Safety and Built Environments Relationship to Children's Physical Activity: A Pilot Study

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Safety & Built Environment Relationship to Children's PA: Pilot Study

- Funded by RWJ's Active Living Research program
- June 2005 – Sept 2006
- Grew out of the TASK (Transportation that is Active and Safe for Kids) School Travel Project

Project Team

Investigators

- Maryann Mason, PhD, PI
- Xingyou Zhang, PhD, Statistician
- Katherine Kaufer Christoffel, MD, MPH, Co-I

Advisory Committee

- Joseph L. Schofer, PhD, Northwestern U
- Weimo Zhu, PhD, U of IL (Champaign/Urbana)
- Thomas Murtha, MS, Chief Transportation Planner, Chgo Area Transport. Study (CATS)
- Jan Metzger, Center for Neighborhood Tech

Background: Obesity

- #1 health problem facing children
- Young urban children at high risk
  - Chicago: 23% of CPS Kg-aged children are overweight
  - NYC: 21% of kindergarten-age children are overweight

Background: Built Environment (BE)

- Research on relationship of BE & overweight so far re adults
- Places with urban features report
  - Higher rates of adult walking/biking
  - Lower rates of adult obesity
- No research on this for children

Background: Safety

- TASK findings suggest *safety* is a key factor for family mode choice for school travel
- Research to date shows no clear findings on influence of safety on physically active travel

Background: Safety

Past studies on safety re child PA

- No objective PA measures
- Recreational focus only
- Focus on older children and youth

Our Study hypotheses

For Chicago children aged 5 to 10 y:

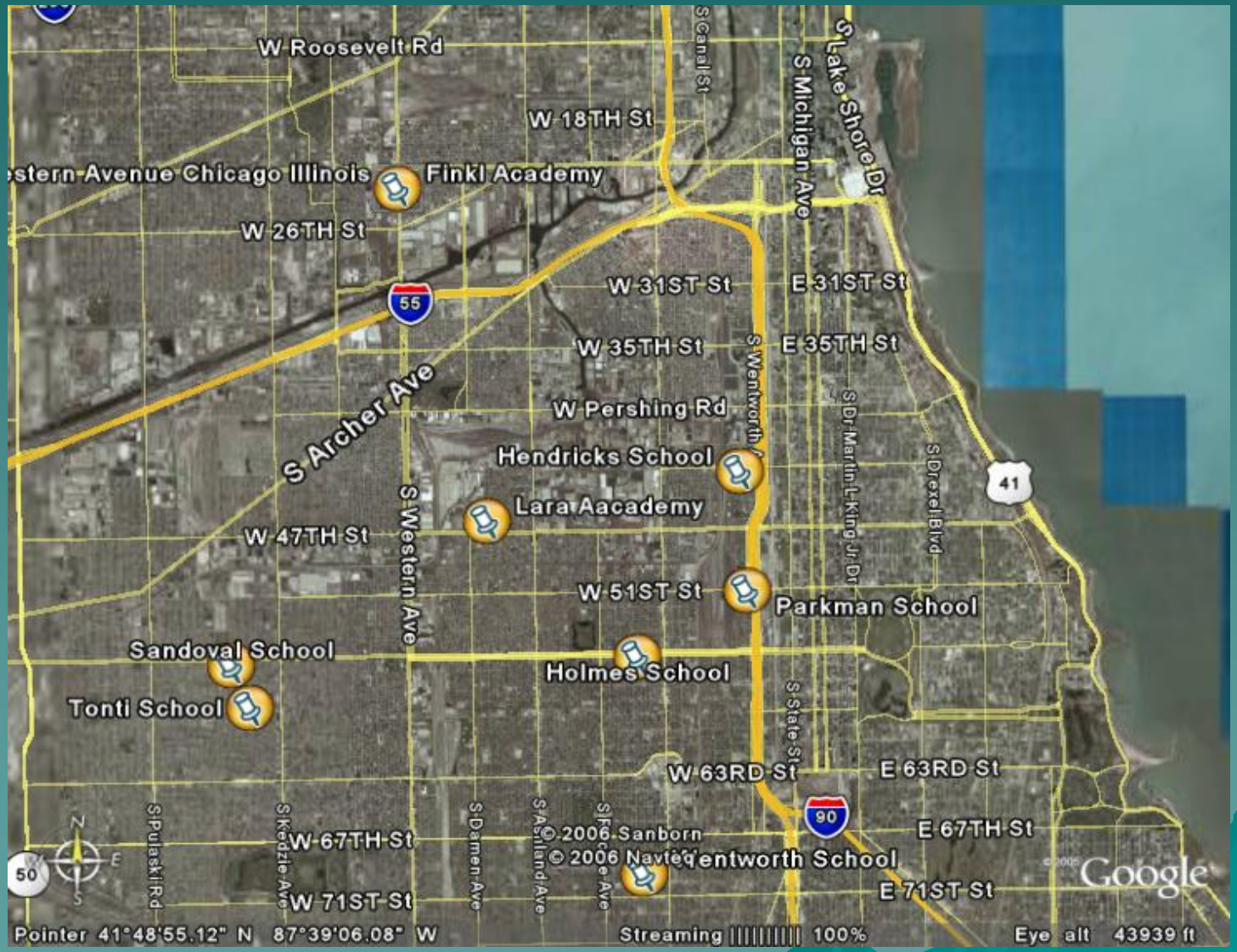
1. The BE in the home/school community influences PA levels
2. The safety environment (crime/traffic) in the home/school community influences PA levels
3. PA level and Body Mass Index (BMI) are related.

