



The Connection Between Transportation, Land Use and Health

EDMONTON, ALBERTA

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BUILT ENVIRONMENT



The built environment affects our health

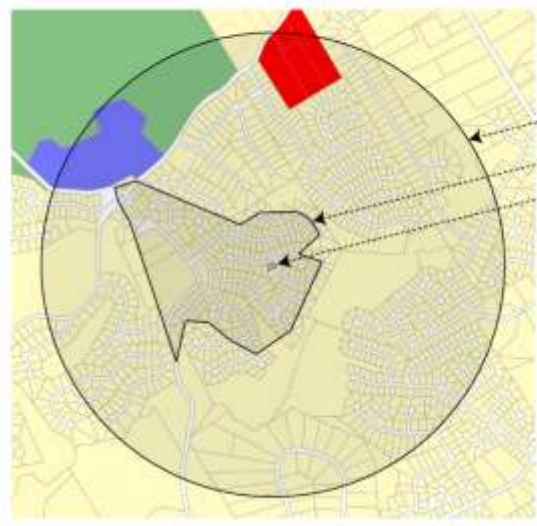


Philosophical Approach

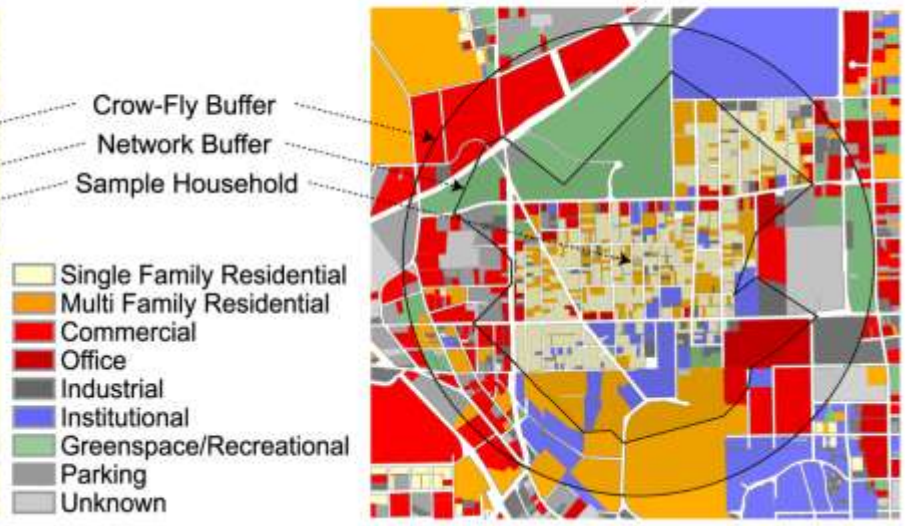
- Bridging knowledge and action
 - Applied Policy Research
- Working across disciplines
 - Connecting Health, Environmental, and Transportation Sectors
- Building evidence base on the impacts of community design on health and environmental outcomes
 - Quantifying the externalities
- Finding strategic opportunities to intervene
 - Evaluating natural experiments

