientific Reports | (2023) 13:7642 | https://doi.org/10.1038/s41598-023-33518-z nature portfolio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PLOS ONE

Active Commuting Throughout Adolescence and Central Fatness before Adulthood: Prospective Birth Cohort Study

David Martinez-Gomez[1]*, Gregore I. Mielke[2], Ana M. Menezes[2], Helen Gonçalves[2], Fernando C. Barros[2], Pedro C. Hallal[2]

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PLOS ONE | www.plosone.org 1 May 2014 | Volume 9 | Issue 5 | e96634


Preventive Medicine 59 (2014) 5–11

Contents lists available at ScienceDirect

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ulthood and as a predictor of physical
Finns Study

nsalo [b], Tuija Tammelin [a], Jorma S.A. Viikari [c], Olli T. Raitakari [d,e]

y of Turku, Finland

C T

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Walking and cycling to school/work should be encouraged, as regular AC is associated with f PA over 27 years of follow-up, and thus, may contribute to a healthy and active lifestyle through es of life-course.

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mode of travel on PA in either children (Cooper et al., 2012; Smith et al., 2012) or adults (Sahlqvist et al., 2013), and none has shown whether these effects persist from childhood to adulthood. To the best of our knowledge, this is the first study to evaluate the longitudinal changes in mode of travel to school or work, in this instance, over a period of 27 years. The aims of the present study were to examine (1) whether AC affected PA over time, (2) whether changes in AC in youth and young adulthood predicted PA in early midlife, and (3) whether this relationship persisted when potential confounders were controlled for.

Methods

Study population

The Young Finns Study (Raitakari et al., 2008) is an ongoing longitudinal population-based study consisting of a series of six surveys of six cohorts born in 1962, 1965, 1968, 1971, 1974 and 1977. The participants were 3, 6, 9, 12, 15 and 18 years of age at the beginning of the study in 1980. All were randomly selected (N = 3596) from the five Finnish university cities with medical schools (Helsinki, Kuopio, Oulu, Tampere and Turku) and their surrounding communities at baseline. Follow-ups were conducted in 1983, 1986, 2001, and 2007 with 2380 (66.2%), 2384 (66.3%), 2443 (67.9%), and 2178 (60.6%)

trends are observed in the UK (Department for Transport, 2012), the US (Brownson et al., 2005; McDonald et al., 2011), and Canada (Buliung et al., 2009). These declines are also seen in adulthood (Borodulin et al., 2008; Department for Transport, 2012). Only a few recent longitudinal studies have evaluated the effects of changes in

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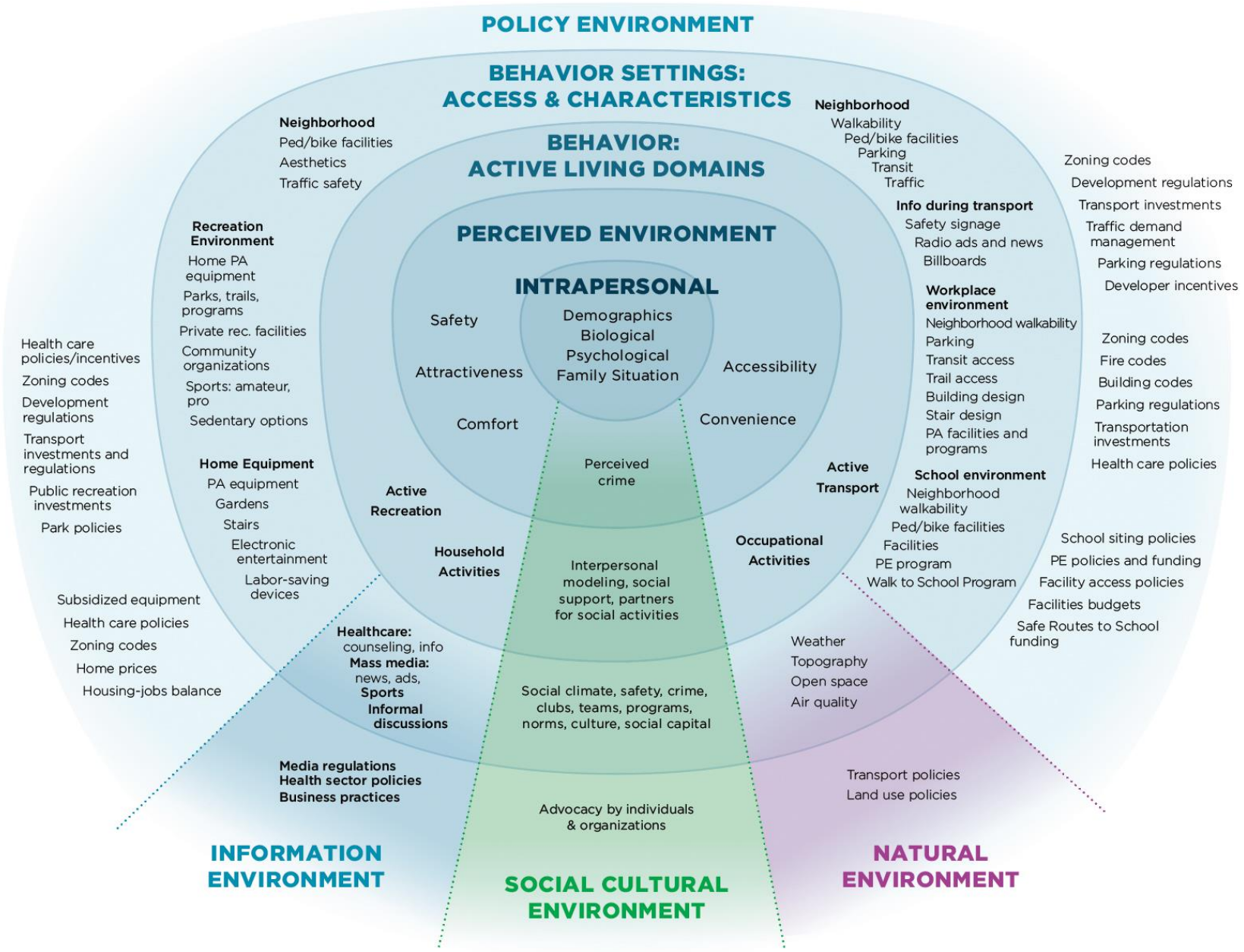
0091-7435/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.ypmed.2013.10.019

Evidence also suggests children's active travel tracks into adulthood

-and-

may beneficially associate with health outcomes in adulthood


POLICY ENVIRONMENT
BEHAVIOR SETTINGS: ACCESS & CHARACTERISTICS
BEHAVIOR: ACTIVE LIVING DOMAINS
PERCEIVED ENVIRONMENT
INTRAPERSONAL
Demographics
Biological
Psychological
Family Situation
Safety
Attractiveness
Comfort
Accessibility
Convenience
Perceived crime
Neighborhood
Ped/bike facilities
Aesthetics
Traffic safety
Recreation Environment
Home PA equipment
Parks, trails, programs
Private rec. facilities
Community organizations
Sports: amateur, pro
Sedentary options
Home Equipment
PA equipment
Gardens
Stairs
Electronic entertainment
Labor-saving devices
Active Recreation
Household Activities
Neighborhood
Walkability
Ped/bike facilities
Parking
Transit
Traffic
Info during transport
Safety signage
Radio ads and news
Billboards
Workplace environment
Neighborhood walkability
Parking
Transit access
Trail access
Building design
Stair design
PA facilities and programs
School environment
Neighborhood walkability
Ped/bike facilities
Facilities
PE program
Walk to School Program
Active Transport
Occupational Activities
Zoning codes
Development regulations
Transport investments
Traffic demand management
Parking regulations
Developer incentives
Zoning codes
Fire codes
Building codes
Parking regulations
Transportation investments
Health care policies
School siting policies
PE policies and funding
Facility access policies
Facilities budgets
Safe Routes to School funding
Health care policies/incentives
Zoning codes
Development regulations
Transport investments and regulations
Public recreation investments
Park policies
Subsidized equipment
Health care policies
Zoning codes
Home prices
Housing-jobs balance
Healthcare: counseling, info
Mass media: news, ads,
Sports
Informal discussions
Media regulations
Health sector policies
Business practices
Interpersonal modeling, social support, partners for social activities
Social climate, safety, crime, clubs, teams, programs, norms, culture, social capital
Advocacy by individuals & organizations
Weather
Topography
Open space
Air quality
Transport policies
Land use policies
INFORMATION ENVIRONMENT
SOCIAL CULTURAL ENVIRONMENT
NATURAL ENVIRONMENT

Preventive Medicine Reports 17 (2020) 101024

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

U.S. active school travel in 2017: Prevalence and correlates

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ARTICLE INFO

Keywords:
Active transportation
Bicycling
Children
Mode choice
School travel
Walking

ABSTRACT

Active transportation to school (ATS), denoting walking and biking, is crucial to promote physical activity for youth. This study uses data from the 2017 National Household Travel Survey (NHTS) to report on the most recent and nationally representative school transportation patterns. Binary logit modeling determines significant factors associated with school travel mode choices. Spatial differences on school mode choices across the US are explored. In 2017 9.6% of the students of 5–17 years old usually walked and 1.1% biked to school. For students who usually walk to school, 77.5% of their school trips were less than one mile and, among usual bikers to school, 82.8% of trips were less than two miles. Student rates of walking to school decreased as the distance to school increased and biking rates peaked when distance to school was between 0.5 and 1 miles. When distance to school was < 0.5 miles, walking was the most common mode for urban and rural regions. When the trip was shorter than or equal to one mile, factors such child's school grade, household vehicles per driver, and household income were associated with the decision to walk or bike to school. Other demographic characteristics like race and gender were not significantly related to ATS. While comparison across NHTS years should be viewed with caution due to changes in survey methodology, the decline of ATS rates indicate that more effective and higher reaching efforts for local, regional, and national interventions should be prioritized.

1. Introduction

Nearly 52 million American children and adolescents travel to school every day (US Census Bureau, 2016). Increasing the proportion of these students that walk or bike to school is a national health goal (Community Preventive Services Task Force, 2018). Active transportation to school (ATS) is associated with building healthy activity and eating habits and contributing to leading physical active lives (Cooper et al., 2005, 2003; Madsen et al., 2015). The prevalence of ATS for students in grades K-8 was almost 48% in the 1970s but declined to 13% by 2009 in the United States (McDonald et al., 2011) with similar downward trends observed in certain Canadian regions, the United Kingdom, and Australian regions (Buliung et al., 2009; Timperio et al., 2006; Tudor-Locke et al., 2001).

Surveillance of ATS is critical to measuring movement toward achieving national health objectives. The National Household Travel Survey (NHTS), conducted by the US Department of Transportation, is the only source of national-level surveillance data on school travel (USDOT, 2017). Our study uses the 2017 NHTS to report on the prevalence of ATS and disaggregate ATS shares by characteristics such as distance to school or urban/rural residence environment classification of a student's residence. Previous research found these characteristics to be correlated with ATS (Buttazzoni et al., 2018; McDonald, 2012; Panter et al., 2010). Our analysis also reports on trip, individual, and household correlates of ATS using binary logit models.

