

Traumatic Brain Injuries in Alaska, 1996-1998

Diane Sallee, MS
Martha Moore, MS
Mark Johnson, MPA

ABSTRACT

Traumatic brain injuries often lead to severe disability or death. These injuries most often affect younger, more active people and are likely to have enduring physical, emotional, and financial costs. In order to determine the incidence, etiology and severity of traumatic brain injuries in Alaska, the Alaska Department of Health and Social Services has conducted a three-year study of the demographic and epidemiologic characteristics of traumatic brain injuries in Alaska. From 1996 through 1998, 1,932 hospitalized cases or out-of-hospital deaths occurred in the state among Alaska residents, for an average incidence rate of 105.2 per 100,000 population. To analyze the incidence of these injuries, the Traumatic Brain Injury Surveillance Project analyzed the location, demographics, and etiology.

INTRODUCTION

Traumatic brain injury is damage to the brain that results when the head is hit, strikes a stationary object, or is violently shaken. Not included in the definition of traumatic brain injury is brain damage caused by genetic abnormalities, near-drowning, stroke, tumors, or Alzheimer's disease.

Each year, approximately 500,000 Americans require hospitalization for a traumatic brain injury, and 75,000 to 100,000 die. Among those who survive, 70,000 to 90,000 must live the remainder of their lives with a severe disability, and 2,000 will exist in a long-term coma.

The emotional impact of traumatic brain injury is devastating for people with brain injuries and their families. Depending on what area of the brain is injured, people with brain injuries may suffer from poor short-term memory and difficulty with organization, concentration, and judgment. They may experience headaches, sudden seizures, and decreased muscular strength and coordination, and they may have difficulties with vision, speech, hearing, smell, and taste. Their personality may change. Family members say brain injury is one of the hardest disabilities to deal with because the survivors may look the same, but they can be totally different.

The financial impact of traumatic brain injury exacts a heavy toll on society. In the United States, the economic costs alone approach \$7.6 billion a year, \$2.9 billion in direct costs and \$4.7 billion in indirect costs, including lost wages and productivity. A person with a severe brain injury faces an average of \$436,000 of medical costs and annual costs

of \$32,000 to \$63,000. Because people with brain injuries are typically young adults, the loss of productivity over the normal life span is enormous.

In the United States, males are twice as likely to suffer serious brain injuries as females, and young males between ages 15 and 24 have the highest rate of injury. Motor vehicle crashes account for one-half of the traumatic brain injuries. Other causes include falls, assaults and violence, sports, and recreation accidents.¹

In children ages 1 through 14 years, trauma is a major cause of death, and traumatic brain injury accounts for 40 percent of the fatalities. The incidence of pediatric traumatic brain injury is approximately 200 per 100,000, with a mortality rate of 10 percent (20 deaths per 100,000). In comparison, leukemia is the next leading cause of death in the pediatric age group, occurring with a frequency of approximately two deaths per 100,000.²

The Alaska Trauma Registry collects information on hospitalized injury patients from every acute-care medical hospital in the state. This database contains up to 144 data elements collected for every trauma patient, as defined by ICD-9-CM injury code, who is admitted to a hospital, transferred to a higher level of hospital care, or declared dead in a hospital emergency department. According to this source, the average hospital charge for patients with traumatic brain injury in Alaska was \$17,179 per patient in 1997. The total charges for hospitalized traumatic brain injury patients were estimated at \$10,530,663 for that year.³

Efforts aimed at preventing traumatic brain injuries must target risk factors associated with these injuries. The following is a descriptive analysis of traumatic brain injuries in Alaska from 1996 through 1998, including location, demographics, and etiology.

METHODS

Hospitalized patient data in this study came from the Alaska Trauma Registry and direct review of patient medical records. Data on out-of-hospital deaths came from the Alaska Bureau of Vital Statistics. The data sets were merged so that traumatic brain injury cases in this study include hospital admissions and out-of-hospital deaths. Population estimates for the years 1996 through 1998 came from the Alaska Department of Labor, Research and Analysis Section.

