

Traumatic Brain Injury Screening Differences between Youth with and without Juvenile Justice System Involvement in Nebraska

Jeff M. Chambers, M.A.  
University of Nebraska – Lincoln – Center on Children, Families, and the Law

Ryan Spohn, Ph. D.  
University of Nebraska – Omaha – Nebraska Center for Justice Research

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This report summarizes a study regarding traumatic brain injury (TBI) conducted by the Center on Children, Families, and the Law (UNL-CCFL) at the University of Nebraska – Lincoln, under contract with the Nebraska Office of Vocational Rehabilitation (NOVR) at the Nebraska Department of Education. Funding for the study comes from a federal grant from the Maternal and Child Health Bureau, located in the Health Resources and Services Administration at the U.S. Department of Health and Human Services. The focus of the study is the prevalence of youth in the Nebraska juvenile justice system that screen positive for a TBI and whether that prevalence rate differs significantly from same age youth not in contact with the juvenile justice system. UNL-CCFL subcontracted a portion of the data analysis to the Nebraska Center for Justice Research at the University of Nebraska – Omaha.

The importance of this study for the State of Nebraska will be an understanding of the prevalence of TBI in youth in the Nebraska juvenile justice system and should inform the development of policy and practice that recognizes the prevalence and impact of TBIs on youth. TBI affects neurocognitive functioning and developmental progress on behavior that result in potential juvenile justice system involvement and progress within the juvenile justice system. TBI also affect cognitive and social cognitive skills Catroppa, and Anderson (2009), Anderson, Godfrey, Rosenfeld, and Catroppa (2012); Kinnunen, Greenwood, and Powell (2011) Ryan, Anderson, and Godfrey (2014); and impulse control and regulation of aggressive responses Cattroppa et al. (2009); Ryan et al. (2014); and Tonks, Yates, Frampton, Williams, Harris, and Slater (2011).

A recent overview of the TBI prevalence for youth in custody literature by Hughes, Williams, Chitsabesan, Walesby, Mounce, and Clasby (2015), finds a wide range of methods used in assessing TBI prevalence of youth in custody, including self-administered questionnaires, parental surveys, and structured interviews by clinicians, detailed medical records and neuropsychiatric evaluations. The degree or severity of TBI is also measured in many different ways ranging from “any head injury resulting in feeling dazed or confused” Davies, Williams, Hinder, Burgess, and Mounce (2012) to “head injury requiring medical attention” Levine, Karniski, Palfrey, Meltzer, and Fenton (1985) and “head injury resulting in loss of consciousness and post traumatic amnesia” Hux, Bond, Skinner, Belau, and Sanger (1998). The range of prevalence found among youth in juvenile justice varies commensurately with the methods used. Hughes (ibid) reporting studies with TBI prevalence ranging from 16.5% to 72.1%. Not all studies compare prevalence rates within juvenile justice to a non-juvenile justice or non-custodial youth population but those that do consistently find a significantly higher prevalence for youth in juvenile justice or custody than youth not in the juvenile justice system or law enforcement custody.

The methodology and TBI identification tool for this study was revised multiple times from the original study design. UNL – CCFL originally proposed a structured interview methodology within the Nebraska Youth Rehabilitation and Treatment Centers (YRTCs) for the prevalence data of youth in the juvenile justice system and comparison group of youth in schools. The original study design identified the TBI screening instrument developed by Virginia Commonwealth University specifically for youth in juvenile justice settings. This instrument was in the process of being validated by VCU through cross referencing of youth medical assessments. UNL-CCFL and NOVR were required to modify the study methodology for multiple reasons including informed consent issues of youth within the YRTCs and staffing issues related completing the screening interview within the YRTC.

The final study design collected TBI screening data from youth aged 14 – 21 years referred to the Nebraska Office of Vocational Rehabilitation. Youth referred to NOVR were assessed by NOVR specialists using the HELPS Brain Injury Screening Tool. The referral source to the NOVR office for services was identified as a juvenile justice source, school with juvenile justice involvement, or other source including schools without juvenile justice involvement. The study's comparison group was composed of youth referred from schools without juvenile justice involvement or from source other than juvenile justice.

