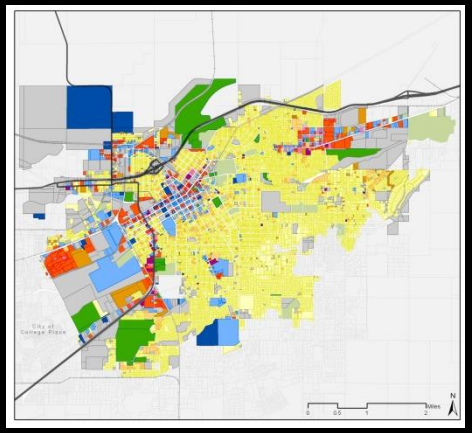
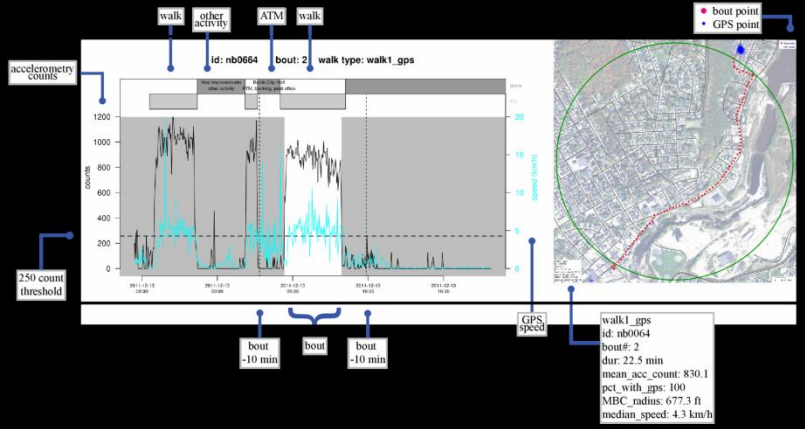
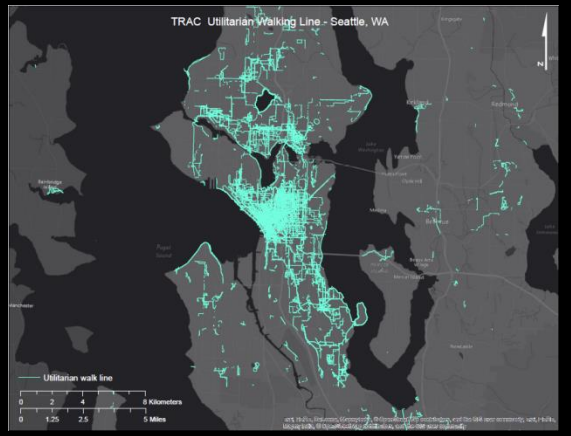
Objectively measured walking and built environments in small towns and urban areas







Orion Stewart, Anne Vernez Moudon, Brian Saelens,
Chanam Lee, Bumjoon Kang & Mark Doescher

Active Living Research Annual Conference, February 25, 2015

Built Environment → Walking

Image byJelson25

Image from www.architets.com/ArchiveFall2006.html

Is it the association different in big cities and small towns?

Outline

- Describe two studies of walking:
  - one in the Seattle metro area
  - one in 9 small U.S. towns
- Compare Seattle and small town sample populations in terms of demographics, BE, and walking
- Compare associations between the BE and walking in the 2 sample populations
- Discuss the results and implications

TRAC (Seattle)

Urban King County, Wash.

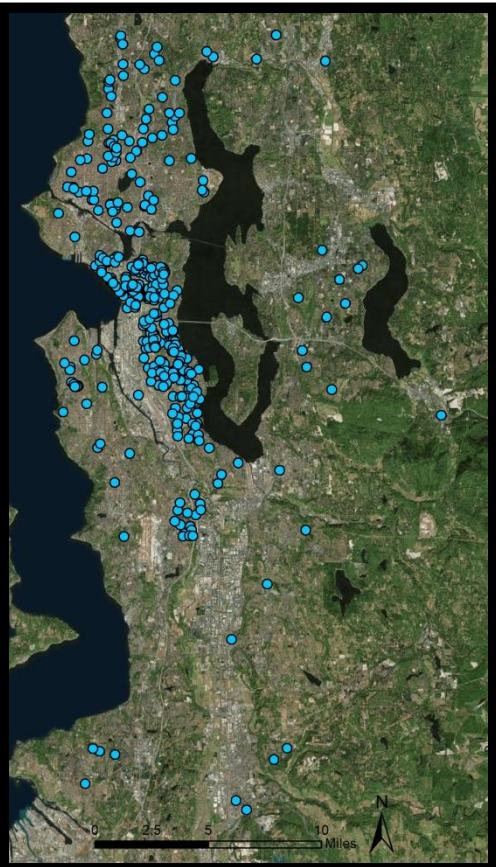
Natural experiment of the effect of light rail on travel