Proximity

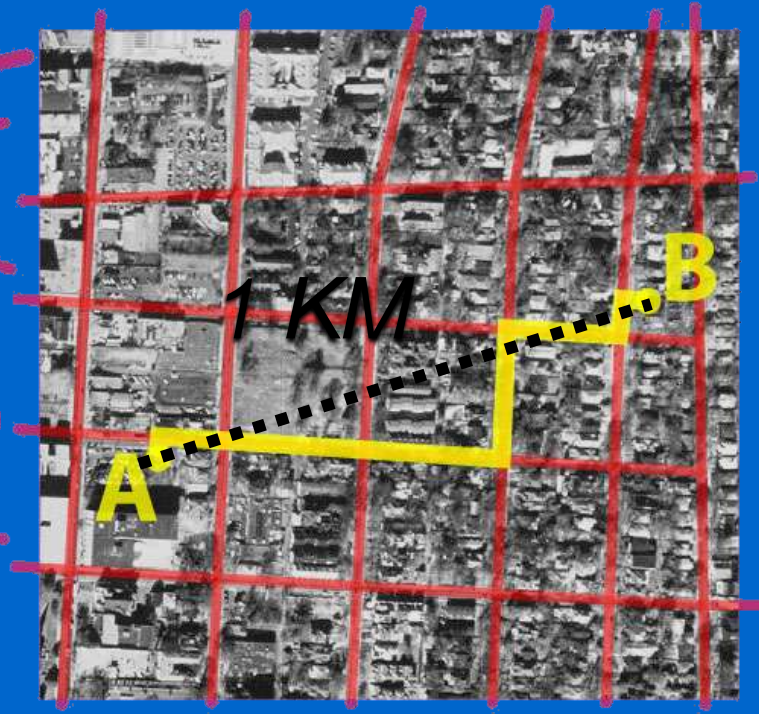
Disconnected



Connected



- Single Family Residential
- Multi Family Residential
- Commercial
- Office
- Industrial
- Institutional
- Greenspace/Recreational
- Parking
- Unknown



