Parental Attitudes Towards Children Walking and Biking To

SCHOOL

Why is this Issue Important?

- Increase in childhood obesity rates in the US.
  - Between 1976 to 2008, obesity increased from 6.5% to 19.6% , among children aged 6-11.
  - In the same time period, obesity increased from 5.0% to 18.1% , among adolescents aged 12-19.
- Obesity can lead to major health issues such as diabetes, cholesterol, cardiovascular diseases.

Why is this Issue Important?

- Physical Activity can help to combat obesity
  - Only 18% of grade 9-12 students in 2007 met the recommended level of exercise.
- Daily walking or biking to school can be a good source for increasing physical activity.
- It can also help to develop a child's autonomy, and introduce them to more sustainable ways of travelling.

Outline

- Motivation for Research
- Data Description
- Modeling Technique
- Results
- Policy Implications
- Future Work

Motivation for Research

- Previous studies look at demographic and household characteristics, built environmental factors and social contexts.
- More recently, there have been studies that look at attitudes to explain mode choice.
- However, there has hardly been any research on the factors that affect the attitude itself.
- This is crucial in determining policies that can shift attitudes towards non-motorized modes

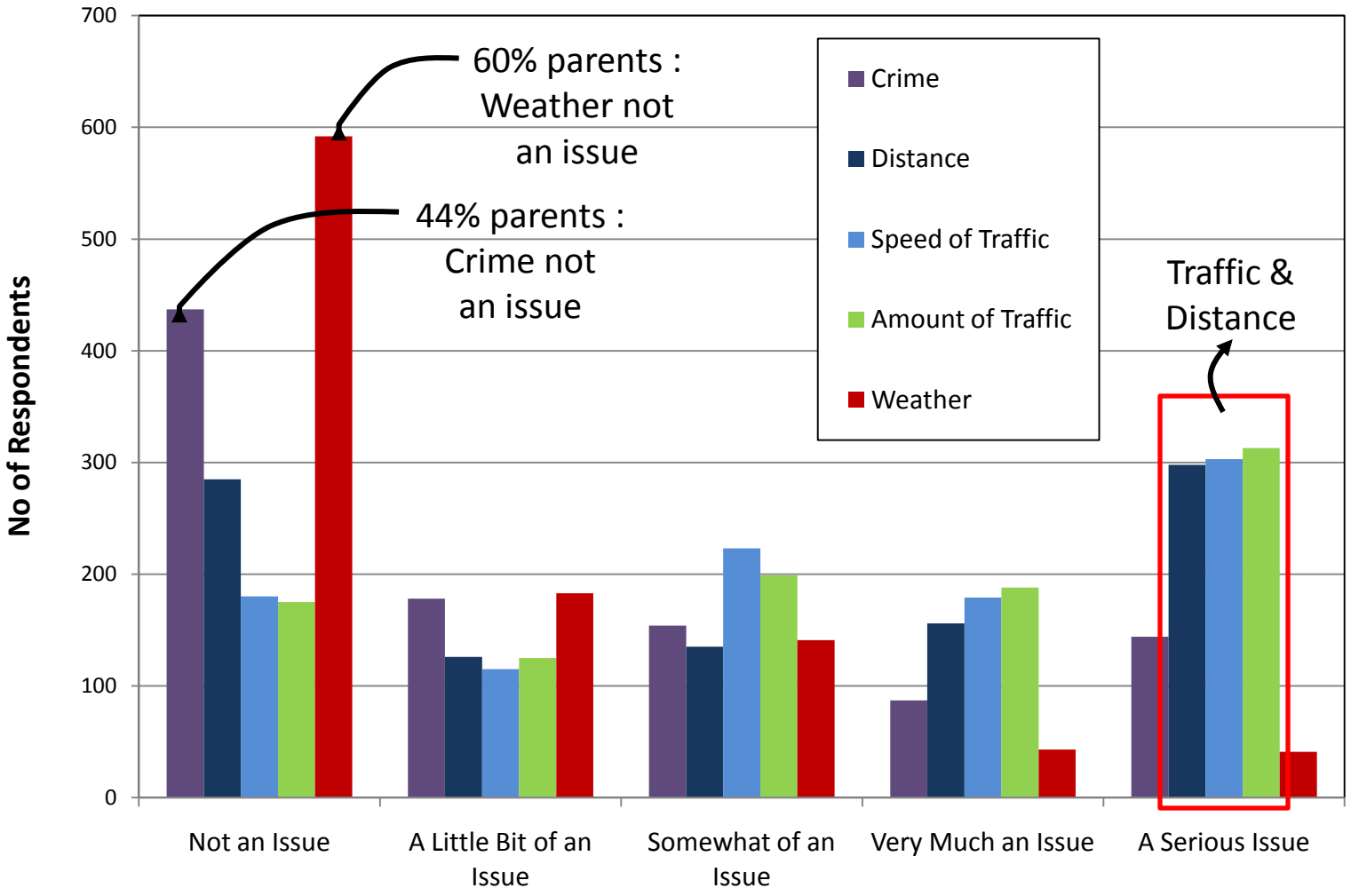
Data – Why use NHTS ?