The study's objective is twofold: (1) document the prevalence of ATS using the most recently available national surveillance data and (2) uncover demographic and geographic factors associated with ATS. A current understanding of school travel mode share and correlates for ATS can help federal agencies and their partners at the state and local level track progress toward achieving health goals and the opportunities for tailoring interventions, such as Safe Routes to School (SRTS) programs. SRTS aims to increase the safety and prevalence of ATS through engineering, education, enforcement, and encouragement efforts (McDonald et al., 2014). Previous research found that SRTS interventions may improve ATS shares; however, effectiveness varies across studies (Boarnet et al., 2005a; Buttazzoni et al., 2018; Chillon et al., 2011; Larouche et al., 2018; Villa-González et al., 2018). Findings

Abbreviations: ATS, active transportation to school; CBSA, Core-Based Statistical Area; NHTS, National Highway Travel Survey; SRTS, Safe Routes to School

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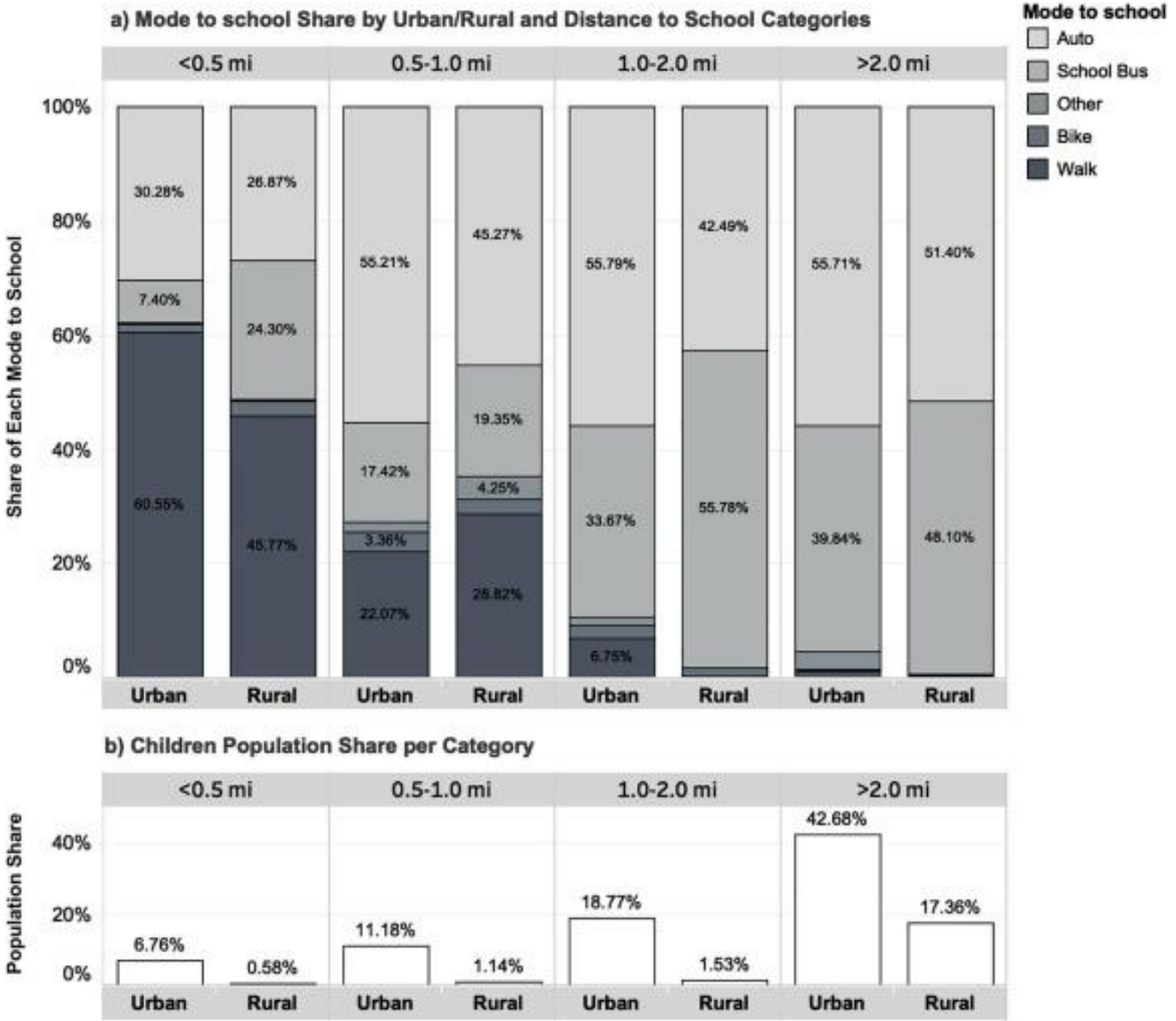
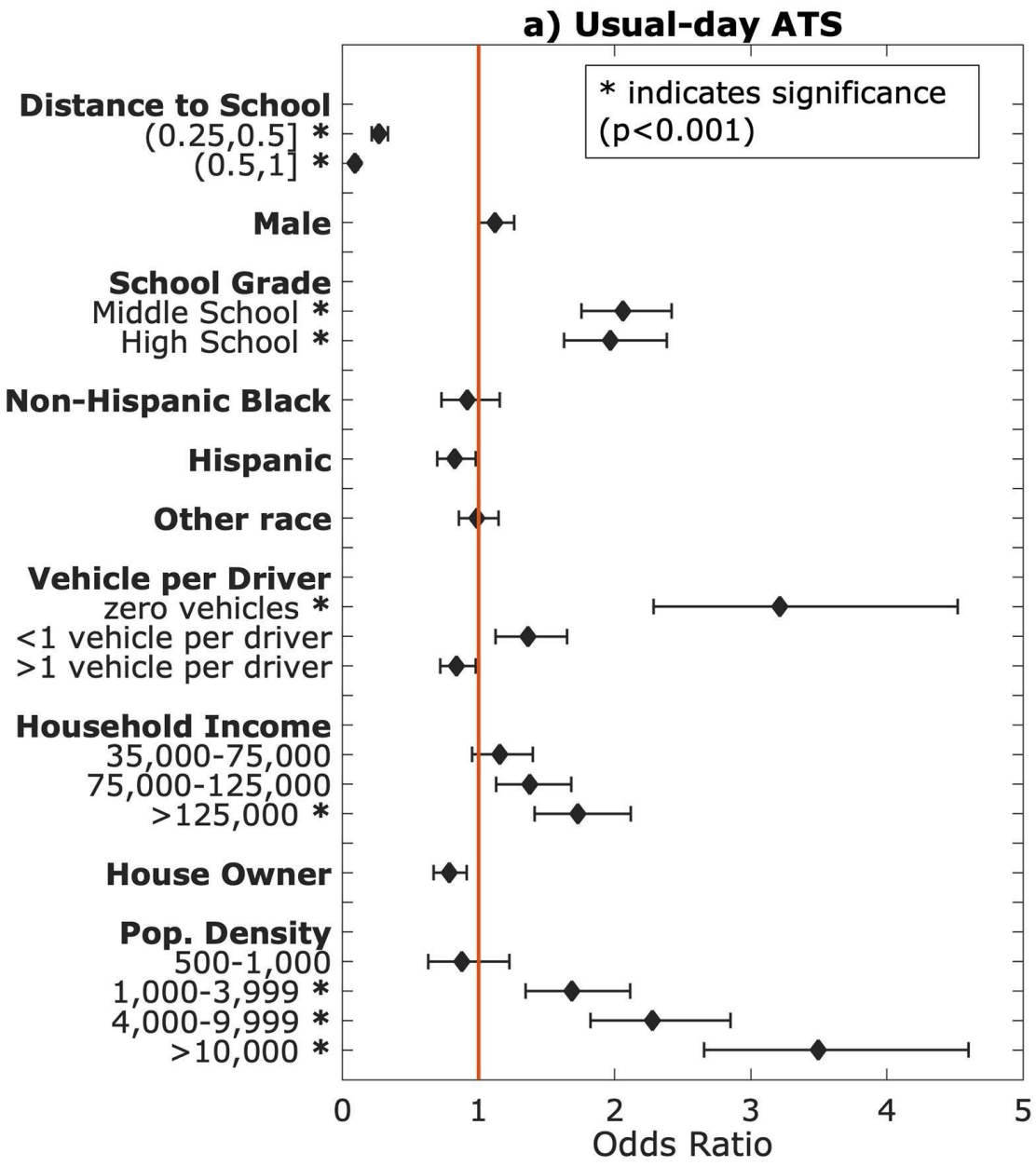
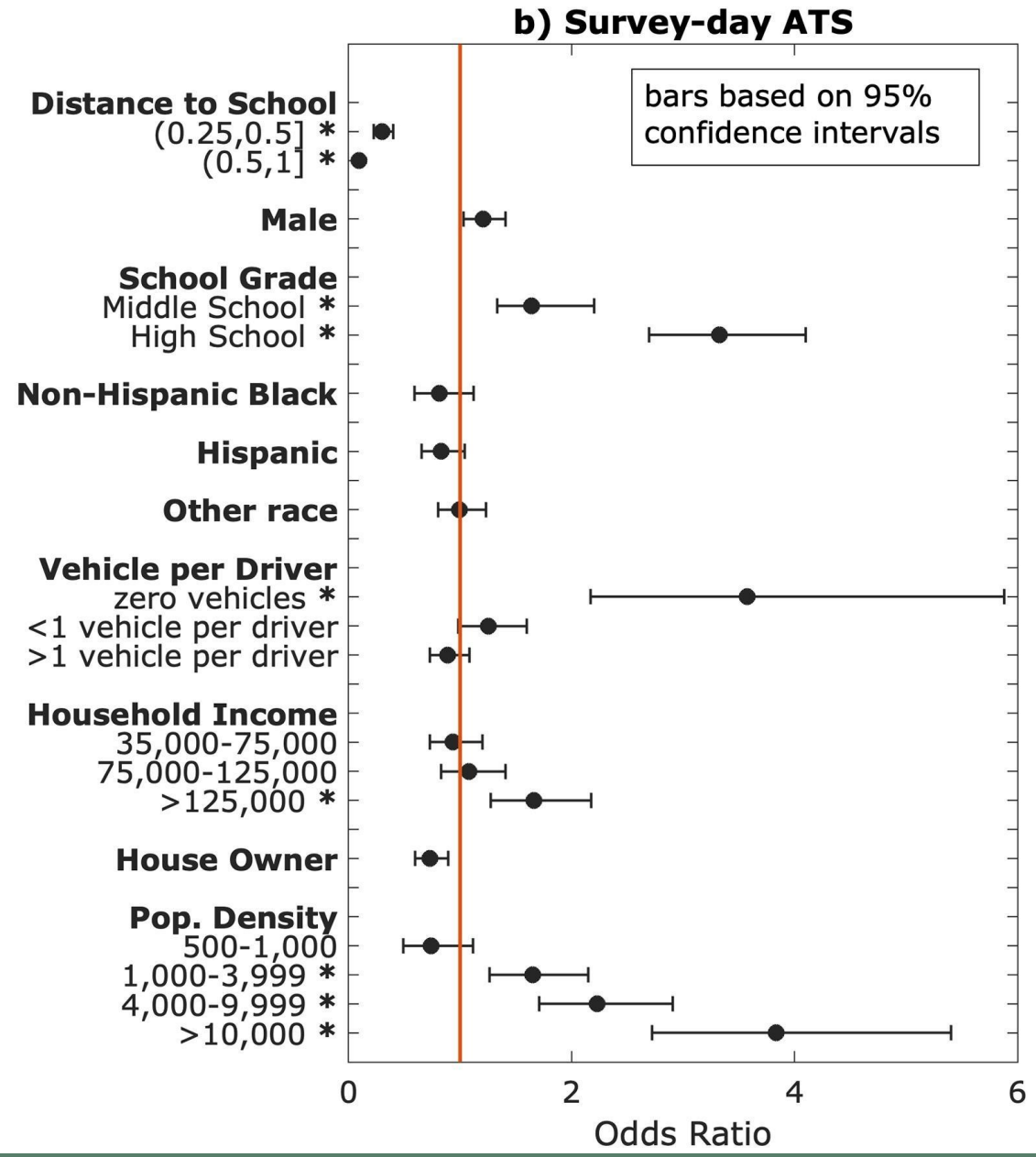
https://doi.org/10.1016/j.pmedr.2019.101024
Received 16 July 2019; Received in revised form 10 October 2019; Accepted 18 November 2019
Available online 10 December 2019