Study design

Matched groups: 8 Local School Areas (LSA)
(contrast on BE, demographic & safety)

Land Use	**Safety**	
	Higher crime	*Lower crime*
Higher pop density/ residential area%	Holmes/ Wentworth	Tonti/ Sandoval
Lower pop density/ residential area%	Parkman/ Hendricks	Lara/Finkl

Study sites


W Roosevelt Rd
W 18TH St
Western Avenue Chicago Illinois
Finkl Academy
W 26TH St
W 31ST St
E 31ST St
55
W 35TH St
E 35TH St
S Archer Ave
S Western Ave
S Wentworth
W Pershing Rd
Hendricks School
Lara Aacademy
W 47TH St
W 51ST St
Parkman School
Sandoval School
Holmes School
Tonti School
W 63RD St
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90
W 67TH St
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© 2006 Sanborn
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entworth School
W 71ST St
E 71ST St
50
S Michigan Ave
S Lake Shore Dr
S Canal St
S Dr Martin L King Jr Dr
S Drexel Blvd
41
S State St
S Pulaski Rd
S Kedzie Ave
S Damen Ave
S Ashland Ave
S Racine Ave
Google
Pointer 41°48'55.12" N 87°39'06.08" W
Streaming 100%
Eye alt 43939 ft

Study design features

- Multi-level
  - Local school areas (LSA)
  - School
  - Household/individual
- Multi-factor
  - BE
  - Safety (traffic and crime)
  - SES
- Complex theoretical model
  - Numerous items comprise multiple factors

Study design: multi-level

- Local School Area (n=8 LSAs)
  - ~½ mile radius around school
  - Comprises attendance area for school
  - Used as a community-level measure
- School (n=8)
  - CPS school
  - K-8th grade

Study design: multi-level

- Household/Individual
  - Sample of K-5th grade students
  - 162 Parent/child pairs enrolled

Multi-factor: LSA

- BE
  - land use, accessibility
  - traffic/walk/ bike conditions
  - street design
- Safety environment
  - crashes involving pedestrians
  - reported crime events
- Socio-demographic environment
  - Poverty rate
  - unemployment rate
  - adult educational attainment rate

Multi-factor: school

- Socio-demographic environment
  - % enrolled students by race/ethnicity
  - % students getting free/reduced lunch

