

Nebraska Health Data Reporter

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Car-Crash Injuries of Children Aged 0-14 in Nebraska, 1996-1999

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Executive Summary

- Car-crash injuries occur to 7 out of 1,000 children aged 0-14 and lead to 4 deaths per 100,000 children aged 0-14 in Nebraska, with the crashes resulting in injury being more likely to happen at 4-6 p.m. of a day, on Friday of a week, or in August of a year.
- Increased restraint use may reduce the fatality and disability rates due to car-crash injuries for children aged 0-14 in Nebraska.
- Increased restraint use may reduce the hospital expenditures and hospitalization due to car-crash injuries for children aged 0-14 in Nebraska.
- Decreased alcohol use by drivers may reduce the fatality and disability rates due to car-crash injuries for children aged 0-14 in Nebraska.
- The most fatal and disabling type of vehicle crash for Nebraska children aged 0-14 is "multiple vehicle head-on."

Introduction

Accidents are the leading cause of death for children aged 0-14 in Nebraska. Motor vehicle crashes are the primary cause of death due to injury in this age group.¹ To better understand how motor vehicle crashes have impacted Nebraska children and communities, this Data Reporter used data from the Nebraska Crash Outcome Data Evaluation System (CODES) to analyze car-crash injuries involving children aged 0-14 in Nebraska from 1996 through 1999.

¹1999 Vital Statistics Report, Nebraska Health & Human Services System.



Nebraska Center for Rural Health Research in partnership with **Nebraska Health and Human Services System**

Objectives

The objectives of this Data Reporter are to:

- demonstrate the magnitude and trend of car-crash injuries of children aged 0-14 in Nebraska from 1996 through 1999;
- describe the characteristics of car-crash injuries for children aged 0-14 in Nebraska from 1996 through 1999; and
- examine the relationship between behavioral risk factors (e.g., restraint use) and outcome (e.g., fatality, disability, use of hospital care) for car-crash injured children aged 0-14 in Nebraska from 1996 through 1999.

Part 1. Magnitude of the Problem

Every year from 1996 through 1999 in Nebraska:

- about 7 out of 1,000 children aged 0-14 were injured in car crashes.
- 4 out of 100,000 children aged 0-14 died as a result of car-crash injuries.

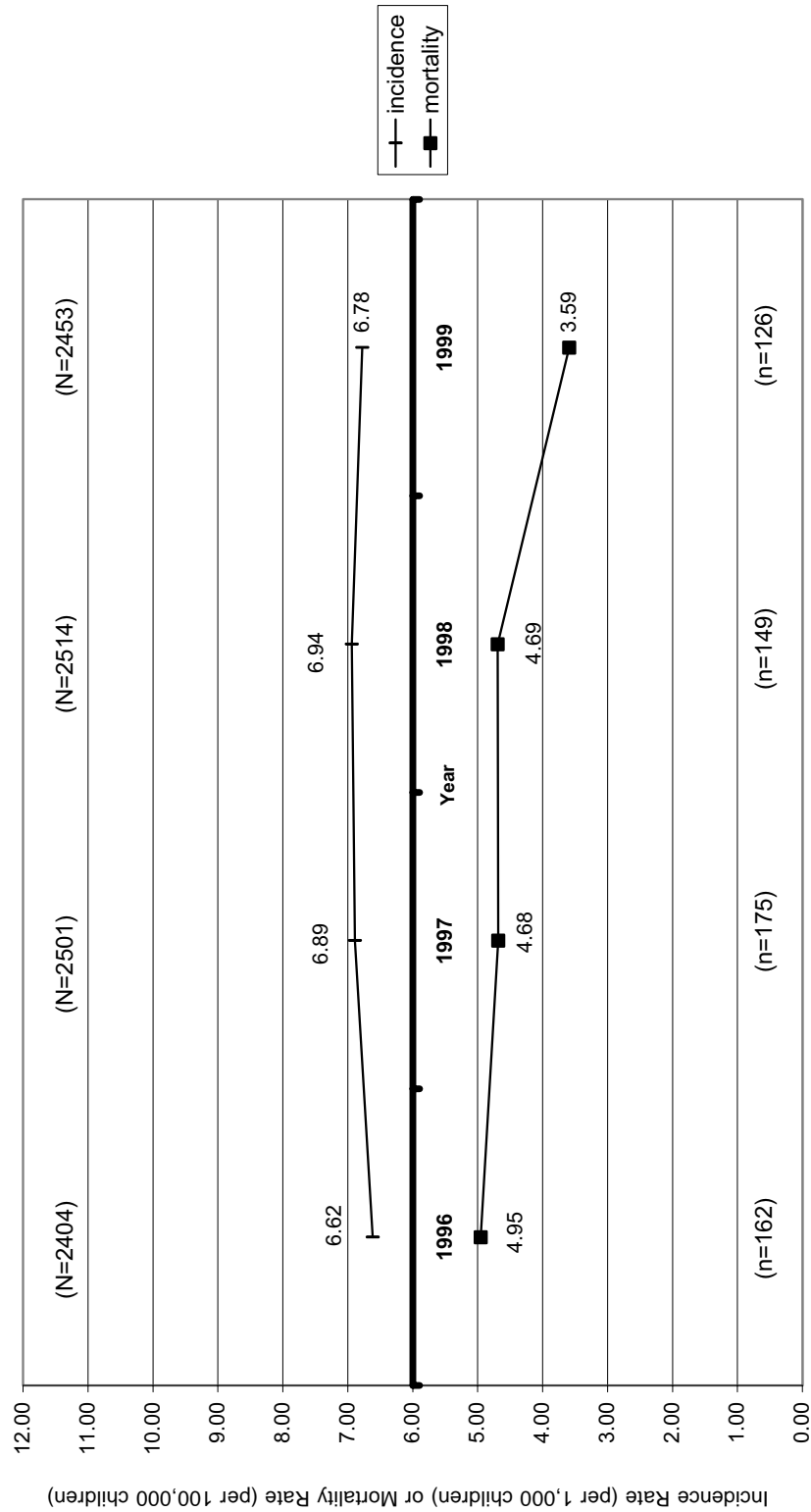
Figure 1 shows the trends of incidence rate and mortality rate due to children's car-crash injuries in Nebraska from 1996 through 1999. Although fluctuating a bit, both incidence rate and mortality rate declined in general in Nebraska from 1996 through 1999. In particular, the mortality rate declined by 1.10 deaths per 100,000 children between 1998 and 1999.

Part 2. When did it happen the most?

Based on **Figures 2, 3, and 4**, children were more likely to have a car-crash injury:

- between **4-6 p.m.** of a day;
- on **Friday** of a week; or
- during **August** of a year.

