JUNE 2013 • ISSUE 13-C14

Traumatic Brain Injury Prevalence:

Indiana Department of Correction Prisoner Population

INTRODUCTION

A recent report by the Centers for Disease Control and Prevention (CDC) suggests that many individuals in prison are living with traumatic brain injury (TBI) (1). The CDC report also suggests that TBI-related problems place additional burdens (e.g., severe depression, anxiety, substance abuse, difficulty controlling anger, suicidal thoughts) on individuals both while they are incarcerated and in adapting to societal norms once they return to their communities. The CDC "recognizes TBI in prisons and jails as an important public health problem" and encourages states to develop programs to address this issue.

In Indiana, there is currently no systematic screening for TBI among incarcerated populations; however, a recent analysis conducted by researchers at the Indiana University Public Policy Institute (PPI) of baseline TBI screening data, collected in fall 2012 by the Indiana Department of Correction (IDOC), suggests that nearly 36 percent of offenders in Indiana facilities reported some form of TBI during their lifetime. This issue brief summarizes the results of the Indiana baseline data analysis, as well as research findings from other states and at the national level, on the prevalence of TBI among incarcerated populations. The brief concludes with a discussion of recommended best practices for diagnosing and treating TBI both pre- and post-release from prison, including recommended next steps for addressing this issue in Indiana.

NATIONAL OVERVIEW

TBI has been referred to as a "silent epidemic" because there is little public awareness about the issue but also because the symptoms of TBI are not always evident (2). A TBI is defined as any damage to living brain tissue that is caused by an external force or penetrating head injury that disrupts the normal function of the brain. Not all blows to the head result in a TBI and the severity of a TBI may range from "mild" (brief change in mental status or consciousness) to "severe" (period of unconsciousness or amnesia). In the United States, an estimated 1.7 million people sustain a traumatic brain injury each year (3). Research into the consequences of a TBI suggests there are impairments in the way the brain functions and processes information that can affect an individual's everyday wellbeing. For example, these impairments can impact decision-making and social skills—leading to attention problems, decreased cognitive and emotional functions, increased aggression, and a lack of impulse control—and are particularly salient if the injury occurs during childhood (4-8). Given these findings, researchers have hypothesized a link between TBI and an individual's predisposition toward criminal behaviors (9-11).

Only recently have criminal justice researchers examined TBIs when assessing the mental and physical health needs of offenders. This research has largely focused on determining whether the rate of TBI is higher among offenders than the general population, but also, how best to screen for a TBI among incarcerated populations. Estimates suggest that about 9 percent of the general population have experienced a TBI (12, 13), but that the prevalence of TBI is much higher among offender populations, with studies showing rates ranging from 25 to 87 percent (14, 15). A recent meta-analysis of this literature suggests 60.3 percent of all offenders and 64.4 percent of male offenders have some form of a TBI (14). Such variations may be explained by the different methodologies used in sampling and in the measurement of a TBI.

To address such discrepancies in the measurement of TBI, researchers at Ohio State University created the OSU-TBI Identification Method (OSU-TBI-ID) (16, 17). The instrument used in this method has been shown to be both reliable and valid; however, prior to its current use in this IDOC baseline study, Ferguson and colleagues' study of TBI among prisoners in South Carolina was the only study to use the OSU-TBI-ID instrument to determine the prevalence of TBI among prisoners (15). That study found that the occurrence of one TBI with an alteration of consciousness among male and female offenders was 65 percent and 72 percent, respectively.

Previous studies discussed above illustrate a need for more systematic TBI data collection among incarcerated populations at both state and national levels. This lack of data and awareness about TBI may cause problems for correctional facilities and place additional burdens on incarcerated individuals in need of services and treatment for TBI. Only when baseline TBI data are collected at the state level can better policies and programs be developed to deal with the negative effects of TBI in correctional facilities as well as the need for services while incarcerated.