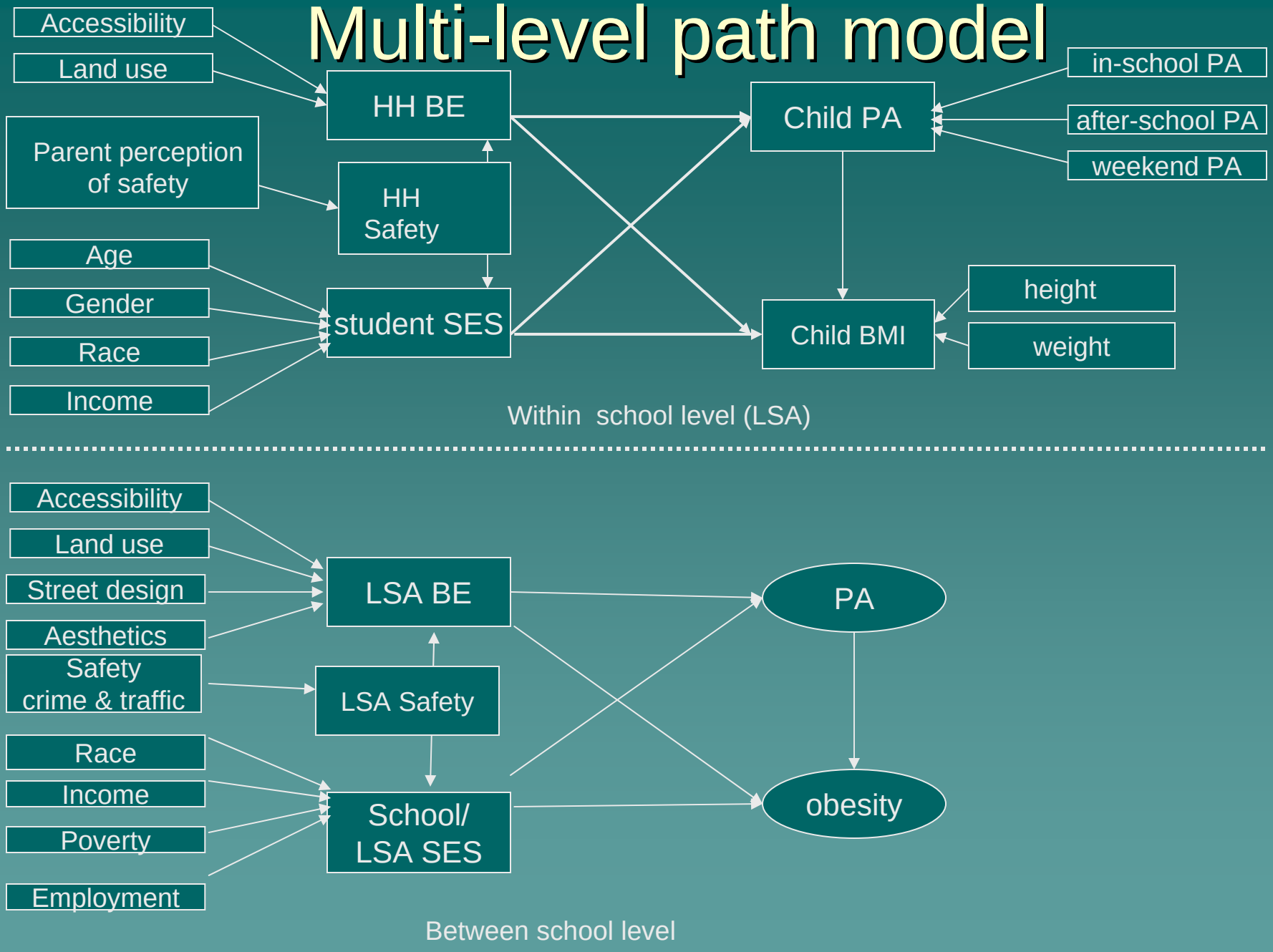
Multi-factor: household/individual

- BE
  - land use (type, number of uses)
  - accessibility (distance to school, parks)
- Socio-demographics
  - race/ethnicity
  - income (annual HH income)
  - educational attainment (highest level obtained by parent)
  - household composition (number adults/children in HH)
- Safety
  - Parental perception of neighborhood safety/problems (survey)
- PA

  child –accelerometers (5 days)

  Parent –PA survey
- Child BMI
  - Height/weight/date of birth

Multi-level path model



Multi-phased analysis

Analysis steps

- Derive PA outcomes
- Exploratory data analysis
- Path analysis
  - Exploratory factor analysis
  - Multiple group analysis
    - School, demography, age, gender, etc
  - Multi-level path analysis
    - LSA, school, family/individual

Analysis: progress to date

Objective: Derive child PA measures

Accelerometer data is complex:

- Accelerometers record a count for every minute of the study period.
- For this study that is 7,200 data points per child or over 1 million data points total!
- Further, counts have to be synchronized to time of day and day of the week and recoded into categorical variables.

Analysis: progress to date

- Count activity level categories correspond to light, moderate and vigorous levels of activity and are validated by other researchers using the same model accelerometers and children of a similar age (Easton).

- As a first step, we computed the percent of hours by activity category. E.g. Subject a: 5% vigorous, 20% moderate, 50% light, 25% no activity.
- Other derivations still need to be done: e.g. % of activity level by time of day, day of week.

Analysis: progress to date

Exploratory analysis has begun:

- Examining correlations between
  - BMI and PA
  - LSA type and PA
  - LSA type and BMI
  - PA and BMI
  - Locations and PA

Preliminary exploratory analysis: Results

- Are BMI and PA related? No ($p \geq .090$).
- Are LSA type (crime/density) and PA related? Yes ($p \leq .027$).
- Are LSA type (crime/density) and BMI related? No ($p = .955$).
- Are LSA type (crime/density) and park use related? Yes ($p = .040$).

Next steps

Further exploratory analysis is needed.

- How do each of the items in the model relate to outcome measures?
- What is the strength and nature of the relationships reported?

Next steps

- Path analysis (testing our causal model using a form of multivariate regression)
- Path analysis tests a causal model

Next steps

Steps in path analysis:

1. Exploratory factor analysis:
   - What items with empirical measures hang together to create a concept? For example: what components of the BE concept hang together to create a BE concept measure?
   - What items be dropped for more efficient data collection/theoretical models in the future?

Next steps

2. Multiple group analysis (school, demographic, age, gender, etc).
   - What group level factors in the model affect outcomes?
   - Does race/ethnicity affect child PA?
   - Does gender affect child PA?

Next steps

3. Multi-level path analysis (LSA, school, family/individual) –this is the holy grail!
– How do each of the levels and factors within the levels contribute to outcomes? This will help us develop better theoretical models for future research.

Thank you!