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## PREDICTORS OF POST-SECONDARY EMPLOYMENT AND EDUCATION AMONG KENTUCKY TRANSITION-AGED YOUTH WITH TRAUMATIC BRAIN INJURY

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PREDICTORS OF POST-SECONDARY EMPLOYMENT AND EDUCATION  
AMONG KENTUCKY TRANSITION-AGED YOUTH WITH TRAUMATIC BRAIN  
INJURY

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DISSERTATION

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A dissertation submitted in partial fulfillment of the requirements for the degree of  
Doctor of Philosophy in the  
College of Education at the University of Kentucky

By

Lebogang Tiro  
Lexington, Kentucky

Co-Directors: Dr. Malachy Bishop, Professor of Rehabilitation Counseling  
and Dr. Debra Harley, Professor of Rehabilitation Counseling

Lexington, Kentucky  
2018

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## ABSTRACT OF DISSERTATION

### PREDICTORS OF POST-SECONDARY EMPLOYMENT AND EDUCATION AMONG KENTUCKY TRANSITION-AGED YOUTH WITH TRAUMATIC BRAIN INJURY

The State of Kentucky has a high and increasing number of reported cases of traumatic brain injury (TBI), mostly attributed to motor vehicle crashes, falls, and being struck by or against an object. Young adults are among those most at-risk for experiencing a TBI through motor vehicle crashes. Using existing data from the Kentucky Post-School Outcomes Center (KyPSO), 90 youth with TBI were identified within a period of 6-years of the longitudinal study (2012-2017). The majority were males and White. Descriptive statistics, chi square, and logistic regression were used to examine the post-secondary outcomes for youth with TBI, using four demographic variables: gender, ethnicity, residence, and rural or urban status. None of these were associated with post-secondary outcomes for the sample. The results indicated that more than 50% of the youth with TBI had positive outcomes, yet they rarely used the services provided for them in the schools or at the workplace. This study suggests that, although the demographic characteristics did not predict post-secondary outcomes, other variables within education and employment yielded interesting results that could benefit rehabilitation counselors.

**KEYWORDS:** Transition, Employment, Education, Youth, Traumatic Brain Injury

Lebogang Tiro  
Student Signature

August 13, 2018  
Date

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## DEDICATION

Dedicated to all brain injury survivors!

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## **Chapter 1: Introduction**

Traumatic brain injury (TBI) is the leading cause of death and disability worldwide, including in the United States (U.S.) (Brainline.org, 2018; Centers for Disease Control and Prevention (CDC, 2017; International Brain Injury Association [IBIA], 2016; National Data and Statistical Center [NDSC], n.d.). TBI contributes to a third of all injury-related deaths in the U.S. (Dillahunt-Aspillaga, et al., 2015). Faul and Coronado (2015) indicated that, annually, 52,000 US residents die as a result of the injury. In addition, it has been noted that TBI is the leading cause of seizures and permanent disabilities internationally (IBIA, 2016). Again, it is also a leading cause of death and lifelong disability among children and young adults in the U.S. Gland (2000) indicated that 1 in 500 children have brain injuries each year. The CDC (2017) stated that in 2012, around 329,290 children aged 19 years and younger were treated due to TBI related injuries in the US. In 2013, TBI-related cases accounted for 640,000 emergency department (ED) visits and 18,000 hospitalizations, including 1,500 deaths among children (CDC, 2017). Although youth experience a higher incidence of TBI than adults (CDC, 2016), relatively fewer research studies have focused on this population than on adults with TBI (Thurman, 2016).

### **TBI in Kentucky**

The Brain Injury Alliance of Kentucky (BIAK, 2018) indicated that the numbers for individuals living with TBI in Kentucky ranged between 202,488 and 214,032. The brain injury prevalence is highest in rural areas, such as Eastern Kentucky (Kentucky Traumatic Brain Injury Trust (KTBITF, 2015). Similarly, the 2010 Kentucky Traumatic Brain and Spinal Cord Injury Surveillance Project (KTBSCSP) indicated that TBI was

most common in Letcher and Perry counties (KTBSCSP, 2010). These are rural Kentucky counties, primarily in the Eastern Appalachian region of the state.

### **Definition of TBI**

TBI has been defined as “damage to the brain tissue caused by an external force and evidenced by loss of consciousness, post-traumatic amnesia, skull fracture, or objective neurologic findings” (Horn, Corrigan, & Bogner, 2015, p. 883). According to the CDC (2017), TBI is an outcome of an energy force transferred to the head. Although not all blows or jolts lead to a head injury (CDC, 2016; Faul & Coronado, 2015), the CDC (2017) further indicated that a significant bump, blow, or jolt to the head, or a penetrating head injury can lead to an alteration in the normal functioning of the brain. Lagbas, Bazargan-Hejazi, Shaheen, Kerman, and Pan (2013) indicated that injury to the head resulting from blunt or penetrating trauma, or from acceleration-deceleration of force, could cause neurological or neuropsychological abnormalities, including death. The most common causes of damage to the brain include bleeding, bruising, swelling, twisting or shearing of neuronal axons, and loss of oxygen (BIAK, 2017).

### **Types of TBI**

Although there are many potential forms of injury that may result in a TBI, two basic types of TBI have been identified, namely, closed head injuries and open head injuries (Brainline, 2017). A closed head injury occurs due to a blow, or sudden or violent motion of the head, causing the brain to knock against the skull. The damage is usually in one area and typical symptoms include dizziness, headache, and, in more severe cases, loss of consciousness (BrainandSpinalcord, 2017; Brainline, 2018). An open head injury

is defined as an injury that leads to a broken, fractured, or penetrated skull, causing damage to the brain (Brainline, 2018).

### **Transition and TBI**

Very little is known regarding the services that equip successful transition from school to work for students with TBI (Wehman, Chen, West & Cifu, 2014). The 1997 amendments to the Individuals with Disabilities Education Act (IDEA) defined transition services for this particular transition as a set of activities that are specifically designed for a student within an outcome oriented process, that promotes movement from school to post-school activities, including postsecondary education, vocational training, and integrated employment. The transition should be based on the needs of the student, while considering the student's preferences and interests (Council for Learning Disabilities, [CLD], 2018). In addition, to meet the unique needs of the student, the amendments to the 1997 Act, which were published in March 1999, stated that the services should be designed to prepare them for employment and independent living.

Some of the transition services include development of employment and other post- school activities and functional vocational evaluation (CLD, 2012). Moreover, Levinson and Palmer (2005) indicated that a successful school-to-work transition program consists of a comprehensive, trans-disciplinary vocational assessment that integrates a variety of school and community agency personnel into the assessment process. The authors further stated that the assessment process should include teachers, counselors, psychologists, representatives from community mental health or mental retardation, vocational rehabilitation, social services agencies, and collaboration among these professionals to identify relevant transition needs.

Transition meetings have been mandated for all students with disabilities including those with TBI as long as they are receiving special education services. The meetings usually comprise of the student, parent or guardian, special education teacher, local education agency (LEA) representative, and other appropriate personnel such as the vocational rehabilitation counselor and related post-secondary educators. Although students with disabilities, more specifically those with an individualized education program (IEP), are expected to have transition services for post-secondary, Todis, Glang, Bullis, Ettel, and Hood (2011) revealed that a few students received transition services to prepare them for post-secondary education while others were denied transition services. Data for this study came from reports provided by 89 youth with TBI in Oregon and Washington.

### **Vocational Rehabilitation Counseling Services and Transition**

Limited information is available on future vocational preparation for individuals with TBI. In addition, limited literature discusses transition for individuals with TBI despite indications that many adolescents with TBI encounter difficulties in making the transition to adult life and finding sustained employment.

### **Purpose of the Study and Research Questions**

The purpose of the study is to examine the predictors of post-secondary employment and education among youth with TBI in Kentucky. The following questions will be addressed by the study:

1. What are the employment or education outcomes for youth with TBI?
  - a. What are the employment outcomes of Kentucky post-secondary youth with TBI one year after high school?

- b. What are the education outcomes of Kentucky post-secondary youth with TBI one year after high school?
- 2. What are the predictors of employment or education outcomes for post-secondary youth with TBI?
  - a. What demographic and educational and employment support factors are associated with employment outcomes of Kentucky post-secondary youth with TBI one year after high school?
  - b. What demographic and educational and employment support factors are associated with education outcomes of Kentucky post-secondary youth with TBI one year after high school?
- 3. How do employment and educational outcomes of post-secondary youth with TBI compare to those of post-secondary youth with other disabilities with symptoms that are similar to those experienced by people with TBI?

### **Statement of the Problem**

Despite the high incidence of TBI among youth, no studies discuss the predictors of post- secondary employment and education for youth with TBI. The incidence of TBI among youth is high, and frequently results in severe consequences, in some cases including death and disability. It has been noted that TBI due to motor vehicle crashes (MVCs) is the leading cause of disability among US youth (CDC, 2016). Among youth who incur a TBI prior to completing high school, the symptoms associated with TBI could cause significant barriers in pursuing post-secondary education or work (Ylvisaker, Todis, Glang, & Tyler, 2001). Challenges may include cognitive, emotional and physical impairments. While there are many youths affected by TBI in the U.S., there have been



very few studies to explore the post-secondary outcomes for youth with TBI, and no studies have been undertaken to discuss the predictors pertaining to employment or education outcomes for post-secondary youth with TBI.

### **Significance of the Study**

This study is intended to guide rehabilitation counselors and other service providers in assisting youth with TBI by increasing awareness of the barriers and factors that affect post-secondary outcomes for youth with TBI, in both education and employment. It is designed to increase understanding of the rates at which youth with TBI participate in post-secondary education and employment in the state of Kentucky, and allow exploration of specific individual factors, including gender, ethnicity, residency, and receipt of various educational and employment services.

### **Summary**

TBI is a leading cause of death and disability and it is defined as an injury to the brain caused by an external force. With regard to transition for youth with TBI, there is limited research about post-secondary employment and education outcomes. Due to the challenges that the youth with TBI encounter, they often require supports to attain post-secondary employment and education. In addition, minimal research has been conducted regarding outcomes and experiences in post-secondary transition among youth with TBI. Legislative initiatives, including education-based legislation, such as Individuals with Disabilities Act (IDEA), Elementary and School Education Act (ESEA), vocational legislation, including the Workforce Innovation and Opportunity Act (WIOA) and Rehabilitation Act, provide important supports and assistance to students with disabilities. The impact of these supports on the experiences of youth with TBI has also

not been clearly established. This study will provide information about the degree to which educational and vocational supports promote participation in post-secondary employment and education.

## **Chapter 2**

### **Literature Review**

This study is intended to guide rehabilitation counselors and other service providers in assisting youth with TBI by increasing awareness of the barriers and factors that affect post-secondary outcomes for youth with TBI, in both education and employment. In this chapter I review the literature relevant to the research questions and focus of this study. This chapter begins with an overview of TBI, which covers the etiology, diagnosis, diagnostic levels of brain injury, and information on such variables as age, gender, ethnicity, educational level, and employment rates. I then discuss incidence and prevalence rates of TBI internationally and in the US, as well as in rural versus urban areas. I specifically examine variables that affect TBI rates among transition-aged youth, including gender, rural or urban status, and other demographic variables. This is followed by a review of the causes and consequences of TBI both in the general population and specifically among transition-aged youth. I then examine the functional and psychosocial consequences of brain injury, with specific coverage of: physical, motor, and perceptual effects; communication effects; cognitive effects; potential personality, and affective sequelae.

Following this overview, I examine the literature related to the impact of brain injury on employment and education in the U.S. for transition aged youth. I then describe vocational rehabilitation programs and educational supports and related legislation for individuals with brain injury. This is followed by a review of vocational rehabilitation services for individuals with brain injury in the US, including information on services

that have been found to be more or less effective in promoting successful employment outcomes.

Finally, I present the research on TBI and post-secondary outcomes among transition-aged youth, because TBI prevalence among this age group is high and outcomes are relatively poor. Recent legislation has focused on transition for youth with disabilities but there is a lack of understanding of best practices and supports to promote positive outcomes for this population. I also evaluate the employment and education outcomes for youth with TBI one year after high school. I discuss the limited research on the predictors of employment and education outcomes for post-secondary youth with TBI; and the demographic, educational, and employment support factors that are associated with employment and educational outcomes of Kentucky post-secondary youth with TBI one year after high school.

### **Traumatic Brain Injury**

The next section discusses the overview of TBI, the classification and levels of TBI. The medical professionals classify the TBI according to the severity of the head injury.

#### **Overview of TBI: Classification and Levels of TBI**

The etiology, diagnosis, and diagnostic levels of TBI will be discussed here. As stated in the previous chapter, traumatic brain injury is an injury to the head, caused by an external force.

Two main classes of brain injury have been identified, including open head and closed head injury. In addition, medical professionals distinguish between two types of injuries: *primary* and *secondary*. A primary brain injury occurs immediately after impact and is a

direct result of mechanical trauma. Depending on the injury mechanism and severity, the initial event might cause primary physical alterations of the brain tissue. Swelling, which is termed “cerebral edema”, is common after a primary injury occurs and it is the most common cause of brain death in persons with severe TBI (Plesnila, 2007). A secondary brain injury occurs when there are complications secondary to the primary injury, such as inflammation and swelling (Graham, Gennarelli, & McIntosh, 2002; Greeve & Zink, 2009; Werner & Engelhard, 2007).

### **Methods of Evaluating TBI Severity**

Severity of TBI has been measured using multiple behavioral observation scores that capture the extent of altered consciousness. The most common measures include the Glasgow Coma Scale, length of loss of consciousness (LOC), and length of posttraumatic amnesia (PTA) (Eastvold, Walker, Curtis, Schwab, & Vanderploeg, 2014; Gardizi, Hanks, Millis & Figueroa, 2014; Hart, Kowzłowski, & Whyte, 2014). These measures are described below.

**The Glasgow Coma Scale (GCS).** The most commonly used severity assessment for TBI is the Glasgow Coma Scale (GCS) score, which is generally collected in the emergency room (Faul & Coronado, 2015; Malec et al., 2007; Teasdale & Jennett, 1974). The GCS is used to rate three aspects of functioning following injury, namely, “eye opening, motor response, and verbal response” (Faul & Coronado, 2015, para 2). Further, it may be used to rate outcome during any phase of recovery and is often a part of a patient's acute hospital record (Chesnut et al. 1999). GCS has been shown to be a useful system in determining TBI severity (Brainline, 2018). Moreover, the extensive use of the scale can be attributed to the simplicity of the method of grading the patient (Hoge,

Auchterloine, & Miliken, 2006). GCS provides a range of scores from 3-15 and the higher the number in GCS, the less the severity. Eighty percent of all head injuries are mild TBI (GCS score between 13 and 15), 10% are classified as moderate TBI (GCS score between 9 and 12), and the remaining 10% are classified as severe, and 8 or lower on the GCS (Brainline, 2018; Cifu & Caruso, 2010). An initial GCS of 9-12 defines a moderate injury and 3-8 a severe injury (Brainline, 2018). As a result, physicians use the scale to determine the extent of a head injury. Again, the scale has been used to measure the conscious state of an individual both in an initial evaluation and in the period following TBI to track recovery (Anyalebechi, 2015).

The reliability and validity of the GCS have been affirmed by various studies. Faul and Coronado (2015) reported a mean interval consistency co-efficient (ICC) of 0.998, Kappa coefficient of 0.981, and an inter-item correlation coefficient of  $r=0.980$ . Despite the relatively high reliability of the GCS, it should be noted that factors not necessarily related to the injury might affect the GCS score and could lead to misleading classifications of TBI severity. Examples of such include factors that can independently alter consciousness include medical sedation, alcohol or drug intoxication, and organ system failure. GCS score should not, therefore, be used alone to determine severity of injury (Cifu & Caruso, 2010; Faul & Coronado, 2015).

#### **Loss of Consciousness (LOC) and Length of Post Traumatic Amnesia (PTA).**

In addition to the GCS, the severity of the injury can also be estimated by measuring the duration of loss of consciousness (LOC) and the depth of coma, and sometimes by the length of post traumatic amnesia (PTA). Lengthy LOC is referred to as coma (Brainline.org, 2008; Faul & Coronado, 2015). A commonly used rule of thumb is that

mild injury refers to a case in which there is no LOC, or LOC lasts no more than 20 minutes. Further, if the LOC is between 30 minutes and an hour, the classification will be termed as moderate and beyond six hours is categorized a severe brain injury (Cifu & Caruso 2010; Faul & Coronado, 2015). These rules of thumb are by no means universally accepted however, and represent only a broad estimate that would be further informed by the inclusion of additional clinical evaluation of symptoms.

PTA is another measure used to determine severity of the TBI and it refers to the period when the individual feels a sense of confusion and disorientation and an inability to remember recent events (Brainline, 2018). This is a period of time immediately following TBI in which an individual is in an acute state of confusion and disorientation. The use of PTA originated with Russell and colleagues in the 1930s, who classified injuries with PTA more than 5 minutes as very mild, 5 to 60 minutes as mild, 1 to 14 hours as moderate, more than 24 hours as severe, more than 1 week as very severe, and more than 4 weeks as extremely severe. PTA is measured using units of time of the amnesia after the injury (Faul & Coronado, 2015; Sbordone, Seyranian, & Ruff, 2000).

With regard to functionality, longer durations of PTA have been shown to predict poorer cognitive functioning and worsened functional outcomes (Brown, et al. 2005). Although PTA has been identified to be reliable to predict extent of cognitive and functional deficits after sustaining a TBI, its validity has been questioned (Sbordone et al., 2000). PTA and LOC have been deemed by some researchers to be unreliable in terms of prognostic validity (Faul & Coronado, 2015).

## **Levels of TBI**

The effects of traumatic brain injury are not the same for everyone and usually varies according to levels. There are three basic levels of TBI severity, namely; mild, moderate, and severe (CDC Report, 2015). The different levels are described below according to their severity. I will start by the less severe one, moving on to the most severe one, including their symptoms.

**Mild TBI.** Mild TBI is a brief change in mental status or consciousness (Kennon, 2017). It is usually caused by a blunt head trauma and or force to the head. Katz, Cohen and Alexander (2015) defined mild TBI as “acute neurophysiologic brain dysfunction resulting from impact contact forces or sudden acceleration or deceleration causing a transient alteration of consciousness and or a period of anterograde (and possibly retrograde) amnesia” (p. 131). The majority of reported TBIs in the US are classified as mild.

Kraus et al. (2005) indicated the symptoms that may be experienced by individuals with mild TBI and these include headaches, sleep disturbances, depression, irritability, and reduced attention span. In addition, the CDC (2016) noted that individuals may also present symptoms like confusion and disorientation immediately after the injury. The recovery period may be a week or more; however, mildest TBI symptoms are unable to be detected by a CT scan, so an MRI is preferred. Previously, the American Congress of Rehabilitation Medicine and the World Health Organization provided the following criterion for a mild TBI: loss of consciousness less than 30 minutes following the injury and posttraumatic amnesia of less than 24 hours following the injury (Faul & Coronado, 2015; World Health Organization(WHO), 2018).



**Moderate TBI.** Moderate TBI is usually attributed to experiences or changes in the brain function, which last longer than a few minutes following the brain injury. The CDC (2015) stated that most causes of moderate TBI are falls (40.5%), motor vehicle crashes (MVCs; 14.3%), assaults (10.7%), and being struck by or against an object (15.2%). In most cases, the symptoms may be similar to mild TBI, although they do not go away and may worsen (TBI Model Systems, 2018). Individuals diagnosed with moderate TBI may experience physical, cognitive, and psychosocial deficits that may last for a few weeks, several months, or even remain permanent (Arlinghaus, Shoaib, & Price, 2005). As has been noted by Lezak (1995), individuals may be affected cognitively due to damage of the frontal lobes, resulting in altered behaviors, changes in personality, learning issues, vision problems, and epilepsy. However, most people with moderate TBI function independently and return to work, although they may have problems performing as leaders or facilitators (Arlinghaus, et al., 2005).

