

A naturalistic study of child and adult bicycling behaviors and risk exposure

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Overview of U.S. Mode Share

Mode of Travel	% of Commuters		% of All Trips Nationwide ⁽³⁾
	Nationwide ⁽¹⁾	52 Large U.S. Cities ⁽²⁾	
	2.8%	5.0%	10.4%
	0.6%	1.0%	1.0%
	5.0%	17.2%	2.2%
 ⁽⁴⁾	91.6%	76.7%	86.4%
All Modes	100%	100%	100%

United States, 2012

2.2 % of traffic fatalities
N=726


2% of all non-fatal traffic injuries
N = 49,000

Bicycling and bicycling
infrastructure increasing
gradually.

Study Purpose

Develop a data collection and coding system to naturalistically (no researcher manipulation) examine:

- Typical riding patterns (length, day, time, infrastructure type, etc.)
- Risk exposure
- Risky behaviors
- Differences between adults and children

$$\text{Bicyclist Fatality Rate} = \frac{\text{\# of people who died while riding bikes}}{\text{\# of people who rode bikes}}$$


Exposure

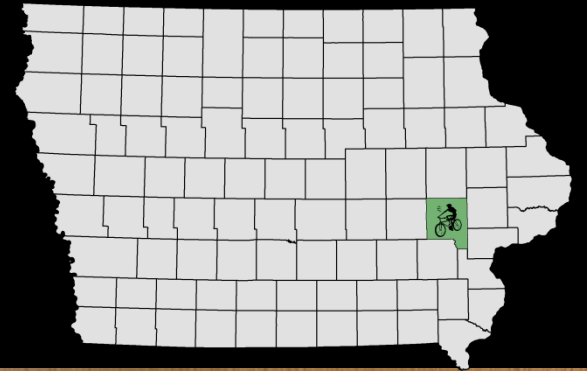
Methods

10 adults, 10 children (aged 10-14) who rode 4+ times per week and lived in Johnson County, Iowa

Record all trips, ridden 'as usual', for 1 week each

Data sources

- Video & GPS data from Contour GPS-enabled helmet cameras
- Baseline demographic survey
- Written trip diaries
- End of study interviews