Connectivity

Transportation \$\$\$, travel choices and outcomes



Working Across Sectors

Environment



Transportation



Health



SMARTRAQ

Travel Survey

8000 Households

Stated Preference



Land Use Database



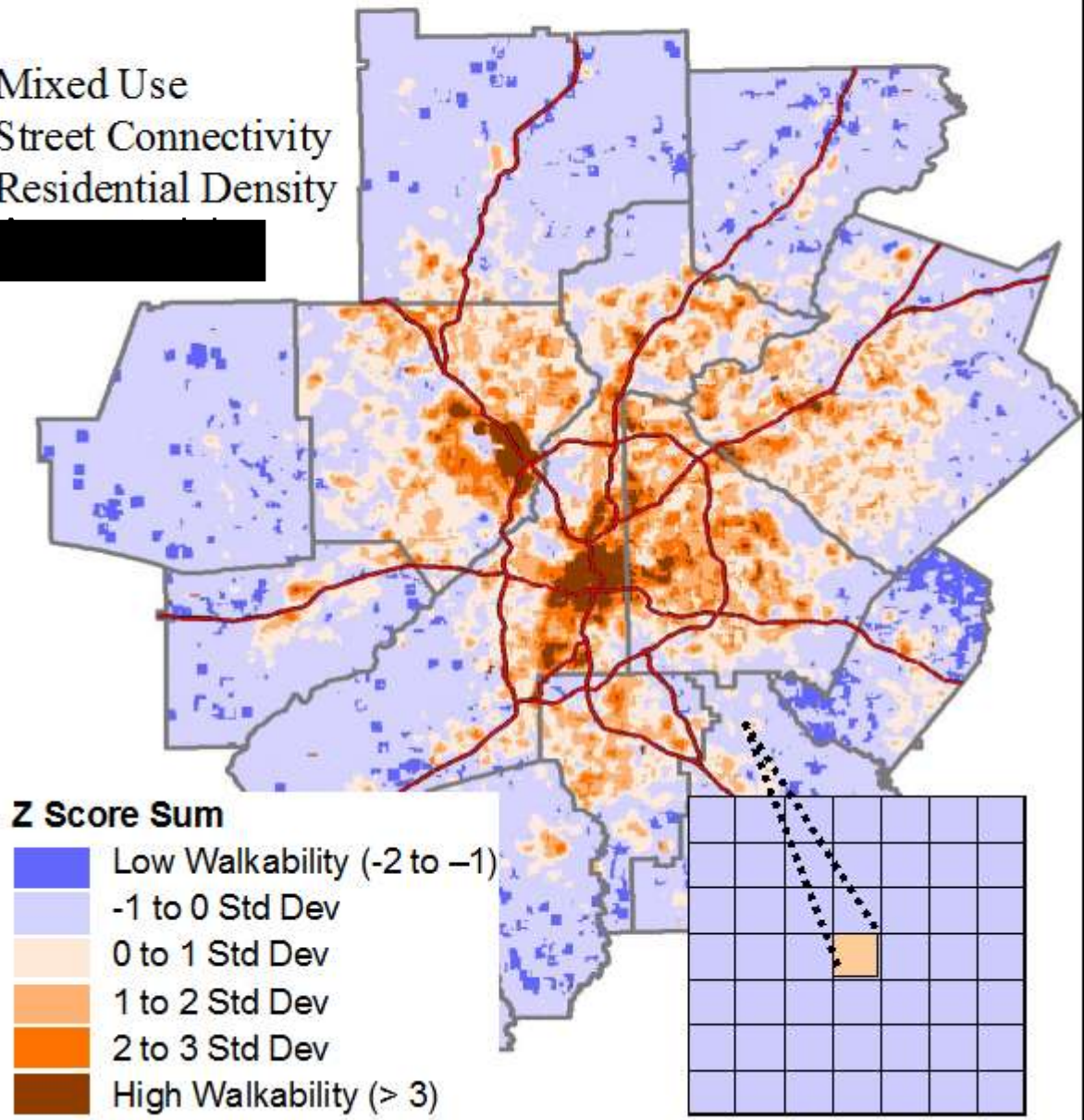
Physical Activity












OUTREACH PROGRAM

Developers, Lenders & Local Government

- Mixed Use
- Street Connectivity
- Residential Density
- [REDACTED]



Predictors of Obesity

	Coefficient	t-Ratio	P-Value
 Age	0.012	6.00	0.000
 Education	-0.080	-4.71	0.000
 Income	-0.057	-4.75	0.000
 Walk Distance	-0.049	-2.04	0.034
 Car Time	0.001	2.875	0.003
 Land Use Mix	-2.035	- 5.65	0.000
 Black Male	0.311	3.930	0.000
 Black Female	0.372	5.09	0.000
 White Female	-0.871	-11.3	0.000
Constant	-0.497	-2.22	0.026

Frank, L., Andresen, M., and Schmid, T., Obesity Relationships With Community Design, Physical Activity, and Time Spent in Cars. American Journal of Preventive Medicine. June 2004.

