Motor Vehicle Occupant Fatality Risk: Age, Gender, Day of Week, Time of Day, and their Remarkable Interactions

C. Craig Morris, Ph.D.
Office of Advanced Studies
Bureau of Transportation Statistics
Research and Innovative Technology Administration
U.S. Department of Transportation

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Note

The following views are those of the author and do not necessarily reflect the official position of the U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, or any other agency or staff.
Objectives

- Motor vehicle traffic crashes killed an average of 41,157 people in the U.S. each year from 2000 to 2009, despite declines to 37,423 in 2008 and 33,808 in 2009 during severe economic conditions from which the country is slowly recovering.

- Here we investigate the association of age, sex, day of week, time of day, alcohol, and fatigue with risk of fatality while traveling in personal motor vehicles excluding motorcycles.

- Occupant fatality risk is defined as fatalities per million occupant hours of travel.

- Analyses using injury and population data are also reported.
Data Sources

- **2009 Fatality Analysis Reporting System (FARS)** - information about scenarios, vehicles, drivers, and passengers in all fatal motor vehicle crashes on public highways and roads in the U.S.

- **2009 National Electronic Injury Surveillance System–All Trauma Program (NEISS-ATP)** via the Centers for Disease Control (WISQARS website).

- **2009 National Household Travel Survey (NHTS)** – using hours of occupant travel by personal motor vehicle.

- **2009 Population Estimates** via the Centers for Disease Control (WISQARS website).
Injury Definitions

- **Minor injury** – treated in emergency room hospital and released

- **Serious injury** – admitted or transferred to another hospital

- **Fatal injury** – died within 30 days of trauma due to trauma
Minor Occupant Injury Risk by Sex, Age

![Graph showing minor injuries per 100,000 population and minor injuries per million vehicle miles traveled by sex and age group.]
Serious Occupant Injury Risk by Sex, Age
Consider the eight consecutive 3-hour periods each day starting at midnight: 0000-0300, 0300-0600, 0600-0900, 0900-1200, 1200-1500, 1500-1800, 1800-2100, 2100-0000.

Define **weekday period** as the sequence of these 3-hour periods from **midnight Monday to midnight Sunday**.
Fatalities by Sex and Weekday Period
Occupant Travel by Sex and Weekday Period

![Graph showing occupant travel by sex and weekday period in millions in 2009. The graph displays two lines representing males and females, with peaks and valleys indicating travel patterns over the week.]

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Fatality Risk by Sex and Weekday Period

5+ Year Old Fatalities per Million Occupant Hours in 2009

Weekday Period

Mon | Tue | Wed | Thu | Fri | Sat | Sun

Males

Females

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15-19 Year Old Occupant Fatality Risk
20-29 Year Old Occupant Fatality Risk

Weekday Period

Weekday
Mon
Tue
Wed
Thu
Fri
Sat
Sun

Occupant Fatalities per Million Occupant Hours in 2009

- 20-29 year old males
- 20-29 year old females
30-39 Year Old Occupant Fatality Risk

Weekday Period

Occupant Fatalities per Million Occupant Hours in 2009

- 30-39 year old males
- 30-39 year old females
40-49 Year Old Occupant Fatality Risk

[Graph showing the number of occupant fatalities per million occupant hours in 2009, categorized by day of the week and gender (40-49 year old males and females).]
Conclusions

• Minor occupant injury risk is greater for females and declines with age after about 24.

• Serious or fatal occupant injury risk is greater for males, and greater for younger (15-29) and older (70+) occupants.

• Occupant fatality risk is circadian, with higher risk during late evening-into-early morning hours every day of the week, but highest during Friday-Saturday and Saturday-Sunday evening-into-morning hours, mainly because of drunk driving.

• Circadian risk trends suggest fatigue or drowsiness acting alone, and sometimes synergistically with alcohol, to impair the judgment and performance of motor vehicle occupants.
Implications

• Describing motor vehicle occupant fatality risk as if it were uniform over time, e.g., “Someone dies in a car accident every 13 minutes,” is inaccurate and implies that fatalities are random so there is little we can do to predict or prevent them.

• Providing accurate information to the public about risky travel times and strong risk factors (e.g., age, sex, fatigue, alcohol, distraction) via advertising, education, and on-board risk monitoring devices, could enable people to better monitor and control exposure to higher-risk motor vehicle travel.