a) Usual-day ATS
* indicates significance (p<0.001)
Distance to School
(0.25,0.5] *
(0.5,1] *
Male
School Grade
Middle School *
High School *
Non-Hispanic Black
Hispanic
Other race
Vehicle per Driver
zero vehicles *
<1 vehicle per driver
>1 vehicle per driver
Household Income
35,000-75,000
75,000-125,000
>125,000 *
House Owner
Pop. Density
500-1,000
1,000-3,999 *
4,000-9,999 *
>10,000 *
0
1
2
3
4
5
Odds Ratio


b) Survey-day ATS
bars based on 95% confidence intervals
Distance to School
(0.25,0.5] *
(0.5,1] *
Male
School Grade
Middle School *
High School *
Non-Hispanic Black
Hispanic
Other race
Vehicle per Driver
zero vehicles *
<1 vehicle per driver
>1 vehicle per driver
Household Income
35,000-75,000
75,000-125,000
>125,000 *
House Owner
Pop. Density
500-1,000
1,000-3,999 *
4,000-9,999 *
>10,000 *
0
2
4
6
Odds Ratio

Preventive Medicine 111 (2018) 314–322

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Review Article

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

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ARTICLE INFO

Keywords:
Walking
Environment and public health
Schools
Child
City planning
School travel

ABSTRACT

Active travel to school has declined during the last 50 years in North America. During the last decade, the children's active school transportation (AST) literature has grown. This systematic review provides an updated examination of AST correlates, and discusses why school travel mode (STM) share may have changed over time. AST trends are described and a systematic literature review of AST correlates in North America for the period 1990–2016 was conducted. Strength of association between correlates and AST, and relationship direction are assessed and reported. Graphical presentation of correlates included in ≥ 5 studies were included. Sixty-three studies were identified and reviewed. Distance to school was most strongly associated with AST. Individual, parental and societal correlates had moderate positive associations with AST including: child age, lower parental education, income and other income related factors, race and positive perceptions of AST. Longitudinal studies were few in number, as were studies about exceptional populations, policy, and interventions. AST intervention should focus on key AST correlates. Social and environmental diversity calls for local solutions to school travel challenges. Changes in AST correlates over time should be considered for evaluating existing policy approaches, and to support development of new policy, regulation, design, and program interventions.

1. Introduction

School transport has changed considerably throughout the automobile century; the use of active modes for school travel has declined over the last 50 years. In the United States, nearly half (49%) of children aged 5 to 14 (i.e. kindergarten to grade 8) actively travelled to school in 1969, but by 2009, only 13% engaged in active school travel (AST) (McDonald et al., 2011). In the Greater Toronto and Hamilton Area (GTHA), Canada auto mode share more than doubled between 1986 and 2011 for 11–17 year olds (Smart Commute, 2015a). Buliung et al. (2009) suggested that the AST decline might have reached its nadir by 2006; however, even in the City of Toronto, where walking to school is more common than other GTHA locations, to/from school walking mode share for 11–13 year olds declined again between 2006 and 2011 (to school: 48% to 45%, from school: 55% to 50%) (Smart Commute, 2015b).

While AST has declined, the prevalence of childhood obesity and emergence and earlier onset of other chronic diseases has risen (Janssen and LeBlanc, 2010; Shields, 2005). Increased sedentary activity offers partial explanation for these trends (Rennie et al., 2005; Trost et al., 2001; Goran, 1997). There are immediate and lifelong physical activity, social, and health benefits related to AST. The school trip represents an important opportunity for daily physical activity and social contact. Evidence from Denmark indicates that active children concentrate better at school (Vinther, 2012). Children who cycle to school have been found to have a higher degree of activation (i.e. alertness and activity) during school than those who travelled by car (Westman et al., 2013). Systematic reviews have found that children who are independently mobile and use AST modes accumulate more physical activity (Schoeppe et al.,

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https://doi.org/10.1016/j.ypmed.2017.11.018
Received 26 July 2017; Received in revised form 18 October 2017; Accepted 13 November 2017
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Preventive Medicine 111 (2018) 314–322

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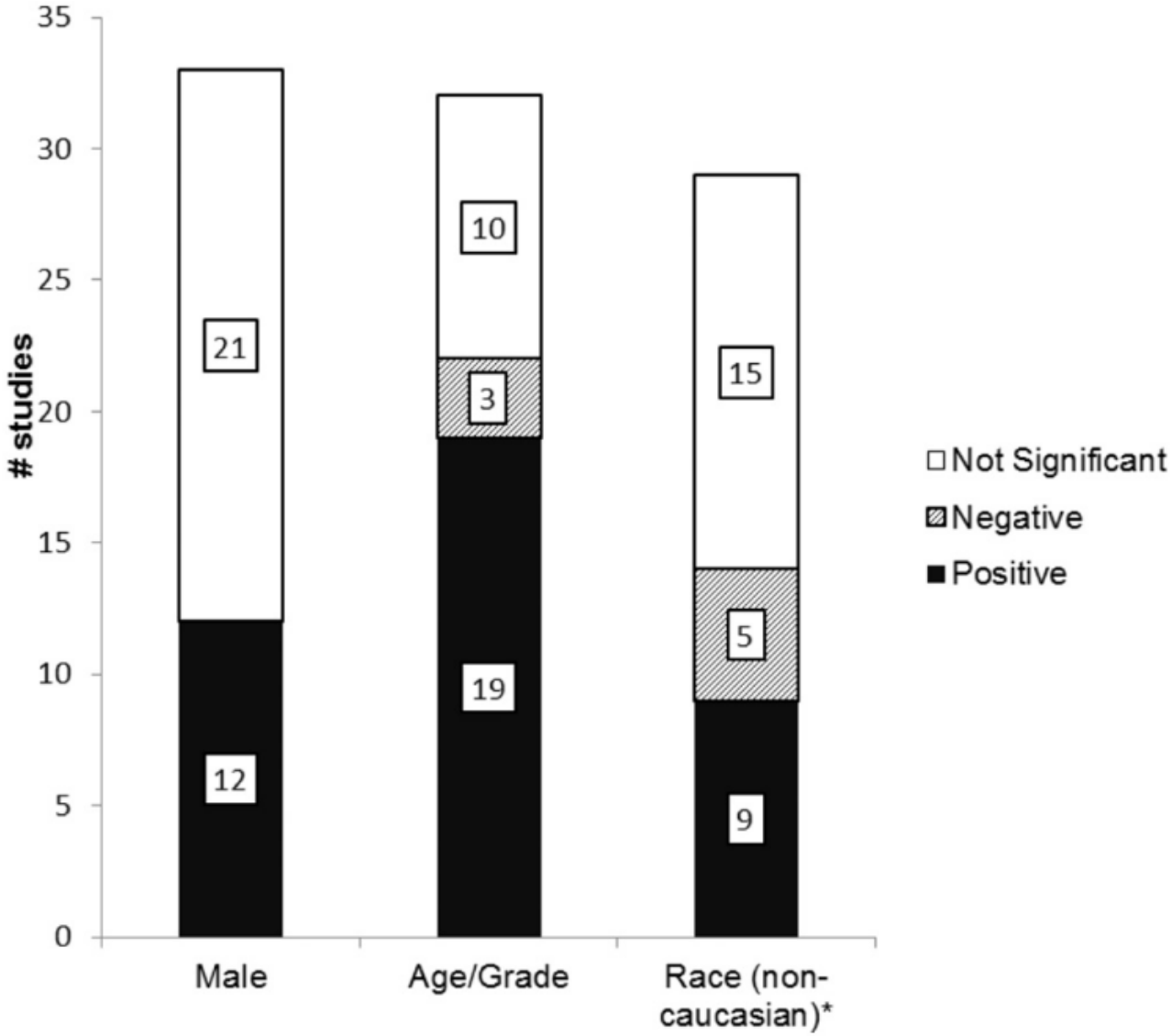

Fig. 2. Individual: child's characteristics relationship with AST (≥ 5 studies).

