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Examining Implementation of the Massachusetts Act Relative to Safety Regulations for School Athletic Programs (Sessions Laws: Chapter 166 of the Acts of 2010): A Multiple-case Study

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A Thesis Presented

By

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DEDICATION

Annie,

You are the stars that light up my sky.
I'll never stop looking up…

Will you marry me?

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I would like to express great appreciation to my committee chair, Professor Maria T. Bulzacchelli, who continually conveyed a sense of purpose in my thesis. Two years ago, I entered her office with a half-conceived idea that has turned into one of my more meaningful endeavors. Without her guidance and her belief in me, this would not have been possible. For all that I have learned, I am grateful.

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To my family; thank you for your support though my life. The lessons you instilled in me as a child are what drive me today.

To my hopeful fiancé, Annie (see Page IV); your love and support are what got me through this process. Sorry for the all spell check requests.

ABSTRACT

EXAMINING IMPLEMENTATION OF THE MASSACHUSETTS ACT RELATIVE TO SAFTEY REGULATIONS FOR SCHOOL ATHLETIC PROGRAMS (SESSIONS LAWS: CHAPTER 166 OF THE ACTS OF 2010): A MULTIPLE-CASE STUDY

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Background/Purpose: Reducing the incidence and negative consequences of concussion among youth athletes is a public health priority. Fifty states have adopted legislation addressing the problem of sports-related concussions among youth-athletes. In 2010, Massachusetts adopted legislation based on Washington State's Lystedt Law, enacting state-wide requirements for high school athletic programs. This study explored how the legislation has been implemented within Massachusetts schools and school-districts and identified factors influential to local implementation.

Methods: A qualitative multiple-case study approach was utilized. US Census data concerning the household median income and population size of the school-district's representative town(s) were used to purposively recruit cases. Semi-structured interviews with a breadth of school-district actors in the Commonwealth of Massachusetts and archival records associated with participating schools were used for analysis. Interview data were analyzed using a conventional content analysis approach. Written documents were subjected to an archival analysis.

Results: 19 participants from 5 schools were interviewed. Interviewed school personnel included 5 athletic directors, 5 coaches, 4 athletic trainers, 4 school nurses, and 1 health and wellness coordinator. Eight case-level themes related to how the regulation was implemented were

identified, and 6 influential factors related to the regulation's implementation emerged. All participating cases decided to utilize neurocognitive baseline testing programs to assist in diagnosing concussions. Cases also decided to place the decision making authority of removal-from-play and return-to-play situations in the hands of athletic trainers. Primary care physicians were expected to provide medical clearance for concussed student athletes. Funding and man-power emerged as a threat to schools' ability to implement the regulation with high fidelity.

Conclusions: At the local level, provisions of the Massachusetts regulation were implemented with high fidelity. However, differences and similarities regarding local-level implementation decisions existed across cases. Conducting the study qualitatively allowed the study to obtain rich detail and identify implementation decisions made within cases. However, the knowledge generated may not be generalizable to other school districts or other states. The study's findings speak to the variability often found when implementation is relegated to the local-level.

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CHAPTER I

INTRODUCTION

A. Public Health Burden of Sports-related Concussion among Youth Athletes

High school athletes are at a particular risk for concussion because of the potential for impacts to the head associated with participating in sports (Schulz et al., 2004). If sports-related concussions are not identified and treated properly, young athletes are at increased risk for permanent brain damage and even death (Schulz et al., 2004). Seven million high school athletes participate in high school sports in the United States each year (Bramley, Patrick, Lehman, & Silvis, 2012; Schulz et al., 2004), making them the largest group of athletes at risk for suffering concussions and their related consequences (Schulz et al., 2004).

American high school athletes suffer approximately 300,000 sports-related concussions each year (Bramley et al., 2012). Sports-related concussions account for approximately 8.9% of all high school athletic injuries (Bramley et al., 2012). Recent research on epidemiologic trends in concussion incidence rates among high school athletes participating in various sports are summarized in Table 1 (Laker, 2011; Marar, McLlvain, Fields, & Comstock, 2012). These studies reveal football as the sport with the highest incidence of concussion in all studies for male athletes. Among female athletes, soccer was the sport with the highest incidence of concussion in every study except for Marar et al. (2012).

Results from the three studies included in the meta-analysis and Marar et al., (2012) indicated that the overall concussion rate for both male and female athletes per 1000 exposures is between 0.175 and 0.49 (exposure defined as 1 athlete participating in a sport per season). However, these concussion incidence rates could be understated. Schulz et al., (2004), Gessel et

al., (2007) and Lincoln et al., (2011) did not include boys' ice hockey within their analysis, a sport that Marar et al. (2012) reported having a concussion incidence rate of 0.54. Boys' and girls' lacrosse, sports that Marar et al. (2012) and Lincoln et al. (2011) reported having concussion incidence rates of 0.3 and 0.4 respectively (boys') and 0.2 and 0.34 respectively (girls'), were excluded in the other studies' analyses. Girls' ice hockey was not included in any study. These exclusions could lead to an underestimate of overall concussion incidence rates. Additionally, evidence suggests that the true incidence of sports related concussion among high school athletes is underrepresented because of reliance studies place on participant self-reporting (Williams & Goodman, 2013).

Table 1: Incidence rates of concussion per 1000 exposures in high school athletes, from prior research

Sports type	**Prior Research Articles**			
	Schulz et al., 2004	Gessel et al., 2007	Lincoln et al., 2011	Marar et. al., 2012
Boys' Sports				
Football	0.33	0.47	0.6	0.64
Ice Hockey	n/a	n/a	n/a	0.54
Lacrosse	n/a	n/a	0.3	0.4
Soccer	0.23	0.22	0.17	0.19
Wrestling	0.03	0.18	0.17	0.22
Basketball	0.1	0.07	0.1	0.16
Baseball	0.11	0.05	0.06	0.05
Girls' Sports				
Soccer	0.13	0.36	0.35	0.34
Lacrosse	n/a	n/a	0.2	0.35
Basketball	0.17	0.21	0.16	0.21
Softball	0.1	0.07	0.11	0.16
Field hockey	n/a	n/a	0.1	0.22
Cheerleading	0.094	n/a	0.06	0.14
Overall	**0.175**	**0.24**	**0.49**	**0.23**

1. Academic Consequences

Research indicates children that suffer a concussion are at risk for problems in acquiring academic skills and higher-order cognitive abilities (Jaffe et al., 1992). Jaffe et al. (1992) completed a study aimed at establishing early neurobehavioral consequences of traumatic brain injury in children ages 6 to 15 years. The study examined 98 children with mild, moderate, and severe traumatic brain injury. Controls were matched for age, gender, school grade, behavior, and academic performance. The study tested for intelligence, memory, motor performance, adaptive problem solving, and academic performance through various assessments. According to the study's results, children that had suffered a concussion showed a decline in intellectual, neurophysiologic, and academic assessment performance compared to matched controls. Test performance was negatively associated with the severity of traumatic brain injury (Jaffe et al., 1992).

2. Economic Consequences

Youth with mild traumatic brain injury have higher healthcare costs compared to youth that have not suffered the same injury. Rockhill and colleagues (2010) performed a prospective cohort study with a 3-year follow up using enrollee records from a 500,000 person HMO group located in Washington State. The database was generally representative of the region's population demographics. Costs were determined using the HMO's accounting information and considered all healthcare services provided for or paid for by the HMO. Four hundred and ninety cases and 1470 controls were selected. Cases were selected if individuals were 14 years old and had suffered a mild traumatic brain injury in 1993 and were identified using computerized records. Three controls were selected for every case and were matched on age, sex, and HMO enrollment at the time of injury. Patients with exposure to mild traumatic brain injury had an

increase, "in the proportion of subjects who had non-zero medical costs…and a 75% increase in mean total costs" (Rockhill et al., 2010, p.1051). The results indicate that healthcare expenditures are significantly higher for children that suffer mild traumatic brain injury compared to children that do not suffer such injury (Rockhill, et. al., 2010).

While there are several studies that examine the health care costs associated with traumatic brain injury, only two offer cost estimates for youth mild traumatic brain injury. Jaffe and colleagues (1993) examined financial costs of mild traumatic brain injury in children by examining 1987/1988 hospital costs and professional fees. Initial hospital charges, professional fees for emergency department services, acute inpatient care, and inpatient rehabilitation were used as a proxy for cost. For mild traumatic brain injury, the median cost was $598 (Jaffe et. al., 1993). The inflation-adjusted cost in 2014 would be $ $1,243.12. Brenner, Harman, Kelleher, & Yeates (2004) used data from the 1997-2000 Medical Expenditure Panel Survey to estimate health care costs in pediatric patients with a mild traumatic brain injury. The per capita expenditure for a sample of 196 patients was determined to be $1044 (Brenner et. al., 2004), or $1,536.09 in 2014 dollars. No study has attempted to determine the economic cost of sports-related concussions.

Research suggests, however, that injury costs for children may not represent the entire expenditure. True injury costs associated with concussions in young children include acute treatment and long-term rehabilitation for the child as well as indirect costs for the guardian or parent (Jaffe et al., 1993). Indirect costs are the estimated cost of lost output associated with diminished productivity such as the loss of wages for a parent or guardian (Jaffe et al., 1993).

B. Mechanism of Injury

1. Definitions

Despite their synonymous usage among scholars, a difference in clinical definition exists between the terms concussion/mild traumatic brain injury and traumatic brain injury. Traumatic brain injury implies a scale of severity in which concussions typically encompasses a less severe subset (Halstead & Walter, 2010). For the purpose of this study, the terms 'concussion' and 'mild traumatic brain injury' (mTBI) will be used interchangeably and will refer to a less severe form of 'traumatic brain injury'. The term 'sports-related concussion' will refer to a concussion sustained during practice or game by an athlete.

2. Biomechanics

Previous research has produced several conclusions regarding how traumatic brain injury occurs. When the head makes contact with a stationary or mobile object, a rapid change in velocity and possible deformation of the skull occurs (Institute of Medicine, 2013). These outcomes occur regardless of whether or not a helmet is present. Contusion or hemorrhage of the brain can occur as a result of contact. The rate of velocity change is lower when the surface of the contacted object is soft. Likewise, if body contact occurs, instead of head contact, the rate of velocity change is known to be lower (Institute of Medicine, 2013).

The motion of the head during contact is influenced by the primary point of contact as well as the interaction between linear or rotational forces and the head, neck and body (Blakely & Harrington, 1993; Cantu, Guskiewic, Herring, Kibler, & Putukian, 2011**;** Harmon et al., 2013; Institute of Medicine, 2013). Linear force, also called translational force, occurs when the head and neck suffering the concussion are stationary at the time of impact; the linear force contains the head within a horizontal plane. Rotational force occurs when the head and neck suffering the concussion rotate back and forth, in a pendulum motion, at the time of impact. (Blakely & Harrington, 1993). When linear impact is sustained, the head does not rotate causing the head,

neck, and body to move only forward or backwards (Institute of Medicine, 2013). Published literature has shown that linear forces alone typically do not produce significant brain motion, or concussions (Institute of Medicine, 2013). Force that occurs linearly can also be said to occur centroidally, or directly, through the body. Rotational force, or non-centroidally force, causes the head and neck to rotate with no linear motion (Institute of Medicine, 2013). Rotational force is believed to cause more harm to the brain compared to linear force (Blackley & Harrington, 1993; Institute of Medicine, 2013). According to the Institute of Medicine (2013), a non-centroidal force acting upon the head/neck, "produces a distortion of the brain's neural and vascular structures within the skull because the brain is softer than the skull and loosely coupled to the skull" (p.55). Most commonly, a combination of both linear and rotational forces are present during head impact (Institute of Medicine, 2013).

3. Sports-related Concussion Threshold

It is not definitively known how much force is needed for a concussion to occur. Force is measured in gravitational force, or *g* force (Barth, Freeman, Broshek, & Varney, 2001). A study commissioned by the National Football League investigated possible thresholds for sustaining concussions through laboratory reconstruction of video-recorded concussions using helmeted dummies. The study suggested that an injury threshold of 70 to 75 *g* may exist for sustaining concussions (Pellman, Lovell, Viano & Casson, 2006). Evidence from McCaffrey and colleagues (2007) indicates that this threshold may not be accurate. McCaffrey and colleagues (2007) performed a prospective cohort study to examine the relationship between impact biomechanics, i.e. strength of force present during impact, and clinical measures of symptom severity. The study followed 76 collegiate athletes for 5 years. All study participants' helmets were equipped with accelerometers and telemetry devices. During the study 104,714 impacts occurred with 11

players suffering 1 concussion and 1 player suffering 2 concussions. All of the recorded concussions ranged from 60.51 *g* to 168.71 *g*. Three concussions occurred at less than 80 *g* while seven concussions occurred above 100 *g*. and 3 concussions occurred between 80 and 100 g. Less than one percent of the impacts that entered or exceeded the proposed range of 70 to 75 *g* resulted in a concussion. Of the 1,858 impacts that exceeded 80 *g's,* 5 *g* higher than the previously believed concussion threshold, only 7 resulted in a concussion. This evidence shows that concussions may result as part of a combination of contextual factors i.e. rotational versus linear force, gender, age, and concussion history, rather than solely levels of *g* force at impact. Currently, no studies have examined possible concussion threshold levels in high school athletes (McCaffrey et al., 2007)

4. Pathophysiology

Concussions skew normal brain cellular function. Bey & Ostick (2008) state that after a concussion occurs, "the brain's auto regulatory mechanisms compensate for this mechanical and physiologic stress and protect against massive swelling" (p. 7). At the cellular level, a concussion disrupts the brain's ionic balance and normal metabolism, causing an increased demand for energy (Harmon et al., 2012). As a result of the concussion, the increased demand for energy occurs at a time where there is decreased cerebral blood flow and dysfunction among the mitochondria (swelling) (Harmon et al., 2012). This causes a deficit in supplied energy/blood to the brain (Harmon et al., 2012). Until the supply of energy from the mitochondria returns to normal metabolic levels, a second injury can have devastating effects. Concussions that occur in the time between initial impact and return to normal brain metabolic levels are referred to as second impact concussions, or second-impact syndrome (Bay & Ostick, 2008).

Effects associated with concussions may include neuropsychological deficits and post-concussion symptoms such as nausea, headache, and sensitivity to light (Cantu et al., 2011). Depending on the severity of the concussion, associated effects are known to linger for periods of a year or longer (Cantu et al., 2011). During this symptomatic period, concussion sufferers are at increased risk for coma or death as a result of an additional concussion. When additional concussions are sustained during symptomatic periods, sufferers are at increased risk to develop second-impact syndrome (Williamson, & Goodman, 2005; Cantu et al., 2011; Harvey, 2012, Halstead, & Walter, 2010), a condition with a mortality rate of nearly 50 percent (Schulz, Marshall, Mueller, Yang, Weaver, Kalsbeek & Bowling, 2004).

Second-impact syndrome was first discovered by Saunders and Harbaugh in 1984 and includes two separate events (Bey & Ostick, 2008). First, an initial concussion occurs. Then, a second concussion occurs before post-concussion symptoms related to the first concussion are resolved. As a result, the second concussion causes cerebral swelling, brain herniation, and sometimes death (Bey & Ostick, 2008; Halstead & Walter, 2010). High-school aged athletes, compared to older athletes, have the highest risk for this condition because underdeveloped brains are more susceptible to impacts to the head (Halstead & Walter, 2010). Specific to football, high-school aged athletes are three times more likely than college-aged athletes to have a catastrophic head injury related to Second-Impact Syndrome (Halstead & Walter, 2010).

C. Preventing a Sports-Related Concussion among High School Athletes

The Haddon Matrix is an injury prevention tool that allows for an examination of the characteristics of the person who sustained the injury, the agent causing the injury, and the environment surrounding the injury before, during, and after an injury occurs (Bean & Pintado, 2011). Time is referred to in three phases: Pre-event, or before the injury occurs; Event, or

moment of injury; and Post-event, or after the injury occurs (Haddon, 1980). Contributing factors are presented in the Haddon Matrix by Host, or characteristics of the individual, Agent/vehicle, or object or person that causes the injury in the host, and Environmental factors (Haddon, 1980). Appendix A shows a proposed Haddon Matrix for the contributing factors associated with sports-related concussions among high school athletes adopted from Bean & Pintado (2013).

Creating Haddon Matrices concerning contributing factors of primary and secondary concussions among high school athletes is helpful in identifying areas that may be targeted for prevention. As the biomechanics section above would indicate, some event factors that could lead to sports-related concussions are the velocity and mass of both the athlete and the vector. While the characteristics of velocity and mass, as McCaffrey et al. (2007) displayed, may not be definitive in providing a threshold for concussion classification, they may, however, give possible solutions, from an injury prevention standpoint, for reducing the incidence of sports-related concussions. A proposed pre-event prevention strategy could be limiting the number of hits an athlete could sustain in a given season above a certain level of *g* force, using accelerometers and telemetry devices, taking into account their mass.

1. Active versus Passive Injury Prevention Methods

Haddon divided injury prevention methods into two distinct categories: active and passive. Haddon (1980) used the term active to, "categorize injury control…measures that require much action on the part of the individuals" (p.6) and the term passive to, "categorize [injury control] measures at the other extreme that require no individual action" (p.6). For example, a passive injury prevention strategy aimed at reducing the incidence of injuries related to motor vehicle accidents would be to require automakers to build safer cars, whereas, an active example would be to require higher levels of driving aptitude before issuing driver licenses.

Research indicates that, from the view of public health agencies, passive injury prevention methods have proven to be more effective in preventing or reducing the incidence of injuries compared to active methods (Haddon, 1980).

D. Current Protection and Prevention Methods

1. Helmets

In general terms, the purpose of wearing a helmet is to reduce the probability of a head injury occurring during an impact (Institute of Medicine, 2013). Helmets typically consist of two liners (one for comfort and one to lessen impact forces), a restraint system to keep the helmet in place, and a shell. These layers work together to weaken *g* forces during impact, distribute impact energy, and protect the head from contact with sharp objects. According to Institute of Medicine (2013), there are two types of helmets: single impact helmets, like a bicycle helmet, "designed to attenuate [forces during] a single impact" (pg. 201), and multiple impact helmets, "used in ice hockey, football, lacrosse, designed to withstand multiple impacts over a season of games and practices" (pg. 201). Both types of helmets are designed to provide optimal levels of safety material i.e. attenuation layer, while still offering comfort and wear-ability. Wear-ability is important, especially within the context of sports, because of the necessity of visibility (Institute of Medicine, 2013).

As discussed in the biomechanics section, limiting linear and rotational forces during impacts to the head has the potential to reduce the risk of concussion (Institute of Medicine, 2013). While helmets have shown the ability to reduce rotational forces during impacts, they have also shown an inability to decrease linear forces. Therefore, within the context of sports, helmets have not shown an ability to significantly reduce the probability of suffering a concussion during athletic activity. A study performed by Collins, Iverson, & Maroon (2006)

examined concussion rates in high school football players using a new helmet design compared to older helmet designs. The researchers wanted to examine if wearing a new style of helmet, intentional designed to reduce the risk of concussions for the athlete, would decrease high school athletes concussion rates and recovery times compared to athletes who used older helmets (Collins, Iverson, & Maroon, 2006). While the relative risk of concussion compared to older helmet designs was decreased by 31%, the decrease in absolute risk was only 2% (7.6 with the older design and 5.3 with the newer design) (Collins, Iverson, & Maroon, 2006), showing that strides in helmet improvement may not result in a substantial reduction in the probability of suffering a concussion during athletic activity (Institute of Medicine, 2013).

2. State Concussion Legislation

The aim of sports-related concussion prevention legislation in youth sports is twofold. First, legislation aims to reduce the incidence of primary concussions. In the context of sports-related concussion prevention legislation, this term refers to the initial concussion an athlete suffers. Primary concussions can occur during practice or game play. Sports-related concussions prevention legislation has attempted to reduce the incidence of primary concussions through educational interventions. The second aim of sports-related concussion prevention legislation is to reduce the incidence of secondary concussion, or second-impact-syndrome-related concussions. Exclusionary and educational measures have attempted to reduce the incidence of second-impact-syndrome-related concussions.

Since 2009, all 50 states and the District of Columbia have introduced legislation addressing the issue of sports-related concussions in high school sports (Institute of Medicine, 2013). Currently, all 50 states and the District of Columbia have either a statute or regulation in place addressing the issue of sports-related concussions in high school sports (Institute of

Medicine, 2013; Pettus, 2014). In 2014, Mississippi became the last state to pass sports-related concussion legislation (Pettus, 2014).

a. Washington State's Lystedt Law

Zackery Lystedt, a 13 year old middle-school boy from Washington State, endured a second-impact syndrome-related concussion during a football game. Zackery had suffered a primary concussion that was not properly diagnosed and returned to play despite being symptomatic. He then suffered another concussion resulting in second-impact syndrome. Washington State's Lystedt Law was passed in 2009 and according to Harvey (2013) it was the, "first law that attempted to set general guidelines and standards involving the identification and reduction of traumatic brain injury in youth sports" (p. 1250). The law contains three main elements: 1) annual concussion education for athletes and parents; 2) removal from play of athletes suspected of sustaining a sports-related concussion; and 3) medical clearance from a designated health professional before a student that suffered a sports-related concussion is allowed to return to practice or game (Harvey, 2013). Table 2 displays what types of prevention methods the Lystedt law employs as well as what types of concussions its three main elements attempt to prevent. As displayed, the Lystedt laws focus predominantly on preventing secondary concussions through active measures.

b. Other State Law Requirements

The majority of state concussion laws follow directly from the three main elements of the Lystedt Law (Harvey, 2013; Institute of Medicine, 2013). However, state concussion legislation varies in how each element is operationalized. Some state laws require formal concussion training whereas other states only require educational materials be present within a school or school-district. Variation in parent and student education exists as well. Most states require an

acknowledgment of receipt of concussion education material through release forms. However, in some states parents are not required to read or sign any participation agreement that provides concussion education materials and an acknowledgement of the risk of concussion as a result of playing sports (Institute of Medicine, 2013). In some states, high school participants are not required to read any concussion education materials (Tomei, Doe, Prestigiacomo, & Gandhi 2012). Variations in the content of required concussion education has potential to decrease the effect the laws have on the actual prevention and reduction of sports-related concussions (Harvey, 2013; Institute of Medicine, 2013).

