

University of Groningen

Pollution-Aware Walking in 16 Countries

Oviedo-Trespalacios, Oscar; Rubie, Elisabeth; de Aquino, Sibebe Dias; Natividade, Jean Carlos; Bastos, Jorge Tiago; Wlodarczyk, Anna; Wang, Yonggong; Yuan, Quan; Martínez-Buelvas, Laura; Orozco-Fontalvo, Mauricio

Published in:
Journal of transport & health

DOI:
[10.1016/j.jth.2021.101166](https://doi.org/10.1016/j.jth.2021.101166)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Oviedo-Trespalacios, O., Rubie, E., de Aquino, S. D., Natividade, J. C., Bastos, J. T., Wlodarczyk, A., Wang, Y., Yuan, Q., Martínez-Buelvas, L., Orozco-Fontalvo, M., Sucha, M., Rinne, T., Ramezani, S., Park, J., Tsubakita, T., Rusli, R., Argandar, G. D., Barboza-Palomino, M., Pereira da Silva, M. D. F., ... King, M. (2021). Pollution-Aware Walking in 16 Countries: An Application of the Theory of Planned Behaviour (TPB). *Journal of transport & health*, 22, [101166]. <https://doi.org/10.1016/j.jth.2021.101166>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

associated with a lower odds of AST (OR 0.96; 95% CI: 0.94, 1.00). While the magnitude of effects varied across the city-specific models, increased child population density was associated with more AST in each city, and less residential land use, higher Walk Score®, local road density, and school crossing guards were associated with more AST in most cities.

Conclusions: This was a unique large-scale study, considering a range of built environment correlates across a diversity of urban/suburban contexts. Several cities had over 60% of children using AST on average, but the high variability between schools and between cities suggests opportunities to increase AST. Results underscore the substantial differences in built environments across Canadian cities, and point to the potential of local interventions, instead of “one size fits all” approaches.

#2888

EVALUATION OF VISION ZERO SCHOOL SAFETY ZONE BUILT ENVIRONMENT INTERVENTIONS IN TORONTO, CANADA: A PILOT STUDY

Linda Rothman, PhD¹, Rebecca Ling, MPH², Brent Hagel, PhD³, Pamela Fuselli, MSc⁴, Alison Macpherson, PhD⁵, Colin Macarthur, MBChB, PhD², Ron Buliung, PhD⁶, Andrew Howard, MD, FRCSC, MSc². ¹Child Health Evaluative Sciences, Hospital for Sick Children, Toronto, Ontario, Canada; ²Hospital for Sick Children, Toronto, Ontario, Canada; ³University of Calgary, Calgary, AB, Canada; ⁴Parachute, Toronto, Ontario, Canada; ⁵York University, Toronto, Ontario, Canada; ⁶University of Toronto, Mississauga, Mississauga, Ontario, Canada

Background: The City of Toronto adopted a Vision Zero Road Safety Plan in 2016 to eliminate traffic deaths and serious injuries. ‘School safety zones’ were created with new built environment modifications consisting of school zone and speed indicators. This pilot study examined effects of these interventions on vehicle speeds, active school transportation (AST) and risky driving behaviours.

Methods: Interventions were implemented in thirty-four schools in 2017-2018 (n=13) and 2018-2019 (n=21). Interventions were determined by school need; those most frequently installed were flashing beacons, pavement markings, and “Watch Your Speed Boards”. Forty-five control schools were matched by socioeconomic status and grade. The proportion of vehicles driving >30 km/hr, the proportion over the speed limit, and the mean 85th percentile speeds were measured using pneumatic speed tubes between 7am-6pm at school frontages. Observers determined AST and nine risky driving behaviours during morning drop off times. Analysis included pre-post intervention repeated-measures beta regression for the proportional speed and AST outcomes, multivariable linear regression for the mean 85th percentile and chi-square analysis for the driver behaviours.

Results: Prior to interventions, an average of 71% (intervention schools) and 79% (controls) of vehicles exceeded 30 km/h and 44% and 48%, respectively, exceeded speed limits. The average 85th percentile speeds were similar in intervention and control schools (47, 49 km/h). Following the interventions there was a 4% reduction in those exceeding the speed limit, representing a 21% decrease in the odds of speeding (OR 0.79, 95% CI: 0.66, 0.96) with only a 1% reduction in controls. There was a 4% increase in AST at intervention schools representing a non-significant 24% increase in the odds of AST (OR 1.24, 95% CI: 0.98, 1.57), with no change in controls. There were reductions in six out of nine risky driving behaviours at intervention schools, with significant reductions in drivers backing up dangerously (from 90% to 62%), with smaller reductions at controls.

Conclusions: High proportions of vehicles were found to speed in front of schools. Following interventions there was a modest but promising reduction in vehicles exceeding the speed limit, in dangerous backing up and some increased AST. These initial interventions were limited given they did not physically slow traffic down but were restricted to school zone and speed indicators. Bolder interventions currently being implemented in the next phase of Toronto’s Vision Zero plan, such as lower speed limits and automated speed enforcement, may have a greater effect on dangerous driving and require evaluation.