**Severe TBI.** Severe TBI is diagnosed after the injury to the brain results in an extended period of unconsciousness or amnesia after the injury (CDC, 2016; Kennon, 2017). Individuals who experience severe TBI may remain in a coma. A coma is a state whereby the individuals are in a vegetative state many days, weeks or even months. Additionally, the individual with severe TBI may also remain permanently unresponsive (Cifu & Caruso, 2010). The severity of permanent consequences varies and depend on the severity of the injury itself (Adamson, 2013). Individuals with severe TBI tend to suffer from more physical and cognitive impairments than those with mild TBI (Dikmen, Machamer, Powell & Temkin, 2003; Gentilini et al., 1985). Severe TBI is most likely to result in death, with estimates of death occurring in 30-50% of cases (Dixon & Layton,

1999; Rosenthal & Ricker, 2000). Other outcomes include a persistent vegetative state (3-20%), severe disability (10%), moderate disability (13%), and good recovery (33%) (Dixon & Layton, 1999).

Regarding places where there is high prevalence of more severe cases of TBI, an example has been indicated from a dissertation on pediatric TBI in Texas, and one of the comparisons covered by Robertson (2009) was severity scales of TBI in rural and urban areas where he found out that the worst severity measures were consistently seen in clients residing in small towns. In his study, Robertson found that among 545 patients who sustained TBI, the majority was male, accounting for 66% of the sample. He noted that small towns had worse trauma scores, and higher GCS scores and longer hospital stays while the urban areas had lower scores. The prevalence of TBI from CDC data and in U.S. generally, including prevalence for Kentucky is discussed below.

### **Prevalence and Incidence of TBI**

Researchers at the CDC and Brain Injury Association of America (BIAA) estimated that 3.1 to 5.3 million people in the U.S. live with long-term disability arising from physical, emotional, or cognitive consequences of TBI (BIAA, 2018; CDC, 2016). The CDC estimated that in 2010 approximately 2.5 million people in the United States sustained a TBI (CDC, 2017; CDC, 2015). Of these, 2.2 million were attended at emergency departments (EDs), 280,000 were hospitalized and survived, and 52,000 died (CDC, 2017). Moreover, in the U.S., the CDC (2017), has noted increases of TBI reported cases, and MVCs, falls, and violence were noted as the three most frequent causes of TBI. For instance, in the U.S. there was an increase in the incidence of TBI

between 2001 and 2010 of 78.2%, with 498.8 per 100,000 of Americans incurring a TBI in 2001-2002 compared with 888.7 in 2009- 2010. For youth aged 15–24, the rate rose from 576.9 in 2001-2002 to 981.9 in 2009-2010, a 70.2% increase. The prevalence of TBI is not well documented because some of the cases, especially the mild TBI, are not always reported (Faul & Coronado, 2015). Nonetheless, in the U.S., TBI contributes to about 30% of all injury deaths and it affects people of all ages (Thomas & Kazukauskas, 2015). Approximately 3.2 million Americans with secondary residual TBI disabilities have long-term needs for assistance in performing their daily life activities (Corrigan, Selassie, & Orman, 2010). Furthermore, CDC reports indicated that 138 people in the U.S. die every day from TBI and one million Americans are treated and released from hospital EDs as a result of TBI annually (CDC, 2016).

Increasing numbers of individuals with TBI have been reported since 2002. Faul and Coronado (2015) indicated that during the years 2002–2007, approximately 1.7 million Americans sustained some kind of traumatic brain injury, annually. This led to 16% of hospitalizations, 81% of emergency visits, and 3% of deaths (Faul, Xu, Wald, Coronado, & Dellinger, 2010). The Defense and Veterans Brain Injury Center (DVBIC, 2015) reported that in 2014, 24,833 active U.S. service members experienced a TBI. According to Kennon (2017), at least 2.5 million children and adults sustain TBIs each year and 2.2 million are treated at EDs. It has also been noted that young adults aged 16 years to 24 years are at most risk for sustaining TBI (BIAA, 2018).

### **Prevalence of TBI in Kentucky**

The prevalence of TBI in Kentucky is reported based on data available from for 2011 to 2014 (Kentucky Injury Prevention and Research Center [KIPRC], n.d.), yet 2007

data has been included for comparison purposes. Just like for the U.S., increasing numbers of Kentuckians sustaining TBI have been reported. In Kentucky, reported cases for TBI the year 2007 were 4,461. The numbers have increased each year since. In 2011, Kentucky had 33,966 individuals sustaining TBI as compared to 4,461 reported cases for 2007. Among those, 30,521 Kentuckians treated at Emergency Departments (EDs), 445 were hospitalized and 1,100 died (KIPRC, 2007). In 2012, 35,000 individuals had a TBI related injury, and from that figure, 31,274 were treated at EDs, 3,637 were hospitalized and the same number for the previous year, 1,100, died as a result of their injuries (KIPRC, 2012). The 2013 report indicated 37,000 individuals being treated in ED, 33,593 attended in ED, 3,458 hospitalized, and 1000 died (KIPRC, 2013). The 2014 report showed a total of 40,000 people attended at hospitals due to TBI related injuries, while 3,673 were hospitalized and 1000 died (KIPRC, 2014).

The above numbers indicate a rising numbers of TBI cases in Kentucky, which include those attended to in EDs and those hospitalized. The estimated number for deaths remained almost the same (KIPRC, 2016). It should be noted though, that, the Kentucky reports do not include federal, military, or Veterans Administration hospitals data. The Brain Injury Alliance of Kentucky (BIAK) stated that there is an estimation of 202,488 to 214,032 Kentuckians living with brain injuries, and this implies that between 5% and 5.3% of the population have brain injuries (BIAK, 2018)

### **Causes of TBI in United States**

The main causes of TBI have been identified as falls, being struck by an object, and MVCs. The CDC (2017) indicated that falls were the leading cause, followed by being struck by or against an object, and the third leading cause has been identified as

MVCs. Faul and Coronado (2015) indicated that falls were the leading causes of TBI (178.4 per 100 000 persons), and stated that being struck by or against an object was the second leading cause (92.7 per 100 000 persons) while MVCs were identified as the third leading cause of TBI (74.7 per 100 000). Although the majority of the studies indicated that falls are the leading causes of TBI, slight differences have been observed regarding the second and third leading causes of TBIs. For instance, a systematic review by Brasure et al. (2013) identified the major causes of TBIs in the U.S. as including falls (35.2%), motor vehicle crashes (MVCs) (17.3%), being struck by or against events (16.5%), assaults (10%), and other or unknown (21%), meaning that they identified the second leading cause as MVCs while being struck by or against an object was identified as the third leading cause. There are differences in the prevalence of the cause of TBI, however, based on age groups and region of the country in which one lives.

### **Falls**

Falls are a more prevalent cause of TBI among very young children aged 0-4 years and older adults aged 65 years and above. The CDC (2017) indicated that falls accounted for 54% of TBI among older population and 79% for younger children. Falls have been identified as the leading cause of TBI for people aged 65 years and above (CDC, 2017; Thurman, Alverson, Dunn, Guerrero & Sniezek, 1990) and falls are identified as the third leading cause of TBI related deaths (Thurman et al., 1990). Moreover, Faul and Coronado (2015) indicated that the falls among the older age group were frequently attributed to arrhythmias, a condition which leads to abnormal heartbeats. The high prevalence of falls as a leading cause of TBI appears to have remained consistent over time. A study from 20 years ago by Thurman, et al. (1999)

identified the causes of TBI in the 1990s and the results concurred with recent analyses, identifying falls as the leading cause among the older population. Among children, those between age 0 and 4 years had the highest percentage (53.5%) of TBI due to falls (Lagbas et al., 2013).

### **Being Struck by or Against an Object**

Being struck by an object, or having one's head struck against an object, has been identified as the second leading cause of TBI in U.S., contributing to 22% of all cases has been found to be most common among those aged 15 years and below (CDC, 2017). This cause has also been found to be the leading cause of death among the group aged 0-4 years. With regard to the young children, Cifu and Caruso (2010) indicated that these kinds of head injuries are attributed to "forcefully striking the infant's head against a surface" (p.148). In 2013, this cause accounted for 15% of TBI-related ED visits, hospitalizations and deaths. Further, 1 in 5 ED visits, hospitalizations and deaths were attributed to this cause for those aged 15 years and younger (Brainline, 2016; CDC, 2017).

**Motor Vehicle Crashes (MVCs).** Motor Vehicle Crashes (MVCs) are identified as the third overall leading cause of TBI. In addition, MVCs were identified as the third leading cause of death in TBI, accounting for 19%. MVCs were most common among persons with ages between 5 and 24 years and MVCs were also identified as the leading cause of death for this age group. It was also noted that MVCs were the leading cause of hospitalizations among persons aged from 15-44 years (CDC, 2017). Specifically, MVCs were the leading causes of hospitalization for ages 15-19 years (27.8%) and ages 20-24 years (48.6%) and Hispanics were more likely to be affected by this cause as compared to

those from other ethnic backgrounds (Lagbas et al., 2013). In addition to the above major causes of TBI, concussions and sports related activities also cause TBI. Emerging studies are increasingly focusing on TBI caused by sports.

### **Race or Ethnicity and TBI Causes**

Few studies discuss race and TBI causes, and different results have emerged regarding which racial or ethnic group is affected mostly by TBI. Two studies were identified, and they had differences regarding which race was affected by TBI mostly. A cross sectional study by Lagbas et al. (2013) indicated that Whites (65.8%) were mostly affected by TBI as compared to Blacks (5.6%) while a study by Faul and Coronado (2015) revealed that Blacks (568.7 per 100 000 persons) were mostly affected by TBI as compared to Whites (456.6 per 100 000 persons).

Lagbas et al. (2013) further discussed the causes among different races while Faul and Coronado (2015) discussed the different races and ages for individuals with TBI. Lagbas et al. (2013) indicated that TBI which was a result of falls was most prevalent among Whites (34.2%), followed by Asians (14.4%) and the lowest percentage was found among Blacks (19.7%). TBI resulting from being struck by or against an object was most prevalent among Hispanics at 0.9%, followed by Blacks (0.7%), Asians (0.6%), and the least prevalent was among Whites at 0.3%. With regard to race and MVCs, Hispanics were mostly affected (27.2%), followed by Blacks at 21.3%, then Whites at 17.2% and lastly Asians 14.4%. Faul and Coronado (2015) stated that Blacks had the highest numbers of hospitalizations due to TBI (78.7 per 100 000 persons), as compared with Whites who had a rate of 69.8 per 100,000 persons.

## **Gender and TBI Causes**

With regard to gender, there is consistency regarding the results. TBI has consistently been found to be most common among males. In a cross-sectional study for the years between 2001-2009 among 61,188 Americans with TBI, males had a percentage of 58.9% compared to 41.1% of females (Lagbas et al., 2013). Additionally, Faul and Coronado (2015) stated that between the year 2002 and 2006, 547.6 per 100 000 males were seen in EDs for TBI as compared to 385.9 per 100 000 females. Although females were affected at a lower rate, falls were the most common among females. Assaults were the leading cause of TBI among males (15.0%) compared with females at 3.5% (Lagbas et al., 2013). Males are at a higher risk for TBI than females and this ratio of male-to-female TBI is highest during adolescence and young adulthood (Jager, Weiss, Coben, & Pepe, 2007). The incidence for this population has been noted by Faul and Coronado (2015), stating that the largest gender-based differences among the population 10-14 years were 913.4 per 100 000 for males and 304.1 per 100 000 for females). The high gender ratio is primarily due to motor vehicle accidents and interpersonal violence among males (Jager, et al., 2007). Although males have higher rates of TBI, females have been shown to have a lower rate of survival from TBI (Kraus, Peek-Asa, & McArthur, 2000; Ponsford et al., 2008). Again, males have been found to have high prevalence of TBI and the results have been consistent in different studies (Faul & Coronado, 2015; Lagbas et al., 2013; Kraus, et al., 2000). This applies across all ages where males have been identified to be have high rates of TBI including for causes of TBI.



## **Causes of TBI in Kentucky**

In Kentucky, falls are the leading TBI-related causes of hospitalization, just like in the U.S., resulting in 47% of hospitalizations. MVCs followed at 18% of hospitalizations, while being struck by or against an object was at 4% (KIPRC,2016). Furthermore, data on emergency department (ED) visits for 2014 indicated that the leading cause of TBI-related ED visits was falls (48%), being struck by or against an object (20%) and lastly MVCs at 18%. The third leading cause for hospitalizations was stated as being struck by an object, while for ED it was noted as MVCs (Kentucky Traumatic Brain Injury Trust Fund [KTBITF], 2015). In addition, a 2017 BIAK report indicated that in Kentucky 35.2% of TBIs are caused by falls, 17.3 by MVCs, and 10% are due to assaults (BIAK, 2017).

## **Causes of TBI Among Youth**

Young adults aged 16 years to 24 years are at most risk for sustaining TBI (BIAA, 2002). According to the CDC (2017) the leading causes of TBI among children aged 19 years and younger is MVCs, and MVCs were the leading cause of death for persons 5-24 years for the year 2013. Being struck by or against an object was the leading cause of TBI for those aged 15-24 years but MVCs were the leading cause of hospitalizations and ED visits for adolescents (CDC, 2016).

In a retrospective study for the years 2009-2012, Leonhard, Wright, Fu, Lehrfeld, and Carlson (2015) explored the disparities for urban and rural pediatric patients in Oregon among 2,794 children aged 0-19 years. Their results indicated that the most frequent mechanisms of TBI were falls (33%) and MVCs (33%). Cause of TBI for children in rural areas was attributed primarily to MVCs (37%) and falls were more

common among children in urban areas (39%). The results of the study indicated that 25% of the reported TBI cases were in small metropolitan areas, and 72% in non-metropolitan areas. Seventy-two percent of the patients were White and 67% were male. The severity for children was also reported as 34% severe injuries reported in rural areas and 34% in urban areas. Leonhard et al. (2015) indicated that majority of the deaths were amongst children in rural areas.

### **TBI in Rural Areas**

The U.S. Census Bureau defines urban areas as an area having a population of 50 000 people or more and rural as any population, housing, or territory not in an urban area (U.S. Census Bureau, 2010). Approximately 21% of the U.S. population resides in rural areas and several studies have found that the mortality rate from MVCs is higher in these areas (Peek-Asa, Zwerling, & Stallones, 2004). Peek-Asa et al. (2004) reported that “deaths resulting from motor vehicle crashes, traumatic occupational injuries, drowning, residential fires, and suicide all increase with increasing rurality” (p. 1689).

According to the National Highway Traffic Safety Administration, an estimated 19% of the U.S. population lived in the rural areas and rural motor vehicle crashes accounted for 54% of all traffic fatalities in 2013 (National Highway Traffic Safety Administration [NHTSA], 2015). In the U.S., 48% of crashes occurred in rural areas while 45% occurred in urban areas in 2015, and for the same year, 78% of crashes occurred in rural areas while 22% occurred in urban areas in Kentucky (NHTSA, 2015). Furthermore, Peek-Asa, et al. (2004) stated that individuals with TBI living in rural areas had higher mortality rates as rural fatalities are more than twice as high as urban rates, and were attributed mostly to MVCs. Peek-Asa et al. (2004) also indicated that residents in

rural areas were less likely to use seat belts. Anyalebechi (2015) indicated that TBI-causing injuries relating to MVCs resulted in lower job stability and engagement in productive work compared to other causes of TBI. It has also been noted, however, that injuries resulting from violence and suicide occur at a lower frequency in rural areas compared to urban areas (Durhart, 2000; Peek-Asa et al., 2004). Other TBI causes more prevalent in rural areas were attributed to mining, construction, and farm work-related injuries.

Delay in receiving trauma care is one of the major factors contributing to risk of death due to traumatic injury in rural environments. Delays in transportation and distance to health facilities also increased the mortality rates due to TBI in rural areas and inadequate access to emergency medical services may increase the likelihood of a fatal outcome among individuals injured in rural areas (Peek-Asa et al., 2004). Gabella, Hoffman, Marine and Stallones (1997) conducted an analysis of data for 6,863 rural and urban dwelling individuals with TBIs, of whom 67% were male and 19% had severe TBI. Their results indicated that the residents of the rural, remote counties had the highest overall rate of TBI and highest mortality rate, almost twice as high as the rate for urban residents. Males had higher incidence of TBI in both rural and urban areas, yet males in rural areas had the highest incidence.

Most of Kentucky is considered to be rural. Rural areas have a relatively lower population and therefore cannot provide resources or services to its citizens such as public transportation and medical assistance at the same level as urban areas with higher population densities. In addition, rural areas do not have as many businesses and therefore offer fewer jobs for residents of the area. Due to the lack of employment in

those areas and the inability to commute to more urbanized areas to work, the socio-economic status of the population may also be lower (Ky.gov, 2017).

### **Consequences of Brain Injury**

The aftermath of TBI may include a complex set of symptoms and impairments not limited to physical, cognitive, and behavioral or emotional, and these may last for a shorter or longer period depending on the severity of the injury, the availability of rehabilitation and related resources (Arlinghaus, et al., 2005; Chesnut et al., 1999; Falvo, 2014; IBIA, 2016; Kennon, 2017). In addition, they may also experience psychosocial impairments which can affect their relationships with other people and that would lead to the individuals with TBI being isolated from community and their loved ones (McNamee, Walker, Cifu, & Wehman, 2009; Ramanathan, 2013). The symptoms and impairments vary according to the severity and the parts of the brain that have been affected including resources available for them to be able to be independent, yet all individuals are unique regarding how TBI has affected them. Some functions or all of them may be impacted and any specific individual may experience only one, a few, or most of the possible effects (Brainline,2017).

**Physical Impairments.** Frequently reported physical impairments include mobility- related functional impairment, persistent headaches, sensory impairments such as losing sense of touch or smell, balance issues, and speech impairment. Paralysis and spasticity have also been found to be affecting individuals with TBI, especially if the motor is affected (Gordon, Cantor, Dams-OConnor & Tsaousides, 2015). Additionally, the Brainline (2017) also indicated that the individual may lose control of bowel and bladder functions. Further, impairments in mobility may limit the individual's access to

go to work or live independently (Chestnut et al., 1999). This indicates that physical problems resulting from TBI can significantly interfere with a person's general life.

**Cognitive Impairments-** The most important cognitive sequelae are memory loss, difficulties with concentration, judgment, communication and planning (Chestnut et al., 1999). The individuals may not be able to recall and comprehend situations to integrate new information. They may also not be able to understand the words, or understanding yet not being able to express themselves. Some may experience short memories (Chestnut et al., 1999). The individuals may also face difficulty acquiring new information, and remembering or being fixated on one thing (Falvo, 2014). Individuals with TBI may think slowly, speak slowly, and solve problems slowly depending on the severity of the injury and they can also be easily confused easily when it comes to a change or a challenging task (Brainline,2017).

**Behavioral or Emotional Impairments.** These issues may include difficulties controlling emotions, lack of inhibition, and personality changes (Atabaki, 2007; BIAK, 2017). In addition, behavioral issues following TBI can include difficulties initiating tasks, impulsivity, and trouble establishing and maintaining appropriate social behavior. Individuals with TBI may also experience trauma and depression (CDC, 2016).

TBI, and particularly severe TBI, can significantly negatively impact an individual's ability to function across multiple areas of life (McNamee, et al., 2009). The functional limitations resulting from TBI may negatively affect the individual's ability to live an independent and productive life (Corrigan & Hammond, 2013; Hammond & Malec, 2013). All the stated symptoms above may lead to lower employment outcomes (Anderson, Brown, & Newitt, 2010) and the lower employment outcomes could cause

individuals with TBI to experience long-lasting unemployment issues (Carew & Collumb, 2008; Thomas et al., 2015).

### **The Consequences of Brain Injury for Employment**

Employment may be defined as participation in work-related activities from which an individual derives satisfaction (Tsaousides et al., 2009). Work defines people as individuals and is a key indicator of successful community reintegration following TBI (Dillahunt-Aspillaga et al., 2015). It provides individuals with a sense of contribution and accomplishment, gives life meaning, and can determine perceived self-worth.

