

Mild Traumatic Brain Injuries, 2010-2013

Report Highlights

- Decline in rate of mTBI between 2010 and 2013
- Rates of mTBI by demographics and level of medical care
- Differences in causes of mTBIs by age group
- Sports related mTBIs

Introduction

The rate of traumatic brain injury (TBI) deaths in Montana is the 2nd highest in the nation.¹ For every fatal TBI there are many more non-fatal TBIs with a range of severity, often leading to temporary or permanent disability. Mild TBIs (mTBIs) are the least severe as well as the most prevalent, accounting for 75% to 90% of all TBI related deaths, hospitalizations, and emergency department (ED) visits that occur nationally.² While the incidence of hospitalized TBIs was previously examined in Montana,³ the full range of medically treated TBIs could not be examined until ED discharge data became available. Furthermore, due to the low incidence of mTBI hospitalizations, little has been known about the burden of mTBI in Montana. This report summarizes the burden of medically treated mTBI in MT from 2010 through 2013.

Background

- A TBI is disruption of normal brain function caused by a bump, blow or jolt to the head or a penetrating head injury.
- The severity is mild when the disruption is only a brief change in mental status (lasting <24 hours) or loss of consciousness (<30 minutes).

- Concussions are the most common type of mTBI.
- The normal recovery period for mTBI is three months, with an estimated 10-15% of individuals experiencing significant symptoms beyond this period.²
- Legislation to increase proper treatment and recovery for concussions among youth athletes was passed in Montana in 2013.⁴

Incidence and Demographics of mTBI

Overall Incidence Rate

- The rate of mTBI hospitalizations and ED visits was 602 per 100,000 persons per year and decreased significantly between 2010 and 2013 from 616 to 585 per 100,000 persons. (Figure 1)
- For comparison to national estimates, the rate of all TBI ED visits, including mTBIs and more severe TBIs, was 632 per 100,000 persons per year (95%CI 624, 640).
- The national rate of all TBI ED visits was 716 per 100,000 persons in 2010⁵ and the national Healthy People 2020 goal for ED treated TBI is 365 per 100,000 persons per year.⁶

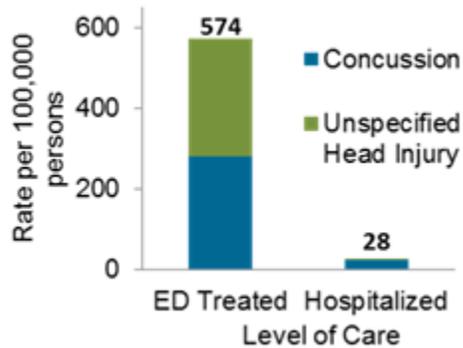
Figure 1. Rate of mTBI emergency department visits and hospitalizations by year, Montana Hospital Discharge Data System (MHDDS), 2010-2013

Year	Rate per 100,000 persons (95% Confidence Interval)
2010	616.4 (601.0, 632.1)
2011	606.8 (591.6, 622.3)
2012	600.3 (585.3, 615.7)
2013*	584.5 (569.8, 599.6)
*Significantly lower rate than in 2010.	

Severity, Type, and Level of Medical Care (Figure 2)

- 90% of all TBIs seen in the emergency room or hospitalized were of mild severity.
- 1/2 of all mTBIs were specified as concussions while the other half were unspecified head injuries, a category which does not exclude concussions (ICD 959.01).
- Nearly all mTBIs were treated and released from the emergency room (96%). 34% of TBI hospitalizations were mild and, of these, 84% were specified as concussions.