A research partnership between the Indiana University Public Policy Institute and the Indiana Criminal Justice Institute

INDIANA CRIMINAL JUSTICE INSTITUTE
INDIANA UNIVERSITY PUBLIC POLICY INSTITUTE
SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS
INDIANA UNIVERSITY IUPUI

INDIANA TBI BASELINE STUDY FINDINGS

In Indiana, there is currently no systematic screening for TBI among incarcerated populations. During the fall of 2012, a group of partner organizations, including the Indiana Criminal Justice Institute (ICJI), the Brain Injury Association of Indiana (BIAI), and the Indiana Department of Correction (IDOC) entered into discussions with PPI to assess the problem of TBI in Indiana's correctional facilities. The group agreed that the first step would be to conduct an initial TBI baseline screening of prisoners to determine both the prevalence of TBI and the need for programmatic services for offenders who reported a TBI.

IDOC staff determined that the most efficient approach for the baseline screening was to define a pilot period for collecting data and to incorporate TBI screening process into the standard set of screenings performed by IDOC staff at intake. IDOC and ICJI requested the assistance of PPI researchers in analyzing the Indiana baseline TBI screening data. The baseline data analyzed by PPI suggested that nearly 36 percent of offenders in Indiana Department of Correction (IDOC) facilities reported some form of TBI during their lifetime. More than 4 percent of inmates screened were classified as experiencing a *severe* TBI, 6 percent were classified with a *moderate* TBI, 20 percent with a *mild* TBI, and 6 percent with a *possible* TBI. (Table 1). TBI classifications were determined through a scoring system utilized in the OSU-TBI-ID (see Exhibit 1).

METHODOLOGY

The major underlying objective of the Indiana TBI baseline study was to examine the prevalence of TBIs among male prisoners in Indiana. IDOC, with guidance from BIAI, selected the short form of the OSU-TBI-ID screening instrument (Exhibit 1) to be administered to every male inmate during the study period.The OSU-TBI-ID is one of only a few widely used, nationally recognized TBI screening instruments that are readily available and can be easily applied to different fields of study.

In Indiana, all male offenders are screened at the Reception Diagnostic Center immediately prior to incarceration. (Due to the limited time and resources available to conduct the baseline study, and the fact that intake for females is conducted at a separate facility, female offenders were excluded from the baseline study.) Each inmate is evaluated by an intake specialist; based on the review of their criminal history and medical needs, they are placed into one of a number of IDOC facilities. In fall 2012, the BIAI trained 23 intake specialists to administer the short version of the OSU-TBI-ID. The sample consisted of all male prisoners who entered incarceration at the designated male offender IDOC intake facility from November 5, 2012 to December 3, 2012.

The OSU-TBI-ID was designed to assess any lifetime history of TBI (see OSU-TBI-ID text box). The instrument was administered through a structured interview that asked individuals to recall all injuries requiring medical attention, as well as injuries involving the head or the neck that resulted in the occurrence of altered consciousness. Information gathered on the source of injury, number of injuries, severity, age of injury, and the occurrence and length of an altered or lost consciousness was then used to assign subjects to an appropriate TBI category defined as *improbable, possible, mild, moderate,* or *severe*. The baseline IDOC brain injury screening data was supplied, de-identified, to PPI researchers. In addition to information on TBI screening results, PPI also received variables from the IDOC Adult Admission Database Codebook, including demographic information (age, race/ethnicity, and education), offense type, expected released date, psychiatric screening results, and any incarceration in IDOC facilities for the 10 years prior to screening.

Table 1. Indiana TBI prevalence study sample, by subject TBI severity, 2012

TBI classification	Study sample	
	Count	%
All offenders screened	**831**	**100.0**
Any TBI	**297**	**35.7**
Severe TBI	36	4.3
Moderate TBI	48	5.8
Mild TBI	164	19.7
Possible TBI	49	5.9
No TBI (improbable)	**534**	**64.3**

Source: Indiana Department of Correction, Baseline TBI Screening of Male Offenders, December 2012.

Note: TBI severity classifications are determined by scoring system utilized in the OSU-TBI-ID.

Exhibit 1. Ohio State University TBI Identification Method—Short Form

v.4/11/12-Lifetime - to be used when querying about lifetime history of TBI

Subject ID: _____Current Age: _____Interviewer initials: _____Date: _____

I am going to ask you about injuries to your head or neck that you may have had anytime in your life.

Interviewer instruction: Record cause and any details provided spontaneously in the box at the bottom of the page.You do not need to ask further about loss of consciousness or other details during this step.