Table 2: Prevention methods and types of concussions for Lystedt law's main elements

Element	**Prevention method**	**Type of concussion aimed to prevent**
1) Annual concussion education for athletes and parents	Active	Primary and Secondary
2) Removal from play of athletes suspected of sustaining a sports-related concussion	Active	Secondary
3) Medical clearance from a designated health professional before a student that suffered a sports-related concussion is allowed to return to practice or game	Active	Secondary

One of the main sources of agreement among states is the utilization of removal-from-play and return-to-play processes. Removal-from-play provisions consist of removing an athlete from the field of play after a confirmed or suspected concussion occurs (Kissick & Johnston, 2005). By definition, this type of sports-related concussion prevention methods is active due to its required behavior change of the host and possible agents in actively attempting to limit the

incidence of the injury. Return-to-play provisions provide a stepwise guideline for athletic and academic re-entry post-concussion, with the main focus placed on ensuring concussion suffers are asymptomatic before returning to activities (Kissick & Johnston, 2005). An return-to-play protocol includes these steps post-concussion: 1) no activity, complete rest; 2) light aerobic exercise; 3) sport-specific training; 4) noncontact training drills; 5) full contact training after medical clearance; 6) return to play (Kissick & Johnston, 2005). Athletes must remain asymptomatic through each step of recovery to ensure proper healing time before returning to athletic activity (Kissick & Johnston, 2005).

While most states have included removal-from-play and return-to-play protocols in their legislation, major discrepancies exist in how these protocols are administered as well as who is primarily responsible for administering them (Institute of Medicine, 2013). Some states identify their removal-from-play requirements ambiguously saying that athletes should be removed from play when they are suspected of a concussion. In contrast, other states, such as North Carolina, provide more specific requirements for removing an athlete from play such as when an athlete displays specific signs and symptoms that are consistent with having sustained a concussion (Tomei et al., 2012). Most states do not specifically state who has authority over making removal-from-play decisions (Institute of Medicine, 2013). Return-to-play authority also varies from state to state. Figure 1, adopted from Tomei et al., (2012) shows a bar graph of the types of individuals allowed by state law to make return-to-play decisions for athletes. As shown, there is major variation in what types of individuals have authority to make return-to-play decisions. Four states do not specify clearly who has authority in return-to-play decisions whereas one state allows chiropractors and 23 states allow physicians to make these decisions.

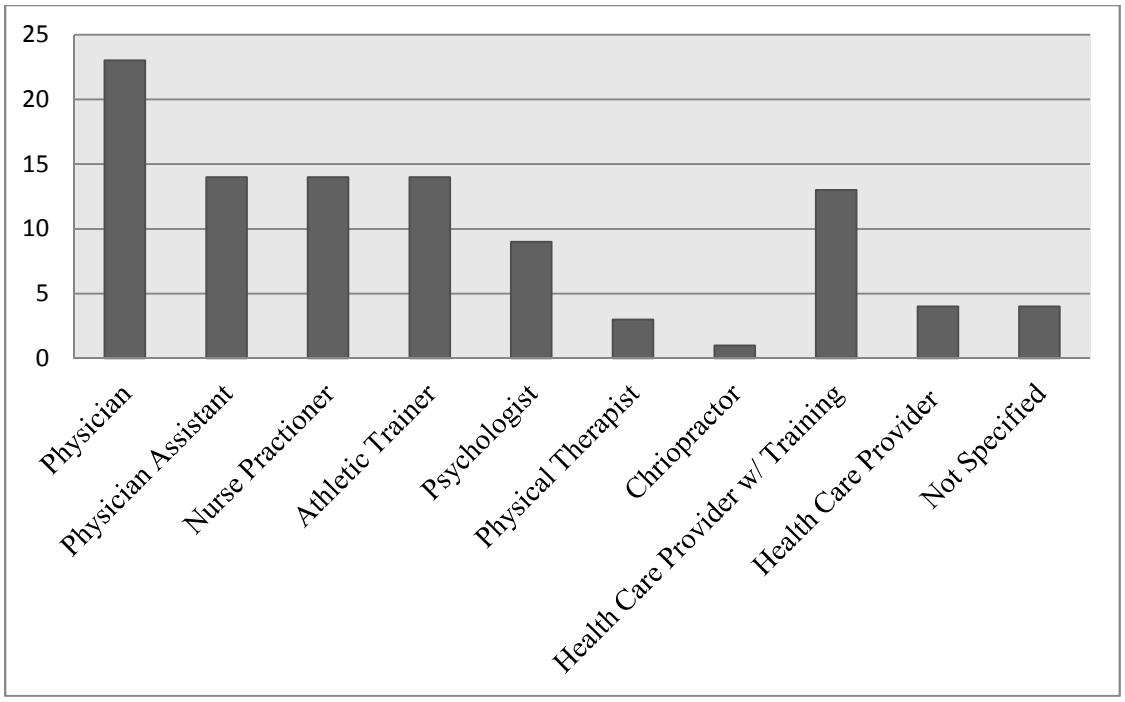

Figure 1: Number individuals with return-to-play authority, by state*
*From Tomei et al, 2012

E. The 2010 Massachusetts Act Relative to Safety Regulations for School Athletic Programs and the Massachusetts Head Injuries and Concussions in Extracurricular Athletic Activities Regulation (105 CMR 201.000)

The Massachusetts Act Relative to Safety Regulations for School Athletic Programs (M.G.L. c. 111, § 222) was passed in 2010. This act directed the Massachusetts Department of Public Health to promulgate the Massachusetts Head Injuries and Concussions in Extracurricular Athletic Activities regulation (105 CMR 201.000). The Massachusetts Department of Public Health is the regulatory body responsible for state level oversight. The requirements of 105 CMR 201.000 apply to all public middle and high schools, however configured, that serve grades 6 through 12, and other schools that are subject to official rules of the Massachusetts Interscholastic Athletic Association (MIAA), a private non-profit association organized to govern, coordinate, and promote athletic activity among Massachusetts high school athletes. All

MIAA member schools and school-districts (370) are subject to the specific policies of the regulation ("2012-2013 athletic participation," 2013). Of the 370 member schools, 316 (857%) are public and 54 (14%) are non-public ("2012-2013 athletic participation," 2013). All schools and school-districts are responsible for implementing the regulation's policies autonomously and without financial backing, as the regulation is unfunded. Like most other states' concussion legislation, the Massachusetts regulation contains the main principles of the Lystedt Law: concussion education, removal-from-play, and return-to-play protocols (105 CMR 201.000).

The regulation lays out specific requirements for concussion education, removal-from-play, and return-to-play protocols. The Massachusetts regulation requires annual concussion education for coaches, certified athletic trainers, trainers, volunteers, school and team physicians, school nurses, athletic directors, marching band directors, parents, and participating students. Concussion education can be completed in four ways: 1) certification of completion from any Massachusetts Department of Public Health approved on-line course; 2) signed acknowledgement that individual understands the Massachusetts Department of Public Health's approved materials concerning concussion education; 3) attending a Massachusetts Department of Public Health approved training; or 4) other means specified by individual schools or school-districts (M.G.L. c. 111, § 222). According to the Executive Office of Health and Human Services of Massachusetts, there are two approved online concussion education videos, the Centers from Disease Control and Prevention Heads up Concussion in Youth Sports On-line Training Program (CDC Course) or the National Federation of State High School Association's Concussion in Sports– What you Need to Know (NFSHS Course) (Executive Office of Health and Human Services).

The Massachusetts regulation states the circumstances for removal-from-play, return-to-play, and medical clearance specifically. According to the regulation, a student who, during either a practice or game:

> …sustains a head injury or suspected concussion, or exhibits signs and symptoms of a concussion, or loses consciousness, even briefly, shall be removed from the practice or competition immediately and may not return to the practice or competition that day (M.G.L. c. 111, § 222, p. 7).

The law does not specifically state who is responsible for making removal-from-play decisions. Additionally, the Massachusetts regulation states four specific individuals that are allowed to provide medical clearance for concussed athletes to return to athletic activity: 1) a licensed physician, 2) certified athletic trainer in consultation with a physician, 3) nurse practitioner in consultation with a physician, 4) neuropsychologist in coordination with the physician managing the athlete's recovery process (M.G.L. c. 111, § 222). However, the regulation does not provide any specific information concerning the stepwise guideline for athletic and academic re-entry post-concussion as discussed by Kissick & Johnson (2005).

The Massachusetts regulation contains 17 distinct provisions aimed at governing the management of sports-related concussions among high school athletes (M.G.L. c. 111, § 222). These provisions are listed in Appendix B. Not all 17 provisions pertain specifically to preventing concussions. For the 13 of the 17 provisions that are aimed directly at preventing concussions, Appendix B indicates what type of concussion prevention measure is being employed. Provisions include creating procedures for: reviewing student's concussion history; obtaining medical review if a head injury occurs during a sport season; reporting suspected head injuries to the school nurse and certified athletic trainer; identifying a head injury; developing and implementing a graduated reentry plan for students post-concussion; providing parents and students with necessary forms; communicating with parents whose first language is not English;

and reaching out to parents who do not sign sports participation forms. Additionally, each school and school-district must include information concerning the regulation in their student and parent handbooks (M.G.L. c. 111, § 222). The majority of the regulation's provisions focus on preventing secondary concussions, which can be said about most regulations based on the Lystedt Law. The few provisions that do focus on primary concussion prevention are based in concussion education and awareness (M.G.L. c. 111, § 222).

Each individual school committee, or board of trustees, working with the local Board of Health, is charged with adopting policies and procedures related to the regulation (M.G.L. c. 111, § 222). Each school and school district must develop their own protocol in compliance with the regulation wherein all of the regulation's requirements must be accounted for (M.G.L. c. 111, § 222). To develop the school-level policy, the board of trustees must assemble a proposal team consisting of at least a school administrator, school nurse, school or team physician, athletic director, certified athletic trainer, neuropsychologist, guidance counselor, and a teacher (M.G.L. c. 111, § 222). Once this team is assembled, the superintendent, principal, or school leader of each district, will designate a person responsible for implementation (M.G.L. c. 111, § 222).

Figure 2 displays the way in which the Massachusetts regulation is expected to decrease the incidence of sports-related concussions in Massachusetts high school athletes. It is a conceptual model adapted from Mello, Powlowski, Nanagas, & Bossert, (2006) displaying how the theoretical effects of the Massachusetts regulation can influence mediating factors and actual effects related to decreasing sports-related concussions. The theoretical effect of the Massachusetts regulation is that all schools and school-districts will adopt measures associated with governing the management of sports-related concussions among high school athletes. If all schools and school-districts implement and execute the regulation's policies, behavior change is

expected regarding concussion management for high school athletes. There are also mediating factors, such as cultural values, stringency of enforcement, implementation capacity of schools and school districts, and the moral force of the law that may influence the level of behavior change that occurs. These mediating factors are not addressed by the regulation, in particular the implementation capacity of schools and school-districts.

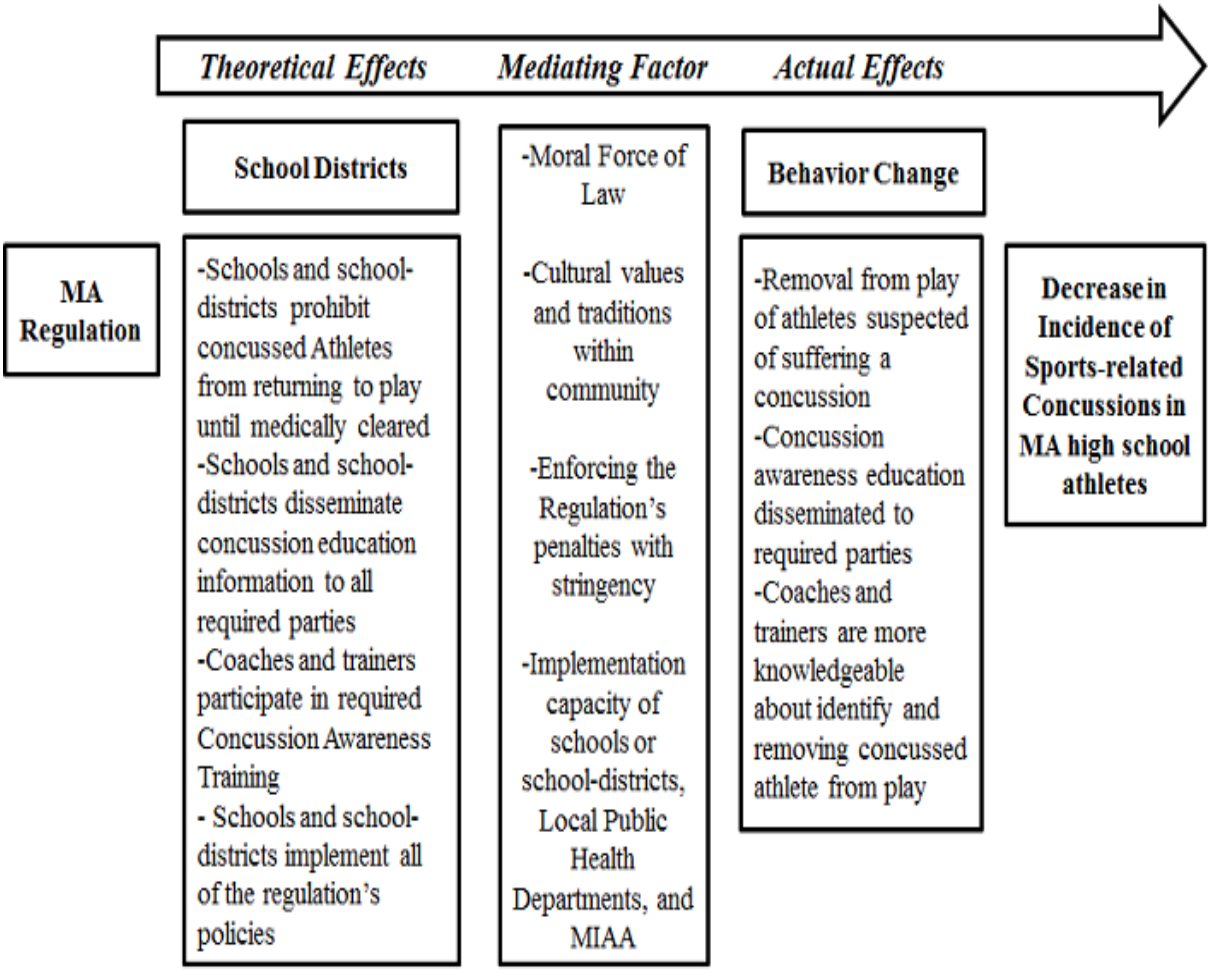

Figure 2: Conceptual model of the effect of the MA Head Injury Law on the incidence of sports-related concussions in MA high School athletes

F. Need for Implementation Evaluation

Ultimately, the question of interest is whether the regulation has been effective in reducing the incidence of sports-related concussions among Massachusetts high school athletes.

However, due to its recent passage, an outcome evaluation to determine the regulation's effectiveness is not feasible at this time, as not enough time has elapsed to measure changes post-legislation.

Currently, identifying best practice procedures for implementing concussion-prevention legislation as well as barriers to implementation are primary concerns (CDC, 2013; Harvey, 2013). Massachusetts is what is called an "early adopter" of concussion-prevention legislation, as it was the first state to adopt legislation based on Washington State's Lystedt Law (CDC, 2013). A 2013 CDC publication made implementation recommendations based on interviews with a limited number of state and local implementers in Washington and Massachusetts. However, to measure implementation accurately, a more comprehensive survey of schools and school districts is necessary. Massachusetts' status as an early adopter of concussion prevention legislation allows for an opportunity to be at the forefront of identifying best practice procedures or implementing concussion prevention legislation.

Exploring how policies are implemented is an essential step towards understanding how and why outcomes were or were not achieved (DeGroff, & Cargo, 2009). According to Patton (1980) implementation evaluations provide useful information concerning whether a policy, "is being put into operation according to design- or to test the very feasibility of the policy" (p.105). When a policy's implementation is not complete there is no reason to expect it to produce its desired outcomes (Patton, 1980). When implementation evaluations do not occur, there is no evidence as to what did or did not produce the outcomes (Patton, 1980). While this study will not be preforming an implementation evaluation, its results can be used to inform a larger, state-wide evaluative implementation study.

Evidence suggests, at the school level, that a disjuncture between policy formulation and policy implementation exists (Amis, Wright, Dyson, Vardaman, & Ferry, 2012). Amis and colleagues (2012) conducted a qualitative multiple case study that examined the process and outcomes of implementing 3 new state-level policies aimed at addressing childhood obesity in 8 high schools in Mississippi and Tennessee. The study collected data from 5 different sources: internal and external documents, semi-structured interviews with adults, focus groups with students, and nonparticipant observation. Across all school cases, the study found multiple policy implementation barriers. A school's resources constraint was one major policy implementation barrier. All 8 schools lacked sufficient resources or personnel to fully comply with all of the new policies' requirements. The study demonstrates that policies aimed at addressing health and/or social problems in a high school setting face significant barriers to effective implementation. For schools or school districts, evaluating and monitoring how policy implementation occurs comes at a cost that is typically considered unaffordable (Amis et al., 2012).

School-level policy implementation may vary by socioeconomic status. A mixed-methods study performed by Lafleur, Cole, Banthia, Sivasubramanian, & Garcia (2013) examined implementation of a physical education and student activity policy in 34 Los Angeles public high schools, middle schools, and elementary schools. Lafleur and colleagues (2013) conducted observations using the System of Observing Fitness Instruction Time in the years of 2010-2011 and 2011-2012 in a random sample stratified by income. Goals of the new policy were to increase the duration and intensity of physical education classes as well as decrease the mean class size of physical education classes. Conducted observations were coded using the existing System of Observing Fitness Instruction Time framework and analyzed using statistical software. The study yielded two statistically significant results: low-income high schools

displayed a decrease in the intensity of physical activity during physical education classes (p-value = 0.015); and high-income elementary schools displayed an increase in the duration of physical education class (p-value = 0.049). Although the difference was not statistically significant, the study also showed that low-income high schools were the only schools to show an increase in mean class size. Lafleur and colleagues (2013) claimed the policy had not been fully implemented across Los Angeles public schools, despite the requirement. A possible reason given by the authors was a lack of resources as well as an insufficient implementation time frame (Lafleur et al, 2013)

An examination of Massachusetts standard-based education reform posits that schools and school districts lack sufficient capacities to ensure polices are implemented properly (McDermott, 2004). According to McDermott's (2004) examination of the Massachusetts standard-based education reform policy, state-level policy makers assume school districts have enough capacity to implement policies with high fidelity devoid of financial or institutional assistance. Massachusetts has many small schools and school districts with minimum administrative staff (McDermott, 2004). Schools and school districts can become overwhelmed with additional policies due to lack of resources, capacity and support systems (Amis et al., 2012; McDermott, 2004).

There is a need to examine how the Massachusetts concussion regulation has been implemented. As with any new policy, understanding barriers or facilitating factors that affect implementation is necessary (Patton, 1980). Evidence from the literature suggests that schools may lack sufficient capacity to ensure unfunded policies are implemented correctly (Amis et al, 2012). Additionally, evidence indicates that a school's ability to implement policies can be affected by its socioeconomic status (Lafleur et al, 2013). This is especially true in

Massachusetts where schools and school districts can often be overwhelmed with policies but provided zero financial means for implementation (McDermott, 2004). Therefore, this study seeks to understand how the Massachusetts concussion regulation has been implemented. The data from this study can inform a quantitative survey used to evaluate the Massachusetts regulation's implementation.

G. Study Objectives

The objective of this study is to answer the following three research questions:

1) How has implementation of the Massachusetts regulation occurred within schools and school districts?
2) What factors influence the implementation process within varying schools and school districts?
3) Does the reported implementation process match written policy?

The study addressed these questions using a multiple-case study approach including semi-structured interviews with key school and school district actors in the Commonwealth of Massachusetts and archival analysis of written policies associated with participating schools and school districts (Yin, 2014). Interview data were analyzed using a conventional content analysis (Hsieh & Shannon, 2005). Written policies were subjected to an archival analysis (Yin, 2014).

CHAPTER II

METHODS

A. Study Design: Case Study Methodology

Qualitative case study methodology allows researchers to examine a phenomenon within its context, employing a variety of data sources (Baxter & Jack, 2008; Yin, 2014). This approach works to ensure that the phenomenon is not examined through one lens; rather, several lenses (i.e. data sources) are used. An amalgamation of data is used to acquire a deeper understanding of the phenomenon of interest (Baxter & Jack, 2008; Yin, 2014). In case study research, observation, interviews, documents, and artifacts are all used to engage with the selected case or cases (Yin, 2014). The data triangulation that arises from multiple data sources helps to investigate the phenomenon of interest. Relevant documents can be combined with data collected via observation or interview to reveal a deeper understanding, ensuring that the essence of the phenomenon is understood (Baxter & Jack, 2008; Campbell & Ahrens, 1998; Yin, 2014). A case study approach should be considered when 1) the purpose of a study is to examine 'how' and 'why' questions; 2) the contextual setting of the phenomenon is relevant to the study; or 3) there is no clear demarcation between a phenomenon and its context (Yin, 2014).