Figure 2. Rate of mTBI by type and level of care, MHDDS, 2010-2013



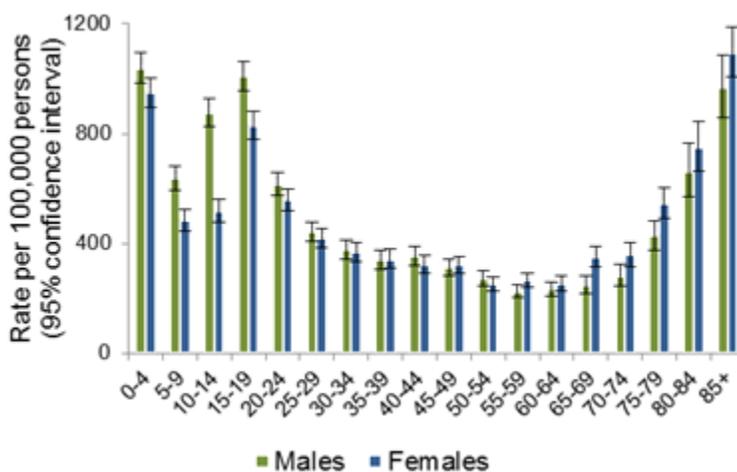
Intent

- 89% of mTBIs seen in hospitals and EDs were unintentional while 11% were due to assault. The focus of this report is on unintentional mTBI.

Age and Sex Distribution (Figure 3)

- Rates of unintentional mTBI were highest among young children, adolescents, and the elderly.
- Males had higher rates than females in the younger age groups and lower rates in older age groups.

Figure 3. Rate of unintentional mTBI by age group and sex, MHDDS, 2010-2013



Costs

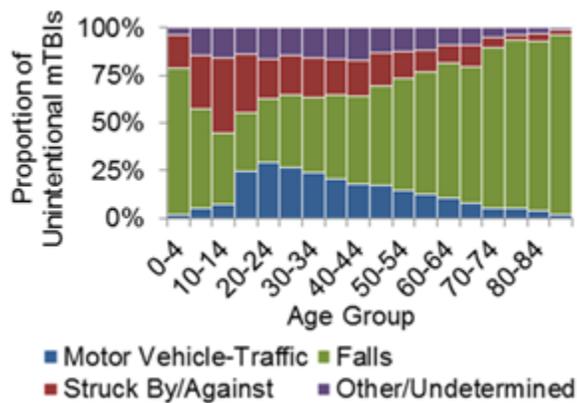
- The median charge for an mTBI ED visit was \$1,700 while the median charge for a hospitalization was nearly \$17,000.

Causes of mTBI

General Causes

- Overall, 55% of mTBIs were due to falls, 20% were due to being struck by or against an object, 14% were due to motor vehicle accidents, and 12% had other or undetermined causes.
- The proportion attributable to each cause varied by age. (Figure 4)

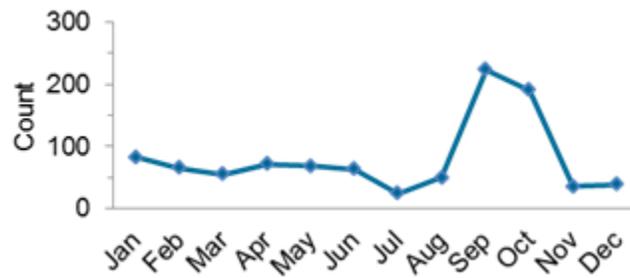
Figure 4. Proportion of unintentional mTBIs by cause and age group, MHDDS, 2010-2013



Sports Related mTBI

- Overall, 6% of mTBIs were sports related. However, the proportion sports related was much higher, 20%, among persons aged 10 to 19.
- The rate of sports-related mTBI among school-aged youth (aged 5 to 19) was 124 per 100,000 persons between 2010 and 2013.
- 43% of sports-related mTBIs in school-aged youth occurred in September and October. (Figure 5)

Figure 5. Seasonality of sports-related mTBIs among youth aged 5 to 19, MHDDS, 2010-2013



Prevention Recommendations

- Wear a seatbelt every time you ride or drive in a motor vehicle.
- Use an appropriate child safety seat, booster seat, or seatbelt according to your child’s height, weight and age.
- Never drive when under the influence of alcohol or drugs.
- Wear a helmet when riding a bike, motorcycle, scooter, snowmobile or ATV.
- Wear a helmet during hazardous recreational activities and contact sports.
- Make living areas safe for seniors by removing tripping hazards, ensuring adequate lighting, and installing handrails on stairways.
- Refer seniors who have had a fall or fear of falling to “Stepping On” or Tai Chi classes to decrease risk of falling.