RESULTS

Location

In general, the urban areas of Alaska had the highest numbers of traumatic brain injuries from 1996 through 1998, while the rural areas of the state had the highest rates. Table 1 shows the regional numbers and rates of traumatic brain injuries, ranked from lowest to highest. The statewide rate of traumatic brain injuries for this three-year study period was 105.2 per 100,000 population. For comparison, the annual crude incidence rate of traumatic brain injuries was 90.0 per 100,000 population in a 1994 study of seven other states.⁴

Demographics

In 1996-1998, males were more than twice as likely than females to experience a traumatic brain injury in Alaska (Figure 1). The rate for males was 144.5/100,000 population and for females was 62.0/100,000. Males who were 15-24 years of age had the highest rate (262.2/100,000) followed by males who were age 75 and older (257.2/100,000). Alaska Natives experienced a disproportionate amount of traumatic brain injuries in 1996-1998 (Figure 2). The rate of traumatic brain injury for Alaska Natives was 214.3/100,000 compared to a statewide rate of 105.2/100,000.

Etiology

The leading causes of traumatic brain injuries from 1996 through 1998 were: automobile, van, or truck crashes; falls; firearms; other assaults; and all-terrain vehicle or snowmachine crashes (Figure 3). Of the 466 traumatic brain injuries resulting from automobile, van, or truck crashes, 56% (262) of the people were not using a safety belt, child restraint, or airbag at the time of the crash (Figure 4). Of the 173 traumatic brain injuries resulting from all-terrain vehicle or snowmobile crashes, 69% (119) of the people were not wearing a helmet at the time of the crash (Figure 5).

DISCUSSION

These results show that injury prevention efforts should focus on preventing and mitigating motor vehicle crashes, falls, firearm-related injuries, and other assaults. Education and intervention aimed at young males might be most helpful in reducing the number and severity of traumatic brain injuries since males ages 15-24 have the highest rates of these injuries. Prevention efforts are especially needed among Alaska Natives, who experience a rate of traumatic brain injury more than twice the statewide rate.

Rural areas tend to have higher rates of traumatic brain injuries than urban areas. For the years 1996-1998, the Nome Census Area, the Northwest Arctic Borough, and Interior Alaska had injury rates more than twice the statewide rate. Intervention that is relevant in rural areas might help reduce these high rates. For example, since four-wheelers and snowmachines are a common form of transportation in rural Alaska, enactment of mandatory helmet ordinances to help reduce injuries can be just as important as enforcement of the safety belt laws on streets and highways. In cold weather, these helmets should be lined for warmth and have anti-fogging face shields.

Further research should examine the effects of helmet ordinances on the incidence and severity of traumatic brain injuries. In October 1997, the City of Nome passed an ordinance requiring minors to wear an appropriate helmet when driving or riding snow machines, ATV's, motorcycles, and motorscooters. In August 1998, the city of Bethel passed a similar ordinance. The Alaska State Legislature is considering passage of statewide helmet legislation for young people under age 16. Future studies on data in the Alaska Trauma Registry can help measure the success of helmet laws in preventing traumatic brain injuries among Alaskans.

REFERENCES

¹Wright, Barbara. *What Legislators Need to Know about Traumatic Brain Injury*. Washington, D.C.: National Conference of State Legislatures, 1993, pp. 1-3.

²Francel, P.C. and B. E. Snell. "Age and Outcome of Traumatic Brain Injury in Infants and Children," *Brain Injury Source*, Spring 1999, p. 14.

³Section of Community Health and Emergency Medical Services, Division of Public Health, Department of Health and Social Services, Juneau, Alaska.