To explore the phenomenon of interest, case studies rely on a constructivist paradigm (Baxter & Jack, 2008). Constructivism states that reality is socially constructed. The subjective human experience of a phenomenon creates meaning for said phenomenon. Likewise, a phenomenon can be constructed as objective truth in a pluralist fashion. Meaning, or truths, can be created to account for naturally occurring phenomena through multiple subjective accounts.

This methodological approach is useful; it allows study participants to describe their views of a phenomenon, which enables a more objective understanding (Baxter & Jack, 2008).

1. Unit of analysis

When determining the unit of analysis for a case study it is important to consider both the phenomenon of interest and the research questions (Baxter & Jack, 2008). For the purpose of this study, the primary research question aims to examine how the Massachusetts regulation has been implemented within local schools and school districts. Therefore, the phenomenon of interest is local implementation of the Massachusetts regulation at the school or school district level. The school or school district is then the unit of analysis, or case. The inclusion of analysis of written policies that have emerged as a result of this implementation process adds to how the unit of analysis is to be understood within its context (Baxter & Jack, 2008).

2. Multiple-case study

A multiple-case study design is differentiated from a single-case study design by the number of cases that are studied (Campbell & Ahrens, 1998; Yin, 2014). A multiple-case study design entails the same methodological procedure repeated over multiple cases. The multiple cases are to be analyzed and interpreted as separate entities, using identical methodologies. By repeating identical methodologies, the study works to augment the validity of its findings (Baxter & Jack, 2008; Campbell & Ahrens, 1998). Additionally, this design is advantageous for examining the differences between cases (Yin, 2014). This study employed a multiple-case study approach to examine how the Massachusetts regulation has been implemented within schools and school districts.

One of the most commonly used sources of information in case study inquiry is the interview (Yin, 2014). Interviews provide two specific strengths: they allow researchers to focus

on case study topic as well as provide insightful explanations of personal views. Interviews can be either long or short in duration and typically occur between the researcher and a study participant (Yin, 2014). This study used interviews as a primary source of data.

As discussed above, case study methodology often includes multiple sources of data to examine the case of interest (Yin, 2014). As part of this methodology, it is useful to examine documents relevant to the case of interest. Archival records can take the form of computer files and records, such as public use files, service records, and organizational records (Yin, 2014). Original documents are analyzed to raise new questions, provide comparisons, or verify existing findings (Corti, 2004). Documents from participating schools were collected and analyzed. As part of the Massachusetts regulation, all schools must produce their own concussion prevention policy to disseminate throughout the school or school district population (M.G.L. c. 111, § 222). This study collected and analyzed each participating school or school district's concussion policy to enhance data richness.

B. Study setting and population

1. School districts

This study examined how the regulation has been implemented within schools and school districts. The regulation requires all of its policies be implemented autonomously at the school and school district level. School-level actors from a breadth of schools and school districts were interviewed. Schools and school districts were selected for inclusion using a purposive sampling strategy (Patton, 1980).

2. Purposive sampling methods

Purposive sampling allows researchers to select cases which illustrate certain features of interest (Silverman & Marvasti, 2008). Selecting these types of cases allows researchers to

garner a deep understanding of the issues related to the purpose of the research (Patton, 1980). There are several different methods for selecting what Patton (1980) refers to as *information-rich cases* (p. 169). This study employed a maximum variation sampling to achieve a level of heterogeneity.

a. Maximum variation sampling

By utilizing a maximum variation sampling technique, researchers aim to examine, "central themes or principal outcomes that cut across a great deal of participant or program variation" (Patton, 1980, p.172). In qualitative studies with small sample size, heterogeneity can be problematic because there tends to be differences between individual cases. However, the maximum variation sampling strategy combats this logic by stating any common patterns that can be produced from a diverse sample may capture the true experience of that phenomenon. Maximum variation is achieved by selecting key characteristics relative to cases. Results of studies that utilize a maximum variation sampling strategy to select their cases typically produce two results: a detailed description of each case with the purpose of documenting distinct characteristics and a list of common categories shared by cases which have added significance due to an emphasis on heterogeneity (Patton, 1980).

As mentioned before, this study utilized a maximum variation strategy to purposively select its cases. This study used the characteristics of socioeconomic status and urbanicity (defined below) to select cases. Using U.S. Census Bureau data, Massachusetts schools and school districts were split and categorized into four categories: low socioeconomic status and rural; low socioeconomic status and urban; high socioeconomic status and rural; high socioeconomic status and urban.

b. Stratification

Stratification was partially informed by the "fundamental cause" hypothesis. The fundamental cause hypothesis states that as individuals and society learn how to prevent or treat diseases, or health outcomes, the benefits from this newfound knowledge will not be distributed consistently across a population (Saladana-Ruiz, Clouston, Rubin, Colen, & Link, 2013). The increased knowledge will disproportionately be recognized by those with greater access to socioeconomic resources such as education or wealth (Saladana-Ruiz et al., 2013). It follows that schools and school districts of diverse socioeconomic statuses may experience implementation of the regulation differently. Therefore, this study stratified schools or school districts by socioeconomic status to capture this potential variability. School and school district socioeconomic status is represented by median household income. Median household income is thought to be a better indicator of wealth compared to per capita income because it is not dramatically affected by high or low values (Orzechowski & Sepielli, 2003).

A school or school district's median household income was determined from the town(s) it represents. Population-weighted averages were used to determine the household median income for participating school districts representing multiple towns. The strata are referred to as 'median income' and contain two categories: schools or school districts with an income below the state median (median income = low) and schools or school districts with an income above the state median (median income = high). Strata limits were determined using data from the United States Census Bureau. According to the United States Census Bureau, the median household income for Massachusetts from 2007 to 2011 was $65,981 ("State and county," 2013). This represented the division between the two categories of 'low median income' and 'high median income'. Municipalities with an average median household income less than $65,981 will be

considered ‘low median income’. Municipalities with an average household median income greater than $65,981 were to be considered ‘high median income’.

Schools and school districts were also be stratified by rural or urban status. Evidence suggests that major disparities in health and lifestyle exist between urban and rural areas (Blumenthal & Kagen, 2002; National Center for Health Statistics, 2001). For example, rural residents are more likely to experience higher rates of chronic disease compared to urban residents (National Center for Health Statistics, 2001). Poor inner city urban areas often consist of inadequate housing which can lead to a decreased quality of life for residents (Blumenthal & Kagen, 2002). However, the justification to stratify for both socioeconomic status and rural/urban status in this study stems from the issue of access to health care services. While rural municipalities typically have less access to health care services compared to urban municipalities regardless of socioeconomic status, impoverished areas in large cities also face a lack of access to health care services compared to their affluent urban counterparts (Blumenthal & Kagen, 2002; National Center for Health Statistics, 2001). It is important to address the differences between rural and urban municipalities’ health care access because, as mentioned above, return-to-play decisions for student athletes are dictated by healthcare professionals. In areas that lack access to healthcare professionals, such as low socioeconomic urban municipalities, there is a need to understand who is making return-to-play decisions on behalf of the student athletes and how these decisions are being made.

Schools and school districts were categorized by rural or urban status. The strata are referred to as ‘population type’ and contain two categories. According to the US Census Bureau, municipalities with more than 50,000 people are considered ‘urban’ and municipalities with less than 50,000 people are considered ‘rural’ (2010). For this study, a school or school district that

represents a town or combined towns with fewer than 50,000 residents was considered 'rural' and a school or school district that represents a city or town with more than 50,000 residents was considered 'urban'. Combined total population was used to determine the population for school districts representing multiple towns. The two categories, 'rural' (total population < 50,000) and 'urban' (total population ≥ 50,000) determined the stratification.

c. Study participants

Interviews were conducted with at least three school- or school-district-level actors associated with implementation of the regulation. The study aimed to include a range of school-level actors such as school athletic directors, nurses, athletic trainers, coaches, and other health and wellness staff.

d. Participant recruitment

The first wave of participant recruitment consisted of introductory emails sent to school principals (n=40). Approximately 10 schools from each of the 4 strata were contacted for recruitment. Follow-up telephone calls were placed within 1 to 2 weeks after introductory emails were sent. This attempt yielded 0 participants. The second wave of participant recruitment consisted of sending introductory emails to athletics directors of the same list of schools. Again, follow-up telephone calls were placed within 1 to 2 weeks after introductory emails were sent. This attempt yielded 1 participating case. The final wave of participant recruitment consisted of introductory letters being mailed out to the same list of schools. Letters were followed up within 1 to 2 weeks with telephone calls. This attempt resulted in 4 additional participating cases. Initially, the study aimed to include 8 cases in the study, interviewing at least 2 school-level actors from each of the 8 cases for an initial estimate of 16 participants. However, only 5 schools agreed to participate. As a result, the study aimed to recruit between 3 and 4 participants from

each of the 5 cases, for a new estimate of between 16 and 20 participants. The rate of participants per-school was increased to ensure the full phenomenon was being captured.

C. Data collection

1. Written policies

As part of the archival analysis, school and school district written concussion prevention policies were collected. These documents were publicly available on the school or school district's website or homepage. After schools or school districts agreed to participate, written policies were collected from their respective websites. Publicly available concussion prevention policies were found on all participating school or school district websites.

2. Interviews

In each case, interviews took place at the participant's place of employment. All interviews started only after the researcher had obtained written informed consent from the participant. Interviews were expected to take approximately one hour. However, the average interview time was closer to 35 minutes. All but one interview was digitally recorded; one participant denied the study's request to digitally record the interview, but still participated. All digitally recorded interviews were transcribed verbatim. For the participant who declined to be digitally recorded, a written synopsis containing direct quotes was created. Interviews started with a brief thanks and introduction. While the majority of the interview questions were open-ended, the first question was 'yes' or 'no' in nature. Follow-up probes were used as needed to ensure that all relevant information was obtained. All interviews were conducted one-on-one with the researcher.

3. Interview Questions

Interview questions were open-ended except for the first question which asked about participant's awareness of the existence of the Massachusetts state regulation governing concussions in high school sports. This study utilized an interview guide approach when interviewing study participants (Patton, 1980). Utilizing this semi-structured, open-ended interview strategy ensured comparable information was ascertained from each participant but left room to probe any emergent issues that arose during interviews. This allowed the researcher flexibility within the line of questioning. If a statement seemed relevant to this study's objectives, room was given to ask follow up questions. This flexibility ensured all relevant information was included in the study. There was an initial interview guide and an emergent interview guide. The initial interview guide was used for the first 5 participants. An emergent final interview guide was created to eliminate redundant questions and to add emergent key probes and was used for the remaining interviews.

All interviews began with introductory statements, and terminology regarding the Massachusetts regulation was clarified. The first several questions were used to gauge general knowledge of the study participant. Questions were asked about the five specific aspects of the law. The probe concerning whether the participant felt the Massachusetts regulation was mandatory was withheld from the emergent interview guide due to redundancy. The questions then moved to a more specific line of questioning that address the participant's own school/school district. Questions were asked concerning how the implementation experience has gone within the participant's school or school district and how the participant's own experience with implementation has been. Next, the participant was asked about what they think impacts implementation within schools or school districts. Probes included questions about inhibiting factors and potential barriers to implementation. The participants were then asked about the types

of changes that have occurred with the new regulation. Follow-up questions dealt with either positive or negative changes depending on the participants' response. The participant was then asked about any suggestions as to how the state and their school or school district could better implement the regulation. The participant was asked if he or she thinks there is anything else that the researcher should know to better understand the implementation process. In interviews conducted with the initial interview guide, participants were then asked if there are any other documents relevant to the implementation. After it became apparent that all schools used state-provided forms to govern their management of concussions, the primary investigator (PI) ceased to ask participants about any documents relevant to the schools' implementation and the question was not retained in the emergent interview guide. To end the interview, the participant was asked if they have any questions of the interviewer.

As stated, general probes were added to the final interview guide due to emergent topics. Whenever the PI felt it appropriate, participants were asked about athletes' honesty in taking neurocognitive baseline tests, whether or not they viewed the state-issued concussion education as adequate, and issues with online-based education, as these topics were brought up in earlier interviews. See Appendix C and Appendix D for the initial interview guide and the emergent interview guide respectively.

4. Validity

The term validity generally describes the degree to which research measures what it set out to measure (Collinridge & Gantt, 2008). In qualitative methods, there is an emphasis on selecting an appropriate method to examine your research questions. Appropriate methods selection is accomplished through a review of the literature. Also, there is an emphasis on applying the selected method in an understandable, reasonable, and rigorous manner. However,

an epistemological debate among qualitative researchers and between qualitative and quantitative researches exists (Rolfe, 2004; Shenton, 2004).

Validity, as a concept, is arguably unachievable in qualitative research (Rolfe, 2004; Shenton, 2004). Some qualitative researchers claim that validity is linked to a positivist viewpoint wherein the researcher has previously constructed their own view of society, thus dictating the direction of the results. Instead, what some researchers call for is an examination of trustworthiness (Rolfe, 2004; Shenton, 2004). This study was conducted under the epistemological vantage point that validity is a concept only applicable to quantitative data, and thus sought to create rigor by establishing trustworthiness.

5. Trustworthiness

Trustworthiness, as a concept, can be viewed as the researchers' attempt to assure readers of appropriate selection methods and appropriate use of methods. There are several elements to trustworthiness that researchers must consider: *credibility*; *dependability; transferability;* and *confirmability* (Rolfe, 2004; Schindel & Given, 2013; Shenton, 2004). *Credibility* is defined as an attempt to ensure findings are consistent with reality, or the phenomenon (Shenton, 2004). *Credibility* is comparable to the quantitative term *internal validity* (Rolfe, 2004; Shenton, 2004). This study created *Credibility* in several ways; use of direct quotes to support found themes and patterns, use of researcher triangulation (described below), and use of methods triangulation (described below). *Dependability* is defined as an attempt to ensure proper and established research methods have been followed (Shenton, 2004). This study created *Dependability*, or reliability, by providing a detailed methodological description of the research approach used by the study and disclosing the researcher's personal perspective. The use of an interview guide worked to also ensure *dependability*. *Transferability* is defined as the extent to which a study's

findings are applicable to comparable situations (Shenton, 2004). *Transferability*, or what can be referred to in quantitative terms as external validity (Rolfe, 2004; Shenton, 2004), was created by ensuring sufficient contextual information concerning the description of the cases is provided. This allows readers to make knowledge transfers (Shenton, 2004). The term *Confirmability* can be defined as an attempt to ensure a study's findings are borne from the study participants and not the researcher's preferences or biases (Shenton, 2004). *Confirmability*, in this study is addressed by again utilizing researcher triangulation.

6. Triangulation

Triangulation is way to garner a 'true' estimation of a situation by merging several different ways of looking at a phenomenon (Baxter & Jack, 2008; Mays & Pope, 2009; Shenton, 2004). Triangulation works to ensure the phenomenon is comprehensively examined through several lenses and aides researchers attempting to achieve trustworthiness. By combining either multiple researchers or multiple data sources, triangulation provides a more thorough examination of the phenomenon of interest (Mays & Pope, 2009). This study used two types of triangulation in an attempt to increase trustworthiness, *researcher triangulation,* and *data triangulation*.

a. Researcher triangulation

Researcher triangulation refers to having multiple researchers examine portions of transcripts to ensure consensus regarding patterns and themes (Shenton, 2004). The additional researcher is, in effect, double-checking the results of the initial researcher to ensure consistent patterns and themes emerge from the same data. This helps to reduce the effect of investigator bias. This form of triangulation adds to the trustworthiness of a paper by providing credibility to the findings (Shenton, 2004). This data analysis process works to ensure produced patterns and

themes are reached by the consensus of at least two researchers. This process is described in more detail below.

b. Data triangulation

Data triangulation, in the context of case study research, refers to having multiple sources of data to help explain how the phenomenon has occurred (Lambert & Loiselle, 2007; Shenton, 2004). Using multiple types of data to explain a phenomenon helps to add credibility to a study's findings (Shenton, 2004). Types of data can be interviews, focus groups, newspapers, written documents etc. Combining two or more of these types of data work to create a richer understanding of the phenomenon of interest. This study used data triangulation to increase the credibility of its results. As mentioned above, this study utilized interview and archival records for data triangulation.

c. Researcher Journal

The principal researcher kept a research journal as part of this study Appendix E. The research journal documented any and all decisions and circumstances related to conducting the study, including school and participant selection, coding decisions, conditions of interviews etc. The intent of the researcher journal was to increase the overall trustworthiness of the study.

D. Data analysis

1. Content analysis

In qualitative research, a content analysis is a method used to examine text data (Hsieh & Shannon, 2005). This type of analysis is used to examine language for the purpose of ordering data into similar categories. According to Hsieh & Shannon (2005), a content analysis entails, "subjective interpretation of the context of text data through the systematic classification process

of coding and identifying themes or patterns" (p.1278). Found themes can either represent direct or indirect communication (Hsieh & Shannon, 2005).

a. Conventional content analysis

A conventional content analysis is most appropriate with a study design whose aim is to explore and describe a phenomenon that lacks any preconceived theory or lacks research literature (Hsieh & Shannon, 2005). In this way, researchers do not use existing categories when beginning to code data. Instead, the data dictates category creation allowing researchers to gather data directly from study participants without imposing preconceived categories (Hsieh & Shannon, 2005). This study employed a conventional content analysis as a basis for data analysis.

b. Coding Strategy

Several steps were required to code data under the conventional content analysis framework. Once data were collected, and transcribed verbatim, the PI became immersed in the data (Hsieh & Shannon, 2005). Immersion was achieved through multiple re-readings of the data. Initial codes were then derived from the text. The PI read all data word for word as a way to identify any exact phrases to highlight initial codes. Labels for found codes were proposed and became the initial coding scheme for all data. Initial codes were kept in a running word document in list form. The initial coding scheme produced multiple codes. The initial coding scheme was then used to organize the data into meaningful themes and create a code book. Once the code book was created, the PI and a member of the research team, a professor at the University of Massachusetts Amherst, met to discuss any and all questions related to coding decisions. A thorough discussion was had related to all coding decisions and an initial code book was agreed upon by the PI and the member of the research team. At this level, codes were

combined to create relevant case-level themes to bring together related codes that existed across cases. The code book offered the theme name, description of the theme, a list of theme-related codes, contextual excerpts for each code, and whether the theme was positive or negative in nature.

Once a final code book was agreed upon, it was given to another member of the research team for use. This member of the research team was a graduate student at the University of Massachusetts Amherst with experience in qualitative coding. A random sample of transcripts was selected and coded by the PI and the member of the research team. Four transcripts (21%) were randomly selected by the member of the research team. The additional member of the research team read the 4 randomly selected transcripts for immersion then proceeded to code according to the code book. The PI and the additional member of the research team met to discuss their coding decisions to ensure that developed themes were agreed upon. The PI and the member of the research team agreed on the contextual meaning of each code. Some codes were moved to other themes once the investigator and member of the research team found an agreed upon contextual meaning. This meeting resulted in a final code book. The final code book was used to code all other transcripts by the PI.

Written policies were subjected to an archival analysis. All collected written policies from the 5 participant schools were converted into a word processor file. Once converted, the researcher read to achieve data immersion. The researcher created a code book for the archival records which contained the name and description of the variable and notes on how to code each variable (see Appendix F); however, it was not subjected to the process of *research triangulation.* Variables were created to correspond with each of the policies required by the regulation (Appendix B). All variables were binary. If the school's written policy matched the

language, or sentiment, stated in the regulation, the variable was coded '1'. If the school policy did not match the language or sentiment of the regulation, the variable was coded '0'. Archival records of the 5 participating schools were coded individually.

E. Human Subjects Protection

The participants of this study were actors within Massachusetts schools or school districts. Subjects were at least 18 years old and held a position as either a school administrator or athletic staff within participating schools or school districts. Electronic study records were stored on an encrypted computer to protect confidentiality. Electronic study records included: digital audio recordings, code book database, researcher journal, participating school policies, recruitment material, and audio transcripts. Signed consent forms were kept in a locked file cabinet along with personal identity codes. Other hard copy study records were labeled with a code; no names appeared on paper research records. Although school policies are available publicly, electronic versions were kept in the encrypted computer to assure participating schools remain confidential. School policies that were received via hard copy were converted to electronic form and stored with the other electronic policies, and then destroyed. A master key that links names and codes was maintained in a separate and secure location. The master key and digital audio files will be destroyed three years after the close of the study. All databases and spreadsheets containing identifiable information were password protected by fingerprint. The computer used to host such files was also password protected to prevent access by unauthorized users. Only the PI had access to the computer. Each participant was given an informed consent statement that clearly identifies the nature of participation, the purpose of the study, possible risks and benefits, and efforts to keep confidentiality. All participants had the opportunity to withdraw from the study at any time as well as be informed of the study's results. Participants

were given the PI's contact information if any questions came up after the interview had occurred. The PI has certification from the Collaborative Institutional Training Initiative to complete social and behavioral research on human subjects. The PI has no conflicts of interest to report. Approval from the University of Massachusetts Institutional Review Board was secured on November 14th, 2014.

F. Preliminary biases and suppositions

In qualitative studies, the researcher is the data collection tool. Thus, it is necessary to make conscious any related biases researchers have. I was, and still am, an avid participant in sport. I am also from Massachusetts. During high school, I played a number of sports including ice hockey, football, lacrosse, and wrestling. To this day, I participate in casual basketball and ice hockey games. All of my experience with high school sports came in a Massachusetts high school. I have never sustained a concussion in, or outside, the realm of sports. Additionally, I have never seen a teammate suffer a traumatic brain injury within the field of play. As a result of my experience with high school athletics, I view participating in high school athletics positively..

