CODES

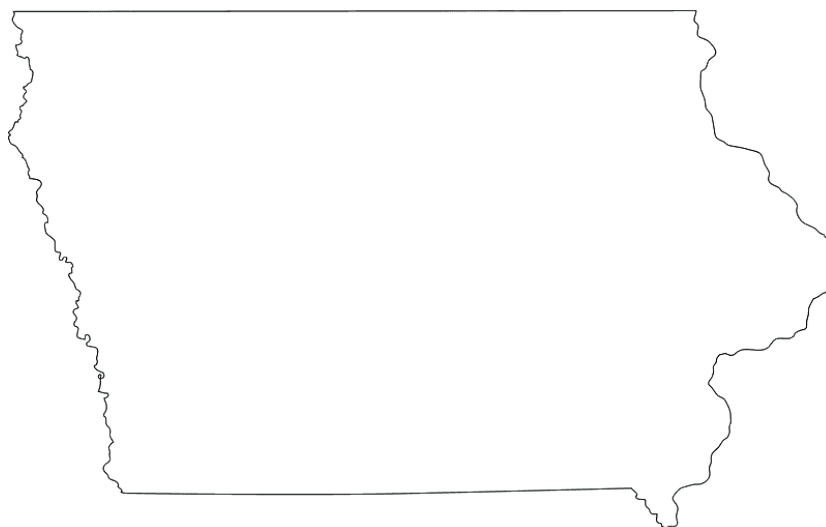## *Iowa* Crash Outcomes Data Evaluation System

2021
Year-End Report

Prepared by the
University of Iowa Injury Prevention Research Center
Under contract to Iowa Governor's Traffic Safety Bureau and Iowa Department of Transportation

THE UNIVERSITY OF IOWA

!PRC INJURY PREVENTION RESEARCH CENTER

GTSB

PROJECT DESCRIPTION

The goal of the CODES project is to examine outcomes (injuries, long-term disability, hospital charges, discharge status) related to motor vehicle crash-related injuries in the State of Iowa. This will be accomplished by probabilistically linking identified person (patient)-level crash, hospital, and mortality data.

The hospital data (inpatient and emergency department) sources are the Iowa State Inpatient Database (SID) and Iowa State Emergency Department Database (SEDD), which comes from AHRQ's Healthcare Cost and Utilization Project (HCUP). Crash data are obtained from the Iowa Department of Transportation and mortality data are obtained from the NHTSA's Fatality Analysis Reporting System (FARS).

CURRENT STATUS

We completed linkages for 2016, 2017, and 2018 data, finished 2019 data cleaning and examined the merged dataset (2016 and 2017). Meanwhile, we are doing a software trial on LinkSolv to evaluate its performance on probabilistic linkage. We tried several linkage software programs: LinkPlus, LinkKing, R package reclin, and LinkSolv. The R package reclin is free and was used as the main tool, but has stopped being updated and cannot be used anymore.