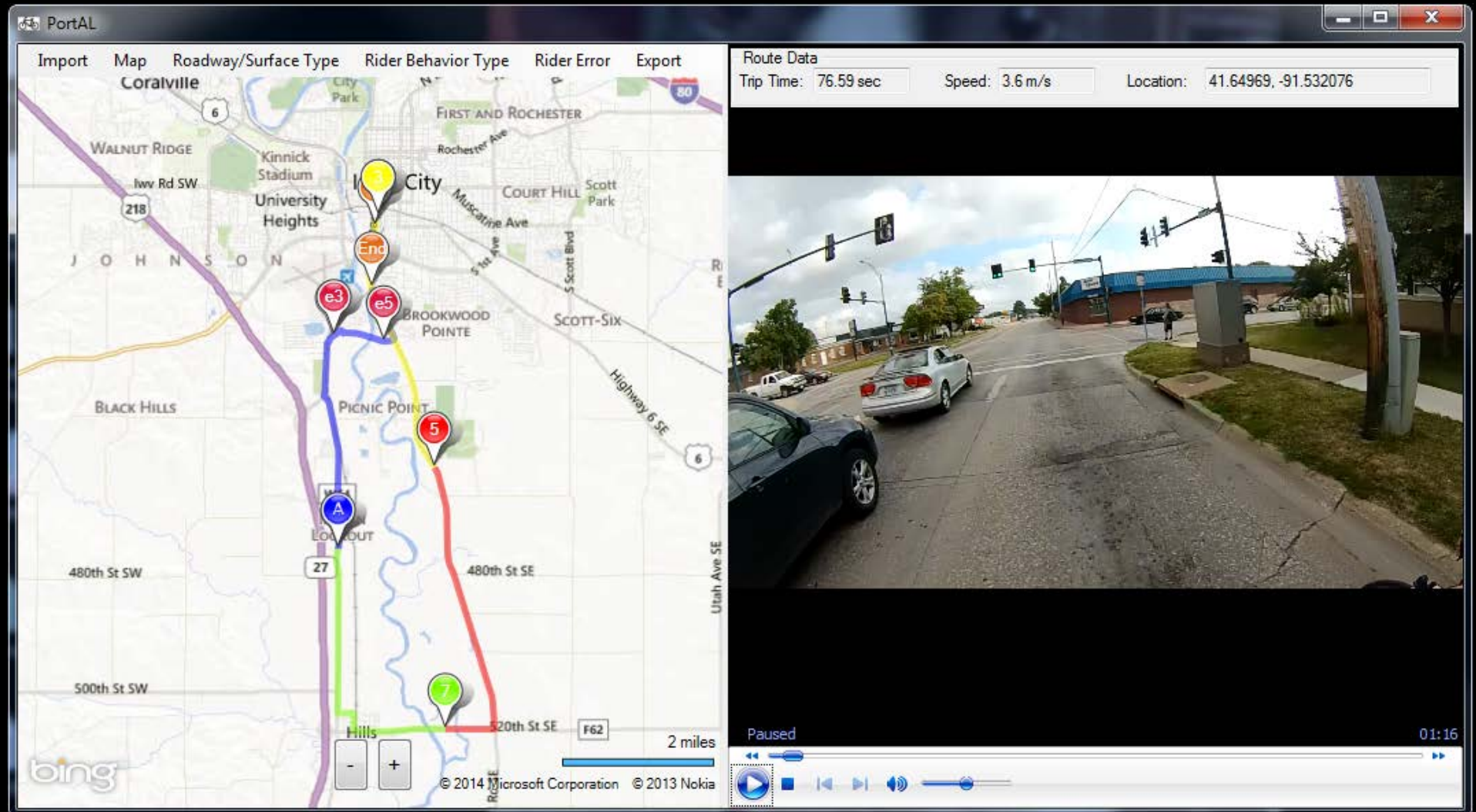


Data coding: Graphical user interface

Infrastructure
Type

Riding Style

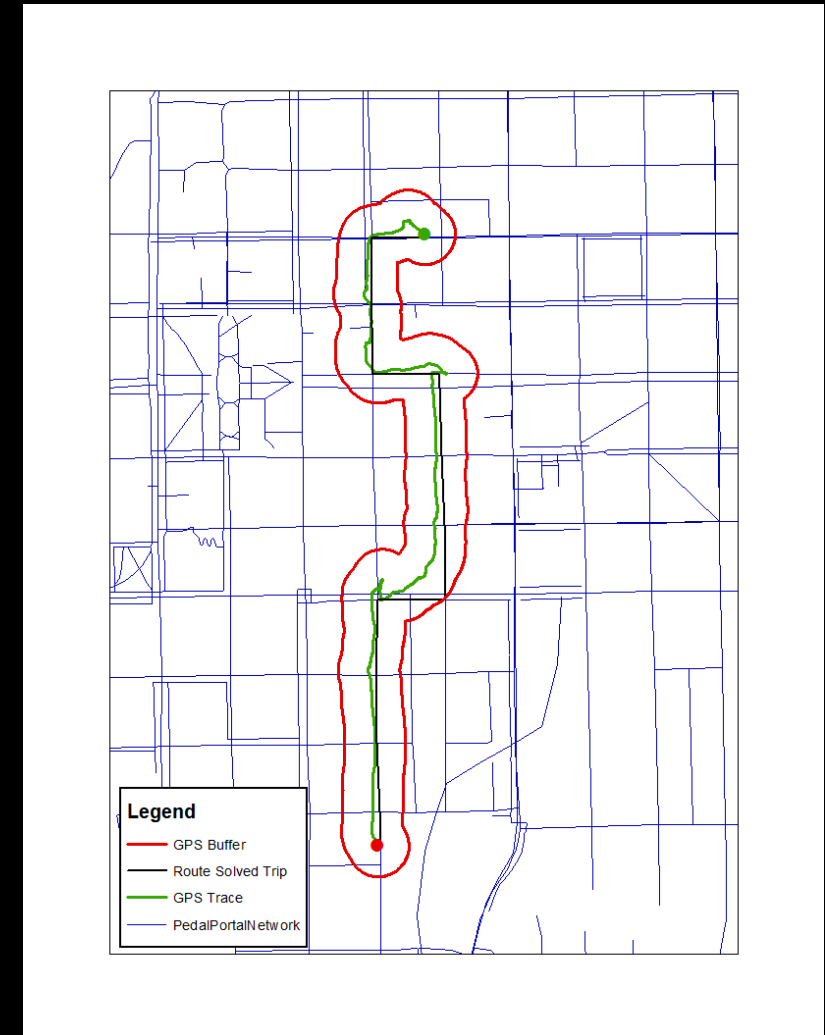
Errors &
Traffic
Violations





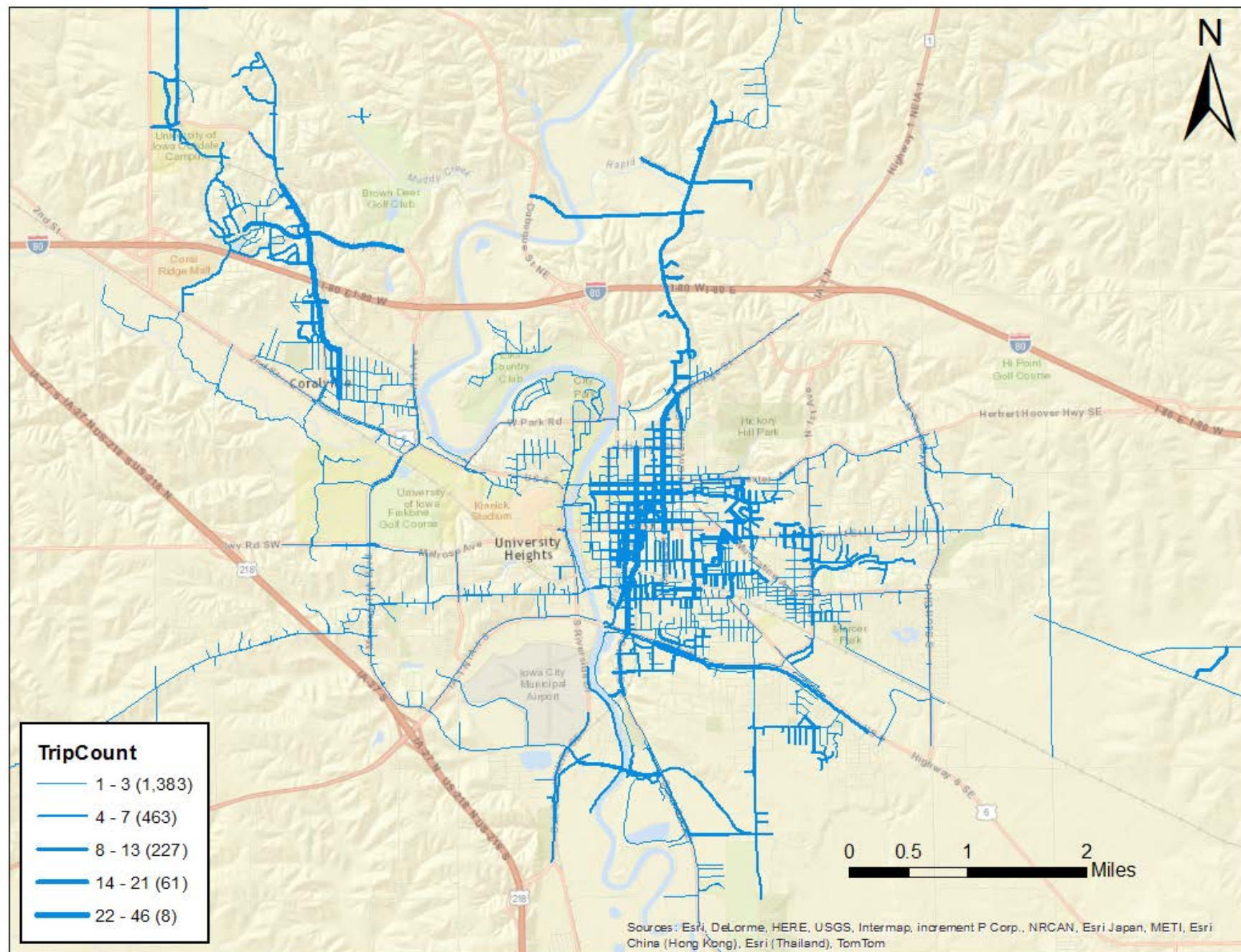
Data coding: ArcMap GIS

- Create trip maps/visualizations
- Determine roadway class and infrastructure available on route (arterial, collector, local, shared lane arrows, bicycle lane, bicycle path, other)
 - Used ArcMap Make Route Layer and Dijkstra's shortest-path algorithm to 'solve' the route
 - Joined GPS points to roadway network
 - Aggregate time spent on each road class/infrastructure
 - Compare to actual infrastructure ridden



Trip counts per
roadway segment
for all participant
trips during study
period, Johnson
County, Iowa.