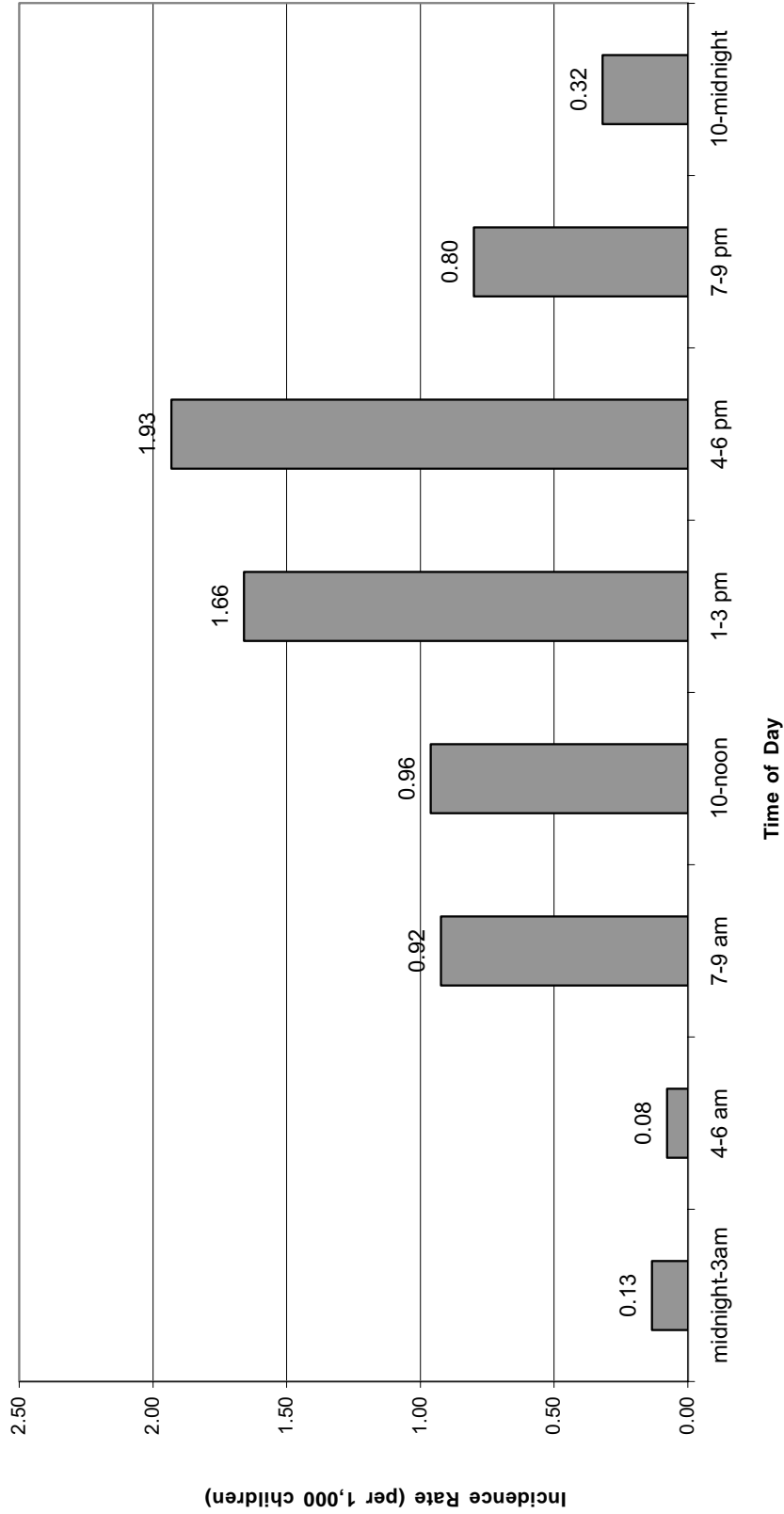
Figure 1: The Incidence Rate and Mortality Rate of Car-Crash Injuries for Children Aged 0-14 in Nebraska, from 1996 to 1999



Sources: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System. The population estimates used to calculate the incidence and mortality rates are from the U.S. Bureau of the Census. (<http://www.census.gov/population>).

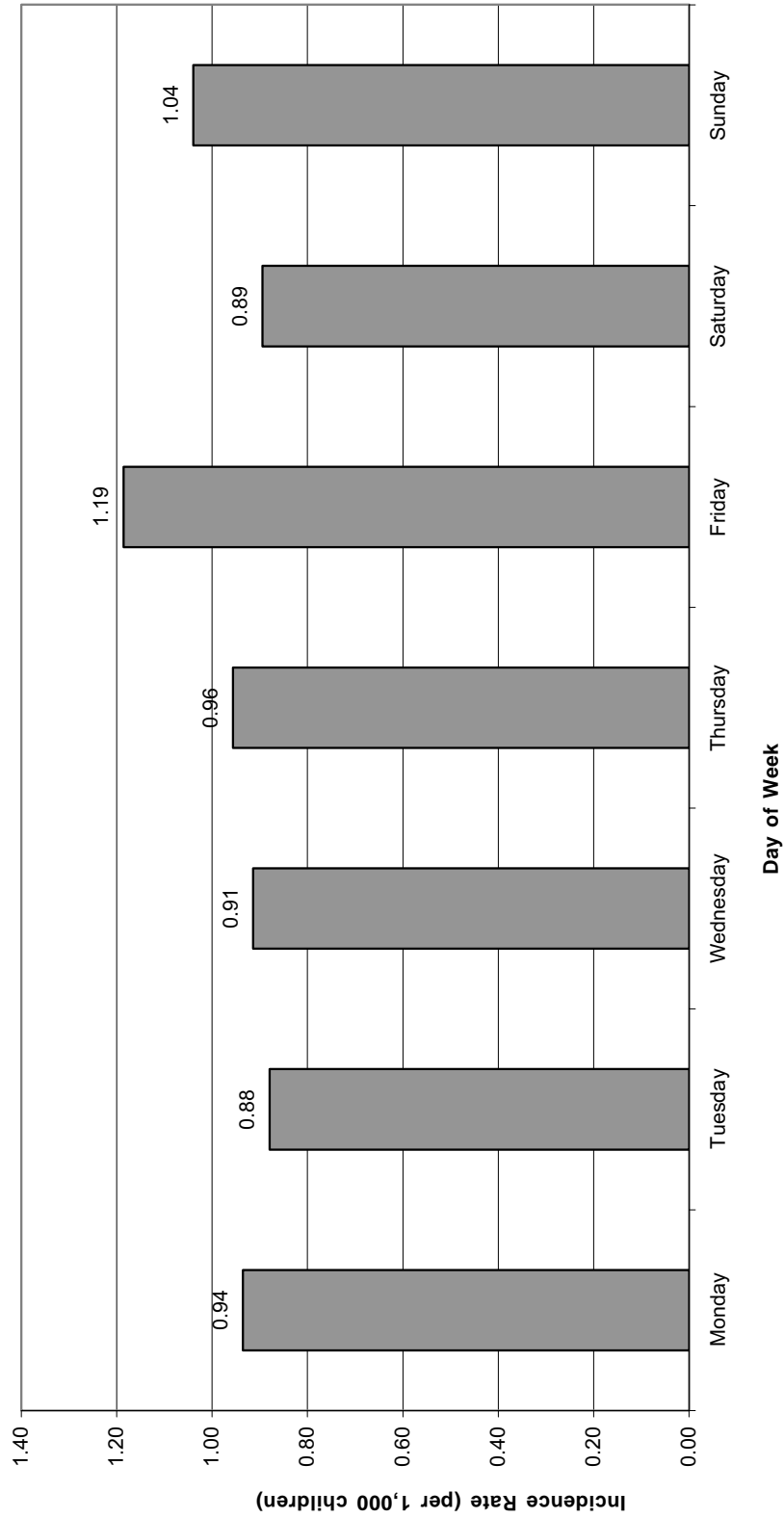
Note: N = the number of children who had a car-crash injury in a specific year.
 n = the number of children who died due to car-crash injuries in a specific year.