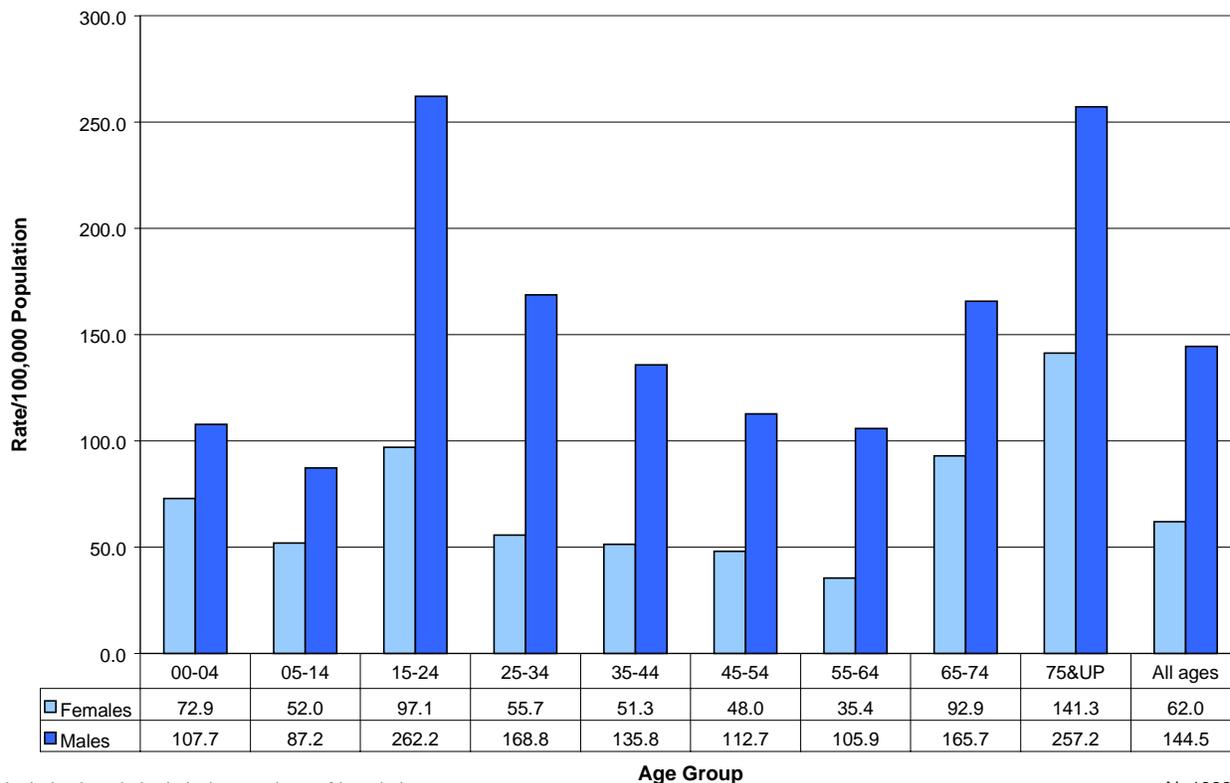
⁴*Traumatic Brain Injury in the United States: A Report to Congress*. Prepared by the Division of Acute Care, Rehabilitation Research, and Disability Prevention; National Center for Injury Prevention and Control; Centers for Disease Control and Prevention, November 10, 1998.

Table 1. Traumatic Brain Injuries in Alaska, 1996-98.

<i>Ranked by Number</i>		<i>Ranked by Rate</i>	
<i>Region</i>	<i>Number</i>	<i>Region</i>	<i>Rate/100,000</i>
Aleutians	14	Aleutians	60.8
North Slope	36	Fairbanks North Star	67.4
Bristol Bay	41	Southeast	82.1
Copper River	49	Anchorage	88.8
Kodiak Island	50	Kenai Peninsula	109.0
Northwest Arctic	51	Kodiak Island	120.9
Norton Sound	61	Matanuska-Susitna	133.0
Yukon-Kuskokwim	114	Copper River	157.2
Interior (excluding Fairbanks)	121	North Slope	165.4
Kenai Peninsula	156	Yukon-Kuskokwim	168.7
Fairbanks North Star	167	Bristol Bay	178.8
Southeast	182	Norton Sound	221.0
Matanuska-Susitna	209	Northwest Arctic	252.7
Anchorage	681	Interior (excluding Fairbanks)	277.1
Total	1932	Average	105.2

Source of population data: *Alaska Population Overview: 1998 Estimates*, June 1999; *Alaska Population Overview: 1997 Estimates*, June 1998, *Alaska Population Overview: 1996 Estimates*, June 1997. Alaska Department of Labor, Research and Analysis Section.