Walk 10.0%

n=1371

3rd tertile density

17.8%

n=852

RI=1.8

2nd tertile density

7.3%

n=329

RI=0.7

1st tertile density

4.4%

n=190

RI=0.4

1st tertile

connectivity

11.2% n=98

RI=1.1

2nd tertile

connectivity

14.4% n=174

RI=1.4

3rd tertile

connectivity

21.4% n=723

RI=2.1

<41 years old

9.5%

n=171

RI=1.0

41-60 years old

6.8%

n=119

RI=0.6

61+ years old

4.0%

n=39

RI=0.4

No degree

3.0%

n=67

RI=0.3

Degree

5.9%

n=123

RI=0.6

No degree

11.7%

n=64

RI=1.2

Degree

16.6%

n=110

RI=1.7

1st tertile

land use mix

11.2% n=40

RI=1.1

2nd & 3rd tertile

land use mix

22.9% n=540

RI=2.3

No degree

7.6%

n=74

RI=0.8

Degree

11.9%

n=97

RI=1.1

1st tertile

land use mix

5.1% n=50

RI=0.5

2nd & 3rd tertile

land use mix

9.0% n=69

RI=0.9

<61 years old

17.7%

n=126

RI=1.8

61+ years old

9.2%

n=17

RI=0.9

No degree

19.2%

n=191

RI=1.9

Degree

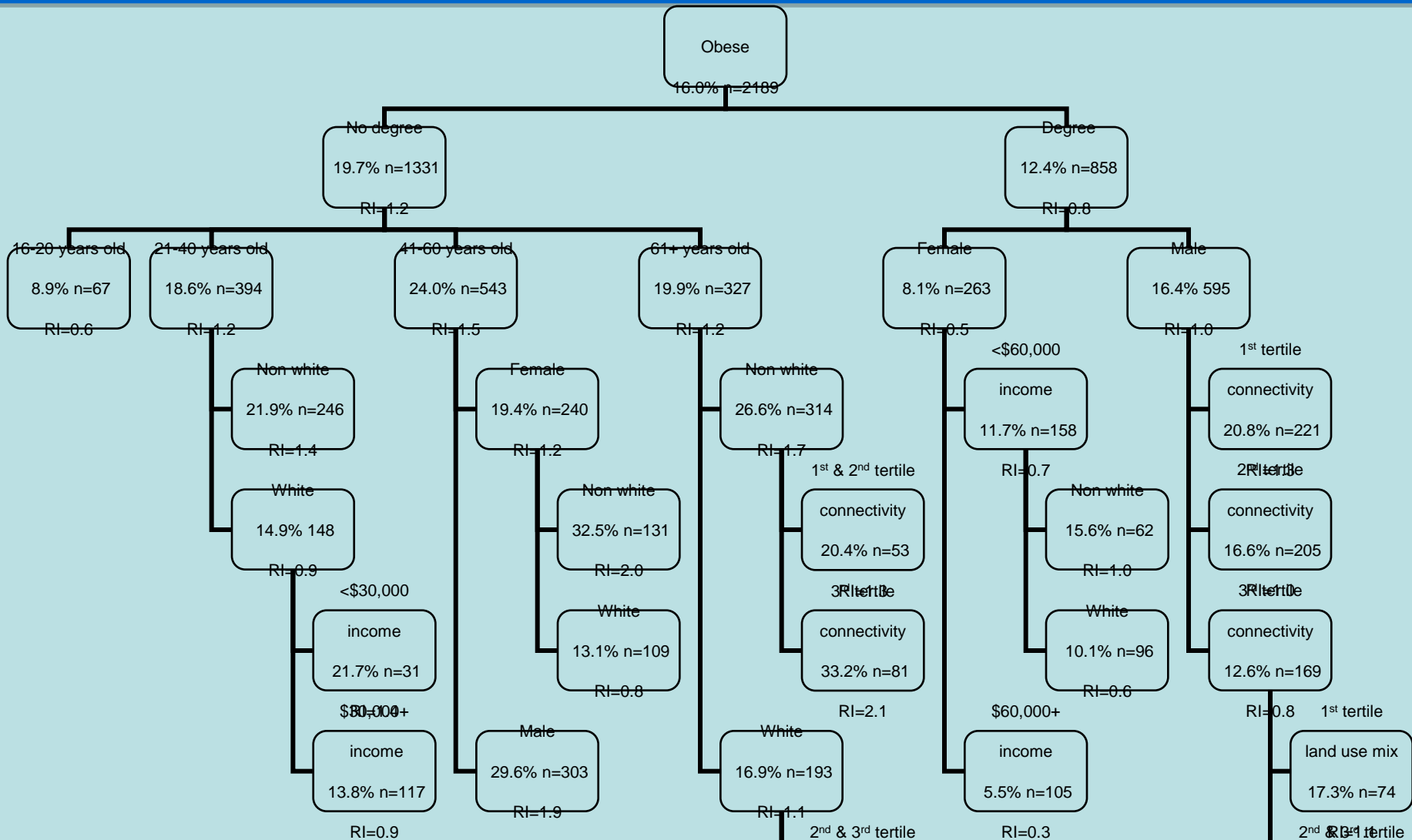
25.6%

n=349

RI=2.6

Hierarchical Significance of Walking Predictors

Frank LD, Kerr J, Miles R, Sallis JF. 2008. A Hierarchy of Sociodemographic and Environmental Correlates of Walking & Obesity. Preventive Medicine



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WHAT ABOUT WHERE PEOPLE GO FOR FOOD?

