

THESIS

TRAUMATIC BRAIN INJURY IDENTIFICATION PROCESSES FOR SCHOOL-
AGED CHILDREN IN RURAL COLORADO SCHOOL DISTRICTS

Submitted by

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ABSTRACT

TRAUMATIC BRAIN INJURY IDENTIFICATION PROCESSES FOR SCHOOL-AGED CHILDREN IN RURAL COLORADO SCHOOL DISTRICTS

Rationale: Recent changes in Colorado legislation have led to the implementation of new procedures in identification and classification of students with traumatic brain injury (TBI). The purpose of this study was to highlight changes to TBI identification protocols and subsequent approbation of services in rural Colorado schools since the change in state requirements.

Methods: The study employed a case study design. Data collection measures included focus groups and interviews with participants, field observations, transcription, coding and triangulation. *Results:* Six patterns emerged from data analysis which spoke to current TBI identification and service delivery protocols in schools: (1) geographic limitations (2) waves of administrative support, (3) low socioeconomic status, (4) fragmented communication, (5) school professionals' perceptions of TBI and (6) cultural attributes of the rural location. *Discussion:* *Influential patterns* present in rural districts lend insight into barriers to implementation of TBI identification and service delivery. Recommendations for improved service delivery in rural areas focus on increasing access of school personnel to professional development as well as state protocols that can facilitate communication between state and local education agencies. These findings in rural Colorado illuminate barriers to TBI service delivery and can be factors to consider for other states attempting to implement new best practices for students with TBI.

DEDICATION

Participants of this study from rural Colorado school districts

Colorado Traumatic Brain Injury Trust Fund

Life Outcomes after Brain Injury Research Team

Master's committee members: David Greene and Lisa Daunhauer

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Introduction

In the United States, traumatic brain injury (TBI) accounts for 435,000 emergency room visits, 37,000 hospitalizations, and 2,685 deaths in students every year (Kurowski et al., 2013). Long-term follow-up studies indicate that symptoms of TBI continue or get worse as students continue through school (Glang et al., 2014; Fulton et al., 2012).

Functional deficits in children with TBI may persist for years after an injury (Rivara et al., 2012). Specifically, quality of life, participation, and adaptive behaviors are compromised for at least three years post-injury. Chronic effects of childhood TBI are numerous, with various medical outcomes that can include chronic headaches, epilepsy, autonomic disturbances (i.e. orthostatic tachycardia), and increased muscle tone (Babikian, Merkley, Savage, Giza, & Levin, 2015). Medical effects of TBI contribute to the alteration of cognitive and neurodevelopmental outcomes leading to impairments in student's attention, processing speed, executive functions, and memory (Babikian, et al., 2015; Fulton, Yeates, Taylor, Walz & Wade, 2012). When cognitive processing skills are compromised, long-term problematic changes in learning, emotional, and behavioral domains can result as well. These changes are most apparent in school and home environments (Babikian et al., 2015). TBI has been proven to have long-term effects on early academic skill development; inhibiting performance in subjects such as math and reading. It is in schools that students with brain injury begin to experience significant challenges with learning and behavioral skills (Babikian et al., 2015). TBI-related challenges place them at higher risk for substance abuse, criminal offenses, and poor academic performance (Ilie, Boak, Adlaf, Asbridge, & Cusimano, 2013).

Twenty-six years ago, with the passage of the Individuals with Disability Education Act (IDEA), the TBI classification was introduced as a federally recognized special education

category (Hooper, 2006). As written in most states' educational policy, in order to qualify to receive services under IDEA, there must be medical documentation of an incident that could have caused a TBI (Glang et al., 2008). Additionally, in some states, assessments must demonstrate a difference in performance from pre- to post-injury (Glang et al., 2008). Thus, even with the federal inclusion of TBI as a major special education category, a large gap persists between the number of students with TBI, who are potentially eligible for special education services under the IDEA legislation, and those actually receiving services. In 2012, those served in the combined categories of deaf-blindness, traumatic brain injury, and visual impairments accounted for one-percent or less of all students receiving services under the IDEA legislation (NCES, 2013a). The number of students treated in hospitals for TBI and the estimated overall prevalence of TBIs in students, is disproportionately larger than those actually receiving special education services for TBI (Glang et al., 2008).

The discrepancy between students receiving services, in contrast to the much larger estimate of students who legitimately need special education support, can be attributed to multiple problematic variables: lack of information for parents, less-than-successful transition of a students from rehabilitation to school, misidentification of students in other disability categories, under identification of brain injury, and lack of educators with knowledge about students with TBI or other types brain injuries (Braine, 2013; Dettmer, Ettl, Glang, & McAvoy, 2014).

It is in the process of identification of TBI that students with brain injuries can be overlooked. The reported 30,000 U.S. students each year who incur long-term disabilities from brain injury, do not include the much larger number of students who sustain mild traumatic brain injuries (mTBI) (Glang et al., 2008).

Mild traumatic brain injury is six to seven times more likely to occur than moderate or severe injuries (Glang et al., 2008). The term *concussion* is often used to refer to a mTBI and describes “a blow to the head, face or neck” that results in a “transient, traumatic disruption of brain activity” and a Glasgow Coma Scale rating between 13 - 15 (Simma, Lütschg, & Callahan, 2013, p. 1134). More than 85% of the brain injuries that occur in the U.S. every year fall under the category of mTBI (Trenchard, Rust, & Bunton, 2013). Despite estimated prevalence, students with a mTBI, and possibly many students with moderate TBI, are underserved in schools. During the 2010-2011 school year, approximately 26,000 students, ages 3-21, with TBI were served under the IDEA legislation (NCES, 2013a), when an earlier conservative estimate noted that at least 130,000 students potentially need special education services due to deficits attributable to brain injury (Glang et al., 2008).

Various studies note the importance of ongoing education for parents regarding potential problems that may result from their child’s TBI, in order to help the parent(s) cope with changes in their child’s behavior, cognition and academic needs (Braine, 2013; McKinly, McLellan, & Daffue, 2012; Savage, DePompei, Tyler, & Lash, 2005). A sense of guilt, self-blame and regret can overwhelm parents as the child returns to home and school, and the reality of the child’s injury sets-in (Savage et al., 2005). Concomitantly, there is a lack of mental health resources addressing TBI to assist families who struggle with the transition back to home and school, especially because most special education programs are designed for students who enter the school systems already receiving services for special needs from their birth (Savage et al., 2005). Parents of children with a newly acquired TBI who are not accustomed to the special education system, may feel overwhelmed by the amount of documentation, meetings, and planning required (Savage et al., 2005).

Furthermore, parents encounter barriers when they do address their children's TBI with educational staff. Inconsistencies are present in school personnel's qualifications to support the unique needs of students with TBI and make services available as the student moves between classes and educators (Savage et al., 2005). Parents are encountered with the need to assume the role as educational advocates, though initially parents are not at all familiar with their child's legal rights, or entitlement, to services (Savage et al., 2005).