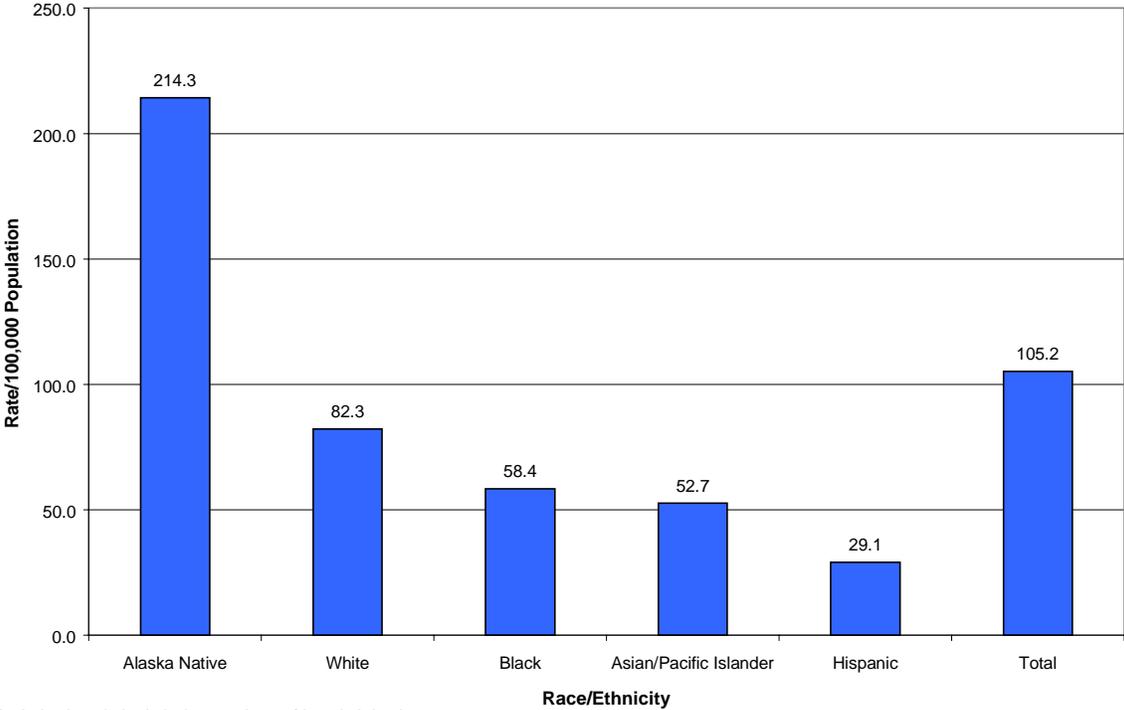
**Figure 1. Rate of Traumatic Brain Injuries*
in Alaska by Age and Gender, 1996-1998**



