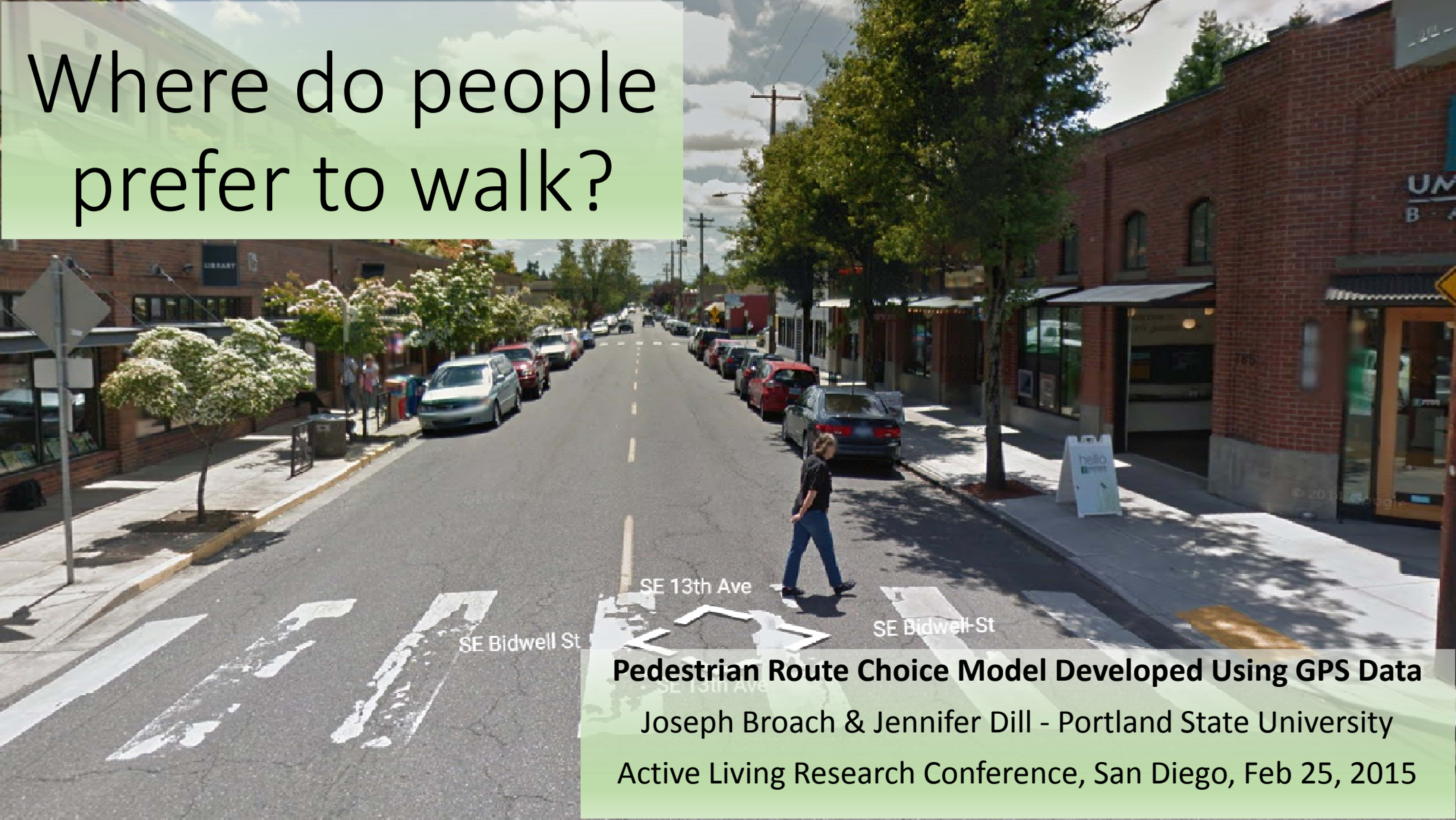# Where do people prefer to walk?

