



Beyond Distance: Children's School Travel Mode Choice

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Structure

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1. Introduction

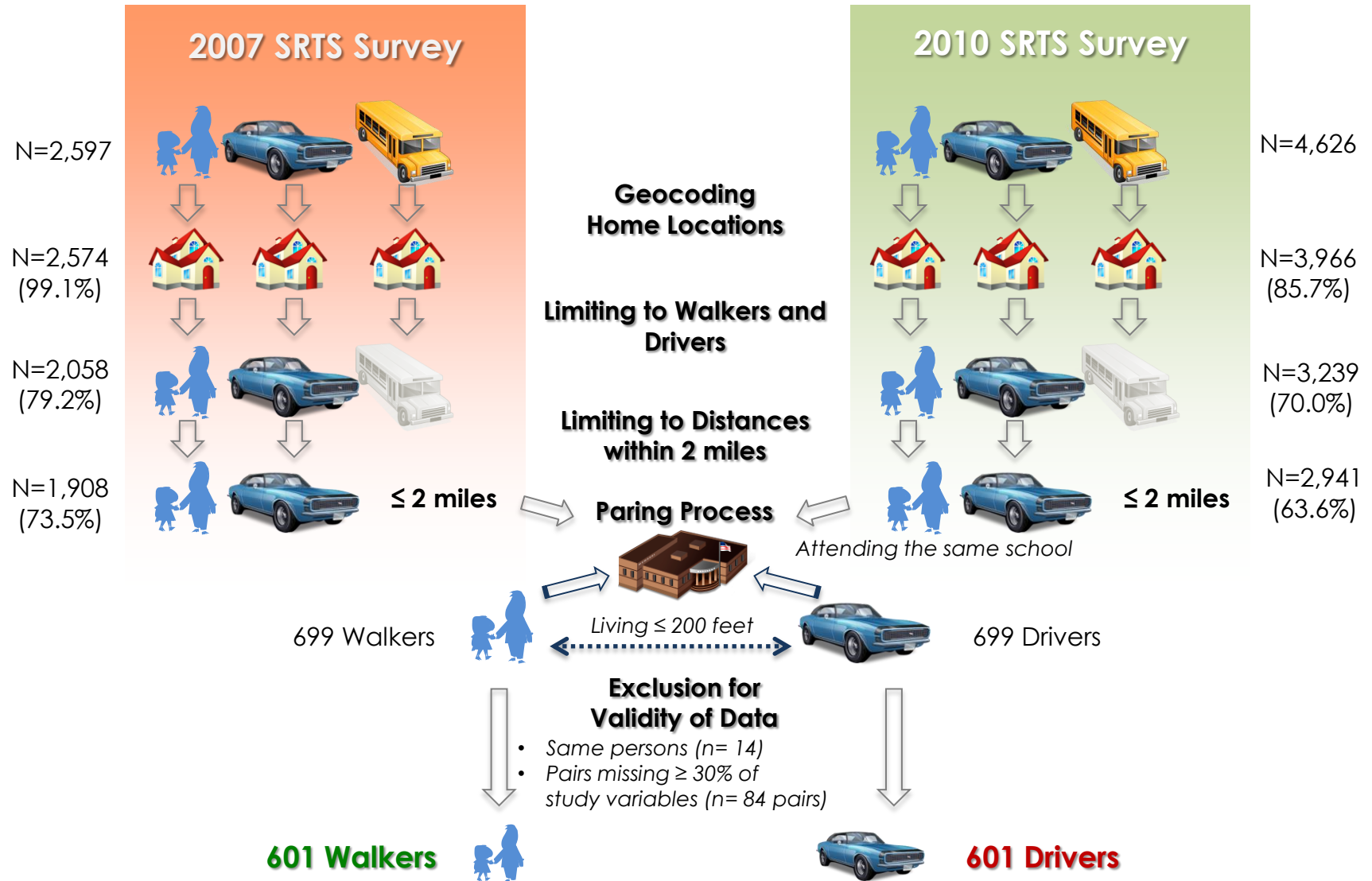
- **Walking to school** as a healthy alternative to being driven to school.
- **Private automobile transportation** remaining as the predominant travel mode chosen by parents.
- **Distance** to be the strongest environmental predictor of school travel mode choice.
- **Shortening the distance to school not easy.**



2. Study Objectives

- To understand **what parental attitude and more readily modifiable environmental factors** (other than **distance**) can help short-distance drivers to walk.
- Utilizing unique **paired data of children matched in their home locations** but varied in their **school mode choice**, the most influential factor (distance) is controlled to increase the likelihood of detecting other significant variables.
- It explores why parents from the **same/similar home location** choose **different travel modes**, and **what environmental and parental attitudinal factors** may help explain this difference.

