



Bicycle-Related Traumatic Brain Injuries, Oklahoma, 1992-1999

April Y. Vance, M.P.H.
Public Health Prevention Specialist
Injury Prevention Service
Oklahoma State Department of Health

Sue Mallonee, R.N., M.P.H.
Chief, Injury Prevention Service

Shelli Stephens Stidham
Division Director

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For more information, please contact:

Injury Prevention Service
Oklahoma State Department of Health
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73117-1299
(405) 271-3430 or 1-800-522-0204
www.health.state.ok.us/program/injury

Background

In Oklahoma, traumatic brain injuries (TBI) are a significant public health concern and cause of death and serious disability.

Bicycle crashes account for a relatively small proportion of TBIs. However, young people, who may suffer the effects of TBI for the rest of their lives, are disproportionately affected. Survivors of bicycle-related TBIs, including those diagnosed with “minor” TBIs, may experience enduring cognitive, behavioral, physical, and psychological difficulties. The estimated annual cost of medical care for bicycle-related injuries is greater than \$8 billion nationally.

Beginning in 1992, the Oklahoma State Department of Health (OSDH) Injury Prevention Service (IPS) began statewide surveillance of fatal and hospitalized TBI cases. Detailed information was collected on all fatal cases from the Office of the Chief Medical Examiner. From 1992-1997, medical, demographic, and epidemiologic data were collected from hospital medical records on persons discharged with one or more of the following ICD-9-CM codes: 800-801.9, 803.0-804.9, and 850.0-854.1. As a result of changing discharge coding criteria, in

1998 ICD-9-CM code 959.0 (head injury, unspecified) was added. In 1999, all TBI cases were reviewed, however, a number of variables were collected for only a 50% sample of hospitalized cases. Basic data (demographic data, length of stay, outcome, and the cause of injury) were collected for all cases. However, specific details on how the injury occurred, (use of safety equipment, etc.) and detailed medical information (occurrence of amnesia, CT scan results, etc.) were not collected for 50% of cases. Cases that were not sampled were excluded from analysis of variables not collected.

An unhelmeted 6-year old boy on a bicycle ran a red light and was struck by a passing vehicle. He was ejected 20-25 feet from the point of impact. After being treated in the hospital for 19 days, he was discharged to a rehabilitation facility for treatment of cognitive and sensory deficits.

Epidemiology

From 1992 –1999 there were 24,971 hospitalized and fatal cases of TBI. Bicycle-related TBIs accounted for 541 (2%) cases, including 35 deaths. Until 1999, there was a steady decline in

the number of hospitalized and fatal bicycle-related TBI cases. From 1998 to 1999, the number increased 36% from 53 to 72 cases (Figure 1). During the same 1-year period, there was also an 11% increase in the overall number of hospitalized and fatal TBIs.

Bicycle-related TBI occurred most frequently among children 5-14 years of

Figure 1. Bicycle-Related Traumatic Brain Injuries by Year of Injury, Oklahoma, 1992-1999

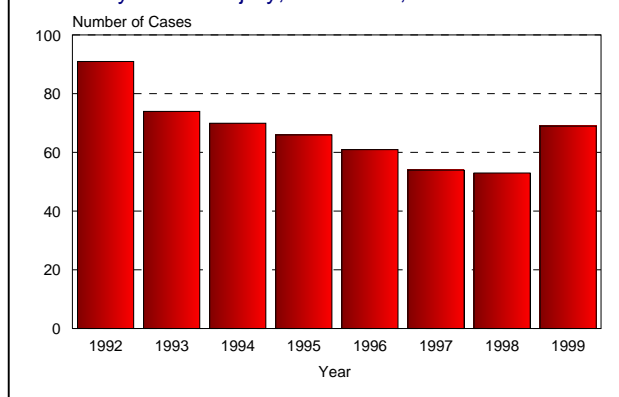
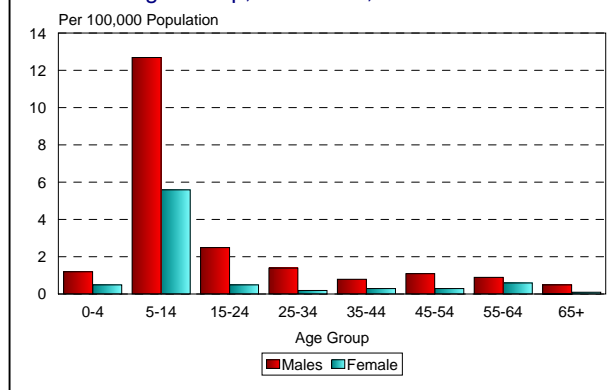