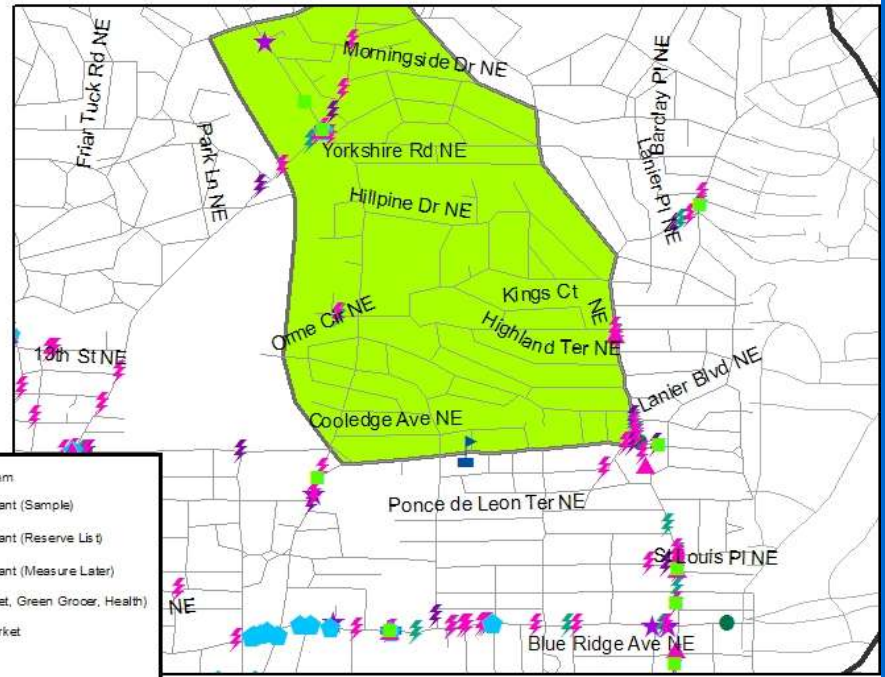
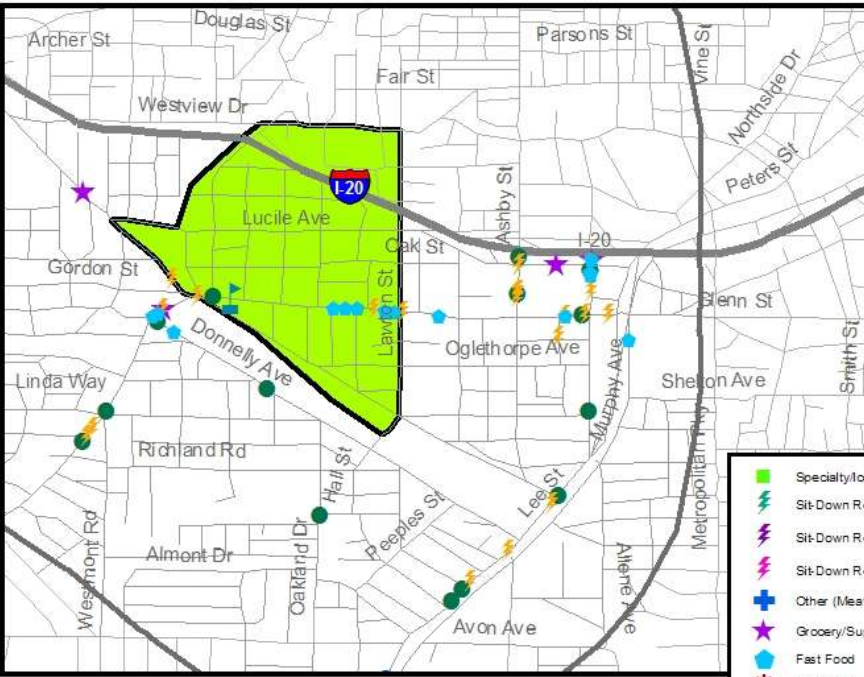
Using Travel Survey
and Physical
Activity Data