Another variable inhibiting TBI service delivery is the inconsistency in the transition of students from the medical setting back to their schools (Savage et al., 2005). The transition from hospital rehabilitation centers is highly variable, and the quality of student support is compromised with the lack of, or inadequate, school re-entry protocols for children with brain injury (Ennis et al., 2013; Savage et al., 2005). Students may return to school without any communication from the rehabilitation teams to the educators, which often results in the educational needs of the students with TBI being overlooked (Ennis et al., 2013). On average students receive only approximately 51% of the care recommended for school re-entry and only 72% of care recommended to manage cognitive and communication impairments (Ennis et al., 2013). Care recommended for school re-entry includes interdisciplinary discussion about the student's educational plan, assessment of academic performance and educating the family on advocacy resources (Ennis et al., 2013). To maximize outcomes for students, scholars call for an enhanced medical-school partnership to support a student return to school process following a mTBI, by means of medical professional training on school demands as well as educator training on a systematic gradual return to school process with emphasis on managing symptom exacerbation (Gioia, 2016).

Researchers advocate for improved protocols for identification, assessment and tracking of students (Gioia, Glang, Hooper, & Brown, 2015). The growing number of free, publicly-accessed identification and assessment tools have been made available to educators over the decade are key components to ensure educational teams' oversight of TBI cases in their student population and to use for an ongoing monitoring protocol (Gioia et al., 2015) (see Appendix A for Colorado's free public TBI resources). Included in the monitoring process should be standardized communication between primary health professionals, educators and family. Increased communication facilitates continuity across a student's care continuum and helps the student to avoid a student falling through the gaps between medical and school settings (Braine, 2013; Dettmer et al., 2014). Braine (2013), also calls for school nursing staff to better understand the process of recovery and return to school, to meet any medical needs of a child following TBI. Improved identification, assessment and monitoring protocols for students with TBI is one important step in addressing the discrepancy in service delivery.

Also contributing to the high prevalence of students with TBIs without appropriate special education services are schools without a standardized protocol to identify TBI or brain injury in students (Braine, 2013; Dettmer et al., 2014; Savage et al., 2005). If an event or accident resulted in the hospitalization of a child, the process of service delivery can begin there. If, however, children do not go to the hospital or are not admitted as a patient, the process of identification and start of service delivery lacks a clear starting point. The injury is often not discussed when a student returns to school, so the educators are left to decipher the change in the student's academic, social and behavioral performance without acknowledgment of cause (Hux, Marquardt, Skinner & Bond, 1999). Even more surprising, the process of TBI/brain injury identification in such cases can be significantly more difficult, because symptoms can be long

term and not apparent until later in the student's development (Glang et al., 2008; Hux et al., 1999). If the presence of a TBI goes overlooked by parents, and is never reported to educators, it is common for a students with a TBI to have their disability unidentified and educational needs unmet; ultimately resulting in impaired academic participation (Sample, Greene, Rieger, Pickle & Mathias, in submission).

Identification of an educationally-impactful brain injury, on-going monitoring of the student, and provision of services for students with brain injury continue to be professional challenges for educators who do not believe that they have had sufficient training or access to research on effective teaching practices and interventions (Gioia, Glang, Hooper, & Brown, 2015; Hux, Dymacek, & Childers, 2013; Savage et al., 2005). Educators' lack of knowledge of outcome characteristics of brain injury in students contributes to the widening discrepancy between the thousands of students who have sustained TBI, and the much smaller amount of students who receive appropriate special education services under the IDEA traumatic brain injury category (Hux et al., 2013). A recent study reported that around 25 percent of students who qualified for special education services had a history of one or more possible brain injury incidents (Hux et al. 2013). The study indicated that students may be incorrectly classified in alternate special education service disability categories and therefore are not receiving services specific to brain injury. The process of developing an academic program that supports the needs of students with TBI begins with identification (Savage et al., 2005). School personnel need to be trained to recognize and monitor possible cognitive, emotional and behavioral characteristics of TBI (Braine, 2013).

In 2012, with the Exceptional Children's Educational Act, the state of Colorado changed requirements for qualifying a student for special education services. The law made students

eligible to receive services under the TBI category for those students that have evidence of medical documentation or a “significant history of one or more TBIs reported by a reliable and credible source,” (Exceptional Student Services Unit, 2013, p. 22). In response to the change in legislation, an educational identification (ED-ID) process was developed at the state level to assist schools to begin conducting on-site identification of TBI (Guttormsen, 2014). ED-ID is effectively executed when essential components of training school personnel support the TBI identification process by “identifying the need for program change, increasing awareness through staff trainings, and creating expertise through secondary staff,” (Guttormsen, 2014, p. ii). These factors were recognized as components that promote program development of special education services for students with TBI.

Progress had been made to begin identification of brain injury through the development, testing and use of a screening tool for school aged-children developed at Colorado State University (Dettmer et al., 2007; Sample et al., in submission). The tool measures characteristics that are present in the student’s behavioral and cognitive domains, as well as notes the history of possible acquired brain injury-causing events (Dettmer et al., 2007; Sample et al., in submission). The Brain Check Survey (BCS), is a parent-report screening tool used to initiate the process of brain injury identification in the student population (Sample et al., in submission). A number of screening instruments developed to identify brain injury in school-aged children have not been formally established and implemented as part of public schools’ standard protocol across the U.S. (Sample et al., in submission). In 2013, several years after the new state regulations were put in place, the Life Outcomes after Brain Injury (LOBI) research group at Colorado State University was awarded a three-year grant, funded by the Colorado Traumatic Brain Injury Trust

Fund (CO-TBITF), focused on examining the identification processes currently in place throughout Colorado school districts.

This sub-study examines TBI identification of students in rural schools. The bulk of current research on identification of TBI in school-aged children discusses service delivery in urban and suburban schools. There is limited published research that addresses special education service delivery in rural schools. Provision of services in rural schools is especially challenged. With 34% of U.S. schools in rural districts, including more than 12 million students, or 25 % of the nation’s public school population, there is a need for increased examination of rural schools (National Center for Education Statistics, 2013b) (Robinson, Bursuck & Sinclair, 2013; Weiss, Petrin & Farmer, 2014). Furthermore, rural districts are comprised of a large portion of the nation’s minority groups; “in 18 states, more than 25 percent of rural schools are black or Hispanic, in 24 states, more than 40 percent of rural students are poor,” (Gross and Jochim, 2015, p.6).

The National Center for Education Statistics (NCES) defines U.S. school districts using an “urban-centric” classification system with the four main categories: city, suburb, town and rural (NCES, 2013b). The four categories are each further divided into three subcategories, or “locales” (NCES, 2013b). Locales are defined by distance from an urban center plus the population count of the area. Rural school districts are described by the following locales:

- i.) *Rural, fringe*: Census-defined rural territory that is less than or equal to 5 miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster.
- ii.) *Rural, distant*: Census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an urbanized area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster.
- iii.) *Rural, remote*: Census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster,” (NCES, 2013b, p. B-2 – B-3).