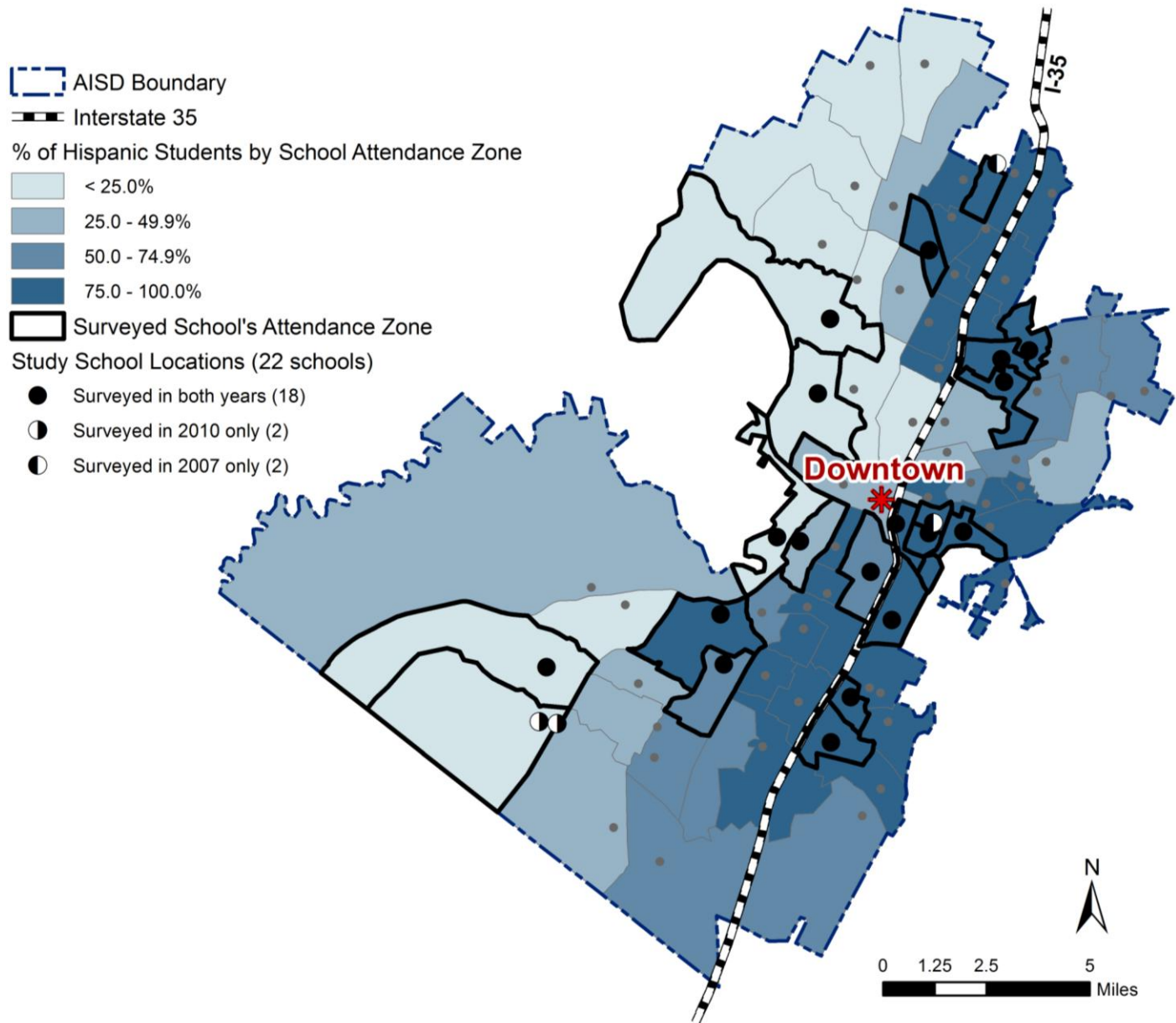
3. Methods: Pairing Process



3. Methods: Overview

- **Study Design:** Cross-sectional
- **Data Collection Method:** Mail survey in 2007 and 2010
- **Study Participants:** 1,202 parents of children attending 22 public elementary schools in Austin, TX (selected out of 7,223 respondents)
- **Response Rates:** 22.7% in 2007 and 34.2% in 2010
- **Study Schools/Settings**
 - Diverse urban/suburban neighborhoods
 - 57.1% in 2007 and 58.9% Hispanic students in 2010
 - 61.0% in 2007 and 63.5% students eligible for special lunch program in 2010

3. Methods: Study Area



3. Methods: Recruitment

- **Survey Instrument Development:**

Based on the literature and three previously validated instruments (Forman et al. 2008; McMillan 2003; Varni et al. 2001)

Including items related to:

- **Children's socio-demographic**
- School travel and other **physical activity behaviors**
- **Parental attitudes** toward school transportation
- Parental perceptions about the **neighborhood environment**
- Parental perceptions about **environmental barriers** to walking to school

3. Methods: Variables & Missing Data

- **Outcome Variable:** If the child walked to school / if the child was driven to school
- **Environmental Perceptions and Personal Attitudes:** How much the perceptions and attitudes affected the travel mode choice (5 points)
- **Missing Values:** Ranged 2.0% - 11.8%
(averaged 4.5%)
 - Variables missing $\leq 5\%$: Single imputation (random or median)
 - Variable missing $> 5\%$: Multiple imputation

3. Methods: Analyses

- **Bivariate Analysis:**

Paired samples t-test and McNemar's test

- **Multivariate Analysis:**

Conditional logistic regression model

- Considered walkers as cases and drivers as controls
- Estimated the odds of walking versus driving
- Statistical significance threshold: $p < 0.05$

4. Characteristics of Respondents' location

- Paired respondents lived in the **mean 47.9 feet**.