- Walkability
- Physical Activity
- Food Outlet
Visitation

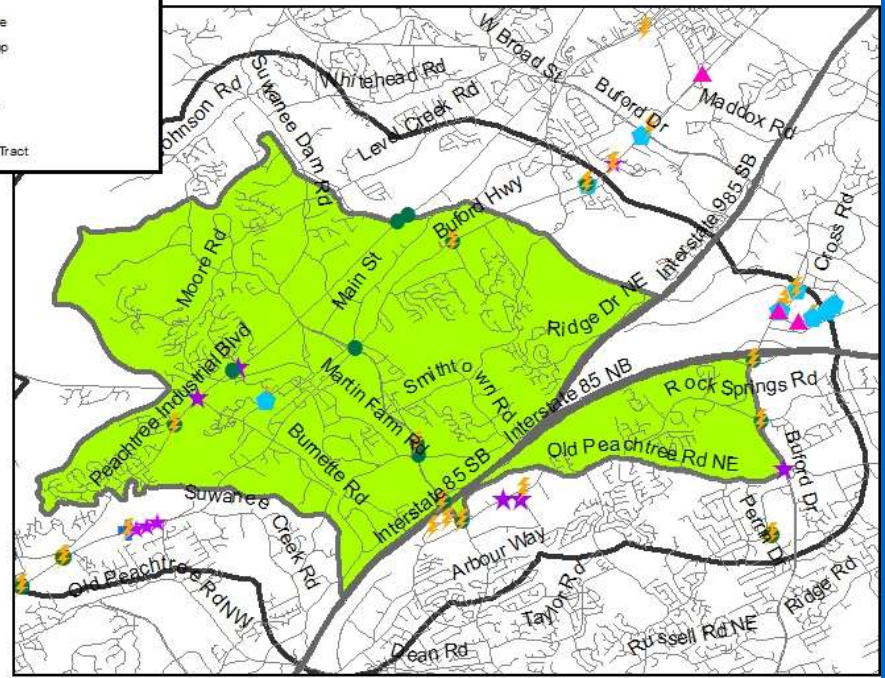
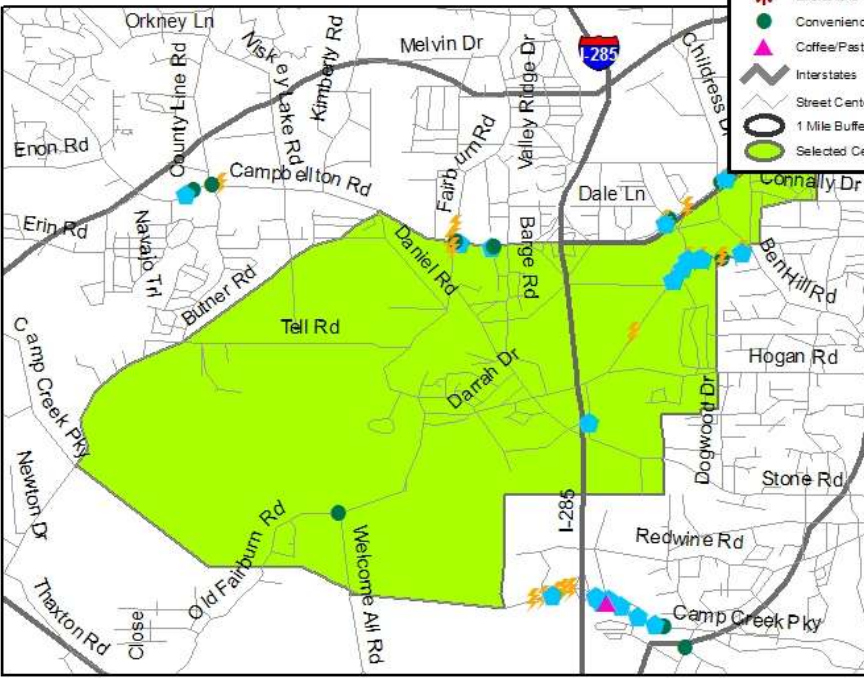
OUTCOME = BMI

High

Walkability



- Specialty Ice Cream
- ⚡ Sit-Down Restaurant (Sample)
- ⚡ Sit-Down Restaurant (Reserve List)
- ⚡ Sit-Down Restaurant (Measure Later)
- + Other (Meat Market, Green Grocer, Health)
- ★ Grocery/Supermarket
- Fast Food
- ✳ Exclusions
- Convenience Store
- ▲ Coffee/Pastry Shop
- Interstates
- Street Centerlines
- 1 Mile Buffer
- Selected Census Tract



Low

Income

High

BMI MODELS ACROSS GENDER

	Women		Men	
	T	P value	t	P value
Block 1 - % variance explained	12.7		5.5	
Age	5.6	0.001*	3.7	0.001*
Race	-9.9	0.001*	-3.0	0.001*
Education	-4.9	0.001*	-4.0	0.001*
Income	-6.1	0.001*	-1.6	0.12
Number in household	4.5	0.001*	4.2	0.001*
Number of vehicles in household	-0.9	0.79	3.3	0.001*
Two or more children in household	-3.2	0.002*	-1.6	0.11
Employment	1.1	0.27	-1.6	0.10
Block 2 - % variance explained	0.0		0.5	
Walkability of home	0.5	0.60	-3.4	0.001*
Block 3 - % variance explained	0.6		0.1	
Ate at fastfood restaurant	3.5	0.001*	0.6	0.57
Shopped at grocery store	-2.5	0.01*	-1.2	0.22
Block 4 - % variance explained	1.1		0.7	
Meeting guidelines for MVPA	-5.4	0.001	-2.7	0.007
Walked at least once over 2 days	-1.1	0.27	-2.8	0.005
Total variance explained	14.4		6.8	