Additionally, it plays a crucial role in overall quality of life, socialization, and participation in leisure activities (Thomas et al., 2015). However, Anderson et al. (2010) found that among individuals with TBI, the lowest levels of life satisfaction were in the areas of employment. The absence of work is a major complaint of individuals with TBI (Hooson, Coetzer, Stew & Moore, 2012). TBI can have a serious impact on competitive employment for individuals returning to work and those entering work, and employment outcomes for people with TBI lag far behind those of the general population.

According to the National Center for Education Statistics (2015), the 2015 employment- population rate was lower for persons with disabilities than those without disabilities. The report further stated that the employment rate was even lower amongst those with disabilities who have lower level of education. The high incidence of TBI among youth and the possibility of multiple limitations resulting from TBI have significant implications for employment among the population of people living with TBI. There is significant variability in the research concerning employment rates among people with TBIs. The reported rates have varied over time and across samples. For

instance, Bjork & Grant, (2009) reported that employment rates for individuals with TBI ranged between approximately 20% and 50% and vary in accordance with the severity of the TBI, pre-injury work experience, and various demographic factors, such as socioeconomic status, education, and age. Bushnik, Hanks, Kreutzer, and Rosenthal (2003) reported that the rate for individuals with TBI returning to work ranged between 18– 88%. Several studies discussed rates of unemployment and factors affecting employability.

Cuthbert, et al. (2015a), analyzed secondary data to evaluate unemployment rates among age-working individuals with TBI in the in the years 2001 to 2010. Their results indicated that two-years post TBI injury, the prevalence of unemployment was 60.4%. The severity of the injury was significantly associated with unemployment, with more severe TBI being associated with much lower rates of participation in employment. In addition, individuals with higher disability rating scores were less likely to maintain jobs. The authors also noted that females with TBI had an increased risk of unemployment compared with the males. According to Brainline (2008), the severity and location of the TBI could also affect the individuals' employment performance. An example is, if someone is injured in the frontal brain, they may be able to do farm work and be unlikely to perform well in a white-collar job.

In a separate study, Cuthbert et al. (2015b) examined the ten- year employment patterns of working age individuals after moderate and severe TBI among 3,618 participants with ages ranging between 16 and 55 years for the years 1989-2009. The authors indicated a reduction of employment participation between 5 years and 10 years post injury. They noted a regress in symptoms of TBI 5 years post injury for individuals

having moderate to severe TBI. Cuthbert et al. (2015b) indicated that the decline in employment rates was related to the severity of TBI.

Some factors affecting employability after TBI include educational levels, substance abuse, demographic factors, disability resulting from other injuries, and other factors. Race is also one factor that may be related to post-TBI employment. This was suggested, for example, in a retrospective cohort study by Gary et al. (2009) who studied racial differences in employment after TBI at 1, 2, and 5 years' post injury among 615 Blacks and 1,407 Whites from 16 TBI model system centers in the US. The results indicated that Blacks had lower employment rates. Most of the participants for their study were White (69.9%) and the majority were male (75.5%) and 72.2% had at least high school education. The authors indicated that Blacks had significantly greater odds of not being competitively employed versus being competitively employed as compared with Whites at 1 year (OR=2.61;95% CI, 1.93-3.53), 2 years (OR=2.10;95% CI, 1.56-2.83) and 5 years (OR=3.15;95% CI, 2.30-4.30) post injury.

O'Neil-Pirozzi et al. (2017), identified factors which affected employment for individuals with TBI were severity of injury (for example, the more severe the injury, the less likely return to work is) and age at time of injury (for example, the older the individual at time of injury, the less likely return to work is). Other factors were noted as pre- injury education level and marital status. They also noted that the effects of TBI on an individual's work productivity can be devastating. The authors stated that some individuals decide not to go back to work while others attempt to get back to work and end up being unsuccessful due to the result of TBI.



Dikmen, Machamer, Powell and Temkin, (2003) analyzed vocational outcomes for 210 individuals with TBI using an observational cohort from a level 1 trauma center who were enrolled within 24 hours of injury. Their results indicated that 30% of the population reported the inability to work or attend school, and difficulties performing responsibilities at work. In the same sample, 25% reported reduction in the number of friends and/or less contact with family and friends, and 10% reported complete dependence on a caregiver in an institutional setting to accomplish daily tasks. The participants were evaluated 1,6, and 12 months after injury with a final follow up at 3 to 5 years. The majority were male (82%) and White (88%) with a mean age of 34.2 years.

Although severity of injury has generally been found to be predictive of employment status, this has not been universally the case. Anyalebechi (2015) examined the effect of TBI on employment outcomes based on archival records collected through the Traumatic Brain Injury National Data and Statistics Center (TBINDSC) and found no significant differences in employment based on TBI severity, which included mild, moderate and severe TBI. His findings indicated that severity of TBI had no impact on job stability, however those with causes by MVCs had lower job stability and engagement in productive work. He concluded that TBI had a negative effect on engagement in productive work. The sample included 1,322 participants one-year post injury. Thirty-nine percent of the TBIs were caused by MVCs and 19.9% were caused by falls. The main variable for the study was engagement in productive work. The author stated that age, prior education, disabilities, or other factors, such as substance abuse, were not included because such information was not available in the dataset.

Many individuals with TBI have difficulty finding and maintaining jobs due to the consequences of TBI (McNamee et al., 2009). The behavioral, cognitive, and emotional symptoms associated with TBI are clearly related to employment outcomes (Hoge, et al., 2006). Some non-visible symptoms, examples being loss of smell or taste, ringing ears and headaches, can make it particularly hard for the individuals to cope in a work setting (Schonberger, Ponsford, Olver, Ponsford, & Wirtz, 2011) and when such symptoms are present, they are also associated with (Anderson, et al., 2010). Other factors affecting employability after TBI include educational levels, substance abuse, demographic factors, disability resulting from other injuries, and other factors (Anderson, et al., 2010).

### **Return to Work**

For many brain injury survivors, a final goal of community integration may be return to work (RTW), school, or training, all of which are often classified as “productivity” outcomes (Brasure, 2013). Returning to work is often a major goal in the recovery process (Shames, Treger, Ring, & Giaquinto, 2007; Tsaousides, Ashman & Seter, 2008). As suggested above, research has consistently shown that work reentry for people with TBI has been difficult, and poor employment outcomes are frequent (Falvo, 2005; Gordon et al., 2006; Lam & Priddy, 1991; Ownsworth & McKenna, 2004; Shames, et al., 2007).

Although meaningful employment plays an integral role in enhancing self-esteem, quality of life, and financial status, it is a challenge for many people with TBI to return to productive employment after their injury (Hoge, et al., 2006). Most individuals with TBI are motivated to resume work, yet reentering or finding new employment with TBI-related symptoms and limitations is often challenging (McNamee et al., 2009). According

to the National Association of State Head Injury Administrators (NASHIA), 2006, 75% of persons with TBI who return to work lose their jobs within 90 days if they do not have adequate job retention supports, such as assistive technology and other reasonable accommodations. Difficulties with return to work could cause economic hardship, forcing many individuals with TBI to depend on government benefit programs as their main source of income (Kersel, Marsh, Havill, & Sleigh, 2001; Thomas et al., 2015).

In one study Dikmen, et al. (2003), discussed functional outcomes for individuals with TBI having 3 to 5 years' post-injury. The authors indicated that the 210 individuals struggled with multiple life domains including the inability to work or attend school (30%), difficulties performing responsibilities at work, a reduction in the number of friends and/or less contact with family and friends (25%), and complete dependence on caregiver in an institutional setting to accomplish daily tasks (10%). Although the struggles that individuals with TBI have been identified, supports could help in assisting the individuals to return to work and maintain employment.

Trexler, Parrott, and Malec (2016), conducted a randomized controlled trial about return to work after a brain injury amongst 44 participants aged 18-60 years old. The authors indicated that through support, individuals with TBI were able to return to work and maintain their jobs. Specifically, fifty percent of the participants successfully returned to work, and among that population who returned to work, 78% had full time jobs, and 67% individuals returned to their previous employment, not necessarily with the previous employers. The participants, who comprised of 62% men and 95% White, were assigned to two groups, control and treatment, and the groups had moderate or severe levels of disability. Data was collected for a period of 15 months, once every three months. Since

many individuals with TBI have difficulty maintaining employment, and broader awareness of the resources that are available to maximize vocational outcomes is needed (Thomas, Burker & Kazukauskas, 2015).

### **Employment Barriers**

Frequently experienced TBI-related symptoms, including cognitive and physical deficits, psychological distress, and impaired motor function, have been seen to negatively affect individual's ability to find and maintain employment (Benedictus, Spikman & Van der Naalt, 2010; Ponsford, 2013). In cases where the individuals are employed, they may need ongoing help when adapting to any changes brought along. Due to the memory loss, they may also forget what they are supposed to do in the workplace, so continued support is required (Rumrill, et al., 2016). This is frequently the case whether the brain injury is mild or more severe (Anderson, et al., 2010; Rumrill, et al., 2016). However, external and environmental barriers also impact the ability to engage in employment for people living with TBI.

Environmental and access barriers that impact employment include transportation barriers; workplace characteristics, such as lighting, noise, and space; interpersonal relationships; support in re-learning job skills; and the natural environment generally, with regard to accessibility. Whiteneck, Gerhart, and Cusick (2004) stated that individuals with TBI may report a variety of environmentally-based obstacles that impede life satisfaction and community participation. A systematic review by Scherer et al. (2014) indicated that access to transportation, access to services, and social interaction were the major barriers identified among the 63 studies they reviewed. They also noted that the studies reviewed had conflicting findings and few conclusions were made

regarding the environmental barriers studied. The authors also stated that prior systematic reviews had also revealed inconsistencies in barriers to employment outcomes. Few studies in the U.S. have discussed post-secondary outcomes for youth with TBI.

### **TBI and Post-Secondary Outcomes Among Transition-aged Youth**

Prevalence of TBI among transition-aged youth has been shown to be relatively high yet outcomes are not well researched. Recently there has been an increased legislative focus on transition services and supports for youth with disabilities. However, there remains a need to identify factors specifically related to the employment or education outcomes for youth with TBI, including the employment and educational needs of post-secondary youth with TBI. It is also important to evaluate the employment and educational outcomes and needs of post-secondary youth with TBI as compared to those of post-secondary youth with other disabilities that are associated with similar symptoms to those experienced by people with TBI. This information will allow the development and application of the most effective resources for youth with TBI in Kentucky and nationally.

### **Post-Secondary Education Outcomes for Youth with TBI**

Few studies have discussed post-secondary outcomes for youth with TBI. The National Center for Education Statistics (NCES, 2018), indicated that among 395,000 students between the ages of 14 years to 21 years who received IDEA and exited school in the year 2014-2015, 69% graduated with high school diploma, 18% dropped out, and 11% received an alternative certificate. Those students with visual impairment graduated high school at a rate of 82%, being the highest, and the lowest rate was identified among those with intellectual disabilities, at 42%. The percentage for those

exiting with an alternative diploma among students with intellectual disabilities was 34%, and the lowest rate was seen among those with speech or language impairments, at 5%. The percentage that dropped out included those with emotional disturbance at the highest rate (35%) and the lowest rate was among those with autism and visual impairments at 7%. Unfortunately, TBI rates were not reported. This may be because of the few numbers for individuals with TBI being served. The NCES (2013) reported fewer numbers of individuals with TBI served under IDEA. For instance, for the years between 2000 and 2001, 16 individuals with TBI were served as compared to 2,860 individuals with specific learning disabilities and for the years between 2011 and 2012, 26 individuals with TBI were served as compared to 2,303 individuals with specific learning disabilities.

Todis and Glang (2008) evaluated outcomes for 89 youth with TBI and indicated that 24 students graduated from high school with a regular diploma (27%), and 8 were given an alternative certificate, while 1 dropped out. These researchers also noted that 54% of the youth with TBI attended some type of training program or college upon exiting school. Again the authors indicated that whatever post-secondary program the youth chose, they faced common academic challenges like memory issues, and social challenges. The authors concluded that in most cases the high school programs did not prepare the youth adequately for post-secondary education. With regard to positive outcomes, Rumrill et al. (2016) indicated that youth who were involved in transition planning had positive post-secondary outcomes.

In yet another study, Todis, Glang, Bullis, Ettl, and Hood (2011), conducted a longitudinal study among 89 youth having TBI, with ages ranging between 17 and 25 years old and the authors indicated that, although there were no significant gender

differences, males were significantly less likely than females to attend post-secondary education. The authors used interviews, which took place 1.3 years after high school, and were repeated every 6 months for the first 5 years, and annually for the next 3 years. The sample comprised of 67.4% males and 32.6% females.

### **Post-Secondary Employment Outcomes for Youth with TBI**

Post-secondary employment outcomes for youth with TBI have been narrowly discussed in the literature. A study by Toddis, et al. (2011) with 89 youth with TBI, stated that less than 44% of the youth with TBI were employed, while 81.3% were employed at entry level, unskilled or semi-skilled jobs. The authors also noted that the types of employment were not associated with the employment the students chose, as stated in the Individualized Education Plans (IEPs).

There has been indication that a relatively small number of youth with disabilities access employment (Carter, Austin & Trainor, 2012). In addition, many of the work experiences pay low wages and provide few hours (Toddis, et al., 2011). According to Rumrill, et al. (2016), employment outcomes for youth with TBI lag far behind those of the general population. Wehman, et al. (2014) conducted an exploratory, prospective, longitudinal study on employment support among 200 post-secondary students drawn from National Longitudinal Transition Study-2 (NLTS-2). The results indicated that 51% were currently employed. This was because they received VR services, post-secondary vocational training programs, and other service agencies. The majority was male (73%), while 74% were White, 13% were Black, 11% were Hispanic, and 2% were otherwise identified.

## **Predictors of Post-Secondary Employment and Education for Youth with TBI**

According to the USDOE (2017), the number of people with TBI who do not return to work is very high. Few studies have been conducted on predictors of post-secondary employment and education for youth with TBI. Seven studies about predictors of post-secondary employment and education among youth for different categories of disability were identified. Two were reviews, of which one was a systematic review, and the five were studies, mostly based on longitudinal data. In addition to the seven general studies, LoBianco and Kleinert (2013) analyzed successful transition outcomes for youth with disabilities and they found employment in high school to be the strongest predictor of obtaining competitive employment. Specifically, their results showed that the students who worked during their high school years were 3.18 times as likely as those who did not work.

Test et al. (2009) conducted a systematic review on evidence-based secondary transition predictors for improving post-school outcomes for students with disabilities in the areas of education, employment, and independent living. The results yielded 16 evidence-based in-school predictors and these were identified among three groups of disabilities, namely; emotional disturbances, learning disabilities, and intellectual disabilities. The most common predictors from the list were vocational education coursework, acceptance of post-internship, internship completion, paid work, percentage of time spent in regular education placement and social skills.

Seven variables correlated with improved post-school education and employment, and these were noted as career awareness, interagency collaboration, occupational courses, self-advocacy or self-determination, social skills, transition program, and



vocational education. With regard to post-secondary employment outcomes, five variables were identified as community experiences, exit exam requirements or high school diploma status, parental involvement, program of study and work-study. In addition, four variables had improved outcomes on post-secondary education only, and those were identified as inclusion in general education, paid employment or work experience, self-care or independent living skills, and student support.

Daviso, Denney, Baer, and Flexer (2011) conducted an analysis on transition services for students with learning disabilities, looking at predictors of achievement of post-school goals for 416 students, which was a subset of data collected from the Ohio Longitudinal Transition Study (OLTS). For the prediction of post-secondary goals, four variables were identified as predicting post-secondary employment, including: mainstream academics for specials and electives only, work study participation, vocational education, and attendance at a vocational school. Regarding post-secondary education, the predictors identified were attending regular high school and passing all the proficiency tests.

Another study examining post-secondary outcome predictors among was a dissertation by Feldman- Sparber (2015) who evaluated the post school outcomes of post-secondary education and employment for students with autism. The author identified two predictors of post-secondary education as being inclusion and academic proficiency. Regarding employment outcomes, the author stated that students who participated in work-study program during high school had two times the odds of being employed one year after exiting high school as compared to those who did not participate in this

program. The author concluded that employment rates for individuals with autism were lower than the employment rate for the other categories of disability.

Migliore, Timmons, Butterworth, and Lugas (2012) conducted a study on 2,913 youth with autism. The best predictor for employment among these youth was job placement services. Other predictors noted were improved secondary education since application for a job, shorter time in the VR program, receiving miscellaneous training, and being male. Regarding post-secondary education, the model did not yield conclusive findings.

In another study, Carter, Austin and Trainor (2012) explored predictors of post school employment outcomes for 120 young adults with severe disabilities. The results indicated that parental expectation that the youth would get a paying job was a strong predictor of the youth getting a paying job. In addition, job search instruction and spending more than 25% of the day in work-study increased the odds of post-secondary employment. The authors concluded that very few youths with severe disabilities were working and 50% were in segregated work settings. Again, Cmar (2015) explored predictors of employment for youth with visual impairments using secondary data from the National Longitudinal Transition Study-2. The single predictor identified was that youth with high ratings on community travel skills were more likely to be employed.

A recent review on predictors of post-secondary employment was conducted by Southward and Kyzar (2017), and based on the 13 articles they reviewed, paid work experience during high school was a significant predictor of post-secondary employment. In addition, six of the articles included found vocational skills instruction to be another predictor. Vocational skills instruction concerned job-specific skills education or training,

career assessment and counseling, internships, apprenticing, job shadowing, and placement support. Other predictors noted included family expectations (3 studies), high school completion (3 studies) and the remaining three predictors were found in two studies each, and those were IEP relating to competitive employment goal, self-determination, and post-secondary education respectively.

### **Transitioning from High School to Post School Activities**

In the 2004 reauthorization of the Individuals with Disabilities Education Act (IDEA), transition is defined as a coordinated set of activities for a child with a disability that is designed to be within a results-oriented process, that is focused on improving the academic and functional achievement of the child with a disability to facilitate the movement from school to post-school activities, including postsecondary education, vocational education, integrated employment (including supported employment), continuing and adult education, adult services, independent living (IL), and community participation (IDEA Regulations, 2004). IDEA states that transition is based on the individual child's needs, taking into account the child's strengths, preferences and interests, and includes instruction, related services, community experiences, the development of employment and other post-school adult living objectives, and if appropriate, acquisition of daily living skills and functional vocational evaluation. (IDEA Act, 2004). In addition, transition includes instruction and community experiences. An annual meeting is usually held to coordinate the activities. During the annual meeting, appropriate measurable post-secondary goals from the Individualized Education Plan (IEP) are discussed and these include training, education, employment and independent living skills and these are meant to assist the child in reaching his or her goals. An IEP is

a map that lays out the program of special education instruction, supports, and services youth need to make progress and succeed in school.

LoBianco and Kleinert (2013) conducted a study on transition from the Kentucky Post-School Outcome (KyPSO) longitudinal data about factors that contributed to successful transitioning of youth with disabilities. The authors found out that students' future plans were positively associated with their outcomes. For instance, a student who had planned to go to college was 4.89 times more likely to enroll in higher education, and students who had employment as their identified goal were 1.8 more likely to be employed when they completed high school than those who did not.

### **Legislative Acts for Youth with TBI**

In this section I discuss legislation that has been enacted to improve post-secondary outcomes for youth with disabilities. The acts include the Rehabilitation Act of 1973, Workforce Innovation Opportunity Act (WIOA), Every Student Succeeds Act (ESSA), and Individuals with Disabilities Education Improvement Act (IDEA).

