



### **Brain Injury Overview** Overview for Behavioral Health Professionals 2021

### **Maryland Traumatic Brain Injury Partner Grant**

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### Why is important for Behavioral Health (and Human Service Professionals) in any setting to have a working understanding of brain injury?

- Being brain injury informed means that professionals, advocates, family members and friends are familiar with tools and approaches to best support individuals living with a known or unknown history of brain injury
- Being brain injury informed includes knowing where to obtain more information, tips and resources to help those who may be living with a hidden or not so hidden history of brain injury



### Who is Affected By Brain Injury?

- People impacted by the intersection of mental health and brain injury, especially as it relates to suicide
- People who use drugs and alcohol
- People who are justice involved, both adults and children
- People who are homeless
- People who serve in the armed services
- People who are victims and perpetrators of intimate partner violence



## Who is Affected By Brain Injury?

Broadly:

- People of lower socioeconomic status, especially those without medical insurance
- People who live in rural areas
- Young people
- Older Adults



## By the End of This Training Attendees Will:

Become familiar with types and causes of brain injury

Understand who is impacted by brain injury

 Understand how living with a brain injury can impact physical, thinking and social/emotional health and well being



### **Traumatic Brain Injury vs. Acquired Brain Injury**

TBI Defined	ABI Defined
Traumatic Brain Injury (TBI) is an	Acquired Brain Injury (ABI) is an
insult to the brain caused by an	insult to the brain that has occurred
external physical force, such as a fall,	after birth, such as TBI, stroke, near
motor vehicle accident, assault,	suffocation, infections in the brain,
sports-related incident, or improvised	or anoxia and opioid overdose(s)
explosive device (IED) exposure	

\*Both mechanisms of injury can result in a chronic disability that may get worse with age.



### **Brain Injury Severity**

**Distribution of severity:** 

- Mild injuries = 80 percent (Loss of consciousness (LOC) < 30 minutes, post traumatic amnesia (PTA) < 1 hour)</li>
- Moderate = 10–13 percent (LOC 30 minutes to 24 hours, PTA 1 to 24 hours)
- Severe = 7–10 percent (LOC >24 hours, PTA >24 hours)



### How Big is the Problem?

# According to the CDC up to 15% of "mild" TBIs result in long term consequences!



## **Traumatic Brain Injury & Health Disparities**

The Centers for Disease Control and Prevention (CDC) identifies the following regarding Health Disparities and TBI:

- American Indian/Alaska Native children and adults have higher rates of TBI-related hospitalizations and deaths than other racial or ethnic groups (factors include motor vehicle accidents, substance use, and suicide).
- Non-Hispanic black and Hispanic individuals are less likely to receive follow-up care and rehabilitation following TBI than non-Hispanic whites.
- Racial and ethnic minorities are also more likely to have poor psychosocial, functional, and employment outcomes post TBI than non-Hispanic whites.





## **Traumatic Brain Injury & Health Disparities**

- Those who live in rural areas are more likely to die from a TBI than those in urban areas due to:
- More time to get to care
- Less access to a Level 1 trauma center (Maryland's Shock Trauma for example)
- Lack of TBI specialized programs

\*Children in rural areas who incur a TBI are more likely to die than children living in urban areas



### **Acquired Brain Injury Secondary to Overdose**

What is known and observed regarding the impact of opioid overdose and the brain:

- Sudden loss of oxygen to the brain has the greatest effect on parts of the brain that are high oxygen users such as the hippocampus, basal ganglia and frontal region among others
- These areas of the brain are oxygen "hogs" and are critical to memory, learning and attending to new information, problem solving and the ability to manage our emotions and impulses — in other words, they are responsible for our adult thinking skills aka "executive functioning"

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Source: Adapted from Ohio Brain Injury Program/John Corrigan PhD, 2017

### **Brain Injury is a Chronic Condition!**

As more individuals thankfully survive brain injury, research is looking at the potential implications of aging with a history of brain injury.