1. In your lifetime, have you ever been hospitalized or treated in an emergency room following an injury to your head or neck? Think about any childhood injuries you remember or were told about.

   Yes—Record cause in table below

   No

2. In your lifetime, have you ever injured your head or neck in a car accident or from crashing some other moving vehicle like a bicycle, motorcycle or ATV?

   Yes—Record cause in table below

   No

3. In your lifetime, have you ever injured your head or neck in a fall or from being hit by something (for example, falling from a bike or horse, rollerblading, falling on ice, being hit by a rock)? Have you ever injured your head or neck playing sports or on the playground?

   Yes—Record cause in table below

   No

4. In your lifetime, have you ever injured your head or neck in a fight, from being hit by someone, or from being shaken violently? Have you ever been shot in the head?

   Yes—Record cause in table below

   No

5. In your lifetime, have you ever been nearby when an explosion or a blast occurred? If you served in the military, think about any combat- or training-related incidents.

   Yes—Record cause in table below
   No

6. If all above are"no"then proceed to question 7. If answered"yes"to any of the questions above, ask the following for each injury: **Were you knocked out or did you lose consciousness (LOC)? If yes, how long? If no, were you dazed or did you have a gap in your memory from the injury? How old were you?**

Cause	Loss of consciousness (LOC)				Dazed/Memory gap		
	No LOC	< 30 minutes	30 minutes – 24 hours	More than 24 hours	Yes	No	Age

7. Have you ever lost consciousness from a drug overdose or being choked?

   ____# overdose ____# choked

SCORING

_____ # TBI-LOC (number of TBI's with loss of consciousness from #6)
_____ # TBI-LOC ≥ 30 (number of TBI's with loss of consciousness ≥ 30 minutes from #6)
_____ age at first TBI-LOC (youngest age from #6)
_____ TBI-LOC before age 15 (if youngest age from #6 < 15 then =1, if ≥ 15 then = 0)
_____ Worst Injury (1-5):
If responses to #1-5 are"no", classify as Improbable TBI.
If in response to #6 reports never having LOC, being dazed or having memory lapses, classify as Improbable TBI.
If in response to #6 reports being dazed or having a memory lapse, classify as Possible TBI (no LOC).
If in response to #6 loss of consciousness (LOC) does not exceed 30 minutes for any injury classify as Mild TBI (with LOC).
If in response to #6 LOC for any one injury is between 30 minutes and 24 hours, classify as Moderate TBI.
If in response to #6 LOC for any one injury exceeds 24 hours, classify as Severe TBI.
_____ # anoxic injuries (sum of incidents reported in #7)

* adapted with permission from the Ohio State University TBI Identification Method (Corrigan, J.D., Bogner, J.A. (2007). Initial reliability and validity of the OSU TBI Identification Method. J Head Trauma Rehabil, 22(6):318-329

CHARACTERISTICS OF INDIANA BASELINE SCREENING SAMPLE

A total of 831 male offenders were screened for TBI during the study period, of which 297 (35.7 percent) reported experiencing some form of TBI, meaning that they were categorized as having a possible, mild, moderate, or severe TBI.The ages of all offenders included in the screening ranged from 16 to 69 years, with an average age of 32.9 years (see Table 2). Individuals who reported experiencing some form of TBI were younger than both the sample population and the group of offenders determined to have no TBI. The average age of offenders with some form of TBI was 31.9 years, while the average age of offenders with no TBI was 34.7 years. Table 2 illustrates that the rate of TBI was not significantly different by race/ethnic groups. Thirty-five percent of the study sample did not complete high school.

TBI PREVALENCE

Nearly 36 percent of the 831 offenders screened for TBI during the study period reported experiencing a TBI at some point during their lifetime (see Table 1). Approximately 20 percent of offenders screened suffered from *mild* TBI, while about 10 percent of the sample reported *moderate* (5.8 percent) or *severe* (4.3 percent) TBI. The TBI prevalence rate found among Indiana offenders is slightly higher than the only other study to use a brief structured interview to screen all admitted offenders. This study, conducted by Morrell, Mertbiz, Jain, & Jain (1998), screened 1,000 offenders consecutively admitted into a Midwestern prison and found that 24.9 percent had at least one head injury (18).

