

Correlates of Walking-to-School Behaviors & Implications for Public Policies

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CONTENTS

- I. Introduction
- II. Research Design and Methods
- III. Data Analysis
- IV. Results
- V. Conclusion and Discussion







Can I walk ???

I. INTRODUCTION

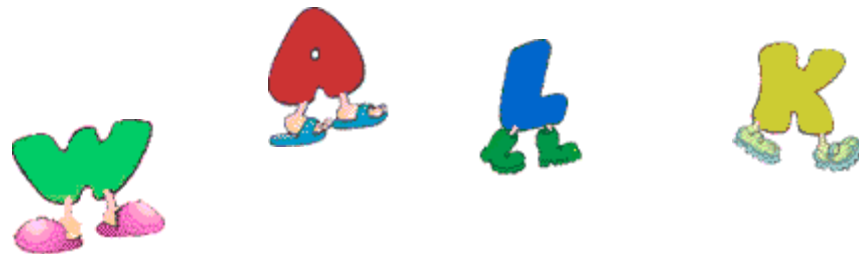
- Trends of school travel & childhood obesity

- Benefits of walking-to-school behaviors

- For children's health
- For environmental health

- Promotion efforts

- Federal transportation bill SAFETEA-LU (2005):
\$612 million for the national Safe Routes to School Program



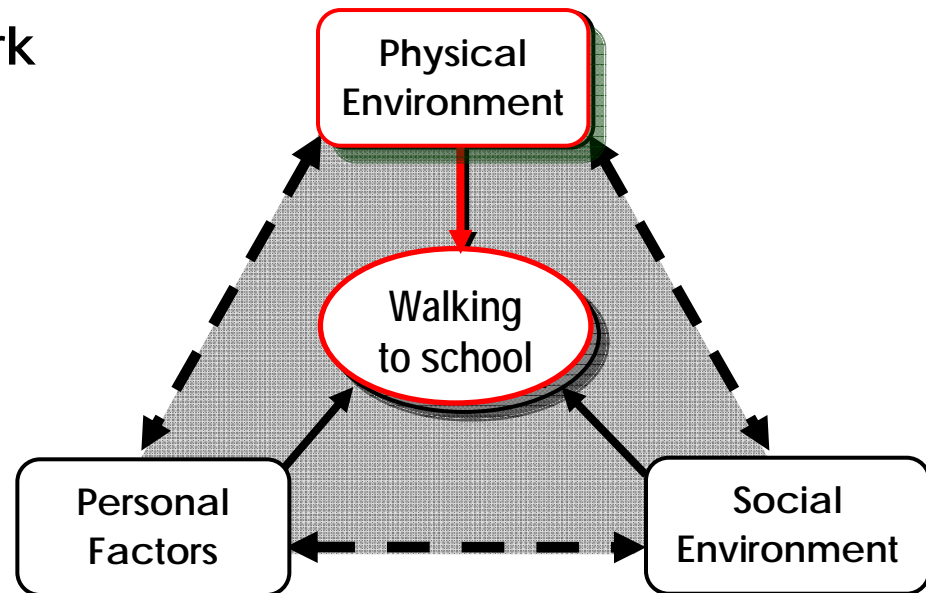
■ Previous Literature

- Negative impact of travel distance & safety concerns
- Positive impact of sidewalk quantity & quality

■ Gaps of knowledge

- Impact of other physical environmental factors, personal characteristics, & social environment

■ Conceptual framework



II. RESEARCH DESIGN & METHODS

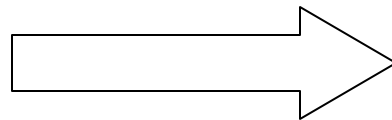
- Cross-section study using surveys
- Aims
 - To identify the multi-level **correlates** of walking-to-school behaviors
 - To suggest relevant **policy interventions**
- Samples
 - **19** public elementary schools with **11,880** students from Austin, TX
 - Stratified random samples of schools based on **socio-economic status**, with ensured sufficient variability in **physical environmental characteristics**

