Understanding Land Use and Walk Behavior in Utah

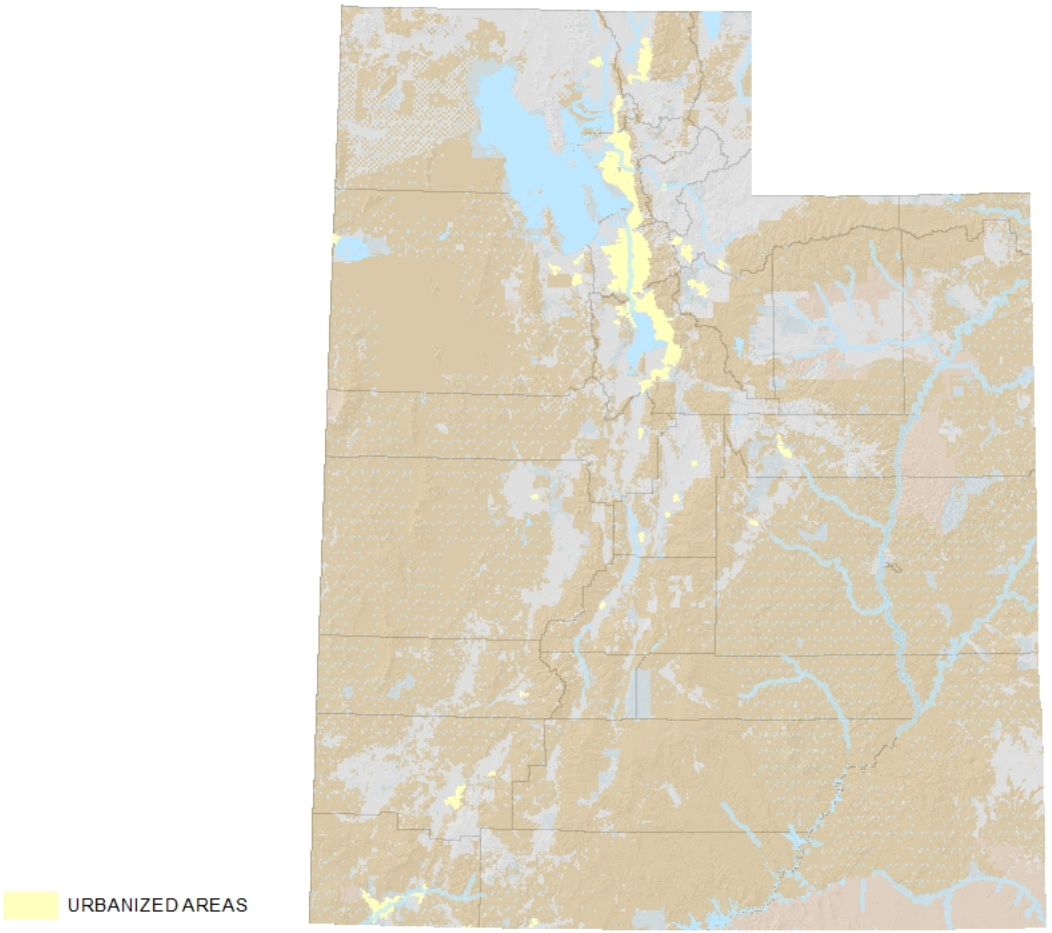
15th TRB National Transportation Planning Applications Conference

Callie New | GIS Analyst + Planner

STUDY AREA

WASATCH FRONT REGIONAL COUNCIL

STUDY AREA



11 statistical areas (2010 census)

55,000 square miles federal land;
65% of total land area:

5 National Parks
6 National Monuments
3 National Historic Trails

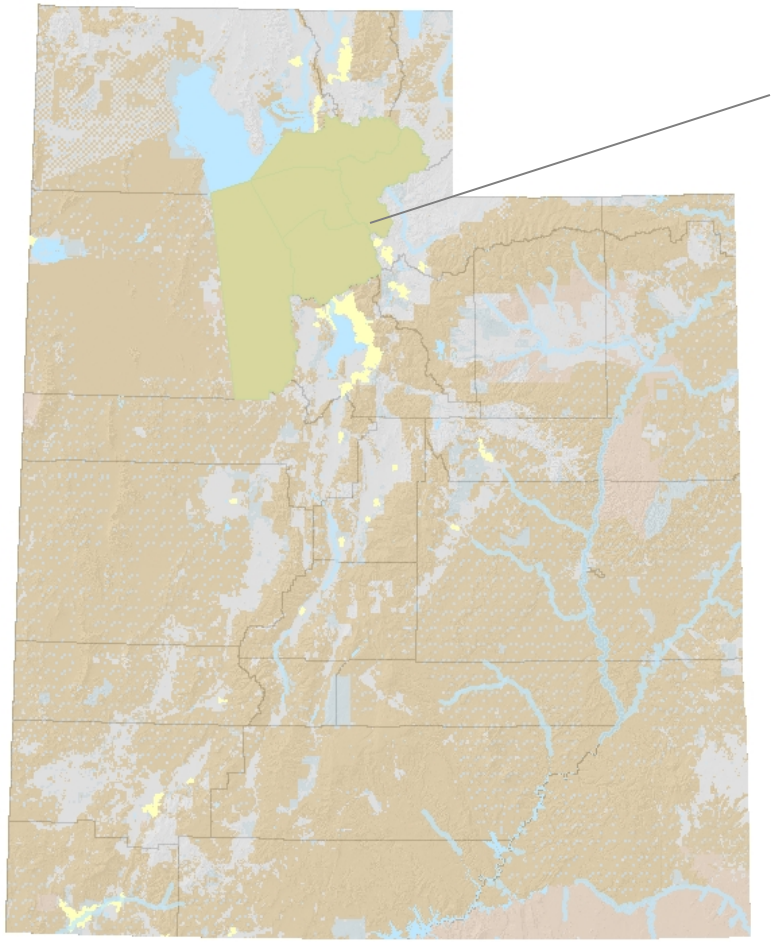
STUDY AREA





WASATCH FRONT REGIONAL COUNCIL

STUDY AREA



Wasatch Front Regional Council
Planning Area:

6 counties
4 statistical areas

multi-modal planning
+ growth management

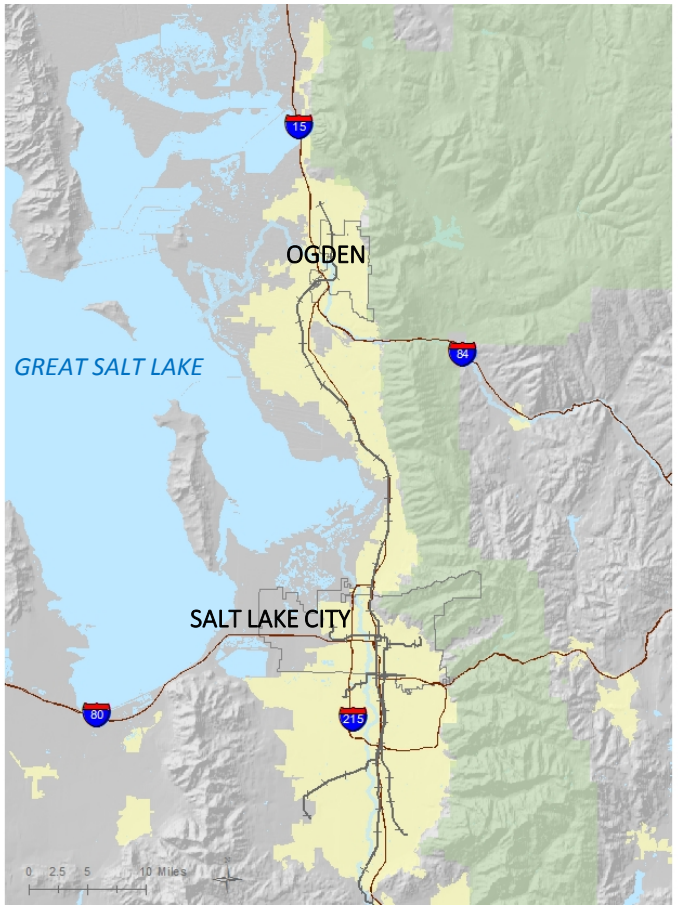
WASATCH FRONT REGIONAL COUNCIL

STUDY AREA

QUICK FACTS: URBANIZED AREA
Population: 1.7 million
Median household income: ~$60,000
Median age: 30.5
Educational attainment | HS diploma: 89%
Unemployment rate: ~3.4%

