Measuring the Impacts of Local Land Use Policies on Vehicle Miles of Travel: The Case of the First Big Box Store in Davis, CA

Susan Handy

AND Kristin Lovejoy, Gian-Claudia Sciara,

Deborah Salon, and Patricia Mokhtarian

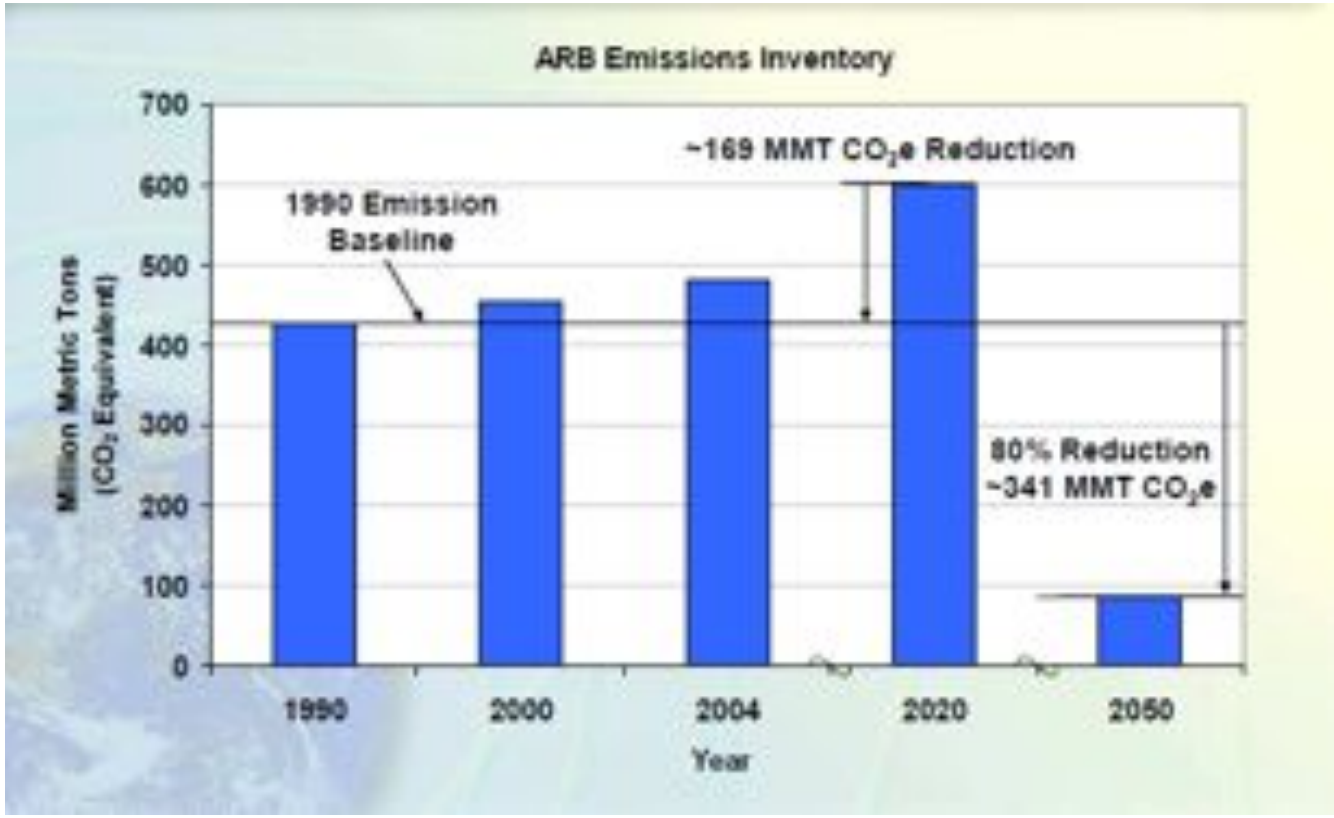
UCDAVIS

SUSTAINABLE TRANSPORTATION CENTER

of the Institute of Transportation Studies

AB32
The California Global Warming Solutions Act of 2006

- 80% reduction of 1990 levels by 2050



http://www.arb.ca.gov/cc/scopingplan/meetings/070808/slides_julyspworkshops.pdf

SB375
Redesigning Communities to Reduce Greenhouse Gases

- Targets for GHG emissions reduction from cars and trucks for metropolitan areas, by reducing vehicle-miles-travelled (VMT)