	Total enrollment	% of Hispanic students	Poverty Rate (% of students receiving free or reduced-price lunch)	Yearly crash rate (per street mile)	Yearly crime rate (per 100 acres)	% of students living within 1/2 mile of school
Mean	639	67.2%	74.1%	6.1	71.5	27.2%
S.D.	187	0.261	0.313	3.5	50.3	0.150
Minimum	353	10.7%	5.7%	0.8	5.1	8.0%
Maximum	1007	96.5%	97.8%	13.2	185.5	73.3%
Mean of all elementary schools	642	66.2%	75.1%	6.0	70.0	26.9%

Data sources: Texas Education Agency, Austin Independent School District, Austin Police Department; S.D.: Standard deviation

■ Collaboration

with city of Austin & Austin Independent School District (ISD)



City of Austin's Safe Routes to School Plan

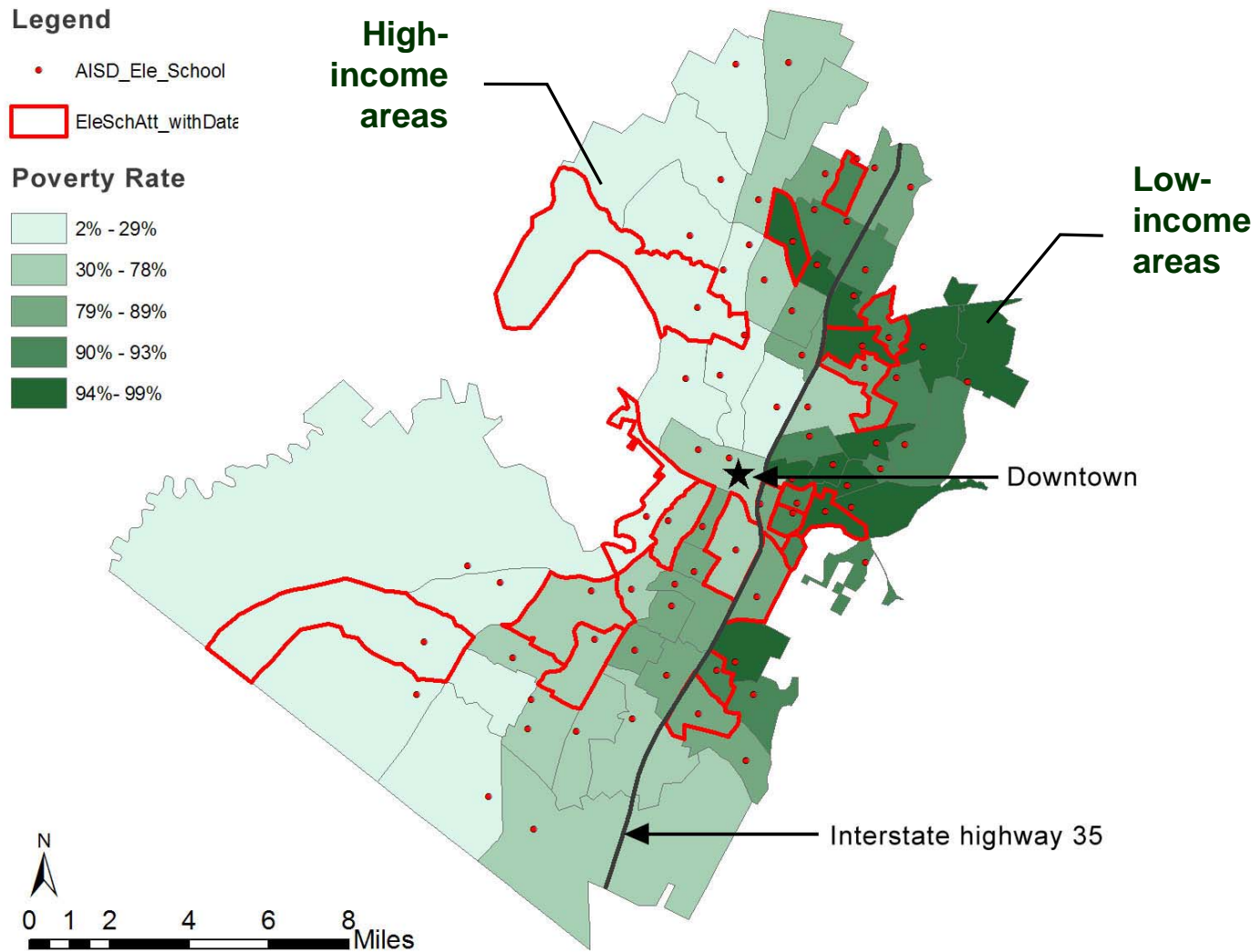


Figure. Poverty rates of elementary schools in the Austin ISD and locations of sampled schools

■ **Measurement:** Survey of Parents/Guardians

● **Instrument:**

- Developed based on the conceptual framework, literature review, & some previously validated instruments
- Revised after cognitive interview

● **Variables:**

- Independent variable: Personal, social, & **perceived** physical environmental factors
- Main outcome variable: walking as a typical school travel mode

Child's Name: _____

Date: ____ / ____ / ____

SAFE ROUTES TO SCHOOL SURVEY

Directions: This survey is to be answered by the parent/guardian who is most involved in getting the child to and from school. Please be assured that everything you tell us will be kept strictly confidential (secret).



The first few questions are about how your child normally gets to and from school. Please answer the questions in both columns by checking the box that applies.

	From home to school	From school to home
1. On a normal day, how does your child travel?	<input type="checkbox"/> Walk <i>alone</i> <input type="checkbox"/> Walk <i>with friends</i> <input type="checkbox"/> Walk <i>with a parent/adult</i> <input type="checkbox"/> Bike <input type="checkbox"/> School bus <input type="checkbox"/> Public bus <input type="checkbox"/> Private cars, including carpool	<input type="checkbox"/> Walk <i>alone</i> <input type="checkbox"/> Walk <i>with friends</i> <input type="checkbox"/> Walk <i>with a parent/adult</i> <input type="checkbox"/> Bike <input type="checkbox"/> School bus <input type="checkbox"/> Public bus <input type="checkbox"/> Private cars, including carpool