Major industries:
-Aerospace + defense
-IT+ software
-Finance
-Life Sciences
-Natural resources + energy
-Outdoor recreation

U.S. Census, 2009 – 2013 American Community Survey 5-year Estimates. S1501, S2301; U.S. Bureau of Labor Statistics, 2014; Utah Governor's Office of Economic Development



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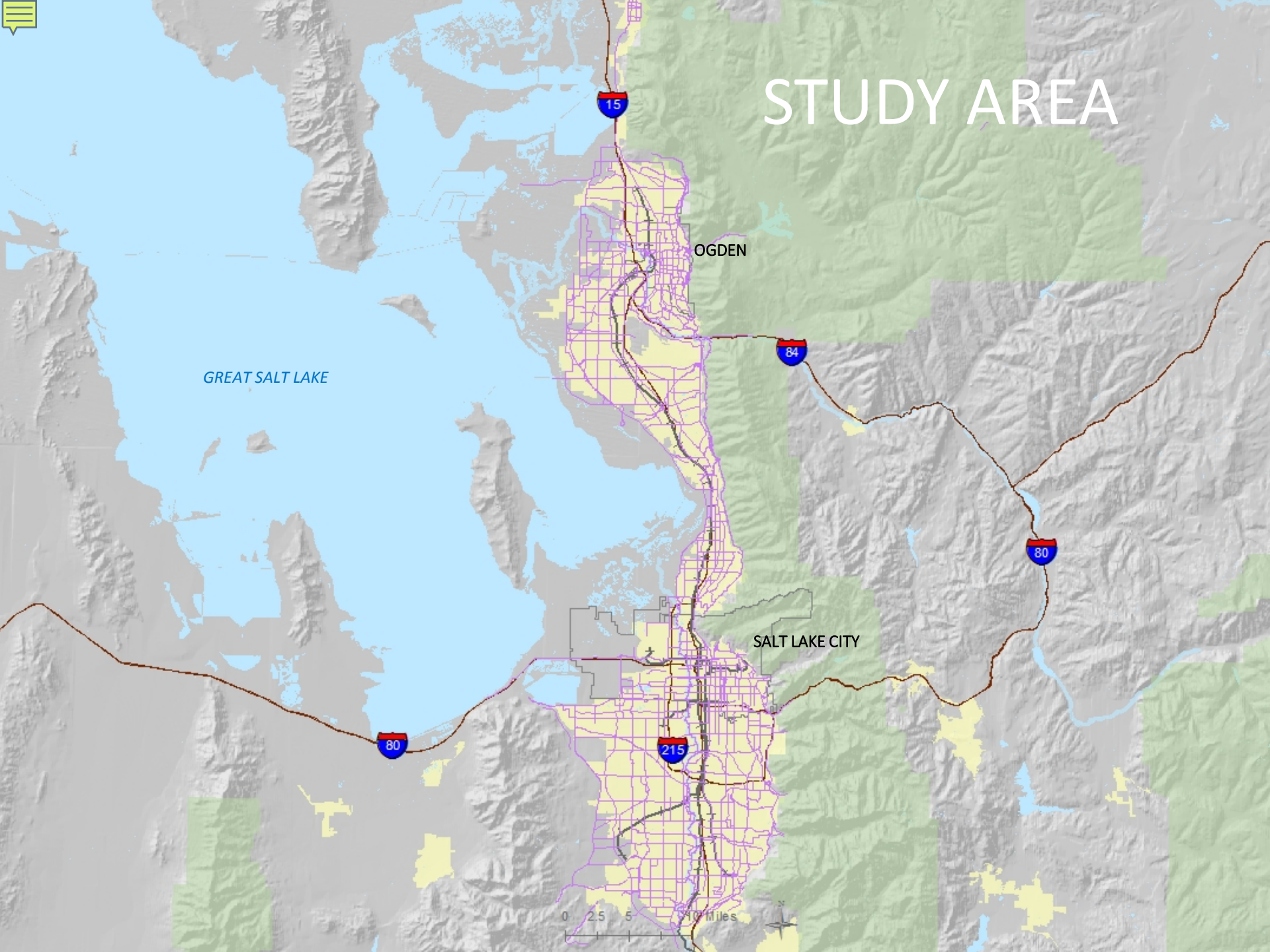
STUDY AREA


STUDY AREA
OGDEN
SALT LAKE CITY
GREAT SALT LAKE
15
84
80
80
215
0 2.5 5 10 Miles
N

PLANNING CHALLENGES

Regional Population Growth

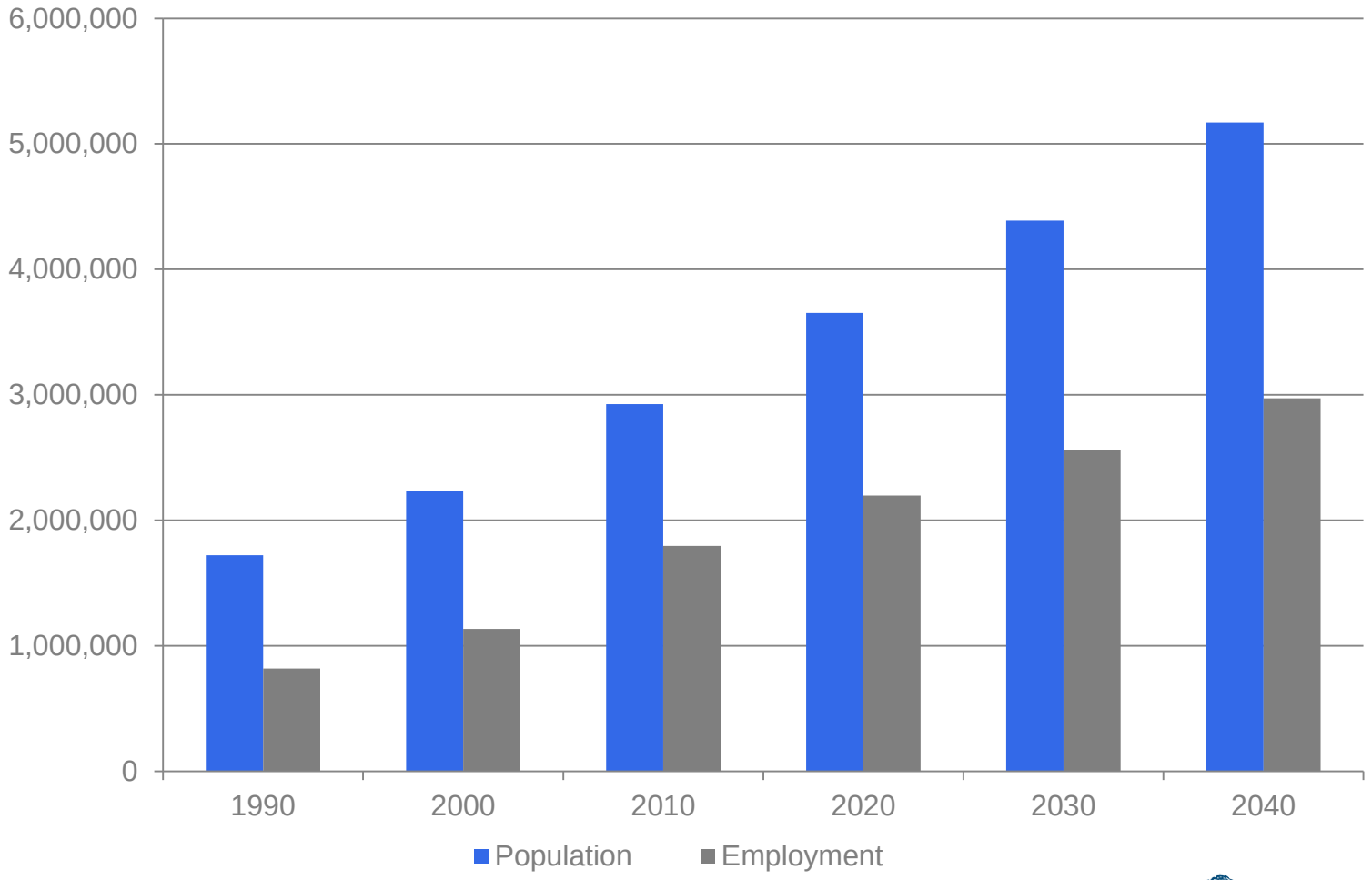
Air Quality

Supporting Active Transportation

Land Use and Transportation Nexus

PLANNING CHALLENGES

Utah population to double by 2050



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PLANNING CHALLENGES

Regional focus on improving air quality.