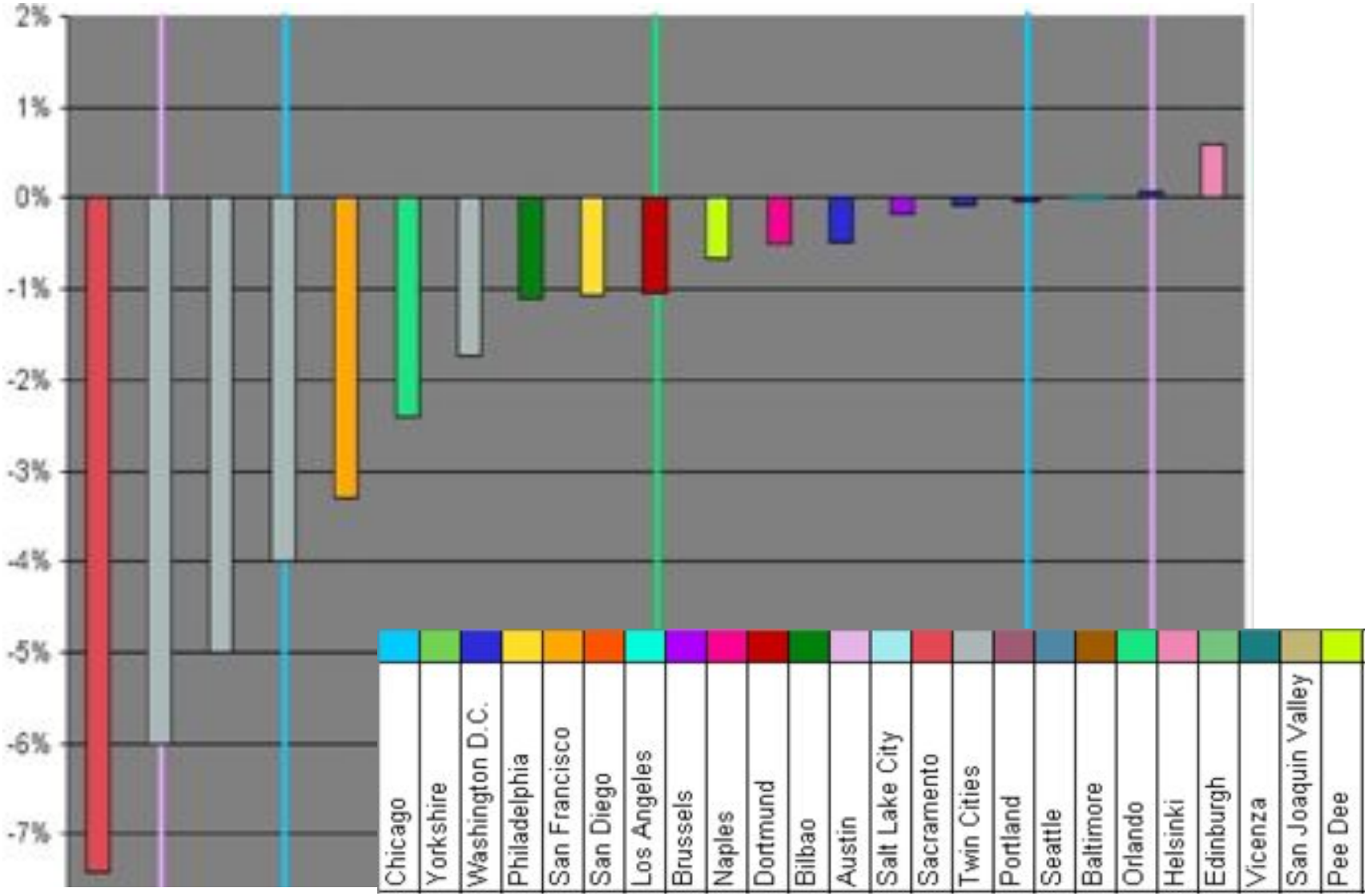
	2020	2035
Bay Area	7%	15%
Sacramento	7%	16%
LA region	8%	13%
San Diego	7%	13%

Elasticities for BE and VMT

	Weighted average	Range across studies
Job density	0	0 to 0.02
Jobs-housing balance	-0.02	-0.09 to 0.03
Household/population density	-0.04	-0.12 to 0
Job accessibility by transit	-0.05	-0.10 to -0.03
Proximity to nearest transit stop	-0.05	-0.19 to -0.01
Land use mix	-0.09	-0.27 to -0.01
Intersection/street density	-0.12	-0.29 to -0.04
Percent 4-way intersections	-0.12	-0.15 to 0
Job accessibility by auto	-0.20	-0.31 to -0.03
Distance to downtown	-0.22	-0.27 to -0.20