My interest in examining the Massachusetts Head Injuries and Extracurricular Athletic Activity stems from my interest in two things: health policy analysis and the heightened public awareness of concussions. In recent years, media attention has brought notoriety to the concussion problem that major sports leagues, such as the National Football League, face. This has caused me to view sports-related concussions as an important public health issue. More specifically, the body of knowledge surrounding sports-related concussions has caused me to believe general concussion-prevention laws, such as the Massachusetts regulation, do not do enough to stop initial concussions. Additionally, my knowledge of policy implementation has

caused me to believe schools representing low socioeconomic status communities may lack certain capacity to implement unfunded policies.

CHAPTER III

RESULTS

The study recruited 5 cases: 2 schools were 'urban' with 'high' socioeconomic status; 1 school was 'rural' with 'high' socioeconomic status; 2 schools were 'rural' with 'low' socioeconomic status. Three of the 4 strata the study aimed to gather information from were represented; no participating school was both urban and low socioeconomic status. Table 3 provides a demographic break down for both strata. All 5 cases were recruited to participate by their school's athletic director. Athletic directors procured a signed letter of support from their school's principal that was submitted as part of the IRB application. After gaining IRB approval, the investigator used publicly available information from participating schools' websites to recruit other school-level actors for participation. Each school's nurse(s), trainer(s), and all school-employed coaches were contacted via email. Emails were followed up with phone calls within 1 week. These recruitment efforts yielded 19 interviews with a breadth of school-level actors; 4 schools had 4 interviews and 1 school had 3 interviews. Employment types for the participating school-level actors were athletic director, athletic trainer, school nurse, health and wellness coordinator, and coach. Case number 1 was considered 'rural' and of 'high' socioeconomic status. Case number 1 had 4 interviews with the school's athletic director, athletic trainer, head nurse, and football coach. Case number 2 was considered 'urban' and of 'high' socioeconomic status. Case number 2 had 4 interviews with the school's athletic director, athletic trainer, head nurse, and football coach. Case number 3 was considered 'urban' with 'high' socioeconomic status. Case number 3 had 3 interviews with the school's athletic director, athletic trainer, and boys' varsity soccer coach. Case number 4 was considered 'rural' and of 'low'

socioeconomic status. Case number 4 had 4 interviews with the school's athletic director, head nurse, girls' varsity soccer coach, and the school district's health and wellness coordinator. Case 5 was considered 'rural' and of 'low' socioeconomic status. Case number 5 had 4 interviews with the schools' athletic director, head nurse, girls' ultimate Frisbee coach, and athletic trainer. Case and participant characteristics are summarized in Table 3. Exact population size and household median income data is withheld so as not to provide identifiable information.

Case Number	**Strata**		**School Personnel Type**				
	Median Income	Population Type	Coach	Trainer	Athletic Director	Nurse	Health and wellness coordinator
1	'High'	'Rural	X	X	X	X	-
2	'High'	'Urban'	X	X	X	X	-
3	'High'	'Urban"	X	X	X	-	-
4	'Low'	'Rural'	X	-	X	X	X
5	'Low'	'Rural'	X	X	X	X	-

Table 3: Case demographics and interview personnel breakdown

A. Study Question 1: How has the implementation of the Massachusetts regulation occurred within schools and school districts?

Eight themes were identified and represent how the Massachusetts regulation governing concussion management in high school athletics has been implemented at the local level. These themes represent various ways schools have decided to put into place components of the regulation as well as how schools have decided to delegate associated work among school personnel. Themes were created from similar conceptual codes and concern 1) the use of

neurocognitive testing for student athletes, 2) trainers having ultimate authority in the removal from play and return to play decision making process, 3) decision to have concussion education training as online-video, 4) use of online document management system for organizing regulation-related paperwork, 5) the presence of the combined role of nurses and trainers in completing day to day concussion-management-related tasks, 6) academic accommodations for students with severe concussions, 7) additional 5 day symptom free rest period for players who sustain concussions, and 8) the role of the physician in the concussion management process.

1. Neurocognitive Testing

All 5 cases employed some version of a neurocognitive baseline testing program. These programs provide a preseason assessment of the student athlete's cognitive abilities. When a concussion is suspected of occurring, the test is used to assess whether the student athlete's cognitive abilities are similar, greater, or less than their preseason baseline scores. Four of the 5 cases use the program, ImPACT, while 1 case uses the program Concussion Vital Signs. In addition to stating that the testing program was in place, participants revealed both positive and negative sentiments regarding the use of these testing programs.

At least 2 participants from each case acknowledged that neurological baseline testing occurs within their school. In most instances, participants either referenced the testing program in passing or referred to it by its name (ImPACT or Concussion Vital Signs) throughout their interview. When asked about the neurocognitive test that their school uses, the athletic director from case 1 replied, "We use Concussion Vital Signs." Another participant, when prompted to discuss their school's return to play and removal from play policy, responded:

> I think it's, I mean, I think we've also done a good job with that, um, we've, we have a system like, I don't know the name of it, um, but I'm sure a lot of schools are getting involved, with the kids they can take a online test and it creates a baseline, um, so every ones ImPACT tested at the beginning of each season…

It was evident, in discussing with participants during interviews, that each school placed an emphasis on using the neurological baseline testing as a way to determine if a concussion had occurred.

There were, however, mixed feelings towards the use of neurocognitive testing. One of the overall sentiments expressed concerning the use of neurocognitive testing was how advantageous it was. Scores produced by the neurocognitive testing programs gave school personnel information to fall back on when making return-to-play decisions. When asked about their school's use of neurological testing, the athletic director from case 3 replied:

I think it's a great tool…I don't think it's an end all be all. So I don't think that it has to be required, um, I think that any, and obviously there's other programs in place outside of ImPACT, ImPACT was more of the forefront when this all started, but, I think it's a tremendous tool.

Other participants shared the same view point, in that, the neurological tests were beneficial in adding to the decision making process. The coach from case 3 expounded after being asked about his school's use of neurocognitive testing, stating

> …but its, its been very very useful. It has served as, I don't want to speak for them (athletic trainers) but just based on conversations I've had with them it serves as a really, really good tool in assessing concussions.

He went on to specify that the testing has been beneficial for athletic trainers making return-to-play decisions. He added, regarding this topic, "It's served, it's really allowed them, um, again, not the full picture, but definitely has given them additional tools in decision making…," also stating, "… just being able to have as much information as possible in making a decision, the ImPACT test, the baseline testing has really helped out in that manner." When asked a follow up question regarding the benefits of neurological testing, the athletic director form case 4 answered, "Yeah It is, I think it is beneficial, you're getting that baseline before the season starts, then an injury occurs, and you know you get an opportunity to see, is there a difference…" The

trainer from case 5 provided the details about a time when neurological scores were used to provide a concussion diagnosis and physical evidence to parents who were skeptical that their daughter had sustained a head injury. Talking about the athlete who had been removed from play during a game because of a suspected concussion, the trainer stated:

> We had this person do a follow up ImPACT test compared to their baseline scores, the scores were very low, um, at that point, you know, another phone call was made home to talk to dad, and then dad had a few choice things to say when, she, when this person says she's fine, she doesn't have any symptoms I don't think she should held out of her game today, blah, kind of going on and on and on, um, and so, you know, we put our foot down, by myself and the athletic director, um, and said no this person's not playing today based on the ImPACT scores and on the ImPACT test itself it asks you to rate their symptoms, and this person was rating her symptoms out of a scale of 6, with 6 being the worst, head ache, dizziness, nausea, at like 4's and 5's, even though she's telling me, no I don't feel anything, so, you know, that's why obviously ImPACT testing is important…

Neurological testing provides concrete individualized information concerning student athletes who may sustain a concussion.

Not all remarks concerning the use of neurological testing were positive, however. There was, in effect, a sense that procuring baseline preseason tests for student athletes, which, at some schools, number close to 700, could be very time consuming for school personnel. When the coach from case 5 was asked about his experience with neurological testing within his school, he replied:

> Our school is doing it…I mean, I've heard complaints from the trainer, or not complaints in that they don't like doing it, but just realizations that it takes a fair amount of time to do it so to test all the athletes is sort of an onerous process if you don't have a lot people to do the testing.

When asked about the level of monitoring that trainers accomplish within his school, the athletic trainer from case 3 shared a similar sentiment regarding the time consuming nature of neurological testing stating, "… its only one piece of, how we deicide um, so - it's been a lot of work, especially when you want to ImPACT test 5 and 600 kids." The nurse from case 4

discussed the time consuming nature of putting in place portions of the regulation and the neurological testing in this statement:

> Um, initially it was a challenge because we had a lot, a lot of paperwork to do, we had a lot of teaching to do, we had a lot of education, um, personally, and for the students, parents, staff, coaches, everybody, um, getting the ImPACT testing in, you know, choosing which neurological test we're going to do, then actually carrying it out, having each kid, each athlete, do this test. That was time consuming.

Although it was stated that the neurological testing programs were time consuming, several participants also took pains to state that the work necessary for implementing the testing program was well worth it. An example of this sentiment was shared by the athletic director from case 3 when he stated:

> Ah, so I mean, that would be one of the negative areas of it. You know, making sure that you get everyone ImPACTed in a timely manner can be difficult, some times, but the pros far outweigh the cons in terms of what you're going to struggle with in terms of the test. Um, and it's one of those other things that's, you know, for an administrator, for a school district, it's one of those other things I think that provides, you know, for lack of a better term some insurance, in terms of making sure that we, you know, are doing all we can do to, to, um, asses the health of a student, to prevent injuries.

According to participants, using neurological baseline testing provides schools with physical evidence that can be presented to a student or a parent who question whether a concussion occurred.

2. Athletic Trainer's Role in Removal-from and Return-to Play Decisions

The theme most consistently seen throughout all cases was the decision to put athletic trainers in control of removal-from-play and return-to-play decisions. The Massachusetts regulation did not make a specific effort to designate trainers as the sole school personnel responsible for removing from play athletes suspected of sustaining a concussing and return those athletes to the field of play. All cases, though, made it abundantly clear that athletic trainers were the ultimate decision making authority when it came time to make removal-from-

play and return-to-play decisions. This sense of decision making authority was agreeable to all school personnel. Coaches, especially, felt comfortable with the decision making process being taken out of their hands. The coach from case 5, when asked about situations where a head injury was suspected of occurring, stated, "… if they say they feel a little bit weird, um, if they're acting in any way abnormal, um, I will just stop immediately and bring them to the trainer and basically just like hand them off at that point." He went on to make that point that the decision making authority is the athletic trainers regardless of the magnitude of the athletic contest. He explained stating, "Um, and I understand that it's out of my hands at that point, so even if it's in the middle of the big game or whatever you know, it's just like, it's what you do." The health and wellness coordinator from case 4 expressed similar thoughts regarding the decision making authority of trainers. When she was asked about her thoughts on the regulations removal from play and return to play components, she stated, "So removal from play is, um in the athletic trainer's hands." The athletic director from case 2, when the same question was posed, responded in a similar way stating, "…the trainer should be the sole person who's responsible for putting somebody back in or taking somebody out and you know follow through with doctors, because most coaches and ah athletic directors are not qualified to do so." When the same coach was asked about how school personnel have received the regulation, the coach reiterated, emphatically, the schools reliance on trainers to make removal from play and return to play decisions:

> Absolutely, in our city, no question about it, ah, the coaching staff at (High school name withheld) they understand the protocol that the trainer is at the top of the list and, ah, any questions, you know, or any issues with injury ah, removal from play ah, getting kids back into play, is up to, it's at the sole discretion of the trainer.

It was made clear that, for case 2, the athletic trainer had sole discretion in return to play and removal from play decisions. The trainer from case 2 backed up the school's directive when she

expressed, in reference to return to play and removal from play decisions, that, “all coaches are all completely on board and completely understand why it is necessary.” In one instance, it was noted that the authority of athletic trainers in removal-from and return-to-play decisions was superior to even physicians. The athletic director from case 5 specified, when asked about the physician’s role in returning student athletes to play, that, “My trainer is fully able to say no you’re not playing, you know. Fortunately, that doesn’t happen very often, but, um, she does have the ability to override, but we do ask for something from the physician.” With the decision making authority over removal-from-play and return-to-play decisions placed squarely on athletic trainers, participants felt their schools were able to successfully manage concussed student athletes.

3. Concussion Education Decisions

All five cases have decided to use an online-video, approved by the Massachusetts Department of Public Health, as their concussion education for all school personnel, student athletes and paretns. As discussed previously, this method of concussion education is within the guidelines of the regulation. Participants expressed a number of sentiments regarding the use of an online-video for concussion education including the use of the online concussion education video, the annual reviewing of training by schools, the importance of the concussion education video, possible inadequacies the online video contains, and how schools keep records for completed education.

These online courses were considered, by all five schools, acceptable forms of concussion education. In most cases, participants referred to these concussion education trainings as ‘the online training,’ the, ‘online video,’ or just the, ‘video’. When asked how the experience of implementation had gone, the head football coach from case 2 stated, “Yeah, so I mean, I’ve

had to make sure all coaches take the online training..." The nurse from case 2 shared a similar sentiment about the concussion education video occurring when she stated, "Um, I know all of the nurses are trained. We, we have to do the yearly online training as do the coaches and the trainer." The athletic director from case 5 summed up all schools' sentiment towards the online concussion education when he stated, "So um, we ask that all of our, as the law asks, you know, as the law states that all of our athletes, coaches, trainer, any personnel who are dealing with the kids, take the NFHS (NFHS Course), concussion, online concussion training."

All five cases stipulated that yearly concussion education training was mandated for applicable school personnel. Case 4's coach made it clear that her school requires all personnel to the concussion education course before every season when she expressed:

> Well I think they've done what they're supposed to do, I mean, we all have to take the course, um, our athletic director before, you know, every season, has, um, it's part of our mandatory, we cannot start preseason until he (athletic director) has our course certification, um, filled out.

The coach from case 1 expressed a similar sentiment when he stated, "We, we do it. Every coach has to get a, you know, every coach has to get like that little diploma thing and, and what we do is I take it further with my staff, we, it's an agenda item." For school personnel, yearly concussion education training was mandated in all 5 cases.

All 5 schools also stipulated that yearly concussion education raining was mandated for student athletes and parents. In some instances, student athletes that participated in multiple sports were made to complete the concussion education training more than once per year. When asked about her opinion on the concussion education component of the state regulation, the athletic trainer from case 3 made it clear that athletes and parents were made to complete concussion education yearly through the claim that, "Um. Well its mandatory for the athletes and the parents to get some education and the way we do it here is have them watch a film…and

that's something that's required once a year." All participants agreed with the notion that concussion education training was mandated of student athletes and parents.

In a large portion of interviews, whenever a negative feeling was felt towards how various school personnel acted towards concussions, the PI introduced a probe, wherein, the participant was asked about their opinion on the content of the concussion education their school was providing. In a somewhat even fashion, both negative and positive responses arose when this probe was introduced; sentiments that the mandated online concussion education video was both important and provided adequate educational material were as prevalent as opinions to the contrary. Case 1's athletic director expressed support for the content and integrity of the online concussion education when he stated, "Mhm, so the mandatory concussion education for coaches and parents and kids, ah, I believe, is excellent." In a way that speaks to the videos' validity, the trainer from case 5 expressed how the obtained knowledge helps to manage concussions when she stated:

> Um, I think that it's definitely, um, been beneficial. Ah, to help spread knowledge to not only, parents, coaches, referees, athletes, ah, to help them really understand the importance of recognizing head injuries early on and potential, you know, preventing them in the future by knowing the risks are, um, you know, a long time ago you have the term, you got your bell rung or whatever the case may be…

It was clear that the coach from case 3 viewed the online concussion education as a valid supply of information when he stated, "I think they've done a, a thorough job, um, by providing the online resources and providing the online concussion course I think that really is a great resource."

On the opposite end of the spectrum, some participants viewed the concussion education video as an inadequate source of information for student athletes and parents. When asked about her school's concussion education component, the nurse from case 4 provided a poignant

explanation as to why she felt the concussion education video may not go far enough in this statement:

> I think it could be improved. I think it could be more in-depth. I think it could be more, um, better evaluated if these, if the students and the parents truly understand what is involved, because a lot of the times when a student athlete gets a concussion we have to go through 'a' to 'z' with those parents, what, what is a concussion, they're like, well can't we just get a CAT scan, they have no idea that, you can't get a CAT scan for a concussion, so, we, we have to go through 'a' to 'z', sometimes those phone calls will last a half an hour just explaining what a concussion is, the process of, um, going to the doctor, getting accommodations if needed, the gradual return to play and everything that is involved with it, so I think they could do a lot better with the education part of it.

While it cannot be parsed whether the nurse felt the content of the video was lacking or if she felt disappointed that the information was coming from an online source, it is clear, she perceives that an undereducated population exists within her school.

Regardless of how school personnel felt about the concussion education's efficacy, inconsistencies existed in how schools dealt with keeping track of yearly concussion education training across school personnel. For instance, in some cases, it was found that athletic directors, trainers, nurses, coaches, and the wellness coordinator, were required to hand in certificates of completion to their athletic director, while parents and students were only required to sign off that they had received the educational material. For cases 1, 2, 4, and 5 this was the status quo. The athletic director from case 5 provides a detailed rationale as to why this decision had been made in the following statement:

> …so for the coaching staff, we require the coaching staff, once a year, to take the online course and then send our trainer, they actually certify at the end, right, um. The first couple years, there was an attempt made and it was, one year it was before I was in this position and then one year was when I was in the position, um, there was attempts made to have athletes and parents sending certificates, certification, as well. But you can imagine how challenging and kind of ineffective it was to actually collect all of those certificates. Cuz we have, you know, about 1000 kids in the school and over the course of the year about 600 of them play a sport, um, and so there's no, (pause), to actually collect that from everybody and get all parents to get that in our hands is like very very challenging, um, and so we, we did what several other schools in the area of done after

> talking to other athletic directors and my trainer talking with other trainers, is that, we embed that within our sign offs and so we put the information there for parents and we ask them to sign off that they have actually watched the NFHS concussion education…

Other schools following the same template offered similar rationale as to why they do not require students and parents to hand in certificates. The athletic director from case 4 expanded similarly that, "our, um, all of our coaches are required on a yearly basis to take the, it's either the National Federation Course or the CDC course, the heads up concussion course, ah, which are both computer based programs," he added further that those personnel were required to hand in certificates of completion and that, "…in terms of education for parents and athletes, um, what we've done now is made it part of our registration form, where they have to check off that they read and understand, um, the heads up CDC concussion information…"

In case 3, all personnel are required to hand in some form of certificate that stipulated that they had completed the online training with a passing grade. Parents and students, in addition to coaches, trainers, nurses, and other school personnel, are required to watch the concussion education video and turn in a certificate for verification. When the athletic director for case 3 was asked about his experience with the regulation's implementation, he first stated, regarding parents and students, that, "…we have an online registration process, where we inform students and parents of what needs to be done, parents also have to watch the video…" He then went on to state that for students to be considered eligible for athletic participation they would need, "Number one, registration, permission to participate, number two, physical, number three online concussion certificate, um, and if any one of those pieces is missing, obviously, they can't participate at all." If students did not complete their concussion certificate on time, the athletic director make it clear that, "Um, we hold students out, if need to be, they never get a chance to participate if they haven't done it." The athletic director further stipulated that coaches and other

personnel were held to the same standards in the following statement, "…I've held coaches out of coaching because they don't have their concussion forms done, or their online video done."

4. Online Document Management System

Three of the five cases used an online document management system to procure and review documents related to the management of student-athlete concussions. The documents that cases collected electronically were pre-participation forms concerning prior history of head injury and paperwork that signified completion of concussion education. While all five cases collected these documents, cases 2 and 4 do not utilize an electronic system for record keeping. 'Family ID", an online system used for all school related documentation, was used by cases 1, 3, and 5. An example of a participant confirming the use of an online system for pre-participation can be found with the nurse from case 1. She stated, after being asked about her opinion on the pre-participation forms, that, "Um, we do, pre-participation. We used to do paper participation forms for every student. Now, our athletic department goes through Family ID, which is an online…" Other examples provide very similar expressions of the inclusion of an online-system for pre-participation documentation.

The organizational advantage of the online system for tracking school related documents was met with positive responses. While speaking to how his school had dealt with the pre-participation requirements of the regulation, case 1's athletic director discussed how moving to an online system had helped deal with the copious amount of work. In regards to the collection of the pre-participation forms, the athletic director said, "…um it is a massive amount of work, to get all the paperwork." He later, in the same response, specified that the amount of work had been reduced by his decision to employ an electronic system, stating, "When the law first came out we were actually making copies form and having it turned in, in print, we no longer do, do

that, we do that all online now, so that has streamlined that a little bit." He was asked a follow up question regarding any efficiency the online-system may have brought his school, the athletic director replied first stating:

> … it's called FamilyID.com…It was streamlining the medical information, the contact information, all online, so we can either print reports, I can email reports, our nurse can go on and check things so it's just streamlined that whole process while it reduced paper.

The nurse from case 1 agreed that the online system had made reviewing concussion management related documents easier. When she was asked about her experience in moving from a paper system to the online system, the nurse claimed, "Family ID definitely made it easier because I can go on and just go to the head injury report." The same nurse further praised the new system saying it has a, "…fair amount of confidentiality. Which is very important and, um, the, the parents don't seem to mind doing it as much as the paper pre-participation forms."

However, the prior history of head injury form mandated by the regulation was not necessarily held in high regards independent of whether it existed in paper or electronic form. Participants were skeptical about whether or not parents and students were answering the pre-participating questions truthfully. The lack of transparency caused several participants to question the integrity of the process. The prevailing sense was, short of physically being present when parents and students were filling in pre-participation requirements, there was no way to ensure the results of the form were valid. When asked about her opinion of her school's pre-participation requirement, the athletic trainer from case 3 expressed her opinion bluntly stating, "…they, they put it on Family ID so you know they check yes or they check no, it's not another piece of paper we have to kill. As far as whether or not its accurate that's, that's a crap shoot." The nurse from case 4 was asked about her school's decision making process in putting pre-participation components of the law into place, responded, rather poignantly:

> Um, once again, there's no, um, um, there's no body checking to see if, oh so you had a concussion tell me about that, so, um, and a lot of people don't admit to it. They're not truthful on the forms. We'll find one student that has had concussions in the past that we know about and we'll see their new form and it will be zero. How many concussion did you have, um, and it could just be, they're not even thinking there just filling out these forms really fast, or it could be intentional, you don't know.