Address-based sampling

2nd follow up of longitudinal data collection

464 adults

2012 - 2013



STW (Small towns)

9 small towns in 3 regions (WA, TX, and the N.East)

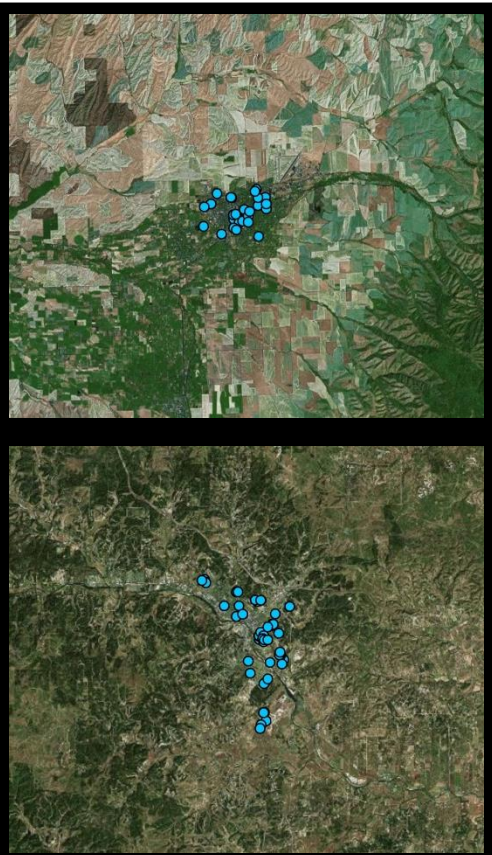
Cross-sectional study of walking in small towns

Address-based sampling

Validation sub-sample from telephone survey

299 adults

2011 – 2012



Data collection

- Survey: socio-demographics and neighborhood perceptions
- Secondary GIS data: objectively measured neighborhood BE
  - Classified as 6 domains: density, general land uses, destinations, transportation infrastructure, natural environment, and neighborhood wealth
  - Measures taken using 1km home network buffers
- GPS, accelerometer, travel diary: objectively measured walking

Walking algorithm

- Bouts of PA at levels consistent with walking for ≥5 minutes
- GPS speeds consistent with walking, or
- occurred during a trip reported in the travel diary

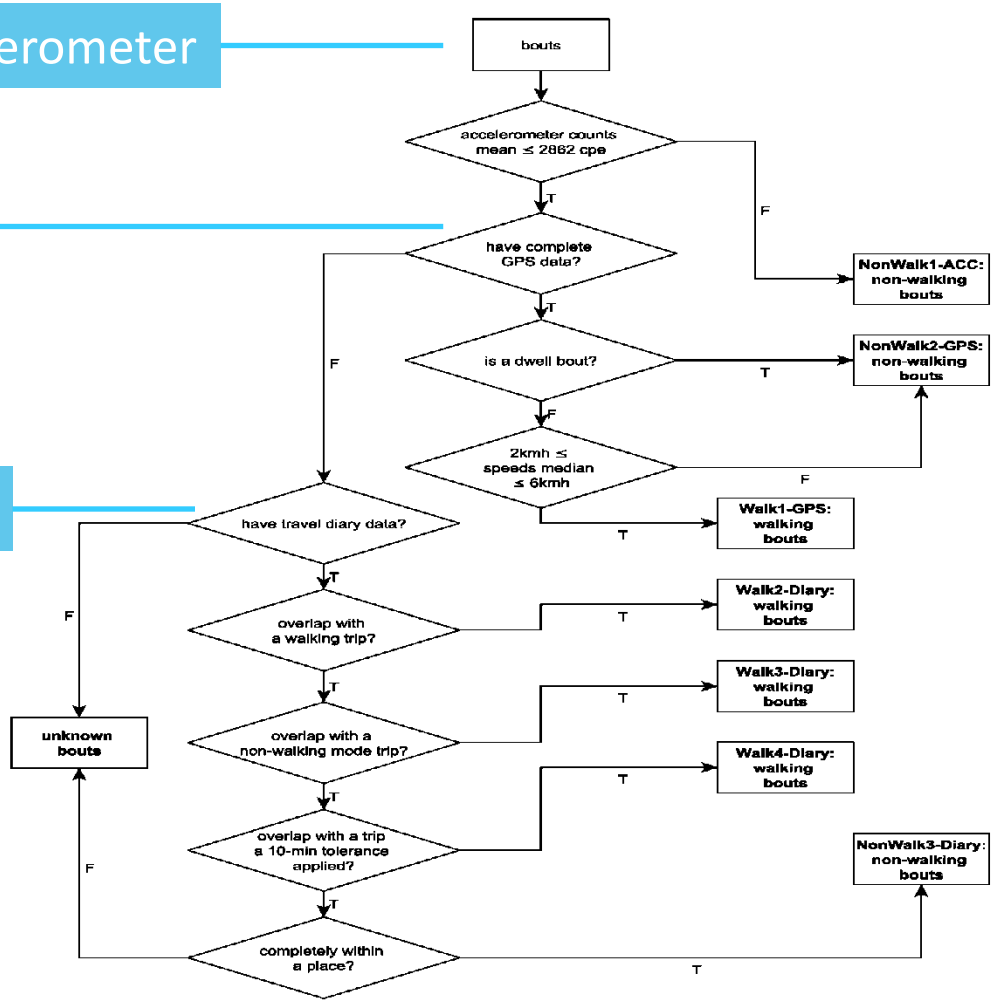
Further classified as:

- Utilitarian
- Recreational (same start and end)

Accelerometer

GPS

Diary



Demographics

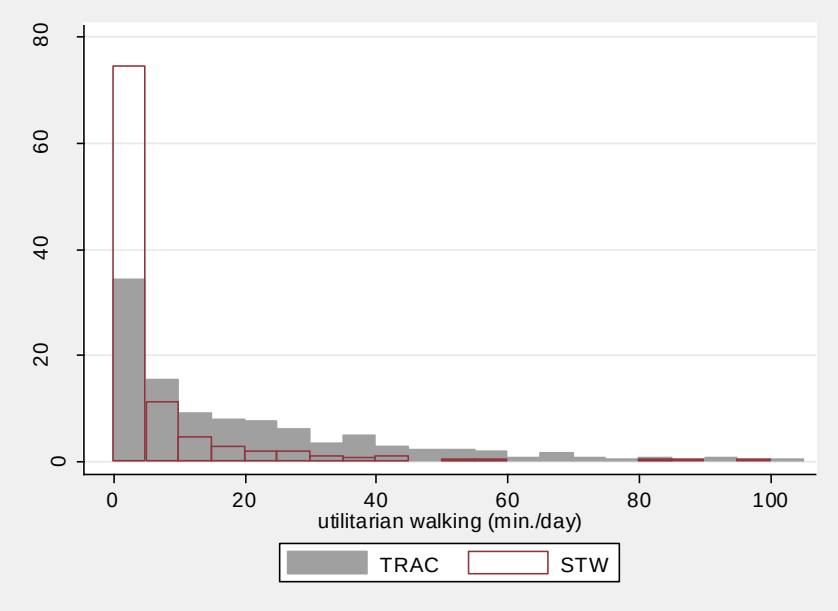
Domain	Variable	Seattle % / Mean (SD)	Small towns % / Mean (SD)	P-value
Demographics	Age (yrs)	55.3 (12.2)	56.0 (14.7)	0.485
	Female	65%	66%	0.762
	Non-Hispanic White	81%	81%	0.814
	College degree	74%	45%	***<0.001***
	Household income <$50K	35%	43%	***0.028***
	Overweight or Obese	52%	63%	***0.006***
	≥1 Child in household	21%	28%	***0.037***
	≥1 vehicle in household	90%	96%	***0.006***
N'hood Selection	Walkable destinations important	68%	31%	***<0.001***

Select BE characteristics

Domain	Variable	Seattle % / Mean (SD)	Small towns % / Mean (SD)	P-value
N'hood perception	Traffic speed is slow (agree)	67%	73%	0.353
Density	Residential density (units/ha)	23.1 (17.7)	6.2 (3.6)	***<0.001***
Land uses	Retail (ha)	6.4 (4.7)	8.4 (8.7)	***<0.001***
Destinations	Food Stores, all types (count)	13.5 (14.2)	2.9 (3.0)	***<0.001***
	Restaurants (count)	88.1 (128.6)	6.5 (7.9)	***<0.001***
	Schools (count)	3.3 (2.2)	1.6 (1.4)	***<0.001***
	Parks (count)	6.9 (4.0)	2.1 (2.1)	***<0.001***
Transportation	Network buffer area (ha)	205.5 (48.1)	150.2 (58.6)	***<0.001***
Natural environ.	>8.33% slope (% buffer)	34.4 (14.0)	15.8 (21.6)	***<0.001***
Wealth	Mean residential value/unit ($1000)	270.0 (99.5)	98.8 (54.0)	***<0.001***