Figure 2: The Incidence Rate of Car-Crash Injuries by Time of Day for Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



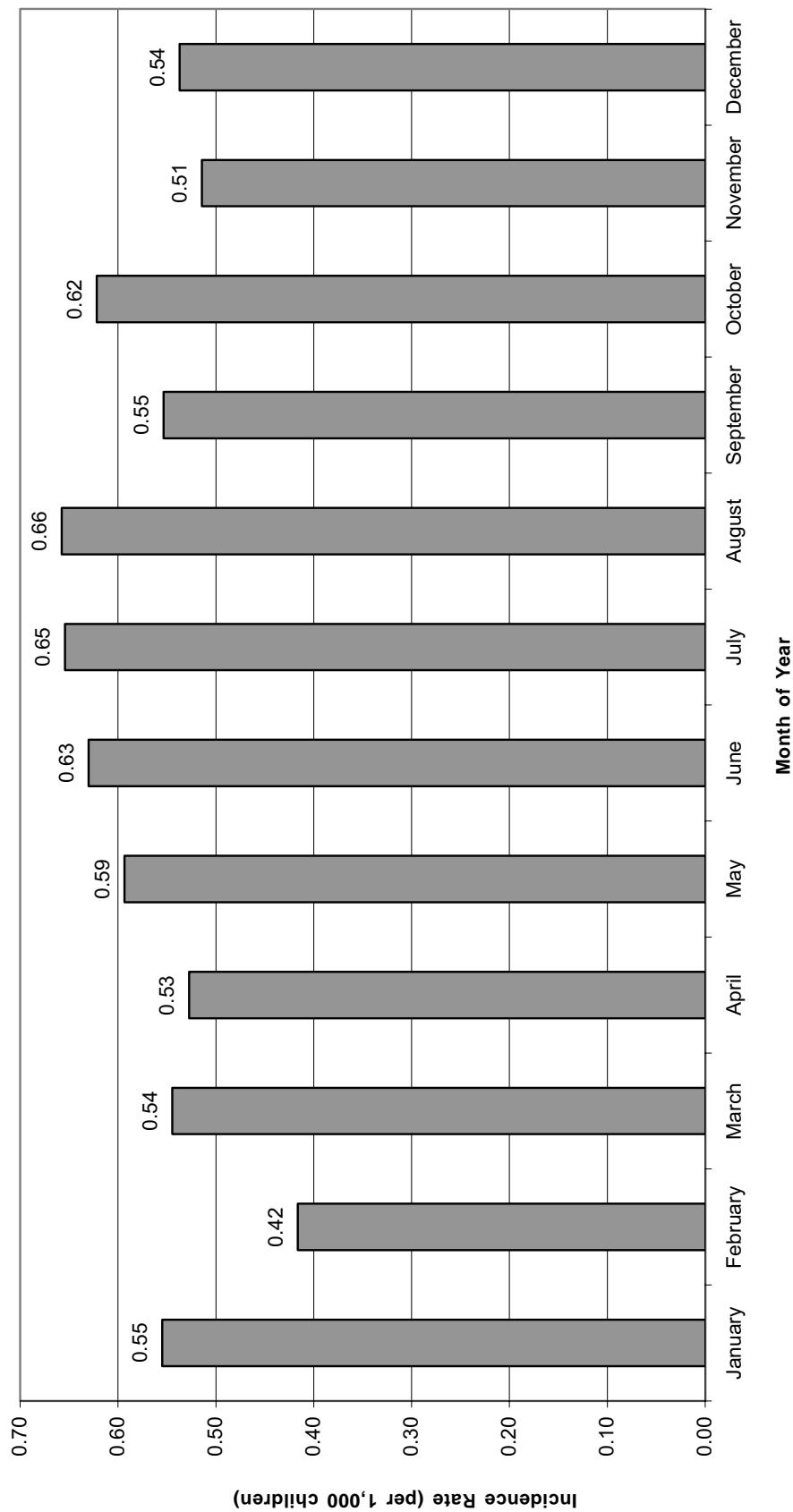
Sources: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System. The population estimates used to calculate the incidence and mortality rates are from the U.S. Bureau of the Census. (<http://www.census.gov/population>).

Figure 3: The Incidence Rate of Car-Crash Injuries by Day of Week for Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



Sources: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System. The population estimates used to calculate the incidence and mortality rates are from the U.S. Bureau of the Census. (<http://www.census.gov/population>).

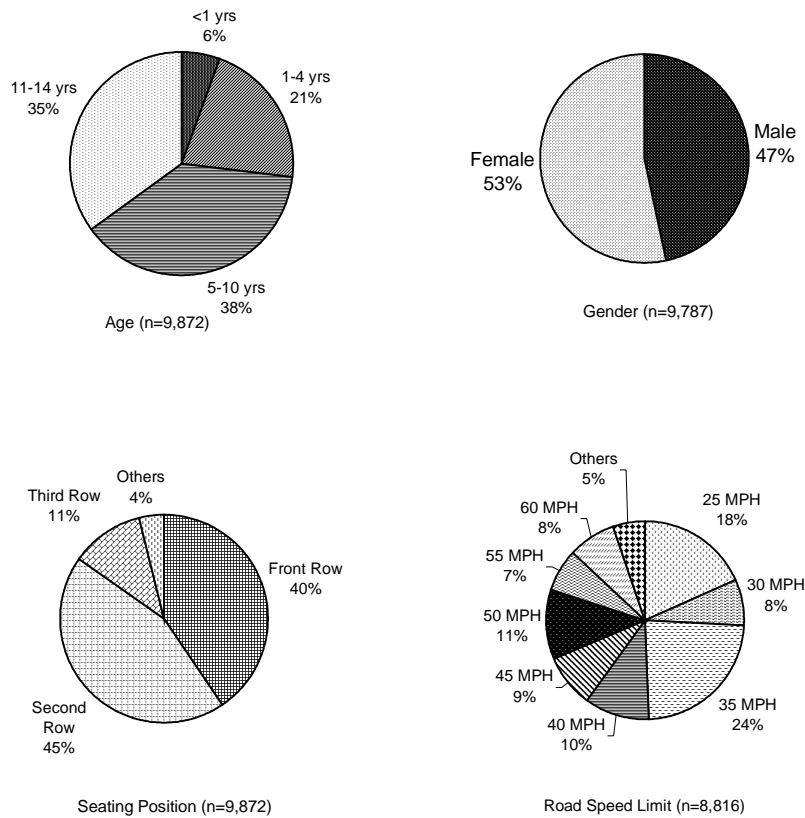
Figure 4: The Incidence Rate of Car-Crash Injuries by Month of Year for Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



Sources: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System. The population estimates used to calculate the incidence and mortality rates are from the U.S. Bureau of the Census. (<http://www.census.gov/population>).