PLANNING CHALLENGES

Growing enthusiasm for walk and bike travel in region.

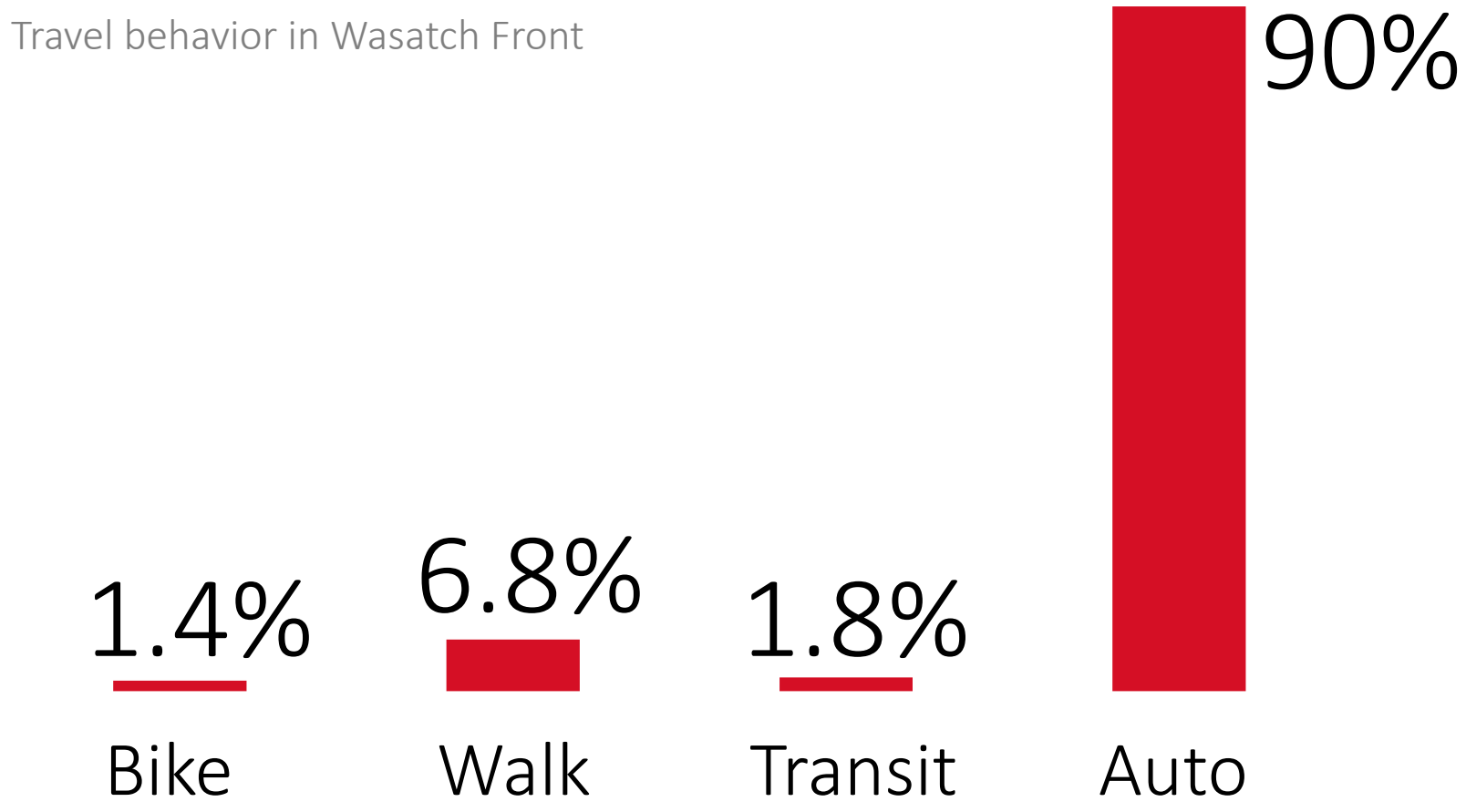
PLANNING CHALLENGES

Growing enthusiasm for walk and bike travel in region.

200 West Protected Intersection at 300 South
Source: CITYLAB, “Why Salt Lake City Chose to Build the First Protected Intersection for Bicycling in the U.S.”

PLANNING CHALLENGES

Current travel patterns highly auto-centric.



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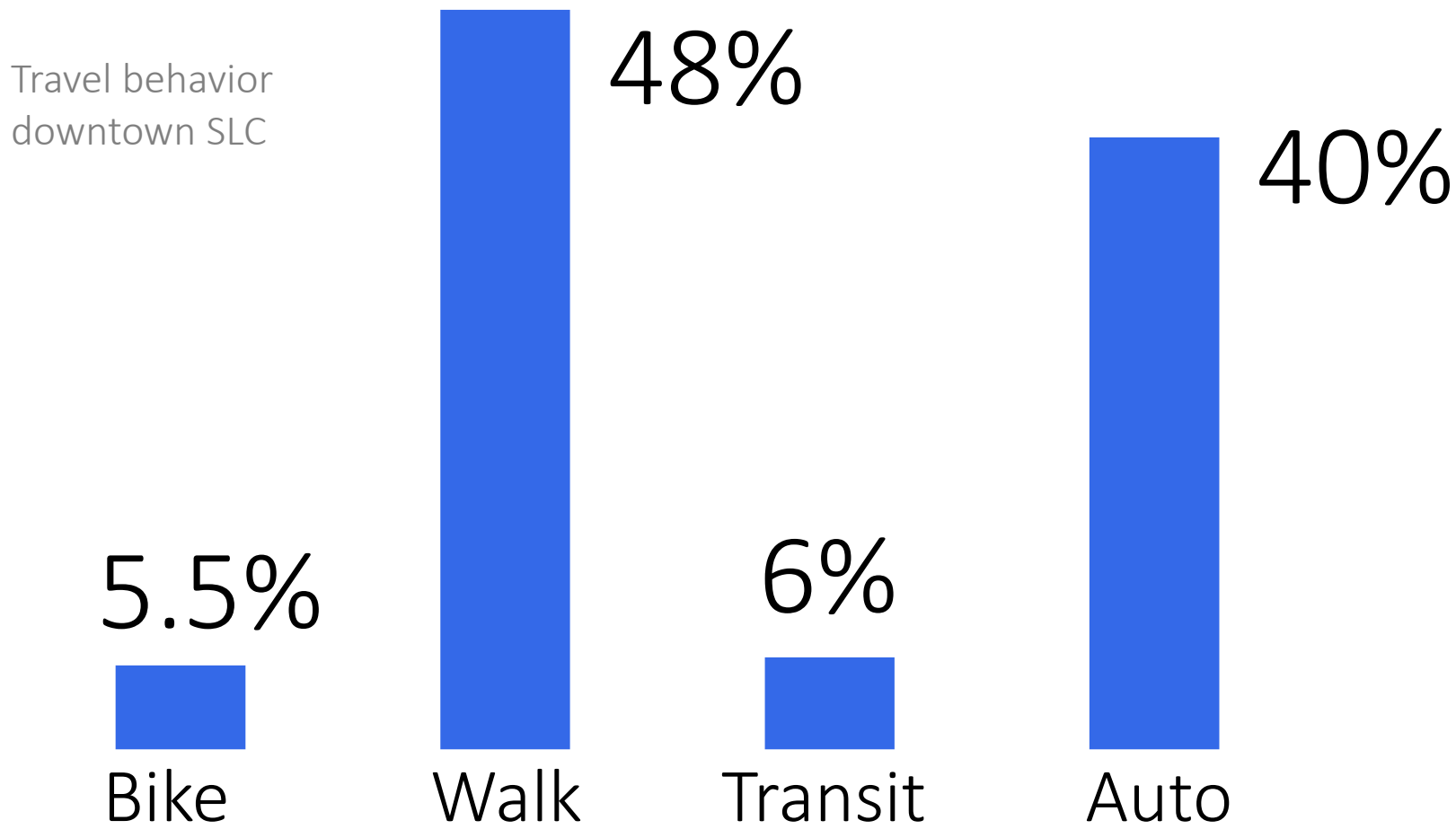
2012 Household Travel Survey, WFRC

PLANNING CHALLENGES

...there are pockets of high walkability.