#### **The Rehabilitation Act of 1973**

The Rehabilitation Act of 1973 represented a landmark extension of the state-federal vocational rehabilitation program. The Act was significant for several mandates and outcomes. Among these, the Act (a) mandated that states serve individuals with the most severe disabilities before serving persons with less severe disabilities; (b) promoted and ensured client involvement in rehabilitation plan development through the joint (counselor and client) development of an Individualized Written Rehabilitation Program [IWRP], now called Individualized Plan of Employment [IPE]), which requires the identification of a vocational objective, needed related services, and the criteria for

evaluating client progress; (c) implemented Client Assistance Programs (CAPs), through which clients could receive assistance with application and advocacy services; (d) established demonstration projects in rehabilitation services; (e) mandated program evaluation, so that states became accountable for collecting information on the target population being served, the timeliness and adequacy of VR services, the suitability of placements and the retention of clients in employment, and client satisfaction with services; (f) increased funding for rehabilitation and disability research; and (g) advanced the civil rights of people with disabilities through Title V (Bishop, Umeasiegbu, & Espinosa-Bard, 2017). Title V prohibits discrimination against qualified individuals with disabilities (Section 501), requires federal affirmative action to employ and to advance in employment qualified individuals with disabilities (Section 503), and prohibits discrimination against qualified individuals with disabilities in employment and their programs and activities (U.S. Department of Labor, n.d.).

As amended in 2014 by the Workforce Innovation Opportunity Act (WIOA) and amendments added to Title I through WIOA, the most recent amendments to the Rehabilitation Act emphasized provision of services to students and youth to promote successful post-secondary outcomes (United States Department of Labor, n.d.). Specific services identified in WIOA to promote post-secondary outcomes include pre-employment services, group transition services, and individualized transition services.

### **Workforce Innovation and Opportunity Act**

The Workforce Innovation and Opportunity Act (WIOA) is the federal legislation and funding stream administered by the US Department of Labor (USDOL) to support state workforce systems and programs. It is designed to help individuals in accessing

employment, education, training, and support services they need to meet the employers' requirements and succeed in the labor market (U.S. Department of Education, n.d.). Additionally, WIOA has established services specifically for transitioning youth called Pre-Employment Transition Services (Pre-ETS), and these services can be provided before a student exits school. The purpose of Pre-ETS is to promote work and independence for individuals with disabilities with increased focus on youth in transition.

Pre-ETS services may be provided to those who have been identified as eligible for vocational rehabilitation (VR) and those potentially eligible. Those who are eligible are students with a disability, in a secondary, post-secondary or other recognized education program who are not younger than the earliest age for the provision of transition services under the IDEA Act section 614, are not older than 21 years old, and are eligible for and receiving special education or related services under Part B of IDEA (Workforce Innovation Technical Assistance Center [WINTAC], 2016). The services offered under Pre-ETS include job exploration counseling, work-based learning experiences, counseling opportunities for enrollment in comprehensive transition or post-secondary educational programs, work readiness training and instruction in self-advocacy (WIOA, 2016). Under WIOA, it is now mandated that 15% of each state's public VR funds must be used for pre-employment transition services for youth between the ages of 16 and 24 (Bates-Harris, Hager, & Scherer, 2017). Moreover, the Rehabilitation Services Administration (RSA) requires that 15% of the federal VR services grants be reserved for Pre-Employment Transition Services (Pre-ETS).

### **Every Student Succeeds Act (ESSA)**

Another legislative initiative that has placed emphasis on transition-age youth with disabilities is every Student Succeeds Act (ESSA), which is the most recent version of the federal government's biggest K-12 law, the Elementary and Secondary Education Act. It is a reauthorization of the 1965 Elementary and Secondary Education Act, which established the federal government's expanded role in public education. At the beginning of the 2018/19 school years, schools across the U.S. will be held accountable using the nation's new ESSA. ESSA, which replaced the No Child Left Behind Act (NCLB) of 2001 in 2015, has placed a focus holding schools accountable for achievement of students by race, socio-economic status, status as an English learner, and disability status, rather than overall student achievement (Department of Education, 2017, para 2). ESSA provides a significant opportunity for States and school districts to develop and implement new plans to help secure educational equity for all children, including those with TBI. ESSA reauthorized the Elementary and Secondary Education Act of 1965 (ESEA) (USA.gov, 2017). In addition, ESSA requires states to use evidence-based methods to help struggling students and other measures of success for students like progress toward early literacy (USDOE, 2018). On the other hand, NCLB of 2001 and IDEA of 2004 have placed increased demands of accountability on school systems for the outcomes of all students.

### **Individuals with Disabilities Education Improvement Act (IDEA)**

The Individuals with Disabilities Education Improvement Act (IDEA) is an education law that offers supplemental funding for services to students with specific educational disabilities. It governs how states and public agencies provide early

intervention, special education, and related services to eligible children and youth with disabilities. They receive the services between the ages of three and 21 years old. The eligibility process for IDEA includes determining if the child has a disability and if he or she requires special education resources. IDEA determines as eligible only those students who have specified types of educational disabilities and who, because of one or more of those conditions, need special education and related services (USDOE, 2016).

TBI was added as one of the 13 disabilities specified in the 1990 federal amendments to the Individuals with Disabilities Education Act (IDEA; American Psychological Association [APA], 2004). Through IDEA, it was noted that students with TBI might need specialized services. The justification was that, due to the nature of the injury, which, first of all, occurs suddenly, and secondly, is complex and multifaceted, including emotional, behavioral, cognitive and physical symptoms. In Kentucky, IDEA 2004 and the Kentucky Administrative Regulations require that “for students who graduate or age out of the program, the Local education Agency (LEA) shall provide the child with a summary of the child’s academic achievement and functional performance including recommendations on how to assist the child in meeting the child’s post-secondary goals” (707 KAR 1:300 Section 4 [21]). The re-authorization of IDEA mandated that beginning at age 16, all students who have IEPs must receive services designed to help them successfully transition from high school to adulthood (Todis & Glang, 2008).

### **Educational and Employment Supports and Services for Youth with TBI**

Employment supports are services provided in the community for individuals with disabilities who have paid employment. Wehman (2012) indicated that employment



supports involve assisting the job seeker with identifying his or her abilities, specifying vocational interests, and job placement. The most important value of supports is placing individuals with disabilities in competitive jobs, leading to above minimum wage and the benefits being at par with the other coworkers.

A few studies have been conducted on supports and services for individuals with TBI. A study by Kennedy, Krause and Turksa (2008) indicated that 80% of college and university students with TBI reported problems when in college, yet only 20% reported being aware of the support services like using campus services in college. Another study by McCaleb (2003) was conducted on the relationship of brain injury and the provision of school services, and the results interestingly indicated that students who were reported as having TBI were “less likely to be receiving services under the category of TBI than under other disability categories” (McCaleb, 2003, p 142). The author attested the results to misidentifying the symptoms of TBI.

Before 1996, TBI was included in the IDEA Act. The reason it was included in the IDEA Act, was to ascertain that students with TBI receive appropriate services and supports. In 1996, the TBI Act was enacted. The Act stated that “TBI has become the number one killer and cause of disability of young people” (Congress Report, 2017, p.5) and due to that, the Act recognized the need for coordination of TBI services to promote increase of more effective services for such population. In addition, the TBI Act of 1996 focuses on developing, expanding and improving access to service delivery for individuals with TBI. Furthermore, agencies like the Health Resources and Services Administration, a federal agency for improving access to health care services for people who are uninsured, isolated, or medically vulnerable, also emphasized the needs and

services of children (CDC, 2017). Moreover, the USDOE report (2018) indicated that the supports that are required by youth with disabilities include tutor, reader, or interpreter (18-33%), and psychological counseling (13-28%).

Youth with TBI require specific programs to address the consequences of TBI. According to Levinson and Palmer (2005), high schools can better engage and support students with disabilities by helping identify their strengths and interests and providing them with the skills they need to succeed in the workplace. They can do this by having knowledge of the career development and career related objectives.

### **Vocational Rehabilitation Services for Youth with TBI**

The State-Federal Vocational Rehabilitation (VR) program is designed to provide vocational rehabilitation services for individuals with disabilities, consistent with their strengths, resources, priorities, concerns, abilities, capabilities, interests, and informed choice, so that they may prepare for and engage in competitive integrated employment and achieve economic self-sufficiency (State Vocational Rehabilitation Services program, 2016). Ultimately, the goal for VR is for individuals with disabilities including those with TBI to return to work (USDOE, 2017). Eligible individuals are those who have a physical or mental impairment that results in a substantial impediment to employment, who can benefit from VR services for employment, and who require VR services. Priority must be given to serving individuals with the most significant disabilities if a state is unable to serve all eligible individuals (Rehabilitation Services Administration [RSA], 2017). Additionally, the VR services provided to an individual must be consistent with the individual's strengths, resources, priorities, concerns,

abilities, capabilities, interests, informed choice, and economic self-sufficiency (USDOE, 2018).

Many individuals with TBI have difficulty maintaining employment, and more knowledge of resources that can be used in conjunction with VR programs, such as recreation and leisure activities, is needed to maximize vocational outcomes (Thomas, et al., 2015). With the aid of rehabilitation counselors, services provided by VR programs can lead to more concrete and attainable employment goals (Gamble & Moore, 2003). One of the roles of the rehabilitation counselor is to develop a plan that can guide the individual with a TBI towards successful psychosocial adjustment and transition back into the community and employment (Dillahunt-Aspillaga, Agonis-Frain, Hanson, Frain & Sosinski, 2014). An individual has to be eligible for the services in order to receive them and the majority of the states serve individuals with disability based on level of need for services, prioritizing those with the most significant disabilities and most complex needs.

In order to qualify for state vocational rehabilitation services, an individual must meet certain requirements. There are four requirements for an individual to qualify for the services the individual (1) must have physical or mental impairment, (2), should be having an impairment that results in a substantial impediment to employment, (3) must be able to benefit from vocational rehabilitation services in terms of employment outcome, and (4) must require vocational rehabilitation services in order to obtain or maintain appropriate employment. Further, individuals who receive social Disability Insurance(SSDI) or Supplemental Security Income (SSI) are deemed eligible for VR services. All the requirements must be met in order to meet the eligibility criteria and

receive services (Kentucky Office of Vocational Rehabilitation [KOVOR], 2017).

Vocational Rehabilitation may provide any vocational rehabilitation services a consumer needs to reach his or her employment outcome (vocational goal) provided that the services are specified in the Individual Plan for Employment (IPE). The IPE is a jointly developed plan for services, developed by the VR counselor and the client. The VR services provided may include assessment, counseling and guidance, personal assistance services, interpreter and note taking services, rehabilitation technology, job placement and job retention services, employment follow up and post - employment services.

Ways in which individuals with TBI can be assisted by VR include the provision of services that are referred, located, or established (Adamson, 2013). On that note, the CDC report (2015) suggested that person-centered and individualized planning is needed to comprehensively address the goal of returning to work for individuals with TBI due to the range in severity and types of difficulties among persons affected by TBI (CDC report, 2015).

Although there are many resources that can benefit individuals with TBI among the VR service, the State-Federal Vocational Rehabilitation (VR) system is not well known to people with TBI and research has also showed that the number of people with TBI who fail to return to work is relatively large (USDOE, 2017). According to Sykes-Horn, Wrigley, Wallace and Yoels (1997), only one third of the population with brain injury from their study, were aware of their State's VR program. Moreover, people with TBI underutilize the VR services (Kennedy, et al.,2008), yet there have been services which were identified to be included.

## **Effective VR Services for Youth with TBI**

Effective services increase the employment of individuals with disabilities in the competitive integrated labor market, the workforce system must provide individuals with disabilities opportunities to participate in job-driven training and to pursue high quality employment outcomes (WIOA, 2016). Two studies were identified that discussed effective services associated with successful outcomes for youth with TBI. Alsaman and Lee (2017) indicated that youth who received job placement services were more likely (3.37 times) to be employed than those who did not receive it. These were the results of their study for 122,703 youth between ages 16 and 25 years (60.3% were males and 61.0% were females). The study also indicated that youth with intellectual disabilities and TBI had better opportunities to achieve successful employment outcomes when state economy is good and they have fewer opportunities in a poor economy.

Another study by Rumrill, et al., (2016) indicated that assessment services were associated with employment outcomes for youth with TBI (67% were males and 72% were White). The study concluded that 49.7% of the youth who received VR services obtained competitive employment. Other studies, which were not focused on youth only, identified other effective VR services. For instance, among the population aged between 16 and 65 years old, Boutin (2011) indicated that diagnosis and treatment was an effective service for veteran with TBI, where 89% were males, 74% were White, who were followed by Blacks at 25%. Again, two studies identified assessment as the most effective service (Catalano, Pereira, Wu, Ho & Chan, 2006; Johnstone, Vessell, Bounds, Hoskins, & Sherman, 2003).

Based on the above studies, the majority of the participants accessing VR services were males, and with regard to ethnicity, the majority was White. For youth with TBI, two effective services were identified as job placement and assessment. For the other individuals with TBI, assessment was also identified in two studies, and diagnosis and treatment was identified as leading to positive employment outcomes.

### **Summary**

For transition to occur, there should be adequate planning which involves everybody who can have an input towards students' needs and interests. Legislative initiatives have placed emphasis on the transition of youth. NCLB has been replaced by ESSA, which will be in place starting 2018/2019 year. WIOA also emphasizes evidence-based services for youth with disabilities. Post-secondary outcomes for youth differ according to the type of disabilities. For instance, youth with visual impairments had a higher percentage of high school graduation and regarding employment, it was indicated that less than 44% of youth with TBI were employed. With regard to predictors of education and employment for youth with TBI, there are no studies relating to that. In fact, studies have focused on other disabilities like learning disabilities, autism, severe disabilities, visual impairments and intellectual disabilities. The predictors for such populations included vocational education work, general education, high school completion and parental expectation. Most of the studies were using secondary data and analyzed their results using logistic regression. With regard to supports and services, individuals with TBI are not aware of the services available for them, although they face numerous challenges to education and employment. With regard to services which led to

higher employment outcomes for youth with TBI, job placement and assessment were identified.

## **Chapter 3**

### **Methods**

The purpose of the study was to examine the predictors of post-secondary employment and education among Kentucky transition aged youth with a TBI.

Specifically, the research questions that were addressed are:

#### **Research Questions**

1. What are the employment or education outcomes for youth with TBI?
  - a. What are the employment outcomes of Kentucky post-secondary youth with TBI one year after high school?
  - b. What are the education outcomes of Kentucky post-secondary youth with TBI one year after high school?
2. What are the predictors of employment or education outcomes for post-secondary youth with TBI?
  - a. What demographic and educational and employment support factors are associated with employment outcomes of Kentucky post-secondary youth with TBI one year after high school?
  - b. What demographic and educational and employment support factors are associated with education outcomes of Kentucky post-secondary youth with TBI one year after high school?
3. How do employment and educational outcomes of post-secondary youth with TBI compare to those of post-secondary youth with other disabilities with symptoms that are similar to those experienced by people with TBI?



In order to address these questions, de-identified data for the state of Kentucky were obtained from the Kentucky Post School Outcomes center (KyPSO) for the years 2012-2017. Specifically, the Year One Youth Out (YOYO) survey data were used. KyPSO is a collaborative project with the Kentucky Department of Education (KDE) and every Local Education Agency (LEA) in Kentucky. The aim of the KyPSO center is to gain insight into how students who exit high school with an Individual Education Program (IEP) transition into post-secondary life in regard to whether these former students choose to further their education or enter the workforce. The center also helps to determine levels of community engagement, as well as former student assistance and support needs. The data for the present analysis included a population of 15,232 youth who had completed high school between 2012 and 2017, surveyed one year after graduating, with participants' ages ranging from 19 and 23 years old.

Every year, KyPSO develops and oversees the administration of the Kentucky Post School Outcome Study, a longitudinal investigation of the post high school outcomes of Kentucky youth with educational disabilities during the final year of high school and one year after high school exit, using the YOYO interview. The YOYO is a computer assisted telephone interview developed by KyPSO and administered by trained school district staff. The YOYO includes questions regarding employment, higher education, community participation, and other factors (LoBianco & Kleinert, 2013). In addition, the interview covers post-secondary employment and educational supports. The YOYO interview is designed to address post-school outcomes to determine community engagement and to determine former students' needs for assistance or supports. Those who were eligible for the interviews must have met the following criteria:

- a. Had an IEP in place at the time of exiting high school;
- b. Exited by means of regular diploma, graduation with alternative diploma, dropped out, or reached maximum age; and
- c. Did not return and re-enroll in the K-12 system prior to the beginning of YOYO.

Every year, about 2,500 youth with disabilities respond to the interview. The response rates vary for each year, but are generally around 60%. For instance, for 2014 the response rate was 59%, while the response rate for 2017 was 57% (KyPSO, 2017).

### **Research Design**

This study used an annual repeated cross-sectional design. Different samples are collected every year (high school students who are one year out of high school), yet the interview questions are essentially the same each consecutive year. As further discussed below, minor changes in the questions and coding of the responses have been made over the course of the project, but generally the questions remain constant. In this design there are no conditioning effects or respondent fatigue (Lavrakas, 2008).

### **Participants**

Participants for the present analysis included a population of 15,232 youth who had completed high school between 2012 and 2017, surveyed one year after graduating, with participants' ages ranging from 19 and 23 years old. This method used a non-random sampling approach, because all youth who had completed the questionnaire in these years were included. A subset of participants with TBI was of primary concern in the analyses for this study. Specifically, participants in the YOYO dataset included 90 youth with TBI who were one-year post-high school completion at the time of the survey

for the years 2012-2017. The TBI sample is a subset of the larger sample of 15,232 youth with disabilities who completed the YOYO questionnaire in these years.

Kentucky is a state in the east south-central region of the United States. Kentucky has a total of 120 counties, the largest one being Jefferson. Kentucky has a population of 4,425,092, and 49.2% of the population is male. Regarding race/ethnicity, 87.8% of the population identify as White, 7.8% as Black, 3.1% as Hispanic or Latino, 1.7% as being of more than one race, 1.1% as Asian, and the smallest percentage identify as Native American/American Indian, at 0.2% (Infoplease, 2017).

For the YOYO data used in this study, data were available on four demographic characteristics, which included gender (male and female), ethnicity, residence, and rural/urban/suburban dwelling. With regard to ethnicity, seven races are identified and coded in the YOYO as follows: Native Americans (AM), Asian (AS), Black (BL), Hispanic (HI), Multiple races/two or more races (MU), Pacific Islanders (PI) and White (WH). Further, the ethnicity was coded as follows AM (0), AS (1), BL (2), HI (3), WH (4), MU (5), AND PI (6). For residence, ten categories were identified and coded as follows: (1) at my family home, (2) by myself, (3) with my friends, (4) with significant other, (5) with foster family, (6) with others in group home, (7) in a homeless shelter, (8) in a jail/correctional facility, (9) in a college dormitory or apartment, and (99) other. For rural-urban status, the participants' residence is identified as either rural (0), urban (1), or suburban (2). In order to address the research questions, a comparison sample of participants with eight different disabilities was utilized. The selected disability categories included: mild mental disability (MMD), specific learning disability (SLD), other health impairment (OHI), emotional-behavioral disability (EBD), functional mental

disability (FMD), multiple disabilities (MDIS), autism (AUT), and orthopedic impairments (ORTI). These disability categories were selected based on the typical symptoms or functional limitations associated with these disabilities, which are similar to those frequently experienced by people with TBI. For example, youth with TBI may experience behavioral impairments, and youth with EBD may also experience similar behavioral issues. Participants with sensory disabilities, including blindness, were excluded from the analysis. Demographic and educational and employment supports data were also available for the comparison sample, and are further described below.

### **Procedure**

After receiving human subjects' approval from the University of Kentucky Institutional Review Board, I accessed the Youth One Year Out (YOYO) dataset, including existing, de-identified data from statewide surveys for the years 2012-2017. The YOYO data included responses from youth who completed high school from April to June, for each of the six previously stated years. The sample of individuals with TBI was identified from a population of 15,232 youth with disabilities. The KyPSO Principal Investigator (PI) at the University of Kentucky Human Development Institute authorized the use of the previously coded, de-identified data. The data were evaluated for missing data, and for completeness based on the changing (addition or subtraction) of certain questions in the questionnaire over the period under evaluation, and changes in response sets. Data analyses to evaluate the research questions were then conducted as described below. For the purpose of the statistical analyses, the dependent variables concerned the participants' employment or educational status at the time of the YOYO survey.

