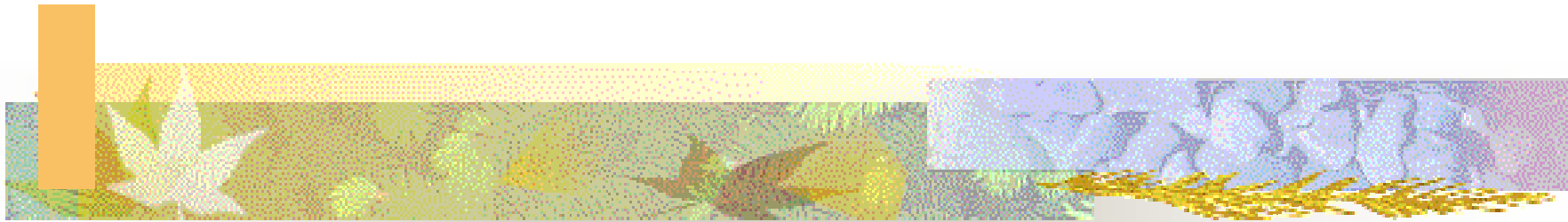# Willingness to Pay for Reduced Accident Risk for Children and Adults:
Inferences from the Demand for Bicycle Helmets

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Advantages of Studying the Bicycle Helmet Market

- Personal safety product

- Purchased for young and old alike

What's New

- Theoretical model
- Injury data
- Weather data

Data

- National Survey on Recreation and the Environment (NSRE)
- Centers for Disease Control and Prevention (CDC) data on pedal cyclist deaths and injuries
- Census data on population and income
- NOAA's National Climatic Data Center data on weather

NSRE

- Managed by USDA's Forest Service
- Random-digit-dialed phone survey of US residents over age 16
- Interviews collected July 2000 - July 2001
- 13 versions comprised of different modules
  - common module concerning demographics and participation in outdoor activities
  - specialized modules collecting detailed information on selected outdoor activities and other special interest topics

NSRE Bicycle Helmet Modules

- 3,956 were either bike riding adults or parents of bike riding children between ages 5 and 14

- In general, respondents were asked either adult bicycle helmet questions or child bicycle helmet questions
  - adult questions concern the respondent's own helmet purchasing decisions
  - child questions concern purchasing decisions made by the respondent for his/her child's helmet

Baseline Mortality and Injury Risk

- Average annual pedal cycle deaths and head injuries by (CDC)

- Information from health literature
  - percent of population that rides bikes (Sacks et al. 1996)
  - percent of bike deaths due to head injuries (Sacks et al. 1991)
  - percent of bike riders who wear helmets (Sacks et al. 1996, Bolen et al. 1998)
  - percent reduction in severe head injuries due to wearing a helmet (Thompson et al. 1996)

- Population (Census)

- Calculate risk with no helmet use

Weather Data

- Raw data from NCDC

- USDA's Economic Research Service (ERS) analysis provided data by zip code
  - Monthly mean maximum temperature
  - Total monthly precipitation

Means for Child Bicyclists (N=1,984)

Own	0.895
Age	9.513
Parent's Age	38.855
Male	0.543
Helmet Law – Yes	0.519
Helmet Law–Don't Know	0.171
Household Income Minus Price ($1000)	58.247
Black	0.088
White	0.887
Parent rides	0.583
Highschool	0.284
College	0.671
Days Ridden	11.008
Risk of Death	5.300 E-6
Risk of Injury	3.083 E-3
Monthly Mean High Temp (degrees)	62.413

Theoretical Model

- Household production model follows Dickie and Gerking (1991) and Agee and Crocker (1996) and allow us to estimate the value of risk reduction.

Empirical Model

$$H = 1 \text{ if } \bar{v}_H - \bar{v}_O > 0$$

$$H = 0 \text{ otherwise}$$

$$\bar{v}_H(\cdot) - \bar{v}_O(\cdot) = \mathbf{X}'\beta + \varepsilon$$

$$\Pr(H = 1) = F(\mathbf{X}'\beta + \varepsilon)$$

Empirical Model (continued)

$$MWTP_b = -\left(\frac{\hat{\beta}}{\hat{\lambda}}\right) F(\overline{X}'\hat{\beta})$$

Logit Models of Purchase Decision – Parent for Child

	(1)	(2)	(3)	(4)
Constant	1.225	0.573	0.898	0.338
Age	-0.122**	-0.093**	-0.120**	-0.082*
Parent's Age	0.014	0.021*	0.020*	0.019*
Male	-1.848**	-1.858***	-1.942***	-1.900***
Helmet Law – Yes	1.905***	1.877***	1.866***	1.887***
Helmet Law – Don't Know	1.012***	0.946***	0.896***	0.956***
Household Income Minus Price ($1000)	0.010***	0.010***	0.010***	0.010***
Black	-2.587**	-2.882***	-3.00***	-2.802***
White	-1.528*	-1.903**	-1.912**	-1.823**
Parent Rides	0.631***	0.551***	0.570***	0.540***
Highschool	0.764**	0.673**	0.815***	0.712**
College	1.303***	1.247***	1.298***	1.301***
Risk of Death	1.999 E5**	1.951 E5**	2.109 E5***	1.900 E5**
Risk of Injury	2.542 E2**	2.860 E2**	2.763 E2**	3.059 E2**
Days Ridden	-0.016		-0.001	
Temp	-0.009*			
Days Ridden * Temp	0.0003			
Appearance Factor				9.810
Comfort Factor				13.398

VSL and VSI

- VSL - $9.5 million ($8.9 - $9.9 million)
    - higher than most adult VSL estimates
    - higher than two child-specific VSL

- VSI - $7 million ($7 - $8.4 million)
    - higher than direct medical costs