The NCES classification of rural districts uses population count and distance from an urban center to determine if a school falls in a rural district; however rurality is “not simply an attribute of place” (Gross and Jochim, 2015, p.5). Rather, it is an attribute of attitudes towards, work in which locals engage, the local’s relationship to the land and community as well as how time is spent. For this reason, the NCES rural locale classifications may exclude populations that contain rural attributes, but due to distance or population count the school can still be categorized as a locale that is *urban*, *suburban*, or *town*. Moreover, locale codes for every district are assigned based on the population of the majority of the schools in the districts (personal conversation with statistician P. Keaton at NCES, October, 2015). The population count per school is averaged with the surrounding schools to determine the district locale category. Therefore, a school within a particular locale may be rural by population count, but the district may not be categorized as a rural locale because one school in that district that contains a majority of the students may cause the district’s locale to be categorized as *urban*, *suburban*, or *town*. With this in mind, this study does not only consider populations that are classified by NCES as rural. "Rural" in this study is defined by characteristics of the place. Districts considered to be *characteristically* rural include those districts that report reduced funding, geographic inaccessibility and/or uniquely rural activities that students participate in their free-time.

Rural schools face challenges distinct from urban schools that affect the most fundamental aspects of education (Bryant, 2010; Gross and Jochim, 2015; Weiss, Petrin, & Farmer, 2014). Education scholars have noted that the primary obstacle for rural schools is the federal government’s “willful ignorance” of school conditions and school needs (Bryant, 2010, p. 55). Rural schools have fewer resources, and rural districts receive two percent less to cover

district budgets than urban districts (Bryant, 2010, p. 55). Rural schools, like urban schools, however, have a need for increased quality professional development for educators (Beesely, 2011; Robinson, 2013). An added challenge in rural schools is the low professional retention rates that perpetuate a cycle of “rotating educators” (Beesely, 2011). Filling vacancies of educators who leave schools also is difficult. Furthermore, rural schools struggle to meet compliance standards for education laws and regulations designed for ‘big-city schools,’ (Gross and Jochim, 2015). Rural schools struggle to balance the allocation of funds between facility improvement, competitive educator salaries to attract more qualified educators, and to meet government standards that have been tailored to urban districts (Bryant, 2010). Challenges and constraints that rural districts face are exacerbated when it comes to allocating funds for special education, training and retaining special education professionals and ultimately, meeting the needs of special education students (Weiss et al., 2014).

Problems that are presented in rural districts are compounded when it comes to providing services to special populations. Specifically, “recruiting, retaining, and professionally supporting,” related service providers qualified to support special populations is particularly difficult in rural schools, (Bailey and Zumeta, 2015, p. 41). Professionals are reluctant to work in rural districts where they have reduced resources for services and may risk “professional isolation” (Bailey and Zumeta, 2015, p. 41). When professionals do accept positions in rural districts, it is common for them to stay for a limited time, which inhibits development of skills and knowledge tailored to rural district populations. Additionally, due to geographic inaccessibility and reduced funding; professionals have limited access to networking, exchange of knowledge with other professionals, as well as access to continuing education.

Despite the widespread attention to TBI identification and allocation of services nationwide, there is no information how the demographic variables of rural districts (i.e. socioeconomic status and race) may influence perceptions of TBI (Block, West, & Goldin, 2016). Rather, available information largely addresses characteristics of urban populations. Research into rural district TBI special education service delivery can provide further insight into perceptions surrounding TBI among rural populations.

This qualitative case study will focus on the current practices of identification of TBI in students for special education eligibility in rural public districts in Colorado. The general research questions for this study include:

1. What is the current process for TBI identification in the rural school districts?
2. In what ways does the rural environment of the school influence the identification process?
3. What is the understanding of the needs of students with brain injury in rural school districts?
4. What are the greatest barriers and supports for identification of TBI in rural school districts?
5. Are there changes anticipated in the rural school districts' process of identification of TBI?

Methods

Purpose and Design

The purpose of this qualitative case study in rural Colorado was to gather current knowledge related to the assessment process by which students are found eligible for special education services under the category of TBI, with the subsequent expectation of provision of services to such identified students. The case study design is a comprehensive strategy used to observe a process “within a real-life, contemporary context or setting” (Creswell, 2013, p. 97). The design, as described by Creswell (2013), was chosen for this study in order for this researcher to gain an understanding of methods, procedures and attitudes regarding the process of TBI identification through detailed, in-depth data collection in rural Colorado.

Definitions.

- *Traumatic brain injury (TBI)* – “An injury that disrupts the normal function of the brain. It can be caused by a bump, blow or jolt to the head, or penetrating head injury,” (Center for Disease Control, 2015, pg. 15).
- *Acquired brain injury (ABI)* – “An injury to the brain, which is not hereditary, congenital, degenerative, or induced by birth trauma. The main causes are traumatic brain injury (TBI), cerebrovascular accident (CVA) and brain tumors,” (Luna, et al., 2014).
- *Related services* – “Developmental, corrective, and other supportive services as are required to assist a child with a disability to benefit from special education” including but not limited to: “speech-language pathology and audiology services, interpreting services, psychological services, physical and occupational therapy,” (U.S. Department of Education, n.d.[a])
- *Special education* – “Specially designed instruction... to meet the unique needs of a child with a disability,” (U.S. Department of Education, n.d.[b]). This includes all related services.
- *Boards of cooperative educational services (BOCES)* – Is an organization comprised of two or more school districts in close proximity that form an educational service agency to more efficiently deliver services across districts (Colorado BOCES Association, 2016). BOCES allow districts to share costs and pool funding which allows districts to provide services that might not otherwise be available.

Participants and Data Collection

In order to reach individuals who participate in the identification of students with TBI, whether the process requires medical documentation or the districts have implemented educational identification of TBI, researchers in the Department of Occupational Therapy at Colorado State University were required to obtain CSU-IRB approval, and were required to obtain research approval from each selected rural school district's respective IRB board/Committee/Officer. As approval was obtained from each school district or BOCES, the project staff communicated with educational staff in rural districts to organize one-on-one interviews and/or focus groups with participants, and obtained written approval from them on site, prior to any data collection activities.

Critical case sampling (Creswell, 2013) within each district was used for the recruitment of district special education and regular education teachers, and related services staff including school psychologists, school nurses, occupational therapists, physical therapists, speech and language therapists, who participated in the evaluation or identification process of students with probable brain injuries. The strategy for choosing which rural school districts to recruit for this study involved applying to school districts that had sent personnel to attend training sessions on TBI identification, held by the State Department of Education, the Colorado TBI Trust Fund, and the Colorado TBI Program. As we sought out rural school districts, we were intentional in recruiting at least one of the districts that is considered remote, as defined by the NCES definitions of locales. Three rural school districts were recruited for this thesis project.