Independent variables included demographic variables and accessing of educational and vocational supports, as described in more detail below.

### **Dependent Variables**

For the purposes of the statistical analyses, current employment status and current educational enrollment status were used and for the other analyses a dichotomous dependent variable was derived from the data, representing participants who were either (1) employed or engaged in education at the time of the survey, or (2) not engaged in either education or employment at the time of the survey. Prior to combining the variables, the outcome variables were identified as (a) engaged in post-secondary employment, (b) enrolled in post-secondary education, and (c) not engaged in employment or education. The variables are further defined below:

- a. Post-secondary education- enrollment in any form of higher education institution, full time or part time, at the time of the survey;
- b. Employment- employment, full time or part time at the time of the survey;
- c. Neither- participants not meeting either of the above criteria.

Post-secondary education included those who were involved in any of a variety of education situations, including the following; college or university (4-year college, community or technical college (2-year college), vocational or technical school, high school completion document or certificate (adult basic education, GED course), short-term education, or employment training program (e.g. job corps), and other. In terms of post-secondary education duration, the participants were asked if they completed an entire semester or term. The YOYO data also included information about the post-secondary degree or certificate being pursued, including the following: Bachelor's

degree, Associates Degree, Certificate, Audit only, not seeking certificate, and Other.

Other variables recorded in the YOYO data concerning post- secondary education included whether they had visited the disability resource coordinator at the post- secondary education program or school.

With regard to post-secondary employment, YOYO data categories included those who were employed and those who were not. The following additional categories were recorded: employed currently, duration of employment, hours of employment, and employment wage. Other variables related to employment concerned whether the person was receiving supports and services from an employment coach, receiving personal aide or assistance, receiving special equipment (like a computer), and the extent to which they found their work interesting. For this latter variable, the participants were asked to rate on a 5-point Likert-type scale the degree to which they found their work interesting. The responses ranged from not interesting at all (1) to very interesting (5). Yet, for the years 2013-2016, the scale was reversed, where, very interesting was 1 and not interesting at all was 5. Additionally, for the same variable, the scale response options in 2012 were phrased differently, ranging from “love my job (5) to “hate my job (1). These variations led to this variable being excluded from the analysis.

Additional variables in the YOYO dataset explored characteristics of the participants with respect to post-secondary employment and education. First, in terms of employment, if participants reported that they were not working, they were asked to select from a list of options the reasons that they were not employed. The options included the following: (a) going to school, (b) dismissed from job, (c) cannot find a job that fits my interests, (d) looking for a job, (e) need assistance finding a job, (f) lack of

required skills, (g) transportation problems, (h) don't want to lose my benefits, (i) my health will not allow me to work, (j) don't want to work, and (k) childcare. The response options were either "yes" or "no". The data did not provide reasons for not being engaged in post-secondary education. Additional employment-related variables explored categories which included "Agency" in which participants were asked if they currently working with someone from an employment agency, such as vocational rehabilitation, on things like finding a job or paying for classes or books. The response options were either "yes" or "no" and the variable was only present for years 2014-2016. Further, the participants indicated their interest in receiving more information on services regarding the following: transition consultant, vocational rehabilitation, Medicare or Medicaid, Michelle P. Waiver, and Supported employment.

### **Independent Variables**

The independent variables for the statistical analyses in the present study included demographic information, disability categories, and supports and accommodations.

**Demographic information.** The demographic variables from the data included gender, race, residence, rural or urban or suburban dwelling. These variables have been shown in the previous KyPSO reports to have significant relationships with post-secondary employment and education outcomes (KyPSO, 2017). All these variables were categorical. Frequency (count and percentages) was used to depict the overall characteristics of the sample in terms of these categorical variables.

- a. *Gender*- Gender was coded in the YOYO as male (M) or female (F). Dummy variables were used to fit the logistic regression analysis. Males were coded as "0" while females were coded as "1".

- b. *Race*- Youth with disabilities identified themselves among seven races/ethnicities, including Native American, Asian, Black, Hispanic, Multiple races or two or more races, Pacific Islanders and Whites. Each category was coded with a corresponding numeral, from 0 to 6. Specifically, the following codes were used: Native American (0), Asian (1), Black (2), Hispanic (3), Multiple races or two or more races (4), Pacific- Islander (5), and White (6). These variables were further recoded as dummy variables with 0 for Whites and 1 for the combined other ethnicities for the purpose of the chi square and logistic regression (LR) analysis.
- c. *Residence*- Youth indicated where they lived in the previous year, selecting from among 10 options. These included the following: (1) at my family home, (2) by myself, (3) with my friends, (4) with my significant other, (5) with my foster family (6) with others in a group home, (7) in a homeless shelter, (8) in a jail or correctional facility, (9) in a college dormitory or apartment, and (99) other. The categories were collapsed to create a dummy variable with “0” indicating living with family and “1” indicating all other categories, due to the majority of participants residing in their family home.
- d. *Rural, suburban and urban Settings*- The rural, suburban, or urban settings were based on the 2013 National Center for Health Statistics (NCHS) data systems for U. S. counties (NCHS, 2013). These variables were coded as follows in the YOYO dataset: “0” for rural, “1” for suburban, and “2” for urban. Settings were recoded as dichotomous variables (“0” for rural and “1” for other settings: urban or suburban) for the purpose of chi square and the LR analysis.



**Disability categories.** Disability categories were coded as (0) AUT, (1) EBD, (2) MDIS, (3) MMD, (4) OHI, (5) FMD, (6) ORTI, (7) SLD, and (8) TBI. These variables were recoded as dichotomous variables for the chi square test of independence, “0” for TBI and “1” for the rest of the disabilities that were compared with TBI.

**Supports and accommodations.** The supports and accommodations information was defined in three ways: supports and accommodations for post-secondary employment, for post-secondary education, and for both groups. Youth engaged in post-secondary employment were considered to have received support if they received assistance from a job coach or employment specialist, and a personal aide or assistant. Youth engaged in post-secondary education were considered to have received assistance if they received support from a disability service coordinator. For the combined groups, receipt of services was indicated by assistance from a transition consultant or vocational rehabilitation counselor, including other service providers like supported employment, Medicare/Medicaid.

### **Data Analysis**

In order to address the research questions, descriptive statistics, logistic regression analysis, and chi square statistical analyses were completed.

**Research Question 1.** In order to answer Research Question 1, descriptive statistics were used. Specifically, the YOYO data were examined in order to evaluate the number and percentage of participants with a TBI who were (a) employed at 1-year post completing high school, and/or (b) enrolled in employment and education at 1-year post completing high school, or (c) those who were neither employed nor enrolled in education.

**Research Question 2.** In order to answer Research Question 2, logistic regression analysis (LRA) was used to identify predictors of employment or education outcomes for post-secondary youth with TBI. LRA was used to determine the association between each independent variable and the dependent variable (i.e. either (a) post-secondary employment or post-secondary education or (b) neither). Tripepi, Jageer, Dekker, and Zoccali (2008) stated that regression analysis is used to describe the linear dependence of the outcome variable (or dependent variable) from one or more predictor variables. Bagley, White, and Golomb (2001) indicated that the LR model serves two purposes: (1) it can predict the outcome variable for new values of the predictor variables, and (2) it can help answer questions about the area under study, because the coefficient of each predictor variable explicitly describes the relative contribution of that variable to the outcome variable, automatically controlling for the influences of the other predictor variables.

LR analysis is based on the concept of odds ratios, which are based on proportions. Because the odds are not symmetric, LR analysis considers the natural log of values, which are symmetrical around zero. Based on that, the results are usually reported in terms of the odds ratio. The odds ratio is a way of comparing whether the probability of a certain event is the same for two groups. Odds ratios greater than 1 indicate that increasing the predictor increases the odds of the outcome, odds ratios less than 1 indicate that increasing the predictor decreases the odds of the outcome, and an odds-ratio of 1 indicates that the predictor does not affect the odds of the outcome. To provide an example, if the odds ratio for a predictor is 3.0, then it is three times more likely that the outcome variable will occur when the variable is present, and this happens after taking

into consideration all other variables in the model. Likewise, if the odds ratio for a predictor is .25, then it is four times less likely that the outcome variable will occur when the variable is present, and again, after taking into consideration all other variables in the model (Brant, 2004).

LR is used to analyze relationships between dichotomous categorical dependent variables and categorical or continuous independent variables in social and behavior research (Pedhazur, 1997). Although ANOVA and t-tests may also be appropriate analyses to use in evaluating categorical outcome variables, LRA model was considered the most appropriate analytic approach for this study given the multiple independent variables. In addition, LRA requires fewer assumptions and is more robust when those assumptions are not met (Kleinbaum & Klein, 2010).

**Research Question 3.** Chi-square tests were used to evaluate how employment and educational outcomes of the post-secondary youth with TBI compare to those of post-secondary youth with other disabilities, which included learning disabilities, orthopedic impairments, autism, specific learning disability, mild moderate disability, other health impairments, multiple disabilities, functional mental disabilities, orthopedic disabilities, and emotional-behavioral disability. In addition, chi-square analyses were used to evaluate differences with respect to the outcome variables based on the demographic and supports and accommodations variables.

LRA and chi-square analyses were conducted at the  $p < .05$  alpha level. An a priori power analysis, based on a sample of 90, and an alpha of  $p = .05$ , was conducted and the result suggested that the power would be 0.41. Power of 0.80 or greater is generally accepted (Zint, n.d). The power for the present analysis was quite low, as is discussed in

the limitation section. Statistical analyses were completed using IBM® Statistical Package for the Social Sciences (SPSS®) software, Version 23.

## Chapter 4: Results

The purpose of this study was to examine the predictors of post-secondary employment or education among Kentucky transition aged youth with TBI. The information provided in this section has been categorized regarding youth who were in employment or in education (those with positive outcomes) and those in neither category when surveyed at one-year post high school completion. The results include information about youth who were employed, youth who were not employed, supports and services received during employment. In addition, information on youth with TBI involved in post-secondary education has been provided according to those who were engaged in post-secondary education, including if they ever visited the Disability Resource Coordinator, and services they may be interested in, and those who were not in education.

### Descriptive Analyses

Descriptive statistics are provided here to describe the characteristics of the TBI sample. The demographic characteristics of the sample, which include gender, ethnicity, rural or urban settings, and residence are presented in Table 1. The sample was composed primarily of males ( $n=62$ ; 68.9%) and the majority of the sample was White ( $n=78$ ; 86.7%). With regard to residence type, the majority of the youth with TBI lived with their family ( $n=70$ , 77.8%), and concerning rural or urban settings, over half resided in rural areas ( $n=49$ ; 54.4%).

Table 1

#### *Demographic Characteristics for Youth with TBI*

<b>Variables</b>		<b>Frequency</b>	<b>Percent</b>
<b>Gender</b>	Male	62	68.9

	Female	28	31.1
<b>Ethnicity</b>	Asian	1	1.1
	Black	8	8.9
	Hispanic	3	3.3
	White	78	86.7
<b>Residence</b>	Family home	70	77.8
	By myself	2	2.2
	With friends	3	3.3
	Significant other	5	5.6
	Group home	1	1.1
	Jail	1	1.1
	College dormitory	5	5.6
	Other	3	3.3
	<b>Rural or Urban</b>	Rural	49
Suburban		9	10.0
Urban		32	35.6

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*Note:* n=90

**Table 1**  
*Demographic Characteristics for Youth with TBI*

Table 2 illustrates the demographic characteristics for the sample of youth with other disabilities combined. The demographic characteristics of the participants in this sample were similar to those with TBI. For instance, concerning gender, the majority was male ( $n=10,392$ , 68.6%) and for ethnicity, the majority were White ( $n=12,797$ , 84.5%) followed by Black ( $n=1,826$ , 12.1%). Other ethnicities were represented in the sample at

a rate of under 2%. Regarding residence, the majority of the youth resided in the family home ( $n=11,655$ , 77%), followed by those who resided with friends ( $n=762$ , 5%) and the lowest number was for those who resided in a group home ( $n=5$ , 0.03%). For rural or urban settings, the majority of the youth resided in rural areas ( $n=9,027$ , 59.6%) followed by those who resided in urban areas ( $n=4,677$ , 30.9%).

Table 2

*Demographic Characteristics for Youth with Other Disabilities*

Variables	Frequency	Percent
<b>Gender</b>		
Male	10,392	68.6
Female	4,750	31.4
<b>Ethnicity</b>		
Native American	25	0.2
Asian	42	0.3
Black	1,826	12.1
Hispanic	251	1.7
White	12,797	84.5
Multiple Races	196	1.3
Pacific Islander	4	0.03
<b>Residence</b>		
Family home	11,655	77
By myself	633	4.2
With friends	762	5.0
Significant other	709	4.7
Foster home	93	0.61
Group home	5	0.03
Jail	68	0.4
College or Dormitory	660	4.4

Other	442	
Rural or Urban		
Rural	9,027	59.6
Suburban	1,429	9.4
Urban	4,677	30.9

*Note:* Gender:  $n=15,142$ ; Ethnicity:  $n=15,141$ ; Residence:  $n=15,142$ ; Rural or Urban:  $n=15,133$

Table 2  
*Demographic Characteristics for Youth with Other Disabilities*

**Research Question 1** (*What are the post-secondary employment and education outcomes for youth with TBI?*)

All the participants in the study responded to the question concerning their current educational or employment status ( $n=90$ ; 100%). Outcomes were classified as either positive outcomes (i.e., those youths with TBI who were in (a) post-secondary employment and/or post-secondary education or not positive outcomes (i.e., youth who were not engaged in either post-secondary employment or education. As shown in Table 3, 61.1% ( $n=55$ ) of the youth with TBI had positive outcomes (working and/or in education), and 38.9% ( $n=35$ ) were not engaged in post-secondary education and/or employment (not positive outcomes).

Table 3  
*Post-secondary Outcomes for Youth with TBI*

Variable	Frequency	Percentage
Positive Outcome	55	61.1
Not positive outcome	35	38.9

*Note:*  $n=90$



For this sample, 38 participants reported that they were currently employed and 29 reported that they were currently enrolled in education (12 reported being both in education and currently employed). Table 4 shows the post –secondary employment and education outcomes.

Table 4

*Results for Youth with TBI in Post-Secondary Employment and Education*

Category	Frequency	Percentage
Employed	38	42.2
In Education	29	32.2
Engaged in both	12	13.3
Not Engaged in either	35	38.9

*Note: n=90*

**Post-secondary employment outcomes and youth with TBI.** Thirty-eight youth with TBI (42.2%) responded that they were employed. Other variables related to employment were collected, including whether participants were paid at or above minimum wage, duration of employment, and hours worked. (Note that respondents to these latter questions included those participants who reported that they had ever had a paying job since they left school, and not only those who were currently working.)

Concerning employment wage, participants who reported to have worked for some period since graduation ( $n=50$ ) were asked if they were paid at least minimum wage (\$7.25 per hours). Forty-five youth with TBI (90% of those who had ever worked) reported they were paid at least minimum wage. Participants were asked if they worked an average of 20 hours or more per week. Forty youth (80% of those who had ever

worked) reported they worked an average of 20 hours or more per week. Participants were also asked if they had worked for a total of 3 months (90 days) since they left school. Forty-two youth with TBI (84%) of those who had ever worked) responded affirmatively.

**Reasons provided by youth for not working.** The unemployed youth were asked to provide the reasons that they were not currently working by selecting from a list of 12 options, including: (a) being dismissed from the job, (b) not finding job of interest, (c) needing assistance finding a job, (d) lacking required skill, (e) transportation issues, (f) not wanting to lose benefits, (g) poor health, (h) not wanting to work, and (i) not having childcare. A total of 39 (43.3%) participants responded. The most frequently reported reason was poor health ( $n=10$ , 25.6%). Among the other responses, seven (18%) respondents stated they were going to school, while four (10.3%) did not work because they did not want to lose their benefits. Notably, only two (5.1%) of the youth who were not working reported to have been dismissed from a job. Respondents were able to select more than one option.

**Post-secondary education outcomes and youth with TBI.** Twenty-nine (32.2%) youth reported being enrolled in school or a training program. For the proportion of the sample that reported to be in post-secondary education, youth reported the education type, degree, where they lived during their time of study, and duration of program. Data for these categories were available for 29 (32.2%) youth in post-secondary education.

For education type, the youth were asked to report the kind of education program they were in. The options included: (a) college or university (4-year college), (b) Community college (2-year college), (c) vocational or technical college, (d) high school

completion document or certificate, (e) short-term education or employment training program, and (f) other. The largest percentage of the youth in post-secondary education reported being in a 2-year community or technical college ( $n=12$ , 41.4%), and eight youth with TBI reported to be attending a 4-year college (27.6%). Concerning where the youth lived during post-secondary education, the largest percentage reported to be living on campus, ( $n=14$ , 48.3%), followed by off-campus ( $n=11$ , 37.9%; with the remainder not reporting). With regard to duration, the youth were asked if they completed an entire semester or term, and most of them, ( $n=20$ , 69.0%) reported to have completed the entire term. Tables 5-7 illustrate the results discussed above.

Table 5

*Education Type for Youth with TBI*

Variable	Frequency	Percent
Community or Technical College (2 year college)	12	46.1
College or University ( 4 year college)	8	30.7
Vocational or Technical School	2	7.7
Short Term education	2	7.7
Other	2	7.7

Note:  $n=26$

Table 6

*Degree Type for Youth with TBI*

Variable	Frequency	Percent
Bachelor's Degree	10	45.5
Associates Degree	5	22.7
Certificate	4	18.2
Not Seeking Degree	1	4.5
Other	2	18.2

Note:  $n=22$

Table 7

*Where Youth Lived During School or Training Program*

Variable	Frequency	Percent
On campus by myself	8	32
On campus with roommates/friends	6	24
Off campus with parents	10	40
Off campus by myself	1	4

Note:  $n=25$

**Youth who were not in education.** Of the total sample ( $n=90$ ), 61 (67.8%) youth reported not being involved in post- secondary education (though they may have been engaged in employment).

**Supports and services.** Access to different forms of supports and services were reported for both the youth with TBI who were in post-secondary employment and those

who were in post-secondary education. Unfortunately, data on all supports were not available for every year. For instance, data related to whether they were working with an agency like OVR on things like finding a job was available for the years 2014-2016 only. The following describes the results for those participants who were employed for the years that the various service data were available. The participants were asked to choose among the various options for the services they received.

1. Job Coaching: Participants were asked if they received services from a job coach (someone who offers advice to improve performance). Data on receipt of job coaching assistance were available for 50 participants who had indicated that they had a job ever since they left school. Of these, five (10%) received this service.
2. Equipment: Participants were asked if they received any special equipment, like computer or furniture. Data on receipt of employment-related equipment were available for 50 employed participants who had indicated that they had a job ever since they left school. Of these, only one (2%) received this service.
3. Personal Assistant: Participants were asked if they received personal aide or assistance (for personal care needs, not specifically work related). Data on receipt of an employment assistant or personal aid were available for 50 employed participants who had indicated that they had a job ever since they left school. Of these, only one (2%) received this service.

Because the receipt of these employment-related supports and services (a) were only available for employed participants and (b) likely depended on the severity of the disability, and because (c) the data is incomplete for these variables, these variables do

not provide clear information about the predictive nature of these services for positive outcome.

In terms of supports and services for youth engaged in education, the data available address whether the enrolled participants visited a Disability Resource Coordinator or not. The results indicated that 18 out of 29 youth in education for whom this data were available (62.1%) visited the Disability Resource Coordinator.

**Supports and services that youth were interested in.** Participants for both post-secondary education and employment identified specific services that participants were interested in receiving by responding to the statement “Please let me know if you would be interested in receiving more information about these services: transition consultant, vocational rehabilitation, Medicare/Medicaid, Michelle P. Waiver, and supported employment”. These are listed below, with the number and percentages indicating interest in working with these professionals or receiving these supports.