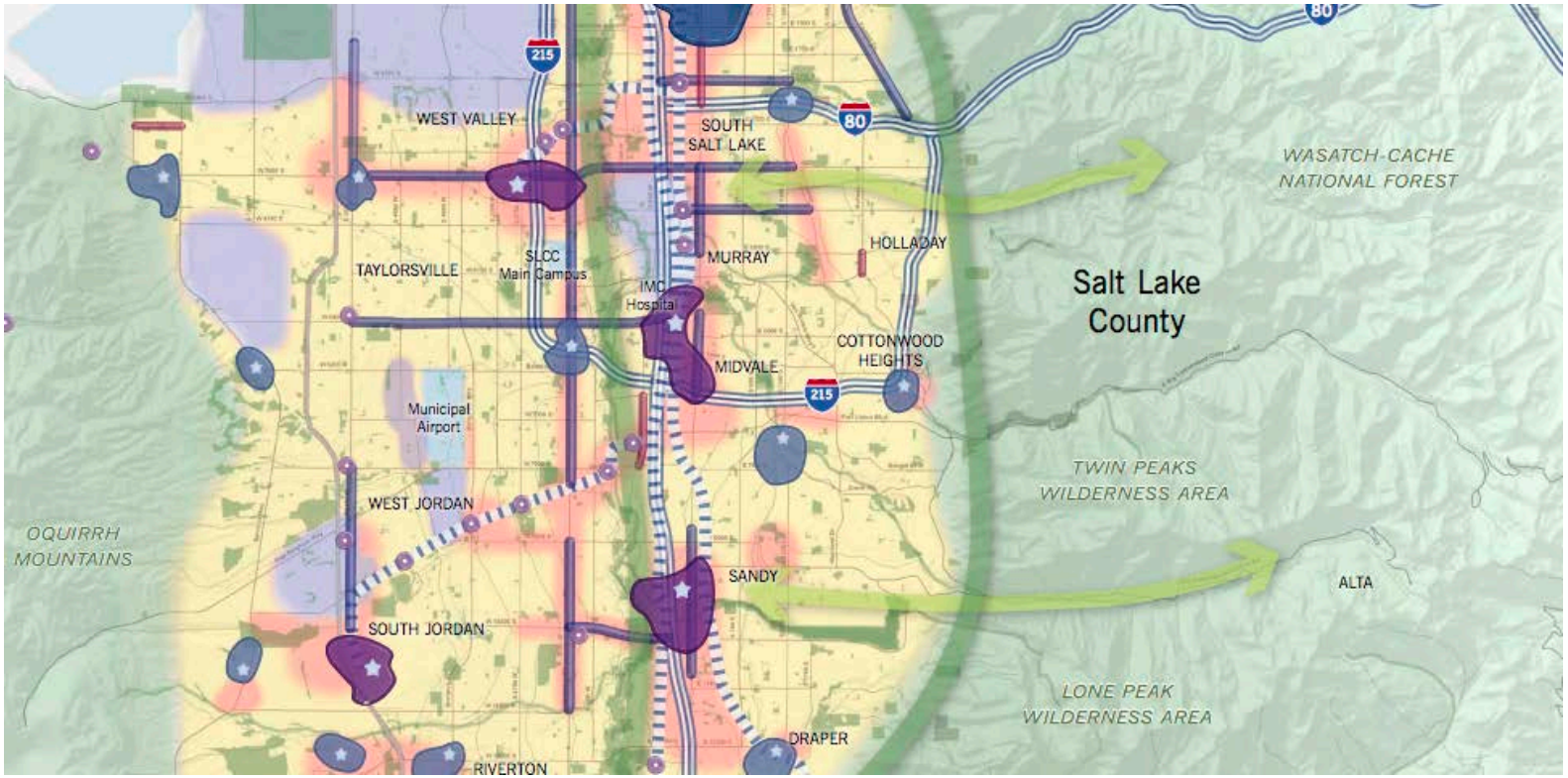


WASATCH FRONT REGIONAL COUNCIL

2012 Household Travel Survey, WFRC

PLANNING CHALLENGES

WFRC aims to focus growth in centers; provide multi-modal infrastructure planning.



WASATCH FRONT REGIONAL COUNCIL

RESEARCH QUESTIONS

- What factors influence non-motorized trip making decisions?

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- What factors influence the length of non-motorized trips?

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- What factors influence non-motorized trip making decisions?
- What factors influence the length of non-motorized trips?
- What factors influence the frequency of non-motorized trips?

VARIABLES

1 BUILT ENVIRONMENT

2 NATURAL FEATURES

3 HOUSEHOLD CHARACTERISTICS

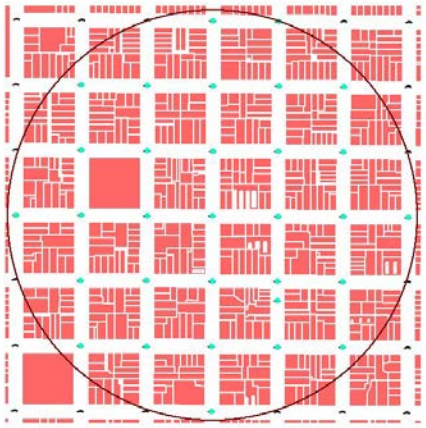
4 PERCEPTIONS AND ATTITUDES

VARIABLES

1 BUILT ENVIRONMENT

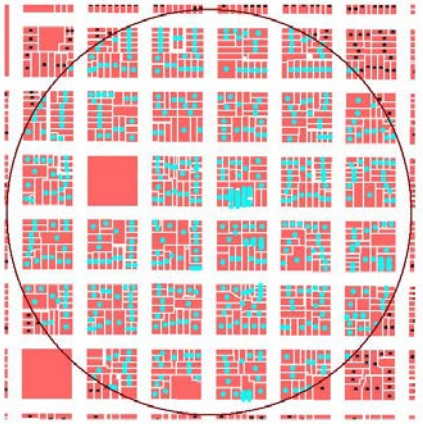
VARIABLES

1 BUILT ENVIRONMENT: 3 D'S



DESIGN

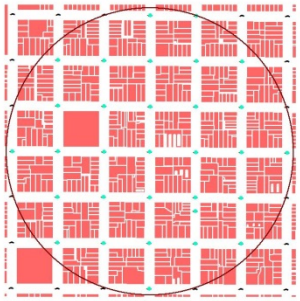
DIVERSITY



DENSITY

VARIABLES

1 BUILT ENVIRONMENT: 3 D'S
street connectivity and block size
side walk and bike lane infrastructure



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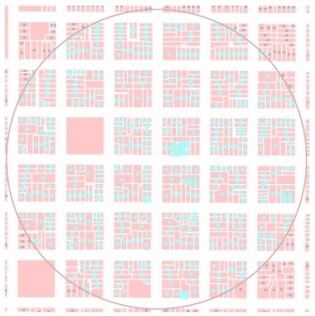

DENSITY

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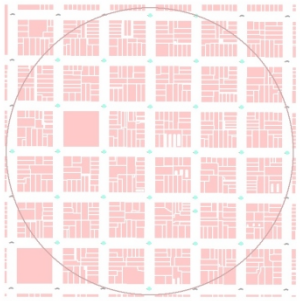
Ewing & Cervero, 2010; Dill & Voros, 2006

VARIABLES

1 BUILT ENVIRONMENT: 3 D'S
multi-modal access to opportunities
land use mix
jobs/household mix



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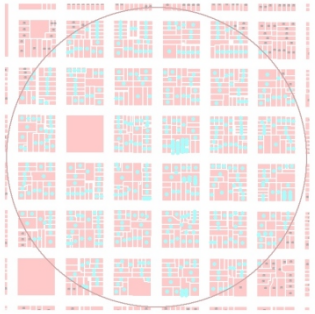

DENSITY

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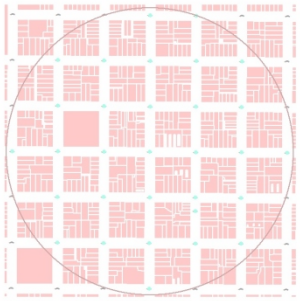
Federal Highways Administration, 2014

VARIABLES

1 BUILT ENVIRONMENT: 3 D'S

population and employment density



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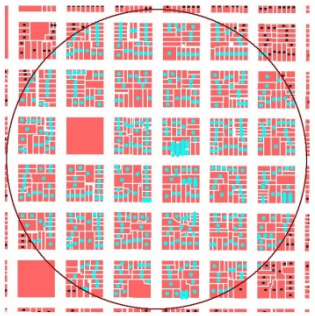