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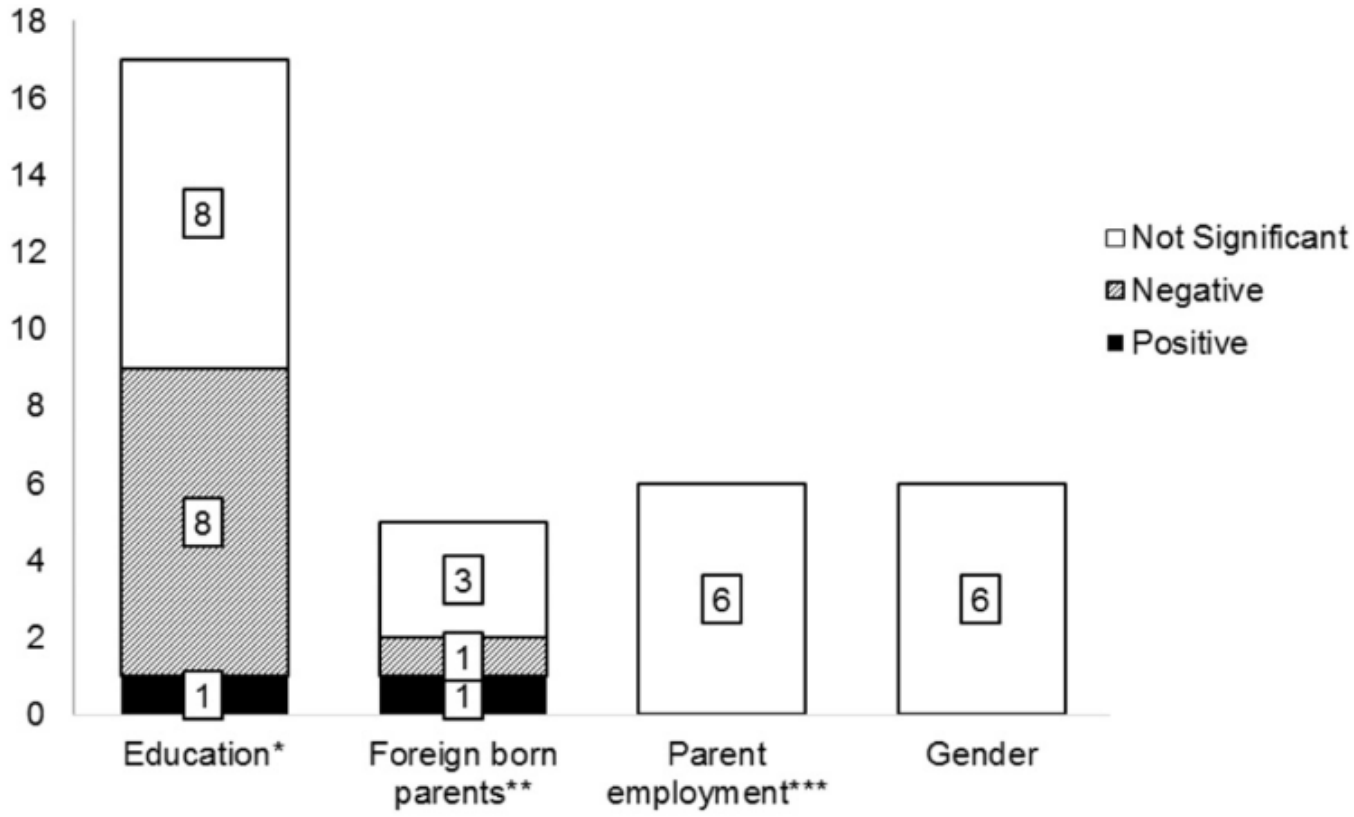

Fig. 3. Individual: parent's characteristics relationship with AST (≥ 5 studies).
**Parent education, mother's education, father's education.*
*** Foreign born parents, number of years in the U.S. (as indicator of foreign birth).*
****Parent employment, mother's employment.*

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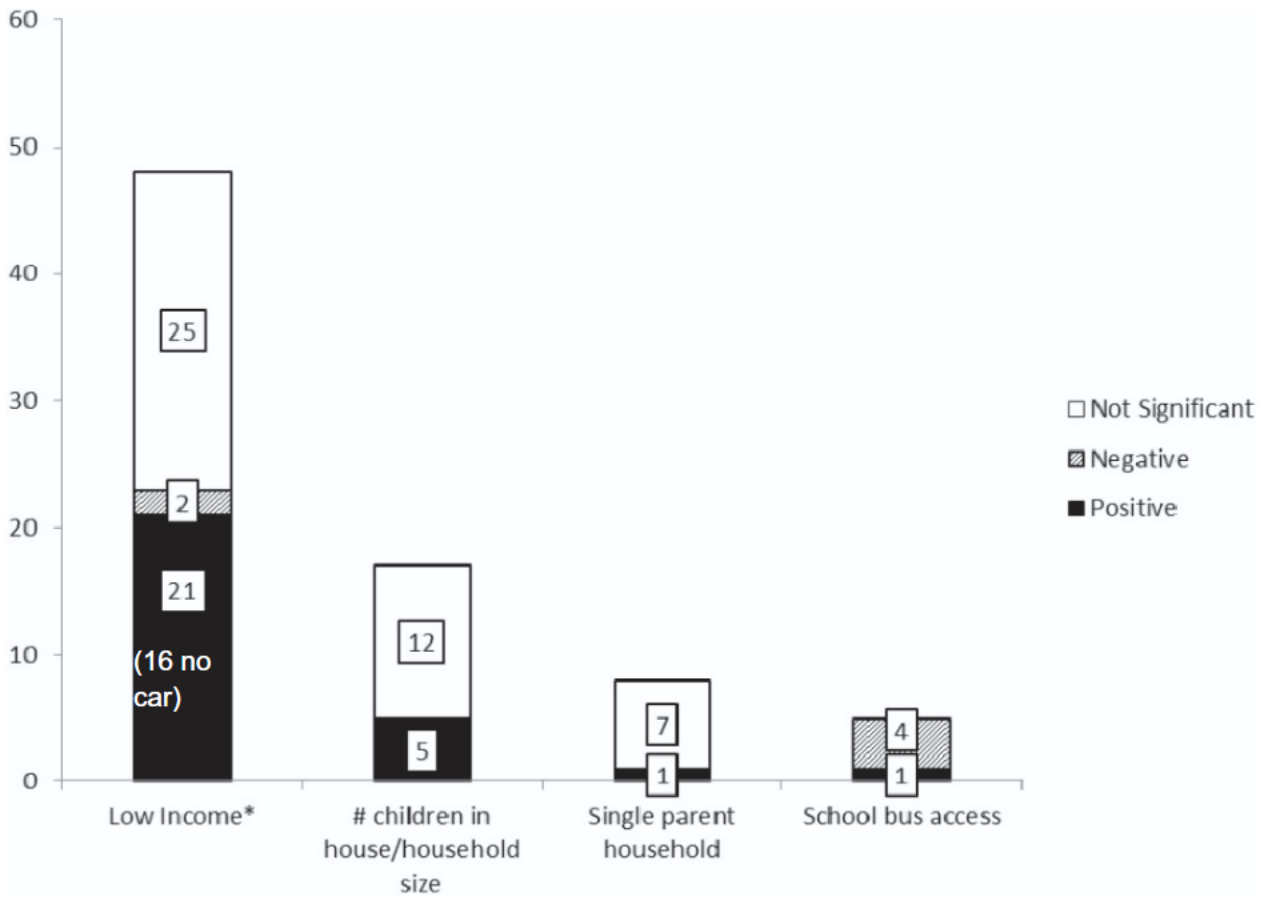

Fig. 4. Social: household relationship with AST (> 5 studies).
**Low income from census, deprivation index, number of rooms in the house, car access (numbers of vehicles per licensed driver or number of vehicles in household, access to car, car ownership).*

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School travel

ABSTRACT

Active travel to school has declined during the last 50 years in North America. During the last decade, the children's active school transportation (AST) literature has grown. This systematic review provides an updated examination of AST correlates, and discusses why school travel mode (STM) share may have changed over time. AST trends are described and a systematic literature review of AST correlates in North America for the period 1990–2016 was conducted. Strength of association between correlates and AST, and relationship direction are assessed and reported. Graphical presentation of correlates included in ≥ 5 studies were included. Sixty-three studies were identified and reviewed. Distance to school was most strongly associated with AST. Individual, parental and societal correlates had moderate positive associations with AST including: child age, lower parental education, income and other income related factors, race and positive perceptions of AST. Longitudinal studies were few in number, as were studies about exceptional populations, policy, and interventions. AST intervention should focus on key AST correlates. Social and environmental diversity calls for local solutions to school travel challenges. Changes in AST correlates over time should be considered for evaluating existing policy approaches, and to support development of new policy, regulation, design, and program interventions.

1. Introduction

School transport has changed considerably throughout the automobile century; the use of active modes for school travel has declined over the last 50 years. In the United States, nearly half (49%) of children aged 5 to 14 (i.e. kindergarten to grade 8) actively travelled to school in 1969, but by 2009, only 13% engaged in active school travel (AST) (McDonald et al., 2011). In the Greater Toronto and Hamilton Area (GTHA), Canada auto mode share more than doubled between 1986 and 2011 for 11–17 year olds (Smart Commute, 2015a). Buliung et al. (2009) suggested that the AST decline might have reached its nadir by 2006; however, even in the City of Toronto, where walking to school is more common than other GTHA locations, to/from school walking mode share for 11–13 year olds declined again between 2006 and 2011 (to school: 48% to 45%, from school: 55% to 50%) (Smart Commute, 2015b).

While AST has declined, the prevalence of childhood obesity and emergence and earlier onset of other chronic diseases has risen (Janssen and LeBlanc, 2010; Shields, 2005). Increased sedentary activity offers partial explanation for these trends (Rennie et al., 2005; Trost et al., 2001; Goran, 1997). There are immediate and lifelong physical activity, social, and health benefits related to AST. The school trip represents an important opportunity for daily physical activity and social contact. Evidence from Denmark indicates that active children concentrate better at school (Vinther, 2012). Children who cycle to school have been found to have a higher degree of activation (i.e. alertness and activity) during school than those who travelled by car (Westman et al., 2013). Systematic reviews have found that children who are independently mobile and use AST modes accumulate more physical activity (Schoeppe et al.,

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https://doi.org/10.1016/j.ypmed.2017.11.018
Received 26 July 2017; Received in revised form 18 October 2017; Accepted 13 November 2017
Available online 16 November 2017

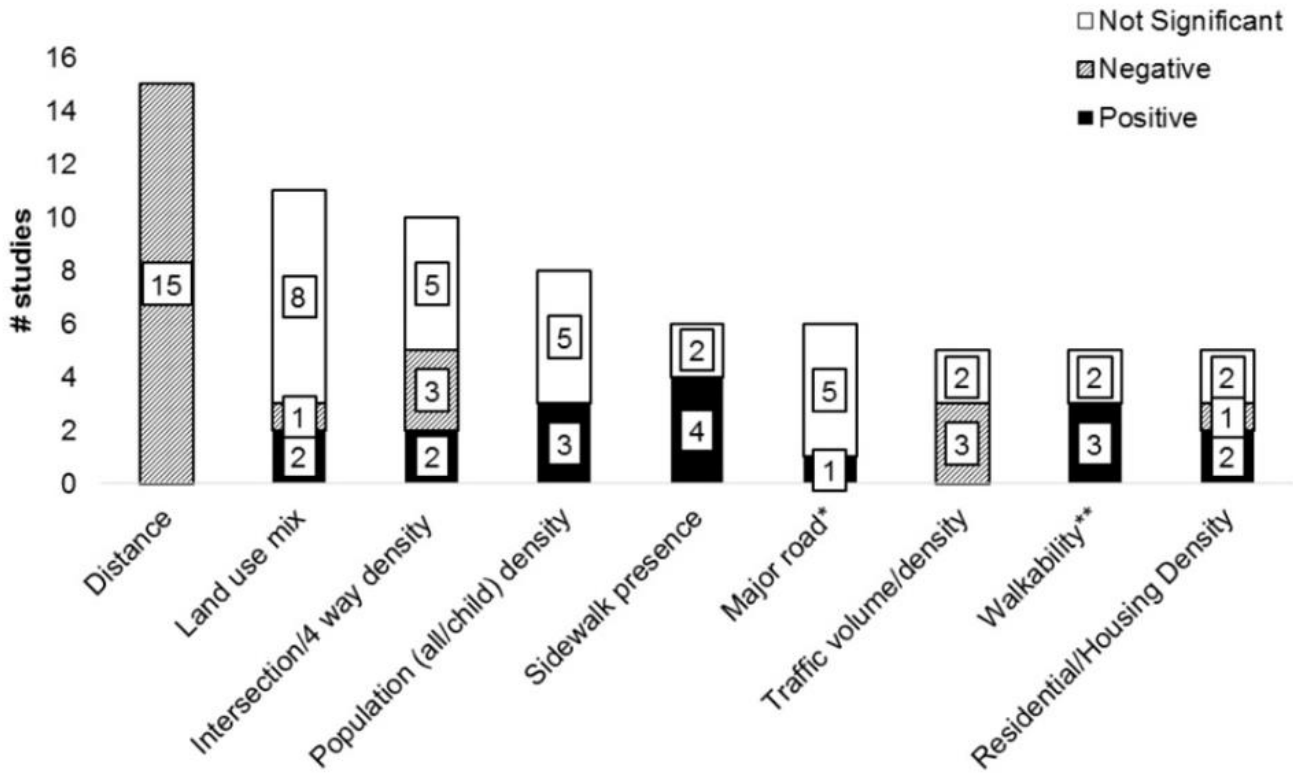

Fig. 5. Physical environment: objective, relationship with AST (with ≥ 5 studies).