Regardless of whether the use of an online document management system was present, cases found a similar experience; distrust existed towards answers found on the pre-participation forms.

5. Nurses' and Trainers' Roles

The task of day to day concussion management has been, overwhelming, allocated to school trainers and nurses. In a way, this created important roles for both school personnel at the individual and collaborative level. Participants expressed sentiments that discuss the individualized and cooperative roles of school nurses and trainers, the importance of athletic trainers to the concussion management process, the importance of school nurses to the concussion management process, and the collaborative relationship between nurses and trainers.

As mentioned above, trainers were granted ultimate authority over other school personnel when making removal-from-play and return-to-play decisions. Due to the amount of work subsumed within these processes, the importance of school trainers raised dramatically. Many participants made a point to discuss the amount of work and responsibilities trainers had acquired as part of their role in managing concussions for the student athletes. In the statement that follows, the nurse from case 5 made it clear, when asked about her school's decision to implement pre-participation forms, that the trainer from her school wore many hats:

> I actually think we've done a good job. I have to give the athletic trainer credit for that, um, cuz she handles the, we get all the pre-participation information through the athletic department and then she handles it from them. Um, she handles all the documentation about kids that are in contact, or collisions sports and do the ImPACT testing and the ImPACT testing is offered to all athletes, um, so if you have, um, a a, your student is a

> golfer and you want them to have an ImPACT test, she will make that available to any student but it is obviously required of those that are, that are playing contact or collision sports, um.

For schools that have positioned athletic trainers as the school personnel most involved with day to day concussion management, the amount of work, withstanding hyperbole, has become seemingly endless. So much so, that some participants have expressed empathetic views of the role athletic trainers have assumed. The coach from case 4 explains why she feels as if there has been an immense amount of pressure put on athletic trainers, when she stated:

> Um, she (the athletic trainer) does a lot of that ImPACT testing with all the kids, has to make sure they're in there and if a kid, gets, returns to play, they shouldn't be, um, it's really falls on her. We only have one athletic trainer for the, our, our entire school, um, so I'd say for her, she would be the one most impact by it, um, policy wise. Obviously that then would reflect our AD and our principal, you know, everyone does their job, what they're supposed to do, but I would say the person most affected by it would be our athletic trainer.

The importance of athletic trainers has increased dramatically as a result of how schools have decided to implement the Massachusetts regulation.

Nurses, too, have assumed a large day-to-day role in the management of concussions for student athletes. In the view of one nurse, when asked what the Massachusetts regulation has meant to her, she expressed that the state has, "set up a series of mandates for students who have been injured, who have had a head injury, um, can be followed until they are cleared (referring to medical clearance)," and that the mandate of following and clearing concussed students is, "overseen mostly by the school nurse."

Additionally, stated within the regulation's return-to-play process is a requirement for schools to provide academic accommodations to concussed students as necessary. Participating cases have placed the burden of addressing academic accommodations for concussed student athletes on school nurses. With academic accommodations being associated with other school

staff not included within the Massachusetts regulation, the nurse has had to act as a concussion liaison between concussed students, teachers and guidance counselors. Types of academic accommodations will be discussed in a later theme. However, the process of disseminating academic accommodation plans has mostly been left up to school nurses. In response to a question regarding how her school has put the component of return-to-play into place, the nurse from case 1 first acknowledged that the academic accommodations piece is hers to handle, saying, "The return to play is the last step, there's a whole section before we even get to return to play. And that whole section is, is, mine to move along…" She then goes on to describe the how process of securing an academic accommodation for a concussed student occurs, stating:

> Um, the basic, ah, basic thing is, um, I get a student, I usually will get an injury report from the trainer, at that point, I also get a note of some kind from the doctor, sometimes it's a head injury report form, sometimes it's a just a doctor's note, um, but I get something that says concussion on it. Usually that has some kind of accommodations written on it. All of those I photo copy and I give to the guidance counselor. The guidance counselor is then responsible for the academic portion of it. Some students need more help than others. Some of the kids, their academics, they just do it along the way, and they don't need a lot of extra help. Some do require extra help from the guidance counselor, but I follow all of it. I see the kids every day, if they need to come in. If they're not coming in, then I see them weekly. I call them in weekly, find out how they're doing, any time they have a note they need to bring me the note, the note goes to guidance. So I follow them until they are 5 days symptom free. Once they are 5 days symptom free then we get them back to the trainer. And the trainer will do the 5 days of the return to play. So from diagnosis until the end of 5 days, symptom free, I follow.

A nurse from case 5 went on to back up the statement that nurses, for the most part, are tasked with the responsibility of dealing with any academic accommodations that are necessary for concussed student athletes. She stated that, "But then in the nurse's office here we also manage the academic piece…"

Nurses, trainers, and even other school personnel, all stated that a relationship between athletic trainers and school nurses has developed to deal with the copious amount of work associated with the Massachusetts regulation. The athletic director from case 2, when asked

about the specific state-level concussion education component, expressed support for his nurse and trainer in the statement as follows, "…our trainers and our nurses have worked hard, ah, to try to implement the policy, you know, you want to follow through with the policy…" The nurse from case 5, when asked about her schools decision to put pre-participation requirements into place, provided a window into the working relationship between the athletic trainer and herself:

> So, so (athletic trainer) does a good job with the paper work and the documentation and the communication between the two of us, you know I get an emails from her all the time about, you know, somebody had a head injury or a potential concussion she'll give me a heads up so that we have that information at school in the morning for the morning when kids are here for class.

Both the trainer, responsible for the athletic portion of the regulation, and the nurse, responsible for the academic portion of the regulation, have developed their own system for dealing with concussed student athletes within the context of the Massachusetts regulation. In a way to back up this statement, the athletic trainer from case 5 made a similar comment describing the symbiotic relationship between the nurse and herself, stating, "Ah, anyone who designates that they have sustained a head injury prior, ah, that paper work gets reviewed by myself or the school nurse, ah, and then it's followed up with to make sure they have the appropriate paperwork." The nurse from case 2 shared a similar sentiment about the working relationship she has with her trainer, "we meet with her every afternoon, and she updates me as to who has returned to play, um, she follows the protocol, gets documentation back from the doctors and we keep everything in their students health record, it's all confidential." As outside observers, the athletic directors from case 4 and case 5, respectively, both shared similar thoughts on the cooperative role of trainers and nurses in the following statements:

> Oh. It's a plus, yah, it's absolutely a plus. I think they, we're very fortunate, like I said, that the nursing staff and athletic trainer work hand in hand together to make sure that they're getting proper notification and, um, that's needed so that the student athlete gets the proper care.

> So the trainer in conjunction with our school nurse, just like they do with the, um, the, all of the physicals that happen because were also mandated, obviously, to have a current sports physical on file, um, we use a similar system where the trainer and the nurse, um, double check all of our kids to make sure that they have done the pre-participation head injuries forms and, um, they're and then if there questions they will follow up with the families and the nurse can then double check if there's a kid who had something that was reported to the school that we didn't, as a athletic department know, so that two of them work closely together on that

The amount of worked required to manage concussed student athletes has created a space where school nurses, athletic trainers, and guidance counselors work in sync to provide the necessary athletic and academic accommodations.

6. 504 plan or Individualized Educational Program Accommodations

As mentioned above, students who are removed-from-play after suffering a concussion are put into what is referred to as the return-to-play process. According to 105 CMR 201.010, part of the return-to-play process includes withholding, or limiting, concussed student athletes from academic work. It also includes creating a graduate reentry plan for academics, referred to as academic accommodations. Three cases dealt with the academic accommodation component by extending either a 504 plan or an Individualized Educational Program (IEP) to concussed students. For Massachusetts, 504 plans and IEPs represent academic accommodation programs that extend assistance for statewide standardized test assessments. These academic accommodation programs are typically used to ensure students with identified disabilities receive specialized instruction. They also entitle students with disabilities access to the learning environment. Although not discussed in the regulation, the Massachusetts Department of Public Health issued a document on November 7th, 2011 titled, "MDPH (Massachusetts Department of Public Health) Guidance on 504 or IEP Plans for Students Returning to Academic Work," that specifically discusses how schools should go about extending these accommodation programs.

Cases 1, 3, and 4, extend these academic accommodations to concussed athletes. When asked about his school's decision to put in place return to play components, the athletic director from case 3 discussed how his school offered academic accommodations, sometimes in the form of 504 plans:

> When, if a student has a concussion, they can't be at school for a certain amount of time, they have, it's very limited, um, you know their class work, they'll get extra time to take exams whatever they need, so they'll get a lot of accommodations, sometimes as much as a 504.

Another athletic director, for case 3, after telling a story about a student athlete that suffered a severe concussion during an athletic event stated, "He was one of those students that went out and got an IEP based on the injury." The athletic director from case 1, within a statement where he addressed how students take neurological baseline tests referred to the accommodations stating, "…like a general 504 plan…" Three out of the five participating schools had decided to extend 504 plans or IEPs for certain students. It seemed that, in most cases, these accommodations were extended when a severe concussion occurred.

7. Five Additional Mandatory Days of Rest

The regulation does not specifically lay out guidelines for how schools are supposed to create the return-to-play process. However, it was understood that all participating cases followed guidelines provided by the aforementioned Kissick & Johnson (2005) stepwise re-entry plan for concussed athletes. It was the prevailing sense that, even though this was not technically listed within the regulation, this athletic return-to-play model was the standard being used within Massachusetts high schools. One case, though, decided to include a mandatory 5 day symptom free period before starting the return-to-play process. The athletic director from case 1 explained in the following statement:

> Because, when we laid our policy out, we were very clear that it's non-negotiable. We've even gone further to say that some doctors are saying if the kid is symptom free after 3 days they can start return to play. We've overrode all the doctors and we're 5 days symptom free and then they can start return-to-play. So for us, it's at least a two week process…

The athletic director felt that this additional 5 day symptom free period provided a higher degree of certainty that concussed students were indeed returning to play fully healed.

Mixed feelings were had regarding this additional 5 day symptom free period the athletic director had mandated. The athletic trainer from case 1 agreed with his athletic director in the decision to include a 5 day symptom free period before starting the return-to-play process. When asked about his school's decision to put into place the return-to-play component of the regulation, the athletic trainer replied, "Um, I think it's necessary." Within the same response, the athletic trainer also stated, "We have our own 5 day, actually it's a 10 day process, it's a 5 day symptom free and a 5 day return-to-play." The coach from case 1 had an interesting, and opposite, opinion about the additional 5 days symptom free period. When asked about his opinion on the regulation, the coach from case 1 responded, "It's dangerous." When he was asked what he thinks makes it dangerous, the coach stated:

> Because it's, it's, gonna have a lot of kids going underground and not report condition of a, of a, um, potential concussion. The protocol is wrong. It's two weeks. And that's ok if it's a doctor but, you know, um, so a kid gets a concussion, right, um, doctor sees him, and then doctor clears him in a week.

According to the researcher's journal (Appendix E) the interview with the coach from case 1 was, "the most interesting interview to date." The researcher's journal also went on to discuss the nature of the interview and how negatively the coach from case 1 felt about the additional 5 day symptom free period. In the same entry, the journal reads:

> (Case 1's Coach) seemingly only wanted to discuss how he felt the additional 5 days symptom free period was, in his words, dangerous, and caused his student athletes to go, quote, underground. At first I was unaware at what this meant. After a few minutes, I

> realized he was implying that student athletes feared reporting their symptoms to school personnel knowing that any suspected or real concussion could minimally result in a 2 week loss of playing time. Regardless, (Case 1's Coach) was candid and forthcoming when his responses were specific to the questions at hand.

Case 1's coach felt that a minimal 2 week process of returning to play after a suspected or diagnosed concussions was causing student athletes to be less honest about concussion symptoms. It was clear that within case 1, dissention existed between the athletic trainer and director and the coach. However, no participant provided any factual information as to whether the additional 5 day symptom free period was effective or ineffective in managing concussed student athletes.

8. Physicians' Role

Physicians, in all 5 cases, were included in the process of returning concussed students back to play. Fifteen of the 19 participants included reference, either directly or indirectly, to physicians' involvement with the return-to-play process. In all cases, it was noted that if a student athlete was to sustain a suspected concussion, the individual would need to go to their primary care physician to get a confirmed diagnosis. In some cases, physicians would accompany a confirmed concussion with specific instructions for academic accommodations. Participants expressed several sentiments regarding this theme including how physicians have been included in the process of returning concussed student athletes to play, the hardships that some concussed student athletes face when trying to secure medical clearance from a physician, and challenges schools face when physicians are included in the decision making process.

Overwhelmingly, cases have relied on independent physicians for concussion diagnosis and medical clearance. In all cases, physicians are used to provide concussion diagnoses, clear student-athletes for returning to athletic activity, and recommend academic accommodations. For all cases, if a student-athlete is suspect of sustaining a concussion and is removed from athletic

activity, the athlete, and subsequently the athlete's parents or legal guardians, as these are high school aged individuals, are responsible for securing a visit with a physician. In most cases, it was assumed by participants that primary care physicians or the student-athletes family's physician were the doctors making decisions. The athletic director from case 5, when asked about the types of physicians' students who sustained a suspected concussion see, replied, "… it, it has to be just, you know, family, whoever, whoever the family physician is, that they've seen." Additionally, participants made it clear to the PI that medical clearance was the responsibility of the physician. The athletic trainer from case 5 discussed the role of the physician in the return-to-play process in the statement as follows:

> Um, and an athlete may not return to contact participation, um, which would be steps 4 and 5 of the 5 step gradually return-to-play process that we implement here, ah, without the (medical clearance) form being signed by a physician. Um, so that is required for them to have full return to participation.

The health and wellness coordinator, when asked what the Massachusetts regulation meant to her, shared a similar sentiment regarding physicians providing medical clearance for concussed students, stating:

> It means that every school has to have, every school system needs to have some type of policy in place to address concussion injuries during, during athletic events and/or practice and then a set of regulations or a steps that then return that student safely back into athletics, athletics once cleared by a physician.

The involvement of physicians in the concussion diagnosis and medical clearance process was evident in all 5 cases.

Schools, though, faced challenges when dealing with the outside involvement of physicians. There was a prevailing notion that the physicians making decisions on whether concussed student-athletes were medically cleared to return-to-play actually had little to no knowledge of the regulation itself. When asked about the factors he thought would help assist

schools in implementing the regulation, the trainer from case 1 provided a statement questioning whether physicians are actually aware of the regulation, stating:

> …and you know what else, there's a lot of doctors who aren't aware of these regulations. And I thought, thought (it) was supposed to have had happened already. There was, the first thing that came out was, they dumped on the schools, so ok, now, you will do this, but, the doctors are supposed to be educated, like, the following year and I don't think that's ever happened because you still have doctors who don't know what the regulations are. Although they may be aware of regulations somewhere, they may not know what they are.

In addition to this idea that physicians are undereducated about the regulation's specifics, there was also the sense that physicians may not have the most up to date information regarding how to manage concussions. When asked about her school's decision to implement the return-to-play component of the regulation, the health and wellness coordinator from case 4 expanded on the idea of physicians being undereducated, replying:

> The return to play is always a little more grey. We do have specific steps before we even allow the student to start the return-to-play process. But often getting to that point in the documentation from the physician is a challenge, um, I'm just gonna throw this out there, we are also still struggling with physicians who I don't think have, know anything about the policy and are operating under concussion, um, ideas that, are 10 years old and that is also is a challenge.

Being that physicians were not employees of the schools, some participants found it difficult to discern, with a degree of confidence, whether physicians making medical clearance decisions were adequately educated on the topics of concussion management and the Massachusetts regulation.

Families also faced challenges when ascertaining the medical clearance necessary for the student athlete to return from a concussion. The challenge they faced was different from that of school personnel. The financial strain of visiting the doctors several times was perceived as burdensome to some families. The trainer from case 1, when asked how parents and students have responded to the regulation, offered a response that articulates the position of some

families, stating, “The biggest thing with parents that, that I get from them is, is not so much keeping their kid out, but it’s the cost involved of going back to the doctors, you know.” In the same response, the trainer went on to specify that:

> First they’re getting diagnosed, then they’re going back to get cleared, and, you know, whatever co-pay they’re paying, it could be 50 bucks! I mean, that’s a lot of money. Which, um, you know, some families, that’s a difficult thing to swallow… (Pause)…

Other participants provided responses that mirrored the financial frustration some families faced when tasked with visiting the doctor several times. The nurse form case 4 explains, when asked about any negative changes she has seen as a result of the regulation being implementing, stating, “Yeah, we get a lot of grief from a lot of those athletes and some parents,” further stating, “…um, I think there’s a financial strain on the parent as well because they have take(n) their kids to the doctor frequently and then they have to pay a co-pay each time they go…” The athletic trainer from case 3 shared similar thoughts when she described getting the medical clearance as, “…difficult for some kids because they can’t get to the doctor so that keeps them out of the sport.” While physicians participate in the medical clearance decision making process, schools and parents struggle with their involvement.

B. Study Question 2: What factors influence the implementation process within varying schools and school-districts?

Six themes emerged from the data as influential factors associated with local implementation. These themes represent various factors that facilitate or impede local implementation within the participating cases. Themes were created from codes and concern: 1) the availability of a full time athletic trainer, 2) how funding and man-power have influenced implementation, 3) the honesty of student athletes and parents in dealing with the concussion management procedures, 4) the impact of raised societal awareness and expectations on local

implementation, 5) the communication between local implementers, and 6) implemented or suggested ways to improve local implementation.

1. Availability of a Full Time Athletic Trainer

One of the more agreed upon factors participants felt influenced a school's ability to implement the regulation was whether a full time athletic trainer was employed. Athletic trainers, inherently, act as a third party between the student-athlete and their coach. Athletic trainers, as the trainer from case 5 put it, do not, "care if your team wins or loses as long as all those kids on the field are safe." For the coach and the student-athlete, clear perverse incentives exist if an athlete sustains a concussion; having an athlete play rather than sit is mutually beneficial to the coach's and player's career. Having that added layer of objectivity between a coach and a student-athlete is thus imperative. Therefore, many participants believed that having a full time trainer greatly influenced their school's ability to implement the regulation. They also believed that schools without a full time trainer had diminished capacity to successfully implement the regulation. The athletic trainer from case 3 stated her support for this idea, bluntly, when she was asked about the types of factors that could limit a school's ability to implement the regulation, stating, "Not having an athletic trainer. Yeah. (Long pause), because if you don't have somebody who's been hearing about this and dealing with this, and you don't have an awareness, you know, it's just ignored…" The athletic director from case 1 shared a similar sentiment after being asked the same question. He, after discussing the amount of work that the return-to-play and removal-from-play process includes, talked about the advantage his school has over schools without a full time trainer, stating, "If we didn't have that, this would be, in school districts that don't have a trainer, that really only have one nurse, I don't know how they're doing it." The athletic director went on to express his thoughts on how difficult it would be for a school without

a full time trainer compared to a school, like his, that employed a full time trainer, stating, "I, I'd be shocked to know that they're doing it to the level that we're doing it and again I don't say that in a negative way, I just know, how much work it takes…" The athletic director from case 4 also questioned other schools' ability to properly implement components of the regulation if they were without a full time trainer. The athletic director, after being asked about what types of factors could better assist schools with the regulation's implementation, discussed other schools' diminished capacity for proper implementation, stating, "I guess my question is, what happens, at a school that doesn't have a athletic trainer, how are those kids implementing the return to play…"

Some participants, when asked about the advantage having a full time athletic trainer provides schools, responded in a way that suggests full time trainers are needed to build rapport and trust with student-athletes. The trust that is built between a full time athletic trainer and student-athletes, in the eyes of two participants, is what cultivates an atmosphere of trust where students feel free to report their concussion symptoms. The trainer from case 5 was asked about the difficulties a school would face if they were unable to hire a full time athletic trainer. She explained how schools in her area of the state faced this exact issue, stating, "Um, they're actually many schools in this area that don't have full time athletic trainers, um, budget reasons or size, you know, or whatever their reason being…" She went on to describe the challenges those schools would face if they employed a per diem, or part time, trainer as opposed to a full time trainer, further stating:

> … some of the things that those schools would face would be lack of continuity of care, if they hired per diem, they could have a different athletic trainer at every event, if it's a part time person, they might not be there all the time, they might only come for games. Um, and head injuries are not unique to game play scenarios, so, there could be an athlete who sustains a head injury during a practice, doesn't tell anybody, continues playing and there's not any one really there to recognize that something's not quite right. Um, this is

> my 5th year here at the school and I've got to know most of the kids pretty well, um, by this point, and so, you know, I've gotten to know when, you know, athlete 'A' comes to me, I'm hurt, um, I know that this person is probably in agony because they never tell me they're hurt, um, or if someone comes to me and says, you know, someone, they feel comfortable coming to me and saying like, you know, this kid, and it actually happened in a football game, um, got a head injury, or he got hit in the head and he is not acting quite right, um, you might want to go check on him kind of thing, and so, you know, building that rapport with your athletes is obviously very important, someone who's not there all the time, um, or in a full time capacity might not have that relationship with their athletes.

In her opinion, the rapport built with her students has directly caused students to self-report concussive symptoms. The type of trust necessary, in her opinion, for this relationship to develop is not possible if a school does not have its own full time trainer.