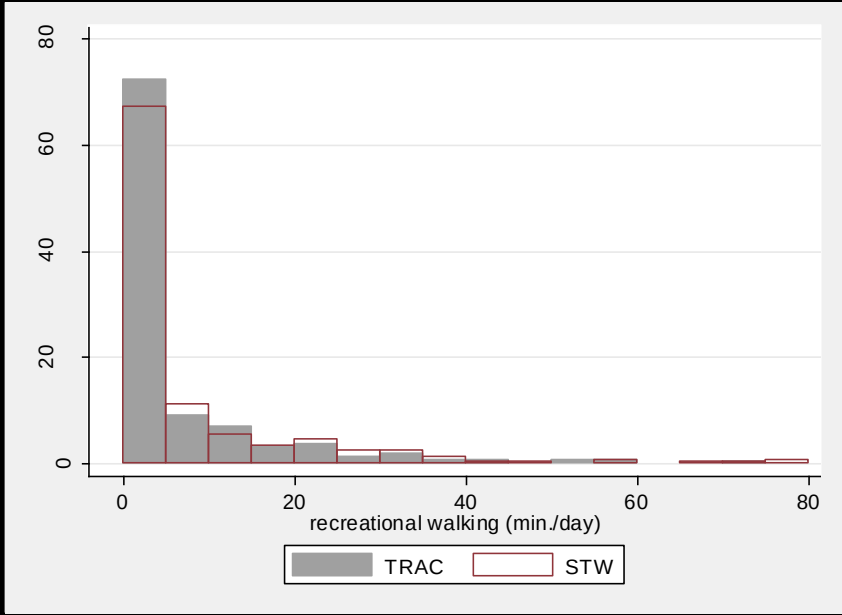
Utilitarian walking

	Mean min./day	Any walking
Seattle	17.3	85%
Towns	5.5	50%



Recreational walking

	Mean min./day	Any walking
Seattle	5.4	47%
Towns	7.2	50%



Analytic steps

1. Develop base models of walking (negative binomial regression)
   - Includes observation characteristics, demographics, and n'hood selection variables independently associated with walking in 3 populations: (1) Seattle only, (2) small towns only, and (3) combined
2. Add BE variables to base model separately for each of 3 sample populations
   - Add BE variables one at a time
   - Add all significant ($p<0.05$) BE variables by domain
   - Add all significant variables in domain-level testing and retain significant variables
3. Create final model
   - Base model + all significant BE variables from any of the 3 populations
   - Stratify by Seattle and small towns

BE correlates of utilitarian walking

Domain	Variable	Seattle Only	Towns Only	Combined
N'hood perception	Sidewalks available	+		+
Density	Residential density (units/ha)	+		+
Land uses	Multi-family residential (ha)	+		+
	Manufacturing (any)	+		
	Retail (ha)	+		Inverted U
	Services (ha)	+		+
	Transport and utility (any)	+		+
Destinations	Food Stores (count)	+		+
	Convenience stores (count)	+	–	
	Grocery stores (any)	+		
	Supermarkets (any)	+		+
	Restaurants (count)	+	U-shaped	U-shaped
	Schools (count)	+		
	Shorter distance to nearest post office (km)	+		+
	Parks (count)	+		
	Fitness facilities	+		+
Transportation	Network buffer area (acres)	+		+
	Intersection density (3+ way/ha)	+		+

Controlling for base model variables: BMI, Age, children, vehicles, and importance of walkable destinations for residential selection (combined associations also control for TRAC/STW)

Utilitarian walking: final model

Domain	Variable		Seattle IRR (95% CI)	Small Towns IRR (95% CI)
Destinations	Restaurants:	0 restaurants	1.00 (ref)	1.00 (ref)
		1 - 3 restaurants	1.94 (0.87, 4.33)	***0.30 (0.15, 0.58)***
		4 - 10 restaurants	***1.95 (1.01, 3.75)***	0.62 (0.33, 1.19)
		>10 restaurants	***3.38 (1.86, 6.16)***	0.87 (0.45, 1.67)

Controlling for base model variables: BMI, Age, ≥1 child in household, ≥1 vehicle in household, and importance of walkable destinations for residential selection

BE correlates of recreational walking

Domain	Variable	Seattle Only	Towns Only	Combined
N'hood perception	Sidewalks available (agree)		+	
	Traffic is slow (agree)		+	

Controlling for base model variables: observation days, race/ethnicity, household income, BMI, and education (combined associations also control for TRAC/STW)