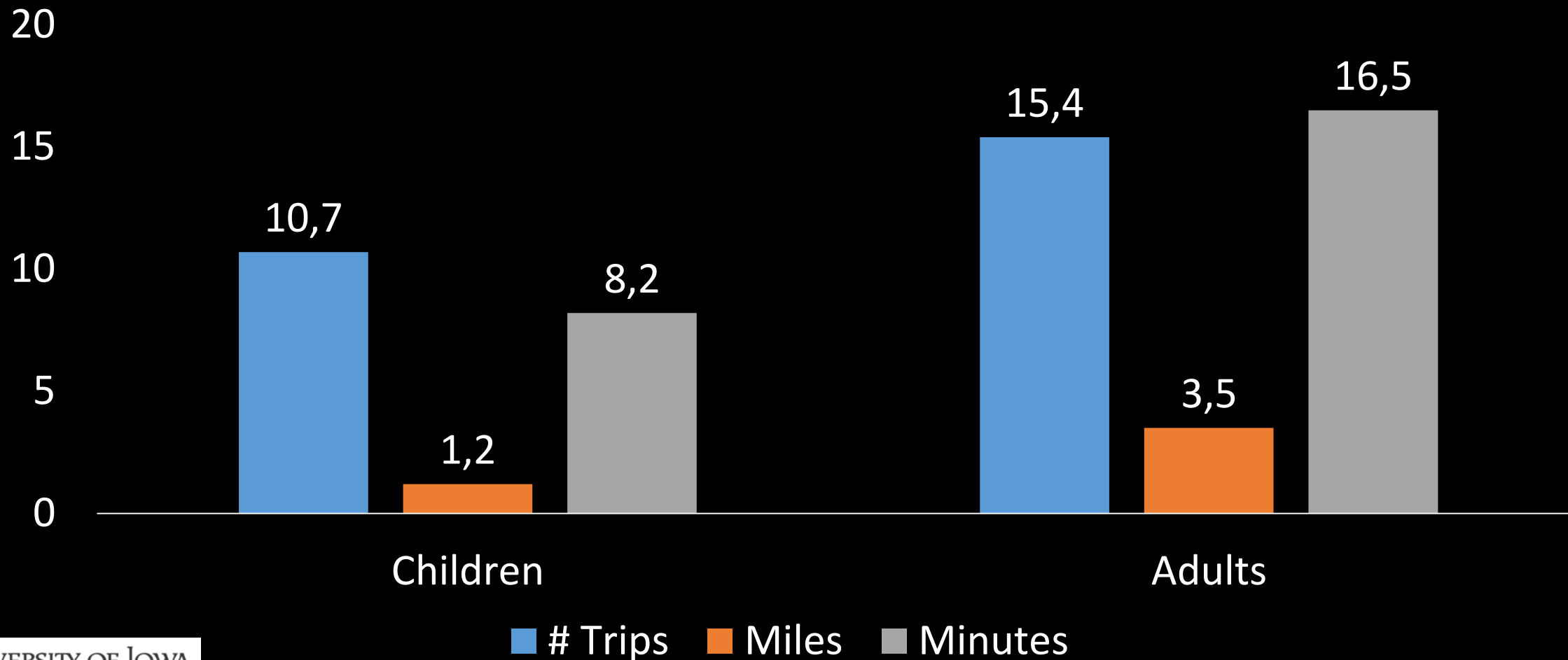
261 trips
57 hours
670 miles



Participant characteristics

	Children	Adults
Age, Mean(SD)	12.0 (0.8)	38.4 (13.6)
Years of regular biking, Mean (SD)	5.3 (1.9)	16.2 (12.1)
Ride bike to work/school	80%	80%
Taken a bicycle riding class	20%	40%