"Injury to the brain can evolve into a lifelong health condition termed chronic brain injury (CBI). CBI impairs the brain and other organ systems and may persist or progress over an individual's life span."



**Source:** Galveston Brain Injury Conference 2010

### **TBI: A Chronic Condition**

A longitudinal study of the TBI Model Systems cohort (N=6,913) found those who received inpatient rehabilitation at a specialized brain injury center have a reduced life expectancy:

- People were 2.23 times more likely to die than those of comparable age, sex, and race in the general population
- Reduced life expectancy of nine years
- People are at higher risk of dying from seizure (although this is relatively infrequent cause of death)
- External causes of death include: Fall, accidental poisoning, homicide, motor vehicle accident, and suicide



**Source:** Harrison-Felix C., Pretz C., Hammond, FM., Cuthbert, JP., Corrigan, J., Miller, AC., Haarbauer-Krupa, J. (2014) Life Expectancy after Inpatient Rehabilitation for Traumatic Brain Injury in the United States. J. Neurotrauma.31:1-9.

### **Brain Injury Fast Facts**

- In 2013, 2.8 million Americans were treated in Emergency Departments (ED), hospitalized, or died as a result of a TBI.
- The brain reaches its adult weight of 3 pounds by the age of 12.
- The adult brain reaches cognitive maturity by the mid-20s.
- The last part of the brain to develop is the frontal lobe.
  - Males 2:1 more than female
  - Very young and very old due to falls
  - Adolescents and young adults due to intentional injuries (e.g., falls, unintentional poisoning, self-harm, assault and moving vehicle crashes)

**Source:** Adapted by Corrigan 2014



### **Lightning Round:**

A brain injury can be caused by which of the following?

- 1. a concussion
- 2. an opioid overdose
- 3. an aneurysm
- 4. all of the above



### **Brain Injury - The Skull**

Many of our adult thinking skills reside in the frontal lobe; the frontal lobe is very vulnerable to injury.





### **The Frontal Lobe**

**The frontal lobe** is the area of the brain responsible for our "executive skills," or higher cognitive functions. These skills include:

- Problem solving
- Spontaneity
- Memory
- Language
- Motivation
- Judgment
- Impulse control
- Social and sexual behavior





### **Frontal Lobe Injury Consequences**

- Frontal lobe injuries, even those that occur in childhood, can cause long term problems in thinking, responding and behaving
- It's important for Department of Socials Services staff and other human services professionals to know this since it can explain some of current behaviors professionals may observe
- Signs of brain injury can look a lot like other behavioral health conditions



### **The Frontal Lobe**

"... What takes a little longer to develop are the connections between areas like the prefrontal cortex, that regulate thinking, and the limbic system, where emotions largely stem from, as well as biological drives you could call "the four F's— fight, flight, feeding, and ffff... fooling around."

**Source:** James Griffin, the deputy chief of the National Institute of CCHD's Child Development and Behavior Branch, quoted in Julie Beck's 2016 <u>article in The Atlantic entitled "When are You Really an Adult?"</u>. <u>https://www.theatlantic.com/health/archive/2016/01/when-are-you-really-an-adult/422487/</u></u>



### **The Temporal Lobe**

The temporal lobe plays a role in emotions and is also responsible for smelling, tasting, perception, memory, understanding music. aggressiveness, and sexual behavior.

The temporal lobe also contains the language area of the brain.

Source: Adapted from Dr. Mary Pepping of the University of Idaho's presentation "The Human Brain: Anatomy, Functions, and Injury"



### **Brain Injury**

For Behavioral Health Professionals, the behavioral impact of damage to the frontal and temporal lobes can be a factor during interactions with people who otherwise appear "normal."



### **TBI and ABI "Fingerprints"**

There are two other lobes in the brain, the occipital and the parietal lobes.

Our frontal lobe and the temporal lobes are key to managing behavior and emotions.