Table 2. Indiana TBI prevalence study sample demographic characteristics, 2012

Demographic characteristics	Study sample		Subjects with No TBI		Subjects with Any TBI	
	Count	%	Count	%	Count	%
All offenders screened	**831**	**100.0**	**534**	**100.0**	**297**	**100.0**
Age group						
16 to 20	74	8.9	53	9.9	21	7.1
21 to 29	291	35.0	199	37.3	92	31.0
30 to 39	257	30.9	166	31.1	91	30.6
40 to 49	147	17.7	89	16.7	58	19.5
50 to 59	52	6.3	20	3.7	32	10.8
60 to 69	10	1.2	7	1.3	3	1.0
Average age	*32.9*	*na*	*34.7*	*na*	*31.9*	*na*
Race/ethnicity						
White	509	61.3	319	59.7	190	64.0
Black	273	32.9	182	34.1	91	30.6
Latino	37	4.5	25	4.7	12	4.0
Multiracial (not Latino)	4	0.5	2	0.4	2	0.7
Asian	1	0.1	1	0.2	0	0.0
Unknown	7	0.8	5	0.9	2	0.7
Education level						
Did not complete high school	291	35.0	199	37.3	92	31.0
High school diploma or more	536	64.5	333	62.4	203	68.4
Unknown	0	0.0	2	.4	2	0.7

Source: Indiana Department of Correction, Baseline TBI Screening of Male Offenders, December 2012.

Note: All offenders screened for TBI during the baseline study were male.

Offense Type

Offenders screened for TBI during the study period were incarcerated for various types of criminal offenses. These criminal offenses were categorized into four groups: *person offenses,* which were most commonly robbery, battery, and sexual misconduct (25 percent); *property offenses,* which were primarily burglary and theft (30.2 percent); *controlled substance offenses,* including both the possession and dealing of illegal substances (25 percent); and *other offenses,* including crimes such as operating a vehicle while intoxicated, weapons charges, and resisting arrest (19.7 percent). In creating these categories, PPI researchers examined whether there were differences in offense types among those offenders who had a TBI and those who did not (Table 3). Findings suggest that those with a TBI were 1.5 times (range 1.1 – 1.8, p<0.002) more likely to have committed a crime against a person than those without a TBI (Table 3).

TBI and Psychiatric Disorders

After the initial intake, offenders are clinically screened at a later date to determine potential mental health problems. In the IDOC data offenders are coded as either "free of mental illness" or as having a psychiatric disorder that requires provision of psychiatric services. Table 4 shows that 119 of the 831 offenders screened (14.3 percent) were coded as having a psychiatric disorder and of these nearly 56 percent also had a TBI (shown in Table 4). In comparing the presence of a psychiatric disorder among those with and without a TBI, PPI researchers found that, among the 297 offenders reporting a TBI, 22 percent had a psychiatric disorder, compared to only 10 percent of offenders without a TBI. This relative risk difference was statistically significant, suggesting that the proportion of offenders with a psychiatric disorder is about 2.2 times (range 1.6 – 3.1, p<0.000) higher among those with TBI than those with no TBI (Table 5).

Table 3. Indiana TBI prevalence study sample, by TBI status and offense type, 2012

Offense type	Study sample		Subjects with Any TBI		Subjects with No TBI		Relative risk of committing offense type
	Count	%	Count	%	Count	%	RR = % TBI/ % No TBI
All offenders screened	**831**	**100.0**	**297**	**100.0**	**534**	**100.0**	**na**
Person*	208	25.0	93	31.3	115	21.5	1.5
Property	251	30.2	84	28.3	167	31.3	0.9
Controlled substance	208	25.0	64	21.5	144	27.0	0.8
Other	164	19.7	56	18.9	108	20.2	0.9

Source: Indiana Department of Correction, Baseline TBI Screening of Male Offenders, December 2012.

Notes:
*** The relative risk of offenders with TBI who committed a crime against a person compared to offenders with no TBI was found to be statistically significant (range 1.1 - 1.8, p<.002).**
Differences between other offense types were not found to be significant.