JOURNAL OF SCHOOL HEALTH

RESEARCH ARTICLE

Parent and Child Perceptions of Barriers to Active School Commuting

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ABSTRACT

BACKGROUND: Active commuting (AC) to and from school can contribute to physical activity, although it has recently seen a global decline. The purpose of this study was to examine the agreement between parent and child perceptions of barriers to school AC.

METHODS: Participants were parents (N = 152, M_{age} = 40.6 ± 6.3 years) and elementary school children (N = 98, M_{age} = 10.0 ± 1.2 years). School commute type/frequency and barriers to AC were collected via surveys. Intraclass correlation coefficients (ICCs) were used to assess relative agreement between parent and child perceptions (N = 98 dyads). Paired *t* tests and equivalence testing were employed to assess group-level agreement. Bland-Altman analysis was used to assess individual-level agreement. Partial correlations of AC with perceptions were also assessed.

RESULTS: All parent and child perceptions of barriers to AC to school had low agreement. Bland-Altman Plots indicated negative bias for all but 3 barrier perceptions. Paired *t* tests indicated significant differences between parent and child perceptions for 8 out of 15 barriers while equivalence testing deemed no parent-child perception equivalent. Partial correlations with AC frequency were significant for 7 parent perceptions and 2 child perceptions.

CONCLUSIONS: Parent and child perceptions have low agreement. Programs aimed at promoting AC to and from school should account for these discrepancies.

Keywords: active travel; walking; biking; parent; child; school.

Citation: Pfledderer CD, Burns RD, Byun W, Carson RL, Welk GJ, Brusseau TA. Parent and child perceptions of barriers to active school commuting. J Sch Health. 2021; 91: 1014-1023. DOI: 10.1111/josh.13090

Received on April 7, 2020
Accepted on February 3, 2021

While there are many opportunities throughout the day for children and adolescents to accrue physical activity (PA), active commuting (AC) to and from school, which is typically defined as any active mode of transport such as walking or cycling,[1] has been shown to be a significant contributor to overall PA.[2] AC has been shown to confer a number of mental and physical health benefits in children and adolescents as well. Some of these benefits include lower body mass index (BMI) and depressive symptoms,[3] higher cardiorespiratory fitness,[4] reduced stress during the school day,[5] and higher cognitive performance.[6]

Despite the positive benefits associated with AC, there has been a marked global decline in AC among children and adolescents within the past few decades.[7] While the exact cause of this decline is unknown, many studies have explored the reasons why children do or do not actively commute to school, resulting in a complex and multifactorial view of the behavior. Current research on AC in children and adolescents has typically used 3 separate approaches by exploring parental perspectives, child and/or adolescent perspectives, and objective correlates of AC. Some studies with child and adolescent populations

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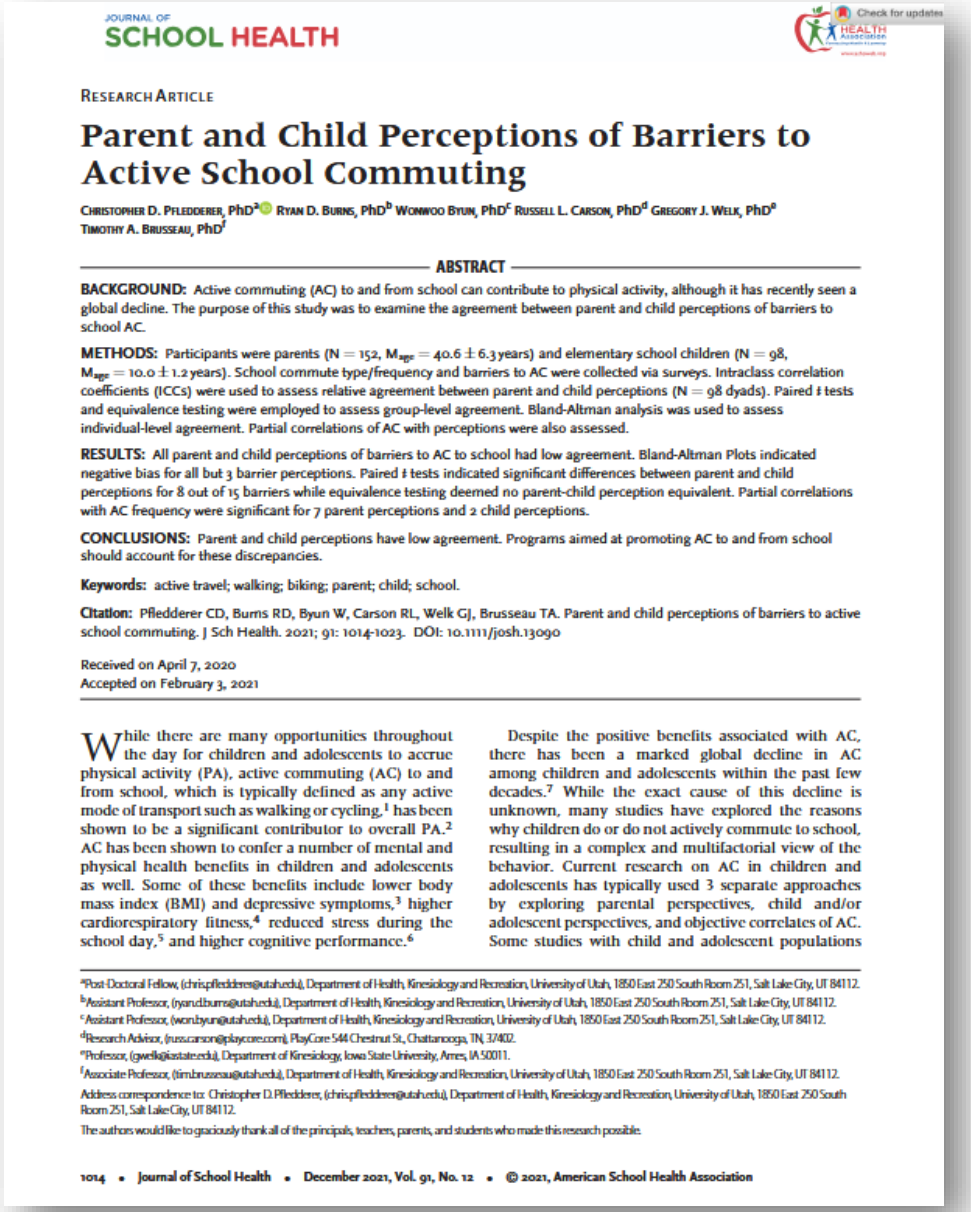

JOURNAL OF SCHOOL HEALTH

Research Article

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Christopher D. Pfledderer, PhD[a] Ryan D. Burns, PhD[b] Wonwoo Byun, PhD[c] Russell L. Carson, PhD[d] Gregory J. Welk, PhD[e] Timothy A. Brusseau, PhD[f]

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Table 2. **Parent-Reported Children's Commute Mode and Frequency of Commute Mode to and from School During an Average School Week (5 days)**

Commute Mode	Frequency to School (Avg. Trips/School Week)	Frequency to Home (Avg. Trips/School Week)	Total (Avg. Trips/School Week)
Walk	1.68 (2.22)	2.25 (2.27)	3.93 (4.30)
Bike	0.06 (0.47)	0.04 (0.30)	0.11 (0.76)
Car/bus	3.26 (2.23)	2.71 (2.26)	5.97 (4.30)

All frequencies are reported as mean (SD).

Table 3. Agreement Between Parent and Child Perceived Barriers to School Active Commuting

	Responses		Differences	Relative Agreement		Individual-Level Agreement		Group-Level Agreement			
Barriers	Parent response	Child response	Mean difference (child-parent)	ICC	95% CI	Limits of agreement	Percent outside limits of agreement	t-statistic	90% CI mean difference	10% equivalence interval	20% equivalence interval
Too many hills	1.71 (1.07)	1.52 (0.83)	−0.27	.04	−0.41, 0.35	−2.91, 2.38	9.18	**−1.94**	−0.49, −0.04	−0.17, 0.17	−0.34, 0.34
No sidewalks	1.74 (1.08)	1.26 (0.66)	−0.31	.18	−0.72, 0.19	−2.77, 2.15	12.24	**−2.41**	−0.52, −0.10	−0.17, 0.17	−0.34, 0.34
Route is boring	1.49 (0.88)	1.83 (1.10)	0.40	.39	0.10, 0.58	−1.95, 2.75	9.18	**3.29**	0.20, 0.60	−0.15, 0.15	−0.30, 0.30
Bad lighting	1.82 (1.12)	1.37 (0.71)	−0.22	.12	−0.29, 0.41	−2.54, 2.09	8.16	−1.88	−0.42, −0.03	−0.18, 0.18	−0.36, 0.36
Traffic	2.69 (1.16)	1.88 (1.05)	−0.71	.37	0.05, 0.58	−3.29, 1.87	4.08	**−5.37**	−0.94, −0.49	−0.27, 0.27	−0.54, 0.54
Dangerous crossings	2.76 (1.20)	2.12 (1.15)	−0.54	.29	−0.02, 0.52	−3.48, 2.40	5.10	**−3.57**	−0.79, −0.29	−0.28, 0.28	−0.56, 0.56
Get too hot/cold	1.84 (1.05)	1.79 (1.02)	0.12	.33	−0.01, 0.55	−2.34, 2.58	7.14	0.97	−0.09, 0.33	−0.18, 0.18	**−0.36, 0.36**
No other children walk/bike	1.94 (1.12)	1.55 (0.90)	−0.33	.01	−0.44, 0.33	−3.02, 2.37	4.08	**−2.35**	−0.56, −0.09	−0.19, 0.19	−0.38, 0.38
Too much stuff to carry	1.74 (0.94)	1.72 (0.95)	−0.03	.18	−0.23, 0.45	−2.52, 2.46	6.12	−0.23	−0.24, 0.18	−0.17, 0.17	−0.34, 0.34
Easier to drive	2.46 (1.29)	2.70 (1.27)	0.27	.48	0.24, 0.66	−2.61, 3.18	6.12	1.91	0.04, 0.50	−0.25, 0.25	**−0.50, 0.50**
Planning	1.87 (1.08)	1.47 (0.93)	−0.33	.21	−0.16, 0.46	−2.90, 2.25	12.24	**−2.46**	−0.55, −0.11	−0.18, 0.18	−0.36, 0.36
Crime	1.79 (1.07)	1.18 (0.62)	−0.46	.16	−0.19, 0.41	−2.62, 1.71	9.18	**−4.12**	−0.64, −0.27	−0.18, 0.18	−0.36, 0.36
Bullies	1.47 (0.91)	1.18 (0.56)	−0.15	.33	0.00, 0.55	−1.85, 1.54	10.20	−1.75	−0.30, −0.01	−0.15, 0.15	**−0.30, 0.30**
Stray dogs	1.62 (0.94)	1.48 (0.91)	−0.03	.24	−0.14, 0.49	−2.27, 2.21	8.16	−0.27	−0.22, 0.16	−0.16, 0.16	−0.32, 0.32
Distance	2.03 (1.20)	1.94 (1.19)	−0.07	.47	0.21, 0.65	−2.83, 2.69	13.27	−0.50	−0.31, 0.16	−0.20, 0.20	**−0.40, 0.40**

