Analysis of Bicyclist Involvement in Indiana Motor Vehicle Collisions

Partnership with the Indiana Criminal Justice Institute

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Indiana University Public Policy Institute
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Today’s Discussion

• Background on traffic safety research project
• Select research findings on bicyclists involved in collisions
• Innovative approaches to improving bicycle safety
Background on traffic safety research project

PPI now entering 10th year partnering with ICJI on statewide traffic safety collaboration. Federal support provided by National Highway Traffic Safety Administration (NHTSA), and much of our work follows NHTSA guidelines

PPI traffic safety research team
- Dona Sapp, Principal Investigator
- Dr. Seth Payton
- Rachel Thelin
- Dr. Sam Nunn

Indiana Traffic safety partners
- ICJI
- Governor’s Council on Impaired and Dangerous Driving
- Other state agencies (ISP, BMV, INDOT, JTAC)
- Local law enforcement agencies
- Other (AAA, SADD, Bicycle Indiana, Riley Automotive Safety Program, Purdue Center for Road Safety)
## Background on traffic safety research project

### Traffic safety data sets

- Indiana State Police Automated Reporting Information Exchange System (ARIES) *(crash report data – collisions, vehicles, people)*
- Indiana Bureau of Motor Vehicles *(driver history, licensed drivers, registered vehicles, citations)*
- Indiana Department of Transportation *(Indiana county level VMT)*
- Indiana Supreme Court, Judicial Technology and Automation Committee (JTAC) *(Electronic Citation and Warning System (eCWS) data)*
- Bureau of Transportation Statistics, State Transportation Statistics *(State VMT)*
- Fatality Analysis Reporting System (FARS), National Highway Traffic Safety Administration *(fatal traffic crashes)*
- Federal Highway Administration, Traffic Volume Trends *(national VMT)*
- U.S. Census Bureau *(State and county population data)*
Background on traffic safety research project

ARIES crash database overview

- ARIES – “Automated Reporting and Information Exchange System”

- Owned by Indiana State Police, managed by Appriss

- IC 9-26-2-1

Sec. 1. A law enforcement officer shall investigate each motor vehicle accident that results in any of the following:

(1) The injury or death of a person.
(2) Total property damage to an apparent extent of at least one thousand dollars ($1,000).
Background on traffic safety research project

ARIES crash data entry and database structure

Officer completes crash report
(As of 2015, nearly 100% of law enforcement agencies submit reports electronically, 94% are timely (within 5 days of crash))

Data stored in relational database
(includes 15 core tables, more than 200 fields, ~4 million records annually)
ARIES crash data entry and database structure

Officer completes crash report
ARIES crash data entry and database structure

ARIES database organization

- Replicated ARIES DB structure: 15 core tables...added views (virtual tables) to simplify querying, added additional data sets to enhance analysis
- Created functions as needed from Core ARIES data (locale, impaired driving, dangerous intersections)
- PPI is one of 3 entities with full ARIES access and as a result has the greatest analytical capabilities.
Background on traffic safety research project

PPI research process

• PPI receives ARIES data extract from Appriss

• Data management partner, Department of Biostatistics, IUPUI

• Import ARIES and other data sets into SQL
  • Reconcile fatality counts with FARS team, Indiana State Police

• Research team queries and analyzes data

• Create data visualizations for use in publications, presentations, infographics, etc. to assist law enforcement and community partners with enforcement and public awareness campaigns
Background on traffic safety research project

PPI annual traffic safety publications

Spring fact sheets (February thru June)
- Alcohol
- Children (child passenger safety)
- Dangerous driving
- Non-motorists (bikes, pedestrians)
- Motorcycles
- Occupant protection
- Trucks
- Young drivers
- County/municipality profiles book (2 pages per county)

Annual Indiana Crash Facts book
(July thru September)
- Problem ID (in accordance with Indiana's Highway Safety Plan)
- General Trends
- Collisions (including work zones)
- Vehicles
- Motorcycles
- People
- Alcohol
- Speed
- Counties

