

North Carolina Crash Injury Surveillance System: Year 1 Summary

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We have concluded the first year of the North Carolina Crash Injury Surveillance System (NC-CISS) project. The goal of the project was to create a sustainable linkage methodology to link crash report data with health outcome data. To fulfill this goal, we evaluated different linkage methodologies before creating final linked datasets. The linked datasets will provide a more complete picture of the circumstances and outcomes associated with motor vehicle crash injuries in North Carolina.

Descriptions of Source Data

The system in Year 1 is comprised of two health datasets linked with the crash report data: death certificate data and emergency department (ED) visit data from the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT). All data were from 2018.

Crash Report Data

There were 832,058 persons involved in 355,571 crashes in the 2018 crash report data.

- 0.4% (N=1,468) of persons were reported as fatally injured in crashes.
- 16% (N=129,774) of crash victims were reported as having non-fatal injuries ranging from possible injury to serious injury.
- 84% of all persons in crashes were reported as having no injury (N=689,423) or were missing an injury designation (N=11,392).

Death Certificate Data

There were 94,867 deaths recorded in North Carolina in 2018. 8% (N=7,680) had an injury cause of death code and 1.8% (N=1,677) had a transportation-related cause of death code.

NC DETECT Emergency Department Visit Data

There were 5,084,987 emergency department (ED) visits in the 2018 dataset, among which 803,649 (16%) had at least one injury diagnosis code. 126,734 (2%) contained at least one transportation-related external cause of injury code. In North Carolina, the reporting of external cause of injury codes is not mandatory; therefore, some transportation crash injury-related ED visits may be missing these codes.

Evaluating Linkage Methodologies

We tested three different data linkage methodologies for the linkage of crash and death certificate data:

- a. Recursive partitioning trees (RPT) in R
- b. Probabilistic linkage using LinkSolv
- c. Cascading hierarchical deterministic linkage with block filtering in R (CHD)

For crash and ED visit data linkage, we tested only the last two methods (b and c above). Because RPT and LinkSolv required more computing resources and may be more challenging for multi-disciplinary audiences, we focused on refining the CHD linkage methodology to achieve our desired results.

We compared the results of the linkage using the different methodologies and analyzed the results for missingness and data mismatch patterns. For the crash and death certificate linkage, we also created a

hand-reviewed set of 1,483 matched records to use as a comparison set. All analyses using the 2018 death data will use the hand-reviewed dataset. Due to the amount of resources required for creating the hand-reviewed dataset, future years of analyses will use the CHD method.

We applied a similar process to the crash and ED data linkage. We also sampled 1% of the results from LinkSolv and CHD linkage methods and used the verification of those results to inform the process. We also reviewed LinkSolv matches with ED visits four or more days after the crash and subsequently revised the algorithms for both methodologies based on the results.

Linkage Results

Linked Crash and Death Certificate Data

The CHD-generated dataset matched 1,375 death certificates to persons from 1,274 crash events.

- 92% (N=1,355) of crash-reported fatalities were matched with death certificates.
- Less than 1% (N=13) of persons reported as having non-fatal injuries, ranging from possible injury to serious injury, were matched with death certificates.
- Less than 1% (N=7) of persons reported as having no injury or were missing an injury designation were matched with death certificates.

Linked Crash and NC DETECT Emergency Department Data

The CHD-generated dataset matched 83,998 emergency department visits to persons from 63,681 crash events.

- 10% (N=158) of crash-reported fatalities matched with ED visits.
- 40% (N=52,502) of persons reported as having non-fatal injuries, ranging from possible injury to serious injury, were matched with ED visits.
- 4% (N=31,338) of persons reported as having no injury or were missing an injury designation were matched to ED visits related to the crash.

Note: Linkage totals reflect the linked datasets at the time of this report. Future analysis using later iterations of the linked datasets may produce different totals due to additional data validation and linkage evaluation.

Next Steps

- Analyze the data linkage and linked datasets and share the results with local, state, and federal partners in transportation, planning, and public health.
- Leverage state funding to create a data dashboard and assemble a research advisory board to help identify important research and policy questions to be addressed with the linked data system.
- If funding is procured, add additional years of linked data and, eventually, additional data sources.

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NC DPH Data Attribution & Disclaimer

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