Indiana Prevalence of Traumatic Brain Injury

- 2,472 Annual hospitalizations for just Traumatic Brain Injury
- 13,282 (20%) are moderate to severe, and have chronic disability
- 66,410 Hoosiers living with Traumatic Brain Injuries
- CDC has determined that moderate to severe brain injury is a lifelong condition
ABI

- There are two categories of ABI, traumatic and non-traumatic.

- **Traumatic**
  - Contusion
  - Diffuse Axonal Injury (DAI)

- **Non-traumatic**
  - Stroke
  - Anoxic / Hypoxic
  - Brain Tumor
  - Brain Surgery
  - Infection
  - Toxic / Metabolic Injury
  - Electrocution / Struck by lightning

Traumatic Brain Injury (TBI)

- "TBI occurs when an external mechanical force causes brain dysfunction." (Mayo Clinic)

- "Traumatic brain injury (TBI) is a nondegenerative, noncongenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical, and psychosocial functions, with an associated diminished or altered state of consciousness."

Mechanisms of Traumatic Injuries

Coup – Contrecoup injury  Diffuse Axonal Injury
93% of acute CT scans are normal in mTBI; 10% are normal in severe TBI, and significant new lesions and ICP may develop in as many as 40% of cases with an initially normal head CT.

Diffuse Axonal Injury – Diffusion Tensor Imaging

Severity of TBI

<table>
<thead>
<tr>
<th>Imaging</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC</td>
<td>0-30 minutes</td>
<td>&gt; 30 minutes</td>
<td>&gt; 24 hours</td>
</tr>
<tr>
<td>AOC</td>
<td>A moment up to 24 hours</td>
<td>&gt; 24 hours</td>
<td>Severity based on other criteria</td>
</tr>
<tr>
<td>PTA</td>
<td>0-1 day</td>
<td>&gt; 1 and &lt; 7 days</td>
<td>&gt; 7 days</td>
</tr>
<tr>
<td>GCS</td>
<td>13-15</td>
<td>9-12</td>
<td>3-8</td>
</tr>
</tbody>
</table>

Classification based on 2009 VA/DoD Clinical Practice Guidelines for Management of Concussion/Mild Traumatic Brain Injury

*LOC = loss of consciousness
*AOC = alteration of consciousness / mental state
*PTA = post-traumatic amnesia
*GCS = Glasgow Coma Scale
Moderate to Severe TBI

- Basic cognitive skills may be disrupted:
  - Sustaining attention
  - Concentrating on tasks at hand
  - Remembering newly learned material
  - Processing of information
  - Solving problems / making decisions

- Neurobehavioral changes are common:
  - Decreased inhibition and impulsivity
  - Difficulty with initiation
  - Diminished awareness of weaknesses / limitations
  - Social inappropriateness

- Possible emotional & social consequences:
  - Increased irritability / aggression
  - Depression & anxiety
  - Mood lability
  - Social withdrawal

*** Can also experience physical & other medical complications related to the TBI

TBI Consequence | Functional Impact on Behavior
--- | ---
Attention deficit | Difficulty focusing on or responding to required tasks or directions on the job or in the classroom
Memory deficit | Difficulty understanding or remembering new information or directions
Irritability or Anger | Incidents with co-workers / supervisors
Uninhibited or Impulsive Behavior | Poor Inhibition of emotions or desires (e.g., making inappropriate jokes, drug use, rage)
Executive Function deficit | Difficulty organizing behavior to execute stated intentions or goals (e.g., don’t actually do what they wanted or said they would do)
Traumatic Brain Injury in Prisons and Jails: An Unrecognized Problem


Prevalence

Meta-analysis of 20 epidemiological studies found 60% of offenders had history of TBI \(^1\)

Compared to 8.5% of people in the community \(^2\)

\(^1\) Shiroma, Ferguson, & Pickelsimer (2012). J Correctional Health Care, 16(2), 147-159.


Adolescent TBI and Crime

- Population-based clinical sample of 508 psychiatric inpatient adolescents from Northern Finland
- Adolescents with TBI had significantly more often committed crimes (53.8%) compared to adolescents without TBI (14.7%)
- Subjects with TBI had significantly more violent crimes
- TBI during childhood and adolescence increased the risk of:
  - any criminality 6.8-fold (95% 3.0–15.2),
  - conduct disorder 5.7-fold (95% 2.1–15.4), and
  - concomitant criminality and conduct disorder 18.7-fold (95% 4.3–80.1)

Relationship Between TBI and Incarceration

- 7% of survivors of severe TBI had had legal involvement within 1 year after the injury.  
- 24% of subjects with TBI had committed crimes leading to arrests within a 2-year period.  
- By 5 years after the head injury, 31% had legal involvement.  