- **51.1%** paired respondents lived in the **same location**.
- **71.1%** children walking to school **walked with a parent or other adult**.
- Children traveled **0.49 mile** to school on average.
- **62.7%** of children's travel distance to school was **shorter than 0.5 mile**.
- **About half** of parental respondents considered **proximity to school** when they chose their neighborhood (54.3% vs. 46.3% among walkers vs. drivers).

4. Respondent Characteristics

Variable	Walker	Driver	Bivariate Test
Gender (Female (%))	325 (54.4%)	319 (53.3%)	$\chi^2=.225$
Grade (Mean \pm SD)	1.91 \pm 1.858	1.63 \pm 1.808	$t=2.726^{***}$
Race (Hispanics (%))	441 (76.2%)	418 (73.2%)	$t=-1.264$
BMI percentile (Mean \pm SD)	67.63 \pm 36.451	70.71 \pm 34.729	$t=-1.232$
Special Lunch (N (%))	228 (81.7%)	251 (79.4%)	-
Educations Level (N (%)) \geq College/associate degree	166 (28.3%)	232 (39.5%)	$t=-7.535^{***}$
Number of siblings (Mean \pm SD)	2.68 \pm 1.261	2.57 \pm 1.198	$t=1.488$
Residence year (Mean \pm SD)	4.34 \pm 4.647	4.56 \pm 4.402	$t=-1.586$
Number of cars (Mean \pm SD)	1.40 \pm 1.056	1.66 \pm .895	$t=-5.892^{***}$
Number of driver's license (Mean \pm SD)	1.33 \pm .823	1.57 \pm .710	$t=-6.346^{***}$

4. Bivariate: Perceived Environment

Variable	Walker	Driver	Bivariate Test
Perceived Distance Being Close Enough (N (%))	440 (73.2%)	378 (62.9%)	$\chi^2=19.380^{***}$
Land use (N (%))			
Park	127 (21.1%)	96 (16.0%)	$\chi^2=6.207^{**}$
Convenience store	86 (14.3%)	127 (21.1%)	$\chi^2=12.800^{***}$
Large office building	41 (6.8%)	61 (10.1%)	$\chi^2=4.198^{**}$
Transportation facility (N (%))			
Road with busy traffic	261 (43.4%)	309 (51.4%)	$\chi^2=8.697^{***}$
Sidewalk (Mean \pm SD)			
Well maintained and clean	3.41 \pm 1.509	3.56 \pm 1.466	t=-1.844*
Overall walking environment (Mean \pm SD)			
Convenience of walk	3.90\pm1.204	3.54 \pm 1.379	t=5.392 ^{***}
Quiet from noise	3.37\pm1.407	3.11 \pm 1.354	t=3.586 ^{***}
Nice things to see	3.12\pm1.323	2.98 \pm 1.281	t=1.969 ^{**}