#2892

POLLUTION-AWARE WALKING IN 16 COUNTRIES: AN APPLICATION OF THE THEORY OF PLANNED BEHAVIOUR (TPB)

Oscar Oviedo-Trespalacios, Ph.D.¹, Elisabeth Rubie, Ph.D.¹, Sibebe Aquino, Ph.D.², Jean Natividade, Ph.D.², Jorge Tiago Bastos, Ph.D.³, Anna Wlodarczyk, Ph.D.⁴, Yonggang Wang, Ph.D.⁵, Quan Yuan, Ph.D.⁶, Laura Martínez-Buelvas^{1,7}, Mauricio Orozco-Fontalvo⁸, Matus Sucha, Ph.D.⁹, Tiina Rinne, Ph.D.¹⁰, Samira Ramezani, Ph.D.¹¹, Joonha Park, Ph.D.¹², Takashi Tsubakita, Ph.D.¹², Rusdi Bin Rusli, Ph.D.¹³, Gabriel Dorantes-Argandar, Ph.D.¹⁴, Miguel Barboza-Palomino¹⁵, Maria de Fátima Pereira da Silva¹⁶, Rui Mendes, Ph.D.¹⁶, Mario Velindro, Ph.D.¹⁶, Anna Marti-Belda, Ph.D.¹⁷, Sergio Useche, Ph.D.¹⁷, Violeta Enea, Ph.D.¹⁸, Tatiana Volkodav, Ph.D.¹⁹, Ali Kemal Çelik, Ph.D.²⁰, Erkan Oktay, Ph.D.²¹, Duy Q. Nguyen-Phuoc, Ph.D.²², Mark J. King, Ph.D.¹. ¹Centre for Accident Research and Road Safety-Queensland (CARRS-Q), Queensland University of Technology (QUT), Australia; ²Pontificia Universidade Catolica, Brazil; ³Federal University of Parana, Brazil; ⁴Universidad Catolica de Norte, Chile; ⁵Chang’an University, China; ⁶Tsinghua University, China; ⁷Universidad Tecnológica de Bolívar, Colombia; ⁸Universidad Militar Nueva Granada, Colombia; ⁹Palacký University Olomouc, Czech Republic; ¹⁰Aalto University, Finland; ¹¹University of Groningen, Netherlands; ¹²Nagoya University of Commerce & Business, Japan; ¹³Universiti Teknologi MARA, Malaysia; ¹⁴Universidad Autónoma del Estado de Morelos, Mexico; ¹⁵Universidad Privada del Norte, Peru; ¹⁶Polytechnic Institute of Coimbra, Portugal; ¹⁷Universidad de Valencia, Spain; ¹⁸Alexandru Ioan Cuza University, Romania; ¹⁹Kuban State University, Russian Federation; ²⁰Ardahan University, Turkey; ²¹Atatürk University, Turkey; ²²The University of Danang, Viet Nam

Background: The current levels of air pollution in European countries reduces life expectancy by an average of 8 months. People who actively travel by walking have a higher level of exposure to air pollution than those who use motor vehicles or electric buses. Some routes have higher air pollution levels than others, but little is known about pollution-aware route choice and intentions to actively avoid walking near polluted roads. An improved understanding of how air pollution influences intentions to walk or avoid polluted routes can inform interventions to decrease exposure. The present investigation has three aims: (1) compare experiences walking near roads with high levels of air pollution across countries; (2) identify groups of countries based on perceptions of air quality; and (3) examine how pedestrians develop their intentions of avoiding pollution using the extended TPB (demographics, social norms, attitudes, perceived control, and perceived risk).

Methods: A cross-sectional design was applied. Pedestrians were asked about their experiences walking near roads with high levels of air pollution. To identify groups of countries with different levels of air pollution, a cluster analysis was implemented based on the perceptions of air quality. Finally,

regressions were used to predict pedestrians' intentions to avoid polluted roads per country group using the extended TPB.

Results: 6180 respondents (Age M(SD)= 29.4(14.2); Males= 39.2%) ranging from 12.6% from Russia to 2.2% from Finland completed the questionnaire. The proportion of participants who reported never walking near air polluted roads was 12.4% (from 3% in Brazil to 54% in Japan). Seven groups of countries were identified using perceptions of air quality: G1(Japan, Mexico, Colombia, Turkey, Malaysia & Brazil), G2(Spain, Romania & Czechia), G3(Chile, Russia & Peru), G4(China), G5(Australia), G6(Finland), and G7(Portugal). Participants in China (G4) and Australia (G5) reported the worst and best air quality respectively. Across all countries, intentions to avoid polluted roads were associated with perceptions of risk. TPB-psychosocial factors such as social norms and perceived behavioural control also influenced intention in most groups. Favourable TPB-beliefs and low perceived risk increase intentions to avoid polluted routes.