Public Health Actions

- The “Dylan Steiger’s Protection of Youth Athletes Act”, passed in 2013, promotes safe response to and recovery from concussions in school sports as well as concussion awareness.
- This legislation requires each school district to adopt a policy addressing concussion awareness and safety protocols for participants in school-sponsored organized youth athletic activities. Athletes who exhibit signs, symptoms, or behaviors consistent with concussion should be removed from play and obtain medical clearance before returning to play.⁴
- The act could be strengthened by extending its coverage to non-school sponsored athletics.⁷
- Implementation could be improved through the creation of policy templates for schools and through holding random audits for policy implementation.⁷

Resources

- [CDC Guidelines For Healthcare Providers: Clinical Diagnosis and Management](#)
- [Recognition, Response, and Recovery](#)
- [Concussion in Sports](#)
 - [CDC Heads Up Campaign](#)
 - [Montana Protection of Youth Athletes Act](#)
- [Montana Brain Injury Alliance](#)

Methods

The Montana Hospital Discharge Data System (MHDDS) receives annual de-identified hospital discharge and ED data sets through a Memorandum of Agreement with the Montana Hospital Association. Most hospitals in Montana participate in voluntary reporting from their Uniform Billing forms. The MHDDS receives information on more than 90% of inpatients admissions in the state. Records were included for this analysis if a primary or secondary diagnosis was for an mTBI. The ICD-9-CM-based operational definition of mTBI proposed by the Centers for Disease Control and Prevention in a 2003 Report to Congress on mTBI was used.⁸ Those with ICD-9-CM code 959.01 (“Head Injury-Unspecified”) were included based on their provisional inclusion in the CDC definition and the similar ratio of hospitalizations to emergency department visits as mTBIs with other codes (1.4% and 7.7%, respectively, compared to 78.6% among moderate/severe TBIs). Only ED visits discharged to home or self-care were included while all hospitalization were included to avoid counting ED visits that led to hospitalizations twice. An exception to this is the all-TBI ED visit rate, which was not limited to home discharges for comparability to national estimates. Sports-related mTBIs were defined as those with an E-code E917.0, E917.5, or E886.

Limitations

- The ICD-9 based mTBI definition used for case ascertainment may be lack sensitivity. One study

comparing clinical assessment to the ICD-9 code definition found the ICD-9 definition to have 46% sensitivity and 97.8% specificity.⁹

- Only mTBIs for which medical care was sought in an ED or hospital were identified, underestimating the true incidence of mTBI.
- Records with no E-codes (5.3% of mTBIs) were not able to be classified by cause or intent, leading to possible error in cause- and intent-specific estimates.

References

1. Centers for Disease Control and Prevention, National Centers for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2005) {cited 2015, Jan 1}.
2. Centers for Disease Control and Prevention. Heads up. Facts for physicians about mild traumatic brain injury (MTBI). Atlanta, GA: Centers for Disease Control and Prevention; 2007.
3. Montana Department of Public Health and Human Services, Injury Prevention Program. Hospitalizations for Traumatic Brain Injury, Montana. Winter. 2011.
4. Dylan Steiger's Protection of Youth Athletes Act. MT. SB0112. (2013).
5. Centers for Disease Control and Prevention. Rates of TBI-related Emergency Department Visits, Hospitalizations, and Deaths—United States, 2001-2010. Available online at www.cdc.gov/traumaticbraininjury/data/rates.html.
6. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC. Available at <http://www.healthypeople.gov/>. Accessed Jan. 2, 2015.
7. Montana Department of Public Health and Human Services. Dylan Steiger's Protection of Youth Athletes Act Evaluation Summary Report. December, 2014. Available online at <http://dphhs.mt.gov/publichealth/napa/datasurveillanceeval>
8. National Center for Injury Prevention and Control. Report to Congress on Mild Traumatic Brain Injury in the United States: Steps to Prevent a Serious Public Health Problem. Atlanta, GA: Centers for Disease Control and Prevention; 2003.
9. Bazarian JJ, Veazie P, Mookerjee S, Lerner EB. Accuracy of mild traumatic brain injury case ascertainment using ICD-9 codes. *Acad Emerg Med*. 2006 Jan;13(1):31-8.