In 2000 and 2001, nearly all of the crash-involved motor vehicle occupants who were killed in Kentucky were in vehicles that were reported by police as being severely damaged. The majority of those who were hospitalized were in severely damaged vehicles (SDV’s), as well.

However, among the 14% of all crash-involved occupants who were in SDV’s, most were not seriously harmed (i.e., were neither killed nor hospitalized). This leads to the research question:

What factors explain the difference between occupants of severely damaged vehicles who were killed or hospitalized, and those who were not?

Methods

Kentucky motor vehicle crash reports

Any collision reports for occupants who were involved in passenger motor vehicle crashes in Kentucky with vehicles severely damaged during 2000 and 2001 were taken as our crash data.

Kentucky inpatient hospital discharge data

Any Kentucky hospital inpatient records with any diagnosis code between 800 and 999 during 2000 and 2001 were taken as our hospital data.

Data linkage

Probabilistic data linkage was used to link the crash and inpatient hospital data files. In this way the hospitalized occupants were identified.

Risk factors considered

Occupant factors: age, gender, driver/passenger, restraint usage, ejected from vehicle, suspected of driving under the influence of drugs or alcohol

Vehicle factors: vehicle type, vehicle year, overturned, vehicle caught fire

Crash factors: single-vehicle crash, head-on collision, collision with fixed object, collision at intersection

Environmental factors: road type, weather, time of crash (11pm – 4am vs. 5am – 10pm), number of lanes on roadway, posted speed limit, rural vs. urban crash location

A logistic regression model was built using these factors as independent variables, and an indicator for occupant death or hospitalization as the dependent variable. The analysis was conducted using SAS v8.2.

Results

Risk factors

A brief discussion of several factors found to be associated with a marked increase (i.e., at least 1.5 times) in the risk of occupant death or hospitalization follows.

Occupant factors

- Being ejected from the vehicle increased the risk of death or hospitalization for occupants in SDV’s by over 6 times. Occupant ejection is strongly related to restraint use: 86% of occupants who were ejected were unrestrained.
- Unrestrained occupants of SDV’s were more than 3 times as likely to be killed or hospitalized as those who were restrained.
- Occupants of SDV’s who were traveling with drivers suspected of DUI were 1.5 times more likely to be killed or hospitalized than those who were not.
- The risk of death or hospitalization increased by 1.035 times for each year of occupant age. For example, the risk for a 60-year old SDV occupant was 3.6 times the risk for a 20-year old SDV occupant.

Crash factors

- Occupants of SDV’s who were involved in head-on collisions were more than twice as likely to be killed or hospitalized than those who were not.
- Occupants of SDV’s that collided with a fixed object were nearly 1.5 times more likely to be killed or hospitalized than were occupants of SDV’s that did not.

Environmental factors

- Occupants of SDV’s that crashed on a roadway having a posted speed limit greater than 50 miles per hour were 1.8 times more likely to be killed or hospitalized than were those who crashed on a roadway having a posted speed limit of 50 m.p.h. or lower.

Limitations

- Out-of-state hospitalizations

In the western part of Kentucky, and in some border counties in other parts of the state, many seriously injured crash-involved occupants are transported to trauma centers outside the state for treatment. Such persons will not be accounted for in Kentucky’s inpatient hospital discharge file. The result is that these occupants will be misclassified as non-hospitalized when they were, in fact, hospitalized.

Misclassification of restraint use

According to collision reports, 93% of persons involved in crashes in 2000 and 2001 were restrained. However, statewide observations studies for those years reported that the restraint use rates for all vehicle occupants were 60% and 62%, respectively. Clearly restraint use is overstated on collision reports.

Data linkage

The probabilistic data linkage process is subject to both Type I (matching pairs that are not, in fact, matches) and Type II (failing to match pairs that are, in fact, matches). The Type I error can be controlled by specifying a cutoff for accepting matches, which was set at 10% for this study. The Type II error is more difficult to estimate with confidence.