The HELPS is a brief TBI screening tool that was designed to be used by professionals who are not TBI experts. "HELPS" is an acronym for the most important parts of screening: H = Hit in the head; E = Emergency room treatment; L = Loss of consciousness; P = Problems with concentration and memory; S = Sickness or other physical problems following injury. The original HELPS TBI screening tool was developed by M. Picard, D. Scarisbrick, R. Paluck, International Center for the Disabled, TBI-NET, U.S. Department of Education, Rehabilitation Services Administration, and Grant #H128A00022. The Helps Tool was updated by project personnel to reflect recent recommendations by the CDC on the diagnosis of TBI. HELPS has been in use by NOVR for a number of years and is a part of their standard assessment process.

The HELPS screening tool is a more conservative instrument than some others that have been used in the identification of possible TBIs among juveniles. An individual screening positive for potential TBI through the HELPS will have responded positively to all three of these conditions: 1) suffered an event that could have caused a brain injury; 2) incurred a period of loss of consciousness after the event or other indication (emergency room visit, feeling dazed or confused, or having temporary amnesia) that injury was severe; and 3) followed by the presence of two or more chronic problems associated with head trauma that were not present

before the injury. The HELPS Brain Injury Screening Tool used in this study is attached as Appendix A.

NOVR Specialists began TBI screening for this study using the HELPS tool in February of 2013 and continued screening of youth referred to their offices through February of 2015. Four hundred and twenty-three (423) TBI screenings were conducted and provided to UNL-Center on Children, Families, and the Law and UNO – Nebraska Center for Justice Research for analysis.

Results

The majority of those screened were Caucasian (62.3%); males (56.1%); and high school seniors (62.5%) although grade information was missing for a substantial number of youth (63). The average age of those screened for TBI was 17.3 years of age with a range from 14 to 21. Complete demographics of the study population are presented in Appendix B.

Across all referral sources 6.1% (26) youth screened were identified as TBI positive screenings by NOVR specialists using the HELPS Screening Tool criteria (Yes to H, E, or S; AND Yes to L or E; AND Yes to P).

Table 1

<b>HELPS TBI Screening Tool Results</b>		
	Frequency	Percent
TBI Screen Negative	404	95.5
TBI Screen Positive	<b>26</b>	<b>6.1</b>
Total	423	100.0

Table 2

		<b>HELPS TBI Screening</b>			
		Negative		Positive	
		Count	Row N %	Count	Row N %
<b>H - Ever hit your head</b>	No	204	98.1%	4	1.9%
	<b>Yes</b>	<b>190</b>	<b>89.6%</b>	<b>22</b>	<b>10.4%</b>
<b>E- Seen in ER or by Doctor</b>	No	332	99.1%	3	0.9%
	<b>Yes</b>	<b>60</b>	<b>72.3%</b>	<b>23</b>	<b>27.7%</b>
<b>L- Lose consciousness</b>	No	348	98.3%	6	1.7%
	<b>Yes</b>	<b>44</b>	<b>68.8%</b>	<b>20</b>	<b>31.3%</b>
<b>P- Problems</b>	No	382	100.0%	0	0.0%
	<b>Yes</b>	<b>5</b>	<b>16.1%</b>	<b>26</b>	<b>83.9%</b>
<b>S- Sicknesses</b>	No	361	97.3%	10	2.7%
	<b>Yes</b>	<b>24</b>	<b>63.2%</b>	<b>14</b>	<b>36.8%</b>

Using a less conservative TBI screening criterion, of an injury or hit to the head with subsequent loss of consciousness, (Yes to H and L on the HELPS), the percent of youth screening positive in the sample increased substantially to 14.7% positive. This percentage is consistent Hux, K., Schneider, T., & Bennett, K. (2009) findings of TBI positive youth. TBI screenings meeting these criteria will be referred to as HH-LOC.