2. How long does it take to travel?	<input type="checkbox"/> Less than 15 minutes <input type="checkbox"/> 16-30 minutes <input type="checkbox"/> More than 30 minutes	<input type="checkbox"/> Less than 15 minutes <input type="checkbox"/> 16-30 minutes <input type="checkbox"/> More than 30 minutes

3. Is this distance close enough for your child to walk to school?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
4. Does the school provide bus service for your child?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

9. What do you think about the <u>overall walking environment (including sidewalks [if available], roads, and buildings)?</u> Please tell us how much you agree or disagree with each statement by circling your answers.	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
1). It is convenient to walk to school.	1	2	3	4	5
2). It is well maintained and clean.	1	2	3	4	5
3). It is well shaded by trees.	1	2	3	4	5
4). It is quiet (without much noise from vehicles, airplanes, etc.)	1	2	3	4	5
5). There are nice things to see.	1	2	3	4	5
6). Streets are well lit.	1	2	3	4	5
7). The school zones are well enforced.	1	2	3	4	5
10. What do you think about the safety issues for your child to walk to school?	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
1). My child may get lost.	1	2	3	4	5
2). My child may <i>be taken or hurt by a stranger.</i>	1	2	3	4	5
3). My child may <i>get bullied, teased, or harassed.</i>	1	2	3	4	5
4). My child may <i>be attacked by stray dogs.</i>	1	2	3	4	5
5). My child may <i>be hit by a car.</i>	1	2	3	4	5
6). Exhaust fumes will harm my child's health.	1	2	3	4	5
7). People in the neighborhood will easily see and help my child in case of danger.	1	2	3	4	5



III. Data Analysis

■ Data reduction

- Simple bivariate analysis between each individual independent variable & the outcome variable
- Factor analysis for perceptual & attitude variables