Responses were coded as 1 = Strongly disagree, 2 = Somewhat disagree, 3 = Somewhat agree, and 4 = Strongly agree; all responses reported as Mean (SD); criterion for all perceived barriers is parent perception; **Bold** indicates a significant t-statistic at the $p < 0.5$ level or a denotation of equivalence; equivalence is denoted if the 90% CI is contained completely within the equivalence interval and is **bold**.
ICC, intraclass correlation coefficient (2-way random model); 95% CI, 95% confidence interval.

Table 4. **Partial Correlations of Active School Commuting and Child and Parent Barrier Perceptions Controlling for School-to-Home Distance and Child Age**

	Parents				Children			
Perceived Barriers	Correlation (r)	p-value	Partial correlation (r)	p-value	Correlation (r)	p-value	Partial correlation (r)	p-value
Too many hills	**−.34**	**<.01**	**−.23**	**<.01**	−.14	.19	−.14	.19
No sidewalks	**−.25**	**<.01**	−.13	.12	−.15	.15	−.01	.92
Route is boring	**−.23**	**<.01**	−.13	.11	−.04	.67	.06	.57
Bad lighting	**−.21**	**.01**	−.14	009	−.05	.62	−.05	.65
Traffic	**−.39**	**<.01**	**−.30**	**<.01**	**−.28**	**<.01**	−.19	.06
Dangerous crossings	**−.37**	**<.01**	**−.31**	**<.01**	−.11	.27	−.09	.38
Get too hot/cold	**−.19**	**.02**	−.10	.22	−.06	.57	−.03	.76
No other children walk/bike	**−.36**	**<.01**	**−.32**	**<.01**	−.01	.90	−.07	.49
Too much stuff to carry	**−.27**	**<.01**	−.16	.06	−.18	.07	−.18	.09
Easier to drive	**−.64**	**<.01**	**−.56**	**<.01**	**−.28**	**<.01**	**−.25**	**.01**
Planning	**−.45**	**<.01**	**−.33**	**<.01**	**−.29**	**<.01**	**−.25**	**.02**
Crime	**−.23**	**<.01**	−.15	.07	−.11	.27	−.13	.21
Bullies	**−.22**	**<.01**	−.14	.08	−.06	.54	.00	.96
Stray dogs	−.09	.28	−.04	.66	.08	.45	.09	.37
Distance	**−.58**	**<.01**	**−.41**	**<.01**	**−.23**	**.02**	−.10	.34

Bold denotes significance at the $p < .05$ level.

Active Commuting to School in Texas

- What's the current status of ACS among Texas children?
- Potential factors associated with school travel mode?
  - Socio-demographic factors
  - Physical environment

Texas School Physical Activity and Nutrition Survey (Texas SPAN)

- Texas SPAN is a statewide surveillance system.
  - Cross-sectional data collected using questionnaires at six time points.
  - Years 2000-2002, 2004-2005, 2009-2011, 2015-2016, 2019-2020, 2021-2023.

- Representative data at the Texas state level, Public Health Region (PHR), and at the Texas-Mexico border and non-border areas.

- Measure child health and related behaviors of school-aged children in 2nd, 4th, 8th, and 11th grades.
  - Monitor the prevalence of overweight and obesity.
  - Identify factors related to obesity, cardiovascular diseases, cancer, and diabetes, such as dietary behaviors and physical activity.

This Study

- Texas SPAN 2019–2020 was the 5th time the state-wide project was conducted.
- This data collection period was interrupted by the COVID-19 pandemic in 2020, resulting in a smaller sample than in previous years.

*Statewide and Texas-Mexico border/non-border sampling weights were able to be calculated.

Variables of interest

Predictors

- Demographic characteristics
  - Sex, race/ethnicity
- % economically disadvantaged students
- % limited English proficiency students
- Community type:
  - Major urban, Urban, Rural
- Texas-Mexico border region status

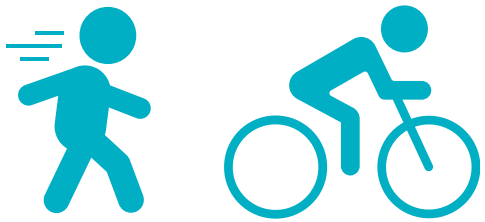
Texas SPAN
Texas School Physical Activity and Nutrition Survey

Outcome

School travel mode

- Walk/bike, Bus (school or city bus), Car

*Walk/bike -- Active commuting mode

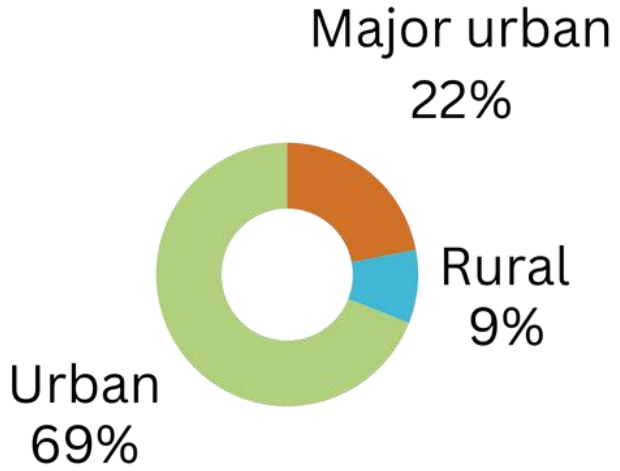


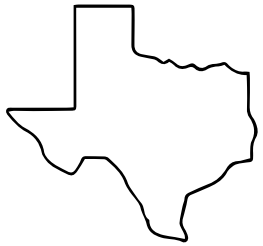
Study Participants

65 school districts
177 schools

7,371 Texas students
from 4th, 8th, and 11th grades

1,029,983
population representation





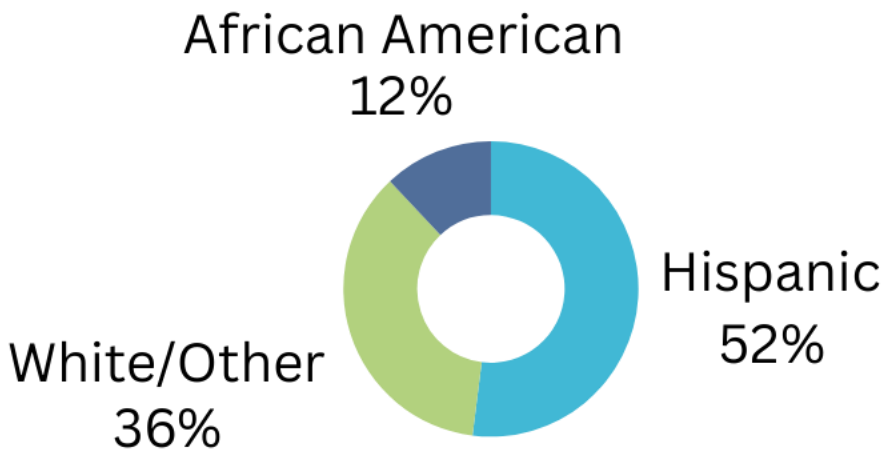
23%
Texas-Mexico
counties

Study Participants

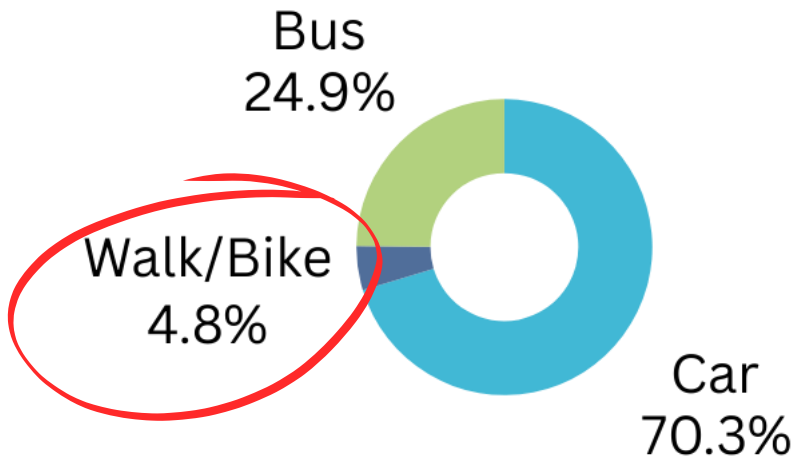
~49%

Mean age by grade

- 4th: 9 years
- 8th: 13 years
- 11th: 16 years

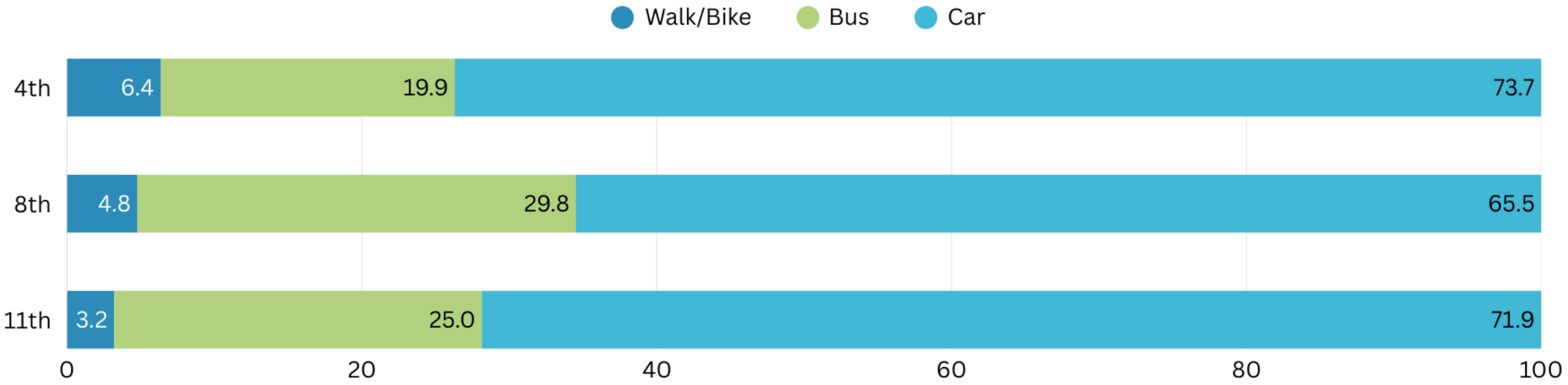


Race/ethnicity



School Travel mode

School Travel Mode by Grade



Declining prevalence as students age

Factors Associated with Walk/Bike to School by Grade

- **Boys** were **more** likely to walk/bike to school (vs. by car) than **girls**, across all grades.