Interviews were conducted from May 2015 to April 2016. For the larger study, throughout Colorado, a total of 10 districts agreed to participate. Four districts were contacted by email and declined or the district's IRB refused to approve the project proposal. Seven additional

districts were contacted by email and did not response. Interview questions written in advance, were open-ended, and focused on the researcher gaining an understanding of the participants' experiences regarding the process of determining student eligibility for special education services under the TBI category. Written materials were sent before each focus group met to describe the study and outline questions that would be asked during the interview. Examples of interview questions are listed in Table 1. Focus group interviews consisted of two - four related service professionals who were in some way involved in TBI identification and service delivery. Professions included in the focus groups were social workers, school psychologists, occupational therapists and special education teachers (see Table 2).

Table 1

Selection of Focus Group Questions.

- I. Can you describe the process you and your colleagues use to identify TBI?
Probe: Thinking of specific cases, what steps were taken in the brain injury identification process for students?
 - II. How have parents responded to the process of TBI identification and efforts for delivery of services specified to TBI?
 - III. Do you find that the families in your district live here for the duration of their student's education?
Probe: For the families that move, how does that influence tracking of their educational and medical histories?
Probe: For the families that move into your district, what success do you all have in obtaining their educational and medical histories?
 - IV. For districts who indicate that they are using the new educational identification protocol, can you identify barriers encountered trying to implement this new policy for students with possible, unidentified TBI?
 - V. Can you identify sources of injury that are more common to your student population?
 - VI. What seemed the most helpful information for you when you attended the training(s) by CDE, related to identifying and assessing needs of students with possible TBI?
-

Table 2

Demographics of Rural School Participants

	District 1	District 2	District 3
Participants, n = 11	4	4	3
Profession	School psychologist	School psychologist	School psychologist (2)
	Speech-language pathologist	Speech-language pathologist	Occupational therapist
	Special education teacher (2)	Social worker	
		Occupational therapist	

To form a descriptive overview of the TBI identification process in rural schools multiple sources of data were collected. The sources of data included digital audio recordings and written field notes from interviews and focus groups, as well as written artifacts (available documents related to the evaluation processes for eligibility for special education services) from the sites. The researcher kept confidential any identifying information of participants.

Reflexivity. Throughout the study preparation, data collection, and data analysis, the researcher kept a reflexive journal as a record of her personal perspectives, frame of reference, stereotypes and assumptions that were present before, during and after onsite visits at the rural school districts. The researcher ascribes to the belief that all human needs should be upheld for all populations. Specifically, students with disabilities should receive as much support as needed to ameliorate their gaps in educational attainment. Additionally, the researcher’s master's coursework in occupational therapy has framed her understanding that there is a dynamic interaction of people with their environment, that influences how people perform activities in their everyday life. Furthermore, she understands that there is a strong mind-body connection that influences one's overall health and wellbeing.

Data Analysis

The objective of the data analysis was to understand the process of TBI identification for students in Colorado rural schools, and organize the results in a manner that highlights relevant findings. This researcher prepared the study's data by transcribing interviews and focus group recordings; compiling transcripts, observation field notes, and written artifacts; and then reducing the data into patterns and unique instances through the process of coding (Creswell, 2013). As the researcher recognized key issues in each transcript, she proceeded to note common patterns that were similar between the transcripts, which were described, defined and displayed in tables. For the first district, triangulation of codes (Creswell, 2013) was accomplished by individually reading and coding transcripts then findings were discussed with the Occupational Therapy Department's representative on the thesis committee. For the remaining two districts, peer-review of codes by this researcher's thesis advisor occurred to confirm or reject accuracy of codes.

Results

Results from the data analysis process illuminated current practices of identification of students with brain injury for the purpose of students obtaining 504 or IEP service provision. Emergent patterns found in the transcripts of the audio-recorded interviews and focus groups about the process of TBI identification across rural Colorado districts included: geographic limitations, waves of support from state and local education administrators, socioeconomic status of families, fragmented communication at many levels, possible rural culture-related attributes of TBI, as well as school professionals' perception of TBI.

Geographic Limitations

The rural school systems we came to know all were confronted with geographic limitations to TBI identification and service delivery that seemed to be associated with the schools' rural locations. Specific limitations that participants reported included difficulty due to distance from urban centers; distance between schools within districts; and the "revolving door" of educational staff. A district's distance from urban centers, where TBI trainings often are held, greatly impacts the time required to travel and time away from the professionals' work place, both of which necessitate additional funding. Conversely, due to distance or remote terrain, rural districts may be less likely to attract TBI policy-focused training groups to travel to their location. Another geographic limitation that rural schools face is the large area that related service professionals cover within the school district, or BOCES, in which they are employed. Many professionals find themselves being stretched thin as they commute many miles each school day to reach the various schools in their assigned caseload. Several of the rural professionals we spoke with expressed feelings that they do not have enough time to deliver quality services to students in schools they serve. Rural schools in remote areas also face the

added challenge of attracting special educators and related service providers to work in districts that are far away from more urban areas, and that may not pay personnel as well as they might be paid in certain urban areas. Program directors struggle to attract and retain qualified therapists and special educators without the monetary resources, or the varied nearby cultural and/or educational centers, to incentivize potential employees. The presence of both patterns: recruitment, as well as retention problems, and low levels of related service staff, increase the difficulty in developing and maintaining a group of district/BOCES staff members who have the skills and information to serve in the capacity of functional and active “TBI teams¹” (acronyms of the original, state-organized and trained teams are omitted to comply with confidentiality needs). Therefore, this pattern of “geographic limitations” is linked closely with the following one.

Waves of Administrative Support

A number of rural school study participants reported that there has been varying support and organization, over the years, for TBI program development from local and state education agencies. The outcome, as reported by several study participants is much less priority-setting around initiatives to emphasize either TBI prevention or TBI identification for school students. Several education team members explained that in years past there were waves of trainings, staff outreach and program development, from state agencies. Then, “TBI dropped off the face of the planet,” (Participant 3.3, school psychologist). Reduced momentum for addressing TBI-related concerns was seen as a fairly direct outcome of the district “TBI teams” dissipating, when the increased focus from the state level faded out. A second explanation for reduced emphasis by

¹ TBI teams are made up of multidisciplinary school personnel with the objective to provide consultation and support for school staff who are providing services for students with TBI (Colorado Department of Education, 2013). The TBI teams rely on leadership and advocacy of members for program implementation of the ED-ID process (Guttormsen, 2014).

educators in identification and in maintaining coordinated TBI teams was offered by other study participants, who explained that their district staff received one-time funding for staff to travel and take time off work to attend TBI trainings. After attending this training, the school professionals relayed information to colleagues and organized them to form a local school-based TBI team. Over time, however, the established TBI-team members, who also were members of various other educational initiatives became overloaded with team work, and the emphasis on TBI, with a unique team addressing only TBI-related issues, seemed to have been relegated to a background activity. Third, there has been inconsistent support from local administrators when professionals attempt to implement new TBI policies. This study's participants explained that local administrators and general education teachers have not consistently been informed about the prevalence and persistence of the TBI condition, so the educational team members hoping to implement new policies and protocols such as the educational identification of TBI, which can replace the historical requirement for medical documentation, find little support from those administrators in moving forward. Therefore, our study participants reported resistance from other school professionals when the staff trained in the ED-ID protocol attempted to qualify a student for special education services by implementing the newer state-established TBI protocols, rather than require formal medical documentation of a TBI.