Note: Focus from October thru January of each year is on presenting results to stakeholder groups; debriefing and planning priorities and changes for coming year; project management activities including file clean up, establishing work assignments and schedules, and obtaining updates to all necessary data sets prior to beginning analysis. Committee meetings take place year round.
Select Research Findings on Bicyclists Involved in Collisions
Bicyclists in Indiana collisions, injury status and year, 2006-2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Fatal and incapacitating injuries in Indiana collisions as a percent of all involved, by person type, 2011-2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Indiana traffic collisions involving bicycles by month and day/night, 2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Indiana collisions, by bicycle involvement, hour, and day of week, 2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Bicyclist fatality rates and geographic distribution of bicyclist fatalities and non-fatal injuries in Indiana collisions, by Census locale, 2006-2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Bicyclists involved in Indiana traffic collisions, by road class and injury status, 2006-2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
### Proportion of bicyclists in Indiana collisions, by age group and gender, 2011-2015

#### Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016

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<td>All ages</td>
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<td>78.1%</td>
<td>21.9%</td>
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</table>
Bicyclists in Indiana collisions, by bicyclist action as a contributing factor, 2006-2015

- Crossing at intersection: 3,276
- On roadway: 1,452
- Moving: 1,103
- Crossing not at intersection: 924
- Other: 710
- Against traffic: 646
- With traffic: 587
- Not in roadway: 332
- On shoulder: 207
- On designated non-motorist lane: 192
- Standing: 22

n = 9,451 bicyclists in collisions

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Fatal and incapacitating injuries among bicyclists in Indiana collisions, by bicyclist action as a contributing factor, 2006-2015

Source: Indiana State Police Automated Reporting Information Exchange System (ARIES), as of March 17, 2016
Innovative approaches to studying and improving bicycle safety
Public policy - informing change to policy and program activities

Results are presented to many stakeholder groups including:

• Governor’s Council on Impaired and Dangerous Driving
• Traffic Records Coordinating Committee (TRCC)
• Law Enforcement Liaisons
• Legislators
• Chronic Disease Integrated Epidemiology Group, ISDH (bicycle collision findings – Bicycle Indiana)
Innovative approaches to studying and improving bicycle safety

Estimating bicyclist exposure to risk of injury in crashes

Indiana bicycle crash data analysis has been limited by the lack of bicyclist exposure to risk data. Implementing the Minneapolis model to gathering exposure data in Indianapolis will address this need and may lead to applications of this model in other Indiana bicycle-friendly communities over time.

<table>
<thead>
<tr>
<th>Region V State</th>
<th>Pedalcyclist Fatalities 2013</th>
<th>Pedalcyclist Fatalities / 100,000 population</th>
</tr>
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<tbody>
<tr>
<td>Illinois</td>
<td>30</td>
<td>0.23</td>
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<tr>
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<td>Wisconsin</td>
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</table>
Innovative approaches to studying and improving bicycle safety

*Estimating bicyclist exposure to risk of injury in crashes*

Collaborating with Dr. Greg Lindsey, University of Minnesota, to replicate methods used in Minneapolis to collect bicycle count data and model bicycle traffic volume estimates in Indianapolis.

- Student capstone, service learning, or graduate assistant research project to collect the bicycle count data.
- Conduct surveys to assess awareness of the recent addition of bicycle lanes on Indianapolis roadways and appropriate driver and bicyclist behaviors related to bicycle lanes.
- Utilize spatial analysis tools to overlay Indianapolis crash data with bicycle lanes and greenways to determine the impacts of the addition of bicycling infrastructure on bicyclist involvement in collisions.
Innovative approaches to studying and improving bicycle safety

Estimating bicyclist exposure to risk of injury in crashes

Planned Case studies: Use of monitoring, modeling, and analytic procedures developed in Minneapolis to analyze crashes in Indianapolis, Columbus, and Milwaukee. The specific objectives of the research are to:

- Use recent estimates of bicyclist exposure to risk in Minneapolis in analyses of factors associated with bicycle crashes in Minneapolis;
- Assemble bicycle counts and estimate bicycle traffic demand models and exposure to risk in Indianapolis, Columbus, and Milwaukee;
- Use estimates of bicycle traffic volumes to analyze needs for traffic controls and factors affecting bicycle crashes in Indianapolis, Columbus, and Milwaukee.