Ewing and Cervero, Journal of the American Planning Association, 2010

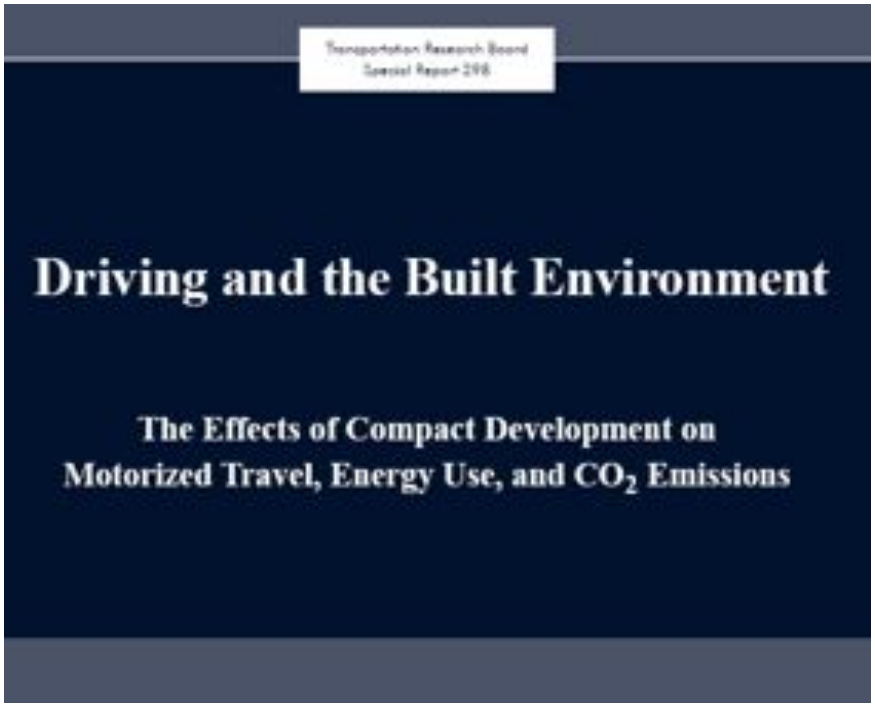
Modeling Studies: VMT Reductions from Land Use



Rodier, TRB Annual Meeting, 2009

TRB Special Report 298

"careful before-and-after studies of policy interventions to promote more compact, mixed-used development to help determine what works and what does not"



"Natural experiments"

"Intervention studies"

"Policy evaluation"

Evaluation Studies

Element	Issues
Treatment and control groups	What is the "treatment"? Who is the treatment group? What is an appropriate control group?
Measures of outcomes of interest	How to measure outcomes accurately? How to measure outcomes efficiently?
Before and after measurement	How long before the treatment? How long after the treatment?

Defining the "Treatment"

Davis Target Study

- Target opened in Davis, CA in Fall 2009
- Town's first big box retail store

Target was a big deal for Davis

- Stand-alone city with healthy downtown
- Big box stores in neighborhoods cities > 10 miles away

Target was also controversial

- City council put approval on November 2006 ballot
- Target approved by 51.5% margin (674 votes)

Con	Pro
• siphon business from downtown	• fill retail need: "I can buy socks in Davis!"
• increase local driving and traffic	• reduce trips to Woodland, etc.
• reduce bicycling in town	• keep tax dollars in Davis

Research Questions

- Have shopping-related trips and VMT by Davis residents changed since Target's opening? How?
- What is Target's impact on downtown? Are people shopping there less?
- How can local governments best evaluate VMT outcomes in similar projects?

Before-and-After Surveys

- Repeat cross-sectional
- Random sample of residents with addresses
- Recruitment via letter to residents
- On-line (or paper)self-administered survey
- One reminder postcard