Figure 5: The Distribution of Car-Crash Injuries by Age, Gender, Seating Position, and Associated Road Speed Limit for Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: The sample size (n) varies by the factor of interest because of missing data.

Part 3. Who was more likely to be injured (as a passenger) or involved (as a driver)?

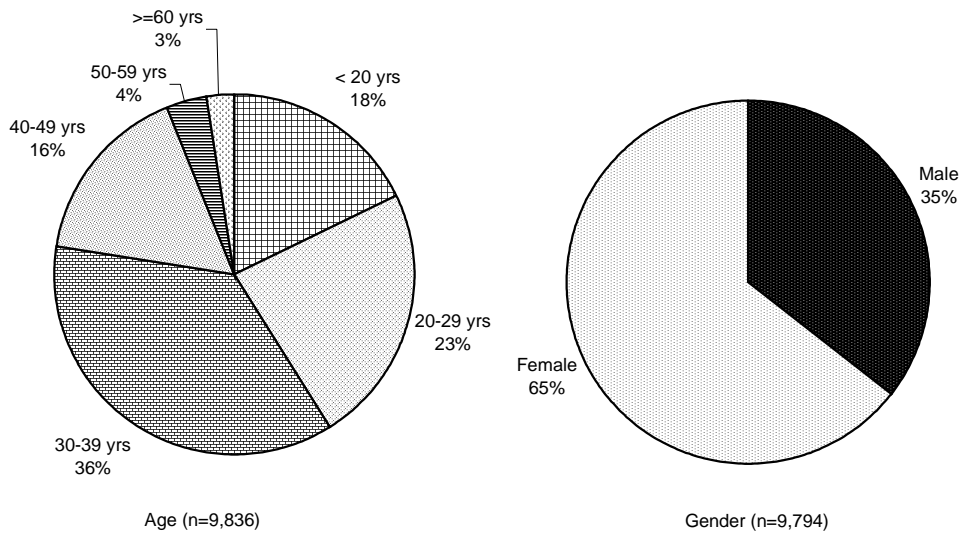
According to **Figure 5**, children injured due to car crashes in Nebraska from 1996 through 1999 were more likely to be:

- 5-10 years old;
- female;
- sitting in the second row of a vehicle; or
- on a road with a 35 MPH posted speed limit.

Figure 6 shows that the drivers who were most associated with car-crash injuries of children aged 0-14 in Nebraska from 1996 through 1999 were:

- 30-39 years old; or
- female.

Figure 6: The Distribution of Associated Driver's Age and Gender for Car-Crash Injured Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: The sample size (n) varies by the factor of interest because of missing data.

Part 4. Restraint Use and Injury Outcome

Figures 7 and 8 show that increased restraint use may reduce the fatality and major injury¹ rate due to car-crash injuries of children aged 0-14. In general, when the rate of restraint use increased, the fatality rate and the rate of major injury both decreased.

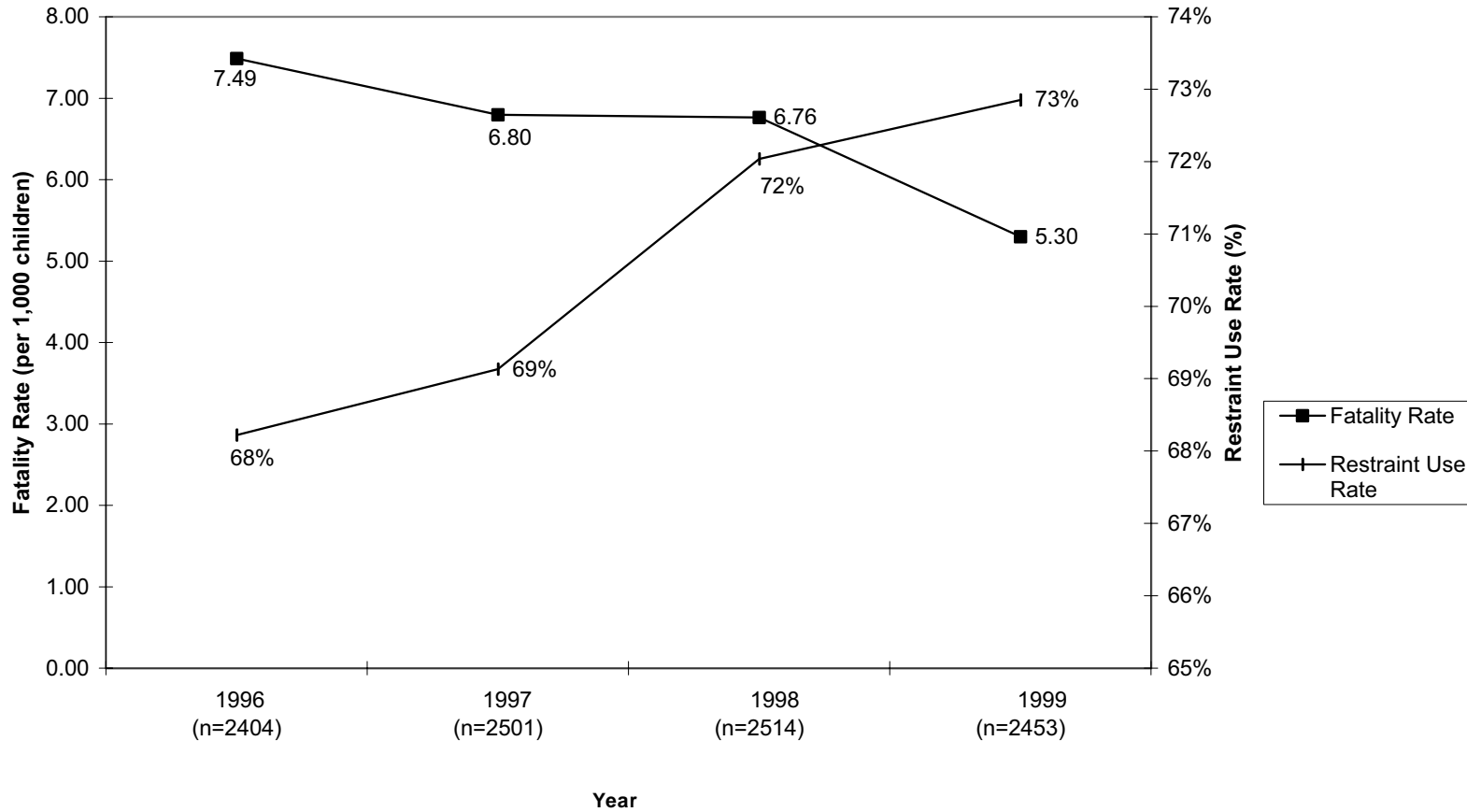
Figure 9 also shows that restraint use is negatively associated with the occurrence of major injury due to car crashes of children aged 0-14. The proportion of major injury among those who did not use restraint was about four times as great as that among those who did (12.2% vs. 3.8%).