Low Socioeconomic Status

According to the study participants, socioeconomic attributes of local populations also influence TBI service delivery. Rural district participants reported that the transient lifestyles and subsequent chaotic home environments of families faced with un- or underemployed families in their area can present barriers to TBI identification and subsequent provision of 504 or special education services for some students in need (See Appendix B for population characteristics of

sample school districts). Families of low socioeconomic status (SES) are more prone to move from one residence to another within a year's time for a variety of reasons. Study participants expressed difficulty with numbers of students who come and go each year, and few of the transferring students arrive with any accompanying information on their educational history. One related service provider explained that her student caseload has experienced on average a 50 percent turnover of students each year. School staff must call students' previous schools and track down parents to identify and then interpret the student's educational needs. In addition, students of homes in lower SES locations often have parents who are forced to commute multiple hours a day into neighboring towns that are more urban and/or more tourist-drawing, in order to find and maintain employment. Study participants reported that by the time many of those parents get home in the evening, there virtually is no time or energy left for the parent(s) to attend school IEP-related meetings for their child, or even take their child to required medical appointments.

A chaotic home environment is another attribute of the students from low SES families that makes TBI identification difficult. Absence of biological parents, frequent home changes, and very limited time to spend with children creates an environment that is unstable for students. Students may present with behaviors that are atypical. Yet, for some of them unsettled home environments make it difficult for school professionals to determine whether or not the student's behaviors are a result of living in a chaotic home environment or from having sustained a brain injury.

Fragmented Communication

Ineffective, or minimal communication between schools, and even within schools, can impede transmission of students' medical and educational histories. Various rural study

participants explained they have no clear protocols between professionals within the same school to communicate when a child has been injured during recess, sports or during out of school activities. The example was given that nursing staff may learn and document that a student has a history of head injury, but they do not necessarily have an established protocol for communicating this information to special educators and related service professionals who then could assess the student for brain injury. The sometimes poor communication within and between departments, combined with students transferring schools often, makes it particularly difficult for educational teams to continue prior special education services for a student moving from one school to another. One related service provider we interviewed cited the story of a recent student transfer incident, wherein halfway through the year the staff found out that the student had an open IEP at his previous school. Furthermore, various participants stated that their school had a set protocol for concussions; yet, concussion procedures do not carry over to related service professionals or educational history records. A student may be injured during sports, physical education class or at recess, and the nursing department or athletic trainer may tell parents the concussion protocol, but there may be no established mode of communication between departments to make related service professionals aware of the injury and how the injury was addressed. This lack of information transmission between and within schools understandably results in frustration with current communication systems.

School Professionals' Perception of TBI

Educator and related service professionals' perceptions of TBI influence assessment, categorization of the disability and service delivery. Level of understanding of TBI disability and comfort with addressing assumed medically-oriented symptoms renders some educational professionals feeling under-qualified for assessing and delivering services to students with TBI.

One participant states “[I] didn’t know to ask those question about TBI and I wouldn’t know what to do with the information if I got it,” (Participant 1.2, special education teacher). As a result, when professionals are faced with the question of whether a student with multiple TBI symptoms and history of head injury should be placed in the TBI special education category, the professionals have, on occasion, categorized some of these students in other, more familiar, disability categories. In this case, students are more likely to be placed in categories including *speech and language disability, learning disability or developmental disability*. When a student is identified with brain injury, however, school staff and related service professionals reported being more understanding of deficits or behaviors with which the student presents. Participants stated that if a student’s behavior or academic performance has changed, when staff learned of a student’s past head injury there was an ‘aw-hah’ moment. If staff has knowledge of a TBI, even if the student is not placed in a special education category, knowledge of the condition allows teachers and related support professionals to make accommodations to address the needs of students in the classroom and be “more forgiving” of behaviors. Change in perception of child’s behavioral symptoms was true whether the student had an individualized education plan (IEP) for a TBI diagnosis or merely a verbal account of a head injury was reported. When asked if she thinks the services changed when a student was recognized to have a TBI, the participant stated:

“I would hate to say that, because I don’t think that it’s *that* big of a difference. Like sometimes there is resistance to a behavior plan [on the part of special education personnel], but if you talk about how this is part of that frontal lobe dysfunction, or *whatever* it is, you can sometimes get there – so a *little bit* easier,” (Participant 2.1, school psychologist).

That is, when a child’s symptoms or behaviors can be attributed to a condition that can be labeled, it is “easier” for school professionals to respond to the student’s needs.

Use of Time and Cultural Perspectives of TBI in Rural Areas

Cultural attributes of the rural dwelling populace also seemed to influence TBI identification and service delivery. The study participants noted etiology and perceptions of TBI as attributes of the local populations in their districts. Activities in which students in rural districts tend to engage are indicative of how time is spent in these locations. Students known by our study participants to have sustained brain injury over the years in these rural districts or other districts cited, were injured when participating in such activities as bull riding, rodeo-related sports, motocross, automobile transportation across long stretches of country roads, and risky “games” involving children/teens playing on top of moving cars or in pick-up truck beds. Reactions of some of the rural district parents to children and youth who possibly have sustained actual brain injuries, were described as notably ‘old-school’ or ‘macho,’ with those particular parents tending to down-play the possible implications of an injury. Participants explained that parents who minimize an injury are less prone to report such incidents to school professionals, who could monitor their child for possible changes after an injury.

This study strictly analyzed the data that were obtained from the various focus groups and interviews in several rural school districts/BOCES throughout Colorado. Undoubtedly, those rural environments will share many of the same obstacles to identifying and delivering services for students with TBI, with those experienced in urban and suburban schools. Future analysis of the combined set of all of the rural, urban, and suburban data collected throughout the state of Colorado will address and report on that concern. For the purposes of this study, however, the findings have been examined as being from a rural context, and will be reported as that. Further discussion of similarities and differences between urban, suburban, and rural districts in the state therefore is out of the scope of this study.