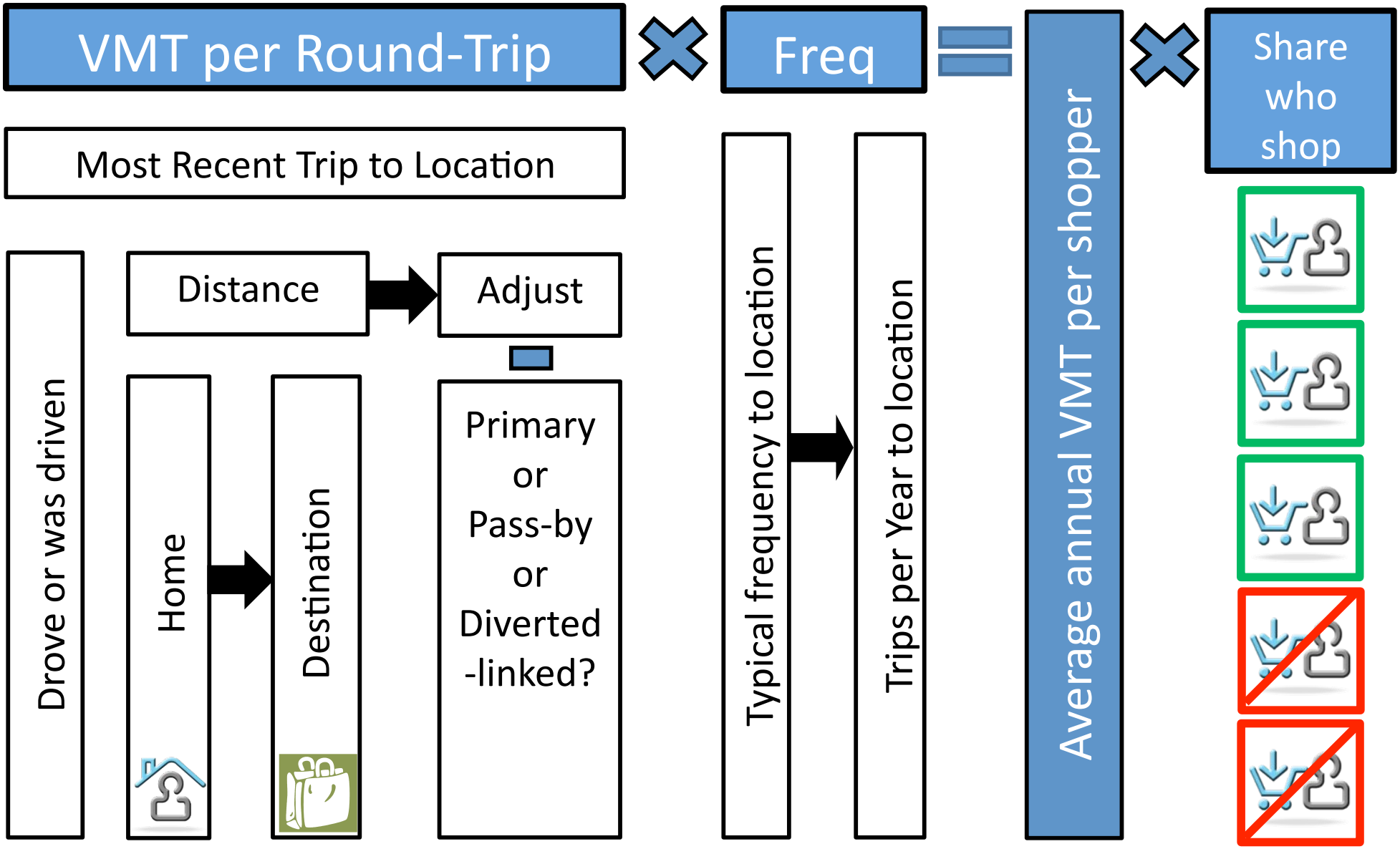
BEFORE SURVEY	AFTER SURVEY
September 2009	October 2010
4,613 residents invited	4,434 residents invited
1,018 responses	1,025 responses
22% response rate	23% response rate

How to measure change in VMT? Shopping VMT in particular.