Further statistical analyses showed that the difference in major injury rate between the restrained and unrestrained samples was statistically significant at $p < 0.001$, and that the negative correlation between restraint use and occurrence of major injury was also statistically significant at $p < 0.001$.²

²Major injury refers to an injury which results in disability or death based on reported observation of law enforcement officers.

³The estimate of correlation coefficient between restraint use and having major injury was -0.16 ($n=9,251$).

Figure 7: The Relationship of Restraint Use Rate and Fatality Rate for Car-Crash Injured Children Aged 0-14 in Nebraska, from 1996 to 1999



Sources: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

- Note:
1. Restraint use rate is calculated as the percentage of car-crash injured children who used restraint.
 2. Fatality rate is calculated as the number of deaths per 1,000 children who were car-crash injured.

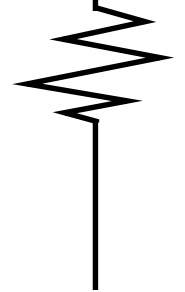
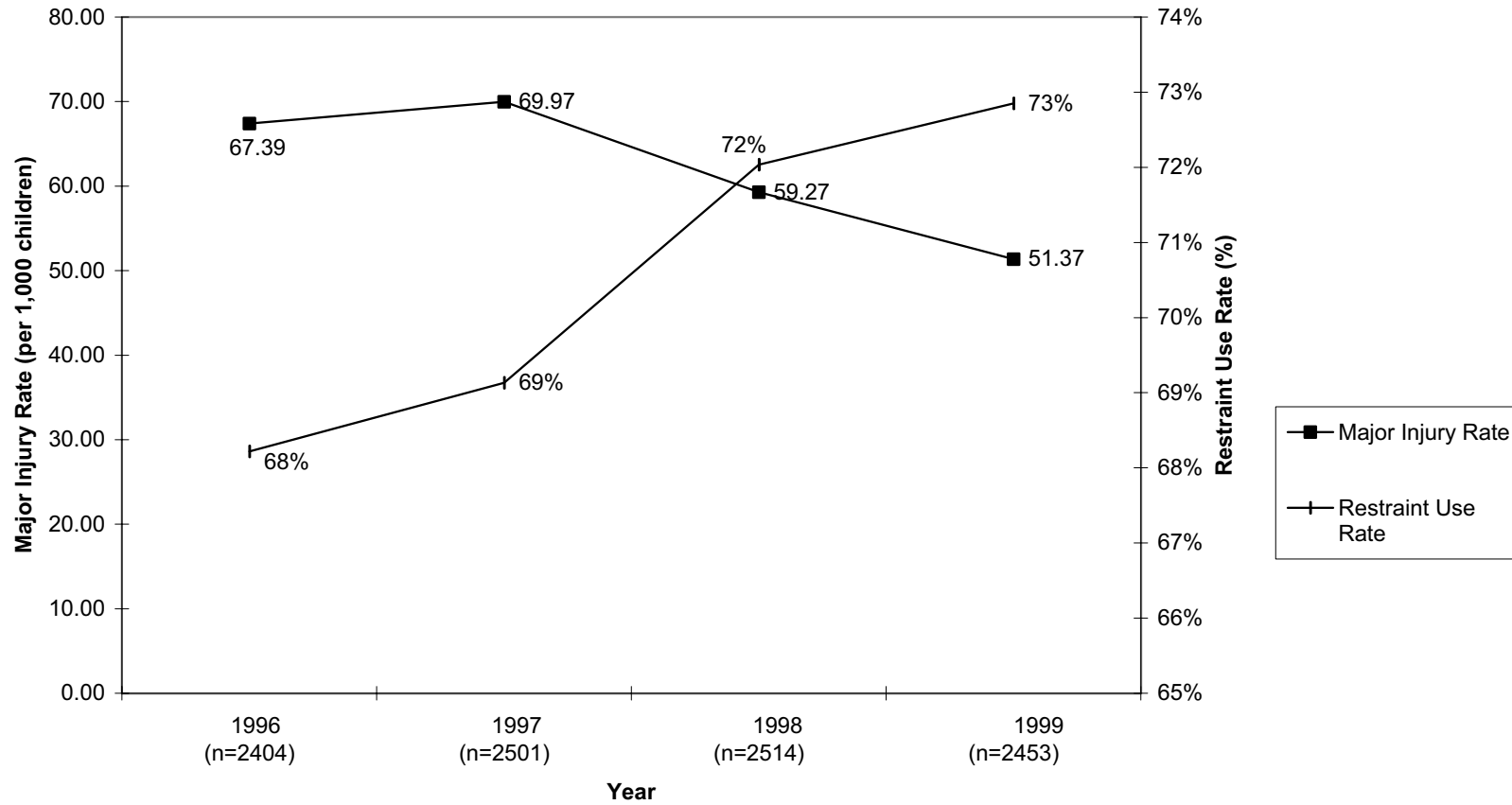


Figure 8: The Relationship of Restraint Use Rate and Major Injury Rate for Car-Crash Injured Children Aged 0-14 in Nebraska, from 1996 to 1999



