The Medical & Economic Impact of Traumatic Brain Injury in Ohio

a report from the

CENTER FOR INJURY RESEARCH & POLICY

NATIONWIDE CHILDREN'S HOSPITAL℠

The Problem

Nationally, 1.4 million Americans suffer a Traumatic Brain Injury (TBI) each year, with about 475,000 incidents occurring among children under the age of 14 years[1].

Motorized recreational vehicles (MRV) are responsible for an increasing number of serious injuries, including TBIs, with children under the age of 16 years accounting for roughly one-third of MRV- related injuries and deaths[2].

Project Goals

Describe the medical and economic impact of TBI in Ohio, including MRV-related TBI.

Identify risk and protective factors associated with the outcome of individuals with MRV-related TBI.

Basic Methodology

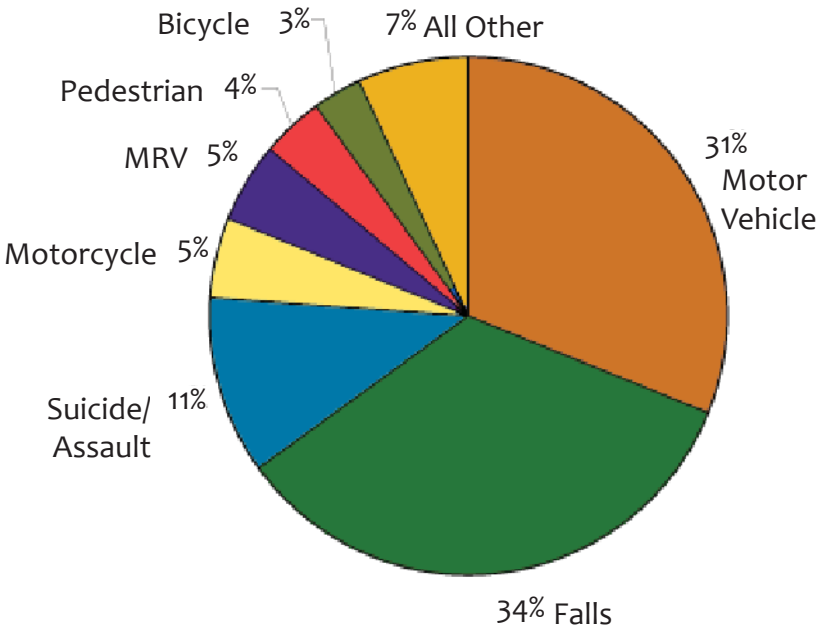
The Ohio Trauma Registry Database and the Emergency Department and In-patient Hospital Database were probabilistically linked for the years 2003 through 2006 in order to assess the impact of TBI in Ohio.

To be included in the Trauma database, individuals must have been admitted for at least 48 hours, transferred into or out of the hospital, pronounced dead on arrival, or died at any point during care in the hospital. Therefore, only individuals with severe injuries were included in this analysis.

Traumatic Brain Injury in Ohio

From 2003 through 2006, there were 26,063 cases of TBI in Ohio.

Cause of Traumatic Brain Injury in Ohio 2003 through 2006

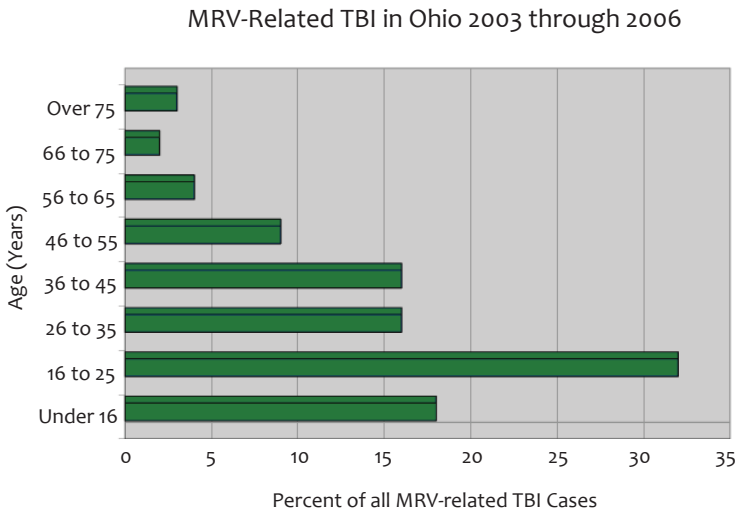


Motor vehicle crashes and falls account for 65% of all TBI cases.