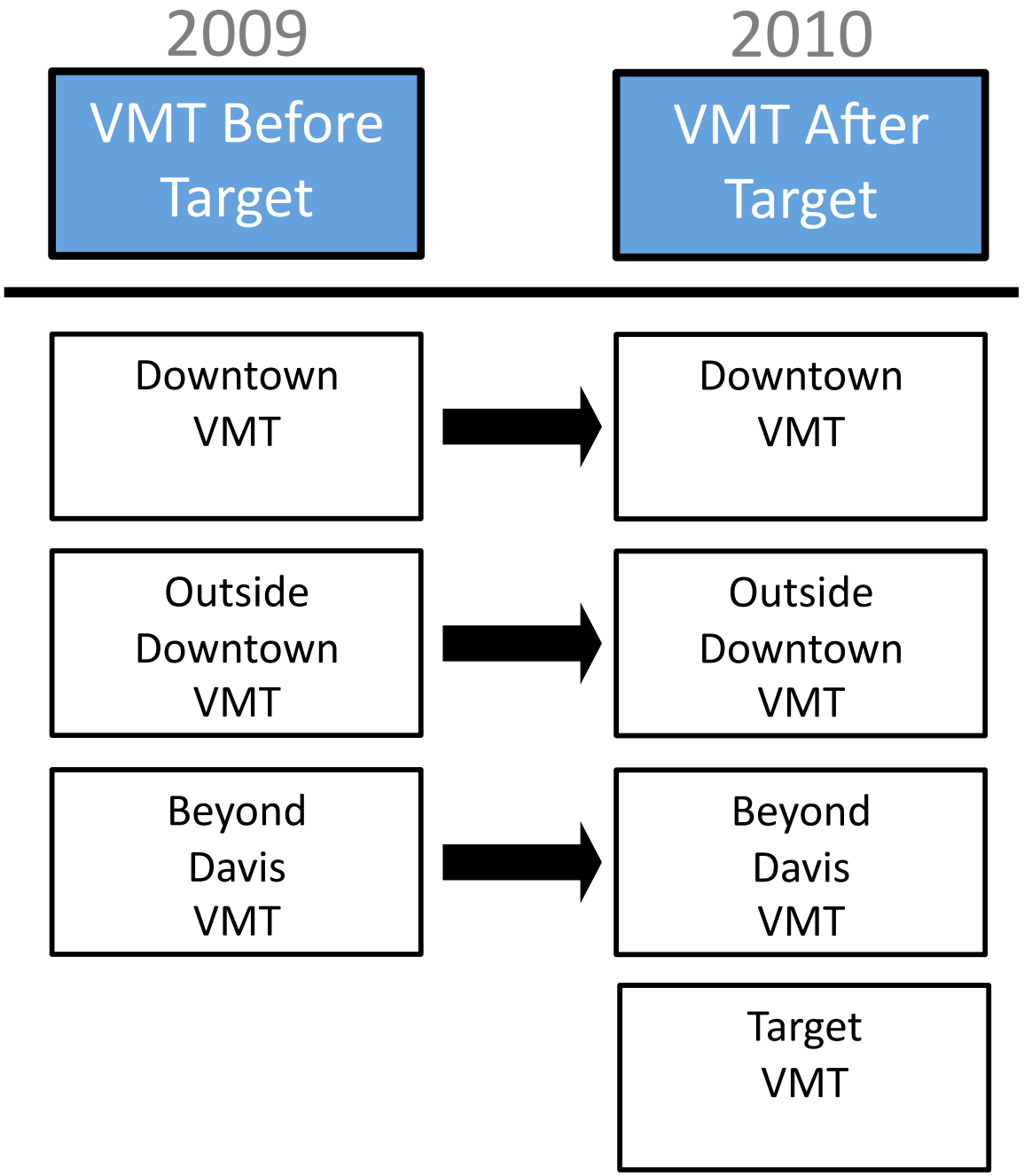
- Challenge: Shopping trips are…
  - less frequent than commute trips
  - varied with respect to destinations
  - only a portion of total VMT
- Options:
  - Travel diary survey? Would need many days.
  - GPS or odometers? Hard to isolate Target effect.
  - Piece-it-together approach…

Calculating Shopping-Related VMT

for each location



Evaluating VMT Change



Sample Characteristics

	BEFORE	AFTER	Davis
Percent female	54.4%	56.1%	52.5%
Median Age	50	53	25.2
Households w/ kids	28.4%	31.1%	24.6%
Median HH income	$50,874	$57,085	$58,280
Bachelor's or higher	84.2%	83.8%	67.4%
Percent employed	61.4%	61.6%	62.5%
Vehicle access	90.1%	90.5%	-

Weighting by household with or without kids

Shopping Locations

	Average One-Way Distance
Downtown	2.2 miles
Outside downtown	2.0 miles
Outside Davis	55.5 miles
Target	3.6 miles

For both surveys…

Mode by Destination

	Drove myself	Was driven	Took the bus	Biked	Walked
Downtown	75%	6%	1%	12%	5%
Outside downtown	77%	4%	1%	11%	6%
Outside Davis	86%	12%	2%	0%	0%
Target	85%	8%	1%	5%	1%

For both surveys…

Annual Frequency by Location
(for those who do shop there)

	BEFORE	AFTER	Change	p-value
Downtown	50.9	44.8	-12%	0.094
Outside downtown	71.4	59.5	-17%	0.008
Outside Davis	54.7	36.1	-34%	0.000
Target	n/a	28.3	-	-

Share Shopping in Each Location

	BEFORE	AFTER	p-value
Downtown	96%	97%	0.549
Outside downtown	91%	81%	0.000
Outside Davis	96%	93%	0.001
Target	n/a	90%	n/a

vs. 51.5% of vote!