* Includes hospital admissions and out-of-hospital

N=1932

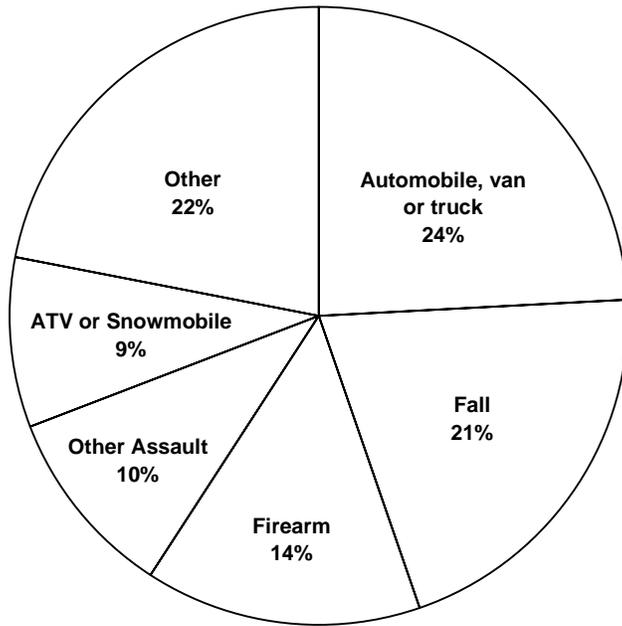
**Figure 2. Rate of Traumatic Brain Injuries*
in Alaska by Race/Ethnicity, 1996-1998**



* Includes hospital admissions and out-of-hospital deaths.

N=1932

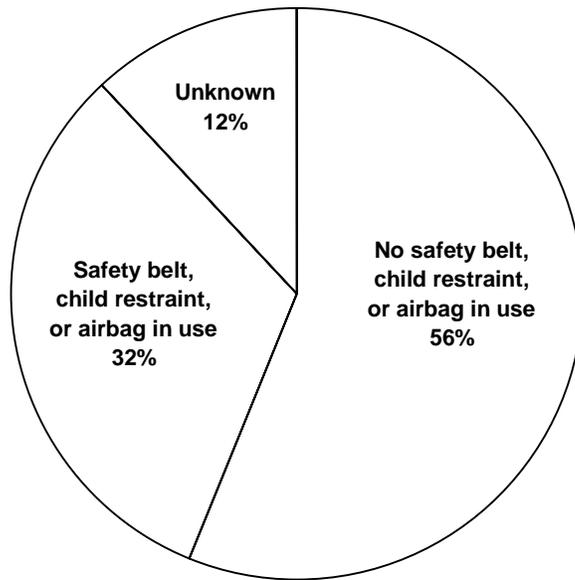
Figure 3. Etiology of Traumatic Brain Injuries* in Alaska, 1996-1998



* Includes hospital admissions and out-of-hospital deaths.

N=1932

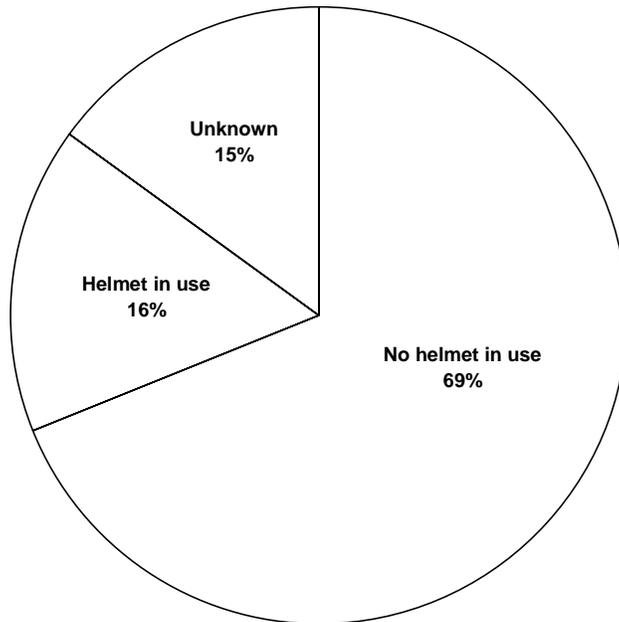
Figure 4. Traumatic Brain Injury* Patient Use of Personal Protective Equipment during Automobile, Van, or Truck Crashes in Alaska, 1996-1998



* Includes hospital admissions and out-of-hospital deaths.

N=466

Figure 5. Traumatic Brain Injury* Patient Use of Helmets during All-terrain Vehicle or Snowmobile Crashes in Alaska, 1996-1998



* Includes hospital admissions and out-of-hospital deaths.

N=173