

The temporal association between the built environment and walking:

A longitudinal residential relocation study

Chelsea Christie¹, Christine Friedenreich^{1,2}, Jennifer Vena^{1,2}, Liam Turley¹, Francisco Alaniz Uribe¹, Jonathan Chapman³, Ryan Martinson⁴, Graham Matsalla², Greg Morrow¹, Alberto Nettel-Aguirre¹, and Gavin McCormack¹

¹University of Calgary, ²Alberta Health Services, ³City of Calgary, ⁴Stantec



Background

- Neighbourhood built characteristics including residential density, pedestrian connectivity, land use mix, and overall 'walkability' are related to physical activity¹
- Cross-sectional studies may be biased due to residential self-selection (individuals choosing to reside in a neighbourhood matched to their physical activity preferences)²
- Residential relocation studies address this limitation by monitoring people's physical activity before and after they relocate neighbourhoods³

Research Question

- Do changes in neighbourhood built characteristics, due to residential relocation, impact walking?

Method

- Data from the Alberta's Tomorrow Project (ATP)
 - Province-wide longitudinal study
- Participants who completed both wave 2 (2008) & wave 3 (2009-2015)
 - n = 9 793
- Measures include sociodemographic variables and self-reported walking
- Walkability scores for participant postal codes will be used with participation relocation information to group participants into four groups:

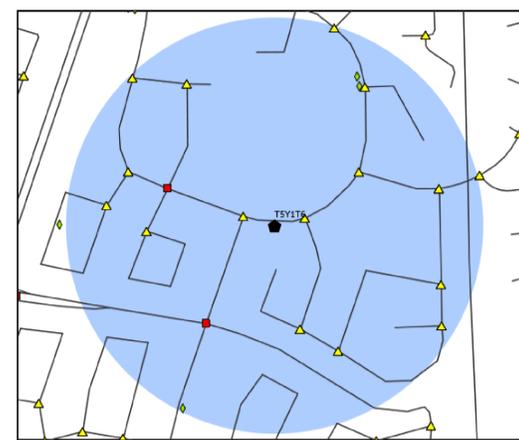
1. Increased Walkability
2. Decreased Walkability
3. No change in Walkability
4. No relocation

Development of the Alberta Walkability Index (AWI)

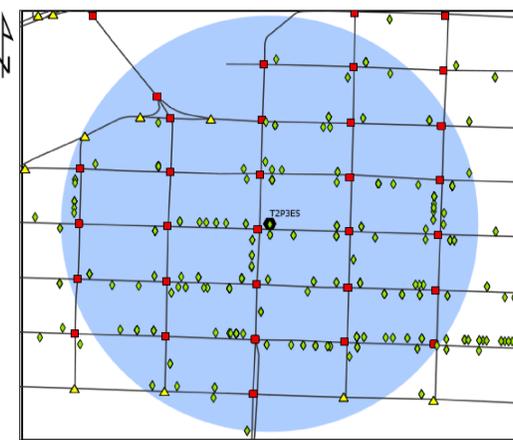
- Estimated for 400m radial buffers around all urban postal codes in Alberta 2008 - 2015
- Developed using Geographic Information Systems (GIS)
- Spatial data used:
 - Population density (Statistics Canada Census)
 - Diversity of destinations (Number of different DMTI Spatial's Enhanced Points of Interest)
 - Connectivity (DMTI 3 & 4 way intersection counts)
- AWI score (max. 350) calculated as a weighted combination (% relative to the maximum value for the attribute found across all years (2008-2015)):

$$\text{AWI Score} = [1 \times (\# \text{ of residents}/7956) \times 100] + [1 \times (\# \text{ of different destinations}/23) \times 100] + [1 \times (\# \text{ of 4-way intersections}/51) \times 100] + 0.5 \times (\# \text{ of 3-way intersections}/92) \times 100]$$

Low-walkability neighbourhood:



High-walkability neighbourhood:



Random Rated Buffer	POSTALCODE	Top Rated Buffer
TSY1T6	EDMONTON	T2P3E5
41.08/350	MUNICIPAL	CALGARY
4.35/100	WI weighted 2008: 4way_POMP + (0.5*3way_POMP) + Population_POMP + Destination_mix_400m_v1_pomp	230.17/350
1	Destination_mix_400m_v1_2008_pomp	91.3/100
24.66/100	Mix of different types of destinations within 400m of PC v1_2008	21
1961.71	Pop_2008_POMP	83.21/100
3.92/100	Pop_2008	6620.09
2	AB08FW_POMP	52.94/100
16.3/100	AB08FW	27
15	AB08TW_POMP	5.43/100
	AB08TW	5

Demographics at baseline

Sex	37% male, 63% female
Mean age (SD)	36.9 (9.1)
Education	6% < high school, 15% high school, 39% technical school, 40% university or higher
Marital status	73% married, 10% divorced, 6% single, 5% co-habituating, 6% other

Analysis Plan

- Link the AWI score to each participant's postal codes (before and after relocation)
- Use generalized linear models (adjusting for sociodemographic and health covariates) to estimate the relationship between changes in built environment variables following relocation and changes in walking

Implications

- Study results could be used for developing evidence-based urban planning policy that can positively impact population health

References

1. Saelens BE, Handy SL. Built environment correlates of walking: a review. *Med Sci Sports Exerc.* 2008 Jul;40(7)
2. McCormack GR, Shiell A. In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *Int J Behav Nutr Phys Act.* 2011 Nov 13;8(1):125.
3. Ding D, et al. Moving to an active lifestyle? A systematic review of the effects of residential relocation on walking, physical activity and travel behaviour. *Br J Sports Med.* 2018 Jun 1;52(12):789-99.

Acknowledgements