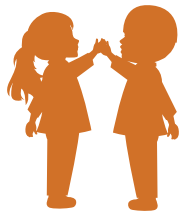
- **African American students** in 4th and 11th were **more** likely to commute by bus (vs. car) when compared to **White & Other students.**

Factors Associated with Walk/Bike to School by Grade

- **4th** graders living in urban communities were **more** likely to take buses (vs. by car) than those living in major urban communities.
- **8th** graders living in urban communities were **less** likely to walk/bike to school (vs. by car) than those living in major urban communities.

- **11th** graders living in a Texas-Mexico border county were **more** likely to walk/bike to school (vs. by car) than those living in a non-border county.

Summary and Implications



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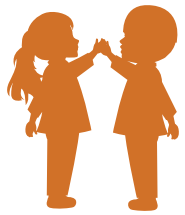

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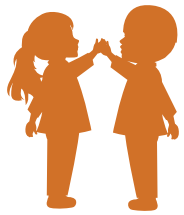
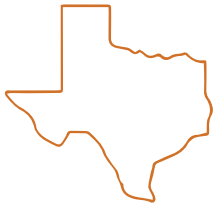


- Boys are consistently more likely to engage in ACS than girls.
  - Physical fitness and self-efficacy.
  - Perceived safety and parental concern.
  - Differences in overall physical activity level.

Summary and Implications

Environmental and geographic factors

- Urbanization
  - Housing density
  - Traffic congestion
  - Decreased walkability



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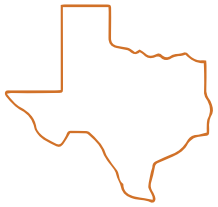
  - Traffic congestion
  - Decreased walkability



- Walking and biking out of necessity or by choice
  - Lack of alternative transportation in border regions
  - Health concerns and disparities

Summary and Implications

- Encourage ACS in young children and to promote these positive behaviors throughout life.

- Gender-based disparities in ACS are prominent.

- Programs and strategies to account for the negative effects of increased commute distances as children transition into intermediate schools.

- School-based programs and local policies are critical to promote ACS in addition to physical infrastructure improvement.

Resources

- Texas Child Health Status Report & Texas Child Health Toolkits
  - Infographics and toolkits help you learn about and advocate for child health at home, at school, and in your community.
  - Infographics are being updated with the latest 2021-2023 data!

- Texas School Activity and Nutrition Survey (Texas SPAN) Project Information

- Interactive Website SPAN Data Explorer.
  - The data explorer provides representative Texas data from SPAN from 2000 to 2020.

Preventive Medicine 123 (2019) 232–241

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Review Article

Interventions promoting active transport to school in children: A systematic review and meta-analysis

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ARTICLE INFO

Keywords:
Active travel
School children
Public health
Intervention programs
Physical activity
Transport

ABSTRACT

The systematic review investigated the effectiveness of active travel (AT) interventions on physical activity and fitness in primary school children. The review assessed intervention effectiveness, design, complexity, and study quality.

Searches were conducted in five databases on 30/08/2018. Studies with an AT intervention compared to an inactive control, in 4 to 11 year olds, measuring AT or fitness outcomes were included. Two-stage screening identified relevant studies. Relevant data were extracted using Cochrane Extraction Form, Quality Assessment Tool for Quantitative Studies, Active Living by Design model, and Intervention Complexity Assessment Tool for Systematic Reviews. Meta-analysis and Cohen's D effect size assessed effectiveness.

Seventeen eligible studies were included. Effectiveness assessment found a statistically significant standardised mean difference (SMD) in AT outcomes in favour of the intervention (continuous AT - SMD 0.78 (CI 0.11–1.46); frequency AT - SMD 1.87 (CI 0.88–2.86)). Cohen's D calculation concurred with this finding. Fifteen studies had SMD favouring the intervention – two studies had SMD favouring the control. Sixteen studies received a weak quality rating - one study rated moderate.

Active travel shows promise in increasing physical activity in primary school children. The review found walking school buses and educational strategies most effective for increasing relevant outcomes, although overall study quality was weak. Effect size did not associate with the complexity of an intervention, therefore supporting efforts to promote active travel through interventions may be easier to scale. Further intervention studies of greater methodological quality are necessary to confirm these findings due to the limited evidence available.

1. Introduction

Regular participation in physical activity (PA) reduces overall cardio-metabolic risk, with inactive children at a significantly greater risk of hypertension, obesity and cancer than their physically active peers (Vaisto et al., 2019; Abadie and Brown, 2010). Associated psychological benefits include improved cognition, self-esteem and emotional well-being, with reduced risk of depression and anxiety (Rasmussen and Laumann, 2013; Cheung et al., 2008; Parfitt et al., 2009; Tomson et al., 2003; Parfitt and Eston, 2005; NHS, 2016). Furthermore, there are improvements to academic behaviour and performance from PA interventions in schools (Sullivan et al., 2017). In 2017,

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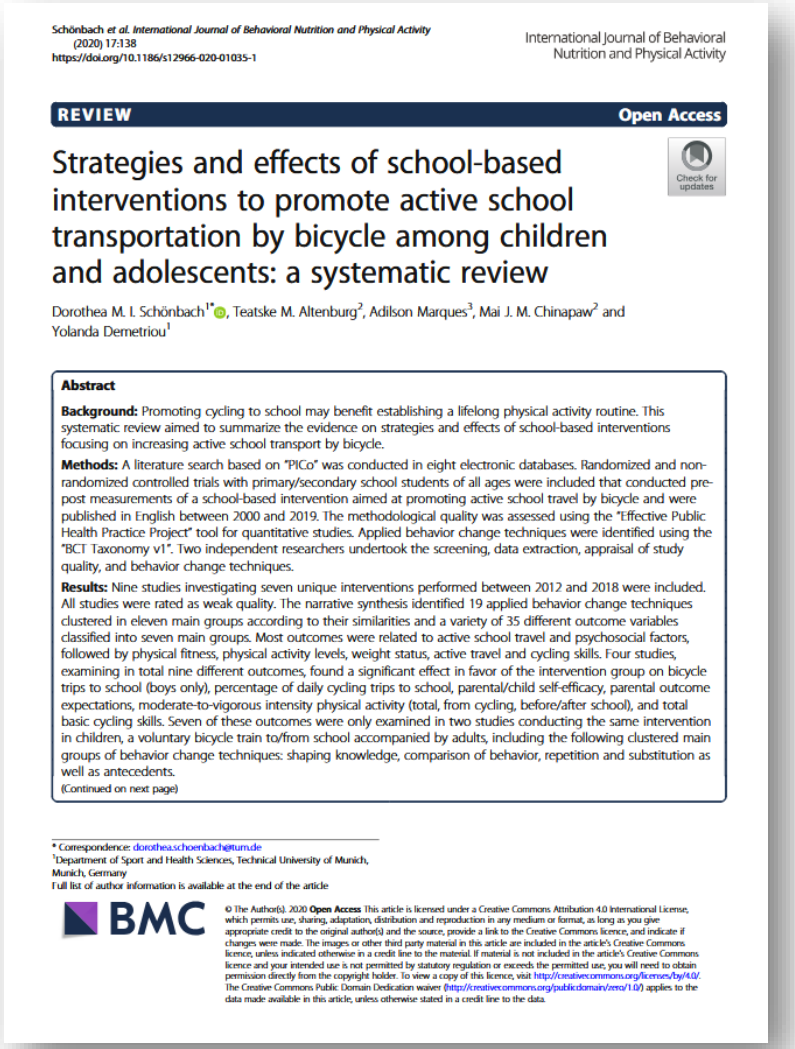
https://doi.org/10.1016/j.ypmed.2019.03.030
Received 12 November 2018; Received in revised form 4 February 2019; Accepted 16 March 2019
Available online 20 March 2019
0091-7435/



Schönbach et al. International Journal of Behavioral Nutrition and Physical Activity (2020) 17:138
https://doi.org/10.1186/s12966-020-01035-1

International Journal of Behavioral Nutrition and Physical Activity

REVIEW Open Access

Strategies and effects of school-based interventions to promote active school transportation by bicycle among children and adolescents: a systematic review

Dorothea M. I. Schönbach[1*], Teatske M. Altenburg[2], Adilson Marques[3], Mai J. M. Chinapaw[2] and Yolanda Demetriou[1]

Abstract

Background: Promoting cycling to school may benefit establishing a lifelong physical activity routine. This systematic review aimed to summarize the evidence on strategies and effects of school-based interventions focusing on increasing active school transport by bicycle.

Methods: A literature search based on "PICo" was conducted in eight electronic databases. Randomized and non-randomized controlled trials with primary/secondary school students of all ages were included that conducted pre-post measurements of a school-based intervention aimed at promoting active school travel by bicycle and were published in English between 2000 and 2019. The methodological quality was assessed using the "Effective Public Health Practice Project" tool for quantitative studies. Applied behavior change techniques were identified using the "BCT Taxonomy v1". Two independent researchers undertook the screening, data extraction, appraisal of study quality, and behavior change techniques.

Results: Nine studies investigating seven unique interventions performed between 2012 and 2018 were included. All studies were rated as weak quality. The narrative synthesis identified 19 applied behavior change techniques clustered in eleven main groups according to their similarities and a variety of 35 different outcome variables classified into seven main groups. Most outcomes were related to active school travel and psychosocial factors, followed by physical fitness, physical activity levels, weight status, active travel and cycling skills. Four studies, examining in total nine different outcomes, found a significant effect in favor of the intervention group on bicycle trips to school (boys only), percentage of daily cycling trips to school, parental/child self-efficacy, parental outcome expectations, moderate-to-vigorous intensity physical activity (total, from cycling, before/after school), and total basic cycling skills. Seven of these outcomes were only examined in two studies conducting the same intervention in children, a voluntary bicycle train to/from school accompanied by adults, including the following clustered main groups of behavior change techniques: shaping knowledge, comparison of behavior, repetition and substitution as well as antecedents.
(Continued on next page)

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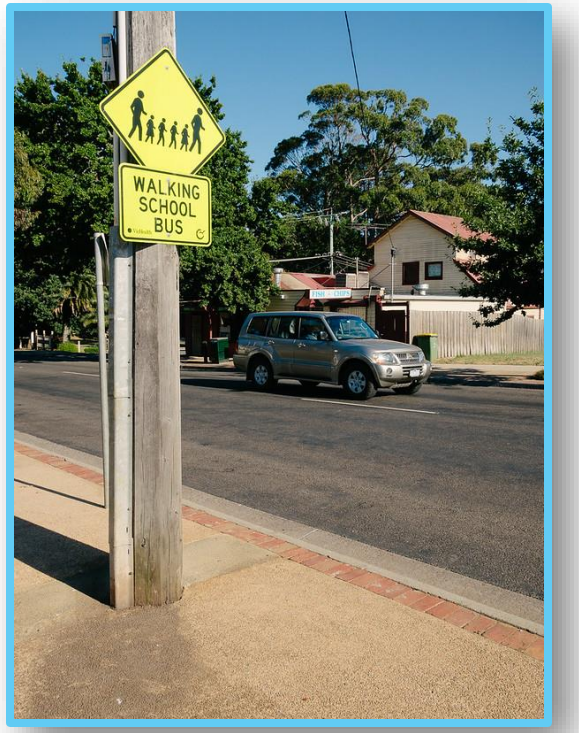
What works?