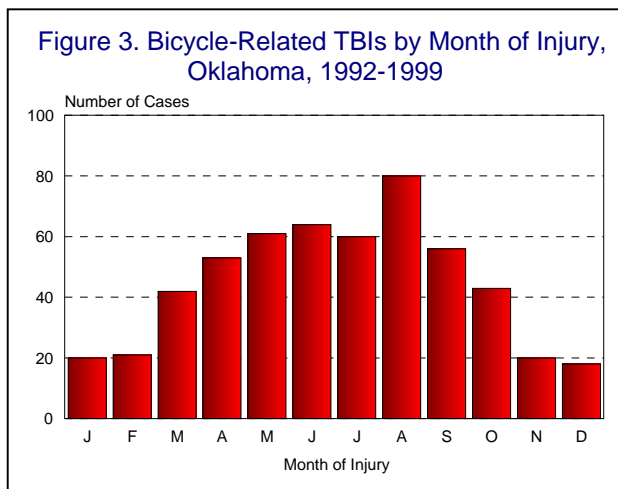
Figure 2. Rates of Bicycle-Related TBI by Age Group, Oklahoma, 1992-1999



age, accounting for 69% (351/506) of hospitalizations and 46% of deaths (16/35). In concordance with these figures, the rates of bicycle-related TBI were also highest among 5- to 14-year olds (Figure 2). The age of persons injured ranged from less than 1 year to 90 years of age, with an average age of 16 years. A total of 1707 years of potential life before age 75 were lost as a result of fatal bicycle-related TBIs. Seventy-three percent (395/541) of injuries occurred among males, with a male to female ratio of 2.7:1.

Injuries were more likely to occur among African Americans than whites or Native Americans (annual rates: 2.5, 2.0, and 1.9 per 100,000 population, respectively). Injuries occurred most frequently during the spring and summer months, peaking in August (Figure 3). The time of injury was known for 445 bicycle-related TBI cases. Seventy-two percent (319/445) of injuries occurred between noon and 8:00 p.m. The two major causes of bicycle-related TBIs were falls (54%) and motor vehicle crashes (45%). Residents of Hughes County had the highest rate of bicycle-related TBIs (Figure 4).

Helmet use was reported for 39%



A 9-year old female bicyclist was chasing a friend and pulled out into traffic without looking. The young bicycle rider was struck by an oncoming car and knocked down. She was released after a 4-day hospital stay.

(209/541) of bicycle-related TBI cases; 92% (193/209) were unhelmeted at the time of injury. Among the 176 persons who were 14 years of age or older, alcohol was known to have been involved in 12% of bicycle-related TBIs.

Fifty-six percent (263/469) of survivors experienced definite or probable loss of consciousness; 43% (200/469) had documented post-traumatic amnesia. Among all 506 survivors, the average hospital stay was 4 days and ranged from 1 to 50 days. Ninety-two percent of survivors were discharged home and 8% were discharged to rehabilitation, skilled nursing, acute or intermediate care facilities, or required home health care. Forty-nine persons (10%) were discharged with definite neurological sequelae such as cognitive deficits, hearing loss, persistent amnesia, hemiplegia, and visual impairment.

Prevention

Bicyclists wearing a helmet at the time of injury are less likely to sustain a TBI than bicyclists not wearing a helmet. Bicycle helmets have been demonstrated to reduce the risk of fatal and nonfatal brain injury by 88% and 85%, respectively. However, despite evidence of their effectiveness, the prevalence of self-reported helmet use remains sub-optimal in Oklahoma at 25%.

From 1993 - 2000, the IPS in collaboration with numerous national, state, and community partners and with funding provided by the National Center for Injury Prevention and Control, implemented bicycle helmet programs in several Oklahoma communities. These comprehensive, community-based efforts targeted children at greatest risk of bicycle related TBIs, those 5-12 years of age. Mini-

grants were awarded to county health departments, schools, police departments, civic organizations, and injury prevention coalitions to implement bicycle helmet distribution and education programs throughout the state.

These bicycle helmet programs have been conducted in more than 90 communities and more than 100,000 bicycle helmets have been distributed. To increase the use of bicycle helmets within target communities, educational programs have included elementary school assemblies, presentations to local organizations, bicycle rodeos, and media

A 10-year old boy rode his bicycle off a 3½ foot loading dock and fell striking his head on the concrete below. He suffered a skull fracture and spent 2 days in the hospital.

campaigns. Observational studies of more than 8,000 cyclists throughout the program period indicate that helmet use greatly increased in many targeted communities. For example, in Enid, helmet use increased from a pre-intervention rate of 3% to 37% one year following intervention. According to the OSDH Behavioral Risk Factor Surveillance System (BRFSS), from 1992 to 1998, reported bicycle helmet use among children increased from 6% to 25%. The IPS has initiated collaboration with

several new partners within the OSDH to help continue to increase bicycle helmet use and promote bicycling and physical activity among children and adults throughout the state.

Figure 4. Bicycle-Related Traumatic Brain Injury Rates by County of Residence, Oklahoma, 1992 to 1999