Thus, damage to these regions can contribute to mental health and/or addiction problems. Damage to these lobes due to a TBI from a car accident or from a serious overdose is considered the **"Fingerprint of Brain Injury."** 





### **Recognizing Brain Injury**

Groups who may have multiple mild TBIs include:

- Athletes especially boxers, football players, and hockey players
- Victims of intimate partner violence and childhood physical abuse
- People who misuse and abuse substances
- People who are homeless
- People with mental illness
- People in the criminal justice system
- Those who have served in the armed forces



## According to the Centers for Disease Control & Prevention, about 150 Americans die from TBI-related injuries each day



### Brain Injury by the Numbers, Maryland

According to the Maryland Department of Health Center for Environmental, Occupational, and Injury Epidemiology in 2018:

There were 4,221 TBI related hospitalizations and 15,205 TBI related Emergency Department visits with some rural counties and Baltimore City especially hard hit



## Brain Injury by the Numbers, nationally

### Among non-fatal TBI-related injuries in 2014

Rates of Emergency Department visits are highest for those 75 and older and children 0-4

Being struck by or against an object was the leading cause of TBI related visits for those 15-24

Falls were the leading cause of hospitalization among children 0-14 and adults 45 and older

Motor vehicle crashes were the leading cause of hospitalizations for adolescents and persons 14 to 44 years of age

### Source:

https://www.cdc.gov/traumaticbraininjury/index.html



### **Common Physical Challenges after Brain Injury**

Injury-related problem	How it may affect a person functionally
Coordination	Unsteady gait, poor eye-hand coordination, slow or slurred speech, tremors, paralysis
Visual Deficits	Staring or poor eye contact, blurred or double vision, inability to follow an object with their eyes
Additional Physical	Seizures, deaf or hard of hearing, fatigue



Challenges

### Common Cognitive Challenges after Brain Injury

### Injury-related problem

Memory

**Processing (receptive)** 

Processing (expressive)

Problem solving (related to frontal lobe and temporal tip injury)

### How it may affect a person functionally

Trouble following directions, providing requested information, making appointments

Understanding what is being said and reading

Trouble putting thoughts into words — tip of the tongue syndrome

Impulsive, easily frustrated, sexually disinhibited, verbally/physically combative, interpersonally inflexible, poorly organized



### **Common Behavioral Challenges after Brain Injury**

Injury-related problem	How it may affect a person functionally
Depression	Flat affect, lack of initiation, sadness, irritability
Unawareness	Unable to take social cues from others
Confabulation	"Making up stories"
Perservation	Gets "stuck" on a topic of conversation or physical action
Anxiety	Can exacerbate other cognitive/behavioral problems



# Reduced or NO Awareness of the functional implications of injury imposed barriers

For example, the injury has left the person with difficulty moving the right side of their body, they drag their right foot and their fingers can't grasp objects. Despite what seems to be an obvious disability, they insist they can drive without any accommodations or modifications to their car.



### **Levels of Awareness**

- Intellectual Awareness: "My memory is so bad" but can't link that awareness to using such strategies as keeping a calendar so appointment aren't missed
- Emergent Awareness: Individual is able to recognize a problem when it is actually happening "Darn it, I knew I should have taken a picture of the parking space number" (as they are wandering around the parking garage)
- Anticipatory Awareness: individual is able to anticipate a problem will occur and plan for the use of a particular strategy or compensation that will reduce the chances that a problem will occur, e.g. keep and refer to a calendar, take a picture of the parking space number and/or park in the same general area each time they go to the mall

Source: Crossen et.al (1989) J Head Trauma Rehabilitation



# This lack of awareness extends into awareness of an individual's personal history of brain injury

This is why routine screening for a history of brain injury is so important, it can reframe what looks like personality or behavioral health issues

# There are other clues that may indicate a person may be living with a history of brain injury

- You may observe scars on an individual's forehead, neck, face
- The individual is unsteady on their feet, limps or drags one foot while walking, may use a cane, walker or wheelchair
- Speech is slurred
- Individual is wearing an eye patch, or they have what looks like a diamond cut lens in one side of their glasses
- The individual denies problems or challenges that are clear to others
- Individual seems to have difficulty making eye contact or looks like they are not paying attention to you