Table 4. Indiana TBI prevalence study sample, by subject TBI severity, prior incarcerations, and diagnosed psychiatric disorders, 2012

TBI classification	Study sample		Subjects with ANY prior incarcerations		Subjects diagnosed with psychiatric disorder	
	Count	%	Count	%	Count	%
All offenders screened	**831**	**100.0**	**253**	**100.0**	**119**	**100.0**
Any TBI	**297**	**35.7**	**113**	**44.7**	**66**	**55.5**
Severe TBI	36	4.3	14	5.5	6	5.0
Moderate TBI	48	5.8	20	7.9	9	7.6
Mild TBI	164	19.7	61	24.1	40	33.6
Possible TBI	49	5.9	18	7.1	11	9.2
No TBI (improbable)	**534**	**64.3**	**140**	**55.3**	**53**	**44.5**

Source: Indiana Department of Correction, Baseline TBI Screening of Male Offenders, December 2012.

Note: TBI severity classifications are determined by scoring system utilized in the OSU-TBI-ID.

Table 5. Indiana TBI prevalence study sample, summary of TBI status, prior incarcerations, and psychiatric disorders, 2012

	Study Sample	Any TBI	No TBI (improbable)	Relative risk RR = % TBI/ % No TBI
All offenders screened	**831**	**297**	**534**	**na**
Subjects with ANY prior incarcerations	253	113	140	1.5
% with prior incarcerations	*30.4*	*38.0*	*26.2*	
Subjects diagnosed with psychiatric disorder	119	66	53	2.2
% with psychiatric disorder	*14.3*	*22.2*	*9.9*	

Source: Indiana Department of Correction, Baseline TBI Screening of Male Offenders, December 2012.

Notes:
The relative risk of offenders with TBI who who had been previously incarcerated compared to offenders with no TBI was found to be statistically significant (range 1.1 - 1.7, p<.004).
The relative risk of offenders with TBI who who had been diagnosed with a psychiatric disorder compared to offenders with no TBI was found to be statistically significant (range 1.6 - 3.1, p<.000).

TBI and Prior Incarcerations

More than 30 percent (253 of 831) of offenders screened for TBI had experienced one or more prior incarcerations in the IDOC in the 10 years prior to the TBI screening, and of those offenders with a prior incarceration, nearly 45 percent reported having a TBI (Table 4). Among the 297 offenders reporting a TBI, 38 percent had one or more prior incarcerations, while 26 percent of offenders with no TBI had been previously incarcerated. The proportion of offenders with any prior incarceration is significantly higher among those with a TBI when compared to those without a TBI. In short, offenders with a TBI were about 1.5 times (range 1.1 – 1.7, p<0.004) more likely to have been incarcerated in the IDOC in the past 10 years than those without (Table 5).

CONCLUSIONS

Determining the prevalence of TBI among incarcerated populations is an important clinical and intervention question for consideration in developing programs that will enhance offenders' ability to manage their incarceration and minimize the risk of post-release recidivism .

The Commission on Safety and Abuse in America's Prisons recommends increased health screenings and treatment programs for offenders who had experienced a TBI (19). Further, reentry programs should include specialized transition services and treatment to better assist individuals with TBI-related problems as they return to their communities.1 Therefore, effective TBI screening and treatment is needed to reduce individuals' burden of dealing with TBI symptoms throughout the criminal justice process and to potentially decrease repeat criminal offenses. From here, criminal justice professionals can help link those with a TBI to rehabilitation treatments and services such as case management, peer-to-peer support, educational assistance, pre-vocational resources, employment assistance, and extended support provision.

IMPLICATIONS FOR FUTURE SCREENING AND TREATMENT IN INDIANA

TBI is a chronic health condition that is associated with a range of emotional, behavioral, and cognitive problems. Only recently have researchers started to examine TBI within a criminal justice context; this research suggests that, whether directly or indirectly related, TBI is linked to criminal activity (9-11). Detecting TBI as early as possible in the criminal justice process could reduce the burden of dealing with TBI symptoms in a confined environment and, in doing so, decrease repeat criminal offenses. The Indiana TBI baseline study demonstrates that the short version of the OSU-TBI-ID, which takes less than ten minutes to complete upon intake, can be incorporated and combined with existing screening instruments to obtain information about the presence of TBI among offenders. Findings suggest that the prevalence of TBI is significantly greater among Indiana offenders than the general population. Further research is needed, however, to replicate the use of the OSU-TBI-ID among consecutively admitted prisoners to see if similar TBI prevalence rates are detected.