- The 2009 National Household Travel Survey (NHTS) Dataset is used.
- For the California add on section, this dataset provides unique data on:
  - Adult Attitudes towards walking and biking
  - Parental Attitudes towards children walking or biking to school.
- Only the Los Angeles, Riverside and Orange County CMSA region has been used.

Dependent Variables

- Respondents with school going children were asked how much of an issue the following topics were to them:
  - The Distance between home and school
  - Violence or Crime along the route
  - The Speed of Traffic along the route
  - The Amount of Traffic along the route
  - Poor Weather or Climate in the area.

Dependent Variables



Modeling Techniques

- Multivariate Ordered Response Modeling used
  - We assume there is a set of multivariate continuous latent variables.
  - A covariance matrix is estimated which shows the correlation between the latent variables.
  - A composite marginal likelihood (CML) method is used, instead of maximum simulated likelihood or Bayesian Markov Chain Monte Carlo Methods.

Explanatory Variables

- School Characteristics
    - Distance, Type
- Child Characteristics
    - Age, Sex, Activity Level
- Parents Characteristics
    - Education, Work Info, Modes Used, Activity Level, Attitudes towards their own physical activity
- Household Characteristics
    - Vehicle Count, Income, Race, Presence of Other Children, Housing Type, Number of Adults
- Built Environment Characteristics (Accessibility Measures)

Model Results

- Effect of School Characteristics on Attitudes
  - As distance to school increased, parents were more likely to be concerned about traffic and weather.
  - Parents of children who went to private schools were more worried about crime and traffic. However they were less worried about weather.

Model Results

- Effect of Child Characteristics on Attitudes
  - Parents of more physically active children were less likely to be concerned about crime and distance.
  - Parents of children who are male were less likely to be concerned about crime and distance to school.
  - Parents of older children were less likely to be concerned about the speed of traffic or distance to school.

Model Results

- Effect of Parent Characteristics on Attitude
  - Other than one model, parents work patterns did not have an effect on attitude.
  - Mother and Father's perception of their environment and their reactions are very different.
  - Usually, if a father uses public transit, or feels that there is adequate walk and bike facilities around, he is less likely to worry about crime and traffic.
  - However, a mother who rides public transit, is more likely to be concerned about these issues. This suggests an inherent bias in mothers to worry about children, regardless of circumstance.

Model Results

- Effect of Household Characteristics on Attitudes
  - Parents from High Income Household is less likely to be worried about crime and weather.
  - Parents from Hispanic and Asian Households tend to be more worried about Crime and Weather.
  - Parents from Caucasian Households are more worried about volume of traffic.
  - Speed of Traffic is the only model that was not affected by Income or Race. This suggests that this issue can be a general concern of most parents.

Model Results

- Effect of Built Environment on Attitudes
  - Built Environment is described using Accessibility Measures, which shows for example the length of freeways or no. of shops that can be accessed within a certain time buffer.
  - If a household is in an urban area (as defined by the length of arterials one can access within 10 minutes) parents are likely to be more worried about crime.
  - If a household is near an area with more schools and education establishments, parents are less likely to worry about traffic.

Model Results

- Correlation between the dependent variables
  - Parental concerns about Traffic Speed and Traffic Volume were the most strongly correlated.
  - Traffic Volume and Speed was also strongly correlated with parental concerns about the distance to school.
  - By modeling jointly, we get to capture these correlation effects in the model estimates, which give a better representation than if the dependent variables were modeled separately.

Model Results

- Correlation Table is shown below:

Variable Name	Crime	Dist. to S.	T. Speed	T. Vol.	Weather
Crime	1	-	-	-	-
Dist. to School	0.294	1	-	-	-
Traffic Speed	0.369	0.444	1	-	-
Traffic Volume	0.343	0.541	0.833	1	-
Weather	0.364	0.261	0.218	0.220	1

Policy Implications

- Minimum Acreage Requirement for Schools
  - Redevelop neighborhood schools
- Make Walking and Biking a Habit for Children
  - Have Mandatory Walk to School Days with Parents
  - Have safety walk and bike demonstrations at school
  - Provide incentive for children
- Alleviate Parental Concerns
  - Initiate Walking Bus Programs
  - Educate them about benefits

Future Work

- Using Built Environmental Measures for connectedness of sidewalks and bicycle lanes
- Taking Children's own attitudes into account
- Building a psychological framework that creates a hierarchy of variables that effect attitude.

