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Bicycling Is Different: Built Environment Relationships to Nonwork Travel

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Bicycling is Different

Built Environment Relationships to Non-work Travel

Source: Muhs, 2013

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OTREC
OREGON TRANSPORTATION RESEARCH AND EDUCATION CONSORTIUM

U.S. Department of Transportation
Research and Innovative Technology Administration

Paper 14-4778
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Introduction

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Non-motorized travel

Introduction

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Non-motorized travel

?

Introduction

Source: CC, Harvey Barrison, Flickr

Source: CC, DDOTDC, Flickr

Background

Key findings from separated walk/bike analyses in non-work mode choice literature:

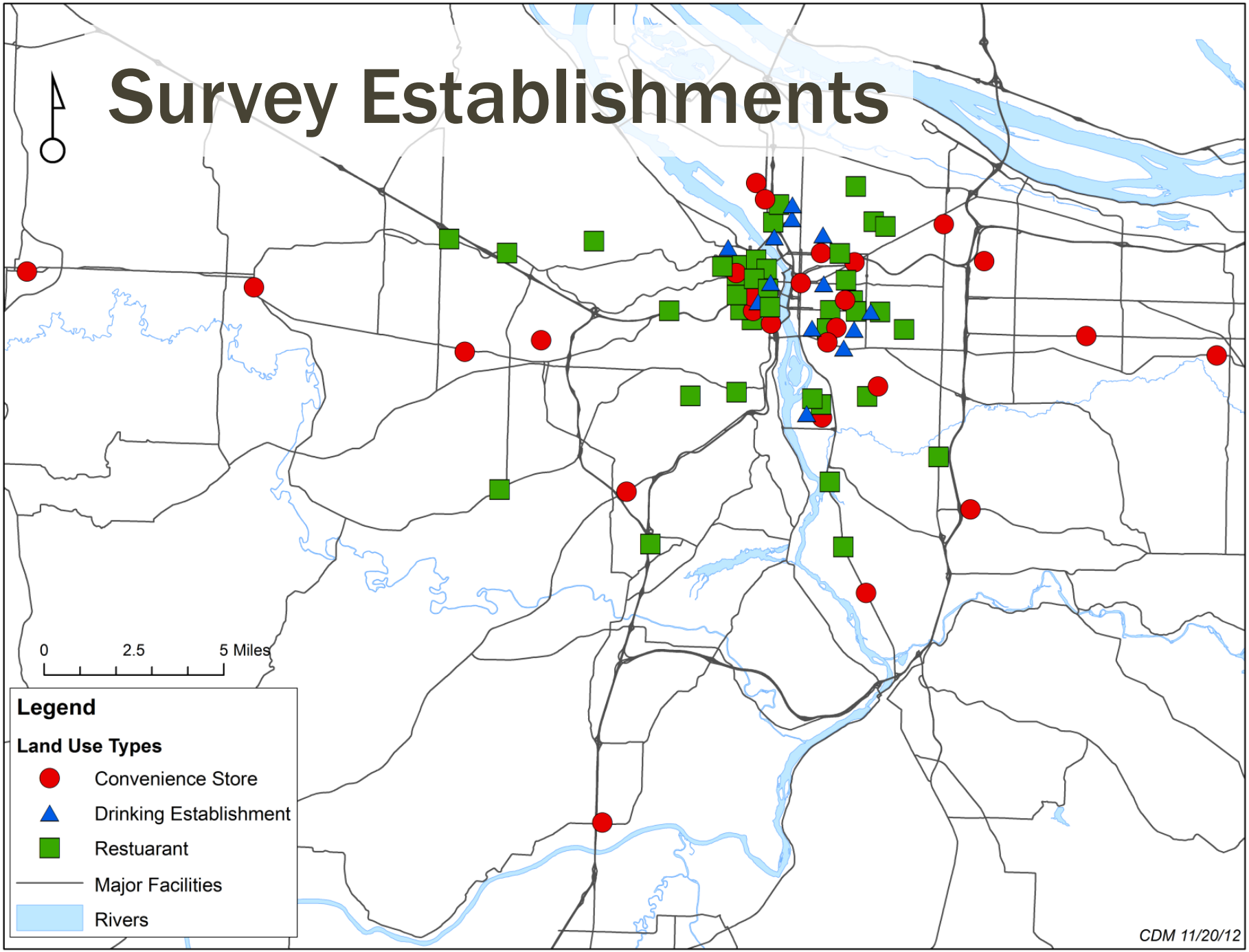
1. Trip distance matters more for walking than for biking
2. Mixed results in environmental variables that have significant relationships between the two modes
3. Socio-demographic variables often have most explanatory power