Recreational walking: final model

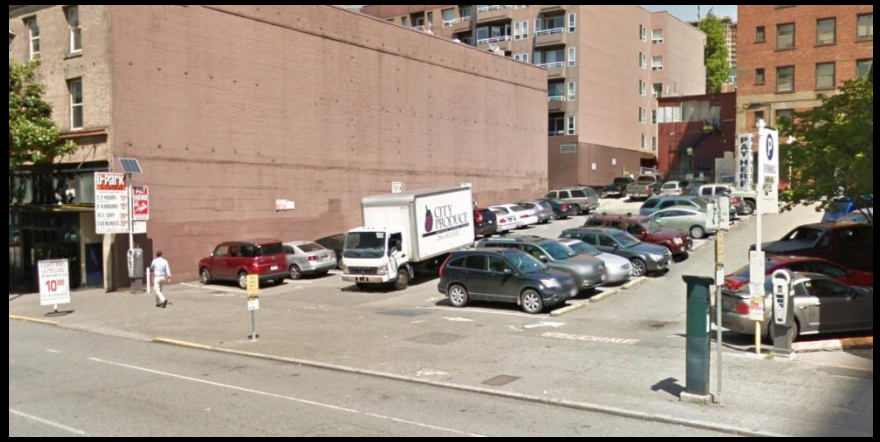
Domain	Variable	Seattle IRR (95% CI)	Small Towns IRR (95% CI)
N'hood Perceptions	Traffic speed is slow	0.93 (0.55, 1.58)	***2.12 (1.15, 3.93)***

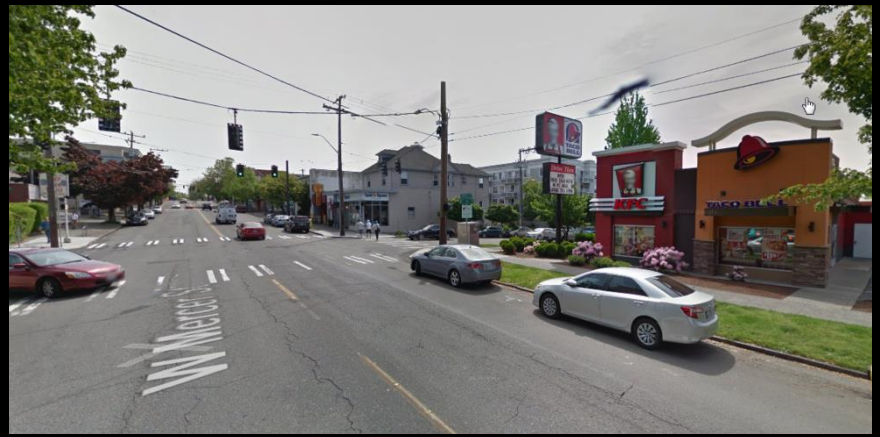
Controlling for base model variables: observation days, race/ethnicity, household income, BMI, and education

Summary of findings

Utilitarian walking	Recreational walking
• Less utilitarian walking occurred in small towns • Fewer neighborhood BE characteristics were associated with utilitarian walking in small towns • Having a few restaurants nearby was negatively associated with utilitarian walking in small towns, but the association was positive in Seattle	• Similar levels of recreational walking occurred in small towns and in Seattle • More perceived neighborhood BE characteristics were associated with recreational walking in small towns • Perceiving slow traffic in one's neighborhood was positively associated with recreational walking only in small towns

Seattle





Small towns

Images from Google Street View

Implications

- Caveat: exploratory analysis that may not be generalizable
- Evidence that there is a differential association between the BE and walking in Seattle and 9 small towns

Practitioners:

- Use context sensitive solutions (guided by research) to support walking
- Pay attention to urban design elements that support walking in any location

Researchers:

- Identify reasons for differential association between the BE and walking in big cities and small towns

More information

Walking algorithm

Kang B, Moudon AV, Hurvitz PM, Reichley L, Saelens BE. Walking objectively measured: classifying accelerometer data with GPS and travel diaries. *Med Sci Sports Exerc* 2013;45(7):1419-28.

TRAC study overview

Saelens BE, Vernez Moudon A, Kang B, Hurvitz PM, Zhou C. Relation between higher physical activity and public transit use. *Am J Public Health* 2014;104(5):854-9.

STW study overview

Doescher MP, Lee C, Berke EM, Adachi-Mejia AM, Lee CK, Stewart O, et al. The built environment and utilitarian walking in small U.S. towns. *Prev Med* 2014;69:80-6.

Funding source

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http://depts.washington.edu/ufl