Table 3

Key Patterns from Rural District Focus Groups and Interviews

Pattern	District 1	District 2	District 3
Difficulty implementing new protocols when resources are geographically distant	X	X	X
Geographic distance between schools limits time of special service professionals at each school in district	X	X	X
Difficulty of TBI team development due to revolving door of educational staff	X		X
Chaotic home environments compound student's educational issues (i.e. behaviors)	X	X	
Low SES demographics contribute to transient nature of population	X	X	X
Limited funding to support staff in gaining access to TBI-related training and maintain an adequate level of support professionals	X		X
Limited power to enforce protocol changes by state-level administration department, and limited support from local administrators to implement state protocol	X		
Rotating related services staff and low level of related services professionals per school in district	X		
Etiology of student brain injuries correlates with time use of students reported by study participants		X	X
Occasionally, some parents' 'macho,' 'tough it out,' 'old school,' attitude toward injury or illness impedes pursuit of appropriate assessment and delivery of services for brain injury		X	X
Teachers seem more understanding of deficits when students have a documented TBI diagnosis with an IEP	X	X	
Waves of support from SEA for different service development initiatives (i.e. TBI, Autism, etc.)	X		X
Concussion protocols for school not related to/in communication with TBI special education protocols	X	X	X
Schools have a set of protocol questions to determine if there is a presence of concussion		X	X

Tailor support services or accommodations to symptoms observed, or use more generalized category (i.e. developmental delay) over TBI	X	X	X
Reduced parent communication with school concerning TBI, in situations where the home environment is 'difficult'	X		X

Table 4

Emergent Patterns and Participant Example

Pattern		Example
Geographic limitations	Distance from urban center	“Yeah, I get all kinds of stuff from the University of Colorado [in Denver], ‘Oh, come to this it’s from four to six on a Thursday night.’ It’s NEVER going to happen out here.” – Participant 1.2
	Distance between schools in district	“But we do feel really torn and we don’t have enough time to really do what we want to be doing because we are traveling and trying to work with all these different schedules, and it makes it hard to access the kids and access all the different teachers that you need to talk with. I think we all feel like we are kind of at the end of our ropes for sure.” – Participant 3.3
	Difficulty of TBI team development due to revolving door of educational staff and low level of related services professionals per school in district.	“No one wants to come here though. It’s too far from anything else.” - Participant 1.2 “The problem [i.e. - recruiting educational staff] is, [this district] is not an attraction, and our salaries are not an attraction.” – Participant 3.3
Waves of support from state education agencies	Limited funding for professional development	“We’re not Metro; we don’t have access to all the tools and supports being on the Western slope the support that we get from CDE is minimal compared to what is offered on the Front Range.” – Participant 1.1
	Dissipated support for TBI initiatives	“It seemed like we were up-and-coming, like a really good team of people who were getting all kinds of trainings and giving our own trainings to staff and doing really good work. Then that team fell apart, and it’s almost like TBI dropped off the face of the planet. I don’t know what happened to it.” – Participant 3.3

Fragmented communication	Lack of communication protocols between disciplines	“The interagency communication, it seems like it takes forever. I just found out yesterday about a student who moved here from a smaller (Native American) community school in February, and we just got the record and there was an active IEP. And that’s very typical, we can go four to five months and not know.” – Participant 3.2
	Difficulty in communicating with families	“So, we spend a lot [of time] trying to get a hold of families, but don’t get a lot of good dialogue. And then it’s not just them, but it’s also just the people in our community, we have a high poverty area.” -Participant 3.1
Socioeconomic status of families	Transient nature of home environment	“He wasn’t reading or writing or anything. He was in the foster system, Dad had him, Mom had him, Dad had him again. He was at the Aunt’s, after a week leaving, coming back, leaving again.” - Participant 1.1 “I think it gets much harder, and then you are doing a lot of calls to previous schools to track down what’s really been going on. So really, this year had been very difficult with kids with significant needs.” – Participant 2.2
	Chaotic home environment	“But there is a lot of neglect, other stuff that would have gone on, reactive attachment disorder, oppositional defiant disorder... We don’t know the trail back.” - Participant 1.1 “Very unstable, I was just talking to a kid and he was just telling me about how he had eight people living in his family [home], and it’s his grandma as the main person holding the whole household together, and then it’s just Aunts and Uncles, and cousins and grandkids.” - Participant 3.3
School professionals perceptions of TBI	Comfort with TBI assessment and intervention	“Cause [I] didn’t know to ask those questions about TBI an I wouldn’t know what to do with the information once I got it, cause I, that’s not my priority.” - Participant 1.2
	Change in attitude with diagnosis of TBI	“We would need that medical person to say, ‘This is about the brain injury, this is not because he is a little stinker... And I think sometimes it’s easier [then] there is more forgiveness.’ –Participant 2.1

	Aptitude of staff to categorize student with TBI condition	“I don’t know how many teachers really understand the brain and how it works. So it is much more comfortable to say, ‘Oh this kid just really struggles in reading,’ versus, ‘There is something in this kids brain that doesn’t function the same way.’” – Participant 1.1
Cultural attributes of rural location	Parent perceptions of TBI disability or injury	“I feel like they are very naïve, and it’s the old school way of thinking especially out here, you know, like, ‘No, you tough it out.’” – Participant 2.2
	Etiology of injury correlates with local time use	“Mmm...middle school and high school you know doing the barrel racing and the roping and bulls.” – Participant 3.2 “One was riding a bull and the other was a ... kid playing on the back of a pick-up truck trying to dunk a basketball.” – Participant 2.1

Discussion

The purpose of this Colorado study was to increase knowledge related to the assessment process by which students are found eligible for services under the special education category of TBI. In light of changes in 2012 to Colorado education law for the process of TBI identification (Exceptional Students Services Unit, 2013), this study was guided by the case study design in order to gain a comprehensive understanding of TBI identification within the real-life context of rural schools. Research questions that propelled this study include:

1. What is the current process for TBI identification in rural Colorado school districts?
2. In what ways does the rural environment of the school influence the identification process?
3. What is the understanding of the needs of students with brain injury in rural school districts?
4. What are the greatest barriers and supports for identification of TBI in rural school districts?
5. Are there changes anticipated in the rural school districts' process of identification of TBI?

This study aimed to deliver sufficient description of results to enhance understanding of the TBI identification process and inform TBI program development in Colorado rural schools.

The results of this study have illuminated challenges rural schools face that are unique to their location and population characteristics. The most consistently-highlighted challenges included: geographic limitations, unpredictable waves of support from local and state education agencies, low and unstable socioeconomic status (SES) of various local populations, school professionals' perceptions of TBI and cultural attributes of the rural location. These challenges

now will be referred to as “*influential patterns*,” in the process of TBI identification in rural schools. Throughout this study the consistent information gathered through focus groups and interviews related to the process of TBI identification was linked to these identified influential patterns.

When describing the identified influential patterns in the current study, the researcher found herself confronting the inherent interdependence between each and every pattern. For example, the pattern of “geographic limitations,” seemed to relate also to the pattern of administrative support concerns. Considering that distance from urban centers is a barrier for educational professionals to access TBI-training, increased support from the state education agency through on-site trainings and on-line seminars, to supplement trainings offered at the state home offices, can enhance and increase the timely learning of new processes and initiatives by rural educational teams. Vast geographic distances in the rural school districts or BOCES, require already short staffed and strained financial resources in the rural districts to be stretched yet further, to address the subsequent need for related service providers to travel far distances during the school day. This strain on resources can diminish the ability of rural school systems to obtain and pay for trainings and on-going skill development, whether they be offered locally, or at the state-level location.