### Mental Health

- Depression is frequent following TBI; depressed clients with TBI are more likely to be suicidal
- Higher rates of anxiety disorders (generalized, Obsessive Compulsive Disorder and Post Traumatic Stress Disorder)
- Higher rates of psychosis among persons with TBI
- Some studies have found higher rates of personality disorders among persons with TBI
- Childhood TBI doubles likelihood of psychiatric disorder by early adulthood



## **Mental Health**

A review of studies of individuals who were homeless, incarcerated, and at risk of or living with mental illness found a positive association between adverse childhood experiences (ACES) and TBI:

- Physical abuse
- Psychological abuse
- Household member incarceration
- Household member drug use

The authors of the review recommend, "Clinicians and researchers should inquire about adverse childhood experiences in all people with traumatic brain injury as pre-injury health conditions can affect recovery."



### **Substance Use and Brain Injury**

"Studies of both brain structure and function indicate that substance misuse and TBI interact in an additive way, specifically, their co-occurrence results in more impairment than either one alone."

"Substance misuse also limits outcomes from TBI by undermining environmental supports such as familial care or access to services."

Data from a Finnish birth cohort study have "reported multiple risk factors associated with incurring a TBI, including that **if parents misused alcohol, there was a two-fold greater chance of childhood TBI."** (possible reasons why??)

Source: Corrigan and Mysiw's chapter "Substance Abuse Among Person's with Traumatic Brain Injury" from Brain Injury Medicine, 2<sup>nd</sup> Edition 2012-Key Points



### **Substance Use and Brain Injury**

- "When all factors are considered, it would appear reasonable to expect half of the adults under age 65 receiving inpatient rehabilitation for a primary diagnosis of TBI to have prior histories of either alcohol misuse or illicit drug use."
- Long term consequences: "Those who also misuse substances face additional complications, including they are less likely to be working, have lower subjective well-being, have an increased likelihood of suicide, and an increased likelihood of premature mortality due to any cause and are at greater risk for seizure."



### National Institute on Disability, Independent Living, and Rehabilitation Research: People with Disabilities & Opioid Use Disorder

- TBI often results in headaches & orthopedic injuries leading to prescriptions for opioids-70-80% of all patients with TBI are discharged with a prescription for opioids
- TBI often results in impairment of memory, leading people to forget when and how much they have taken of prescribed opioids
- TBI often results in impaired judgement and impulsivity which can also lead to overuse of pain medication
- TBI related cognitive and behavioral impairments and related social, community reentry, and vocational challenges can contribute to the development of mood disorders, for which individuals may self medicate with opioids

At present there are no opioid prescribing guidelines for people with TBI

Source: https://acl.gov/sites/default/files/news%202018-



36 <u>05/20180502NIDILRROpioidRFIFindings.pdf</u>

### Homelessness

### Canadian Studies 2004 and 2014:

- Researchers screened 904 individuals receiving services in homeless shelters and meal services for a history of TBI. Over half (53 percent) of the individuals had a lifetime prevalence of TBI
- In a subsequent study, researchers screened 111 individuals at an urban men's shelter finding
- 45 percent screened positive for a history of TBI

**Sources:** Hwang SW, Colantonio A, Chiu S, et al. The effect of traumatic brain injury on the health of homeless people. CMAJ : Canadian Medical Association Journal. 2008;179(8):779-784. doi:10.1503/cmaj.080341.

Topolovec-Vranic J, Ennis N, Howatt M, et al. Traumatic brain injury among men in an urban homeless shelter: observational study of rates and mechanisms of injury. CMAJ Open. 2014;2(2):E69-E76. doi:10.9778/cmajo.20130046.