Table 3

**Hit to Head with Loss of Consciousness  
(HH-LOC)**

	Frequency	Percent
Negative	361	85.3
Positive	<b>62</b>	<b>14.7</b>
Total	423	100.0

Table 4

		Hit to Head with Loss of Consciousness			
		Negative		Positive	
		Count	Row N %	Count	Row N %
<b>H</b> - Ever hit your head	No	208	100.0%	0	0.0%
	<b>Yes</b>	<b>150</b>	<b>70.8%</b>	<b>62</b>	<b>29.2%</b>
<b>E</b> - Seen in ER or by Doctor	No	314	93.7%	21	6.3%
	<b>Yes</b>	<b>42</b>	<b>50.6%</b>	<b>41</b>	<b>49.4%</b>
<b>L</b> - Lose consciousness	No	354	100.0%	0	0.0%
	<b>Yes</b>	<b>2</b>	<b>3.1%</b>	<b>62</b>	<b>96.9%</b>
<b>P</b> - Problems	No	342	89.5%	40	10.5%
	<b>Yes</b>	<b>11</b>	<b>35.5%</b>	<b>20</b>	<b>64.5%</b>
<b>S</b> - Sicknesses	No	326	87.9%	45	12.1%
	<b>Yes</b>	<b>23</b>	<b>60.5%</b>	<b>15</b>	<b>39.5%</b>

### Predictive Models

Binary logistic regression models were constructed for both the HELPS TBI Screening measure and for the less conservative HH-LOC screening measure (hit to head and loss of consciousness) to test the primary research question of differences in TBI positive screens for youth with juvenile justice system involvement versus youth without juvenile justice involvement.

In addition to the source of referral, school or juvenile justice referral (including for youth with juvenile justice involvement from a school), other variables included in predictive models were age, gender, minority status, and geographic location - Omaha / Lincoln or other county.

No significant differences in TBI positive screenings using the HELPS screening criteria between youth referred with juvenile justice system involvement and youth referred without involvement were found when controlling for gender, age, geographic location, and minority status. No variables used in the equation were predictive of a positive TBI screening using the HELPS screening criteria.

Table 5

HELPS Screening Tool Model						
	B	S.E.	Wald	df	Sig.	Exp(B)
Age (Under 18 = 0 Over 18 = 1)	.600	.446	1.809	1	.179	1.823
Gender (Male = 0 Female = 1)	.196	.433	.205	1	.650	1.217
Juvenile Justice Involvement (0 = no, 1 = yes)	-.001	.657	.000	1	.998	.999
Minority (0 = non, 1 = minority)	-.394	.477	.681	1	.409	.675
Location (0 = Omaha/Lincoln, 1 = Other)	-.230	.502	.211	1	.646	.794
Constant	-2.927	.481	37.107	1	.000	.054

Significant differences in positive TBI screenings were found with the HH-LOC TBI criteria in the same model. A test of the primary study hypothesis indicated that the odds of youth with juvenile justice involvement screening positive for TBI (using HH-LOC) were 128% greater than youth without juvenile justice system involvement when controlling for age, gender, minority status, and geographic location.

Gender was also predictive of positive screening with HH-LOC with the odds of females screening positive 53.1% less than males. Additionally, while not significant at the .05 probability level ( $p = .077$ ), the odds of minority youth screening positive with HH-LOC, while controlling for other variables, decreased 44.3%.