■ Predicting the odds of walking to/from school

- With personal, social, & physical environmental factors
- Using binary logistic regression

IV. Results

- Total valid responses: 2,695
- Response rate:
 - Mean: 23%; range: 9% – 40%
- Prevalence of walking:
 - Home-to-school: mean, 28%; range, 9% - 47%
 - School-to-home: mean, 32%; range, 6% - 56%
 - Higher walking rate for school-to-home trips
 - 75% of walking trips are accompanied by an adult
- Travel time:
 - 76% of walking trips take less than 15 minutes

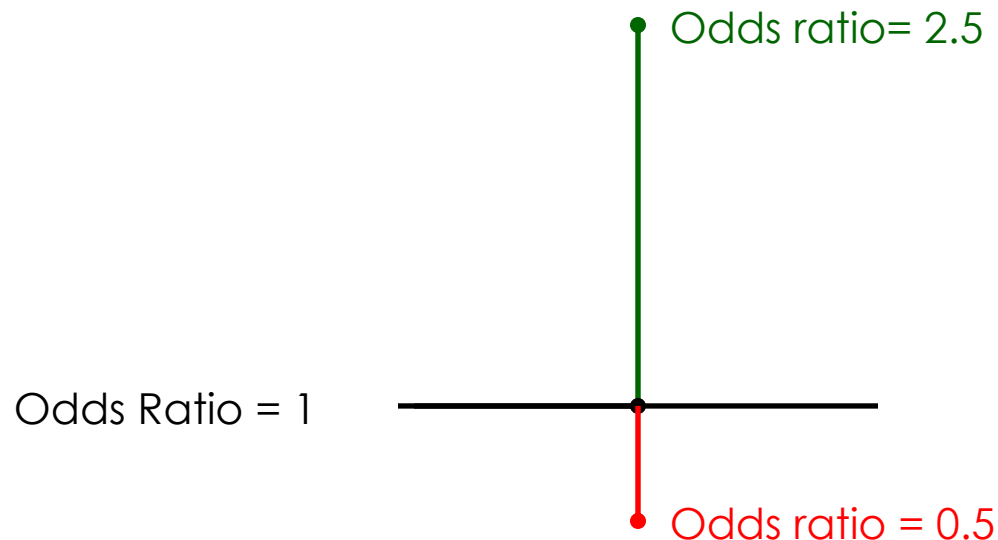
■ Predicting the Odds of Walking using Multi-Level Factors

- Goodness of fit: $P = 0.193$ → adequate fit
- Nagelkerke R Square: explaining 51.6% of variance

● Concept of Odds Ratio:

> 1: positive correlate encouraging walking

< 1: negative correlate deterring walking



Personal Factors		Odds Ratio
Child's grade level		—
Child's gender (0 = female, 1 = male)	→ Limitation of the study	—
Hispanic ethnicity (0 = no, 1 = yes)		—
Parents' highest education level (range: 1 – 7)		0.820***
Single-parent status (0 = no, 1 = yes)	→ Children from low-income families walk more often	—
Number of family members		1.131**
Household's car ownership		0.706***
Parents' personal barriers (factor)		0.421***
Child's personal barriers (factor)		—
Child's & parents' positive walking behavior and attitude (factor)		1.503***

^a — insignificant; * $P < 0.05$; ** $P < 0.01$, *** $P < 0.001$

Independent Variables	Odds Ratio
Social Factors: School and Peer Influence	
Having school bus service (<i>0 = no, 1 = yes</i>)	0.293***
Positive peer influence (<i>factor</i>)	1.183**
School Membership	
Highland Park Elementary	0.338*
Mills Elementary	0.357*