What works?



Walking School Bus

Partnering with programs such as Safe Routes to School

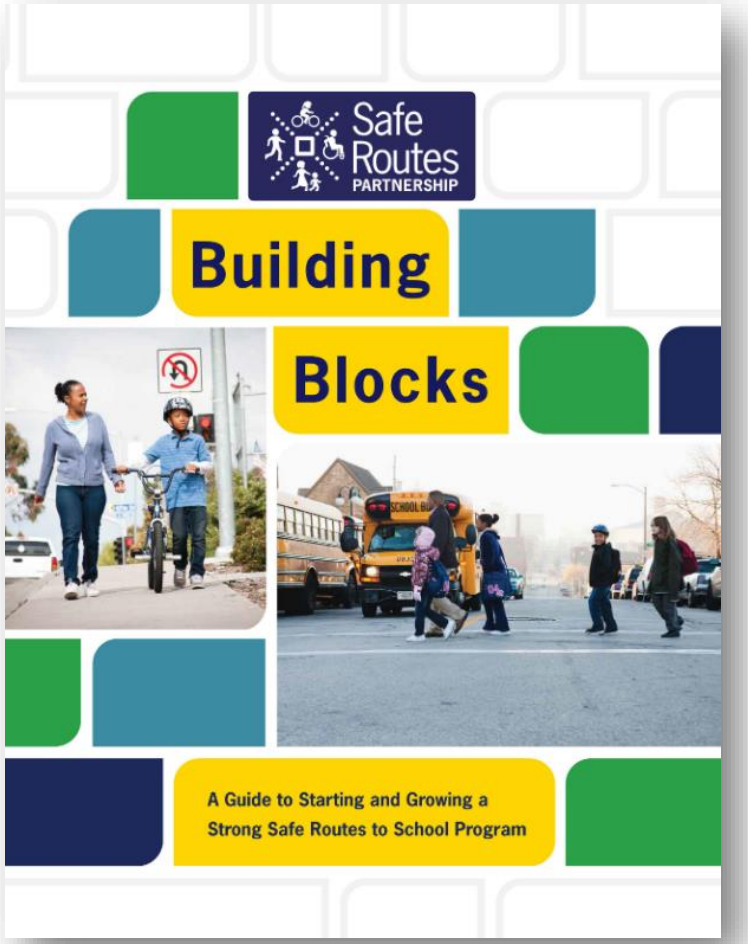
Can provide educational resources for children and their families

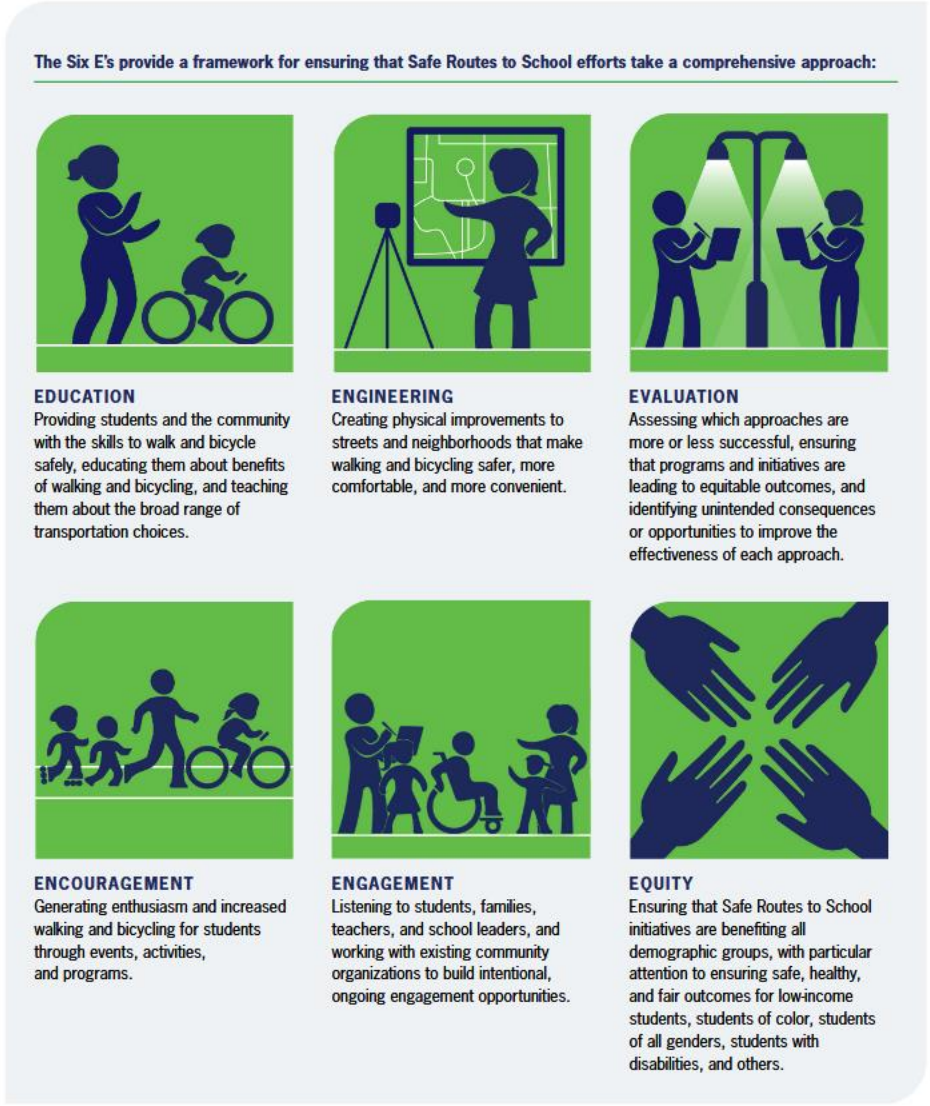
Implement programs such as Walking School Bus, Golden Sneakers, and others

Partner with local law enforcement to promote traffic safety

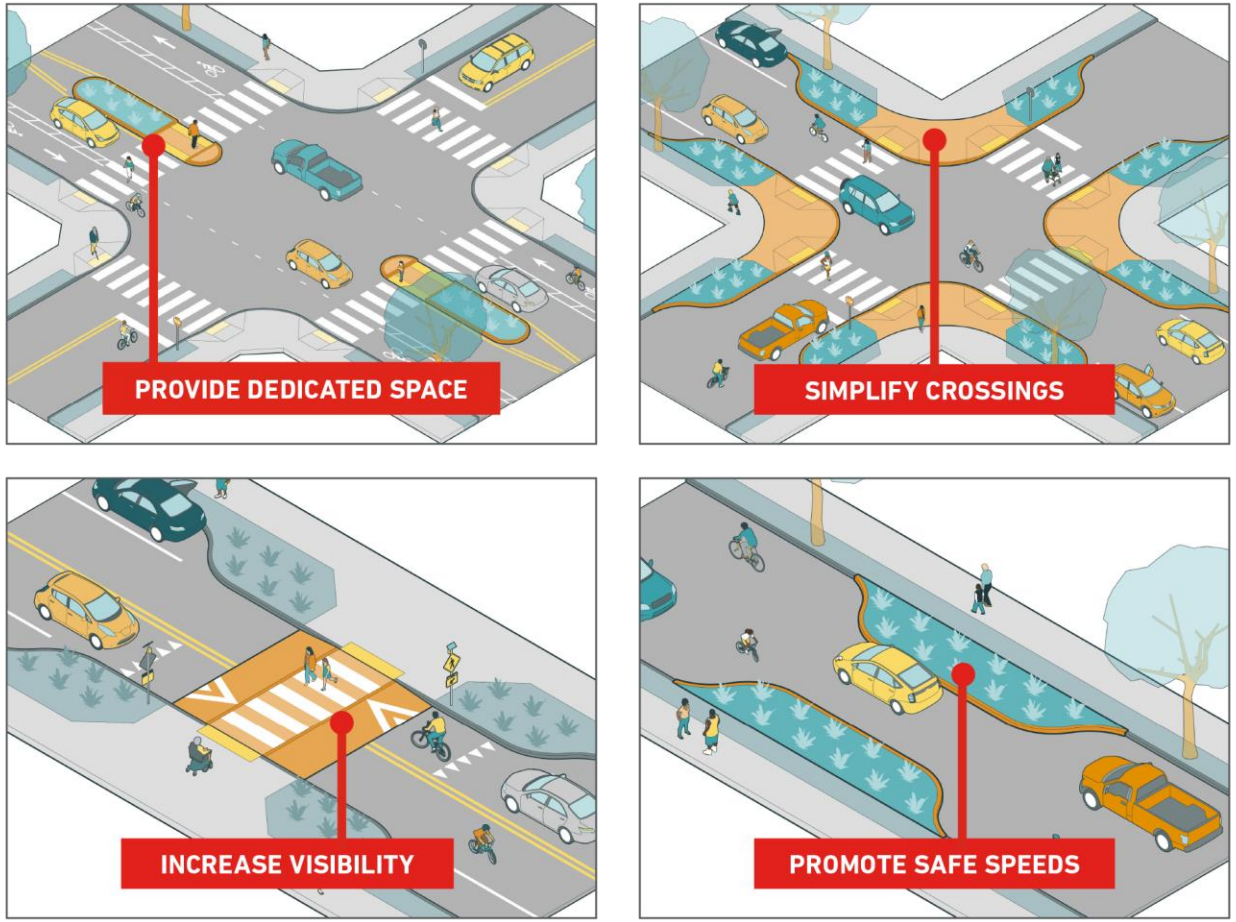
https://www.saferoutespartnership.org/safe-routes-school

What works?





From: https://www.saferoutespartnership.org/sites/default/files/resource_files/Building%20Blocks%20Toolkit.pdf



From Toole Design. https://tooledesign.com/insights/2024/10/best-practices-for-safe-routes-to-school/

Improving infrastructure!

(although this takes much more time and money)

Land-Use Mix
Local Accessibility
Traffic Calming
Connectivity
Aesthetics

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Thank you!
Questions?

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