The IDOC Reception Diagnostic Center is designed as an intake facility to categorize offenders before sending them to long-term facilities. Unfortunately, the prison often serves as the treatment of last resort where individuals can obtain routine diagnosis and needed services; given that, TBI treatment could be located in a centralized facility, and the results of OSU-TBI-ID could be used in identifying offenders' need for services. It is also recommended that practitioners attempt to identify ways that they might detect and intervene in TBI-related cases earlier in the criminal justice process. Given the brevity of the OSU-TBI-ID, the screening could be administered during jail or prior to criminal sentencing to aid in judicial decisions and help divert offenders into needed treatment and service facilities.

IDOC, in collaboration with BIAI and ICJI, is currently developing an adapted "resource facilitation" pilot program that will serve Indiana offenders (and their families) who have experienced a TBI when released to the community (20). The purpose of the resource facilitation approach is to increase the independence and quality of life of offenders living with TBI, both during incarceration and post-release from prison. Resource facilitators are trained practitioners who will work closely with offenders with TBI to break down barriers and navigate systems, with the goal of connecting these individuals with programs, services, and treatments that best meet their individual needs. IDOC estimates the pilot program design will be completed by Fall 2013.

THE OHIO STATE UNIVERSITY TRAUMATIC BRAIN INJURY IDENTIFICATION METHOD (OSU-TBI-ID) (21)

The OSU-TBI-ID is a systematic screening method used to determine lifetime history of TBI. The process involves a structured interview with individuals, using an instrument designed to incorporate Center for Disease Control and Prevention case definitions and best practices for observing, diagnosing, and treating TBI. The OSU-TBI-ID approach is to obtain self-reported information from individuals in an interview setting that will then be fed into summary indices, enabling clinicians to measure TBI occurrences over a person's lifetime. The screening method focuses primarily on injuries involving "a blow to the head or neck" and resulting in "the occurrence of altered consciousness, its nature, and treatment received."

The limitations of self-reporting of personal injuries are widely accepted by both researchers and clinicians. While researchers acknowledge these limitations, including a high vulnerability to under-reporting and variations in the interpretation of TBI terminology (e.g., head injury, traumatic brain injury, concussion, knocked out, loss of consciousness) by individuals being interviewed, the self-reporting approach is now an accepted best practice for both research and clinical uses due in part to the impractical nature of obtaining individual medical records for injuries treated over a lifetime in primary care practices, medical specialists' offices, immediate care clinics and emergency facilities, and hospitals. OSU made efforts to minimize potential biases by incorporating injury recall methods used in previous studies that have proven to maximize individual ability to recall details of personal injury.

OSU developed the following versions of the instrument that vary in length and can be customized for "clinical screening, treatment planning, system administration, or research applications":

> **OSU-TBI-ID short version** *can be used for clinical, research, or programmatic purposes. It is the briefest version that still provides several summary indices on which the original version was validated. To shorten the instrument, TBIs resulting in loss of consciousness are emphasized over less severe injuries. Symptoms, either at the time of injury or persisting to current day, are not elicited. The short version can typically be administered in 5 minutes and is the form recommended by the NIH Common Data Elements and the PhenX Toolkit. The TBI Model Systems National Database uses another version of this shorter instrument, developed for use interviewing after a recent, documented TBI.*

> **OSU-TBI-ID clinical version** *has been made available through the BrainLine website. This version uses the acronym "T-B-I" to remind clinicians about the basic tenets of identifying TBIs (Trauma, Behavioral effect immediately, Impact on everyday function). The clinical version includes questions that can be incorporated into a clinical assessment or other interview to determine a client's lifetime exposure to TBI. The supporting materials include guidance on interpreting the elicited information as well as suggestions for how to accommodate consequences of TBI in practice.*