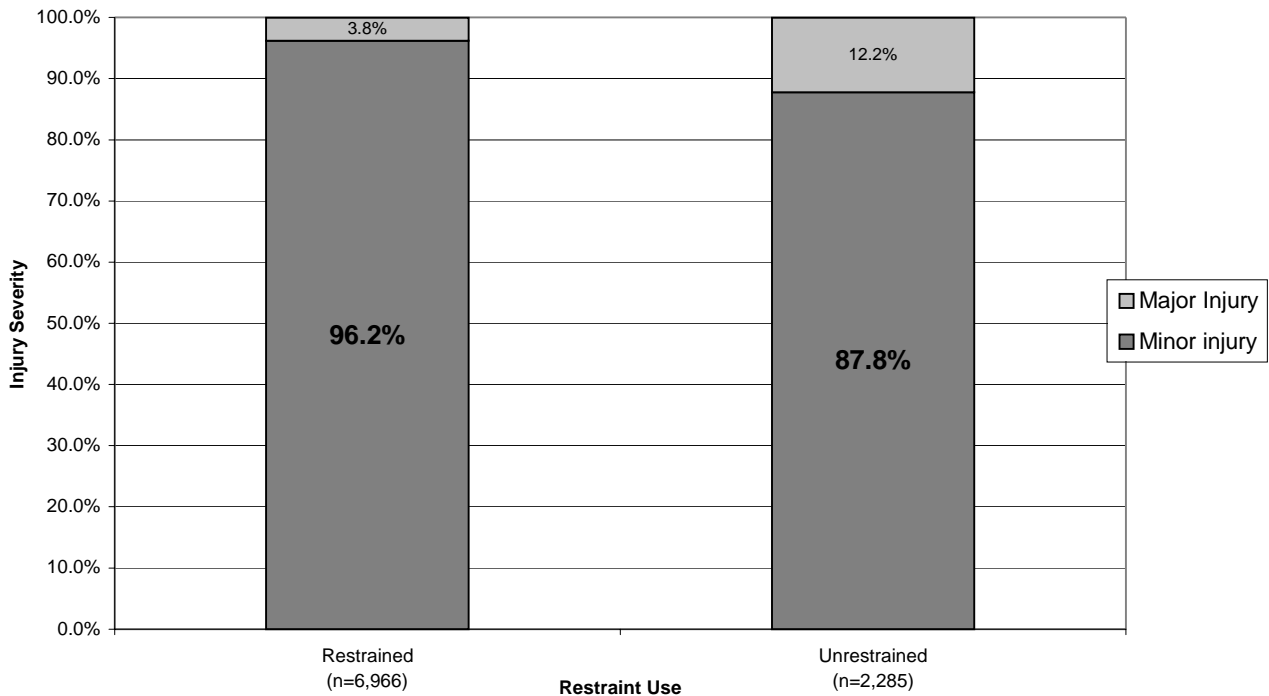
Sources: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: 1. Restraint use rate is calculated as the percentage of car-crash injured children who used restraint.

2. Major injury rate is calculated as the combined number of deaths and disabled per 1,000 children who were car-crash injured.



Figure 9: The Restraint Use and Injury Severity for Car-Crash Injured Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.
Note: Major Injuries refer to those who were disabled or who died due to car-crash injuries.

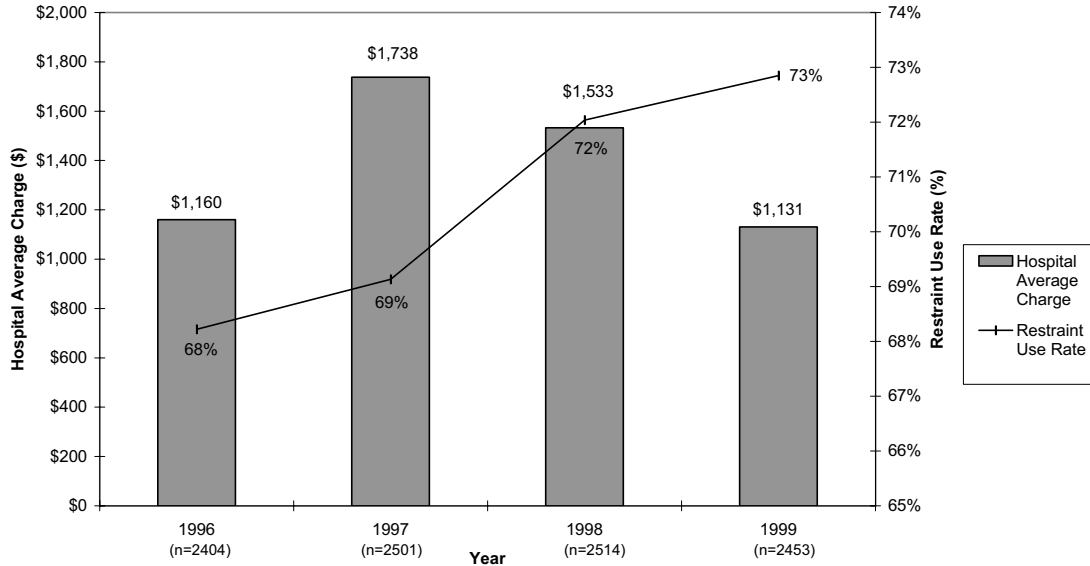
Part 5. Restraint Use and Injury's Impact on Hospital Care

Figures 10 and 11 show that increased restraint use may also reduce the average charge for hospital care³ and the hospitalization rate due to car-crash injuries of children aged 0-14. When the rate of restraint use increased, both the hospital average charge and the use rate of hospital inpatient care due to car-crash injuries of children decreased, except between 1996 and 1997.

However, when we examine the relationship between restraint use rate and hospital median charge for car-crash injured children in Nebraska from 1996 through 1999 (Figure 12), the inverse association shown in Figures 10 and 11 is gone. The reason for these results may lie in the data structure and nature of car-crash injuries. Because the increase in restraint use rate from 1996 through 1999 was marginal, it may not have affected the use of hospital care for most car-crash injured children. Instead, it may have only reduced the incidence of more severe car-crash injuries, which usually require more intensive hospital care and result in higher hospital charges. Since hospital average charge and the use rate of hospital inpatient care are both easily swayed by heavy users of hospital care, they might have been more responsive to the relatively small increase in restraint use rate than has hospital median charge.

⁴Hospital care here includes inpatient, outpatient, and emergency care.

Figure 10: The Relationship of Restraint Use Rate and Hospital Average Charge for Car-Crash Injured Children Aged 0-14 in Nebraska, from 1996 to 1999

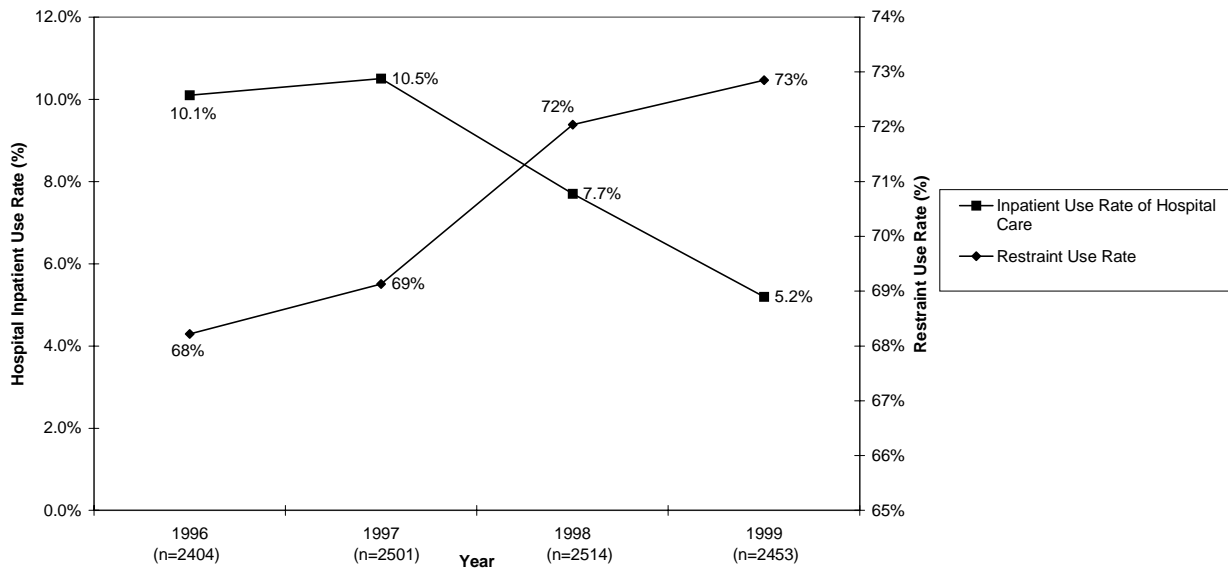


Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: 1. Restraint use rate is calculated as the percentage of car-crash injured children who use restraint.