### Homelessness

(continued):

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- 73 percent of the men had their 1st TBI before adulthood
- For 87 percent of these individuals, TBI incurred prior to homelessness
- Mechanism of injury; assault, sports/recreation, Motor Vehicle Accident (MVA), fall. Positive screen (+) associated with history of arrest or mental illness and parental history of substance abuse

**Sources:** Hwang SW, Colantonio A, Chiu S, et al. The effect of traumatic brain injury on the health of homeless people. CMAJ : Canadian Medical Association Journal. 2008;179(8):779-784. doi:10.1503/cmaj.080341.

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### **Domestic Violence**

People who are victims of domestic violence often have TBI from hitting, choking, etc.

- Studies have suggested the perpetrators also are likely to have a history of TBI
- It is difficult for those who have been abused, especially over a long period of time, to organize a plan to leave, due not only to emotional distress and economic considerations, but also because the parts of their brains responsible for planning, organizing, and remembering have been damaged. Victims may have impulse control problems themselves. "She gives as good as she gets"

### Incarceration

The estimated prevalence of TBI in the offender population is 60.25 percent

"TBI can create challenges to managing offenders and to their successful community reentry upon release."

**Source:** Shiroma, Feguson, Pickelsimer 2012



### Brain Injury: Growing into Brain Injury ...







# Youth

- By late adolescence and early adulthood (16 25 years old):
  - Those hospitalized with first TBI before age six are three times more likely to have a diagnosis of either alcohol or drug dependence by age 25
  - Those hospitalized with first TBI between ages 16–21 are three times more likely to be diagnosed with drug dependence
    - History of childhood TBI is highly associated with likelihood of arrest

Source: John Corrigan Ph.D., Ohio Valley Center 2014



## Children Post-TBI and Access to Mental Health Care

- Approximately 1.7 million including 50,000 children incur a TBI annually
- Up to 50% of children experience behavioral and psychiatric problems post a brain injury, with problems tending to worsen over time
- Following TBI, children have higher rates of Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder/Conduct Disorder, substance abuse, mood disorders and anxiety

**Source:** Moore M, Jimenez N, Graves JM, Rue T, Fann JR, Rivara FP, Vavilala MS. Racial Disparities in Outpatient Mental Health Service Use Among Children Hospitalized for Traumatic Brain Injury. J Head Trauma Rehabil. 2018 May/Jun;33(3):177-184. doi: 10.1097/HTR.00000000000348. PMID: 29194176: PMCID: PMC6110532.

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# "Consequences are particularly related to impulsivity and self-regulation"

John Corrigan Ph.D.

Remarks at the September 2018 National Association of State Head Injury Administrators conference, Des Moines Iowa, regarding the consequences of childhood brain injury.



### **Older Adults and Brain Injury,**

# Structural changes in the brain make the older brain vulnerable to injury



### Source:

<u>http://discovermagazine.com/2012/oct/16-brutal-</u>, <u>truths-about-the-aging-brain</u>



# Why is the older brain so vulnerable to injury?

- Physiologic age-related changes
  - > Balance, vision and hearing, physical strength, gait, dexterity and cognitive skills
  - Shrinkage of certain parts of the brain, reduced communication between nerve cells, decreased blood flow and inflammation
- Presence of co-morbidities
  - Cardiovascular disease, cancer, arthritis, depression, diabetes, chronic kidney condition, chronic obstructive pulmonary disorder, prior history of TBI
- Polypharmacy-simultaneous use of multiple medications
  - Anticoagulants, psychotropics, and sedatives that increase the risk of dizziness, hypotension, arrhythmias, and decreased level of consciousness



# Chronic Subdural Hematomas-a vulnerability unique to the older adult brain





### **Best Practices**

- Screen for a history of brain injury
- Supports offered are guided by the person's preferences
- Cognitive Behavioral Therapy
- Motivational Interviewing
- Stages of Change Model approach