Pedestrian Route Choice Model Developed Using GPS Data
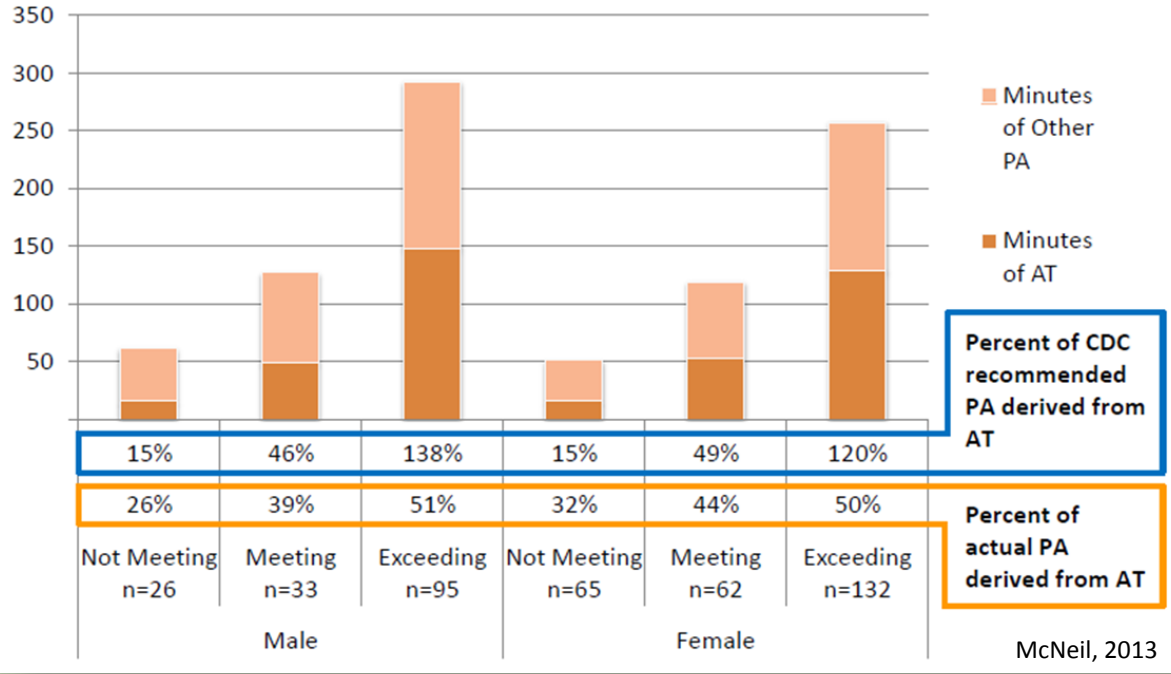
Joseph Broach & Jennifer Dill - Portland State University

Active Living Research Conference, San Diego, Feb 25, 2015

Motivation

Adults Moderate and Vigorous Activity from AT and other PA:

McNeil, 2013

Policies to increase everyday walking

- Promote, inform, educate
- Protect through enforcement

- Improve land-use mix
- <u>Improve walking routes</u>

Home

Ugly Mug

WESTMORELAND

Oaks Bottom
Wildlife Refuge

Oaks Bottom Lake

Willamette River

Sellwood Park

Oaks Pioneer
Church and
Park

SELLWOOD

Southeast Tacoma Street — Southeast Tacoma Street

Sellwood Bridge

Brannen Property

Southeast Milwaukie Avenue

Southeast McLoughlin Boulevard

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Southeast Tacoma Street   Southeast Tacoma Street

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Southeast McLoughlin Boulevard

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Method

Revealed preference

1) GPS - Observe actual walking routes
   - City of Portland, Oregon
   - 1,167 routes by 283 adults
   - 0.5 mile average distance (0.8km)
   - Recreational walking (loops) excluded

2) GIS - Compare with alternative routes

3) Choice Model - Assume route differences (partially) explain choice

Geostats

Expanded Path Size Logit Model

Route & trip attributes

Overlap correction

Sampling correction

$$Pr(i|C_n) = \frac{e^{\mu(V_{in}+\ln(EPS_{in}))+\ln\left(\frac{k_{in}}{q(i)}\right)}}{\sum_{j\in C_n} e^{\mu(V_{jn}+\ln(EPS_{in}))+\ln\left(\frac{k_{jn}}{q(j)}\right)}}$$