4. Bivariate: Personal Attitude

Variable (5 point Likert scale)	Walker	Driver	Bivariate Test
Safety concern (Mean ± SD)			
Getting lost	2.70±1.505	2.88±1.474	t=-2.135**
Being taken or hurt by a stranger	3.54±1.386	3.82±1.291	t=-3.696***
Being attacked by stray dogs	3.32±1.431	3.45±1.374	t=-1.795*
Being hit by a car	3.63±1.381	3.91±1.284	t=-3.658***
Personal barrier (Mean ± SD)			
Too much planning ahead	2.53±1.436	2.86±1.303	t=-4.210***
Easier/faster to drive child	3.58±1.408	4.31±1.068	t=-10.336***
Too much to carry	2.47±1.274	2.65±1.273	t=-2.399**
Attitudes (Mean ± SD)			
Walking to school is "cool"	3.77±1.274	3.59±1.235	t=2.677***
Walking in daily routine (Child)	3.88±1.186	3.12±1.364	t=10.497***
Walking in daily routine (Parent)	4.02±1.160	3.52±1.244	t=7.355***
Enjoying walking with child	4.22±1.137	3.75±1.202	t=7.375***
Liking the idea of walking	3.77±1.270	3.37±1.237	t=5.958***
Other kids walking to school	4.25±1.091	4.06±1.158	t=3.048***
Other kids and parents walk	3.98±1.104	3.88±1.097	t=1.714*

4. Multivariate: Confounding Factors

	Odds Ratio	
	One-by-one	Multi-variate
Grade	1.117***	1.098**
Hispanic	1.193	1.588*
BMI percentile	.994**	.992***
Education Level	.646***	.710***
Reason to choose the neighborhood: Easy to walk around	2.205***	1.803**
Number of cars	.622***	.642***