2. Funding/Man-power

Study participants acknowledged that, in dealing with the concussion-management process, funding, and the availability of man-power, constrained a schools' ability to implement the regulation. When the health and wellness coordinator from case 4 was asked about factors she thought limited the regulation's ability to be implemented, she, emphatically, stated, "Um, lack of funding, lack of time to train staff. Um, it comes down to money and time." After being asked the same question, the nurse from case 4 mirrored the response from the health and well coordinator, stating, "Ah, funding." The nurse from case 4 then went on to speak about how not having additional funding from the Massachusetts Department of Public Health has made it difficult to implement the regulation. Her quote speaks to the need for schools to be funded as part of this regulation:

> I, I think is a big portion of it, um, because the neurological tests are not free, each school or district has to pick which one they want, and then they have to purchase that. Um, so I think that is a huge, ah, hurdle, for most districts, um, but because they have to do it, they have to spend the money because it's a regulation, it's mandated through the state. So, I think, um and the man power, like I said, to get it instituted, and the man power to ImPACT these kids, um, you know, even preseason then, even, once they get injured, um, if the trainer is taping somebody, or taping a whole team ready to get, ready to go

> out, and then there's a kid that needs to be ImPACTed, it will affect our office here because we'll have to ImPACT them here, so it's just, ah, the ripple effect. It just, it affects a lot of people

The cost of the neurological tests, which school personnel believe to be an essential tool in properly handing concussed students, are substantial enough to make school districts debate their costs and benefits. Although the neurological testing is not actually mandated by the regulation, the quote still conveys tough decisions schools have to make between a tool for concussion-management and spending resources elsewhere.

There were several participants who felt that, while funding and man-power do limit schools' ability to implement the regulation, *their* school was unaffected by the regulation's strains. When the athletic director from case 2 was asked about factors that could limit how schools were able to implement the regulation, he replied:

> I would say, ah certain districts are looking at funding issues ah, with (case 2), we are very fortunate we have a full time trainer. I know some communities don't. So it hasn't been in issue in (case 2), ah, we have a great ESL department, they do all the translation for us all the documents ah, the computer labs that the kids can go down and do the testing on the computers, I'm sure some, some communities, they don't have labs they don't have, ah, people to do the translation, I would say those are some hiccups for communities but not in (case 2).

The nurse from case 1 expressed a similar sentiment. She is careful to indicate that her school has the available capacity to deal with, in her opinion, difficulties associated with the regulation. Her statement, however, ends in a way that suggests that, school personnel, including herself, have faced hardships. She explains as follows:

> In my particular school, I mean, we, we have the resources. Um, I can't imagine having a small school with one nurse, um, no athletic director, no trainer, a small guidance department and I know that they would have less students and therefore less concussions, but still, I don't know how they could spend the amount of time that is needed, it's time, it's a time factor. Every single one of us, this has, placed a burden on our time. It's not that we don't want to do it. It's just that we have to take something away from something else, in order to do it properly.

The athletic director from case 3 held similar thoughts as the nurse from case 1 and the athletic director from case 2. After being asked whether there was anything else that he thought the PI should know to better understand how schools have implemented the regulation, the athletic director discussed similar hardships listed by the nurse from case 1 and the athletic director from case 2. He claimed in the statement as follows:

> I would say, you know, one of the questions you asked, you know, about schools with athletic trainers versus non-athletic trainers, um, such school have more resources than other schools, some schools will have ImPACT some schools will not have ImPACT, so I think that, um, it's very important to understand some of the limitations people face, um, and the lack of resources people may have when trying to implement this.

While participants were quick to list possible funding and man-power issues schools faced while implementing the regulation they were also slow in acknowledging the issues faced by their school.

School nurses felt burdened by the amount of work associated with implementing the regulation. With participating schools deciding to involve nurses in the return-to-play process, the issue of time and man-power has developed. When asked about her experience with implementing the regulation, the health and wellness coordinator from case 4 responded to highlight the arduous task of concussion-management, stating, "It's a lot of work. It's a lot of work for a school nurse. Like a majority of 1 staff member's week." She commented further on the subject, stating:

> Ah, it's burdensome. I don't have to deal with the day to day repercussion of it, but I have to, I have to base my staff, make sure I have enough staff, so that staff members can adequately address the concussion paper work coming in, track where students are in the process of return to play, make sure those, any necessary accommodations are getting out to teaching, to academic staff.

In the opinion of the health and wellness coordinator, the nursing staff from case 4 faces copious amount of work in dealing with the concussion-management process. The nurse from case 1

agreed with the statement of the health and wellness coordinator from case 4. She was asked about the kind of suggestions she would make to better assist schools in implementing the regulation. The nurse provided an answer that discussed how, to her, state regulation adds a lot of responsibility to the nurse's day-to-day tasks, "…the mandates that come from the state are usually very good and wanted and needed but they don't take anything else away…" The nurse went on to expand on how regulations, and particularly the concussion regulation, only add tasks to a nurse's day-to-day work load without taking away responsibilities or adding financial incentives. To that end, the nurse stated:

> I go back to a time factor, I have 6 and half hours a day and they give you what you have to do for field trips, what you have to do for concussions, what you have to do with certain other things, and that's fine, but once you get the mandates for several different things placed on one department or one person, but nothing is taken away, there's no added hours or incentive or pay or whatever, it, it becomes very overwhelming.

Nurses, in additional to school districts in general, felt that funding or a lack of man-power truly created a burdensome amount of work. This issue of funding and lack of man-power, in the opinion of participants, limited some schools' ability to ability to properly implement the regulation.

3. Honesty of Student Athletes and Parents

Honesty of student-athletes and parents was found to be an influential factor associated with local implementation. In general, a large majority of participants felt that the regulation's implementation or effectiveness hinged on honesty from parents and students. For students, participants expressed the need for honesty when reporting symptoms to coaches, athletic trainers, or school nurses. Participants also reported that some concussed students were taking advantage of the academic accommodations associated with the regulation and misusing the neurological baseline test to their advantage. Participants reported issues with parents' honesty,

too. Participants encountered situations in which it was clear parents had not read or comprehended the required concussion-education material.

School personnel faced difficulties when dealing with dishonest parents and students. In a somewhat unprompted response, the health and wellness coordinator discussed the impact of dishonesty from parents and students when asked about her thoughts on the pre-participant requirements, stating:

> Um, I think they neglected to take into account the fact that parents and athletes are not always honest especially when it comes to a sport which is very important to a student…Which then presents challenges for the school staff who have to base decisions upon those forms.

Parents and students that were dishonest on their prior history of concussion forms made it more difficult for school personnel to follow the regulation effecting its implementation. The health and wellness coordinator from case 4, when asked about the concussion-education component of the regulation, provided an equally critical statement regarding the dishonesty of parents and students, stating, "The piece we still struggle with is the parent piece and the student piece." Further into her response, the participant expounded more, stating, "We struggle with compliance from our parents, our students, and even from some of our coaches." The issue of compliance is massively indicative of how effectively a regulation can be implemented. The nurse from case 1 also provided a quotation that spoke to the dishonesty of both parents and students. After being asked about any negative changes that she has seen as part of the regulation's implementation, the nurse stated, "Think there's, (pause), they're some kids who use it. They're some parents who use it. (Pause)…" In this instance, the nurse used the term 'use it' to imply that student athletes and parents were purposefully manipulating some aspects of the regulation. The nurse believed student athletes and parents were being dishonest about

concussion symptoms. The nurse went on to discuss her interaction with students who were dishonest about their concussion symptoms, stating,

> …do you kind of see that as a result of maybe, um a major a lack of education on their part? No, I think it's because they know too much. (Pause) Sometimes you have, you get to the point, when you can really tell who does and who doesn't have a concussion, and I can look at students and usually tell by looking at them, it's in their eyes, it's in their demeanor, it's the way they look at you, you can tell, um, and there are kids that just don't have those factors but have all the right answers. And you have to go along with it even though in your heart you know that the student is probably fine, but you have to go along with it.

Dishonest student athletes, who have gone through the concussion-education training, have gained enough knowledge to understand what should or should not be said in order dictate their situation. The participant is unable to discredit what she feels are falsified symptoms because of the potential consequences an incorrect decision would hold.

Participants also expressed difficultly with students' honesty regarding the academic accommodations and the neurological baseline test. The athletic director from case 1 discussed how he perceived student athletes were misusing the academic accommodations granted by the regulation. When asked about his experience with implementing the regulation, the athletic director claimed that the extra assistance granted by the plan is academically appealing, so much so, that students have started to take advantage of the system, stating:

> There are incidences, I feel, that kids are playing the system. So when they get the academic accommodations I feel like, and it's hard to prove that, but we've definitely had suspicions that kids are actually ok and there milking it in a sense to get the accommodations.

Later, he was asked about why he believes this occurs. The athletic director responded, "Um, that extra time to do your homework, why wouldn't a kid, that may be struggling, wanna take that, you know, why wouldn't they?" However, it is important to note that the athletic director did not feel that this was the norm for all student athletes who receive athletic accommodations.

He specified this point, stating, “Again, I don’t think that’s happening at a massive scale, I feel like that’s just isolated cases where we’ve kind of got that feeling, which is good, which is (a) good thing…” The athletic director from case 4 shared a similar sentiment. When asked about whether he had seen any types of negative responses from parents or students, he stated, “I think they understand the law, I think they do get it, um, I think the question is, sometimes are kids taking advantage of it, from an educational standpoint.” The athletic director from case 4 was asked if he could elaborate on that subject matter. He discussed how concussed student athletes were, in his eyes, prolonging academic accommodations to get relief or easier homework:

> When, if a student has a concussion, they can’t be school for a certain amount of time, they have, it’s very limited, um, you know they class work, they’ll take extra time to take exams whatever they need, so they’ll get a lot of accommodations, sometimes as much as a 504, and what will happen is, the compliance piece, the student athlete will now understand that well jeez as long as I have this concussion, I can, I am except from, I shouldn’t say except, but I have extra time to take a test, um, I don’t have to be in school a full day, you know, and some of them we see now where it’s taking longer to return, ah, than usual…

In his opinion, concussed student-athletes realize the benefits from their academic accommodations help them succeed in school. Thus, this benefit leads to student athletes being dishonest about their concussion symptoms. Similar to the athletic director from case 1, the athletic director from case 4 stated that this phenomenon was not abundantly found within his student-athlete population. He expounded claiming, “…because, it’s not, I shouldn’t say, you know, its isolated incidents…” The athletic director then brought up the point that concussed student-athletes were using the neurological baseline tests to prolong their symptoms. Students who sustained or were suspected of sustaining a concussion were typically put back on the neurological baseline test system to gauge their cognitive abilities with respect to their baseline scores. This, in the eyes of some participants, creates an opportunity for concussed student-athletes to purposely fail the post-diagnosis cognitive test. The failed test provides empirical

evidence indicating the concussed student-athlete is still suffering from concussion symptoms. The athletic director from case 4 explains his opinion on the phenomenon, stating,

> …but kids are working it the other way, where I'm going, hey you know, there's a pretty good looking deal where I can get extra time, so, um, and it's tough with a concussion, because we will put them back on to get their baseline test, on Impact test, and they can tank it.

Other participants shared similar sentiments. The athletic trainer from case 3 agreed bluntly, when asked about the negative changes she had seen, claiming, "Yeah, kids use the test to get out of school work…" The athletic director from case 3 agreed with the idea that kids could purposely fail to prolong their academic accommodations, however, he was not as certain about the feasibility of it occurring. He explained, after being asked about if had seen any negatives arise from the use of neurological baseline testing:

> Um, you know, from time to time you hear of kids, um, you hear that sometimes kids, ah, will try to fix it so that if they do suffer a concussion the baseline and post injury will be, but I would find that very difficult thing to do to be quite honest with you, especially for a teenage, I mean, could it happen, I guess it could.

While he felt it was not likely that this phenomenon was actually occurring, the athletic director from case 3 conceded that this certainly could happen.

One participant, the athletic trainer from case 5, brought up the idea that concussed student athletes were purposely failing the neurological baseline test as well, only, in her opinion, the failing was occurring on the actual pre-season baseline test. The rationale for her assumption was that student-athletes, knowing that data from the neurological baseline test would be compared to any post-concussion test's data, would purposely fail the original test to bring down their baseline cognitive scores. She explained, when asked about the negative changes she had seen since the regulation's implementation, stating:

> …kids are pretty smart and they figured out that if they don't try as hard on their baseline ImPACT test and their scores are lower, they have a better chance at returning to play sooner if they were to take a follow up test.

In the athletic trainer's opinion, student-athletes understood the ramifications of failing the neurological baseline test and did so purposely to increase their chances of not having to stop playing.

There was one instance where a participant noted that students who did not want to play sports anymore were intentionally reporting nonexistent symptoms. In the opinion of the athletic trainer from case 3, student-athletes, who did not wish to play sports any longer, knew that they could get out of participating if they reported having a concussion. When asked about any negative responses she had seen as a result of the regulation being implemented, the trainer from case 3 responded, stating

> …kids use head injuries cuz they really don't want to play the sport and ah, this is what there gonna say, my head hurt, you know, I have this this and this, and being so educated on the symptoms makes them have it, pull it out of their pocket when they don't feel like practicing or playing.

In the opinion of the athletic trainer from case 3, students were being dishonest to avoid having to play sports. It was not specified if the trainer believed student-athletes were using the neurological baseline tests to perpetuate the idea that they had sustained a concussion.

Participants reported that parents of student-athletes were also dishonest. Student-athletes who are willing to bend the rules to participate in their sport even if they have sustained a concussion are likely to have parents that think along similar lines. The nurse from case 4 explained that students who do not respect the concussion protocol are likely to have parents that do not respect the concussion protocol and therefore are more likely to push back when a potentially concussed-student athlete is subjected to missing athletic events. She explained, when asked about how people have responded to the regulation's implementation, stating, "…it's those

athletes that really really really really want to play and the parents are, usually if it's those athletes' parents, a lot of the time, they don't appreciate the process…" Referring to the parents, she goes on to say, "…they'll try to do short cuts of even at games or events they'll say no he's fine, he's fine, let him play, let him play." The athletic trainer from case 5 agreed with the idea that some parents try to make it so their child, who has sustained a concussion, can participate in athletic activity sooner than specified by a physician or the school's athletic trainer. She explains, when asked about her thoughts on her school's decision to put the concussion education component of the regulation into place, stating, "Sometimes parents aren't too happy when you tell them their kid can't participate especially if there is a game coming up."

Some participants, though, held the opinion that parents were being very honest and proactive in their involvement with the concussion-management process. Several participants expressed the sentiment that parents were indeed taking the removal-from-play and the return-to-play process seriously. The coach from case 4 explained her thoughts on this idea, when asked about the types of responses she had seen from parents when a concussion had occurred, stating, "Um, no I mean, parents when, when a kid gets their, their head hit, the parents take it pretty seriously, you know." When asked similar questions, the coach from case 5 and the coach from case 3 responded in comparable fashion: The coach from case 5 stated, "Yeah, parents I think, parents have never complained about I think they're just concerned with safety and what not…," and the coach from case 3, referring to parents stated, "I think that they've been very supportive of it. The interactions I've had with them have been very supportive…" While some participants perceived parents as being dishonest in the concussion-management process, others felt that parents were being supportive and were emotionally invested in ensuring their child's health and safety.

4. Societal Awareness and Expectations Surrounding Concussions

Raised societal awareness surrounding concussions and concussion management was certainly a positive influential factor associated with local implementation. With head injuries becoming a national issue within various professional sports leagues, the term concussion was inserted into society's lexicon with negative connotations. When asked about the factors she thought helped the regulation be implemented with schools and school districts, the nurse from case 4 responded poignantly, "Um, society's expectations right? Right now concussions, they're the buzz word, um, so I think that, some people are expected the schools to do something…" Participants provided a general sense that, because concussions had become such a hot topic of discussion, parents expected schools to have steps in place to counteract the negative health outcomes associated with concussions. A cultural change had occurred around concussions. The athletic director from case 5 agreed and after discussing how even youth sports had begun questioning the rules by which their games were being play, he stated, "So I think that, just as a, just as a society, you know, we're thinking about it (concussions) differently."

Popular culture was most certainly at the forefront of this societal change. The trainer from case 5 surmised that media coverage surrounding concussions also worked to raise society's awareness and expectation. Again asked about the type of factors that she thought helped the regulation be implemented within local school and school districts, the trainer replied, "Um, it probably sounds kind of silly but a lot of, um, media coverage surrounding head injuries, um, especially with, you know, like, Junior Seau and people like that, um, who committed suicide unfortunately…" The coverage by the media of former and current athletes that battled concussions was certainly considered, by several participants, to be a cause of the raised societal

awareness and thus helpful for the regulation's implementation. The athletic trainer from case 3, also answering a question about what he thinks helps the regulation be implemented responded:

> And once again, I'll point to, you know, the national information that we have, you know, especially, this area. You know, you have Patrice Bergeron, you have Savard, you know, two Boston Bruins that suffered severe concussions and where they are now. Teddy Johnson, the guy who played for the Patriots, you know, where he has come, Junior Seau played for the Patriots and, you know, they linked his depression and eventual suicide to the PCS (Post-Concussive Syndrome). So, I, I think, you know, where this is a region that's entrenched in, in sport, and sport culture, that, um, it's not very difficult for people to grasp, you know, what's going on and to understand they have to, you know, we have to do what's right for each and every individual student athlete.

The athletic director felt that the social consciousness raised by former and current athletes from professional sports teams located in Massachusetts helped raise awareness about concussions thus making it easier for schools to implement the regulation. The nurse from case 5 shared a similar sentiment when asked about what helps the regulation be implemented within schools, stating:

> Another thing that I think helps is the news and hearing about people that, um, you know, I'll go back to the football players (slightly laughing), cuz that's what I'm thinking about right now, football players, that they're concussed all the time, and then as they age, the problem that they have. So I think that the media, in some ways, is in this situation has helped provided, um, information to the public so because it's, it's, um, I don't know, a hot topic I guess, of discussion, people are aware of it from areas outside of just the school.

Visible negative consequences of concussions in the form of former and current athletes brought awareness to the seriousness of concussions. Participants felt that this awareness acted to help the regulation's implementation.

5. Communication and Collaboration between Local Implementers

Communication and collaboration between local implementers has, predominantly, been mentioned as being a positive factor in how schools have implemented the regulation. Participants felt having open communication and cooperation between concussion-management

personnel has assisted schools' implementation. The athletic trainer from case 4, when asked about what, in his opinion, helped the regulation be implemented within his school responded with an answer that poignantly described many participants' sentiments regarding personnel cooperation, stating, "What helps it is the cooperation with the, from the athletic department, the coaching staff, you know everyone working together and being on the same page, you know, the communication piece is key to it." Posed the same question, the coach from case 4 provided an answer that mirrored her athletic director, stating, "To get it implemented? I mean obviously just communication." Participants from other cases felt similar to the participants in case 4. The coach from case 2, when asked about the positive changes that he has seen as a result of the regulation's implementation, responded, "Again, it opens up more communication between, you know faculty, trainers, parents, and stuff like that, it opens a lot more communication, in that regard." To drive the point home, after being asked to describe how he felt communication between school personnel had assisted his school with implementation, the athletic director from case 3, to reiterate his point, "Yeah, I think that any time, um, I think communication is crucial in anything, especially when you talking about the wellbeing of the student…" The coach from case 3 provided insight into the type of mental support collaboration and communication provides personnel when dealing with concussions. When asked about his experience with implementing the regulation, the coach, referring to the collaborative nature that existed within his school, stated, "It's not just sort of me out there on an island, you know, I've got back up, I've got other people who can help support me in making that decision, so."

In several instances, there was so much perceived collaboration between school personnel that there was reference to either a 'concussion team' or 'team' of people that had developed to deal with the concussion-management process. Ultimately, the emergence of these 'teams'

signified school personnel's willingness to collaborate. The athletic director from case 1, after acknowledging the difficult tasks associated with the concussion-management process stated, "Yeah, and it still is, the tracking of everything is very difficult and is very, very time consuming. Um, and again, we have a great team." To further emphasize the team mentality his school employed, the athletic director stated, "The team of people that we do have and we do meet twice a year as a concussion team to review, review the policy, um, which, again, is in the regulations." The athletic trainer from case 1 spoke similarly to the presence of a 'concussion team'. When asked about his experience with implementing the regulation, he stated, "How's it, um? Well, I think we work really well here. We have a team, the concussion team, I guess you could call it, with the, athletic director, myself, um (the nurse from case 1)…" The nurse from case 4 also mentioned a team was in place to deal with the onerous task of concussion-management. When she was asked about her experience, the nurse, referencing the amount of work the implementing components of the regulation required, stated, "That was time consuming. It was a lot of time, a lot of effort, a lot of coordination, but, um, it went smoothly, we have some good team members." Participants from all cases felt that communication and collaboration between school personnel assisted in how schools were able to implement the regulation.

6. Suggested or Implemented Improvements

Throughout interviews, participants were eager to provide suggestions for how the regulation could be improved and discuss how their school had implemented what they perceived as improvements. Discussed improvements dealt either with the concussion education component of the regulation or improvements in general. Suggestions for the concussion education component were generally constructive and participants provided ideas cemented in

realistic expectations. These suggestions include: updating the concussion education information, doing more concussion education; providing education at younger ages specifically in health classes; and, standardizing the education material across schools.