* p<.05 in final block

BMI MODELS ACROSS RACE

	Black		White	
	t	P value	t	P value
Block 1 - % variance explained	5.6		10.7	
Age	1.8	0.07	7.5	0.001*
Gender	-0.7	0.48	-16.4	0.001*
Education	-3.5	0.001*	-5.1	0.001*
Income	-0.9	0.35	-6.2	0.001*
Number in household	4.0	0.001*	4.2	0.001*
Number of vehicles in household	-1.5	0.14	3.0	0.001*
Two or more children in household	-2.4	0.02*	-2.0	0.04*
Employment	-2.1	0.03*	-0.04	0.97
Block 2 - % variance explained	0.1		0.1	
Walkability of home	-1.2	0.24	-1.7	0.09
Block 3 - % variance explained	0.7		0.3	
Ate at fastfood restaurant	1.0	0.31	3.1	0.002*
Shopped at grocery store	-2.7	0.006*	-1.7	0.10
Block 4 - % variance explained	1.1		0.8	
Meeting guidelines for MVPA	-3.2	0.002	-4.9	0.001
Walked at least once over 2 days	-0.7	0.46	-2.9	0.004
Total variance explained	7.5		11.9	

* p<.05 in final block

LOGISTIC REGRESSION ANALYSES PREDICTING THE ODDS OF WALKING AT LEAST ONCE OVER 2-DAYS

YOUTH Age Range	5-8 years OR (95% CI)	9-11 years OR (95% CI)	12-15 years OR (95% CI)	16-20 years OR (95% CI)
	N=847	N=632	N=867	N=815
Intersection highest tertile (vs lowest)	1.7 (1.0-2.9)	1.3 (0.8-2.3)	1.7 (1.1-2.8)*	2.0 (1.1-3.6)*
Density highest tertile (vs lowest)	1.8 (1.0-3.1)	2.3 (1.2-4.3)**	3.7 (2.2-6.4)***	2.0 (1.0-4.1)
Mixed land use (vs no mix)	1.5 (0.9-2.4)	1.5 (0.9-2.5)	2.5 (1.6-3.8)***	1.9 (1.0-3.2)*
At least 1 commercial land use (vs 0)	1.5 (0.9-2.4)	1.6 (1.0-2.5)	2.6 (1.7-4.0)***	1.7 (1.0-3.1)
At least 1 recreation/open space land use (vs 0)	2.1 (1.3-3.4)***	1.8 (1.1-2.9)*	2.5 (1.7-3.6)***	1.8 (1.1-2.9)**

controlling for socio-demographics and stratified by age group
(Averaged over a two day period)

*p<.05, **p<.01, ***p<.001

Youth Demographics, Physical Activity, and Vehicle Ownership

- Those with no car (OR 6.77, 95% CI 4.01-11.4) or one car (OR 2.17, 95% CI 1.37-3.45) were significantly more likely to walk than those with three cars per household.
- Non whites (OR 1.88, 95% CI 1.38-2.56) were significantly ($p=.001$) more likely to walk half a mile, as were those in households of less than four people (OR 1.72, 95% CI 1.27-2.35)