## **Brain Injury Informed Recommendations**

- Screen everyone who comes into services for a history of brain injury (see the TBI/ABI Screening Tool and the TBI Survey Tool for children in your handouts)
- Educate individuals about the relationship between opioid overdose and brain injury
- If the screen is positive, refer to specialized services and/or implement supports and strategies with the individual to improve day to day functioning
- Always ask what they are already doing to accommodate any brain injury related challenges ("put my keys on a hook by the door"), build upon their preferences and...
- Use the "Accommodating the Symptoms of TBI" as a starting point and a reference, find the link to this resource in the Brain Injury Resources handout
- Hint, the suggestions offered in SAMHSA's guide to Trauma Informed Environments work great for individuals living with brain injury

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Ohio State University Modified Brain Injury Screening Tool 2021 - Word



motorcycle wreck, bicycle crash, being hit by

someone, playing sports or an injury during

a. Thinking about any injuries you have had in

your lifetime, were you ever knocked out or

b. What was the longest time you were knocked

out or unconscious? (Choose just one; if you

are not sure please make your best quess.)

Image: knocked out or lost consciousness for

Image: knocked out or lost consciousness

c. How old were you the first time you were

Complete this screening to determine if a person may have had

a brain injury. It is important to note that this screening does not

result in a diagnosis, is not intended to be used for eligibility

evaluation and assessment with a trained professional. This information should be treated as Protected Health Information.

Deidentified data may be analyzed for program evaluation.

determination and DOES NOT replace a face-to-face

knocked out or lost consciousness?

between 30 minutes and 24 hours

knocked out or lost consciousness for 24

something, falling down, being hit by

did you lose consciousness?

less than 30 minutes

hours or longer

years old

□ No (IF NO, GO TO QUESTION 2)

military service.

□ Yes

1. Please think about injuries you have had 2. Have you ever had a period of time during your entire lifetime, especially those in which you experienced multiple. that affected your head or neck. It might help repeated impacts to your head (e.g., to remember times you went to the hospital history of abuse, contact sports, or emergency department. Think about military duty)? injuries you may have received from a car or 🗆 Yes

No (IF NO, GO TO QUESTION 3)

- a. How old were you when these repeated injuries began? \_\_\_\_\_ years old
  - b. How old were you when these repeated injuries ended? \_\_\_\_\_ years old

- 3. Have you ever lost consciousness from a drug overdose or being choked or strangled? Yes
- No (IF NO, GO TO QUESTION 4)
- a. How many times from a drug
- overdose? \_\_\_\_ overdose(s)
- b. How many times from being choked?
- choked or strangled c. What was the longest time you have been unconsciousness from an overdose, or incident of being choked

or strangled? (If you are not sure

please make your best guess.)

minutes

#### Interpreting Findings

The validity of this tool is not based on elicitation of a perfect accounting for a person's lifetime history of brain injury. Instead, it provides a means to estimate the likelihood that consequences have resulted from one's lifetime exposure.

- A person may be more likely to have ongoing problems if they have any of the following: WORST: one moderate or severe TBI
  - FIRST: TBI with loss of consciousness before age 20
  - ANOXIC: a single incident of prolonged loss of consciousness from an overdose or being choked or strangled.
  - MULTIPLE: multiple instances of blows to the head or multiple overdoses or incidents of being choked or strangled.
  - OTHER SOURCES: any ABI combined with another way their brain function has been impaired or any brain injury diagnosed by a doctor or other health professional.

### Epilepsy or seizures A stroke, cerebral vascular disease or a transient ischemic attack

A tumor of the brain

of the following?

Swelling of the brain (edema)

Toxic effects or poisoning by substances

4. Have you EVER been told by a doctor or

other health professional that you had any

- like from lead poising, alcohol, prescription medications or recreational drugs
- Infection like meningitis or encephalitis
- A brain bleed or hemorrhage
- Child or adult maltreatment syndrome
- Loss of oxygen to the brain like from a

time when you stopped breathing, had a near drowning or experienced a strangulation

 Encephalopathy due to endocrine, nutritional, renal or liver disorders



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### Wrap Up

- Questions
- Comments



# Thank you!!!

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