Significant Factors
Distance
Turns
Higher Traffic Streets
Neighborhood Commercial
Minor crossings without crosswalk
Major crossings without signal
Steep Uphills (10% grade)
Alleys and Unimproved Streets
Companion

Expanded Path Size Logit Results

Route & trip attributes

Overlap correction

Sampling correction

$$Pr(i|C_n) = \frac{e^{\mu(V_{in}+\ln(EPS_{in}))+\ln(\frac{k_{in}}{q(i)})}}{\sum_{j\in C_n} e^{\mu(V_{jn}+\ln(EPS_{in}))+\ln(\frac{k_{jn}}{q(j)})}}$$

Significant Factors
Distance
Turns
Higher Traffic Streets
Neighborhood Commercial
Minor crossings without crosswalk
Major crossings without signal
Steep Uphills (10% grade)
Alleys and Unimproved Streets
Companion

Significant Factors

- Distance
- Turns
- **Higher Traffic Streets**
- Neighborhood Commercial
- Minor crossings without crosswalk
- Major crossings without signal
- Steep Uphills (10% grade)
- Alleys and Unimproved Streets
- Companion

+14 % distance

Significant Factors

Distance

Turns

Higher Traffic Streets

Neighborhood Commercial

Minor crossings without crosswalk

Major crossings without signal

Steep Uphills (10% grade)

Alleys and Unimproved Streets

Companion

−28 % distance

Significant Factors

Distance

Turns

Higher Traffic Streets

Neighborhood Commercial

Minor crossings without crosswalk

Major crossings without signal

Steep Uphills (10% grade)

Alleys and Unimproved Streets

Companion

+28 meters (92 ft)

Significant Factors

Factor
Distance
Turns
Higher Traffic Streets
Neighborhood Commercial
Minor crossings without crosswalk
Major crossings without signal
Steep Uphills (10% grade)
Alleys and Unimproved Streets
Companion

+73 meters (239 ft)

+99 % distance

Significant Factors

Distance

Turns

Higher Traffic Streets

Neighborhood Commercial

Minor crossings without crosswalk

Major crossings without signal

Steep Uphills (10% grade)

Alleys and Unimproved Streets

Companion

+51 % distance

Significant Factors

Distance

Turns

Higher Traffic Streets

Neighborhood Commercial

Minor crossings without crosswalk

Major crossings without signal

Steep Uphills (10% grade)

Alleys and Unimproved Streets

Companion

Implications

- Pedestrians make systematic route choices

- Direct, contiguous routes important

- Traffic along route and at crossings a deterrent

- Neighborhood commercial districts attractive to walk along

- **Where** people walk can help us better understand **Why** they walk

Questions?

Thanks to Active Living Research, TREC, and the Family Activity Study research team

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Additional Material

Path Size Logit Model Results

Significant Factors	Non-significant (p > 0.05)
Distance	Gender
Turns	Weekend/Weekday
Higher Traffic Streets	Walking to transit
Neighborhood Commercial	
Minor crossings without crosswalk	Off-street paths
	Median refuges
Major crossings without signal	Residential streets
	Steep downhills
Steep Uphills (10% grade)	Incomplete sidewalks
Alleys and Unimproved Streets	Parks
Companion	Building design variables

GPS observed routes

Observed walk route characteristics	
number of walk routes	1167
number of individuals	283
mean distance	876 m (0.54 mi)
walk as primary mode	95.5 %
transit as primary mode	4.5 %
percent trips by females	72.4 %
travel on streets with complete sidewalks	80.9 %
travel on off-street paths	4.2 %

Logit model results	
	coeff*
distance (m)	-0.015
turns	-0.809
steep upslope (m)	-0.015
substandard street (m)	-0.008
busy street (m)	-0.002
traveling together	-0.013
neighborhood commercial (m)	0.004
unsignalized arterial crossings	-1.090
unmarked collector crossings	-0.419
ln(EPS)	0.128
Log-likelihood (Null)	-2,919
Log-likelihood (Model)	-1,047
McFadden pseudo R^2	0.641
N	1,167
*all model coefficient estimates were significant at the 5% level, standard t-tests	