DENSITY

Kockelman, 1991; Dill & Voros, 2006

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VARIABLES

2 NATURAL ENVIRONMENT

Image source: https://newd7000user.wordpress.com/tag/wide-angle-hdr/

VARIABLES

2 NATURAL ENVIRONMENT

topography (slope)
weather patterns (number of rainy/snowy days)
climate (extended hot and/or humid summers)

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Dill & Voros, 2006; Kockelman, 1991; ; Federal Highways Administration, 2014

VARIABLES

3 HOUSEHOLD CHARACTERISTICS

- race/ethnicity
- number of non-working adults
- number of school-aged children
- income
- age
- immigration status
- sex
- vehicle / bike ownership

Dill & Voros, 2006; Ewing & Cervero, 2014

VARIABLES

4 PERCEPTIONS AND ATTITUDES

- rating or perception of the bicycling environment; safety
- exercise valuation
- cost
- convenience
- time valuation

Dill & Voros, 2006;

Dill & Voros, 2006; Boarnet, et al., 2015

METHODOLOGY

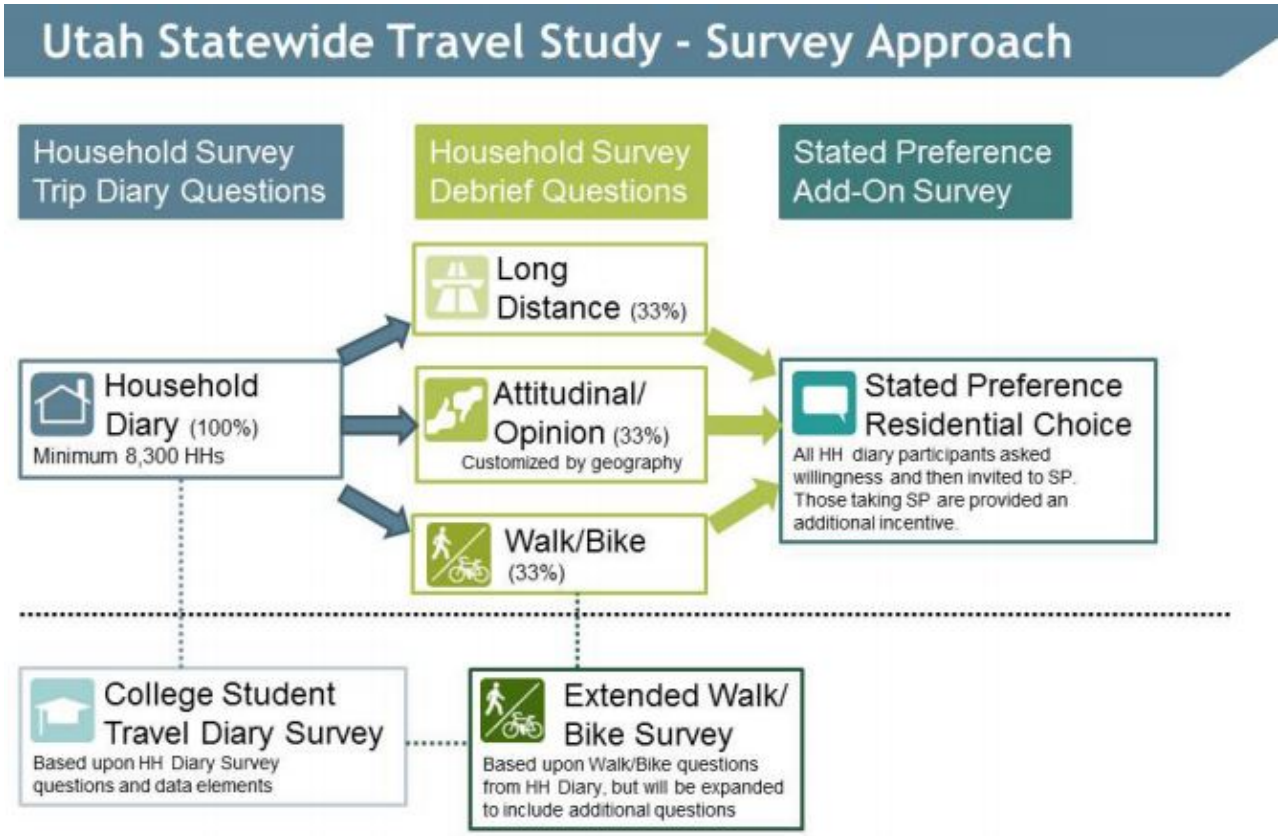
Data collection

Unit of analysis

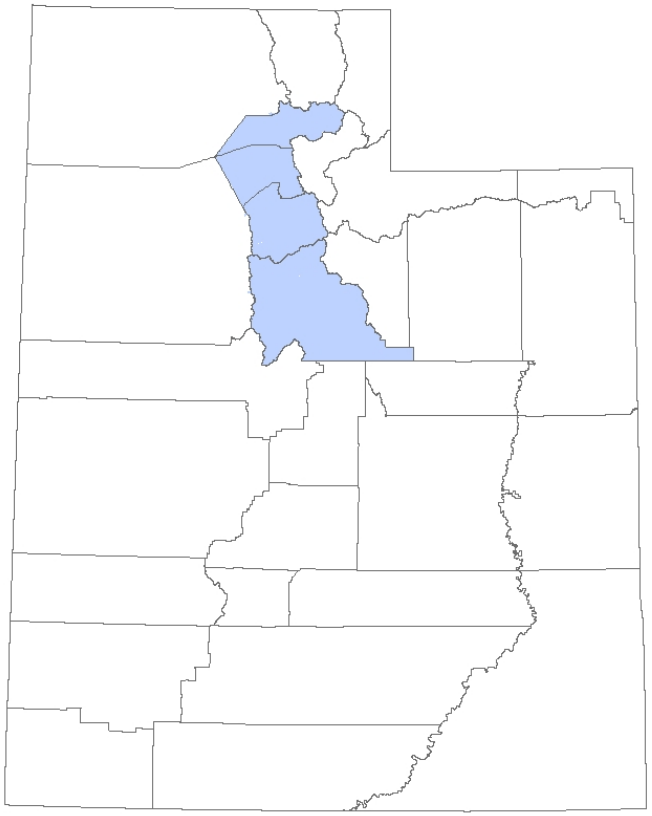
Regression analysis

DATA COLLECTION

2012 Utah Travel Survey



UNIT OF ANALYSIS



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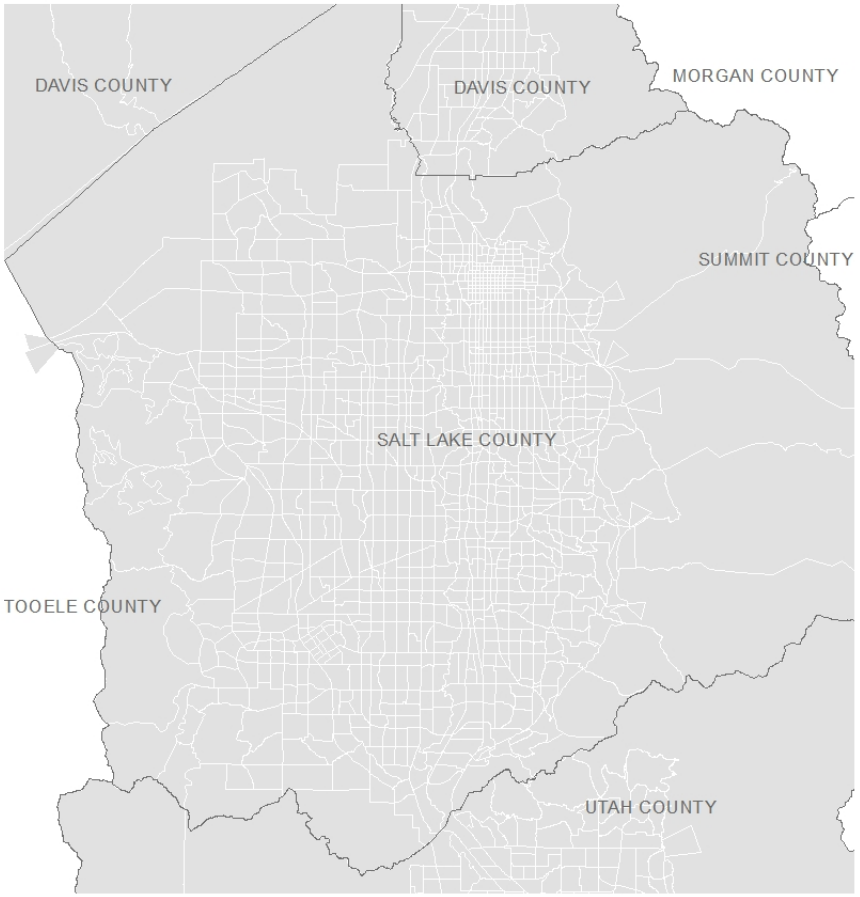
UNIT OF ANALYSIS