2. Hospital average charge is the average charge of hospital care (including inpatient, outpatient, and emergency care) due to car-crash injuries of children.

Figure 11: The Relationship of Restraint Use Rate and Inpatient Use Rate of Hospital Care for Car-Crash Injured Children Aged 0-14 in Nebraska, from 1996 to 1999



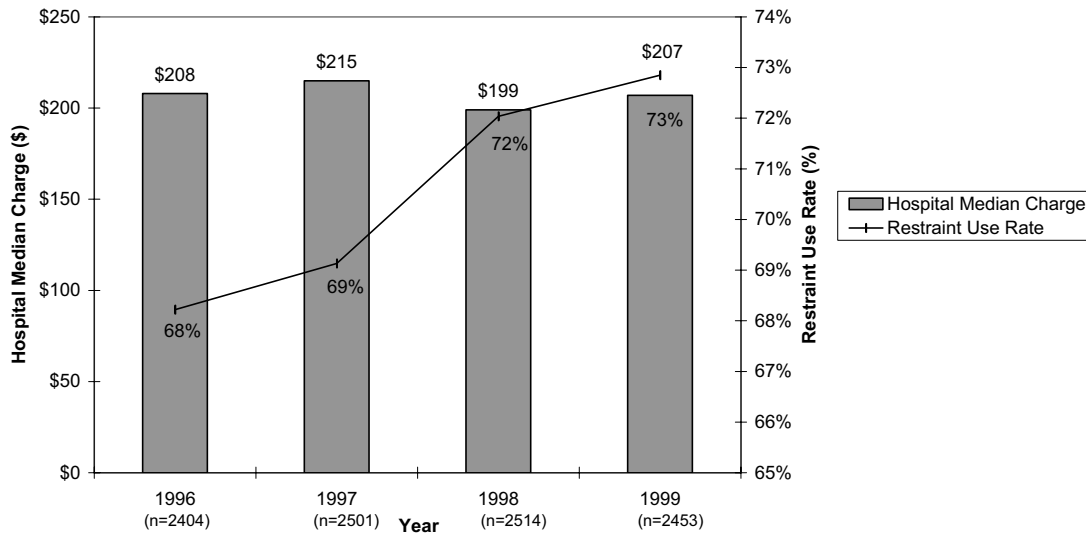
Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: 1. Restraint use rate is calculated as the percentage of car-crash injured children who use restraint.

2. Inpatient use rate of hospital care is the inpatient proportion of hospital care use due to car-crash injury of children.



Figure 12: The Relationship of Restraint Use Rate and Hospital Median Charge for Car-crash Injured Children Aged 0-14 in Nebraska, from 1996 to 1999

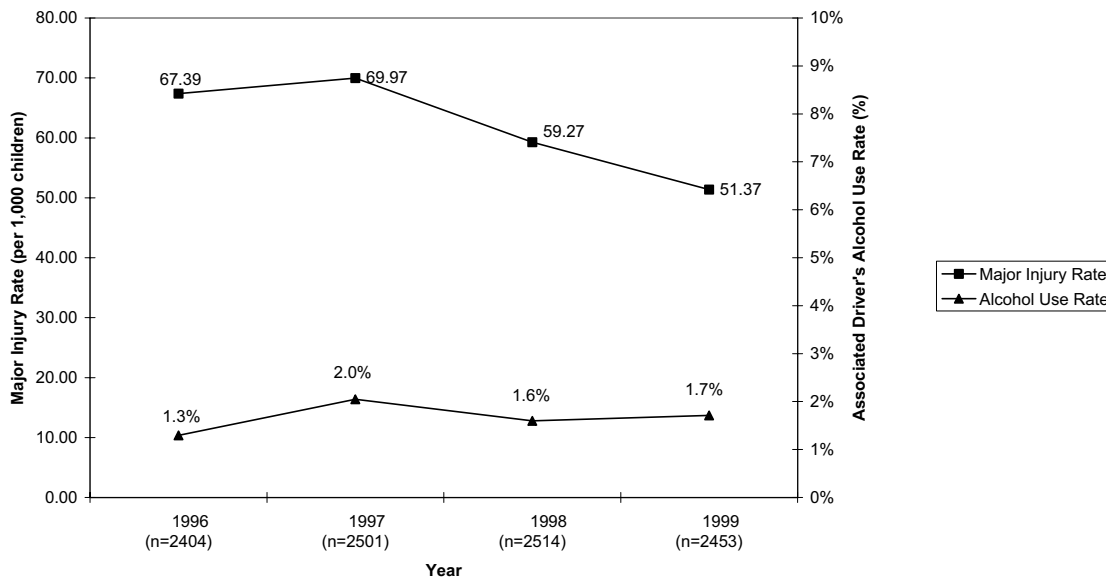


Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: 1. Restraint use rate is calculated as the percentage of car-crash injured children who use restraint.

2. Hospital median charge is the median charge of hospital care (including inpatient, outpatient, and emergency care) due to car-crash injuries of children.

Figure 13: The Relationship of Associated Driver's Alcohol Use Rate and the Major Injury Rate (Passengers) for Car-crash Injured Children Aged 0-14 in Nebraska, from 1996 to 1999



Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.

Note: 1. The associated driver's alcohol use rate is calculated as the percentage of car-crash injured children whose driver use alcohol.

2. Major injury rate is calculated as the combined number of deaths and disabled per 1,000 children who are car-crash injured.

Part 6. Driver’s Alcohol Use and Children’s Injury Outcome

Figure 13 shows that an increased rate of drivers using alcohol may result in more disability and death for car-crash injured children. When the driver’s alcohol use rate increased, the rate of major injury for car-crash injured children increased, too, except between 1998 and 1999.