Demographic Profile of Trauma Patients in Ohio 2003 through 2006			
	All TBI Number (%)	MRV-TBI Number (%)	All Trauma Number (%)
Gender			
Male	17,026 (65%)	898 (77%)	55,488 (57%)
Female	9,037 (35%)	267 (23%)	41,732 (43%)
Race			
White	21,813 (84%)	1076 (92%)	80,497 (83%)
Non-White	4,250 (16%)	89 (8%)	16,723 (17%)
Age			
Under 16	3,558 (14%)	212 (18%)	12,762 (13%)
16 – 25 years	4,949 (19%)	376 (32%)	14,083 (15%)
26 – 35 years	3,042 (12%)	187 (16%)	9,987 (10%)
36 – 45 years	3,314 (13%)	186 (16%)	11,566 (12%)
46 – 55 years	2,094 (12%)	100 (9%)	11,415 (12%)
56 – 65 years	1,838 (8%)	43 (4%)	8,252 (9%)
66 – 75 years	2,635 (7%)	28 (2%)	8,028 (9%)
76 and older	1,515 (16%)	11 (3%)	8,646 (22%)

Males sustain a TBI more often than females.

The average age for a non-TBI patient is 49 years (median 48). However, the average age is 43 years (median 40) for all TBI patients and is 30 years (median 25) for MRV-related TBI patients.



Although individuals age 16 to 25 years comprise only 15% of all trauma cases, they have the largest percentage of TBI (19%) and MRV-related TBI (32%) compared with other age groups.

During 2003 through 2006, there were 3,558 TBI-related injuries among children under the age of 16 years. Of these injuries, 212 (6%) incidents were MRV-related.

Compared with MRV riders over 35 years of age, MRV riders under the age of 16 years are 1.3 times more likely to sustain a MRV-related TBI.

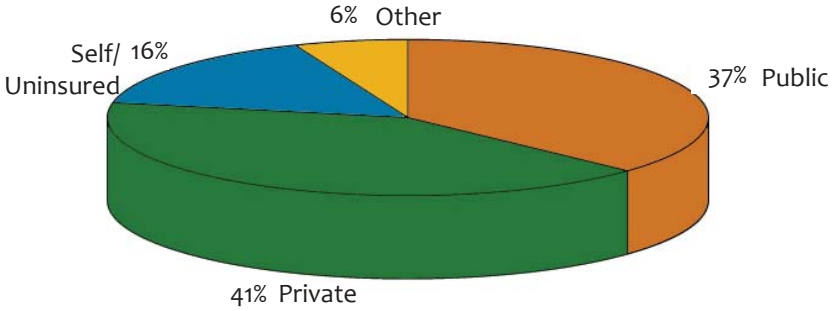
MRV riders 16 to 25 years of age are 1.8 times more likely to sustain a MRV-related TBI than riders over the age of 35 years.

Economic Impact of TBI

Hospital Charges in Ohio 2003 through 2006		
	Mean	Median
TBI	$37,000	$20,164
MRV-related TBI	$35,917	$19,731
Non-TBI	$23,737	$14,135

Hospital charges are $37,000 on average for a TBI, whereas average hospital charges for non-TBIs are approximately $23,700. Hospital charges for MRV-related TBI are approximately $36,000, similar to that for TBIs overall.

Payor Source of Hospital Charges for TBI in Ohio 2003 through 2006



Most hospital charges are paid by private funding sources. However, public funds still cover approximately 37% of hospital charges for patients with a TBI.

The average annual hospital charges in Ohio for TBI and MRV-related TBI are approximately $241,081,000 and $10,461,000, respectively.

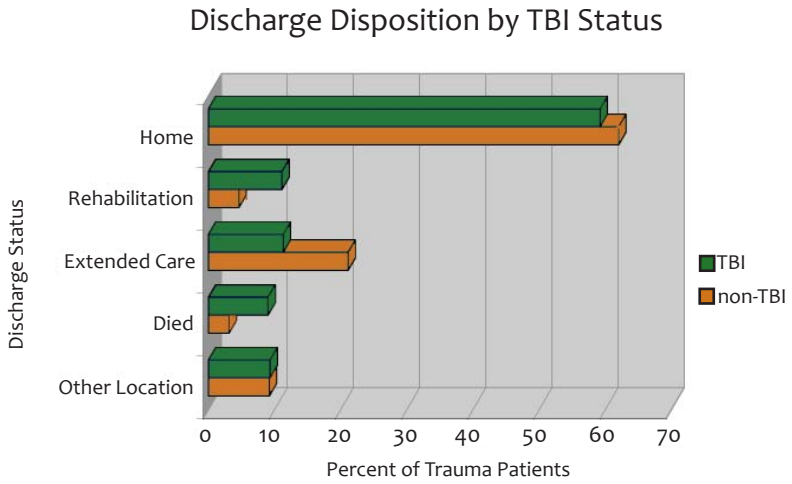
Medical Outcome of TBI

On average, TBI patients have a slightly longer hospital stay than patients without a TBI (mean: 6.9 vs. 5.8 days).