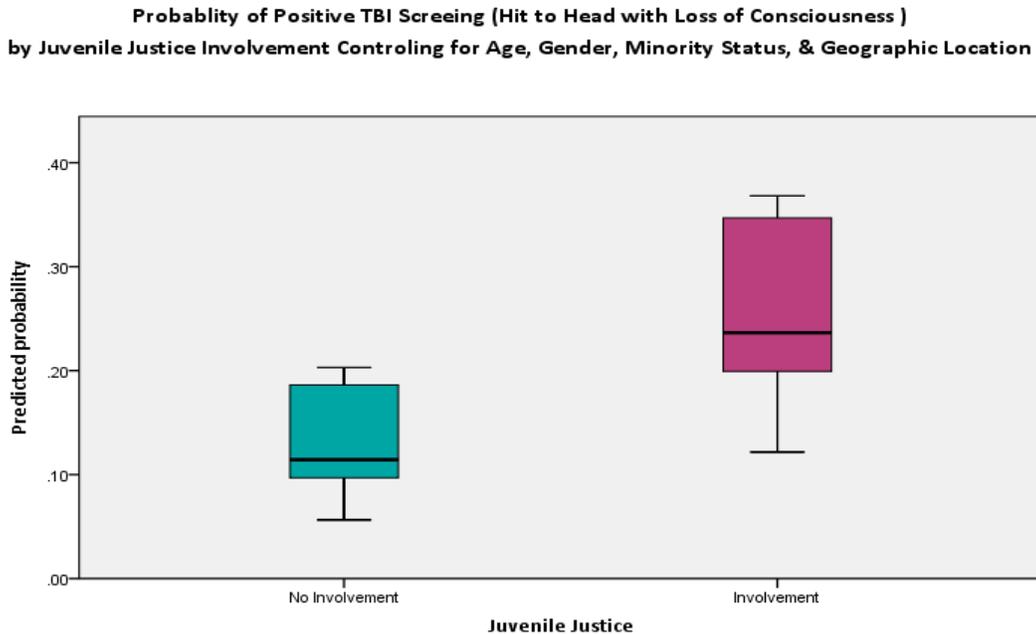
Table 6

Hit to Head with Loss of Consciousness Screening (HH-LOC) Model						
	B	S.E.	Wald	df	Sig.	Exp(B)
Age (Under 18 = 0 Over 18 = 1)	.093	.308	.091	1	.763	1.097
<b>Gender (male = 0 female = 1)</b>	<b>-.757</b>	<b>.317</b>	<b>5.702</b>	<b>1</b>	<b>.017</b>	<b>.469</b>
<b>Juvenile Justice Involvement (0 = no, 1 = yes)</b>	<b>.828</b>	<b>.379</b>	<b>4.767</b>	<b>1</b>	<b>.029</b>	<b>2.288</b>
Minority (0 = white, 1 = minority)	-.586	.331	3.137	1	.077	.557
Location (0 = Omaha/Lincoln, 1 = Other)	-.014	.325	.002	1	.967	.986
Constant	-1.461	.300	23.757	1	.000	.232

The probability of youth screening positive for TBI with the HH-LOC screening criteria by juvenile justice system involvement is displayed in Figure 1. The the mean probability of a

positive TBI screening with the HH-LOC criteria for youth without juvenile justice involvement is 13% and the mean probability for youth with juvenile justice involvement is 26%.

Figure 1.



### Conclusions

The present study found that the number of youth in Nebraska with juvenile justice system involvement that screen positive for traumatic brain injury as measured through the HELPS Brain Injury Screening Tool and scored according to the HELPS criteria were substantially lower than all other studies that have examined TBI among youth nationally and in the state of Nebraska.

This study found no differences in youth TBI positive screens by juvenile justice involvement when using the HELPS Brain Injury Screening Tool scored according to the HELPS protocol.

This study found that using the HELPS Tool and scoring positive screenings as those youth that have suffered a hit to the head followed by a period of loss of consciousness (HH-LOC) more closely replicated previous studies nationally and in Nebraska of TBI prevalence among youth.

This study did find, using the HH-LOC TBI screening criteria, a significant and substantial difference in positive TBI screenings of youth with juvenile justice system involvement compared to youth without such involvement when controlling for age, gender, race, and geographic location. Youth with juvenile justice involvement had 128% greater odds of screening positive than youth without juvenile justice involvement.

Appendix A

**HELPS BRAIN INJURY SCREENING TOOL-JJ SYSTEM**

Date of screening: \_\_\_\_\_ Positive:  Negative:

VR Case Number: \_\_\_\_\_ VR Specialist: \_\_\_\_\_

\*If Positive, complete the HELPS Positive Screen Follow-Up Questionnaire with the individual.

**H** Have you ever **Hit** your **Head** or been **Hit** on the **Head**?  Yes  No

Note: Prompt client to think about all incidents that may have occurred at any age, even those that did not seem serious: vehicle accidents, falls, assault, abuse, sports, etc. Screen for domestic violence and child abuse, and also for service related injuries. A TBI can also occur from violent shaking of the head, such as being shaken as a baby or child.

**E** Were you ever seen in the **Emergency room**, **hospital**, or by a **doctor** because of an **injury to your head**?  Yes  No

Note: Many people are seen for treatment. However, there are those who cannot afford treatment, or who do not think they require medical attention.

**L** Did you ever **Lose** consciousness or experience a period of being **dazed** and **confused** because of an **injury to your head**?  Yes  No

Note: People with TBI may not lose consciousness but experience an "alteration of consciousness." This may include feeling dazed, confused, or disoriented at the time of the injury, or being unable to remember the events surrounding the injury.

**P** Do you experience any of these **Problems** in your daily life since you hit your head?  Yes  No

Note: Ask your client if s/he experiences any of the following problems, and ask when the problem presented. You are looking for a combination of two or more problems that were not present prior to the injury.