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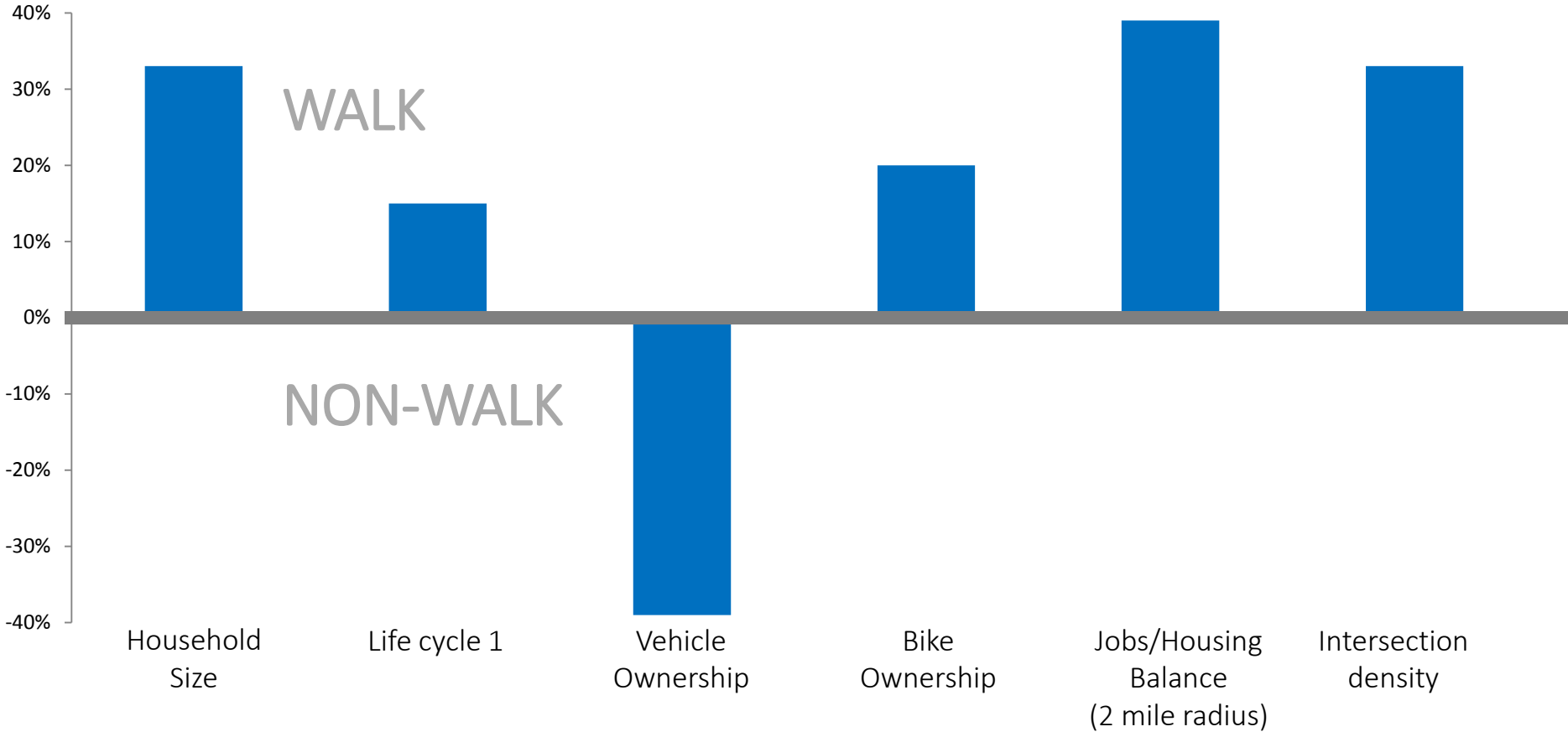
REGRESSION MODEL

ordinary least squares model

zero inflation model

RESULTS

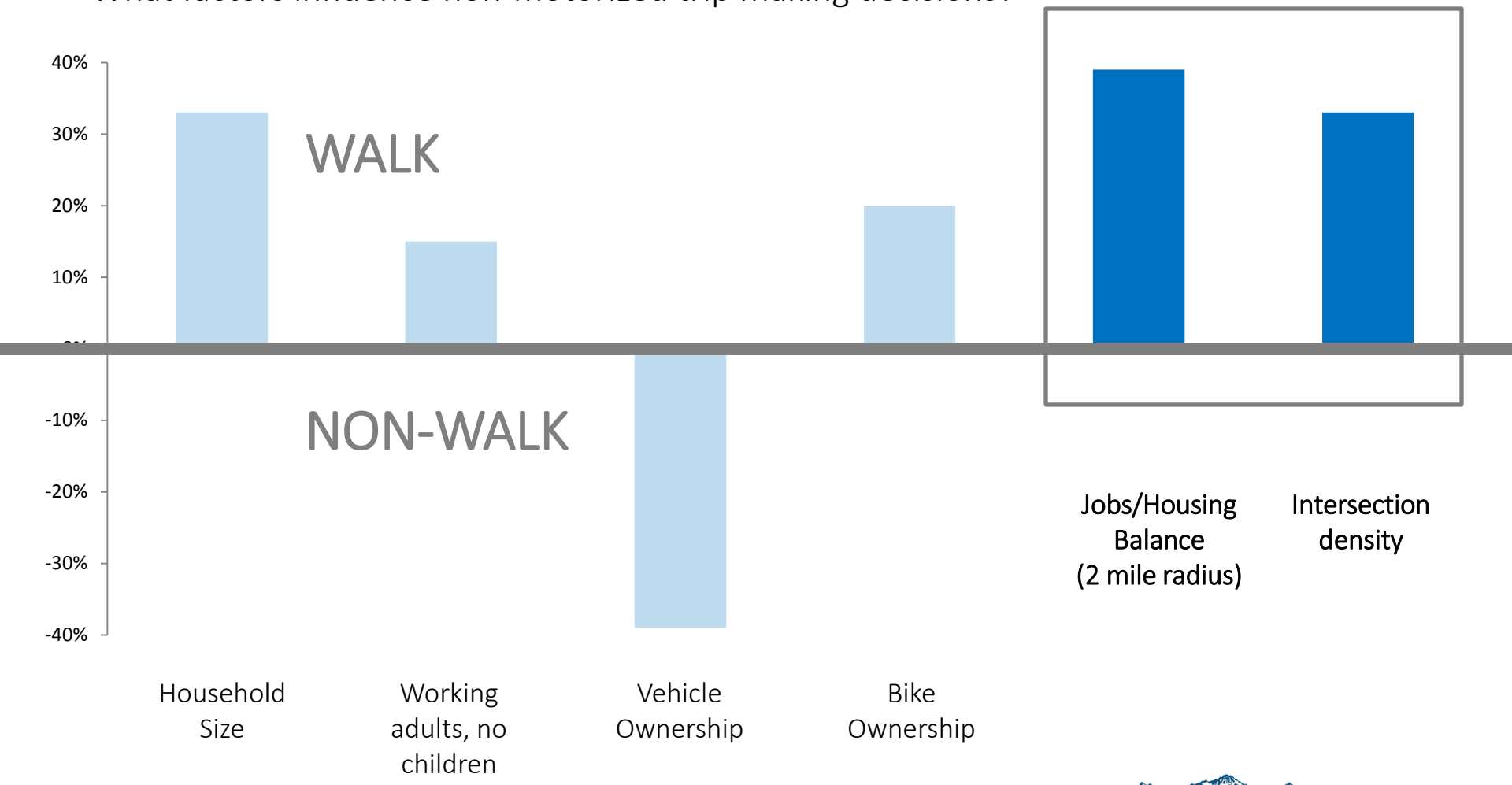
What factors influence non-motorized trip making decisions? zero-inflation model