Weekly VMT by Location

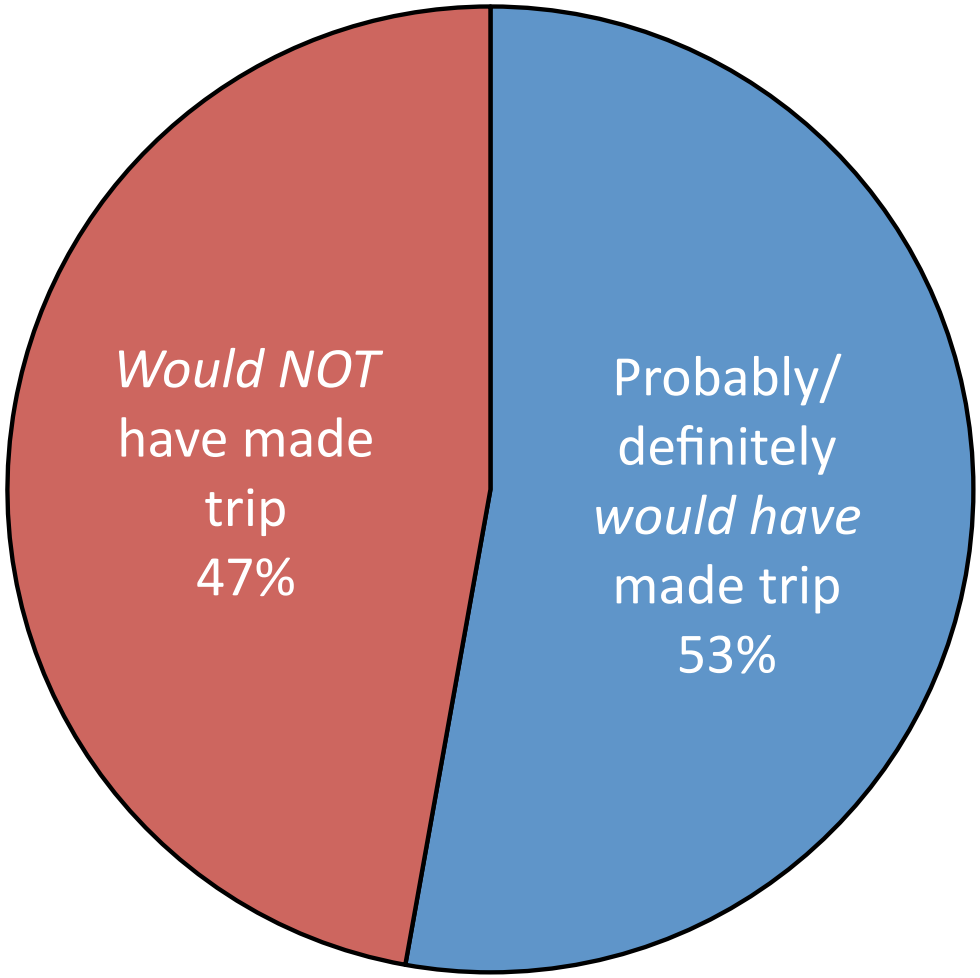
	BEFORE	AFTER	Change	Percent Change	p-value
Downtown	2.7	2.5	0.2	-9%	0.438
Outside downtown	4.3	3.3	1.0	-22%	0.027
Outside Davis	29.9	21.3	8.6	-29%	0.002
Target	-	2.5	-	-	-
TOTAL	36.9	29.7	7.2	-20% (-33% to -6%)	0.041

Intercept Survey

- Wed., Dec. 1, 3:30 PM to 7:30PM
  - 247 / 1,208 (20.4 %)
- Sat., Dec. 4, 11AM – 3PM
  - 225 / 1,825 (12.3 %)

- Implementation advantages vs. online survey:
  - Simpler survey (but less data)
  - Speed and ease of administration
  - Lower cost