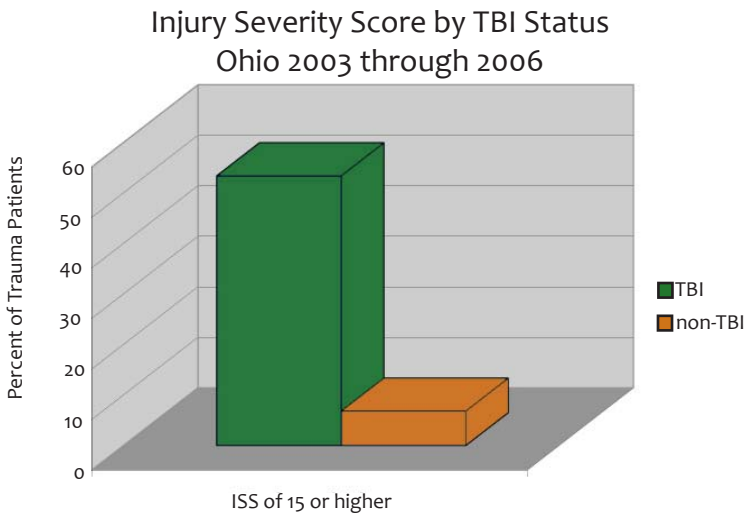
Approximately 37% of TBI patients are admitted to the ICU compared with 14% of non-TBI patients. TBI patients have a longer average ICU length of stay than non-TBI patients (mean: 2.1 vs. 0.7 days).

Only 5% of non-TBI patients require mechanical ventilation, whereas 21% of TBI patients require ventilation. Average days of ventilator use are also higher among TBI patients compared with non-TBI patients (mean: 1.3 vs. 0.4 days).

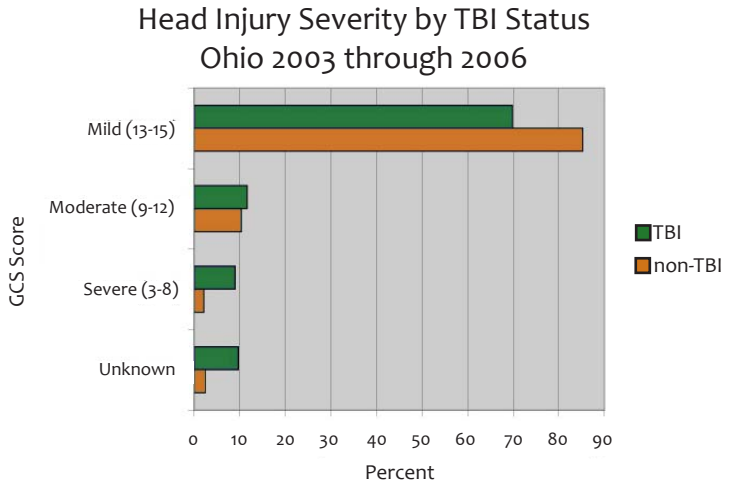
A larger percentage of non-TBI patients is discharged to nursing/ extended care facilities than TBI patients (21 vs. 11%). However, 11% of TBI patients need rehabilitation care and 9% die, compared with non-TBI patients, among whom 5% need rehabilitation and 3% die.



During 2003 through 2006, there were 2,345 fatalities due to TBI. MRV-related injuries were responsible for 63 (3%) of these deaths, with 5 fatalities occurring among children under the age of 16 and 20 fatalities occurring among individuals age 16 to 25 years.

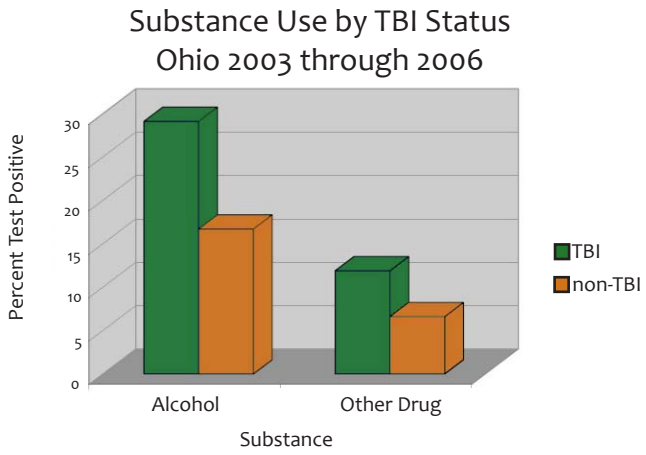


Only 7% of individuals without a TBI have a high Injury Severity Score (ISS ≥ 15), whereas 53% of individuals with a TBI have a high Injury Severity Score.