Average Trip Characteristics, 1 Week



100%

Infrastructure Utilized

75%

50%

25%

0%

■ Children
■ Adults

56,4%

12,7%

24,4%

60,1%

5,8%

9,2%

5,2%

0,4%

4,6%

5,8%

1,3%

10,6%

Sidewalk/
Side Path

Paved Street

Bike Path

Other
unpaved

Other paved

Bike Facility

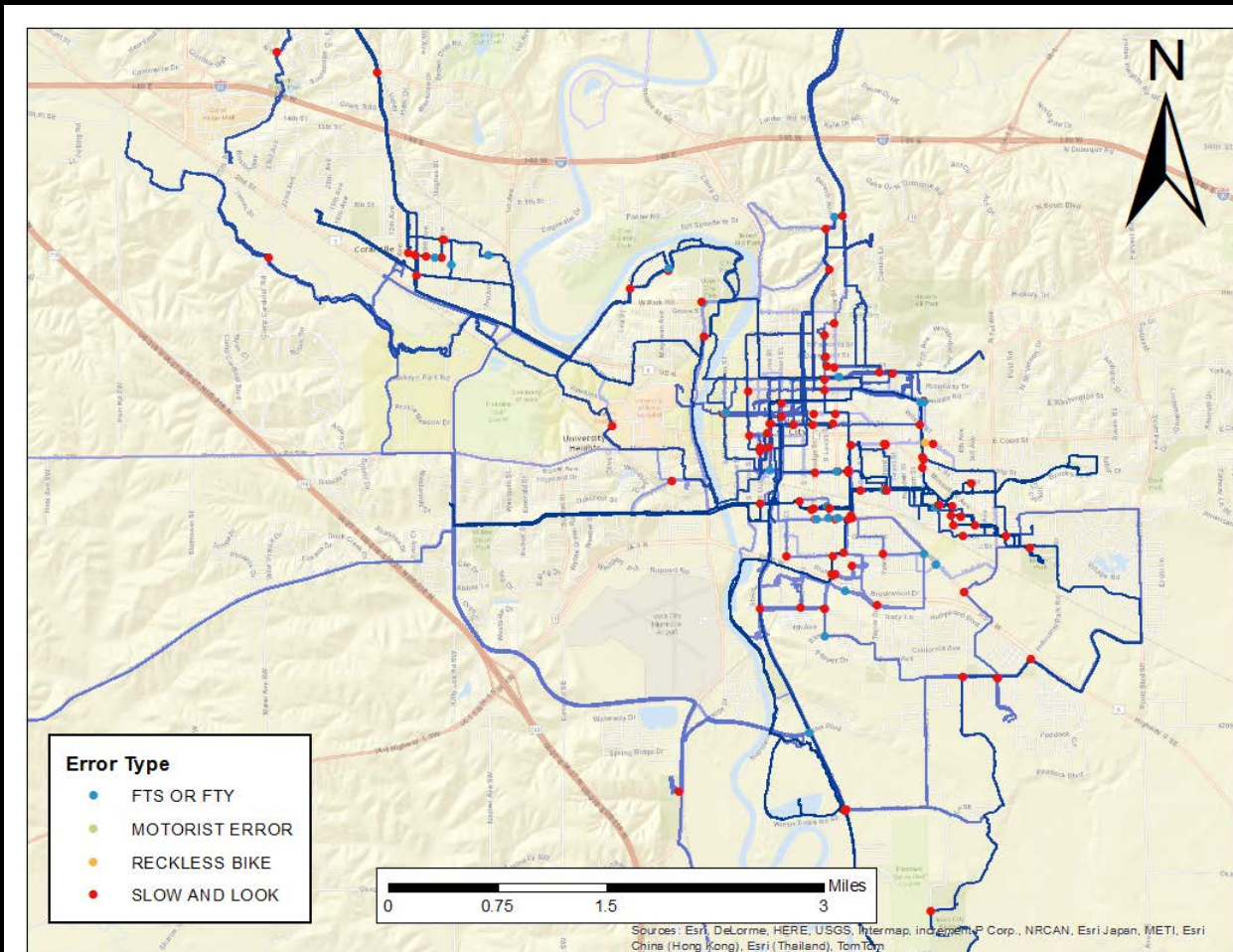
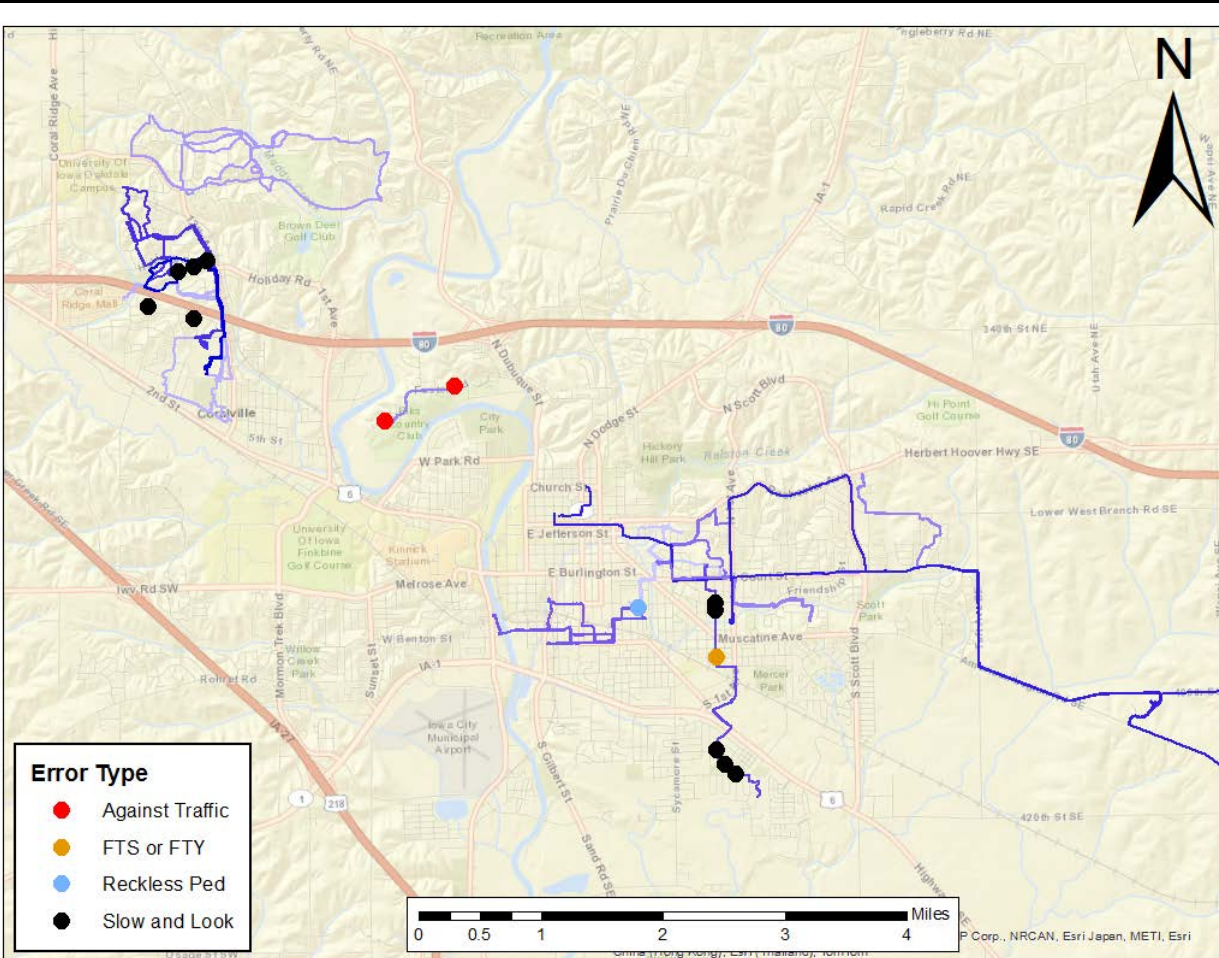
Error, Crash, & Near Crash Rates, Per Mile

	Children	Adults
Slow and Look	0.086	0.203
Failure to stop/yield	0.008	0.102
Reckless toward ped	0.008	None observed
Wrong direction	0.016	None observed
Crash	0.008	0.002
Near crash	0.023	0.006
Motorist error	None observed	0.002

Trip routes and error distributions

Children

Adults



Conclusions

- The use of GPS-enabled helmet cameras is a feasible approach to the naturalistic study of bicyclists
- Limited by small sample size and coding of errors focused on traffic violations
- There are unique variations between children and adults in their bicycle riding experience
- A larger-scale study is needed to further examine bicycling risk exposure and risky behaviors among adults and children

Thank you!

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