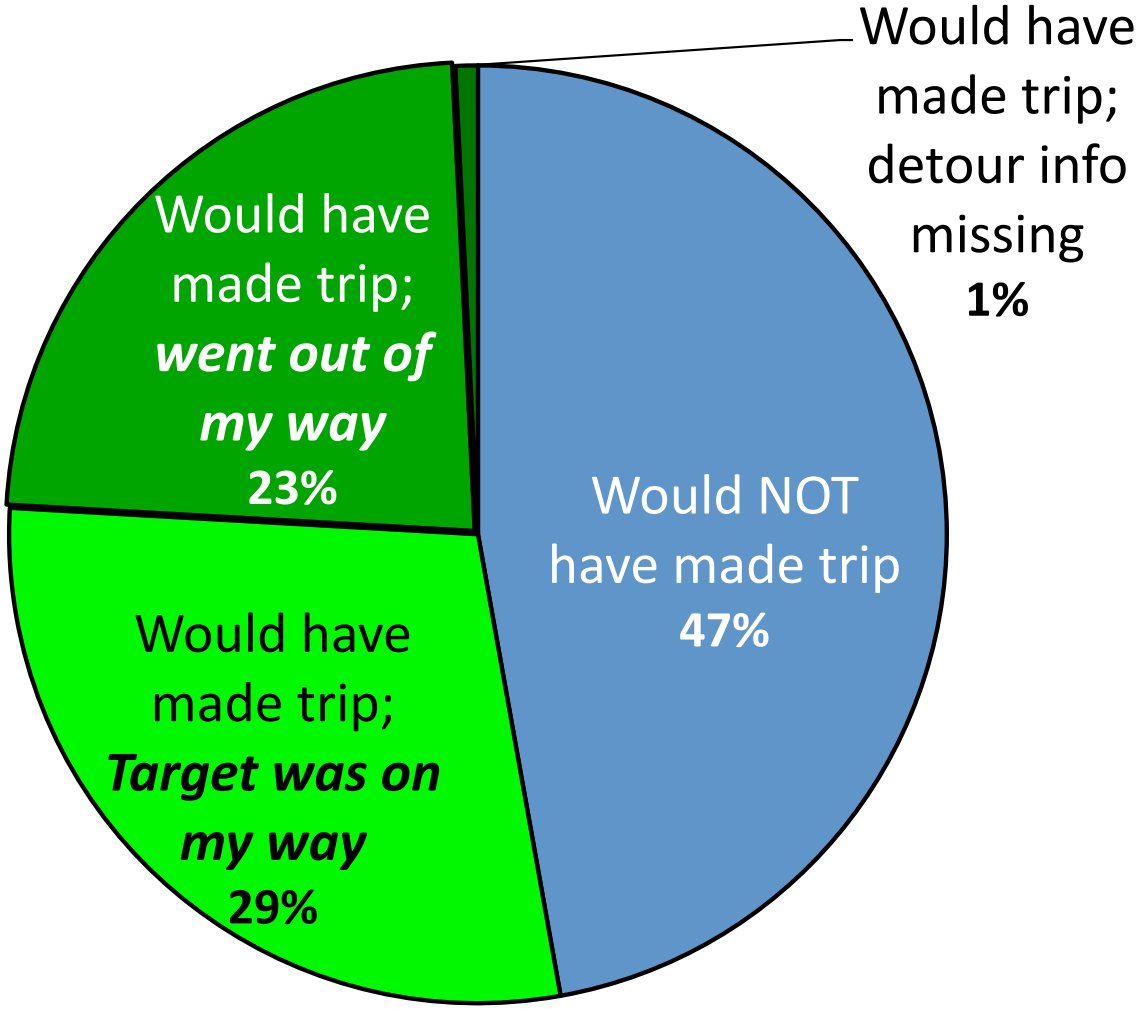
How important was Target to your trip?



N=390

Davis residents shopping at Target

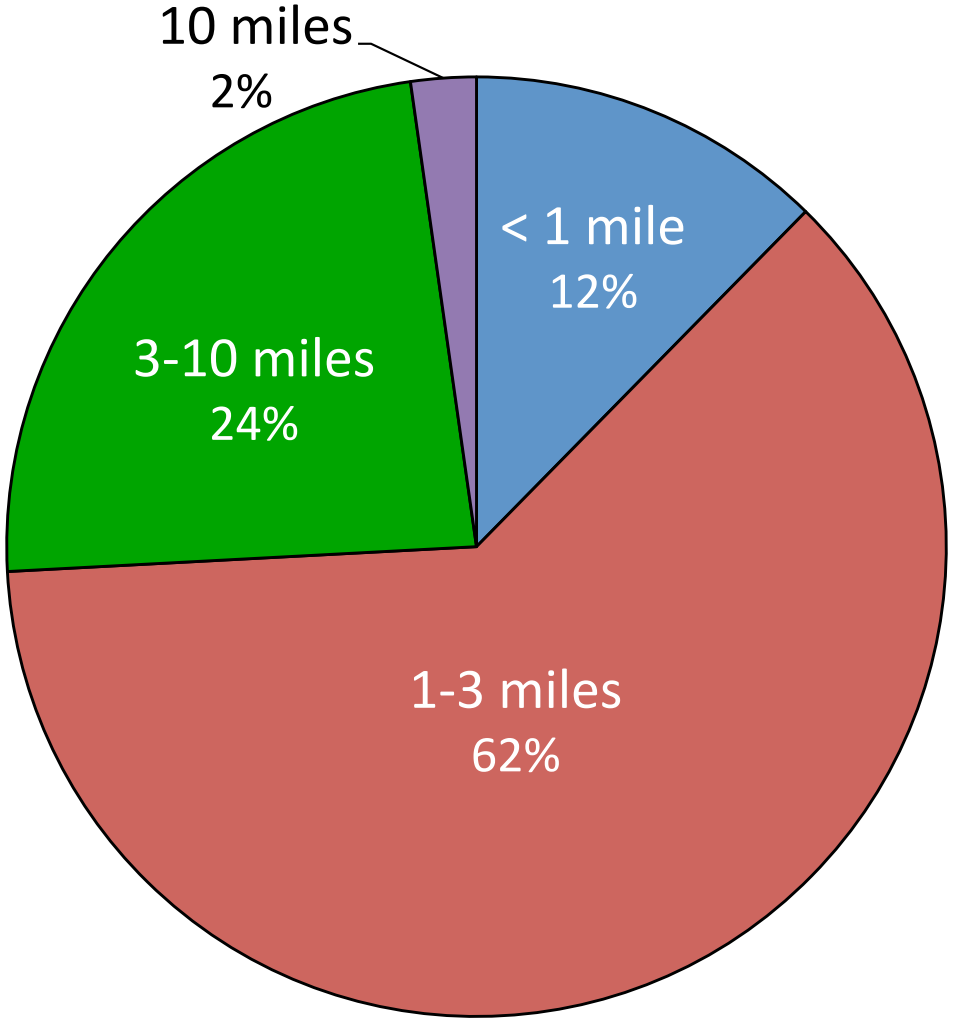
How important was Target to your trip?