- a. Vocational Rehabilitation Counselor: With regard to working with a vocational rehabilitation counselor, 32 participants (35.6%) out of the total sample ( $n=90$ ) reported to have interest in such service.
- b. Transition Consultant: Fourteen youths (15.6%) reported to be interested in receiving services from a Transition Consultant.
- c. Supported employment: Four youths (4.4%) reported to be interested in receiving services from a supported employment officer.
- d. Michelle P. Waiver: Three youths (3.3%) reported to be interested in receiving services from a Michelle P. Waiver officer.

- e. Medicare/Medicaid: One youth (1.1%) reported to be interested in receiving services from a Medicare/Medicaid officer

**Research Question 2** (*What are the predictors of employment or education outcomes for post-secondary youth with TBI?*)

In order to answer Research Question 2, logistic regression analysis (LRA) was used to identify predictors of employment or education outcomes for post-secondary youth with TBI. Participants who are either in post-secondary education or employment are described here in terms of a “positive outcome”. I hypothesized, based on the literature and prior research with the KyPSO data, that the odds that the outcome for youth to be involved in either post-secondary education or employment would be influenced by different demographic variables of the study, namely, gender, ethnicity, residence, and rural or urban status.

Prior to conducting the regression analysis, correlation coefficients were computed to determine the relationships among study variables included in the analysis. Table 8 presents the Spearman rank-order inter-correlations. The inter-correlations suggested that there were no significant correlations with the outcome variable.

Table 8

*Spearman rank order inter-correlations between the variables of gender, ethnicity, residence, and urban/rural and Outcome*

Measure	1	2	3	4
1. Gender	—			
2. Ethnicity	.052	—		
3. Residence	-.103	-.052	—	

4. Rural/urban	-.036	.096	-.048	—
5. Outcome	-.104	-.112	-.043	-.048

Note: No correlations were significant at the  $p < .05$  level

Table 8

*Spearman rank order inter-correlations between the variables of gender, ethnicity, residence, and urban/rural and Outcome*

A test of the full model indicated that there were no statistically significant predictors (e.g., gender, ethnicity, residence, and rural). This suggests that the demographic characteristics individually did not affect the odds of a youth with TBI achieving a positive post school outcome. The combined variables were associated with a Nagelkerke  $R^2$  of .038, suggesting that the combined variables explained a very small percentage of the variability in participants' outcome status. The Hosmer-Lemeshow statistic was not significant, ( $X^2 = 3.11$ ,  $df = 6$ ,  $p = .795$ ), which has historically been interpreted as suggesting that the observed distribution of categorical variables fits the theoretical distribution predicted in the logistic regression model. The classification table suggested that the model correctly predicted group membership 70.0% of the time. The logistic regression output data are presented in Table 9.

Table 9

*Summary of Logistic Regression Analysis*

<i>Predictor</i>	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>Sig.</i>	<i>Odds Ratio</i>
Gender	-.478	.471	1.029	1	.310	.620
Ethnicity	-.715	.715	.999	1	.318	.489
Residence	-.319	.541	.348	1	.555	.727



Rural/Urban	-.194	.442	.194	1	.660	.823
Constant	1.573	.867	3.289	1	.070	4.822

Note: \* $p < .05$ , Variable(s) entered on step 1: Gender, Ethnicity, Residence, Rural/urban

Table 9  
*Summary of Logistic Regression Analysis*

**Research Question 3 (RQ3)** (*How do employment and educational outcomes of post-secondary youth with TBI compare to those of post-secondary youth with other disabilities with symptoms that are similar to those experienced by people with TBI?*)

**Postsecondary employment or Postsecondary education-TBI**

Chi square tests of independence were used to compare the post-secondary employment and education outcomes for youth with TBI (n=90) and those with other disabilities associated with symptoms similar to those with TBI (n=15,142). A chi square test of independence was performed on the relationship between disability type and post-secondary education. There was not a statistically significant difference between individuals with TBI and those with other disabilities in terms of post-secondary education outcome,  $\chi^2(1, N = 15,142) = 0.63, p = .960$ . Therefore, individuals with TBI were neither more nor less likely to be involved in post-secondary education than those with other disabilities. A chi square test of independence was performed on the relationship between disability type and employment. With regard to employment, there was not a statistically significant difference between individuals with TBI and those with other disabilities regarding post-secondary employment outcome,  $\chi^2(1, N = 15,142) = 4.57, p = .335$ . Table 10 shows the results of the analysis for outcomes for youth with TBI and those with other disabilities in the areas of post-secondary education and employment.

Table 10

*Post-Secondary Outcomes for Youth with TBI and for Those with Other Disabilities*

Outcome	TBI	Other Disabilities	P value
Employed	38 (42.2%)	7,834 (51.7%)	0.335
Not Employed	11 (12.2%)	2,009 (13.3%)	
Education	29 (32.2)	4,891 (32.3%)	0.960
Not in Education	61 (67.8%)	10,147 (67.0%)	

## **Chapter 5: Discussion**

### **Introduction**

The purpose of this study was to examine the predictors of post-secondary employment and education among Kentucky transition-aged youth with TBI. The post-secondary outcomes were based on responses to the YOYO survey conducted one year after completing high school. Although different post-secondary employment and education outcomes have been identified among youth with other disabilities, there has been lack of studies identifying post-secondary employment and education outcomes for youth with TBI. Additionally, there has been lack of understanding of best practices in terms of promoting positive transition outcomes for youth with TBI.

The analysis sample for this study included 90 youth with TBI. When considering the four demographic variables of the study (gender, ethnicity, residence, and rural or urban settings) the sample was consistent with expectations in that it had a higher proportion of males, Whites, participants living in their family home, and the majority of the youth lived in rural areas.

### **Demographic Information for Youth with TBI**

**Gender.** The composition of participants of this study, in terms of the prevalence of TBI based on gender (approximately 68% males) was consistent with previous studies and other large US databases in which most of the individuals with TBI were male (CDC, 2016; Faul & Coronado, 2015; Gabella, et al., 1997; Robertson, 2009). For example, Lagbas et al. (2013) indicated that the percentage for males was 58.9% and 41.1% females. Faul and Coronado (2015) reported a rate of 547.6 per 100 000 males compared to 385.9 per 100 000 females with a TBI in their study. Leonhard, et al. (2015) indicated

that 67% of participants with TBI were male. Additionally, Gary et al. (2009) that the majority of their samples were male (75.5%). Johnstone et al. (2003) indicated that in their sample of 220 youth with TBI, the majority were males (82%). Additionally, CDC (2010) and CDC (2016) indicated that males continued to have higher rates of TBI compared to females. The prevalence of TBI based on gender among the sample for this study was as expected.

**Ethnicity.** Concerning ethnicity, the results indicated that the majority of the youth with TBI in the sample were White (78%) followed by Blacks at 8.9%, Hispanics at 3.3% and the lowest percentage was for Asian at 1.1%. This sample appears to be roughly consistent with previous studies for representation of ethnicity (Anyalebechi, 2015; Dikmen et al., 2003; Wehman, et al., 2014). Additionally, the U.S. Census (2010) indicated that 86.3% of the population of Kentucky is White, 7.7% is Black, 3.1% is Hispanic, and 1.5% is Asian. Therefore, ethnicity of the sample is representative of the population of the state.

**Residence.** With regard to residence, the majority of the youth with disabilities indicated that they were staying in the family home (77.8%), followed by those who were residing in college dormitories (5.6%) and those staying with their significant other (5.6%). The least percentages were for those who either resided in a group home (1.1%) or in jail (1.1%). Although comparative studies on living arrangements for transition aged youth with TBI in US are not available, it is logical to assume that because of age and type of disability youth with TBI reside overwhelmingly with family. Only one study was identified that studied residence following being released from hospital after brain injury and the authors indicated the individuals with TBI chose to live with their family

members (Penna et al., 2010). This study was not specific to transition aged youth, however, the literature on disability suggests that young adults with disabilities continue to live with parents or family for longer periods of time than do their peers with no disabilities.

**Rural or Urban/Suburban Settings.** With regard to rural or urban dwellings, in the present sample, the majority of the youth with TBI resided in rural areas (54.4%), 35.6% resided in urban areas, and the remaining 10.0% percentage resided in suburban areas. This result was also expected, as previous reports indicated that high numbers of individuals in Kentucky with TBI reside in rural areas (KTBITF, 2015). This could also be attributed to the fact the state of Kentucky is mostly rural (Kentucky State Data Center [KSDC], 2010). The results are consistent with existing research. For example, Gabella et al. (1997) indicated that among a sample of 6,863 individuals with TBI, participants primarily resided in rural areas. Other examples of studies which indicated that the majority of individuals with TBI reside in rural areas included Robertson (2009), who indicated that there were more cases of TBI in rural areas and also stated that the most severe cases were reported in rural areas. Similarly, Johnstone et al. (2003) stated that among the 220 individuals with TBI in their study, more than one third of their sample resided in rural areas. Therefore, the results from this study are consistent with other studies suggesting that most individuals with TBI reside in rural areas.

**Analysis and Summary of Research Question 1***(What are the employment or education outcomes for youth with TBI?)*

## **Post-Secondary Outcomes for Youth with TBI**

Descriptive statistics were used to analyze the data for Research Question 1. The results indicated that the majority of the sample had positive outcomes (61.1%,  $n=55$ ), in that they were either employed or enrolled in an educational program or both at one-year post high school completion. Although the rate of employment for youth with TBI is difficult to quantify, due to the lack of research and the wide range of reported employment rates, this is a surprising result based on information from previous studies, which generally suggest that positive outcomes for transition aged youth with TBI would be expected to be lower.

**Other factors.** The other factors that were explored under post-secondary education and employment included employment hours and wage (for those working), and for education, the variables included were type of education, duration, and where they lived during their time of study. With regard to employment wage, 45 (90%) of those who had had employment since graduating from high school, indicated being paid more than minimum wage. Concerning employment hours, 40 youth (44.4%) indicated that they had been or currently were working more than 20 hours a week. With regard to employment duration, 42 youth (46.7%) indicated that they had worked for 3 months or more. The results were not consistent with previous research which indicated that majority of the jobs done by individuals with TBI paid low wages and provided few hours (Todis, et al., 2011). Previous studies have also generally indicated that the numbers for individuals with TBI who do not return to work is very high (USDOE, 2017), and that has not been the case with the participants of this study as the majority reported to be working longer hours and having worked for more than three months. This

implies that the participants in this study were more engaged in work and having better wages as compared to results of other studies.

Other factors explored that were related to education included type of education the youth were involved in (4-year college or university, 2-year community college, vocational school, and short-term education), degree type (bachelor's degree, associate's degree, certificate and not seeking degree), and the youth were also asked where they were living during their school or training program (on campus or off campus). In total, 29 youth (32.2%) responded to being involved in post-secondary education. For questions concerning education-related factors, not all of these participants responded. For example, for education type, 26 youth responded, for degree type, 22 youth responded, and for where they were staying while in education, 25 youths responded. The largest percentage of the youth ( $n=12$ , 46.2%) reported to be in a 2-year community college, followed by those in a 4-year college ( $n=8$ , 30.8%). This may reflect the fact that Kentucky is mostly rural and, generally, technical and community colleges are more likely to be available in rural areas. With regard to degree type, where 22 youths responded, the largest percentage of the youth ( $n=22$ ) reported to be completing Bachelor's degree ( $n=10$ , 45.5%). Previous studies have indicated that youth with TBI frequently face challenges in school because there are currently no evidence-based interventions that support the education of the youth with TBI, which impacts their choices for education (DePompei & Glang, 2018). Evidence-based supports are needed to support youth in education. The next highest percentage of youth was completing Associates degrees ( $n=5$ , 22.7%) and the lowest percentage was for those who were not seeking a degree ( $n=1$ , 4.5%) but were engaged in other educational programs.

**Post-secondary employment outcomes.** The results of this study indicated that the youth with TBI in this sample had higher rates of employment outcomes than generally found in previous studies, though there is a wide range of percentages in the research and none specifically looking at the time frame (one year post high-school) studied in this analysis. For this study, from the total sample ( $n=90$ ), 38 youth with TBI (42.2%) were employed. The results align with the previous studies that have indicated that youth with TBI had lower employment of TBI (Anderson et al., 2010; Hoge, et al., 2006; Ponsford, et al., 2011). For example, Bjork and Grant (2009) indicated the range for employment among individuals with TBI was between 20% and 50% as compared to those with other disabilities which had higher than 50% employment outcomes. Wehman et al. (2013) indicated that the percentage for employment for a sample ( $n=200$ ) of youth they interviewed was 51%, while Todis et al. (2011) indicated that among their sample of 89 youth with TBI, only 44% was employed. Again, the type of employment should be considered, (e.g., whether the jobs were competitive or supported, and this factor was not available in the present data). Therefore, the percentage for those employed in this study, goes along the range that was identified in previous studies.

**Reasons for not Working.** The youth who reported that they were not working provided different reasons for not working and these included poor health which was reported by the majority of the participants ( $n=10$ ). This could be attributed to the consequences of the injury which could be devastating, especially if they are categorized as severe. However, the YOYO did not define poor health. That is, it is not clear if poor health referred to consequences of the TBI or to some other health condition. If the health is broadly defined, it is possible for the participants in this study responses could be about



their general health and not specific to effects of TBI. Next were those who could not find a job ( $n=5$ ), those looking for a job ( $n=5$ ), and those who indicated transportation problems ( $n=1$ ) and childcare barriers ( $n=1$ ).

None of the reasons provided by the participants in this study were consistent with prior studies, which may be due to the relatively small sample. Previous studies indicated the main employment barriers for individuals with TBI were identified as shortage of strong TBI advocates, followed by inadequate knowledge of available services (Muss, et al. 2005). Additionally, Scherer et al., (2014) found that limited access to services was a major reason why individuals with TBI were not working. It is not surprising to have different barriers to employment regarding youth with TBI because the consequences of the injury affect the individuals negatively and uniquely (Benedictus et al., 2010; Ponsford, 2013). However, because the present sample was very small, and data on barriers faced by youth with TBI was not captured, the present study unfortunately can only provide very limited information relevant to the larger population. It will be important to continue to explore the impact of multiple factors and barriers on employment among those with TBI who have recently completed high school.

**Post-secondary education outcomes.** Regarding post-secondary education, the results revealed that youth with TBI had lower rates of participation in education than they did for employment. Approximately one-third of the sample were involved in post-secondary education, ( $n=29$ , 32.2%). This percentage was slightly lower as compared to the few previous studies, for instance, one study had indicated that 54% of youth attended some type training program or college after leaving high school (Todis & Glang, 2008). Sample size or real geographic differences may also account for the difference in studies,

but the limited research suggests that further research is warranted to better understand the rate of post-secondary education in Kentucky. Again, the differences in employment and education could be brought up by what families value more.

**Supports and services for youth in post-secondary education and employment.** In the area of supports and services, for those who were employed ( $n=38$ ), only a small percentage of the youth with TBI received services and supports. Of the 38 who were currently employed, 15 (39.5%) youth had worked with VR counselors and 14 (36.8%) youth had worked with a transition consultant. The low percentages for youth in accessing services could be attributed to findings from previous studies. According to Glang, Tyler, Pearson, Todis and Morvant (2004), services to support students with TBI are not being adequately provided, and this leads to youth not being able to access them in large numbers. Other studies have indicated that youth with TBI and their families were not aware of vocational services (Muss et al., 2005). The present study did not allow analysis of this question, but awareness of vocational services would be an important consideration in a possible revision to the YOYO questionnaire. Previous research has suggested that individuals with TBI having difficulties accessing services, and a coordinated approach to employment (Spearman et al., 2009). Unfortunately, this is not a question that can be addressed based on the current data.

Relatively small numbers of the employed respondents reported that they received job coach support ( $n=5$ , 13.2%), and far fewer received equipment ( $n=1$ , 2.6%) and personal assistance ( $n=1$ , 2.6%). Previous studies have indicated that individuals with TBI often had a lack of understanding regarding services and providers available to them (Kennedy et al., 2008; Muss et al., 2005) and the low numbers receiving services could

be attributed to lack of awareness for the services that are provided for these individuals, however this would need to be explored in a larger sample. Consistent with the idea that youth may not be aware of services available, Rumrill et al. (2016) stated that most Americans with TBI have never heard of the state-federal VR program. This, again, could contribute to individuals with TBI having difficulties in accessing services and a coordinated approach to employment (Spearman et al., 2009). Furthermore, for those who were aware of the services, Solovieva and Walls (2010) stated that the majority of participants in their study indicated that they did not have needed supports and only 20% reported that they had received services. Furthermore, Hart et al. (2010) found a significant lack of consistency among service providers, with variation in types of services offered, the extent of services offered, and disagreement in the timing of delivery of such services being the major reasons why individuals with TBI were not accessing services.

Concerning those who were in post-secondary education, 18 youth of the 29 (62.1%) who were attending school had visited the disability support service. The above results are not consistent with previous studies. Kennedy et al. (2008) reported that only 20% of the youth with disabilities in college were aware of support services on campus. Other studies also noted lack of awareness about disability resources by youth (Spearman et al., 2009). This study showed a higher percentage of youth attending school having visited the disability resource office. This is an encouraging finding as it suggests that many youths with TBI are accessing services that will help them to be successful.

As discussed in the literature review, VR research has indicated that less than half of the population with TBI received VR services in 2017, despite the fact that services

such as job training, counseling and guidance, and job placement services may be effective for many persons with TBI in obtaining employment. Although youth in this study did not utilize supports and services at a high rate, they showed interest in working with professionals who provided services. For instance, 32 (35.6%) youths showed interest in working with a VR counselor while 14 (15.6%) were interested in working with a transition consultant. VR services are an important resource in achieving positive employment and education outcomes. Phillips and Radford (2014) indicated that VR services improve outcomes for individuals with TBI. The results were consistent with previous studies, such as Solovieva and Walls (2010), who indicated that 34% of their participants indicated they needed supports.

**Analysis and Summary of Research Question 2** (*What are the predictors of employment and education for post-secondary youth with TBI?*)

The results in this study indicated that the demographic factors (gender, ethnicity, residence and rural or urban setting) were not significant predictors of youths' post-secondary employment and education outcomes. Because the sample was so small, and the power for the LR analysis was relatively low, demographic characteristics cannot be ruled out as having any significance on post-secondary outcomes. The results were, however, consistent with some previous studies which indicated that positive outcomes were related to individuals with TBI receiving services (e.g., Johnstone et al., 2003), but not demographic variables. On the other hand, a different perspective was noted by Rumrill et al. (2016) who indicated that gender was significantly associated with competitive employment outcomes. Additionally, the positive outcomes are attributed to being involved in transition planning. Thus, even though there were no significant

relationships based on the present study, the question of the importance of demographic variables in terms of positive outcomes is one that it is important to consider further.

**Analysis and Summary of Research Question 3** (*How do employment and educational outcomes of post-secondary youth with TBI compare to those of post-secondary youth with other disabilities with symptoms that are similar to those experienced by people with TBI?*)

The lack of association between post-secondary employment and education for youth with TBI and other disabilities with similar symptoms suggests that for the current sample youth with disabilities experience positive outcomes at a similar rate. Previous studies had indicated that youth with TBI had poorer outcomes and may lag far behind those with other disabilities (Anderson, et al., 2010; Rumrill, et al., 2016; Thomas, et al., 2015). It was surprising to find that they had similar outcomes in the present study. Although very few research studies reviewed discussed youth and TBI, the results in the present analysis are interesting in realizing that no differences were identified in the different groups. It may be that during the first year post-high school, the differences that are typically reported have not yet developed and the potential reasons for this will be important to investigate further.

### **Limitations of the Study**

This study has several limitations. The first limitation was the sample size( $n=90$ ). In addition, the sample lacked sufficient diversity across ethnicity to do comparison. It is important to note however that the sample was representative in terms of the state population. Previous studies have indicated low survey response rates for individuals with TBI. Based on prior research (Solovieva & Walls, 2010; Spearman et al., 2009) the

expectation was to have approximately 100 participants for this study. Therefore, the size of the sample was only slightly smaller than expected. The sample size may influence the direction taken with regard to recommendations for decisions about intervention or services.