TBI a Clear Risk Factor for Incarceration

- 83% reported sustaining a TBI before their initial involvement with the criminal-justice


Urban TBI and Health Disparities

- Sample was:
  - 20 African American men convicted of domestic violence
  - 20 African American men without criminal convictions matched for age and socioeconomic status.
- More than half of the participants in both groups had sustained a TBI,
- Injuries in the offender group were significantly more severe.
- Significantly greater problems with anger management in the offender group.
- Published epidemiological data regarding TBI may underestimate the prevalence in urban populations.

TBI and Prison Adjustment

- TBI in offenders is associated with:
  1. higher rates of infraction while in custody
  2. Higher levels of reoffending
  3. Committing more violent crimes

Inmates with TBI were found to have significantly greater risk of violence and self-harm.


TBI and Criminal Behavior

- Aggressive behavior in TBI was significantly associated with:
  1. Major depression
  2. Frontal lobe injury
  3. History of drug and alcohol abuse (further compromise of brain functioning)

The greater the impairment of executive functions, the greater the aggression.


TBI and Criminal Behavior

- In a study of incarcerated adults,
  1. Violent inmates had a history of childhood and adolescent TBI for which they did not receive rehabilitation as well as academic and behavioral problems in school
  2. Non-violent inmates had only a history of academic and behavioral problems in school

TBI and Capital Murder

- 100% of Inmates on death row have a history of TBI

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Overview

- 187 participants were screened from the Marion County Specialty Courts
- Screening took place between August and October 2016 and included every active member of each court:
  - Women’s Drug Treatment
  - Men’s Drug Treatment
  - Mental Health
  - HEAT parole
  - Re-entry Court
  - Veteran’s Court

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Results by Court

<table>
<thead>
<tr>
<th>Court</th>
<th>Number of Participants</th>
<th>% with moderate to severe brain injury</th>
<th>% with any level of brain injury</th>
<th>% with non-traumatic BI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women’s Drug Treatment</td>
<td>53</td>
<td>9.4%</td>
<td>60%</td>
<td>38%</td>
</tr>
<tr>
<td>Men’s Drug Treatment</td>
<td>41</td>
<td>2.4%</td>
<td>46%</td>
<td>42%</td>
</tr>
<tr>
<td>Mental Health</td>
<td>13</td>
<td>0.0%</td>
<td>77%</td>
<td>39%</td>
</tr>
<tr>
<td>HEAT parole</td>
<td>15</td>
<td>6.7%</td>
<td>33%</td>
<td>27%</td>
</tr>
<tr>
<td>Re-entry</td>
<td>44</td>
<td>11.4%</td>
<td>55%</td>
<td>25%</td>
</tr>
<tr>
<td>Veteran’s Court</td>
<td>21</td>
<td>9.5%</td>
<td>95%</td>
<td>91%</td>
</tr>
<tr>
<td>TOTAL SAMPLE</td>
<td>187</td>
<td>7.5%</td>
<td>59%</td>
<td>41%</td>
</tr>
</tbody>
</table>
Conclusions

- The Veteran’s court shows significantly higher TBI rates than the other courts (p<.05) when looking at all levels of traumatic brain injury as well as acquired brain injury (p<.05)
- No other courts differ significantly in TBI/ABI rates
- When looking at moderate to severe rates only, there are no significant differences between the courts ($\chi^2=3.95$, p=.557)
So why are people with TBI more at risk for criminal behavior?

**Orbitofrontal Injury**
- disinhibition and impulsivity ("pseudo-psychopathic")
- hyperkinetic & jocularity
- euphoric & irritability
- impaired maintenance of cognitive set/strategy
Most TBI Frontal Behavioral Impairments are Misdiagnosed as Psychiatric Disorders

Conclusions

- Brain Injury a Significant Priority for Criminal Justice System
  - Prevalence
  - Adjustment in Incarceration
  - Risk for Re-offending
- Needs:
  - Screening
  - Management/treatment during Incarceration
  - Post-release Planning and Treatment
  - Prevention of Criminality after Brain Injury