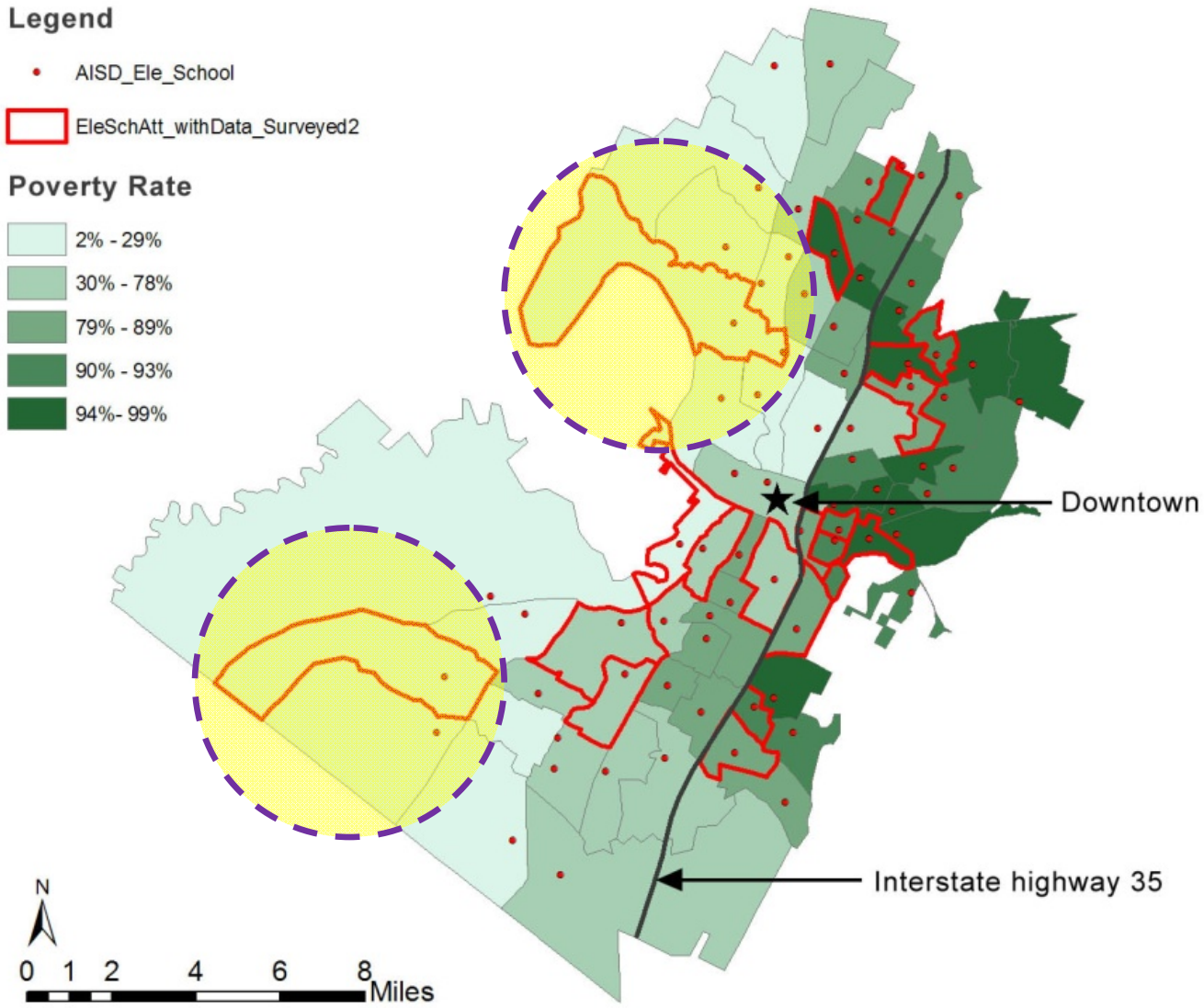
* $P < 0.05$; ** $P < 0.01$, *** $P < 0.001$

Legend

- AISD_Ele_School
- ▭ EleSchAtt_withData_Surveyed2

Poverty Rate

- 2% - 29%
- 30% - 78%
- 79% - 89%
- 90% - 93%
- 94% - 99%



Perceived Physical Environmental Characteristics	Odds Ratio
Distance close enough (0 = no, 1 = yes)	4.034***
Safety concerns (<i>factor</i>)	0.760***
Physical barrier:	
Highway or freeway (0 = no, 1 = yes)	0.636*
Busy road (0 = no, 1 = yes)	—
Intersection without a painted crosswalk	—