Voluntary response bias is another limitation that comes with small sample size. Participants in a study do so because they have strong interest or are highly motivated to do so. Therefore, the results of the survey are skewed to reflect the opinions only of those who responded. The viewpoints of non-respondents are unknown.

The low power for the logistic regression analysis was another major limitation. A study with low power reduces the chances of detecting a statistically significant result and increases the margin of error. As a result, the findings of this study are less conclusive. The smaller sample size was decreasingly representative of the population; thus the results are less accurate.

A fourth limitation was that some of the variables were recorded only for limited years within the time frame for this study. For example, the reasons for not working were reported in 2012 and 2013 only. In addition, cohort differences for the six years could also affect the results. The fifth limitation concerns the inherent limitations of secondary data. The data set did not contain some of the variables I would have liked to explore, and to conduct follow up with participants for follow up questions and additional data could not be collected. As previously mentioned, inconsistencies in the way in which variables were coded and measured have changed overtime, making historical comparison difficult. As a researcher, I had no control over the data quality. The length of the survey represents another limitation. The survey consisted of 108 items. As previously

discussed, the consequences of TBI which include cognitive impairments could be devastating. Again, fatigue is mostly reported for this population and the individuals may not be able to respond to 108 items in one sitting, including thinking of how to respond to the items due to slow processing speed.

Confounding variables that were not indicated could have affected the results of the study too. For instance, there were no data regarding severity of the TBI. Another variable that was not indicated was age at which the injury was acquired. With regard to coding for disabilities, some individuals with TBI might have selected multiple disabilities, which was one of the choices under disabilities, and in the case they had TBI and other disabilities and that could lead to leaving out other potential youth under the TBI category.

### **Recommendations**

Considering the several limitations of this study, opportunities are available for recommendations for future research. Recommendations for this study are presented for service providers, and in the areas of research, supports and services.

**Service Providers.** Based on the results of this study and the indications in the existing literature, it is recommended that the communication between students with TBI, educators, and vocational and educational service providers be improved, particularly as students are preparing to complete, and in the period immediately after completing high school. Relatedly, it is critical that students and their families have a clear understanding of the specific roles of these professionals and of the services and resources that are available to them during this period, and are aware of the means by which to access available services. There is a great need for coordination of services and care for this

population, and other populations of individuals with disabilities, and it is important that the providers are communicating with each other and with the students throughout the transition process. Professionals involved in this process can assist by ensuring that the students are aware of the availability of services and supports, and ascertaining that services are reaching and being accessed by the intended students or youth. Ideally, a navigator, or coordinator, or other professional (or lay) person should be identified and available who can work with individual students and their families and who will dedicate time to understanding the issues faced by youth with TBI, and be able to identify the resources which would benefit them. Furthermore, the development of advocacy skills among youth with TBI and their family members is a critical but often overlooked component of achieving independence after high school. Many of the youth in the current sample appeared to have been successful in finding employment or entering education. The numbers who retain their situation beyond year one post-high school appear to be lower than reported in this study. It is important to find out the barriers that occur, as well as the factors that help the youth to maintain jobs and enrollment, particularly when, as in the present sample, they are not receiving support services in large numbers.

**Research.** An important study to be conducted and extend the current findings would include the variables that were not included in this study, including barriers faced by individuals with TBI regarding post-secondary education and employment. Of particular importance would be qualitative research that would allow the real stories of the youth with TBI to be captured and their situation more fully understood. These stories may uncover more of the issues that were not captured in this study. This could be done using focus group discussions and interviews. Further, research on post-secondary



education outcomes is required for Kentucky and the U.S. because it has not been dealt much. Therefore, it would be important to conduct larger studies, including analyses of demographic variables, despite the fact that this study indicated that there was no relationship between demographic variables and positive outcomes. A larger sample size would be informative, as would including more years in the form of longitudinal study (beyond one-year post high school). Researchers and educators should look closely into transitioning of youth with TBI and seek to advocate for this frequently neglected and overlooked population in the development of policy and legislation.

Concerning the development of relevant employment and educational legislation, researchers should explore the extent to which youth with TBI are really included in discussing issues relating to people with disabilities. Since the population with TBI is increasing, it is recommended that they be included more explicitly and fully in the consideration of legislation, which will also require researchers to further increase the current, limited knowledge of the how individuals with TBI are faring as compared to other youth with different disabilities. Future studies should focus on youth with TBI in both rural and urban areas to develop and evaluate access to and effectiveness of services and supports, few of which are evidence based.

**Supports and Services.** Based on the results of this study, it appears that the emphases in WIOA and IDEA on transition, and on linking educational institutions and employers with teachers and rehabilitation professionals are on the right track and should continue and be expanded. Considering that youth with TBI appear to access vocational and educational services in limited numbers, compared to students with other disabilities, ways of assisting them to become aware of and access the available services appear to be

required. It is also important to further evaluate the reasons they are not able to access or are not using them. This might be because they are not aware of the services available for them, or the services which are provided are not helping them adequately. There is need to develop awareness and evaluate the usefulness of existing transition services, as well as exploring the most effective means of sharing and distributing information to groups and individuals with differing characteristics. In the present study, the majority of the youth were interested in receiving services from a vocational rehabilitation counselor, but few were actually doing so. It is important to better understand the reason for this gap and explore ways that education about accessing services can be enhanced.

The last recommendation is with regard to the YOYO survey. Although this survey was not specifically for this study, it would be ideal to have more in-depth information about some of these critical questions. It may also be worth considering reduction the length of the survey in order to increase response rate, particularly for the group that was the focus of this study, for whom fatigue and concentration may be a major issue.

### **Conclusion**

The aim of this study was to examine the predictors of post-secondary employment and education among Kentucky transition aged youth with TBI using existing data. Descriptive statistics, chi square, and logistic regression were used to examine the post-secondary outcomes for youth with TBI, using four demographic variables: gender, ethnicity, residence, and rural or urban status. None of these were associated with post-secondary outcomes for the sample. The results indicated that more than 50% of the youth with TBI had positive outcomes, yet they rarely used the services

provided for them in the schools or at the workplace. This study suggests that, although the demographic characteristics did not predict post-secondary outcomes, other variables within education and employment yielded interesting results that could benefit rehabilitation counselors. For instance, the majority of the youth resided in rural areas, which implies that more services are required in rural areas. Again, those who had better outcomes were the youth with support, either staying with family, or friends, and this implies that support is a very important attribute for individuals with TBI. There is still a lot to be uncovered, especially based on the effective services that could benefit the youth with TBI and issues related to transition.

## References

- Adamson N.D. (2013). *TBI and long-term competitive employment as a function of services provided by vocational rehabilitation* (Doctoral dissertation) Available from ProQuest and Theses.
- Alsalam, M.A. & Lee, C. (2017). Employment outcomes of youth with disabilities in vocational rehabilitation- A multi-level analysis of RSA- all data. *Rehabilitation Counseling Bulletin, 60*, 98-107. Doi: 10.1177/0034355216632363.
- American Psychological Association (2004). Individuals with disabilities education act. Retrieved from [apa.org](http://apa.org)
- Anderson, V., Brown, S., & Newitt, H. (2010). What contributes to quality of life in adult survivors of childhood traumatic brain injury? *Journal of NeuroTrauma, 27*, 863-870. doi:10.1089/neu.2009.1169
- Anyalebechi, S.O (2015). *Traumatic brain injury and the impact on productive employment*. (Doctoral dissertation) Available from ProQuest and Theses.
- Arango-Lasprilla, J.C., Ketchum, J.C., & Williams, K., Kreutzer, J.S., Marquez de la Plata, C.D., O'Neil-Pirozzi, T.M, & Wehman, P. (2008). Racial differences in employment outcomes after traumatic brain injury. *Archives of Physical medicine and Rehabilitation. 89*, 988-995.

- Arlinghaus, K.A., Shoab, A.M., & Price, T.R.P. (2005). Neuropsychiatric assessment. In J.M. Silver, T.W. McAllister, & S.C. Yudofsky (Eds.), *Textbook of traumatic brain injury* (pp.59-78). Virginia: American Psychiatric Publishing
- Bagley, S.C., White, H., & Golomb, B.A. (2001). Logistic regression in the medical literature: Standards for use and reporting, with particular attention to one medical domain. *Journal of Clinical Epidemiology*, 54, 979-985.
- Bates- Harris, C., Hager, R., & Scherer, A.E. (2017). *Unraveling the mysteries of pre-employment transition services under WIOA. Changed Expectations on employment of people with disabilities*. Retrieved from ndrn.org
- Bazargan, L.C., Kermah, S.H., & Pan, D. (2013). Traumatic brain injury related hospitalization and mortality in California. *Biomed Research International*.  
Doi:10.1155/2013/143092
- Bell, K. (2018). *Fatigue and traumatic brain injury*. Retrieved from msktc.org
- Benedictus, M.R., Spikman, J.M. & van der Naalt, J. (2010), “Cognitive and behavioral impairment in traumatic brain injury related to outcome and return to work. *Archives of Physical Medicine and Rehabilitation*, 91,1436-41.
- Bjork, J., & Grant, S. (2009). Does traumatic brain injury increase risk for substance abuse? *Journal of NeuroTrauma*, 26, 1077–1082. doi: 10.1089/neu.2008.084.
- Boutin, D. L. (2011). Effective vocational rehabilitation services for military veterans. *Journal of Applied Rehabilitation Counseling*, 42, 24-32.

- Brain and Spinal Cord (2017). *Closed head injury*. Retrieved from  
brainandspinalcord.org
- Brain Injury Alliance of Kentucky (BIAK) Resource Journal, 2017. *Rebuilding lives after  
brain injury*. Retrieved from biak.us
- Brainline (2017). *TBI facts*. Retrieved from brainline.org
- Brainline (2018). *Traumatic brain injury basics*. Retrieved from brainline.org
- BrainandSpinalCord.org (2017). *Resources for brain and spinal cord injury survivors*.  
Retrieved from brainandspinalcord.org
- Brain Injury Association of America (2018), *Brain injury information*. Retrieved from  
biausa.org
- Brant, R. (2004). *Odds and ratios*. Retrieved from stat.ubc.ca
- Brasure, M. Lamberty, G.J., Sayer, N.A., Nelson, N.W., MacDonald, R., Quелlette, J., &  
Wilt, T.J. (2013). Participation after multidisciplinary rehabilitation for moderate  
to severe traumatic brain injury in adults. *Archives of Physical Medicine and  
Rehabilitation, 94*, 1398-1429.
- Brody, D.L., MacDonald, C.L., & Shimony, J.S. (2015). Current and future diagnostic  
tools for traumatic brain injury: CT, conventional MRI, and diffusion tensor  
imaging. *Handbook of Neurology, 127*, 267-275. Doi:10.1016/B978-0-444-  
52892-6.00017-9

- Brown, A.W., Malec, J.F., McClelland, R.L., Diehl, N.N., Englander, J. & Cifu, D.X. (2005). Clinical elements that predict outcome after traumatic brain injury: A prospective multicenter recursive partitioning (decision-tree) analysis. *Journal of NeuroTrauma*, 22, 1040-1051
- Bureau of Labor Statistics (2015). *Monthly labor review*. Retrieved from bls.gov
- Catalano, D., Pereira, A.P., Wu, M.Y., Ho, H., & Chan, F. (2006). Service Patterns Related to Successful Employment Outcomes of Persons with Traumatic Brain Injury in Vocational Rehabilitation. *NeuroRehabilitation*, 21, 279–293.
- Carter, E. W., Austin, D., & Trainor, A. A. (2012). Predictors of post school employment outcomes for young adults with severe disabilities. *Journal of Disability Policy Studies*, 23, 60-63. doi: 10.1177/1044207311414680
- Centers for Disease Control and Prevention (2017). *Traumatic brain injury and concussion*. Retrieved from cdc.gov
- Centers for Disease Control and Prevention (2016). *TBI: Get the facts*. Retrieved from cdc.gov
- Centers for Disease Control and Prevention (2015). *Facts about TBI*. Retrieved from cdc.gov
- Chesnut, R.M., Carney, N., Maynard, H., Mann, N.C, Patterson, P., Helfand, M. (1999). Summary report: Evidence for the effectiveness of rehabilitation for persons with traumatic brain injury. *Head Trauma Rehabilitation*, 14, 176-188.

- Cifu, D.X. & Caruso, D. (2010). *Traumatic brain injury*. New York, NY: Demos Medical Publishing
- Cmar, J.L. (2015). Orientation and mobility skills and outcome expectations as predictors of employment for young adults with visual impairments. *Journal of Visual Impairment and Blindness*, 95-106
- Cohen, L., Manion, L. & Morison, K. (2000). *Research Methods in Education*. London: Routledge Falmer.
- Corrigan, J.D., Selassie, A.W., & Orman, J.A. (2010). The epidemiology of traumatic brain injury. *Journal of Head Trauma and Rehabilitation*, 25, 72-80.  
doi:10.1097/HTR.0b013e3181
- Council for Learning Disabilities (2018). *Legislative alerts*. Retrieved from council-for-learning-disabilities.org
- Council for Learning Disabilities (2012). *Legislative alerts*. Retrieved from council-for-learning-disabilities.org
- Cuthbert, J.P., Harrison-Felix, C., Corrigan, J.D., Bell, J.M., Haarbauer-Krupa, J.K., & Miller, A.C. (2015a). Unemployment in the United States After Traumatic Brain Injury for Working-Age Individuals: Prevalence and Associated Factors 2 Years Post-injury. *Journal of Head Trauma Rehabilitation*, 30, 160-174.
- Cuthbert, J.P., Pretz, C.R., Bushnik, T., Fraser, R.T., Hart, T., Kolakowsky-Hayner, S.A., Malec, J.F. & Scherer, M. (2015). Ten-Year Employment Patterns of Working



Age Individuals After Moderate to Severe Traumatic Brain Injury: A National Institute on Disability and Rehabilitation Research Traumatic Brain Injury Model Systems Study. *Archives of Physical Medicine and Rehabilitation*, 96, 2128-2136.

Daviso, A.F., Denney, S.C., Baer, R.M., & Flexer, R. (2011). Post-school goals and transition services for students with learning disabilities. *American Secondary Education*, 39, 77-93

Defense and Veterans Brain Injury Center annual report (2015). *The year in review*. Retrieved from [dvbic.dcoe.mil](http://dvbic.dcoe.mil)

DePompei R. & Glang, A. (2018). Have we made progress with educational services for students with TBI? *NeuroRehabilitation*, 42, 255-257. doi: 10.3233/NRE-180001.

Dillahunt-Aspillaga, C., Agonis, -Frain, J., Hanson, A., Frain, M., & Sosinski, M. (2014). Applying a resiliency model to community reintegration and needs in families with traumatic brain injury: Implications for rehabilitation counselors. *Journal of Applied Rehabilitation Counseling*, 45, 25-36.

Dillahunt-Aspillaga, C., Jorgensen-Smith, T., Ehlke, S., Hanson, A., Sosinski, M., & Gonzalez, C.M., (2015). Disability adjustment and vocational guidance counseling for individuals with traumatic brain injury. *Journal of Applied Rehabilitation Counseling*, 45, 7-18.

Dikmen, S.S., Machamer, J. E., Powell, J.M., & Temkin, N.R. (2003). Outcome 3 to 5 years after moderate to severe traumatic brain injury. *Archives of Physical Medical Rehabilitation*, 84, 1449-1457.

- Falvo, D.R. (2014). *Medical and psychosocial aspects of chronic illness and disability*.  
Burlington, MA: Jones and Bartlett.
- Faul, M., & Coronado, V. (2015). Epidemiology of traumatic brain injury. In J. Grafman  
& A. M., Salazar (Series Eds), *Handbook of Clinical Neurology: Volume 127*, 3-  
13.
- Faul, M., Xu, L., Wald, M.M., Coronado, V., & Dellinger, A.M. (2010). Traumatic brain  
injury in the United States: National estimates of prevalence and incidence, 2002-  
2006. *Injury Prevention*, 16,
- Feldman-Sparber, C. (2015). *Analysis of evidence-based course of study predictors for  
improving the post-school outcomes of post-secondary education and employment  
for students with autism* (Doctoral dissertation) Available from ProQuest and  
Theses
- Gabella, B., Hoffman, R.E., Marine, W.M., & Stallones, L. (1997). Urban and rural  
traumatic brain injuries in Colorado. *Annals of Epidemiology*, 7, 207-212
- Gamble, D., & Moore, C. L. (2003). The relation between VR services and employment  
outcomes of individuals with traumatic brain injury. *Journal of Rehabilitation*, 69,  
31-38.
- Gary, K.L., Arango- Lasprilla, J.C., Ketchum, J.M., Kreutzer, J.S., Copolillo. A.,  
Novack, T. A., & Jha, A. (2009). Racial differences in employment outcome after

traumatic brain injury at 1,2, and 5 years post injury. *Archives of Physical Medicine Rehabilitation*, 90, 1699-1707.

Gardizi, E., Hanks, R.A., Millis, S.R., & Figueroa, M.J. (2014). Comorbidity and insurance as predictors of disability following traumatic brain injury. *Archives of Physical Medicine Rehabilitation*, 95, 2396-2401. doi: 10.1016/j.apmr.2014.06.004

Gentilini, M., Nichelli, P., & Schonhuber, R. (1989). Assessment of attention in mild head injury. In H.S. Levin, H.M Eisenberg, & A.L. Benton (Eds), *Mild Head Injury*, New York: Oxford University

Glang, A, Tyler, J., Pearson, S., Todis, B., & Morvant, M., (2004). Improving educational services for students with TBI through statewide consulting teams. *NeuroRehabilitation*, 19,219-231.

Gordon, W.A., Zafonte, R., Cicerone, K., Cantor, J., Brown, M., Lombard, L., ..., Chadna, T. (2006). Traumatic brain injury rehabilitation: State science. *American Journal of Physical Medicine and Rehabilitation*, 85, 343-382. doi: 10.1097/01.phm. 00002.02106.01654.61

Graham, D.I., Gennarelli, T.A., & McIntosh, T.K. (2002). *Trauma in Greenfield's*. In D.I. Graham, & P.L., Lantos (Eds.). *Neuropathology* (pp.823-898). London: Arnold.

Greeve M.W. & Zink, B.J. (2009). Pathology of traumatic brain injury. *Mount Sinai Journal of Medicine*, 76, 97-104. doi: 10.1002/msj.20104

Hart, T., Dijkers, M., Whyte, J., Braden, C., Trott, C. T., & Fraser, R. (2010). Vocational interventions and supports following job placement for persons with traumatic brain injury. *Journal of Vocational Rehabilitation, 32*, 135-150. doi: 10.3233/JVR-2010-0505

Hart, T, Kozlowski, A, & Whyte J, (2014). Functional recovery after severe traumatic brain injury: an individual growth curve approach. *Archives of Physical Medicine Rehabilitation, 95*, 2103-10.

Hoge, C.W., Auchterloine, J.L., Miliken, S.M. (2006). Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *Journal of American Medical Association, 295*, 1023-1032. doi:10.1001/jama.295.9.1023.

Hooson, J. M., Coetzer, R., Stew, G., & Moore, A. (2012). Patients' experience of return to work rehabilitation following traumatic brain injury: A phenomenological study. *Neuropsychological Rehabilitation, 23*, 19-44.

Horn, S.D., Corrigan, J.D., & Bogner, J., (2015). Traumatic Brain Injury Practice Based Evidence study: design and patients, centers, treatments, and outcomes. *Archives of Physical Medicine Rehabilitation, 96*, 178-196

Human Development Institute(n.d.) *Individual education plan*. Retrieved from hdi.uky.edu

Infoplease (2017). *Kentucky*. Retrieved from infoplease.com.