The influential patterns from this study are corroborated by prior studies that cite related service professional feeling under qualified, low parent report of TBI as well as ineffective interagency communication as barriers to service delivery. The participants in the study acknowledge the gap in the incidence of students with TBI eligible for services under IDEA and those actually receiving services. In this study the gap is in part attributed to limited staff comfort with TBI identification. Participants echoed the sentiment from prior research that educators lack

the knowledge of outcome characteristics of brain injury to identify and deliver services to students with TBI. As a result, participants in this study explained that students will often TBI end up in other special education categories or receive accommodations.

Insufficient support from state education agencies and local education agencies is an influential pattern from this study that serves as a barrier to TBI identification and service delivery. As prior research notes, support from education agencies are fundamental to improve protocols for identification, assessment and tracking of students. Lack of standardized means of communication and protocol to identification TBI or brain injury leads to a gap in information between primary health professionals, educators and family. Participants in this study explained they are left to decipher changes in a student's behavior without report of injury from medical professionals or parents and a student's brain injury goes overlooked.

Contrary to prior research, the pattern that emerged in this study regarding teacher perceptions of TBI does not agree that if a student with a TBI disability goes unidentified, the students educational needs go unmet. The researcher in this study found that often students are classified in alternate special education categories, not receiving services specific to TBI. In addition, a TBI diagnosis allows school staff to better understand the needs of the students and reason for changes in academic performance. However, unlike prior research, participants in this study report that support services are tailored to needs of students whether or not the students are placed in the TBI special education category. When a label of TBI is placed on a child the services do not necessarily change to support the child's needs in an improved way.

Characteristics of rural populations including rotating educational staff and reduced resources for rural schools also serve as influential patterns that align with prior research. Rural schools have fewer resources which reduces opportunities for professional development geared

toward TBI and makes it more difficult to attract and retain related service professionals. When professionals do accept positions in rural districts, it is common for them to stay for a limited time, which inhibits development of skills and knowledge tailored TBI and rural district populations. However, influential patterns identified in this study and not mentioned in prior review research regard TBI identification and service delivery specifically in rural schools. Those patterns not cited in prior research include geographic limitations, low SES of families, parent perceptions of TBI disability or injury as well as etiology of injury.

Special Education in Rural Schools

Information from the districts that participated in this study confirms prior research on rural special education. Earlier research points to the need for flexibility from state agencies, continued collaboration between schools and state agencies, and the pursuit of service delivery methods that are more suitable to the conditions in rural districts (Bailey and Zumeta, 2015). In a 2015 report, commissioned by the U.S. Department of Education, researchers outlined how state education agencies can support local education agencies in rural districts to augment special education services. The following recommendations are taken from the report and applied to TBI service delivery.

Provide support for online programs that recruit qualified special education teacher to train and obtain special education licensing (Bailey and Zumeta, 2015). This strategy can be useful for attracting educational professionals who are native to rural districts, and then providing those professionals with a means to earn the professional credential to work in special education. Extended stay in school positions allow professionals to develop, implement, and carry-through TBI protocols tailored to address the local rural population and schools, in a manner to which they might be more receptive.

Support educator professional development through e-mentoring programs to reduce professional isolation and retain quality special education teachers (Bailey and Zumeta, 2015). Rural special educators and related service providers report feeling ill-equipped to address TBI-related challenges that might be manifested. Due to their geographic distance from urban centers rural school professionals report an inability to participate in TBI trainings to advance their assessment and intervention skills. Online, distance-learning programs can provide professional development needed for them to address TBI.

Enable rural special educators to have access to different methods of service delivery to account for low teacher-student ratio or unfilled positions, e.g. the use of online learning and tele-therapy (Bailey and Zumeta, 2015). Participants in this study reported vast distances between some schools in their district, along with small numbers of related service professionals employed in each district, as factors that rob them of the adequate time needed to meet each student's needs. Related service providers might consider the option of conducting online therapy sessions to assess symptoms, and recommend accommodations needed by the student, specific to the outcomes of their TBI.

Support rural schools to maximize federal funding for special education by training staff on grant writing and soliciting support from state education agencies (Bailey and Zumeta, 2015). Training staff to access financial resources available for TBI trainings and professional development would support development of TBI protocols and TBI teams, and increase their skills and success in meeting their learning needs while meeting the educational needs of their students with TBI.

Facilitate continued dialogue with local education agencies to ensure that policies align with rural district values and adapt requirements according to rural contexts (Bailey and

Zumeta, 2015). To promote follow-through, TBI protocols need to align with the rural district's existing school system and culture. TBI education materials can be tailored to the local perceptions of disability and injury as well as common causes of TBI in that context.

Systemic Statewide TBI Protocols

Rural district participants in this study were overall receptive and open to discussing barriers and supports related to TBI identification. Many participants were quite aware of the gaps in their district's TBI protocols. Moreover, participants expressed a desire for more communication and support from administrative agencies to access resources on best practice in schools for students with TBI. Participants echoed prior research that called for increased effort towards creating system-wide state protocols set by state education agencies (Gioia et al., 2015). Recommendations offered by Gioia et al. (2015), emphasize the need for an a) established communication system between medical and school settings; b) availability for professional development and training for TBI teams; c) systematic identification and assessment protocols; d) appropriate accommodations and services for students with TBI; and e) a well-defined TBI team that includes participation of school-based medical professionals, educators, and parents.

Research on Identification of TBI in School-Aged Children

This study increases knowledge of the assessment/evaluation process, by which students are found eligible for special education services under the category of TBI, with the subsequent expectation of the provision of services to the identified students in rural Colorado schools. Results from this study begin to describe the state of TBI service delivery in rural Colorado public schools. This study identified the intersection of two gaps in information: between TBI protocols in schools, and rural education service delivery. There remains a paucity of information regarding communication systems between state and local education agencies; a lack

of TBI-related educational materials tailored to parents and educational staff in rural schools; as well as no organized methods for tracking educational and medical history of students from transient families.

Limitations

The data used in this study were collected over the span of one year. The researchers found that scheduling data collection activities was particularly difficult due to the maze of school schedules reflecting the unique cultures of each school district or BOCES. Students were testing, schools were on break, or district supervisors were protecting their staff from being over-committed to outside projects. Additionally, the institutional review board (IRB) process was time consuming as researchers were required to get IRB approvals not only through Colorado State University, but also through each school district where data were to be collected. All these factors created a major barrier in moving forward with data collection. Due to fairly inflexible scheduling deadlines, the researchers had to remain flexible with the methods of data collection that were most feasible for the participants. The data collection activities varied from district to district, and therefore were not uniform. Some participants were in focus groups, others preferred individual or two-person interviews, and still others insisted on individual phone call interviews, even though the researchers were prepared and wanting to make the long journey to reach their distant and out of the way site. The project team's protocol for data collection called for phone interviews only if no other option was available. Phone interviews do not allow for contextual and non-verbal communication cues to be collected, along with the verbal data that are generated during the individual, small group, or focus group interviews and observation opportunities that occur during the data collection conversations.