^a — insignificant; * $P < 0.05$; ** $P < 0.01$, *** $P < 0.001$

Association between socioeconomic status & perceived distance & safety

(using education level as a proxy for SES):

- SES is not significantly associated with perceived safety
- Low-income parents are less likely to perceive the **distance to be close enough** for kids to walk to/from school

Contrasting results for objective measures on the school level!

- Difference between **perceived & objective safety**
- **Acceptable walking distance** may vary depending on safety & other walkability features
- Low-income children might be forced to walk due to low SES

Perceived Physical Environmental Characteristics	Odds Ratio
Sidewalk quality (<i>factor</i>)	—
Quality of overall walking environment (<i>factor</i>)	— ?
Land uses en route to school (0 = no, 1 = yes):	
Convenience store	0.563***
Bakery/café/restaurant	—
Bus stop	0.757*
Office building	0.592* ?
Vacant lot	—
Large parking lot	—

^a — insignificant; * $P < 0.05$; ** $P < 0.01$, *** $P < 0.001$

Response bias:

walkers vs. non-walkers

(Limitation of the study)

Population/activity difference:

children's walking-to-school behaviors vs. general populations' daily walking

Interpretation of mixed land use

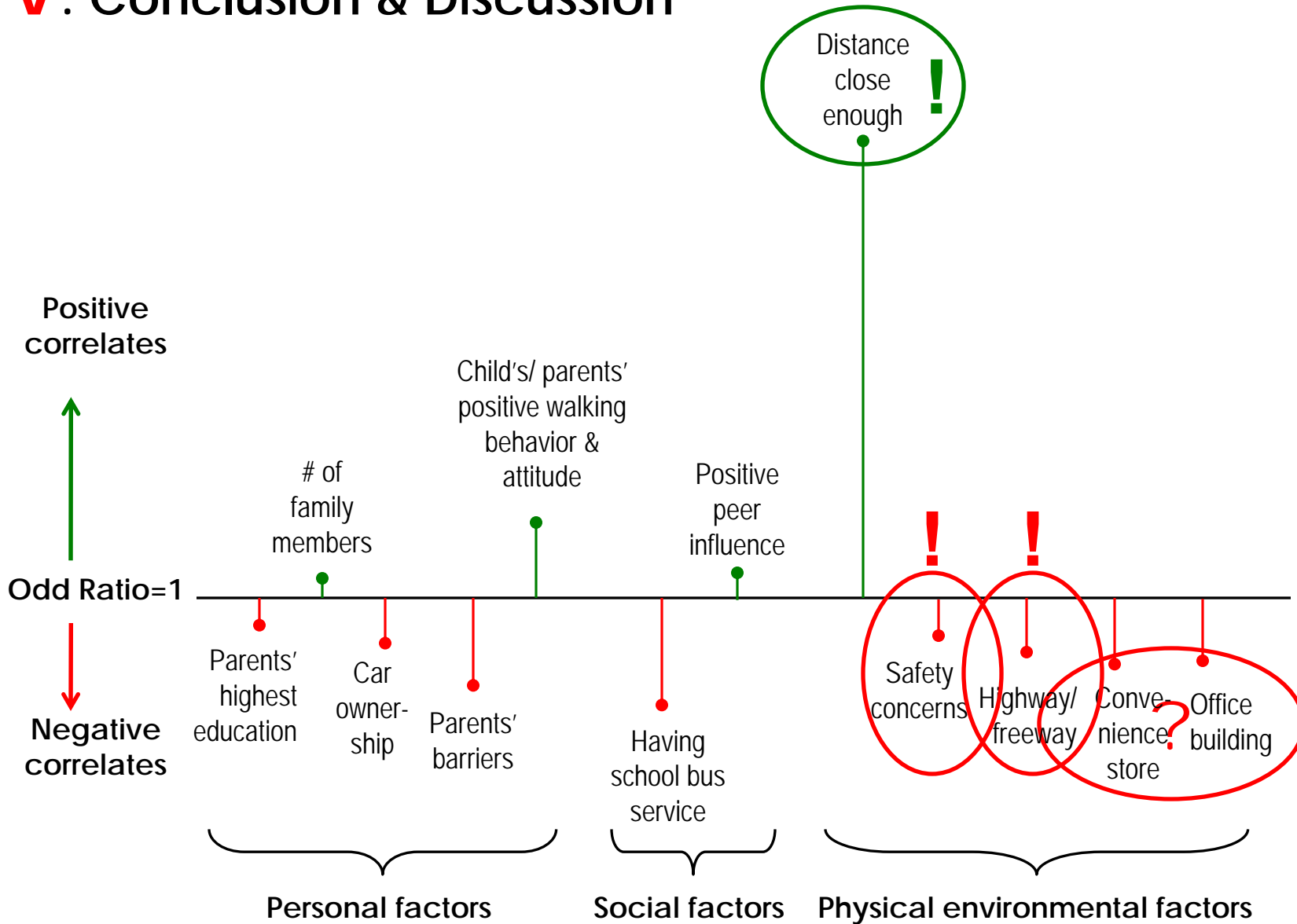


- **Non-walkable** convenience store

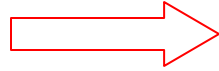


- **Walking-friendly** office buildings

V. Conclusion & Discussion



Findings



Implications for policy interventions

- Distance
 - **School sitting** at centrally-located, accessible locations:
E.g., policy changes related to minimum acreage requirements & funding formula
- Highway/freeway
 - School sitting & attendance area: **“barrier-free”**
- Safety concerns
 - **Safety improvement & educational programs** in addition to infrastructure improvements
- Parents' personal barriers
 - Educational interventions targeting both **parents** & children

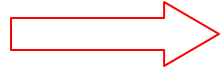


0 50 100 200 300 400 Feet N



0 50 100 200 300 400 Feet N

Findings



Implications for policy interventions