N=390

Davis residents shopping at Target

How far out of the way for Target?



N=89

Davis residents detouring to shop at Target

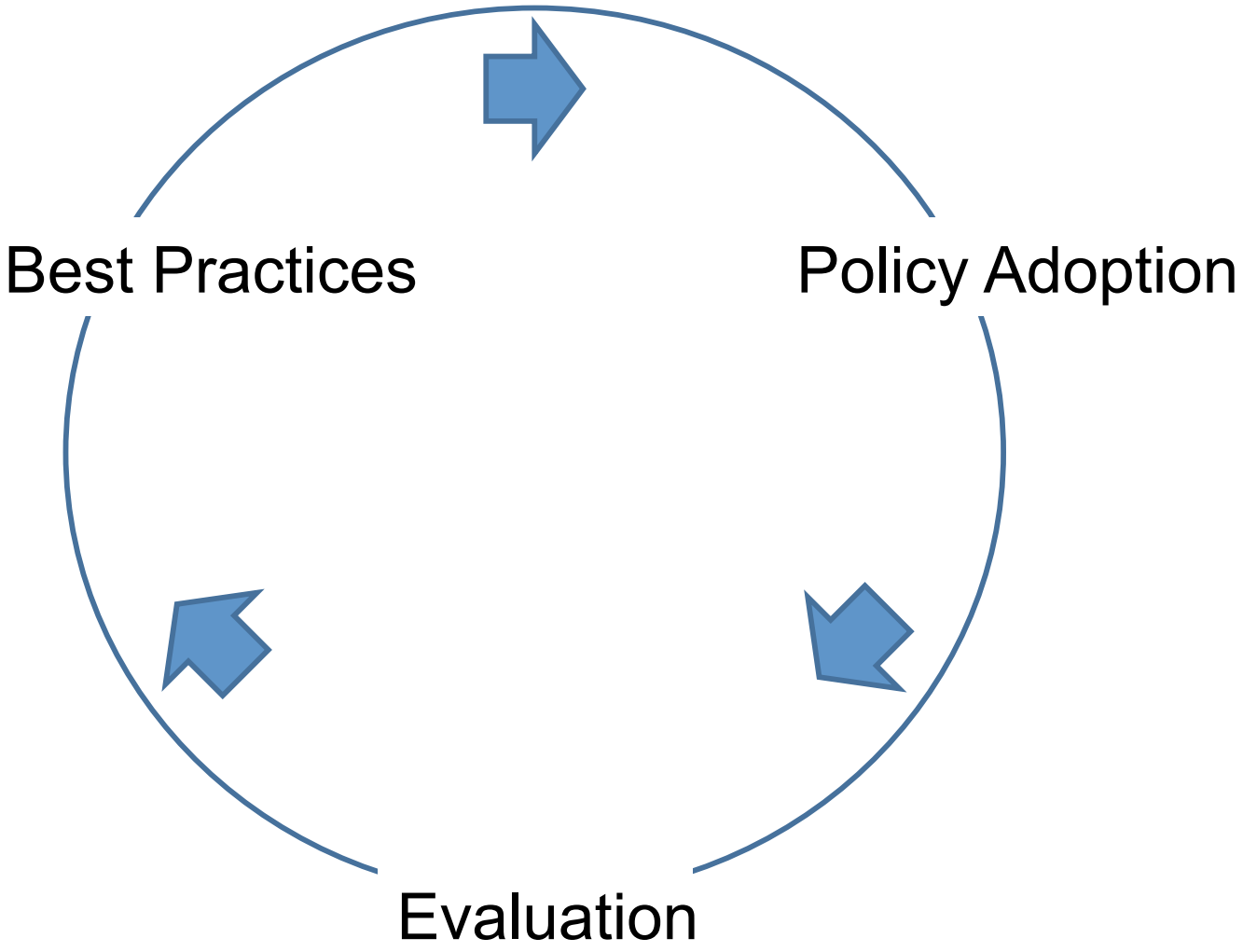
Davis Studies

Target Store opening:
Shopping patterns before and after

Fifth Street Road Diet:
Mode split to downtown and bike/ped safety before and after

West Village Project:
Travel patterns before-and-after moving in

Evidence Cycle



Thanks!