Occupational Therapy Service Delivery

Current research continues to point to the under-identification of TBI, despite its high incidence in school-aged children (Glang et al., 2008). In this study the participants expressed lack of comfort working with a student with a medical diagnosis of TBI, followed by their subsequent concerns over how to provide appropriate, needs-based services to TBI-identified students. Occupational therapists have a knowledge of the intersection of medical symptoms and their implications on function. For this reason, occupational therapy practitioners could work to bridge the gap between medical symptoms and academic performance for students with TBI in school settings. Today's rapidly-evolving use of technology in schools opens the door for rural related services providers to use tele-therapy to increase access to special support services in rural schools (Bailey & Zumeta, 2015). Occupational therapists have the opportunity to expand their scope in schools through the use of tele-therapy (Carson, 2012). Promotion of tele-therapy can work to overcome gaps in service delivery for students with TBI in rural schools. Tele-health interventions are an option that takes into account key barriers for rural schools: a.) vast geographic distances between schools and from urban centers that typically discourage related service professionals from wanting to work in rural schools (Bailey and Zumeta, 2015); and b.) professionals' beliefs that they lack the ability to tailor services to the unique needs of students with TBI (Glang et al., 2008). School based occupational therapists in rural schools can implement tele-health interventions to address problem-solving, communication and behavioral strategies for students with TBI.

Conclusion

This study was conducted to increase understanding of the process of TBI identification in school students, and the subsequent provision of appropriate support services. The persistently

low number of students receiving special education services for students with TBI, in spite of high TBI incidence rates, along with the recent change in Colorado special education law, merit in-depth study about how school districts work with students with TBI. A key question propelling this study was how/if the process of ED-ID in rural Colorado has affected school TBI protocol, since the change in the state's special education law. Special focus was given to rural schools which are known to face more barriers in special education service delivery. The study identified *influential patterns* related to TBI service delivery in rural schools, and provided contextual information on special education and related service professionals' methods, procedures and attitudes regarding the process of TBI identification. The results of this study can be used to further understand how a change in wording in state education law, along with a change in the state's TBI identification policy for school students, can impact the process of TBI identification in rural schools. Insight into rural schools' unique culture and circumstances may also stimulate conversation about how to continue to progress with TBI identification and service provision outside of urban environments.

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Appendix A

Online Resources for Traumatic Brain Injury Identification and Service Delivery



Colorado Kids Brain Injury Resource Network

The website was designed through funding from the Colorado Kids Brain Injury Resource Network to serve as a tool for educators, school administrators, school psychologists, related services professionals, and families.

Accessed at:

<http://cokidswithbraininjury.com/>

Brain Injury in Children and Youth: A Manual for Educators



A manual developed to assist school personnel in understanding how the brain injury can best be recognized and served.

Accessed at:

<https://www.cde.state.co.us/cdesped/sd-tbi>



BrainSTARS Manual

The BrainSTARS online manual was funded by a grant from the U.S. Department of Education. The manual tools on the effects of brain injury, and strategies to guide parents and teachers to support students with a brain injury.

Accessed at:

<http://www.brainline.org/content/2011/09/brainstars.html>

Appendix B

Social and Economic Characteristics of Three Cities from their Respective Rural Colorado School Districts in Study Sample

Data from American Community Survey, 2010-2014 5-year estimates.

Subject	District 1			District 2			District 3		
	Estimate	Margin of Error	Percent	Estimate	Margin of Error	Percent	Estimate	Margin of Error	Percent
HOUSEHOLDS									
Total households	6,524	+/-248		543	+/-64		2,375	+/-236	
Average family size	3.54	+/-0.18	(X)	2.79	+/-0.31	(X)	3.12	+/-0.21	(X)
EDUCATIONAL ATTAINMENT									
Population 25 years and over	12,354	+/-278		891	+/-109		4,272	+/-441	
Percent high school graduate or higher	(X)	(X)	86.4%	(X)	(X)	87.4%	(X)	(X)	88.5%
Percent bachelor's degree or higher	(X)	(X)	15.8%	(X)	(X)	17.2%	(X)	(X)	23.3%
RESIDENCE 1 YEAR AGO									
Population 1 year and over	18,684	+/-313		1,174	+/-150		6,313	+/-599	
Same house	14,571	+/-924	78.0%	967	+/-141	82.4%	4,671	+/-590	74.0%
PLACE OF BIRTH									
Total population	18,826	+/-292		1,181	+/-151		6,409	+/-608	
Born in United	17,236	+/-673	91.6%	1,180	+/-151	99.9%	5,728	+/-576	89.4%

States									
EMPLOYMENT STATUS									
Population 16 years and over	15,715	+/-266		941	+/-115		4,968	+/-494	
In labor force	10,107	+/-495	64.3%	502	+/-99	53.3%	2,973	+/-405	59.8%
Employed	8,773	+/-580	55.8%	447	+/-90	47.5%	2,763	+/-382	55.6%
Unemployed	1,307	+/-472	8.3%	55	+/-33	5.8%	168	+/-82	3.4%
INDUSTRY									
Civilian employed population 16 years and over	8,773	+/-580		447	+/-90		2,763	+/-382	
Agriculture, forestry, fishing and hunting, and mining	531	+/-163	6.1%	87	+/-37	19.5%	415	+/-189	15.0%
Construction	316	+/-136	3.6%	64	+/-47	14.3%	392	+/-182	14.2%
Retail trade	1,497	+/-314	17.1%	65	+/-36	14.5%	302	+/-174	10.9%
Educational services, and health care and social assistance	1,601	+/-255	18.2%	110	+/-54	24.6%	362	+/-140	13.1%
Arts, entertainment, and recreation, and accommodation and food services	1,241	+/-351	14.1%	9	+/-10	2.0%	285	+/-140	10.3%
INCOME AND BENEFITS (IN 2014 INFLATION-ADJUSTED DOLLARS)									

Total households	6,524	+/-248		543	+/-64		2,375	+/-236	
Median household income (dollars)	40,190	+/- 3,105	(X)	35,096	+/- 6,029	(X)	60,179	+/- 9,185	(X)
Mean household income (dollars)	56,696	+/- 3,954	(X)	44,934	+/- 6,102	(X)	73,972	+/- 9,345	(X)
PERCENTAGE OF FAMILIES AND PEOPLE WHOSE INCOME IN THE PAST 12 MONTHS IS BELOW THE POVERTY LEVEL									
All families	(X)	(X)	12.6%	(X)	(X)	13.4%	(X)	(X)	7.9%
With related children under 18 years	(X)	(X)	25.4%	(X)	(X)	19.6%	(X)	(X)	13.6%
With related children under 5 years only	(X)	(X)	18.4%	(X)	(X)	50.0%	(X)	(X)	6.9%