Purpose

Add to knowledge of segmented active travel mode analysis

Contributions

1. Destination-based dataset
2. Control for three shopping destination types
3. Mode choice and mode share analysis


Survey Establishments
0
2.5
5 Miles
Legend
Land Use Types
Convenience Store
Drinking Establishment
Restuarant
Major Facilities
Rivers
CDM 11/20/12

Data - Individuals

- Monday–Thursday, 5-7pm, May–Oct. 2011
- No data collected during rainy weather
- Survey of:
  - Travel mode(s)
  - Socio-demographics
  - Attitudes towards travel @ establishment
  - Locations: home, work, previous, next
- Asked refusals for mode & home location

Methods

1. Address built environment multicollinearity
2. Binary logit models of mode choice
3. Tobit regression models of mode share

Methods – Data Reduction

- Gathered from site visits, RLIS, & US Census Bureau
- Summarized for ½ mile around each establishment
- BE variables all highly correlated ($R > 0.30$, $p < 0.01$)
- Factor analysis used to reduce data to one measure

Built Environment Variable	Factor loading
Activity density	0.906
Intersection density	0.835
Lot coverage	0.944
Percent single-family housing	-0.782
Distance to light rail station	-0.578
Percent of variance explained	67.1%

Built Environment Factor = -1

Source: Muhs, 2013

Built Environment Factor = 0

Source: Muhs, 2013

Built Environment Factor = 1

Key Results – Mode Choice of Individuals

Variables		Walk	Bike	Automobile
Trip	Distance	−−		+

Variables		Walk	Bike	Automobile
Built environment	BE Factor	+		−
	Low-stress bikeways			+
	On arterial	−		+
	Shopping center			+

\+ = Positive significant result

− = Negative significant result

Key Results – Mode Share at Establishments

Variables		Walk	Bike	Automobile
Trip averages	Avg. distance	–		+

Variables		Walk	Bike	Automobile
Built environment	BE Factor	++		––
	Low-stress bikeways	+		–
	On arterial			
	Shopping center			+
	Bike corral		+	
	Bike parking		+	

Findings Summary

- Walking & vehicle modes: similar built env. relationships, in opposite directions
- Bicycling influenced by a different set of characteristics
- Results of analyses at different levels vary

Implications

- Move away from combining active modes into *non-motorized* category
- More empirical work needed to define a "bicycle supportive environment"
  - Models confirm ideas on distances
  - Test in other cities
  - Test at other land use types
  - Study other attributes: traffic separation, intersection controls, built env. at origin & route, pedestrian & vehicle volumes

Thank you!

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Source: Muhs, 2013

Results – Mode Choice of Individuals

Variables		Walk	Bike	Automobile
Establishment type	Convenience store	+		–
	Bar	+	+	–
Demographics	Income		–	
	Gender = M		+	
	Age > 35		–	+
	Vehicle in HH	–		++
	Child in HH	+		–
Trip	Work-based	–	+	
	Group size	–		+
	Distance	––		+
Attitudes/ perceptions	Positive towards car parking		–	+
	Positive towards mode	+	+	
Built environment	BE Factor	+		–
	Low-stress bikeways			+

Results – Mode Share at Establishments

Variables		Walk	Bike	Automobile
Establishment type	Convenience store	+		
	Bar		+	–
Demographic averages	Avg. % Male	–		
	% with Child in HH			–
Trip averages	% Work-based			–
	Avg. group size			
	Avg. distance	–		+
Built environment	BE Factor	++		––
	Low-stress bikeways	+		–
	On arterial			
	Shopping center			+
	Bike corral		+	
	Bike parking		+	

Limitations

- Limited number of customers used to aggregate to establishments
- Good weather during data collection may bias observations towards optimistic travel behavior
- Local establishments → customer bias?
- Uncertainty of results in a different setting