> **OSU-TBI-ID research version** *is the longest version of the instrument; as the basis of the original validation articles, it is being used in several federally funded research projects. It provides the most summary indices, but can typically require 20 minutes to administer. Gale Whiteneck and colleagues adapted the OSU-TBI-ID approach for a Computer Assisted Telephone Interview (CATI), which can be administered typically in a few minutes and provides all the summary indices of the research version.*

In addition to uses in the NIH Common Data Elements, PhenX Toolkit, and the TBI Model Systems National Database referenced above, the OSU-TBI-ID is now a widely recognized best practice approach for assessing lifetime TBI exposure and has been used in a number of federally funded research projects studying diverse populations (i.e., military personnel, veterans, prisoners). The instrument has also been incorporated into the training of "public sector providers in multiple states for screening clinical populations, including clients in substance abuse treatment, high-risk adolescents, victims of domestic violence and older adults."

For more information on the OSU-TBI-ID screening method, including a detailed description of the tools used during the screening process, an explanation of the self-reporting approach, and a discussion of federally funded projects using OSU-TBI-ID, visit the Ohio Valley Center for Brain Injury Prevention and Rehabilitation.

Source: Ohio Valley Center for Brain Injury Prevention and Rehabilitation, 2013

References

1. Centers for Disease Control. (2007). *Traumatic brain injury in prisons and jails.* Retrieved April 5, 2013, from http://www.cdc.gov/traumaticbraininjury/pdf/Prisoner_TBI_Prof-a.pdf

2. Schwarzbold, M., Diaz, A., Martins, E. T., Rufino, A., Amante, L. N., Thais, M. E., et al. (2008). Psychiatric disorders and traumatic brain injury. *Neuropsychiatric disease and treatment, 4*(4), 797-816.

3. Faul, M., Xu, L., Wald, M. M., & Coronado, V. G. (2010). *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.

4. Fleminger, S., & Ponsford, J. (2005). Long term outcome after traumatic brain injury: More attention needs to be paid to neuropsychiatric functioning. *British Medical Journal, 331*(7530), 1419.

5. Birbaumer, N., Viet, R., Lotze, M., Erb, M., Hermann, C., Grodd, W., et al. (2005). Deficient fear conditioning in psychopathy: A functional magnetic resonance imaging study. *Archives of General Psychiatry, 62*(7), 799-805.

6. Raine, A., Buchsbaum, M. S., Stanley, J., Lottenberg, S., Abel, L., & Stoddard, J. (1994). Selective reductions in prefrontal glucose-metabolism in murderers. *Biological Psychiatry, 36*(6), 365-73.

7. Tonks, J., Slater, A., Frampton, I., Wall, S. E,. Yates, P., Williams, W. H. (2009). The development of emotion and empathy skills after childhood brain injury. *Developmental Medicine & Child Neurology, 51*(1), 8-16.

8. Williams, W. H. (2003). Brain injury and emotion: An overview to a special issue on biopsychosocial approaches in neurorehabilitation. *Neuropsychological Rehabilitation, 13*(1-2), 1-11.

9. Leon-Carrion, J., Ramos, F. J. (2003). Blows to the head during development can predispose to violent criminal behaviour: Rehabilitation of consequences of head injury is a measure for crime prevention. *Brain Injury, 17*(3), 207-16.

10. Sarapata, M., Herrmann, D., Johnson, T., & Aycock, R. (1998). The role of head injury in cognitive functioning, emotional adjustment and criminal behaviour. *Brain Injury, 12*(10), 821-42.

11. Timonen, M., Miettunen, J., Hakko, H., Zitting, H., Veijola, J., & von Wendt, L. R. P. (2002). The association of preceding traumatic brain injury with mental disorders, alcoholism and criminality: The Northern Finland 1966 Birth Cohort Study. *Psychiatry Research, 113*(3), 217-26.

12. McGuire, L. M., Burright, R. G., Williams, R., Donovick, P. J. (1998). Prevalence of traumatic brain injury in psychiatric and non-psychiatric subjects. *Brain Injury, 12*(3), 207-14.

13. Silver, J. M., Kramer, R., Greenwald, S., & Weissman, M. (2001). The association between head injuries and psychiatric disorders: Findings from the New Haven NIMH Epidemiologic Catchment Area Study. *Brain Injury, 15*(11), 935-45.