A larger percentage of TBI patients has severe deficits in level of consciousness than non-TBI patients (9% vs. 2%). Additionally, almost 10% of TBI patients have unknown coma scores, because they are intubated or sedated at the time of assessment, compared with only 2% of non-TBI patients.

Substance Use Behaviors



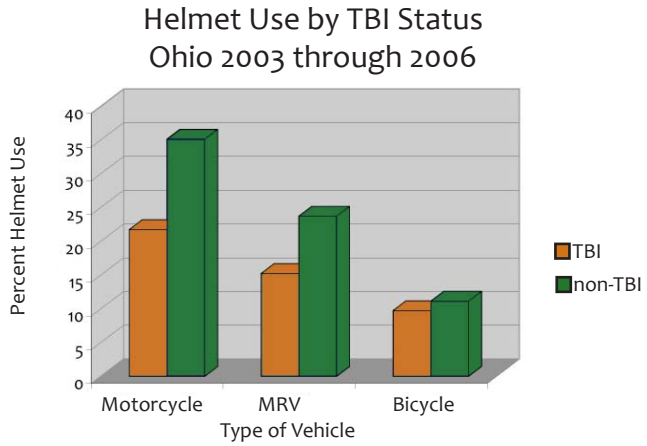
Blood alcohol tests confirm alcohol use in 29% of all TBI cases compared with 17% of non-TBI cases.

Approximately, 12% of TBI patients test positive for other drugs besides alcohol compared with 7% of non-TBI cases.

Injured MRV riders with a positive blood alcohol test are 1.8 times more likely to sustain a TBI than those without documented alcohol use.

Injured MRV riders with a positive blood alcohol test are 1.7 times more likely to be admitted to a rehabilitation facility than those without documented alcohol use.

Protective Behaviors



Among injured motorcyclists, approximately 22% of those with a TBI were wearing a helmet at the time of the crash compared with 35% of those with a non-TBI.

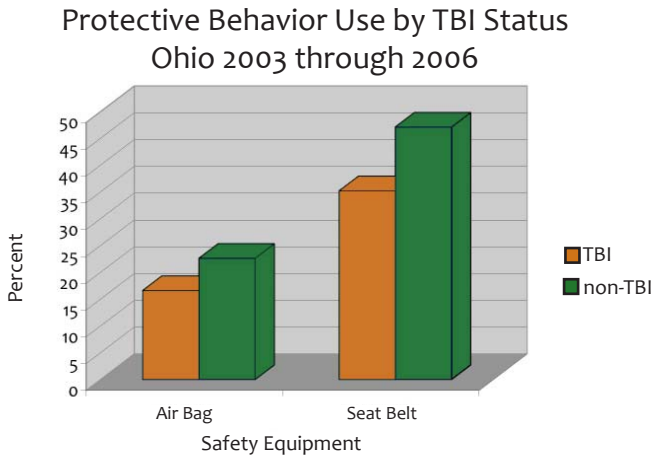
Among injured MRV riders, approximately 15% of those with a TBI were wearing a helmet at the time of the injury compared with 24% of those with a non-TBI.

Less than 2% of all motorcycle, MRV, and bicycle riders use other safety protection devices, such as eye protection, protective clothing, or padding.

Injured MRV riders not wearing a helmet at the time of the crash are 1.5 times more likely to sustain a TBI than those wearing a helmet.

Additionally, death is 2.5 times more likely for injured MRV riders not wearing a helmet at the time of the crash compared with those wearing a helmet.

Among individuals with motor vehicle-related injuries, a smaller percentage of those with a TBI were using motor vehicle passenger safety equipment (air bag and/or seat belt) at the time of the crash than those with a non-TBI.



Conclusions

Hospital charges are greater for patients with TBIs than non-TBIs.

Among trauma patients, younger individuals are more likely to sustain a TBI than older individuals.

Alcohol use at the time of the crash is higher among individuals with a TBI than individuals with a non-TBI.

Among injured MRV riders, a smaller proportion of those with a TBI were wearing a helmet at the time of the crash than those with a non-TBI.

References

1. Consumer Product Safety Commission. 2004 Annual Report of ATV-related Deaths and Injuries. Available at: www.cpsc.gov/library/foia/foia05/brief/atv2004.pdf. Accessed June 10, 2008.

2. Langlois JA, Rutland-Brown W, Thomas KE. Traumatic Brain Injury in the United States: Emergency Department Visits, Hospitalizations, and Deaths. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2006.

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This research project was supported by a grant from the Division of Emergency Medical Services, Ohio Department of Public Safety. The analyses and conclusions in this report are those of the Center for Injury Research and Policy, and do not necessarily reflect the opinions or policies of the funding agency.