Credits:

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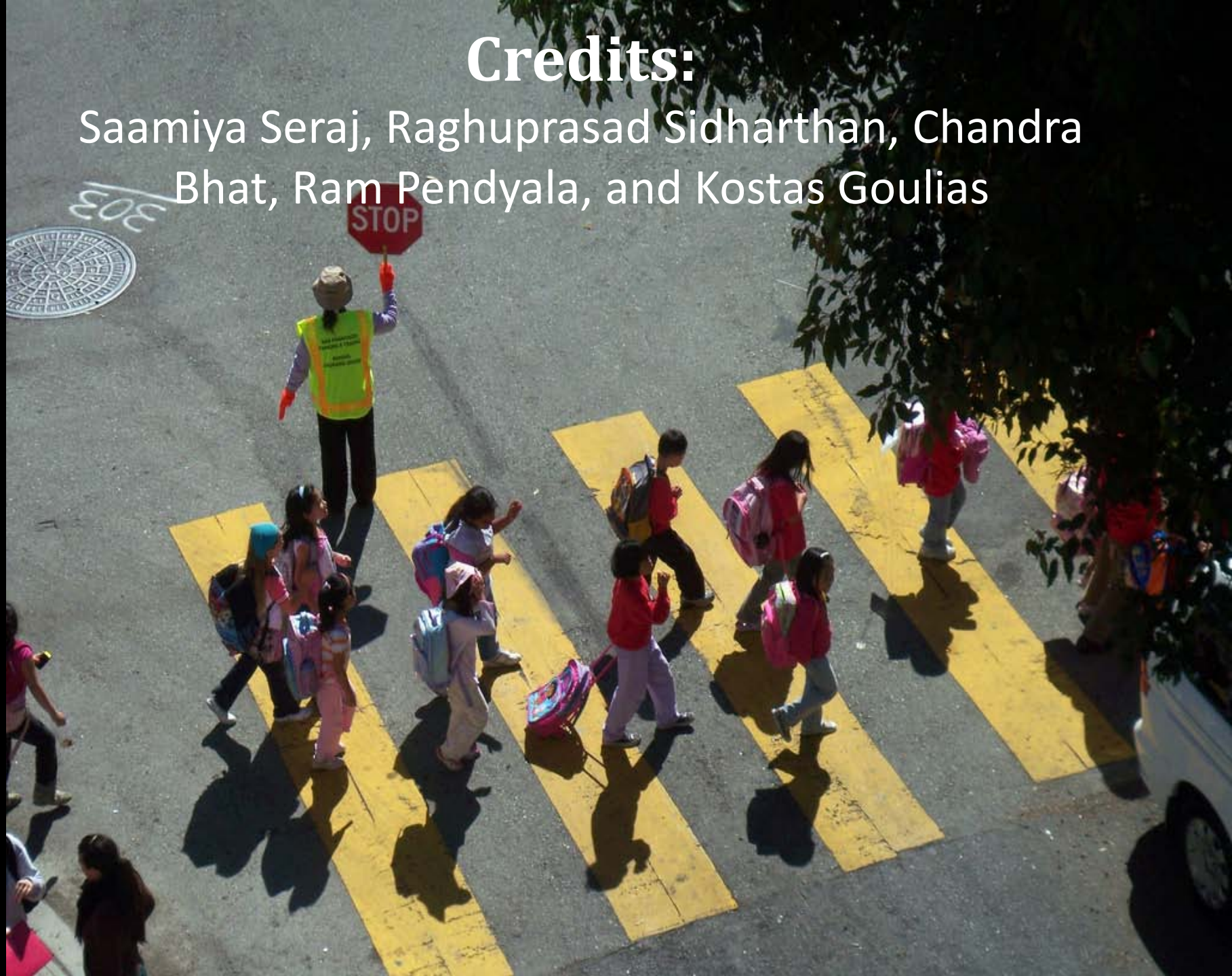

Dependent Variables

- Initially 1166 parents from the LA region had responded to all the five attitude questions.
- However, due to missing data for other factors, only 1000 observations were used.
- The amount of traffic was cited by most parents to be a serious issue

Characteristics of Data Set

- Parents and Household Statistics
  - 87% of fathers and 59% of mothers are workers.
  - Around 70% have an associate's degree or above.
  - 48% of households have an income of above $80,000.
  - 60% of households are Caucasian, 20% are Hispanic.
- Children's Statistics
  - 27% walk or bike to school, 70% use personal vehicles.
  - 38% live over 2 miles away from school.
  - 15% go to private schools.

Mathematical Formulation

The latent propensity for each category of response is written as:

$$y_{qi}^{*} = \beta_i^{'} x_{qi} + \varepsilon_{qi}, y_{qi} = k \text{ if } \theta_i^k < y_{qi}^{*} < \theta_i^{k+1}$$

The error is multivariate normal distributed with a mean vector of zeros and a correlation matrix as follows:

$$\varepsilon_q \sim N\left[\begin{pmatrix} 0 \\ 0 \\ \vdots \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho_{12} & \rho_{13} & \cdots & \rho_{1I} \\ \rho_{21} & 1 & \rho_{23} & \cdots & \rho_{2I} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \rho_{I1} & \rho_{I2} & \rho_{I3} & \cdots & 1 \end{pmatrix}\right],$$

Summary of Model Results

Issues: Distance to School, Crime, Traffic

School is closer	School is far away
Walks or Bikes to School	Goes to School in Car
Physically active children	Not Physically Active
Children in public school	Children in private school
Father Uses Public Transit	Mother Uses Public Transit
High Income	Low-Medium Income
Non-Urban Area	Urban Area