- Multi-level correlates
 - Disparity issues
- Interventions at **multiple levels** involving **different stakeholders**
 - **Priority for low-income and/or minority children:**
 - More frequent walking
 - Higher exposure to safety threats (such as air pollutions and traffic and crime dangers) and poor micro-level environmental features (such as maintenance, visual quality, amenities, & perceived safety, etc.)

Figure. Photos from field audits



High street-level walkability ←

→ Low street-level walkability

VI. Follow-Up Studies

■ Further analysis:

- Relationship between the objective and subjective environmental measures using geo-coded home locations
- Mediating effects of perceived environmental features
- Moderating effects of personal and social factors on environment-behavior relationships

■ Intervention studies:

- Follow up with funded Safe Routes to School Projects

Questions?

Acknowledgement:

- Robert Wood Johnson Foundation Active Living Dissertation Grant
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- Nurture by Steelcase Dissertation Grant



Personal barriers, attitude, & behaviors	Individual observed variables	Association
Parents' personal barriers (<i>factor</i>)	1. "I have no time to walk with my child to/from school."	−***
	2. "It is easier for me to drive my child to/from school."	−***
	3. "Walking to school involves too much planning ahead."	−***
Child's personal barriers (<i>factor</i>)	1. "My child has too much to carry."	−***
	2. "My child gets too hot and sweaty."	−**
Child's and parents' positive walking behaviors and attitudes (<i>factor</i>)	1. "Walking is a good way to interact with other people."	+***
	2. "Walking is a good way to exercise."	(+)
	3. "My child walks quite often in his/her daily routine."	+***
	4. "My child thinks walking to school is 'cool'."	+***
	5. "I walk quite often in my daily routine."	+***
	6. "I enjoy walking with my child to/from school."	+***
	7. "My family and friends like the idea of walking to school."	+***

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$