- International Brain Injury Association (2016). *Brain injury facts*. Retrieved from internationalbrain.org
- Ipsen, C. & Swicegood, G. (2015). Rural and Urban differences in vocational rehabilitation case mix, delivery practices and employment outcomes. *Rehabilitation, Research Policy and Evaluation, 29*, 349-370.
- Jager, T.E., Weiss, H.B., Coben, J.H. & Pepe, P.E. (2008). Traumatic brain injuries evaluated in U.S. emergency departments, 1992-1994. *Academic Emergency Medicine, 7*, 134-140
- Jones, L. (2016). *After no child left behind, 9 things to expect for kids with learning and attention issues*. Retrieved from understood.org
- Jones, L. (2018). *The difference between every student succeeds act and no child left behind*. Retrieved from understood.org
- Johnstone, B., Price, T., Bounds, T., Schopp, L.H., Schootman, M., & Schumate, D. (2003). Rural/urban differences in vocational outcomes for state vocational rehabilitation clients with TBI. *NeuroRehabilitation, 18*, 197-203
- Johnstone, B., Reid-Arndt, S., Franklin, K.L., & Harper, J. (2006). Vocational outcomes of state rehabilitation clients with TBI: A review of the Missouri model brain injury system studies. *NeuroRehabilitation, 21*, 335-347.
- Katz, D. Cohen, S.I., & Alexander, M.P. (2015). Mild traumatic brain injury. *Handbook of Clinical Neurology, 127*, 131-156. doi:10.1016/B978-0-444-52892-6-00009-X

- Kennedy, M.R.T., Krause, M.O., & Turksta, L.S. (2008). An electronic survey about college experience after traumatic brain injury. *NeuroRehabilitation*, 23, 511-520
- Kennon, Y. (2017). *Brain injury awareness month*. Retrieved from [exproxy.uky.edu](http://exproxy.uky.edu)
- Kentucky Injury Prevention and Research Center (2007-2014). *Traumatic brain injury report*. Retrieved from [uky.edu](http://uky.edu)
- Kentucky Person Centered Planning Network (n.d.). *Kentucky transition signal*. Retrieved from [hdi.uky.edu](http://hdi.uky.edu)
- Kentucky Traumatic Brain Injury Trust (2015). *Traumatic brain injury*. Retrieved from [chfs.ky.gov](http://chfs.ky.gov).
- Kentucky Traumatic Brain and Spinal Cord Injury Surveillance Project (2010). *Fiscal year 2010 report*. Retrieved from [mc.uky.uky.edu](http://mc.uky.uky.edu)
- Ketchum, J.M., Getachew, M.M., Kirch, D., Banos, J.H., Kolakowsky-Hayner, S.A., Jamison, L., & Arango-Lasprilla, J.C. (2012). Early predictors of employment outcomes 1 year post traumatic brain injury in a population of Hispanic individuals. *NeuroRehabilitation*, 30, 13-22. doi: 10.3233/NRE-2011-0723.
- Kleinbaum, D.G & Klein, M. (2010). *Logistic regression: A self-learning text*. Atlanta, GA: Springer
- Kraus, M, F., Smith, G.S., Butters, M., Donnel, A.J., Dixon, E., Yilong, C., & Marion, D. (2005). Effects of the dopaminergic agent and NMDA receptor antagonist amantadine on cognitive function, cerebral glucose metabolism and D2 receptor availability in chronic traumatic brain injury: A study using positron emission topography (PET). *Brain Injury*, 19, 471-479

- Kraus, J.F., Peek-Asa, C., & McAurthur, D. (2000). The independent effect of gender outcomes following brain injury: A preliminary investigation. *Neurosurgical Focus, 8*, 1-7
- Kreutzer, J.S., Marwitz, J.H., Walker, W., Sander, A., Scherer, M., Bogner, J....  
Bushnick, T. (2003). Moderating factors in return to work and job stability after traumatic brain injury. *Journal of Head Trauma Rehabilitation, 18*, 128-138
- KyPSO (2017). *Report*. Retrieved from KyPSO.org
- Lagbas, C., Bazargan-Hejazi, S., Shaheen, M., Kerman, D., & Pan, D. (2013). Traumatic brain injury related hospitalization and motivation in California. *Biomed Research International, 2013*, article ID 143092. <http://dx.doi.org/10.1155/2013/143092>.
- Lam, C., Priddy, D.A., & Johnson, P. (1991). Neuropsychological indicators of employability following traumatic brain injury. *Rehabilitation Counseling Bulletin, 74*, 68-74
- Langlois, J., Rutland-Brown, W., & Thomas, K. (2007). *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. Retrieved from PubMed.
- Lavrakas, P.J. (2008). *Encyclopedia of Survey Research*. Thousand Oaks, CA: SAGE Publications
- Leonhard, M.J., Wright, D, A., Fu, R., Lehrfeld, D.P., Carlson, K. (2015). Urban/rural disparities in Oregon pediatric traumatic brain injury. *Injury Epidemiology, 2*, 2-10. Doi:10.1186/s40621-015-0063-2
- Lezak, M.D. (1995). *Neuropsychological assessment*. New York, NY: University Press

- Levinson, E.M. & Palmer, E.J. (2005). *Preparing students with disabilities for school-to-work transition and post-school life*. Retrieved from Vanderbilt.edu.
- LoBianco, T. & Kleinert, H.L. (2013). *Factors in Successful Post-School Transitions. Research Brief*. Retrieved from ED574716.pdf
- McNamee, S., Walker, W., Cifu, D. X., & Wehman, P. H. (2009). Minimizing the effect of TBI-related physical sequelae on vocational return. *Journal of Rehabilitation Research and Development*, 46, 893-908. doi: 10.1682/JRRD.2008.08. 0106
- in acquired brain injury'’. *Disability and Rehabilitation*, 32,14,1140-1147.
- Malec, J.F., Brown, A.W., Leibson, C.L., Flada, J.T., Mandrekar, J.N., Diehl, N.N., & Perkins, P.K. (2007). The mayo classification system for traumatic brain injury severity. *Journal of NeuroTrauma*, 24, 1417-1424
- Malec, J., Buffington, A., Moessner, A., & Degiorgio, I. (2000). A Medical/Vocational Case Coordination System for Persons with Brain Injury: An Evaluation of Employment Outcomes. *Archives of Physical Medicine and Rehabilitation*, 81, 1007–1015.
- McCaleb, K.N. (2003). *The relationship between brain injury, brain injury indicators and the provision of school services*. Available from ProQuest and Theses.
- Migliore, A., Timmons, J., Butterworth, J., & Lugas, J. (2012). Predictors of employment and post-secondary education of youth with autism. *Rehabilitation Counseling Bulletin*,55, 176-184.



National Data and Statistical Center (NDSC) (n.d.) *Traumatic brain injury*. Retrieved from nrd.org

National Center for Education Statistics (2018). *Fast facts*. Retrieved from nces.ed.gov

National Center for Education Statistics (2017). *The condition for education 2017*. Retrieved from nces.ed.gov

National Highway Traffic Safety Administration (2015). *2015 motor vehicle crashes: Overview*. Retrieved from nhtsa.dot.gov

Office of vocational rehabilitation (2018). *Vocational rehabilitation*. Retrieved from kcc.ky.gov

O'Neil-Pirozzi, T.M., Corrigan, J.D., & Hammond, F. (2017). *Studying employment following traumatic brain injury*. Retrieved from tbims.org

Owensworth, T. & McKenna, K. (2004). Investigation of factors related to employment outcome following traumatic brain injury: A critical review and conceptual model. *Disability and Rehabilitation*, 26, 765-783. doi: 10.1080/09638280410001696700.

Pedhazur, E.J. (1997). *Multiple regression in behavioral research: Explanation and prediction*. Belmont, CA: Wadsworth

Peek-Asa, C., Zerling, C., & Stallones, L. (2004). Acute traumatic injuries in rural populations. *American Journal of Public Health*, 94, 1689-1693

- Penna, S., Novack, T.A., Carlson, N., Grote, M., Corrigan, J.D., & Hart, T. (2010). Residence following traumatic brain injury: A longitudinal study. *Journal of Head Trauma Rehabilitation*, 25, 52-60
- Pierce C.A. & Hanks, R.A. (2006). Life satisfaction after traumatic brain injury and the World Health Organization model of disability. *Journal of Physical Medicine Rehabilitation*, 85, 889-898.
- Phillips, J. & Radford, K. (2014). Vocational rehabilitation following traumatic brain injury: What is the evidence for clinical practice? *Advances in Clinical Neuroscience and Rehabilitation*, 14, 14-16
- Plesnila, N. (2007). Decompression craniotomy after traumatic brain injury: Recent experimental results. *Progress in Brain Research*, 161, 393-400.  
doi:10.1016/S0079-6123(06)61028-5
- Premuda-Conti, P. (2009). *Demographic and service variables as predictors of state-federal vocational rehabilitation system competitive employment outcomes among consumers with traumatic brain injury*. (Doctoral dissertation) Available from ProQuest and Theses.
- Rehabilitation Services Administration (2017). *Regulations implementing the rehabilitation Act of 1973, as amended by the workforce innovation and opportunity Act*. Retrieved from [www.ed.gov](http://www.ed.gov)

- Robertson, B.D. (2009). Differences in service delivery and patient outcome between rural and urban areas: The case of TBI at a level 1 pediatric trauma center in north Texas. (Doctoral dissertation) Available from ProQuest and Theses.
- Rumrill, P., Wehman, P., Cimera, R., Kaya, C., Dillard, C., & Chang, F. (2016). Vocational rehabilitation services outcomes for transition-age youth with traumatic brain injury. *Journal of Head Trauma Rehabilitation, 80*, 10-18
- Sbordone, R.J., Seyranian, G.D., & Ruff, R.M. (2000). The use of significant others to enhance the detection of malingerers from traumatically brain-injured patients. *Archives of Clinical Neuropsychology, 15*, 465-477.
- Shames, J., Treger, L, Ring, I.T., & Giaquinto, S. (2007). Return to work following traumatic brain injury: Trends and challenges. *Disability and Rehabilitation, 29*, 1387-1395. doi: 10.1080/09638280701315011
- Scherer, M., Davis, L.C., Sander, A.M., Caroselli, J.S., Clark, A.N., & Pastorek, N.J. (2014). Prognostic importance of self-reported traits/problems/strengths and environmental barriers/facilitators for predicting participation outcomes in persons with traumatic brain injury: A systematic review. *Archives of Physical Medicine and Rehabilitation, 95*, 1162-1173.
- Solovieva, T.I., & Walls, R.T. (2014). Barriers to traumatic brain injury services and supports in rural settings. *Journal of Rehabilitation 80*, 10-18.

- Southward, J.D., & Kyzar, K. (2017). Predictors of competitive employment for students with intellectual and/or developmental disabilities. *Education and training in Autism and Developmental Disabilities*, 52, 26-37
- Spearman, R.C. Stamm, B.H., & Tivis, L.J. (2009). Traumatic brain injury state planning grant: Preparing for change in a rural state. *Brain Injury*, 21, 837-849. doi: 10.1080/02699050701426857.
- Sykes-Horn, W., Wrigley, M., Wallace, D., & Yoels, W. (1997). Factors Associated with Awareness of Vocational Rehabilitation Services after Traumatic Brain Injury. *Archives of Physical Medicine and Rehabilitation*, 78, 1327–1330.
- Teasdale, G. & Jennett, B. (1974). Assessment of coma and impaired consciousness. A practical state. *The Lancet*, 304, 81-84
- Test, D.W., Mazzotti, V.L., Mustian, A.L., Fowler, C.H., Kortering, L., & Kohler, P. (2009). Evidence-based secondary transition predictors for improving post school outcomes for students with disabilities. *Career Development for Exceptional Individuals*, 32, 160-181. doi: 10.1177/0885728809346960
- Thomas, L.C., Burker, E.J., & Kazukauskas, K.A. (2015). Thinking outside the box: maximizing vocational outcomes post-traumatic brain injury through rehabilitation counseling and recreation/leisure activities. *Journal of Applied Rehabilitation Counseling*, 46, 37-44.
- Thurman, D.J. (2016). The epidemiology of traumatic brain injury in children and youths: A review of research since 1990. *Journal of Child Neurology*, 31, 20-27. doi:10.1177/0883073814544363.

- Thurman, D.J., Alverson, C., Dunn, K.A., Guerrero, J., & Shiezek, J.E. (1999). Traumatic brain injury in the United States: A public health perspective. *Journal of Head Trauma Rehabilitation, 14*, 602-615.
- Todis, B. & Glang, A. (2008). Redefining success: results of a qualitative study of post-secondary transition outcomes for youth with traumatic brain injuries. *Journal of Head and Trauma Rehabilitation, 23*, 252-263.
- Todis, B., Glang, A., Bullis, M., Ettl, D. and Hood, D. (2011). Longitudinal investigation of the post-high school transition experiences of adolescents with traumatic brain injury. *Journal of Head Trauma Rehabilitation, 26*, 138- 149.  
<http://dx.doi.org/10.1097/HTR.0b013e3181e5a87a>
- Trexler, L.E., Parrot, D.R., & Malec, J.F. (2016). Replication of a prospective randomized controlled trial of resource facilitation to improve return to work and school after brain injury. *Archives of Physical Medicine and Rehabilitation, 97*, 204-210.
- Tripepi, G., Jager, K.J., Dekker, F.W., & Zoccali, C. (2008). Linear and logistic regression analysis. *Kidney International, 73*, 806-810.  
Doi:10.1038/sj.ki.5002787
- Tsaousides, T., Ashman, T., & Seter, C. (2008). The psychological effects of employment after traumatic brain injury: Objective and subjective indicators. *Rehabilitation Psychology, 55*, 456-463. doi: 10.1037/a0012579
- Tsaousides, T., Warshowsky, A., Ashman, T. A., Cantor, J. B., Speilman, L., & Gordon, W. A. (2009). The relationship between employment-related self-efficacy and

quality of life following traumatic brain injury. *Rehabilitation Psychology*, 54, 299-305. doi: 10.1037/a0016807

United States Department of Labor (n.d.). *WIOA review*. Retrieved from doleta.gov

United States Census Bureau (2010). *Decennial Census of Population and housing*. Retrieved from census.gov

United States Census Bureau (2016). *Population*. Retrieved from census.gov

USA. Gov (2017). *Education*. Retrieved from usa.gov

U.S. Department of Education Report (2018). *Preparing for life after high school: The characteristics and experiences of youth in special education*. Retrieved from ies.ed.gov

U.S. Department of Education (2018). *Every student succeeds act (ESSA)*. Retrieved from ww2.ed.gov

U.S. Department of Education (2017). *Achieving vocational success after traumatic brain injury*. Retrieved from ww2.ed.gov

VR Research in brief (2017). *Achieving vocational success after brain injury*. Retrieved from ed.gov

Wehman, P., Chen, C., West, M. & Cifu, G. (2014). Transition planning for youth with traumatic brain injury: Findings from the National Longitudinal Transition Survey-2. *NeuroRehabilitation*, 34, 365-372.

Werner, C. & Englehard, K. (2007). Pathophysiology of traumatic brain injury. *British Journal of Anesthesia*, 99, 4-9

World Health Organization (2018). *Neurological disorders: Public health challenges*. Retrieved from who.int

Ylvisaker, M. Todis, B., Glang, A., & Tyler, J. (2001). Educating students with TBI: Themes and recommendations. *Journal of Head trauma and Rehabilitation*. 16, 76-93.

Zint, M. (n.d.) *Power analysis, statistical significance, and effect size*. Retrieved from meera.snre.umich.edu

## VITA

Lebogang Tiro

### Education

2014-2016	Graduate Certificate in Developmental Disabilities University of Kentucky
2013-2015	Masters in Rehabilitation Counseling University of Kentucky
2006-2008	Master's Degree in Counseling and Human Services University of Botswana, Botswana
2003-2006	Bachelor's Degree in Special Education University of Botswana, Botswana
1994-1996	Diploma in primary Education Tlokwen College of Education, Botswana

### Certifications

2017-Present	Crisis Prevention Institute
2017-Present	Cardiopulmonary Resuscitation
2017-Present	Administration of Medication
2016-Present	Certified Rehabilitation Counselor

### Professional Experience

2015-Present	Facilitator: Masters in Rehabilitation Counseling program University of Kentucky, Lexington, KY
2011-2013	Lecturer- Counseling and Human Services Program University of Botswana, Botswana
Jan 2010-Dec 2010	Head of Department- Learning Difficulties Kontle Primary School
Jan 2009-Dec 2009	Senior teacher grade I and Brailist Linchwe Primary School, Botswana
Jan 2008-Dec 2008	Senior Teacher grade I Hereford Primary School, Botswana
2001-2002	Senior Teacher Grade I Hereford Primary School, Botswana
1997-2001	Senior Teacher Grade II Hereford Primary School, Botswana

### Publications

#### **Book Chapters**

Harley, D. **Tiro, L.** & Alfulayyih, M. (2017). Challenges after natural disaster for rural residents with disabilities. In D. Harley, N.A. Ysasi, M. Bishop, & A. Fleming (Eds), *Disability and vocational rehabilitation in rural settings*:



*Challenges to Science delivery* (pp. 457-475). Cham, Springer.

Ysasi, N.A. & **Tiro, L.** (2017). Marketing vocational rehabilitation services in rural communities. In D. Harley, N.A. Ysasi, M. Bishop, & A. Fleming (Eds), *Disability and vocational rehabilitation in rural settings: Challenges to Science delivery* (pp. 545-552). Cham, Springer.

Dunkley, L. Alfulayyih, M., **Tiro, L.**, Kim, B.J., & Harley, D. (2017). Adolescents and transition students with disabilities in rural areas. In D. Harley, N.A. Ysasi, M. Bishop, & A. Fleming (Eds), *Disability and vocational rehabilitation in rural settings: Challenges to Science delivery* (pp. 545-552). Cham, Springer.

Harley, D.A., Bishop, M., & **Tiro L.** (2016). Persons with disabilities and addictions. In D. Capuzzi & M.D. Stauffer (EDS), *Foundations of addictions* (3<sup>rd</sup> ed.). Boston: Pearson.

## Articles

Bishop, M., Fleming, A.R., **Tiro, L.**, & McDaniels, B.W. (2016). Critical readings for doctoral training in rehabilitation counseling: A consensus-building approach. *Journal of Rehabilitation*, 82, 28-35.

Major, T. E., & **Tiro, L.** (2012). Theory Vs Practice: The case of primary teacher education in Botswana. *International Journal of Scientific Research in Education*, 5, 63-70.

## Technical Report

Fleming, A., Bishop, M., Crystal, R.M., Kinyanjui, B., Dunkley, L.R., **Tiro, L.**, & Dornbusch, A. (2015). Kentucky Comprehensive Statewide Needs Assessment 2015. Prepared for: The Kentucky Office of Vocational Rehabilitation and The Kentucky Statewide Council for Vocational Rehabilitation.

## Presentations

**Tiro, L.** (2018, March). Vocational Rehabilitation Services and Barriers for Individuals with TBI in Rural Areas. Presented at the 18<sup>th</sup> Annual NCRE conference, California.

Kim, B. J., Harley, D. Dunkley, L., & **Tiro, L.** (2017, April). Syringe Exchange Programs Kentucky: Compliance and Cultural Implications in Rural Kentucky. Presented at the 17<sup>th</sup> Annual NCRE Spring Conference, CA.

Temple, M. & **Tiro, L.** (November, 2016). Establishing a chapter- Online Webinar

**Tiro, L.** (2016, July). Perspectives and Barriers of Caregivers to Future Planning for Individuals with Intellectual Disability. Presented at the 23<sup>rd</sup> Annual NAMRC Training Conference, New Orleans, Louisiana.

Bishop, M., Fleming, A., **Tiro, L.**, McDaniels, B. (2016, April). Critical readings for doctoral training in rehabilitation counseling: Presented at the 16<sup>th</sup> Annual NCRE conference, California.

**Tiro, L.**, Harley, D. & Feist-Price, S. (2015, April). Addressing Injured Mine Workers: Collaboration in the International Rehabilitation. Presented at the 15<sup>th</sup> Annual NCRE conference, California.

**Research Interests**  
sclerosis

Traumatic brain Injury, narcolepsy, and multiple