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INTERACT FLASH REVIEW

GEOGRAPHIC SAMPLING BOUNDARIES OF GREENWAY/URBAN TRAIL NATURAL EXPERIMENTS

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Question

In preparation for INTERACT Vancouver's evaluation of the Arbutus Greenway development, this review explores relevant literature to help guide sampling decisions. Previously, our research teams at Simon Fraser University and the University of British Columbia conducted the Arbutus Greenway Evaluation (AGE), where we recruited older adults (60 years and older) who lived within 500 m of the Arbutus Greenway temporary path. For INTERACT, we are interested in sampling adults (18 years and older) who live near the Arbutus Greenway. To guide our sampling decision for the INTERACT Vancouver study, we aim to review other natural experiment studies evaluating greenways and urban trails.

The papers selected are natural experiment studies that evaluate similar urban trails or greenways (16 articles). The literature search was conducted on Medline, using the following search strategy: ["built environment" AND ("greenway" OR "trail" OR "light rail" OR "path")]. Additionally, the references of each relevant article were reviewed. Based on Vancouver's study design, the following inclusion/exclusion criteria were selected. Since INTERACT's methodology involves self-administered online questionnaires and GPS and accelerometry data collection, intercept surveys were excluded from the review.

Inclusion criteria:

1. Examination of an urban greenway/trail/street/park, and
2. Sampling human participants living near the intervention.

Exclusion criteria:

1. Intercept surveys used as primary or sole methodology.

This flash review addresses the following question: What geographic boundaries have previous studies used for participant sampling?

Review of measures / methods

The studies in this review evaluated the impact of built environment interventions. These interventions included rail trails, multi-use trails, light rail stops, bicycle boulevards, parks, and greenways. Similar to the INTERACT methodologies, a few papers collected GPS and/or accelerometry data (Brown and Werner, 2007; Dill et al., 2014; Knell et al., 2017; Miller et al., 2015; Voss et al., 2016). While most used surveys (Brown and Werner, 2007; Cohen et al., 2014; Evenson et al., 2005; Gustat et al., 2012; Lott et al., 1978; Morrison et al., 2004; Ogilvie et al., 2012; Pazin et al., 2016; Ward Thompson et al., 2014; West and Shores, 2015), one used activity diaries (Burbidge and Goulias, 2008), and another conducted phone interviews (Merom et al., 2003).

The reported sampling boundaries of these studies varied from a radius of 0-5 km. Two studies used the entire neighbourhood for their recruitment sample, reporting unspecific geographic boundaries (Gustat et al., 2012; Morrison et al., 2004). Of the 16 articles included in this flash review, the most commonly used sampling boundary is 1.5/1.6 km (Burbidge and Goulias, 2008; Pazin et al., 2016; West and Shores, 2015).

Three studies used different boundaries of geography for comparison (Merom et al., 2003; Ogilvie et al., 2012; Pazin et al., 2016). Merom et al. had an 'outer' and an 'inner' group (2003), Pazin et al. had three categories of sampling 0-500 m, 501-1000 m, and 1001-1500 m (2016), and Ogilvie et al. had three comparison buffers of 1.5 km, 3 km, and 5 km (2012). Two other studies that evaluated street interventions also sampled from individuals living on or near comparable control streets (Dill et al., 2014; Ward Thompson et al., 2014).

Among the studies that examined comparison boundaries, all three found some differences in their results based on distance (Merom et al., 2003; Panter and Ogilvie, 2017; Pazin et al., 2016). Merom et al. discussed their findings related to trail use among bike-owners; more bike-owners who lived in their inner sampling boundary, closer to the trail, had used the trail compared to those living in the outer sampling boundary (20.5% vs. 3.8%) (2003). Pazin et al.'s study in Brazil found an increase in leisure-time walking among those living within 500 m of the new walking and cycling route, and did not see any significant increases among the other distance groups (501 – 1000 m, 1001 – 1500 m) (2016). And lastly, from Ogilvie's iConnect research project, one of their follow-up reports found that proximity to the new cycling and walking infrastructure "was independently associated with both short-lived increases in and uptake of walking for transport" (Panter and Ogilvie, 2017, p. 532).

None of the studies in this review discussed increasing their sampling boundary due to low recruitment numbers, but Knell et al. indicated that they included a large boundary "to maximize the pool of eligible participants" (Knell et al., 2017, p. 56). Many of the other articles did not discuss the reasoning behind their chosen boundary distance.

However, Merom's article mentioned the challenge of choosing an effective boundary, indicating that it is a challenge to decide how close people must live from an intervention to see any impacts on physical activity outcomes (Merom et al., 2003). They discuss findings from previous Australian studies that show the majority of public space users live about 500 m away from the area, but conclude by saying "the optimal distance that determines if cyclists or pedestrian would use a trail for exercise and for active commuting is not clear, but may be confined to smaller distances than previously thought" (Merom et al., 2003, p. 241).