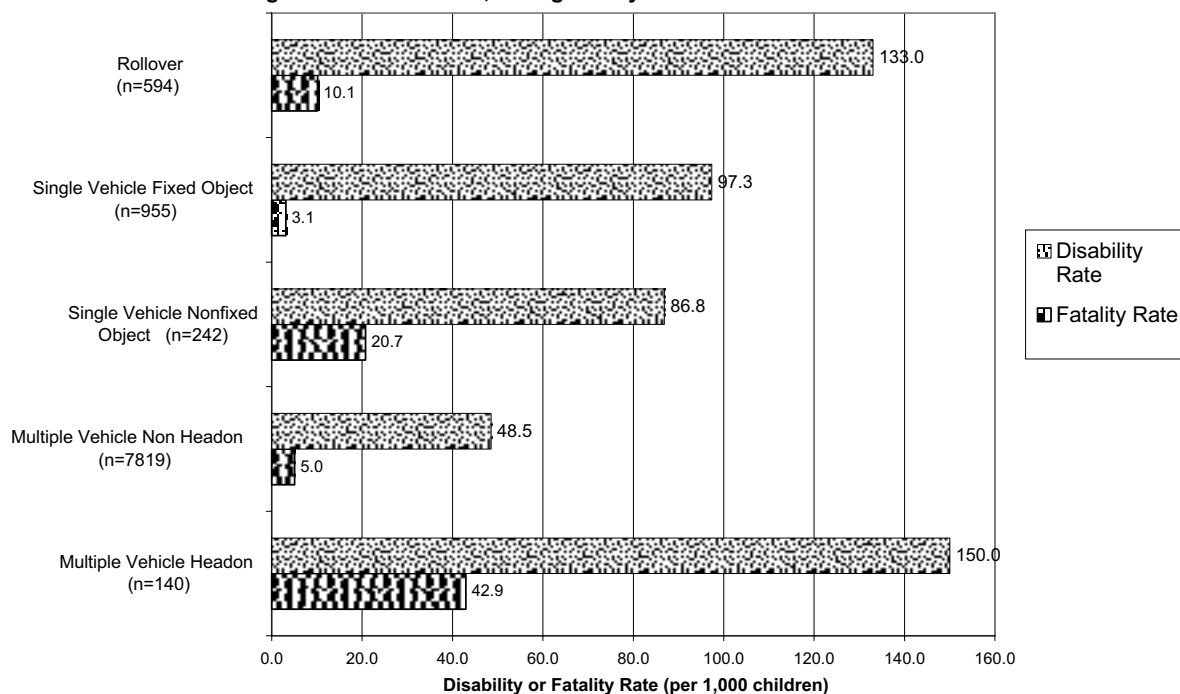
Part 7. Crash Type and Children’s Injury Outcome

Figure 14 shows the calculated disability rates and fatality rates due to car-crash injuries of children aged 0-14 by crash type in Nebraska from 1996 through 1999. The results indicate that:

- the most fatal type of car crashes were “multiple vehicle head-on;” 43 out of 1,000 children injured in this type of crash died.
- the highest disability rate was caused by “multiple vehicle head-on;” 150 out of 1,000 children injured in this type of crash were disabled.

In addition, “rollover” had the second greatest impact on injury disability (133 disabled cases per 1,000 car-crash injured children), and “single vehicle nonfixed object” had the second greatest impact on injury fatality (21 deaths per 1,000 car-crash injured children).

Figure 14: The Disability Rate and Fatality Rate of Car-crash Injuries by Crash Type, for Children Aged 0-14 in Nebraska, during the 4-year Period between 1996 and 1999



Source: Nebraska Crash Outcome Data Evaluation System (CODES), 1996-1999, Nebraska Health and Human Services System.
 Note: 1. Disability Rate is calculated as the number of disabled per 1000 children who are car-crash injured.
 2. Fatality Rate is calculated as the number of deaths per 1000 children who are car-crash injured.



Data Notes

Having been funded by the National Highway Traffic Safety Administration (NHTSA) since 1998, the Nebraska Crash Outcome Data Evaluation System (CODES) links motor vehicle crash data (police reports), emergency medical services (EMS) data from the Nebraska Ambulance and Rescue Squad Information System (NARSIS), hospital discharge data (from the Nebraska Association of Hospitals and Health Systems), and data from other sources such as death certificates and drivers registry data. This Reporter focused its analysis on the CODES data for children aged 0-14 who had a car-crash injury (as a passenger of a motor vehicle) in Nebraska from 1996 through 1999. Those children who were not injured in car crashes were not included in the analysis.

The association between behavioral risk factors and injury outcome demonstrated in this Reporter was based on bivariate analyses. Using a multivariate analysis by controlling for relevant determinants of injury outcome may change the degree of association presented in this Reporter.

Definitions

CRASH TYPE. Single Vehicle Fixed Object refers to those crashes caused by a motor vehicle that hits fixed objects such as trees and buildings. Single Vehicle Nonfixed Object refers to those crashes caused by a motor vehicle that hits moving objects such as animals. Multiple Vehicle Head-on refers to those crashes caused by multiple motor vehicles that hit head-to-head. Multiple Vehicle Non-head-on refers to those crashes caused by multiple motor vehicles that hit in a way other than head-to-head (e.g., side hit).

HOSPITAL AVERAGE AND MEDIAN CHARGES. Hospital charges include the charges incurred by a patient for inpatient care, outpatient care, and emergency room care due to car-crash injuries. Average charge is the mathematical mean of the charges for all crash-injured children that had a link to hospital discharge database, while median charge is the value of the charge at the mid-point of the same sample.

INCIDENCE RATE. The incidence rate in this Reporter is defined as the number of car-crash injury cases per 1,000 children aged 0-14 during a specific year.

INJURY OUTCOME. The outcome (no injury, minor injury, disabled, or death) was determined based on the reported observation of law enforcement and the results of data linkage. All records that were reported by law enforcement as injured and/or had a link to the EMS or hospital discharge file were classified as having an injury. Among these cases, those reported by law enforcement as disabled were classified as being disabled, and those reported by law enforcement as killed and/or had a link to the death certificate database were classified as being dead.

MAJOR INJURY. Major injury refers to an injury which results in disability or death, based on reported observation of law enforcement officers.

MORTALITY RATE. The mortality rate in this Reporter is defined as the number of deaths due to car-crash injuries per 100,000 children aged 0-14 during a specific year.

RESTRAINT USE. The use of vehicle restraints by children was based on the observation of law enforcement officers.

Acknowledgments

We thank the Nebraska Health and Human Services System for providing us with the CODES data. We also thank the members of the Nebraska CODES Advisory Committee for their insightful comments on our report. We would like to give special thanks to Ming Qu, Nebraska CODES Administrator, for his advice and help during the creation of this Reporter.

About the Nebraska Health Information Project

The Nebraska Health Information Project is a partnership project made possible with the financial support of the State of Nebraska and through additional personnel and other resources provided by the University of Nebraska Medical Center. While initiated by Nebraska Unicameral, the ongoing success of the project results from cooperation and collaboration among a number of organizations and individuals, particularly those involved in delivering health care services, financing health care and analyzing health related data.

Other reports have been published by the Nebraska Health Information Project, including biennial databooks which present Nebraska health and demographic data at the county, area and state levels. To find out more about these reports and future reports visit our homepage at: <http://www.unmc.edu/nebraska>

The Nebraska Center for Rural Health Research

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