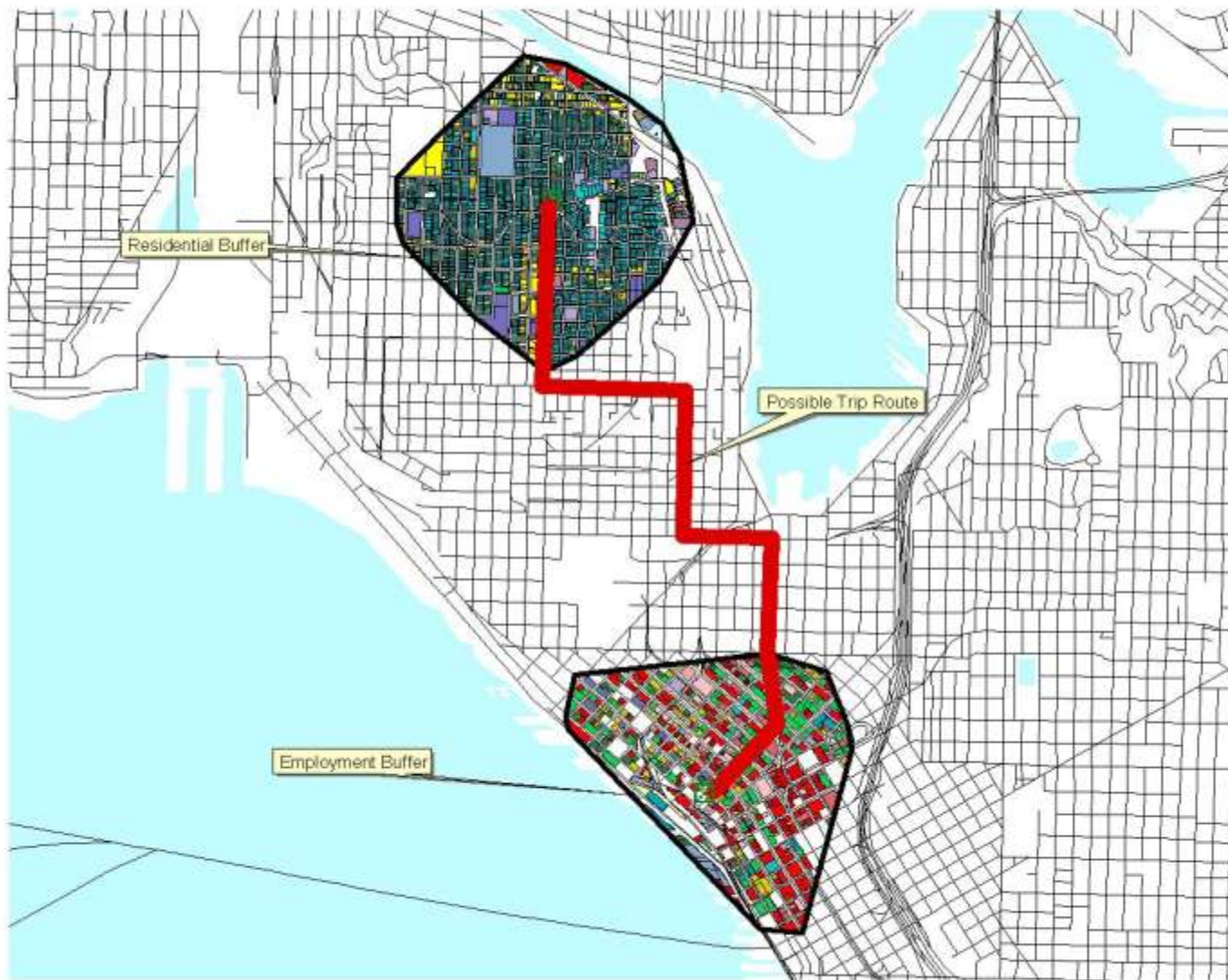
Transit for Work Purposes

- Over a two-day period the odds of someone reporting a transit trip **decreased by:**
 - 16 percent with each $\frac{1}{4}$ mile increase in the distance to transit from the place of residence
 - 32 percent with each $\frac{1}{4}$ mile increase in the distance to transit from the place of employment
 - 45 percent with each additional household vehicle

Transit Use and Physical Activity

- Transit use was significantly associated with greater odds of meeting physical activity recommendations (OR=3.42; CI=2.40-4.87)
 - by walking for transportation
- The odds of meeting 30 minute Physical Activity Recommendation is negative for additional trips as a car driver when compared to moderate walking (OR =.87; CI=0.76-0.99)

Source: LaChapelle and Frank, *In press*



Land Uses

- Agriculture
- Comm. Food/Restaurant
- Comm. Large
- Comm. Office
- Comm. Services
- Comm. Small
- Comm. Sports
- Ent. General
- Ent. Lodging
- Ind. General
- Ind. Manufacturing
- Inst.
- Misc.
- Open Space
- Parking
- Rec. Active
- Res. Group Quarters
- Res. MF Large
- Res. MF Small
- Res. Misc.
- Res. SF
- Services
- Vacant
- Roads