The linking results for each year have similar patterns. Figures 1 and 2 show how many matches there are among the four datasets (crash, SID, SEDD, FARS) for 2016 and 2017, respectively.
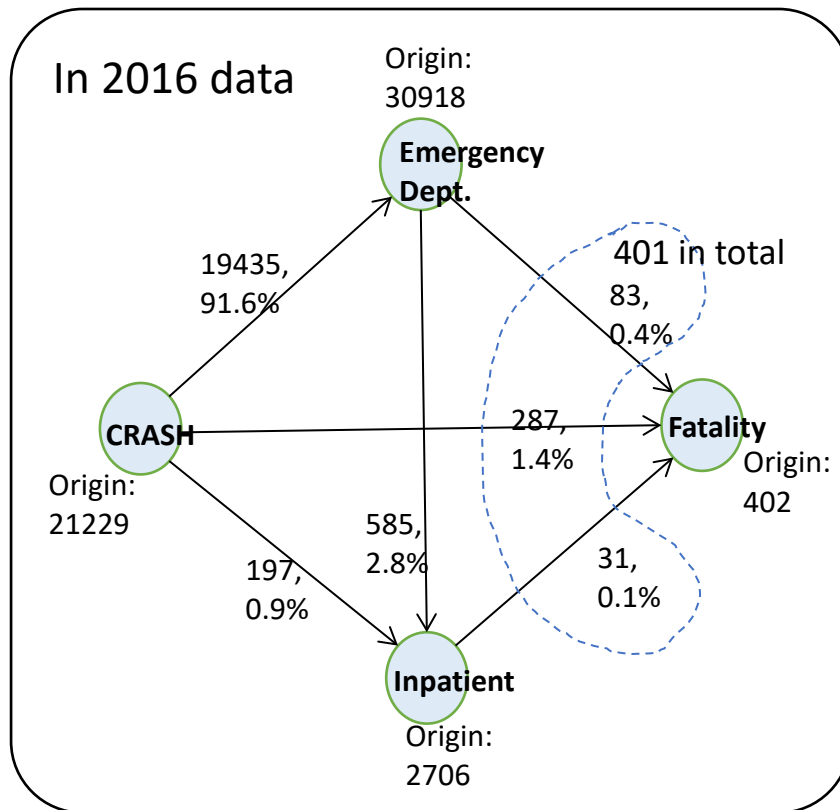
Figure 1. Linkage results among the four data resources for 2016
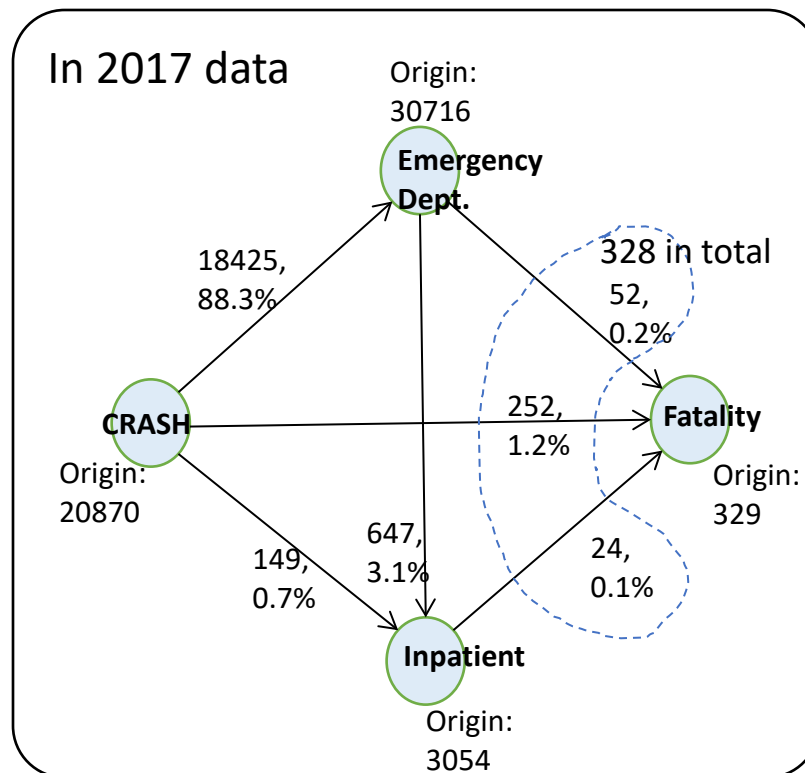

Figure 2. Linkage results among the four data resources for 2017

TEEN DRIVER CULPABILITY ANALYSES

### TEEN DRIVER-INVOLVED CRASH FREQUENCIES AND INJURIES BY CULPABILITY

One analysis we began aims to understand: 1) the frequency of culpable teen driver and non-culpable teen drivers; 2) how frequently other vehicles/parties are involved; and 3) the injury/death frequency among involved vehicles/parties. We are using the 2016 and 2017 linked dataset so far to explore this topic. Figures 3 and 4 show the current preliminary results:
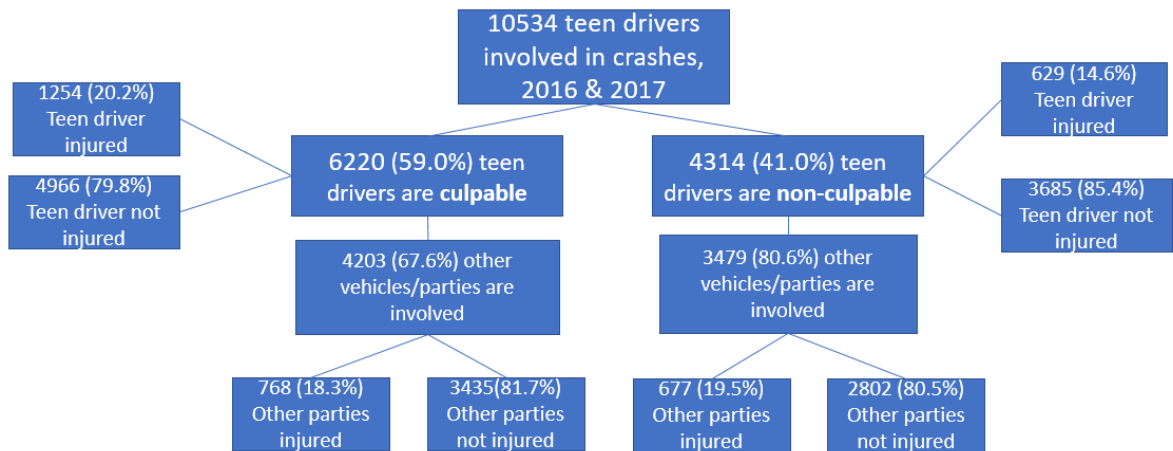
* Other parties = drivers and passengers other than the teen driver
* Relabel the 500 crashes involving culpable and non-culpable to be culpable.

