

Special Emphasis Report:

Traumatic Brain Injury

2020-2024

Montana

UNDERSTANDING TBI

Traumatic brain injury (TBI) is a serious public health problem in the United States. A TBI is caused by a bump, blow, jolt, or penetration to the head that disrupts the normal function of the brain. Each year, traumatic brain injuries contribute to a substantial number of deaths and cases of permanent disability.

Impact and Magnitude of TBI

From 2020-2024, there were 24,165 traumatic brain injuries sustained by Montana residents. Among those, 2,048 were fatal (33.5 per 100,000 residents), another 3,872 resulted in hospital admission (60.9 per 100k), and an additional 18,245 resulted in an emergency department (ED) visit (treated and released) (331.0 per 100k). In all instances, the TBI could be either the only injury or one of several injuries and/or medical conditions listed.

Causes of TBI

Firearms were the leading cause of TBI-related deaths, primarily driven by suicides (Table 1). Among hospitalizations, unintentional falls were the most common cause of TBI (23.9 per 100k), followed by unintentional motor vehicle traffic incidents (11.5 per 100k). For ED visits - which represent the least severe injuries - the leading cause of TBI was unintentional falls (120.9 per 100k), followed by unintentional struck by/against injuries (47.4 per 100k) and unintentional motor vehicle traffic incidents (42.0 per 100k).

TBI by Age and Sex

The highest number of TBI-related deaths were among males ages 25 and older, as shown in Figure 2. The highest number of TBI-related hospitalizations were among persons ages 65 and older, while persons ages 15-34 years had the highest number of TBI-related emergency department visits.

Figure 1: Percentage of TBI-Related Deaths, Hospitalizations, and Emergency Department Visits by Cause, 2020-2024

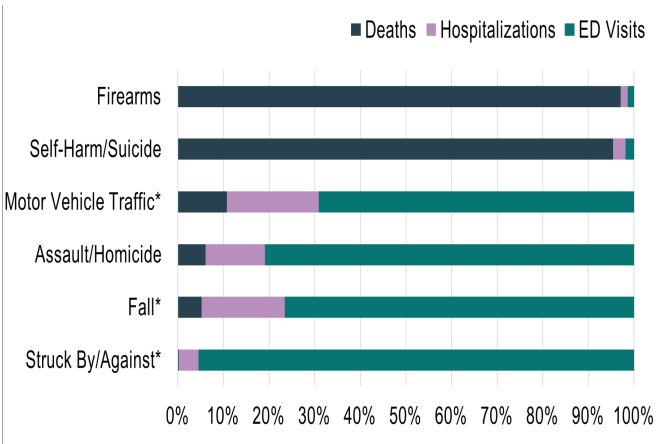
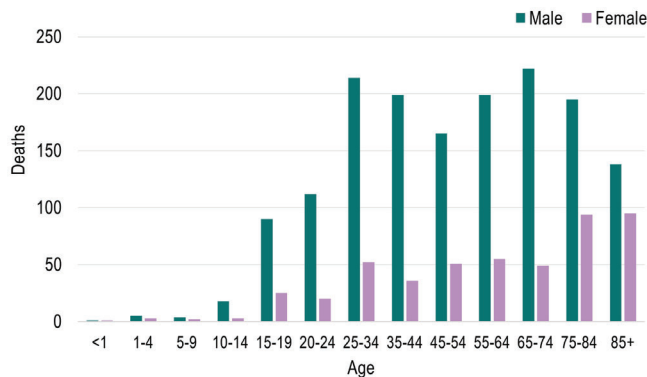


Table 1: Causes of TBI-Related Deaths by Rate per 100,000, 2020-2024

Cause	Count	Rate per 100K People
Firearms	1,029	17.7
Suicide	963	16.4
Unintentional Fall	488	6.7
Unintentional Motor Vehicle Traffic	344	6.0
Homicide	86	1.6
Unintentional Struck By/Against	7	Suppressed

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Figure 2: TBI-Related Deaths by Age and Sex, 2020-2024



TBI Prevention Strategies

Montana's Injury Prevention Program is committed to protecting people against preventable TBI using the following strategies:

- Promoting helmet use in youth sports, biking, ATV use, and recreation.
- Increasing seat belt use to reduce the number of traumatic injuries caused by motor vehicle crashes, including TBIs.
- Helping older adults stay independent in their homes longer by building confidence and strength while reducing falls with three statewide falls prevention programs: Stay Active and Independent for Life (SAIL), Stepping On, and Tai Chi.
- Empowering EMS to assist with falls prevention by walking through a checklist when they are in the homes of elderly patients.
- Supporting firearm suicide prevention efforts such as safe storage campaigns, lethal means counseling training for healthcare providers, and school- and college-based mental health screening and referral.

- Expanding implementation of Excellence in Pre-hospital Injury Care (EPIC) protocols across the state within EMS agencies and EDs to reduce the risk of severe outcomes.
- Improving post-TBI care coordination and rehabilitation referrals.
- Implementing the MT-Brain Injury Guidelines (MT-BIG) for management of BIG 1 TBI patients in rural hospitals.

TBI by Race

Certain populations have higher rates of TBI and may need special prevention measures. The highest rate per 100,000 residents was among American Indian/Alaska Native Montanans. This includes TBIs of any severity.

Table 2: Rate per 100,000 of TBI-Related Deaths, Hospitalizations, and ED Visits by Race, 2020-2024

Race	Count	Rate
American Indian/Alaska Native	1,517	337.7
Black or African American	132	330.0
White	15,336	300.6
Asian/Native Hawaiian/Pacific Islander	90	144.1
More than one race	48	38.4



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TBI Activities

The Montana EMS and Trauma Systems Section (EMSTS), with support from the CDC Core State Injury Prevention Program (Core SIPP), adopted Excellence in Pre-Hospital Injury Prevention-Traumatic Brain Injury (EPIC-TBI) protocols. The EPIC-TBI protocols were developed by Daniel Spaite, M.D., and team at the University of Arizona to improve survival outcomes for individuals experiencing a TBI. In June of 2021, a cadre of pre-hospital and ED staff were trained on the protocols and training methodology. Flow controlled Bag-Valve Masks (BVMs) with rate timers were purchased for training. A student manual was developed and made available on the EMSTS website. EMS Agencies that adopt the protocols and train at least 85% of their responders are given state-wide recognition and an initial supply of flow-controlled BVMs.

Adoption by EMS agencies was rapid, widespread, and continues. Medical directors sign off on the protocols for their agencies when training is completed. Some hospitals in the state also provide training for their ED staff, but the protocols were not necessarily adopted. A few of the Level I and II designated trauma hospitals provide the training to EMS agencies in their catchment area as part of their trauma outreach education.

The Montana State Trauma Care Committee (STCC) had discussions about the success of EPIC-TBI protocols on patient survival but recognized the disconnect between EMS and the ED. EMS providers noted they would follow the protocols with hopes of improving patient outcomes only to have ED staff seemingly undo their work upon arrival. (This was the same concern mentioned in the research findings by Dr. Spaite and his team when implementing the protocols in Arizona.) In 2024, the STCC decided to expand EPIC-TBI protocols to hospitals in a more coordinated, focused way. A team of reviewers examined the protocols, updated them for pre-hospital providers, and added a section specifically for ED adoption. Hospital trauma staff were trained as instructors in September of 2024, and updated MT EPIC-TBI training materials were released in January of 2025. The goal is to have 85% of hospitals in MT fully trained and protocols adopted by the end of the year. This is a significant team approach to emergency care for the state. Outcomes using EMS and Trauma Registry data will be assessed in 2026-2027.

The STCC has also created MT Brain Injury Guidelines (MT-BIG) criteria as guidelines and recommendations for management of BIG 1 (mild) TBI patients in rural hospitals. The goal of these guidelines is to help clinicians in rural hospitals safely manage select patients locally without requiring transfer to a higher-level trauma center, when specific low-risk clinical and imaging criteria are met. Located within these guidelines are appendices that provide resources for discharge and follow up, as well as primary care provider follow up and resources.

Note: All rates are age-adjusted rates, calculated using direct standardization to the 2000 U.S. population.