Participants, as noted above, provided several examples of suggested or implemented improvements to the concussion-education component of the regulation. The suggestion most often discussed was the need to update the concussion education material. Several participants noted that the information in the concussion education online video had remained the same since the regulation's implementation. Asked about his opinion on the concussion education component, the athletic director for case 3 highlighted this issue, stating, "…there's been no new (concussion education) component, or new freshness to it, um, which, I guess, you know, we're getting the information that we need on concussions, but…" He then went on to discuss the implications that this could have on student athletes, in the statement as follows, "…there's less of the people, I think, you know, I think that the students put it on, they go through the motion of it, and don't really pay hard attention to it. They think they know it still." With the video remaining unchanged, the participant posits that student athletes may not take the concussion education component seriously. The coach from case 2 mirrored this sentiment, when asked about any suggestions on how to better improve the regulation's implementation, exclaiming:

> …you know, maybe update the (concussion education) training a little bit, cuz, you know when you go on, every year, it's kinda the same thing. And for people, such as myself, who are on it every year, um, you know, it's the same exact thing every year, so I know what, I know what I'm gonna see…

While she did not necessarily discuss the negatives associated with several-years old concussion education training video, it is evident that he views the staleness as an issue. The athletic director from case 1 discussed, when asked about any negative changes he had witnessed, the challenges he faces as a result of the video remaining unchanged over the years, stating, "…I wish there was

a little bit more, changes in the educational piece to it, um, to make it, you know, worth it for coaches cuz that's what I hear all the time, ah, I gotta do that again, yep…" The athletic director from case 3 faced the same dissention from coaches regarding the unchanged concussion education video. After being asked about any school personnel that have been non-receptive to the regulation, he states:

> Um, no, I mean there's been some feedback in terms of the video and having it, you know the same thing every time it's on, we have to do it again, yes, yes that's your responsibility, that's what the rule is. The law is you have to watch it every year, yes.

Participants felt that the staleness of the unchanged concussion education video was potentially detrimental to personnel's ability to engage in the concussion management process

Participants also felt that more concussion education was needed for all personnel, including parents and student athletes. When asked about the factors that he thought assists schools in implementing the regulation, the trainer from case 1 responded, simply, "I think more education." He went on to specify what he thinks the Massachusetts Department of Public Health could do to better assist schools, stating, "Um, I would like to see, DPH, do like, like, public service announcements, talking about head injuries in athletics, especially high school kids." The same athletic trainer, when asked about the types of state-level suggestions he could make to better assist the regulation's implementation, referenced back to his previous statement and added that the increased education shouldn't just be going to parents but to the, "general population, so the word gets out there." He follows this statement by introducing the idea of a town hall meeting, in which parents, students, and school staff can get together and ask questions. He explained why something like this would be far more beneficial by juxtaposing it with the negative connotations of the unchanged concussion education, stating:

> Um, more emphasis to the coaches, um, maybe some town hall meetings with neurologists or doctors where they can ask questions instead of just sitting at home and,

> and watching a 20 minutes video, I mean, something they've seen a 100 times that my gut tells me they're not buying into.

Participants believed that more education would help schools in implementing the regulation.

Other improvements directed at the concussion education component of the regulation dealt with beginning the education process at a younger age and the idea of including the information within health lessons. The coach from case 4 made the point that while student athletes are growing up with the idea that concussions are a serious issue, the educational aspects of the regulation are not permeating down to lower levels. She states referring to the concussion education that is ongoing:

> But I think having the kids grow up with it, and know of it, but they don't grow up with it in youth sports so they come to the high school and now concussions, um, you know, become important. I think it probably should be implemented at a younger age, with younger athletes too, but.

While it is not clear which demographic of younger athletes the participant is referring to, her argument, logically, speaks to the idea of starting education at a younger age. The athletic trainer and athletic director from case 3 both agreed that including concussion education in health class would be beneficial for students. The athletic director, after being asked about the specific suggestions in how the Massachusetts Department of Public Health could help schools implement the regulation stated, "I would say, require, make the law require for it to be involved in health classes…" The athletic trainer backed up this sentiment, when posed the same questions, stating:

> And I guess the other huge thing that would be helpful is (pause) instead of it just having to do with extracurricular activities, let it be part of like a health lesson, like a unit in health, where, you know, you have the opportunity to talk about head injuries…

Both participants suggested that there would be an educational benefit gained from including concussion education material in health classes.

One participant suggested that the concussion education component should be standardized across all Massachusetts high schools. After being asked about the suggestions she would have for how the Massachusetts Department of Public Health could better assist schools in implementing the regulation, the nurse from case 4 stated, "They could, they could standardize the educational aspects of that…" However, the nurse did not go into any detail as to what types of benefits this would create for schools.

Other suggested improvements for the regulation's concussion education component were more general in nature. These suggested improvements, too, are grounded in concrete expectations of what is and is not feasible within school districts. These suggestions include: making the policy publicly available in other languages; the Massachusetts Department of Public Health providing concussion incidence data back to schools; standardizing all paperwork; holding meetings between students, their families, and schools' concussion management team to ensure student athletes are getting proper care; make the regulation applicable to all non-athlete students; provide guidelines for severe punishment in case of a student or a coach being dishonest; require all schools to have full time trainers; and, develop better guidelines for dealing with physicians.

More general areas of how to improve the regulation's implementation were also suggested by participants. Most of the general improvement ideas came from either one or two participants; it would not be correct to state that these suggestions were felt, overwhelming, by all participants. There was one instance in which two participants within one case brought up a similar suggestion. The nurse and coach from case 2 both felt that if schools were given access to data that Massachusetts Department of Public Health has collected it could potentially improve the regulation's implementation. When asked about the types of suggestions she would make to

the Massachusetts Department of Public Health, the nurse stated, "I'm data driven, so I like to see, data from other schools, maybe if they could. You know we generate this and give it to people, I'd like to see other, um, cities' data." The coach echoed a similar sentiment when asked the same question. He stated:

> I know it creates more work for an RN but, at the same time, if it's real data that we can take a look at, and we can compare to years past and other districts, and then that way we can kinda figure out, you know what this district is doing, why do they have so few concussions, or why do they have a little bit more, you know something in that regard.

Both of these participants suggest that access to data from other schools would help with how districts have implemented the regulation.

The coach from case 3 put forth a suggestion that dealt with language barriers some schools face. When asked about suggested improvements he has for how the Massachusetts Department of Public Health can better assist schools in the regulation's implementation, the coach stated, "Ok, ah. I would say that being able to make sure that it's accessible in multiple languages." In this case, the coach was refereeing to the ImPACT tests. While the neurological baseline testing is not part of the regulation, one can imagine that any difficulty with language a student athlete would face when taking the neurological test would also be present when reading his or her school's concussion policy. He goes on to specify, that, "I think that it would be looking to offer the test in another language, or a few languages. I think that would be helpful possibly."

One participant, the athletic trainer from case 5, felt that every high school should be mandated to have a full time athletic trainer. When asked about the types of factors she thought would help schools in implementing the regulation, the trainer responded:

> Ah, I mean, I personally would love to see every secondary high school have a full time athletic trainer. Um, if that could be part of the law, I think that would be a huge step in

> the right direction. Now, obviously the feasibility of that happening? Probably not likely. Um, but having a full time person available, full time capacity, makes a huge difference.

Participants felt that having a full time athletic trainer available is a huge factor in how the regulation is implemented.

The health and wellness coordinator from case 4 provided several suggestions for the regulation. First, she felt that school nurses should be involved in the drafting and writing process of any future regulations. After being asked about her suggestions as to how the implementation process could be improved, the health and wellness coordinator stated, "Number one I would have had a school nurse help with them out with the impl(ementing)…with the wording and with the law. Because a school nurse knows what we do, how we do it, what we can do…" Additionally, the health and wellness coordinator provided an example of an improvement that her school had already implemented. Case 4 has decided to gather the 'team' of individuals that deal with the academic portion of the return-to-play process. The meeting would serve to ensure the student, parent, nurse, and guidance counselor, and teachers, were all on the same page in regards to the student's academic recovery plan. She explains in the statement as follows:

> But there are some students, usually there's only two or three, um, maybe one a season, two or three, maybe four, a year, at the most, who are truly in trouble, um, physically, academically. I would like to see, and again, this is something we've recently talked about in guidance, getting a meeting with teachers, guidance, nursing, parent, and student. But that would be for the student that is really, really in trouble.

She went on to specify that her school had actually had one of these proposed meetings and discussed the results, stating, "Yes, we've recently had our first one, and I really liked the way it went." This implemented improvement, in the eyes of the health and wellness coordinator, was fruitful.

One participant suggested that the regulation can be improved through increasing scrutiny for physicians making medical clearance decisions. The health and wellness coordinator

from case 4 felt the regulation did not go far enough to ensure physicians were properly educated or prepared to make proper medical clearance decisions for concussed student athletes. She had doubts as to whether physicians making medical clearance decisions had watched the concussion education video, or as she refers to it as, the 'training'. After being asked about specific suggestions that she would have regarding how the regulation could be implemented, she responded:

> …I wish there was more aggressive, um, requirements for physicians writing notes to be trained and to be signed off, and if there was a way were we could check to see if a physician who's writing concussion accommodations has been through the training.

She felt that increased requirements for physicians making medical clearance would assist schools in implementing the regulation. When asked about how she would go about increasing the requirements for physicians related to medical clearance decisions, the health and wellness coordinator offered a suggestion, stating:

> I wish there was a general website that had specifically the training they want and then there was also a registry of physicians who had been through the training, coaches who had been through the training, that there would be one site and so if I get a form from Dr. Smith, I can go on and say, opp, he's been through it or say you know what, he's writing these notes and he hasn't been through these trainings. I need to call him and say you can't be writing these notes you're not, gone through the training.

Creating a database for keeping track of all physicians who have gone through the concussion-education training, to the health and wellness coordinator, would work to ensure medical clearance decisions were being made by physicians with concussion training.

As discussed above, effectiveness of the regulation depends in part on the honesty of student athletes and their parents. The nurse from case 4 proposed, after being asked about the types of suggestions she would have to help implementation, that there should be tighter sanctions if a student athlete is found to have been dishonest about his or her symptoms. She stated, "And then I think there should be absolute consequences for kids that continue to play,

force the coach into letting them play or fake that their not injured." She then goes on to explain the situation that would lead to her proposed absolute consequences, stating:

> I think that there should be consequences for that, then we have those other student athletes that will extend it, because they will, a lot of the time they get academic accommodations, they get to come into school late, they get to leave school early, so sometimes we see kids that will linger and, and, slowly go back to the doctor, they'll miss appointments so, I think if there was some way to regulate that…

Dishonesty, in the form of letting symptoms linger to keep afforded academic accommodations, should have serious consequences. In the eyes of the nurse from case 4, punishments for this type of dishonesty should be included in the regulation.

C. Study Question 3: Does the reported implementation process match written policy?

Coding of the participating cases' written policies resulted in a codebook with 18 codes (Appendix F). Seventeen of the 18 codes directly coincide with the required policies and procedures of the Massachusetts regulation. One code, "Baseln", is not mentioned in the state policy and concerns the use of neurological baseline testing. Participating cases used the language and template of the Massachusetts regulation to create their school policy for concussion management. Because of this, efforts yielded codes that coincided with the required policies and procedures of the Massachusetts regulation.

The archival analysis yielded mixed results. Results of the analysis can be seen in Appendix G. Written policies from cases 1 and 3 were extremely thorough and had all 18 codes present. Case 2's written policy was missing 5 of the provisions specified in the Massachusetts regulation. Policies and procedures concerning the following were not present in case 2's written policy: method for including the concussion policy within the school handbook; procedure for making the policy available in other languages for those not proficient in English; procedure for

reaching out to non-compliant parents; and, procedure for assessing penalties for non-compliance; and, procedure for designating a head implementer. Case 2's written policy also did not discuss the use of neurological baseline testing. Case 4's written policy was missing 4 of the policies and procedures laid out in the Massachusetts regulation. Case 4's written policy did not include the following policies and procedures: procedure for reaching out to non-compliant parents, policy for instructing coaches and trainers on how to teach techniques that minimize sports-related head injury; procedure of how to prohibit athletes from performing dangerous athletic technique; and procedure to designate a local individual as the head implementer of the regulation.

The written policy for case 5 was difficult to analyze. Case 5's school concussion policy consisted of a 1 page written prospectus regarding the regulation that concluded with information as to where parents, students, and other school personal could find the Massachusetts's regulation for their information. This policy was considered to contain 0 variables. When the athletic director from case 5 was asked about the documents associated with the regulation's implementation, he indicated that the concussion policy available on the website was what was offered to parents and students.

To assess the study question regarding whether reported implementation has matched written policy, the study considered the emerged themes produced through the conventional content analysis and the variables produced by the archival analysis. Through interviews with participants, it was clear that the major elements of concussion-education training, review of pre-participating prior-history of head injury, documentation of suspected head injury, removal-from-play, and return-to-play with medical clearance were all present within each case. Through

analysis of written documents, it was clear that policies from most cases provided procedures to govern the major elements listed above.

There was one area in which reported implementation did not match with written policy. Interviews with participants revealed that cases 2 and 5 performed baseline neurocognitive testing. However, the written policies for cases 2 and 5 do not state this fact. Cases 1, 3, and 4 all mentioned the use of baseline neurocognitive testing within their written policies. This matched with what their respective written policies stated. In general, the language of each case's written policy was extremely similar to the language of the Massachusetts regulation.

CHAPTER IV

DISCUSSION

Ultimately, the goal of this study was to investigate the local implementation process of the Massachusetts regulation governing concussions in high school extra-curricular athletic activity. This task was accomplished by interviewing school staff regarding how the implementation process has occurred and factors influential to implementation, and then by comparing written school policies and reported implementation.

Eight themes emerged to explain how the implementation process had occurred: 1) neurological baseline testing programs were used by all schools to assess changes in cognitive performance post-concussion event; 2) return-to-play and removal-from-play decision making authority was allocated to schools' athletic trainers to eliminate the perverse incentives for coaches and players; 3) concussion education was disseminated in the form of an online video; 4) online document management systems were utilized to better streamline paperwork associated with the regulation; 5) academic and athletic accommodations for concussed students were presided over by school nurses and athletic trainers, who worked in a complementary fashion; 6) state-wide academic accommodation plans were provided for severely concussed students in order to provide documented academic reprieve; 7) a 5 day symptom free rest period was instituted to better ensure concussed students were fully healed before returning to play; and 8) primary care physicians were used to procure medical clearance for concussed students.

Six themes emerged from the data as influential to implementation: 1) the availability of a full time athletic trainer; 2) funding and man-power, or a lack thereof; 3) honesty of parents and student athletes in dealing with the concussion-management process; 4) societal awareness

and expectations; 5) communication between local implementers; 6) suggested or implemented improvements.

In general, written policy and actual implementation matched. Schools used the Massachusetts concussion regulation as a template upon which to base their policies. As a result, most school policies looked similar to the regulation both in wording and in sentiment. All participants indicated that the regulation's components, i.e. concussion education training, review of pre-participation prior-history of head injury, documentation of suspected head injury, removal-from-play, and return-to-play with medical clearance were all present within each case.

Reported implementation did not match written policy in one instance. Participants from each case specified that neurological baseline testing was used in the concussion-management process. While this component is not mandated by the regulation, 2 schools did not specify within their concussion policy that neurological baseline testing was being performed. There is no doubt that the participating schools went above and beyond the regulation in deciding to employ the use of the neurological baseline testing program. However, for cases 2 and 4, written policy did not reflect their inclusion of the testing program. This ran counter to the reported implementation discussed by participants, as several participants from each case discussed the use of a neurological baseline testing program. This was the only instance in which reported implementation and written policy did not match.

Major components of the Massachusetts regulations were implemented with a high level of fidelity. While all participating cases had implemented the Massachusetts regulation's components, differences and similarities regarding local-level implementation decisions existed across cases. Some decisions, like the use of neurocognitive baseline testing programs, decision making authority of the athletic trainer, use of online concussion education training, involvement

of local physicians for acquiring medical clearance, and development of collaborative relationship between school nurses and athletic trainers were identical across cases. Other implementation decisions, such as the use of the online-document management system, 5 day additional symptom free period, and the use of state-issued academic accommodation plans, were not homogenous across cases.

Use of the neurological baseline testing programs by participant's schools was seen by participants as a positive contribution to their efforts to deal with concussed students. While the program does not provide school personnel with definitive concussion diagnoses, it does add an extra layer of empirical evidence. Evidence suggests that the program ImPACT test is a viable source of information when evaluating whether a concussion has occurred (Collins et al., 2003). For situations in which school personnel may suspect a student athlete is not being particularly forthright about their concussion symptoms, the neurocognitive baseline testing program can act as an assessment tool to supplement observational-based opinion. A challenge to the utility of neurocognitive testing is the possibility that an athlete can manipulate the baseline test so as to hide evidence of a concussion at post-test. The researcher was not able to determine exactly how the baseline neurocognitive test assesses the cognitive abilities for potentially concussed student athletes. Initial impressions of the testing program seemed to indicate that cognitive ability was being measured, but this was not specified to the researcher. One participant seemed to suggest that part of the testing program relied on student athletes to self-assess their symptoms on a sliding scale between 0 and 6. If the baseline testing programs relies on self-administered ordinal data to judge cognitive ability or concussion symptoms, the program's effectiveness should, rightfully so, be called into question. Reliance on self-administered data would greatly increase

the probability that the tests could be used by students to hide or prolong their concussion symptoms.

The use of neurological tests poses additional challenges to some school districts. Use of the testing program requires funding and man-power, an issue that was reported to significantly inhibit a school's ability to implement the Massachusetts regulation. Funding is needed for schools to afford the testing program for student athletes. Man-power is needed to administer the baseline and post-concussive tests. Regardless of the efficacy of the testing program, school districts that face a lack of funding or man-power will most likely be unable to utilize the technology. This prohibits certain school districts from benefiting from the positive changes use of the neurological testing program could provide.

Mandating the use of neurological baseline testing programs within schools does not seem logistically feasible. One participant went as far as to say that mandating the testing program within all high schools was not necessary; it is unrealistic to require all Massachusetts high schools to spend the money necessary to utilize the testing program. However, if the Massachusetts Department of Public Health were to develop their own neurocognitive baseline testing program or partner with an existing company to negotiate reduced rates for all high schools, perhaps school districts could benefit from the zero-to-low-cost and homogenous alternative. A free or reduced-cost neurocognitive baseline testing program would allow school-district funds to be used for other concussion-management related tasks. Negotiated reduced rates in return for exclusive rights to Massachusetts high schools could potentially allow schools in impoverished areas access to the testing program that they do not have now.

Placing decision making authority for removal-from-play and return-to-play in the hands of an athletic trainer also has implications related to funding and man-power. Utilizing the

athletic trainer as the forward-most involved school personnel in the concussion-management process is unequivocally beneficial for schools and school districts. Organization of power in this way creates an objective barrier between coaches and players. It cannot be understated that for coaches, even with concussion education training, perverse incentives exist. There is no test that can produce a definitive concussion diagnosis. Therefore, the evaluation of a potentially concussed student athlete is inherently subject to one's judgment. Coaches who honestly want to ensure the safety of their student athletes might misinterpret concussion symptoms if removing the athlete from play would be detrimental to the team's performance. Pressure to win, subtle or not, could cloud a coach's judgment in these situations. Saying this is not to highlight the negatives of coaching, rather, it is meant to express the extreme need for high schools to all employ full time athletic trainers. The safety of student athletes is the number one priority for athletic trainers. With student athlete safety being the primary concern for their professional career, athletic trainers are best positioned to provide an objective assessment of potential concussions.

Funding and man-power are real issues for some school districts and hiring a full time trainer is not entirely feasible. For the state to mandate that all schools have at least 1 full time athletic trainer employed would mean that affected schools would need to divert funds from other sections of the school. This, too, is not entirely feasible. It is unclear how the Massachusetts Department of Public Health could mandate such a thing devoid of any sort of financial assistance for schools that need it. Requiring schools to divert funds from other sections of the school to employ a full time athletic trainer would be politically untenable because of the implication it would mean for the value of sports over education. Alternatively, another solution is for the Massachusetts Department of Public Health to provide financial assistance to schools

that cannot afford a full time athletic trainer. This would pose several challenges, such as developing a system to determine financial assistance eligibility threshold levels for Massachusetts high schools. Without a standardized way to identifying which schools were financially unable to employ a full time athletic trainer devoid of state assistance, this solution would be difficult.

The online dissemination route for concussion education training has implications for determining whether student athletes and parents are completing the necessary requirements. While all 5 schools used the 30 minute online video as a means to disseminate concussion education, only 1 case actually required students to hand in certificates of completion. No school required parents to hand in certificates of completion. For the 4 schools that do not require the completion certificate, concussion education is said to have been achieved as long as the student athlete and parent sign a paper saying that it has happened. Essentially, these 4 cases are allowing athletes and parents to self-report whether they have received concussion education training. Inherently, there are many flaws with this situation. Chief among them, there is no way to know how many parents and students actually completed the online training and how many simply signed the form without completing the necessary requirements. A school's compliance with the regulation does not guarantee that student athletes and their parents are receiving the required concussion training.

Evidence suggests that high school athletes do not accurately report their concussion symptoms (McCrea, Hammeke, Olsen, Leo, & Guskiewicz, 2004; Register-Mihalik, et al., 2013; Williamson & Goodman, 2006). Many articles place the rate of concussion reporting around 50% (McCrea et al., 2004; Register-Mihalik et al., 2013). Because of this existing level of dishonesty, it is not hard to imagine a scenario where student athletes are under-reporting their

concussion education. However, no studies have examined the rate at which high school athletes self-report their concussion education.

The issue of student athletes and parents self-reporting their concussion education does not stem from neglect. Rather, similar to the issue schools face when of employing a full time athletic trainer and the use of neurocognitive testing programs, the capacity of the school ultimately the determining factor. Parents and students are being asked to self-report their education because of the immense amount of work collecting completion certificates would entail. The one school that did collect education completion certificates, case 3, was the only school that had two full time athletic trainers and was considered 'urban' and of 'high' socioeconomic status. Even the use of an online-document management system by case 1, considered 'rural' and 'high' socioeconomic status, was not enough to curb the amount of work it would entail to procure completion certificates from all students and parents. A possible solution for ensuring student athletes receive information on the negative health effects of concussions would be to make concussion education part of the Massachusetts middle school or high school health curriculum. This solution would not assist in ensuring parents of student athletes were completing the concussion education training. However, it would significantly increase the probability that student athletes were receiving proper concussion education training.