WASATCH FRONT REGIONAL COUNCIL

FINDINGS

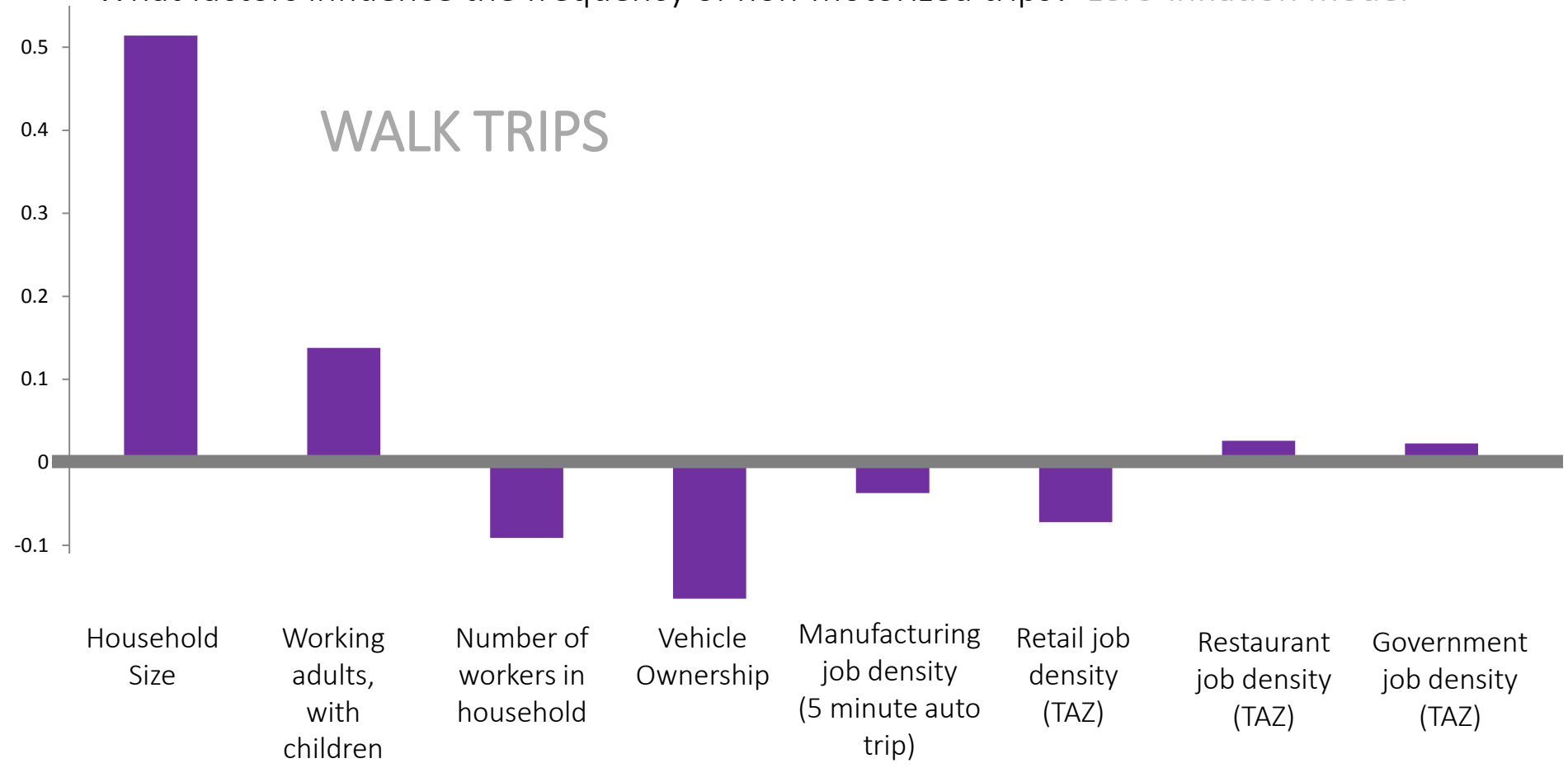
What factors influence non-motorized trip making decisions?



WASATCH FRONT REGIONAL COUNCIL

RESULTS

What factors influence the frequency of non-motorized trips? zero-inflation model



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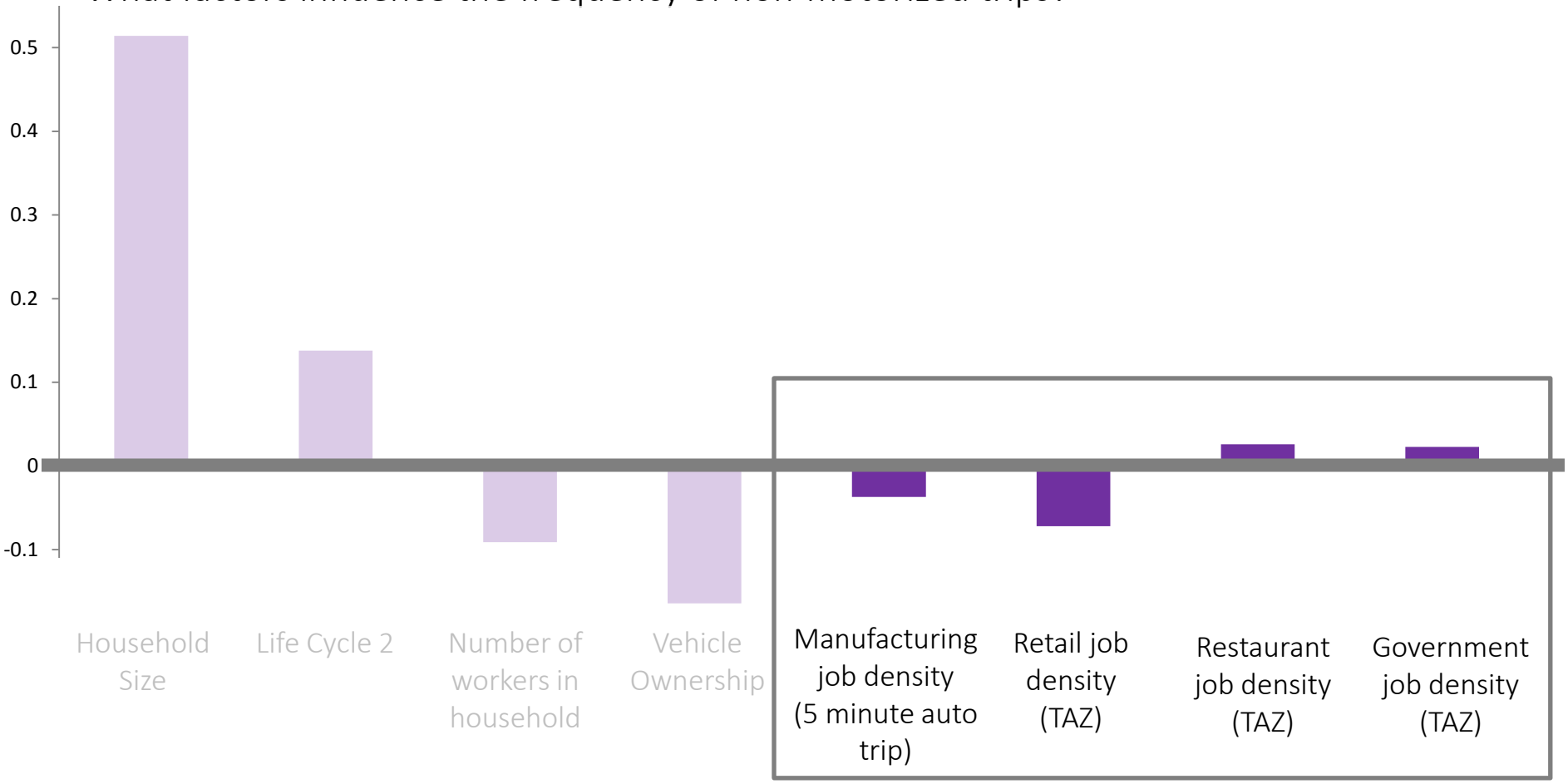
What factors influence the frequency of non-motorized trips?