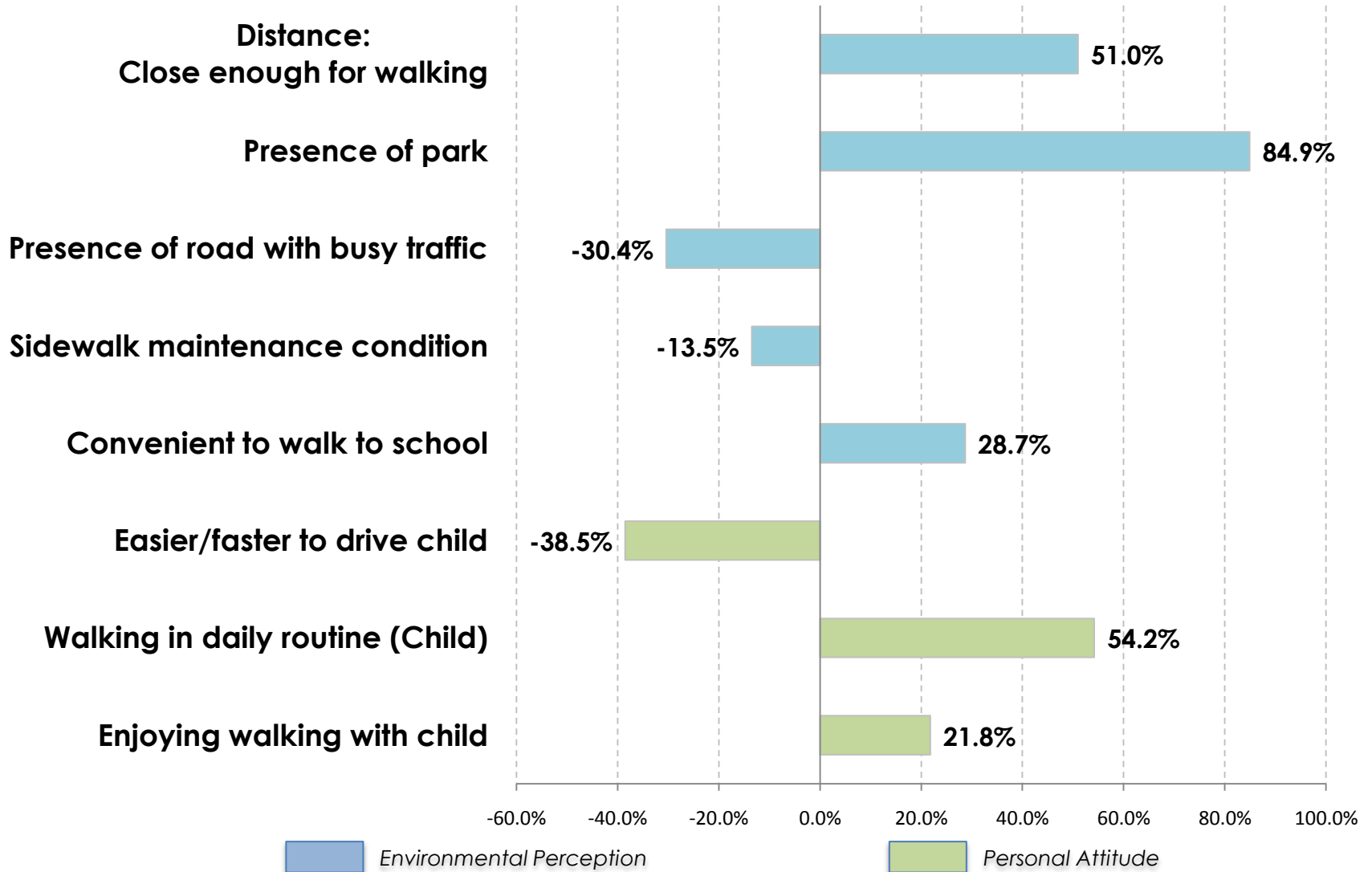
4. Multivariate: Environmental Perception

		Odds Ratio	
		One-by-one	Multi-variate
Distance	Close enough for walking	1.913***	1.510**
Home-to-School Route	Presence of park	1.396*	1.849**
	Presence of convenience store	.595**	.644*
	Presence of large office building	.668	-
	Presence of road with busy traffic	.687***	.696**
Sidewalk	Sidewalk maintenance condition	.942	.865**
Overall	Convenience to walk to school	1.283***	1.287***
Walkability	Quiet overall walking environment	1.115**	-