Conclusions: The willingness of pedestrians to walk on or near roads with high levels of air pollution differs significantly among countries in this study. Countries can be grouped based on their perceived air quality. Perceived risk was the only common predictor of intention to avoid polluted routes across the different groups of countries.

#2894

A JOINT ANALYSIS OF ROADWAY ACCIDENT FREQUENCY AND INJURY SEVERITY TO INVESTIGATE THE EFFECTS OF COVID-19 IN BANGLADESH: APPLICATION OF ARTIFICIAL NEURAL NETWORK AND STRUCTURAL EQUATION MODELS

Zuhayr Shahid Ishmam, junior research assistant^{1,2,3,4,1,2}, Nadia Binte Mohammad, junior research assistant¹, Armana Huq, Ph.D.^{1,2,3,4}, RSP³, Azmary Zannat Aurin, junior research assistant⁴, ¹Bangladesh University of Engineering & Technology, Dhaka, Bangladesh; ²Military Institute of Science & Technology, Dhaka, Bangladesh; ³Accident Research Institute, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh; ⁴North South University, Dhaka, Bangladesh

Background: The COVID-19 pandemic is part of the worldwide coronavirus disease pandemic 2019 (COVID-19) caused by severe acute respiratory syndrome, coronavirus 2 (SARS-CoV-2). In Bangladesh, the first outbreak was detected in December 2019 in Wuhan, China, and has spread worldwide, resulting in an emerging pandemic. The focus of this study is to estimate the number of fatal, grievous and simple roadway accidents in Bangladesh from Multiple Linear Regression (MLR) and Artificial Neural Network (ANN) models based on Feed Forward Backpropagation algorithm and to compare the prediction results of the models. The results of the developed MLR & ANN models were evaluated by mean square error (MSE), the root mean square error (RMSE), and the coefficient of determination (R2).

Methods: Historical data of the monthly number of accidents from the beginning of 2016 to the end of 2020 were used as target variables for the Multiple Linear Regression (MLR) and Artificial Neural Network (ANN) models-based architecture. Monthly counts of police reported road accidents classified by type, accident counts sorted by daylight conditions (day/night), number of vehicles involved in accident categorized by light, medium and heavy were the input parameters of the forecast models. The ANN model has faster predictive power and are viable as compared to the MLR model. In addition, a sensitivity analysis for neural network was carried out to investigate which input parameter has the greatest impact on the explained variables. Lastly, Structural Equation Modelling (SEM) is also used in this study to identify which factors are more contributing to those accidents depending on the severity and compared for the before-after study for COVID-19 situation.

Results: There is a dramatic (20.87% Fatal & 31.63% Grievous and Simple) decrease in accidents, for which the sudden drop cannot be accounted by forecast ANN regression or other statistical Time Series models.

Conclusions: Lockdown due to COVID-19 have caused an unprecedented change in the overall travel patterns and prevailing traffic volume all over the country for a long period of time. Despite the drop in traffic and the number of accidents, still the perilous situation prevails. Lastly, countermeasures to mitigate these accidents are suggested based on cost effectiveness and other measures.

#2895

AUSTERITY, TRANSPORTATION AND THE WEB OF DISPOSSESSION: HEALTH AND HEALTH SYSTEM IMPACTS OF CLOSURE OF THE SASKATCHEWAN TRANSPORTATION COMPANY*

Jacob Albin Korem Alhassan, MSc, Lori Hanson, PhD. *Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan, Saskatoon, SK, Canada*

Background: There has been a global rise in neoliberal austerity characterized by budget cuts to public services including public transportation. In the Canadian province of Saskatchewan, a 71-year-old bus company was shut down in 2017 as part of an austerity budget that sought to reduce the government's budget deficit. Like previous research investigating the links between austerity and health, the closure of STC is used as an analytical entry point to understand health impacts of austerity.

Methods: A qualitative case study methodology was employed to understand health impacts of austerity through a study of the closure of the Saskatchewan Transportation Company. Drawing on interviews with 100 Saskatchewan residents who were former users of the bus, 6 focus group discussions with activists, health and social services professionals and documentary evidence from the Saskatchewan archives, emerging impacts of the closure were explored through a thematic analysis followed by a synthesized member checking exercise.

Results: The closure of the Saskatchewan Transportation Company has had negative consequences for population health. Neoliberal austerity affects health not only through individualized pathways but through a web of dispossession where the absence of the bus affects individual former users (through healthcare access barriers, psychosocial impacts and financial costs), family members (caught up in the web as they step in to ensure access to various services), communities (that have become disconnected), and entire systems (such as health services through health worker stress and inefficiencies due to disruptions attributable to STC closure).

Conclusions: Neoliberal austerity - particularly in relation to public transportation - has negative consequences for health. Analyses of the health

* ICTH 2021 Doctoral Second Highest Scoring Abstract Award - Sponsored by: University College London Health of the Public, Equitable Mobilities and Health Academic Community