- |   |  |
|---|--|
| <input type="checkbox"/> headaches                | <input type="checkbox"/> difficulty reading, writing, calculating              |
| <input type="checkbox"/> dizziness                | <input type="checkbox"/> poor problem solving                                  |
| <input type="checkbox"/> anxiety                  | <input type="checkbox"/> difficulty performing your job/school works           |
| <input type="checkbox"/> depression               | <input type="checkbox"/> change in relationships with others                   |
| <input type="checkbox"/> difficulty concentrating | <input type="checkbox"/> poor judgment (being fired from job, arrests, fights) |
| <input type="checkbox"/> difficulty remembering   |  |

**S** Any significant **Sicknesses**?  Yes  No

Note: Traumatic brain injury implies a physical blow to the head, but acquired brain injury may also be caused by medical conditions, such as: brain tumor, meningitis, West Nile virus, stroke, seizures. Also screen for instances of oxygen deprivation such as following a heart attack, carbon monoxide poisoning, near drowning, or near suffocation.

**Scoring the HELPS Screening Tool**

A HELPS screening is considered positive for a *possible* TBI when the following 3 items are identified:

- 1.) An event that could have caused a brain injury (yes to H, E or S), and
- 2.) A period of loss of consciousness or altered consciousness after the injury or another indication that the injury was severe (yes to L or E), and
- 3.) The presence of two or more chronic problems listed under P that were not present before the injury.

**Note:**

- A positive screening is **not sufficient to diagnose TBI** as the reason for current symptoms and difficulties - other possible causes may need to be ruled out
- **Some individuals could present exceptions to the screening results**, such as people who do have TBI-related problems but answered "no" to some questions
- Consider positive responses within the context of the person's self-report and documentation of altered behavioral and/or cognitive functioning

The original HELPS TBI screening tool was developed by M. Picard, D. Scarisbrick, R. Paluck, 9/91, International Center for the Disabled, TBI-NET, U.S. Department of Education, Rehabilitation Services Administration, Grant #H128A00022. The Helps Tool was updated by project personnel to reflect recent recommendations by the CDC on the diagnosis of TBI. See [http://www.cdc.gov/ncipc/pub-res/tbi\\_toolkit/physicians/mtbi/diagnosis.htm](http://www.cdc.gov/ncipc/pub-res/tbi_toolkit/physicians/mtbi/diagnosis.htm).

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Appendix B

Variables in Models

**Age - Over / Under 18 years**

	Frequency	Valid Percent
Less than 18	258	63.1
18 and older	151	36.9
Total	409	100.0
Missing	14	
Total	423	

**Gender**

	Frequency	Valid Percent
Male	233	56.1
Female	182	43.9
Total	415	100.0
Missing	8	
Total	423	

**Minority**

	Frequency	Valid Percent
White	255	62.3
Minority	154	37.7
Total	409	100.0
Missing	14	
Total	423	

**Juvenile Justice Involvement**

	Frequency	Valid Percent
No J.J. Involvement	360	87.6
J.J. Involvement	51	12.4
Total	411	100.0
Missing	12	
Total	423	

**Geographic Location**

	Frequency	Percent
Omaha / Lincoln	274	64.8
Other Location	149	35.2
Total	423	100.0

Frequency distribution of dichotomized variables in models

**Grade**

	Frequency	Percent
9	2	.6
10	22	6.1
11	111	30.8
12	225	62.5
Total	360	100.0
Missing System	63	
Total	423	

**Age**

	Frequency	Percent
14	1	.2
15	9	2.2
16	71	17.4
17	177	43.3
18	111	27.1
19	31	7.6
20	5	1.2
21	4	1.0
Total	409	100.0
Missing System	14	
Total	423	

**Referral Source**

	Frequency	Percent
School	345	83.9
Juvenile Justice	51	12.4
Other	15	3.6
Total	411	100.0
Missing System	12	
Total	423	

Running head: Traumatic Brain Injury Screening Differences

**Race**

		Frequency	Percent
Valid	White	255	62.3
	Black	69	16.9
	Hispanic	49	12.0
	Asian	18	4.4
	Native American or Alaska Native	11	2.7
	Mixed Race or Other	7	1.7
	Total	409	100.0
Missing	System	14	
Total		423	

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