14. Shiroma, E. J., Ferguson, P. L., & Pickelsimer, E. E. (2012). Prevalence of traumatic brain injury in an offender population: A meta-analysis. *Journal of Head Trauma Rehabilitation, 27*(3), E1-E10.

15. Ferguson, P. L., Pickelsimer, E. E., Corrigan, J. D., Bogner, J. A., & Wald, M. (2012). Prevalence of traumatic brain injury among prisoners in South Carolina. *Journal of Head Trauma Rehabilitation, 27*(3), E11-E20.

16. Bogner, J., & Corrigan, J.D. (2009). Reliability and predictive validity of the Ohio State University TBI identification method with prisoners. *Journal of Head Trauma Rehabilitation, 24*(4), 279-91.

17. Corrigan, J.D., & Bogner, J. (2007). Initial reliability and validity of the Ohio State University TBI identification method. *Journal of Head Trauma Rehabilitation, 22*(6), 318-29.

18. Morrell, R. F., Merbitz, C. T., Jain, S, & Jain, S. (1998). Traumatic brain injury in prisoners. *Journal of Offender Rehabilitation, 27*(3-4), 1-8.

19. Commission on Safety and Abuse in America's Prisons. (2006). Gibbons, J. J., & Katzenbach, N. B., co-chairs. Confronting confinement. Retrieved April 18, 2013, from http://www.vera.org/sites/default/files/resources/downloads/Confronting_Confinement.pdf

20. Trexler LE, Trexler LC, Malec JF, Klyce D, Parrott D. (2010). Prospective randomized controlled trial of resource facilitation on community participation and vocational outcome following brain injury. *Journal of Head Trauma Rehabilitation, 25*(6), 440–6.

21. Ohio Valley Center for Brain Injury Prevention and Rehabilitation, derived from material found at http://ohiovalley.org/informationeducation/synapshots/screening/, accessed January 26, 2013.

This publication was prepared on behalf of the Indiana Criminal Justice Institute (ICJI) by the Indiana University Public Policy Institute. Please direct any questions concerning information in this document to PPI at 317-261-3000.

An electronic copy of this document can be accessed via the PPI website (www.policyinstitute,iu,edu), the ICJI website (www.in.gov/cji/), or you may contact the PPI at 317-261-3000.

CENTER FOR
CRIMINAL JUSTICE RESEARCH

INDIANA UNIVERSITY PUBLIC POLICY INSTITUTE

SCHOOL OF PUBLIC AND
ENVIRONMENTAL AFFAIRS
INDIANA UNIVERSITY
IUPUI

THE INDIANA CRIMINAL JUSTICE INSTITUTE

Guided by a Board of Trustees representing all components of Indiana's criminal and juvenile justice systems, the Indiana Criminal Justice Institute serves as the state's planning agency for criminal justice, juvenile justice, traffic safety, and victim services. ICJI develops long-range strategies for the effective administration of Indiana's criminal and juvenile justice systems and administers federal and state funds to carry out these strategies.

INDIANA UNIVERSITY PUBLIC POLICY INSTITUTE

The Indiana University (IU) Public Policy Institute is a collaborative, multidisciplinary research institute within the Indiana University School of Public and Environmental Affairs (SPEA), Indianapolis. The Institute serves as an umbrella organization for research centers affiliated with SPEA, including the Center for Urban Policy and the Environment and the Center for Criminal Justice Research. The Institute also supports the Office of International Community Development and the Indiana Advisory Commission on Intergovernmental Relations (IACIR).

THE CENTER FOR CRIMINAL JUSTICE RESEARCH

The Center for Criminal Justice Research, one of two applied research centers currently affiliated with the Indiana University Public Policy Institute, works with public safety agencies and social services organizations to provide impartial applied research on criminal justice and public safety issues. CCJR provides analysis, evaluation, and assistance to criminal justice agencies; and community information and education on public safety questions. CCJR research topics include traffic safety, crime prevention, criminal justice systems, drugs and alcohol, policing, violence and victimization, and youth.

Authors: **Dona Sapp,** Senior Policy Analyst, Center for Criminal Justice Research; and **Brad Ray,** Assistant Professor, School of Public and Environmental Affairs