Figure 3. The flow chart of the frequency of teen drivers vs. non-culpable teen drivers
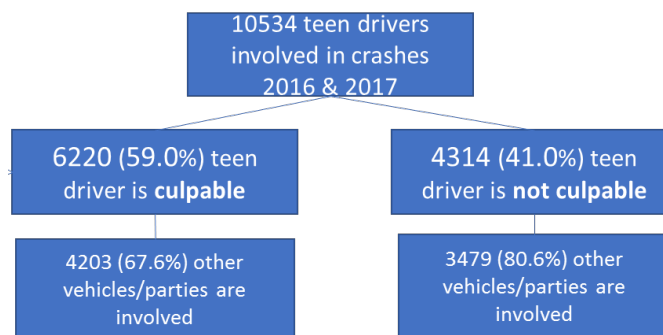
Figure 4. The flow chart of the deaths of culpable teen drivers vs. non-culpable teen drivers

TEEN DRIVER-INVOLVED CRASH COSTS BY CULPABILITY

Another analysis we are working on is to estimate direct medical costs for teen driver-involved crashes by teen culpability, comparing costs for the teen driver, passengers in the teen's car, and occupants of other vehicles. We are using the 2016 and 2017 linked dataset so far to explore this topic. Table 1 shows the charges ($) for teen drivers involved in crashes (the teen drivers only) by teen driver culpability. It shows the average charge of emergency department patients are comparable between culpable and non-culpable, but inpatient charges are much higher in the culpable group.

Table 1. Inpatient and emergency department medical costs for parties involved in crashes with teen drivers, stratified by teen driver culpability

1-Teen driver culpable vs. Non-culpable charge ($)					
	Inpatients		Emergency dept patients		Total
	Tot.	Ave.	Tot.	Ave.	
Culpable	1281579	85438.6	4349141	3527.3	5630720
Non-culpable	296683	29668.3	2153694	3445.9	2450377

2-Teen vehicle with occupants culpable vs. Non-culpable charge ($)					
	Inpatients		Emergency dept patients		Total
	Tot.	Ave.	Tot.	Ave.	
Culpable	534222.5	44518.54	1868176	3743.8	2402398.5
Non-culpable	792085.7	88009.53	1019835	3708.5	1811920.7

3-Other vehicles/parties-total cost of all injuries charge ($)					
	Inpatients		Emergency dept patients		Total
	Tot.	Ave.	Tot.	Ave.	
Culpable	2673079.0	74252.2	3515645.0	4073.7	6188724.0
Non-culpable	2040432.0	68014.4	3018861.0	4090.6	5059293.0

4-Crash level total charge ($)					
	Inpatients		Emergency dept patients		Total
	Tot.	Ave.	Tot.	Ave.	
Culpable	4488881.0	71252.1	9732962.0	3750.7	14221843.0
Non-culpable	2903943.0	60498.8	5946339.0	3811.8	8850282.0

Culpable teen-involved crashes lead to higher proportions of injury and higher costs, with much of these costs for care for other individuals in the crash.

PROBLEMS/LIMITATIONS

1. The linkage keys are not unique to one record (e.g., name, date of birth, etc.). Although we use the best combination of linkage keys to do the linking, the linkage results can still contain errors. In addition, the R package *reclin* used to do linkage stopped updating in 2019, which caused a version matching problem.
2. In the crash data, an issue related to the unitnum (vehicle unit number) arose starting with the 2018 data. The unitnum was input wrongly to the occupants. It will not be possible to reliably determine if and how many passengers the teen drivers had in the vehicle with them, except for single-vehicle or multi-vehicle crashes with unit(s) that contain only the driver(s).

NEXT STEPS

1. Instead of using a single linked dataset, we will use multiple imputed datasets which can lead to unbiased estimates. To do so, we will start a trial of LinkSolv Record Linkage Software supporting multiple imputed datasets.
2. Incorporate justice (charges & convictions) data. Add more years of data (2018 to present) to analyze.
3. We also plan to share the data we have linked so far with Michelle Reyes for use in her GTSB project. We will continue exploring opportunities for collaboration with other states on analyses, work on drafting a paper based on the teen driver culpability and costs analyses, and continue to find additional ways to use the linked data.

Appendix A

Iowa's 2021 CODES Project Personnel

Conducted by the University of Iowa Injury Prevention Research Center
Under contract to Iowa Governor's Traffic Safety Bureau and Iowa Department of
Transportation

<u>Principal Investigators</u>
Cara J. Hamann, MPH, PhD
Assistant Professor
The University of Iowa Injury Prevention Research Center

Corinne Peek-Asa, MPH, PhD
Professor
The University of Iowa Injury Prevention Research Center

<u>Data Analyst</u>
Ling Zhang

<u>GTSB Contact</u>
Mick Mulhern