Table 1. Review of the sampling boundaries of built environment intervention studies

Reference (Author, year)	**Objective**	**Sample and Methods** (# participants, age group, method)	**Sampling Boundary**	**Comparison Group**
(Lott et al., 1978)	To analyze the attitudes of cyclists toward a newly established on-street bicycle lane and its effect on their route selection.	254, all ages, surveys.	Living within 2 blocks.	3 different housing groups within 2 blocks of new bicycle lane.
(Merom et al., 2003)	To assess the impact of a local promotional campaign around a newly constructed Rail Trail in western Sydney, Australia.	450, 18-55 years, pre-post phone interviews and bike counts.	Living within 5 km.	Inner area (≤ 1.5 km) and outer area (1.5-5 km).
(Morrison et al., 2004)	To assess the secondary health impacts of a traffic calming scheme on a community.	425, ≥ 15, surveys.	Living in neighbourhood.	N/A
(Evenson et al., 2005)	To evaluate the impact of building a multi-use trail, in terms of change in physical activity levels among nearby residents. To document any change in physical activity occurring among adults that might be attributable to the construction of a multi-use trail.	366, ≥ 18, surveys.	Living within 2 miles [3.2 km].	N/A
(Brown and Werner, 2007)	To examine the intervention of a new light rail stop in a neighbourhood for relationships with ridership and moderate-activity bouts.	51, all ages, accelerometry and surveys.	Living within 0.5 miles [0.8 km].	N/A
(Burbidge and Goulias, 2008)	To assess a trail construction impact on active travel behavior and overall physical activity among suburban residents. Looking at the same group of residents over time and analyzing if individual changes in behaviour occur following the construction of the trail.	796, all ages, surveys and activity diaries.	Living within 1 mile [1.6 km].	N/A

(Gustat et al., 2012)	To assess the effect of improvements to the built environment on the PA levels of residents in a low-income, African American community.	499, adults, surveys.	Living in intervention neighbourhood.	2 comparison neighbourhoods.
(Ogilvie et al., 2012)	To integrate the perspectives of public health and transport research on the measurement and evaluation of the travel, physical activity and carbon impacts of the Connect2 program.	Goal of 500 per site, adults, surveys.	Living within 5 km.	Three comparison buffers (1.5 km, 3 km, and 5 km). Additionally, another Connect2 program site (city of Kenilworth) is acting as "lagged control site".
(Ward Thompson et al., 2014)	To understand the influence of aspects of the built environment on older adults' outdoor activity, wellbeing and quality of life through two waves of cross-sectional survey, pre-intervention and post-intervention.	96, older adults, surveys.	Living directly on.	9 intervention streets and 9 comparison streets.
(Dill et al., 2014)	This study evaluates changes in physical activity and active transportation associated with installation of new bicycle boulevards.	353, adults with children, GPS and accelerometers.	Living within 1000 ft [0.3 km].	8 intervention streets and 11 control streets.
(Cohen et al., 2014)	To assess the use of new pocket parks in low-income neighborhoods.	392, adults, surveys.	Living within 0.5 miles [0.8 km].	Comparison parks, individuals living within 0.5 miles of different parks.
(Miller et al., 2015)	To test if light rail transit (LRT) generated new PA in a neighborhood of Salt Lake City, Utah, USA.	536, ≥ 18, GPS and accelerometers.	Living within 2 km.	N/A
(West and Shores, 2015)	To compare the physical activity behaviors of residents before and after a greenway was built within 1 mile of their homes with the physical activity behaviors of residents from a control neighborhood located 2 to 3 miles away.	524, adults, surveys.	Living within 1 mile [1.6 km].	A control area located 2-3 miles from greenway.

(Pazin et al., 2016)	To evaluate the effects of a new walking and cycling route on leisure- time physical activity (PA) (walking and moderate-to-vigorous PA) of adults.	745, adults, surveys.	Living within 1500 m [1.5 km].	Three groups for comparison: 0-500 m, 501-1000 m, and 1001-1500 m.
(Voss et al., 2016)	To assess transportation-related and overall physical activity in community-dwelling older adults from downtown Vancouver, a highly walkable area with good access to public transit.	178, older adults ≥ 60, surveys, GPS and accelerometer.	Living within 400 m [0.4 km]	N/A
(Knell et al., 2017)	To assess the relations between transit-use and self-reported and monitor-based physical activity levels in a predominantly minority population from the Houston Travel-Related Activity in Neighborhoods (TRAIN) Study.	865, adults, surveys, accelerometer.	Living within 3 miles [4.8 km].	Distance to new light-rail system is an exposure variable.

Recommendations

Based on these similar studies, we recommend using a 1.5 – 3 km sampling boundary for the INTERACT Vancouver study. This recommendation is justified based on:

1. The desire to evaluate health impacts among differing exposure comparison groups;
2. The similarity of our study and the articles from Pazin et al. (1.5 km boundary, 2016) and Ogilvie et al. (1.5, 3, and 5 km sampling boundary groups, 2012); and
3. The pragmatic decisions based on sample size goal and number of eligible participants living along the Arbutus Greenway in Vancouver, BC.

For the Vancouver INTERACT study, sampling for participants will be based on Forward Sortation Areas within 3km of the Greenway. However, during analysis, more precise exposure measures could be calculated based on geocoded addresses.

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