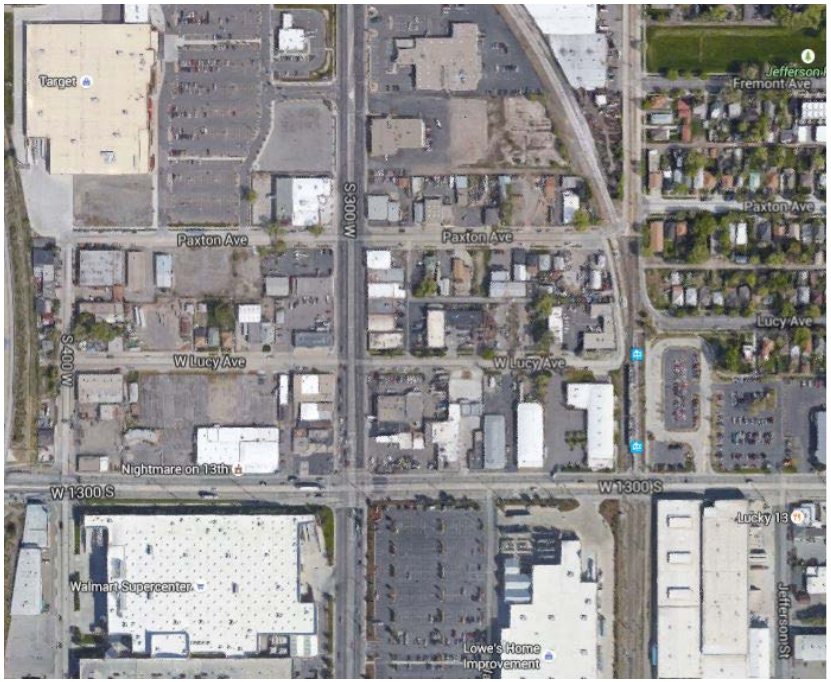


WASATCH FRONT REGIONAL COUNCIL

FINDINGS

What factors influence the frequency of non-motorized trips?

The expected change is a decrease in daily walk trips for one unit increase in retail (employment) density.



Big box retail, SLC

Downtown City Center retail, SLC

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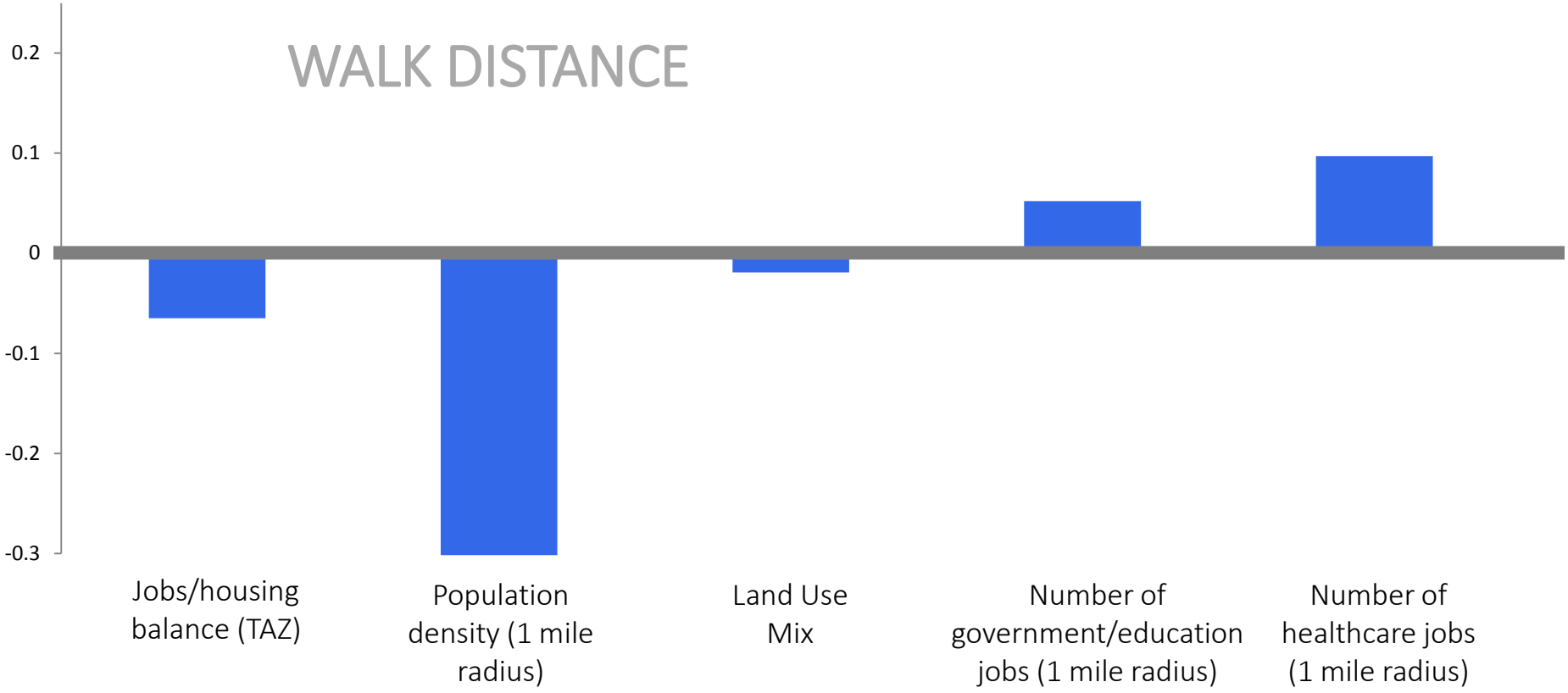
RESULTS

What factors influence the length of non-motorized trips? Ordinary least squares model



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NEXT STEPS

1 Incorporate results into travel model.

2 Increase sample size of bicycle trips.

3 Examine areas of high and low accessibility for planning strategies.

THANK YOU!

callie@wfrc.org

LITERATURE REVIEW

Boarnet, Marlon G., Kristen Day, Craig Anderson, Tracy McMillan, and Mariela Alfonzo. "California's Safe Routes to School Program: Impacts on Walking, Bicycling and Pedestrian Safety." *Journal of American Planning Association* 71.3 (2005): 301-17. Web. 2 Feb. 2015.	Survey and observations; measured changes in behavior associated with traffic improvement projects.
Dill, Jennifer, and Kim Voros. *Factors Affecting Bicycling Demand: Initial Survey Findings from the Portland Region*. Proc. of 86th Annual Meeting of the Transportation Research Board. Portland: Nohad A. Toulan School of Urban Studies and Planning, 2006. Print.	Survey; chi-squared test; spatial analysis (GIS) of distance between proximity to attractive biking locations and varying levels of self-identified utilitarian cyclist categories.
Ewing, Reid, and Robert Cervero. "Travel and the Built Environment." *Journal of the American Planning Association* 76.3 (2010): 265-94. Web. 2 Feb. 2015.	Meta-analysis using summary statistics from previous studies as new observations; elasticities computed.
Kockelman, Kara M. "Travel Behavior as a Function of Accessibility, Land Use Mixing and Land Use Balance: Evidence from the San Francisco Bar Area." Thesis. Graduate School of City and Regional Planning / University of Berkeley, 1991. Print.	simple ordinary least-squares model; binary dependent variables; logit model; step-wise variable deletion and addition.
National Cooperative Highway Research Program. *Estimating Bicycling and Walking for Planning and Project Development: A Guidebook*. Rep. no. 770. National Cooperative Highway Research Program, 2014. Print. Transportation Research Board.	Review and guidebook for planners / policy-makers.

RESULTS

What factors influence non-motorized trip making decisions? (zero-inflation model)

VARIABLES	ESTIMATE	Z VALUE
Household size	-.10968	-3.1861
Family life cycle 1: households without children and no retirees	-.37327	-4.01
Vehicle ownership	.18838	4.081
Bike ownership	-.14179	-5.126
Number of jobs accessible within 5 minute auto travel distance	-.23348	-6.532
Jobs/Household per 2 mile radius	-.23348	-6.532
Intersection density (street connectivity)	-2.077	-3.892

What factors influence the length of non-motorized trips? (ordinary least squares model)

VARIABLES	ESTIMATE	F VALUE
Jobs / Household per TAZ	-.00009	8.34
Population within 1 mile radius	-.00003598	3.21
Population within 2 mile radius	.00000764	2.38
Land Use Mix	-.17201	7.39
Number of retail jobs per TAZ	-.00039317	4.01
Number of government / educational jobs per 1 mile radius	.0000444	6.1
Number of healthcare jobs per 1 mile radius	.0001781	19.44

What factors influence the frequency of non-motorized trips? (zero-inflated model)

VARIABLES	ESTIMATE	Z VALUE
Household size	.172	7
Life cycle 2: Households with children, no retirees	.3354	4.3
Number of workers per household	-.0723	-2.08
Vehicle ownership	-.08	-2.375
Number of manufacturing jobs per 5 minute auto travel distance	-.0006	-3.11
Number of retail jobs per TAZ	.0004	-3.4
Number of food jobs per TAZ	.00022	2.22
Number of healthcare jobs per TAZ	.0001	2.16