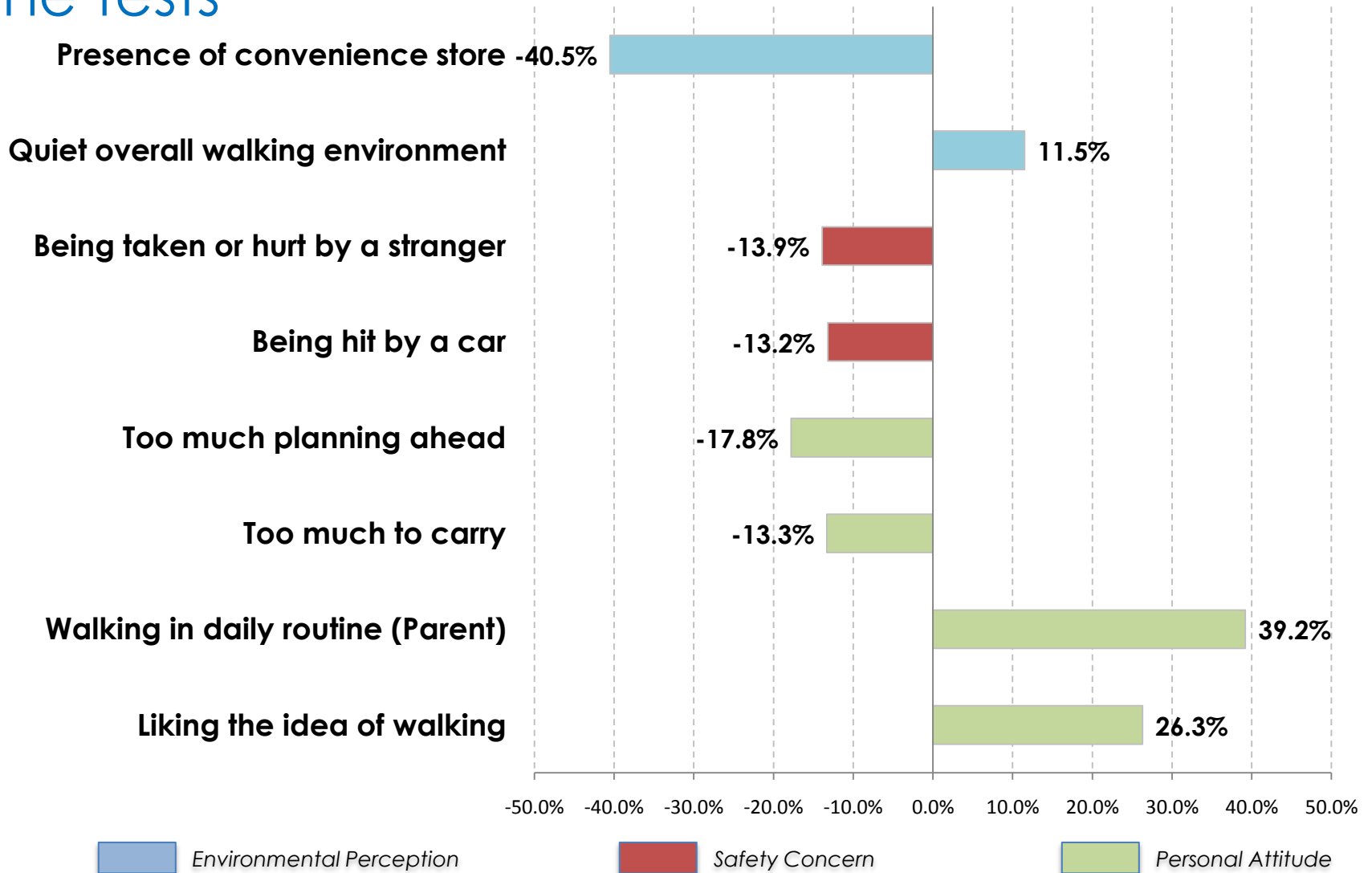
4. Multivariate: Personal Attitude

		Odds Ratio	
		One-by-one	Multi-variate
Safety Concern	Getting lost	.946	1.102
	Being taken or hurt by a stranger	.861***	.884
	Being attacked by stray dogs	.941	1.130
	Being hit by a car	.868***	.860*
Personal Barrier	Too much planning ahead	.822***	-
	Easier/faster to drive child	.615***	.615***
	Too much to carry	.867***	-
Personal Motivator	Walking to school is "cool"	1.069	-
	Walking in daily routine (Child)	1.594***	1.542***
	Walking in daily routine (Parent)	1.392***	1.144*
	Enjoying walking with child	1.386***	1.218**
	Liking the idea of walking	1.263***	-
	Other kids walking to school	1.121*	-
	Other kids and parents walk	1.049	-

4. Perception and Attitude: Significant Odds of Walking vs. Driving (reference)



4. Perception and Attitude: Additional Significant Odds of Walking vs. Driving in One-by-one tests



5. Discussion

1) Perceived Distance vs. Actual Distance

73.2% walkers vs. 62.9% drivers thinking the distance as close)

→ Social Supports, Promotional Events

→ Walking School Day, Walking School Bus, etc.



5. Discussion

2) Same Environmental but Different perceptions on the + vs. – features

- Tailored interventions targeting short-distance drivers
- **Multiple levels of safety concerns: cars, strangers, stray dogs, being lost**
- **Traffic control with calming devices, crossing guards, buffers, sidewalks, etc.**
- **Surveillance**



5. Discussion

2) Same Environmental but Different perceptions on + vs. – features

→ Sidewalk/street maintenance

→ Nice things to see

→ Automobile oriented land uses around schools



5. Discussion

3) Personal Attitudes on Walking as an Important Determinant of School Travel Mode Choice

- Enjoyment of walking, social support, convenience of driving
- **Educations/training programs to increase the awareness of walking benefits and pedestrian safety**
- **Correlations between attitudes and environments [next step]**





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