Evidence from the literature suggests school-based knowledge interventions can increase health knowledge. Harrell, Davy, Stewart, & King (2005) conducted a study evaluating a school-based intervention aimed at increasing health knowledge of cardiovascular disease among rural Mississippi children, aged 6 to 19. The study investigated health knowledge prior to and after a 16-week school-based intervention in 204 fifth-grade students (Harrell et al., 2005). Compared

to controls, schools with the 16-week intervention had an increase in health knowledge (Harrell et al., 2005). The study also tracked health behavior and found that the intervention schools had an increase in health behavior compared to controls (Harrell et al., 2005). This research is transferable for concussion education. As a health topic, there is reason to believe including concussion education as part of the health curriculum could possibly increase knowledge for high school students. Bringing concussion education to the school health curriculum would expose student athletes, and other students, to information concerning the negative health effects of concussions within a classroom setting. This would require collaboration between Massachusetts Department of Education and the Department of Public Health. A drawback to this solution is parents of student athletes would still need to complete concussion education in some form. It is reasonable to expect that schools would be more likely to collect concussion education completion certificates from parents if they no longer had to collect the same form from student athletes.

Participants regarded the involvement of local physicians in the concussion-management process as both necessary and frustrating. Medical clearance, provided by the concussed student athlete's primary care physicians, was agreed to be essential in returning student athletes to play safely. However, participants questioned the validity of some physicians making these decisions. As physicians operate outside the high school's authority, it is not possible to ensure that physicians making medical clearance decisions are educated on the subject matter of concussions. While the regulation states physicians are required to take the concussion education training, high schools have no way of knowing whether the education has actually occurred, are powerless to enforce this requirement, and are in no position to question the medical advice of the physician. Participants admitted that there had been instances in which student athletes still

suffering from the negative health effects of a concussion were medically cleared to return to athletic activity by a physician. While this does not prove that physicians are failing to complete the concussion education training as required, it certainly suggests that some physicians making medical clearance decisions may not be properly prepared to do so. To combat this issue, schools could state that they will only accept medical clearance forms from physicians who are certified as having completed concussion education training. This solution seems logistically challenging. A potential fix could be a state-wide system created by the Massachusetts Department of Public Health to maintain a list of certified primary care physicians. Schools could then cross reference any medical clearance decisions with certification information from a centralized database. This would ensure that medical clearance decisions were coming from physicians certified in concussion education training and thus lower the probability of a concussed student athlete returning to play with persisting symptoms. Ultimately, however, this type of solution may prove difficult to implement as parents might be reluctant to take their child to a different doctor if their usually primary care physician is not certified. Other potential solutions are to require all medical clearance decisions to be made by neurologists or for schools to contract a physician to make medical clearance decisions. These solution, though, are likely unfeasible due to the associated financial costs.

Participants touched upon the lack of punitive measures associated with the regulation. Policy 17 (Appendix B) discusses the need for schools to establish "Penalties, including but not limited to personnel sanctions and forfeiture of games, for failure to comply with provisions of the school district's or school's policy." During participant interviews, no discussion of established penalties took place. More often than not, participants commented on the lack of punitive measures associated with student athletes and parents being dishonest with their prior-

concussion history, watching of the concussion-education video, and reporting of concussion symptoms. Within cases, no real concrete framework for dealing with student athletes and parents who were being perceived as dishonest existed. This is not surprising as the language of the regulation ambiguously refers to possible penalties for student athletes and parents as merely personnel sanctions. In the case of student athletes using the system to gain extra academic accommodation, there is a clear advantage to be dishonest regarding concussion symptoms especially because they face no real repercussion for their actions. Wording of the regulation should act to impose standardized penalties for student athletes that are found to be dishonest regarding their concussion symptoms. Considering the mental maturity level of student athletes, tangible repercussions will not entirely erase dishonest actions. However, standardized penalties would serve to, at a minimum, marginally increase student athlete honesty.

Findings from this study reinforce some portion of the existing literature. Chrisman, Quititquit, & Rivara (2012) indicate that student athletes are dishonest about reporting their concussion symptoms. This is directly in line with the results of this study which found similar concerns. Chrisman et al. (2012) conducted a qualitative study using focus groups with varsity high school athletes in Seattle, WA. Results from the study indicate that athletes who suffer or are suspected of suffering a concussion would keep playing and fail to report their symptoms. This study found that school personnel believe some student athletes are dishonest with regards to reporting their concussion symptoms..

One other article has examined the implementation of State concussion legislation. Chrisman, Schiff, Chung, Herring, & Rivara (2014) found similar results to the study at hand. The authors performed a descriptive epidemiologic study using a mixed-methods survey. Participants were randomly selected and stratified by rural and urban status. Among other things,

results of the survey stated that all coaches received concussion education. Additionally, the study claims that concussion education for athletes and parents are limited compared to education for coaches. The study at hand found similar results to Chrisman et al., 2014, in that, coaches were uniformly found to have received concussion education. While this study did not gauge the level of concussion education parents and students have acquired as part of the regulation's implementation, it is fair to say that concussion education for athletes and students is less rigorous compared to that of coaches due to reliance on self-reporting by parents and athletes at most schools.

A. Strengths and Limitations

One major limitation of the study is that participant recruitment was limited by time constraints, and consequently, the study was unable to recruit a school that was considered both 'urban' and 'low' socioeconomic status. Not involving one of these schools may have been detrimental in that the full range of strata was not accounted for. The fundamental cause hypothesis predicts that schools with lower socioeconomic status would be more likely to have difficulty implementing the regulation without the resources to hire a full time athletic trainer or buy the rights to use the neurological baseline testing program. While some participants indicated theses as likely challenges for schools with limited resources, this study is not able to shed light on the accuracy of this prediction as it lacks participants from a school that was both 'urban' and 'low' socioeconomic status.

Another limitation of this study is that the qualitative approach does not allow generalizable claims and predictions to be made. As with any qualitative study, the knowledge and findings produced might not be generalizable. In this case, the findings of this study cannot be generalized to other schools within Massachusetts. Also, results of this study cannot be

generalized to other states, even those with similar concussion-prevention regulations. Likewise, it is difficult to predict whether the factors influential to implementation are universal within Massachusetts high schools or whether all schools written policies match actual implementation. While the findings may not be generalizable, the knowledge generated by qualitative research is substantial in its own right. Qualitative investigations often gain detail rich and complex comprehension of a specific phenomenon. This is the first study to examine the phenomenon of local implementation of the Massachusetts regulation at the school or school district level. Thus it is uniquely positioned to provide knowledge as to how the regulation has been implemented.

A strength of conducting the study qualitatively is that it allowed the study to obtain rich detail and identify implementation decisions made within cases. This process allowed the PI to study a number of cases in-depth. The qualitative method itself allows for a complex description of the phenomena at hand. A quantitative study would not have provided this level of context into the actual local implementation process. Interviewing multiple school personnel from each school provided important insight into implementation process. Similarly, including school written policies added additional information to better understand implementation decisions. Deciding to use a multiple-case study approach added to the study findings. Schools from varying types of school districts helped to supplement the study's findings.

B. Conclusion

All 50 states have passed legislation aimed at addressing the public health issue of concussions in high school athletics. As with any public health policies, examining how these regulations have been implemented is imperative to understanding their effectiveness. Components of the Massachusetts concussion regulation were implemented with a high level of fidelity. However, differences and similarities concerning implementation decisions at the local-

level exist. Identifying these differences and similarities is essential in ensuring the implementation of the regulation is as intended. Participants viewed the use of neurological baseline testing as a viable tool in dealing with concussed students. While some issues surrounding the integrity of the test's results exist, there is a clear advantage to having concrete data when making concussion-management decisions. In order to ensure all schools have access to privately purchase neurological testing programs, the Massachusetts Department of Public Health should consider either developing their own program or partnering with a providing company to negotiate reduced rates for all high schools. Schools, in general, placed removal-from-play and return-to-play decision making authority in the hands of their athletic trainers. The involvement of a third-party evaluator helped increase the probability that a student with concussive symptoms is removed from a field of play. But, some Massachusetts schools face an issue with funding and man-power and may not be able to employ a full time athletic trainer. The Massachusetts DPH should consider providing subsidies for impoverished school districts to provide availability of a full time athletic trainer. Also, funding and man-power is a factor in how schools decide to mandate concussion-education training. Due to a lack of funding and man-power, 4 out of the 5 cases saw collecting concussion education completion certificates not feasible and resorted to allowing student athletes and parents self-report whether or not they had fulfilled the concussion education training requirements. Including concussion education in the Massachusetts health curriculum would curb the need for student athletes to complete concussion education training as they would receive educational material during school time.

As a result of this study, it is clear that more research is needed to assess whether baseline neurocognitive testing programs are cost-effective tools for managing concussions. The cost of these programs could prove to price out smaller, less affluent, schools from the market. Results

of this pricing out could potentially limit the ability of some school districts to manage concussions and thus limit the effectiveness of the regulation. Also, new research areas should involve the efficacy of the online concussion education video and, more broadly, what the lack of punitive measures means for local implementation.

Several recommendations for the Massachusetts Department of Public health emerged from this study. To better assist schools with economic hardship, the Massachusetts Department of Public Health should consider developing their own neurocognitive baseline testing program. They could also partner with an existing company to negotiate reduced rates for Massachusetts high schools. Providing a zero-to-low cost, homogenous option for neurocognitive baseline testing may allow schools that did not previously have the economic means to utilize this type of concussion-management tool. The Massachusetts Department of Public Health should make efforts to ensure at least 1 full time athletic trainer is employed by all high schools. The Massachusetts Department of Public Health should consider providing financial assistance to schools that lack the financial capacity to employ at least 1 full time trainer. To increase the probability that high school student athletes are being properly trained in concussion education, the Massachusetts Department of Public Health should consider making concussion education part of the health curriculum. While this would require collaboration with the Massachusetts Department of Education, it would significantly increase the likelihood that student athletes were being proper educated in the health risks of concussions. Additionally, the Massachusetts Department of Health should take steps to ensure local physicians are prepared to make medical clearance decisions. A possible solution to this problem is to create a state-wide system to maintain a list of certified primary care physicians. A centralized database would allow schools to ensure medical clearance decisions were coming from primary care physicians who received

the requisite concussion education training. The Massachusetts Department of Public Health should also impose standardized penalties for student athletes and parents that are found to be dishonest about concussion symptoms. Standardized penalties could stand to marginally increase student athlete honesty.

There is a need to continue research on the 2010 Massachusetts Act Relative to Safety Regulations for School Athletic Programs and the Massachusetts Head Injuries and Concussions in Extracurricular Athletic Activities Regulation (105 CMR 201.000). There is a need to qualitatively examine how student athletes and parents interact with the Massachusetts regulation. While this study has shed light on the concussion-management process dictated by the Massachusetts regulation, the opinions have only come from school employees. Exploring how student athletes and parents interact with the Massachusetts regulation is thus necessary to fully understand the phenomenon. A quantitative evaluation is also necessary to determine whether the regulation has achieved its desired goals. A quantitative analysis would seek to prove if the regulation has been successful in reducing the number of secondary-impact related concussions and primary concussions. This information will provide context concerning the degree to which the regulation has been implemented and offers insight into influential factors related to the regulations implementation.

APPENDIX A

HADDON MATRIX APPLIED TO SPORTS-RELATED CONCUSSION INJURIES*

Phases	**Factors**			
	Athletes	**Vector (other player and equipment)**	**Physical Environment**	**Social Environmental (community norms, policies, rules)**
Pre-Event	Velocity Created, Mass, Age, Genetics, Experience, Knowledge of Protective Gear, Proper Footwear	Velocity of Other Player, Mass of Other Player, Experience of Other Player	Maintenance of the Field	Social Norms Regarding Protective Gear, Training on Properly fitting and wearing protective gear, School funds for protective gear
Event	Age, Genetics, Proper Use of Protective Gear, Posture	Posture of the Other Player, Helmet Design, Protective Gear, Ability to Absorb Impact	Surface Hardness	Enforcement of Wearing Protective Gear Appropriately
Post-Event	Knowledge to Report Symptoms, Age, Genetics		Proximity to Medical Care, Proximity and Availability of Trained Medical Response Team, Rehabilitation Programs in Place	Coach and Athletic Trainer Knowledgeable of Symptoms, EMT and Doctor trained, Public Support for Appropriate Care

*Adopted from Bean & Pintado (2011)

APPENDIX B

POLICIES AND PROVISIONS OF THE MASSACHUSETTS REGULATION

Policy (# in MA Head Injury Law)	Type of Concussion Prevention Measure
(1) Designation, by the superintendent or head master, principal or school leader, of the person responsible for the implementation of these policies and protocols, either the Athletic Director or other school personnel with administrative authority	N/A
(2) Annual training of persons specified in 105 CMR 201.007 in the prevention and recognition of a sports-related-head injury, and associated health risks including second impact syndrome utilizing Department-approved training materials or program, and documentation of each person's completion of such training	Primary and secondary
(3) Documentation of physical examination prior to a student's participation in extracurricular athletic activities on an annual basis, consistent with 105 CMR 200.100(B)(3) and information for students participating in multiple sports seasons that documentation of one physical examination each year is sufficient	N/A
(4)Procedure for the school to obtain and ensure review, prior to each sports season, of current information regarding an athlete's history of head injuries and concussions using either the Department Pre-participation Head Injury/Concussion Reporting Form For Extracurricular Activities (Pre-participation Form), or school-based equivalent	Secondary
(5) Procedure for medical or nursing review of all Pre-participation Forms indicating a history of head injury	Secondary
(6) Procedure for the school to obtain and ensure timely medical or nursing review of a Department Report of a Head Injury During Sports Season Form (Report of Head Injury Form), or school-based equivalent, in the	Secondary

event of a head injury or suspected concussion that takes place during the extracurricular activity season	
(7) Procedure for reporting head injuries or suspected concussions sustained during extracurricular athletic activities to the school nurse and certified athletic trainer, if on staff	Secondary
(8) Procedure for identifying a head injury or suspected concussion, removing an athlete from practice or competition, and referring for medical evaluation	Secondary
(9) The protocol for medical clearance for return to play after a concussion that at minimum complies with 105 CMR 201.011	Secondary
(10) Procedure for the development and implementation of post-concussion graduated reentry plans to school and academic activities, if indicated, by persons specified in 105 CMR 201.010(E)(1);	Secondary
(11) Procedure for providing information, and necessary forms and materials, to all parents and athletes including the: (a) annual training requirement, (b) procedure for the school to notify parents when an athlete has been removed from play for a head injury or suspected concussion sustained during an extracurricular athletic activity, (c) protocol for obtaining medical clearance for return to play and academics after a diagnosed concussion, (d) parent's responsibility for completion of the Pre-participation Form, or school-based equivalent, and (e) parent's responsibility for completion of the Report of a Head Injury Form, or school-based equivalent	Secondary
(12) Inclusion in the student and parent handbooks of information regarding the sports-related head injury policy and how to obtain the policy	Primary and secondary
(13) Procedure for communicating with parents with limited English proficiency	Primary and secondary

(14) Procedure for outreach to parents who do not return completed forms required for students to participate in extracurricular sports and for how to handle situations where a student verifies completion of the annual training requirement but a parent has not;	Primary and secondary
(15) Procedure for sharing information concerning an athlete's history of head injury and concussion, recuperation, reentry plan, and authorization to return to play and academic activities on a need to know basis consistent with requirements of 105 CMR 201.000 and applicable federal and state law including but not limited to the Massachusetts Student Records Regulations, 603 CMR 23.00, and the Federal Family Educational Rights and Privacy Act Regulations, 34 CFR Part 99.	N/A
(16) Instructions to coaches, certified athletic trainers, trainers and volunteers: • to teach form, techniques, and skills and promote protective equipment use to minimize sports-related head injury; and • to prohibit athletes from engaging in any unreasonably dangerous athletic technique that endangers the health or safety of an athlete, such as using a helmet or any other sports equipment as a weapon	Primary
(17) Penalties, including but not limited to personnel sanctions and forfeiture of games, for failure to comply with provisions of the school district's or school's policy.	N/A

APPENDIX C

INITIAL INTERVIEW SCHEDULE FOR SCHOOL-LEVEL ACTORS

Interview Guide:

Thank you for taking the time to talk with me today. Our interview today should take between about an hour. I am are here today to interview you the Massachusetts Head Injury and Extracurricular Athletic Activity regulation that was recently passed. For the rest of the interview, I will be referring to this as the Massachusetts regulation. Please do not be concerned if your feel any of these questions are not within your area of focus, we are interested in your response regardless. To help recall our conversation, we would like to tape-record the interview if that is ok with you. Is that ok?
Do you have any questions before we begin?

1. Are you aware of the previously mentioned Massachusetts concussion regulation?
2. If you would, can you please describe your understanding of the Massachusetts concussion-regulation?
    i. In your eyes, is the Massachusetts concussion-regulation mandatory?
3. Can you share with me your opinion about the specifics components of the Massachusetts concussion-regulation? Such as annual concussion education training or
    i. Return-to-play, or
    ii. Removal-from-play, or
    iii. Pre-participating requirements, or
    iv. Documentation and review
4. How do you feel about how your school has decided to put components of the Massachusetts regulation in to place? Again, such as concussion-education or
    i. Return-to-play, or

ii. Removal-from-play, or

iii. Pre-participating requirements, or

iv. Documentation and review

5. What has been your experience with implementing the Massachusetts regulation within your school/school district?
6. If you could, can you please tell me about your experience interacting with other coaches, trainers, school staff, parents, or students while implementing this regulation?
    i. Have people been receptive? Or
    ii. Have people responded negatively to the Massachusetts regulation
7. What do you think impacts how the Massachusetts regulation has been implemented within your school?
    i. Are there inhibiting factors? or
    ii. Are there facilitating factors?
8. What types of changes have occurred in your school as a result of the new regulation?
    i. Any positive changes? or
    ii. Where there any negative changes?
9. If you had the opportunity to make suggestions to improve how your schools has implemented the Massachusetts regulation what would they be?
10. Given your experience, what suggestions do you have as to how the state could better implement the Massachusetts regulation?
11. Is there anything else you think I should know to understand this implementation process?

12. Are there any other documents that your school provides that are relevant to implementation?
13. Is there anything you would like to ask me?

APPENDIX D

EMERGENT INTERVIEW SCHEDULE FOR SCHOOL-LEVEL ACTORS

Interview Guide:

Thank you for taking the time to talk with me today. Our interview today should take between about an hour. I am are here today to interview you the Massachusetts Head Injury and Extracurricular Athletic Activity regulation that was recently passed. For the rest of the interview, I will be referring to this as the Massachusetts regulation. Please do not be concerned if your feel any of these questions are not within your area of focus, we are interested in your response regardless. To help recall our conversation, we would like to tape-record the interview if that is ok with you. Is that ok?
Do you have any questions before we begin?

1. Are you aware of the previously mentioned Massachusetts concussion regulation?
2. If you would, can you please describe your understanding of the Massachusetts concussion-regulation?
3. Can you share with me your opinion about the specifics components of the Massachusetts concussion-regulation?
    i. Such as annual concussion education training
    ii. Documentation and review and the Pre-participating requirements
    iii. Removal from play and return to play
4. How do you feel about how your school has decided to put components of the Massachusetts regulation in to place?
    i. Such as annual concussion education training
    ii. Documentation and review and the Pre-participating requirements
    iii. Removal from play and return to play

5. What has been your experience with implementing the Massachusetts regulation within your school/school district?
6. If you could, can you please tell me about your experience interacting with other coaches, trainers, school staff, parents, or students while implementing this regulation?
    i. Have people been receptive? Or
    ii. Have people responded negatively to the Massachusetts regulation
7. What do you think impacts how the Massachusetts regulation has been implemented within your school?
    i. Are there inhibiting factors? or
    ii. Are there facilitating factors?
8. What types of changes have occurred in your school as a result of the new regulation?
    i. Any positive changes? or
    ii. Where there any negative changes?
9. If you had the opportunity to make suggestions to improve how your schools has implemented the Massachusetts regulation what would they be?
10. Given your experience, what suggestions do you have as to how the state could better implement the Massachusetts regulation?
11. Is there anything else you think I should know to understand this implementation process?
12. Is there anything you would like to ask me?

General Probes added:

1. Do you feel any negatives can be associated with the use of ImPACT testing, such as purposely failing either before or after a concussion occurs?

2. What is your opinion on the content of state-issued concussion education video? Do you feel it is adequate for the students and parents?
3. What types of issues have developed with the use of online education and pre-participation forms?

APPENDIX E

RESEARCHER JOURNAL

Date: November 17th, 2014

Participant: 100401

Interview time: 10:30am

Notes:

Upon arrival, 100401 seemed calm and willing to speak with me. He had a large office, wherein, we sat at what appeared to be his meeting table. After thanking 100401, the consent form was given out and returned signed without questions or hesitation. My reiterated request for our conversation to be audio recorded was approved. Shortly after, the recording devices were turned on to begin the interview process. All questions from the interview guide were asked. Twice during the interview, we were briefly interrupted by students who had questions to ask of 100401. The interruptions were short and duration and therefore the recording devices were not turned off. Twice during the interview a loud bell indicating the end of one and the beginning of another class. During the first loud bell, I stopped speaking to let the bell finish. 100401 talked through the second loud bell noise.

Participant 100401 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. The participant brought up the point that some athletes were being dishonest with their baseline neurocognitive tests in order to hold on to academic accommodations longer. This idea was included dishonestly surrounding the neurocognitive test was included into the interview guide.

Date: November 18th, 2014

Participant: 100501

Interview time: 10:00am

Notes:

Upon arrival for the interview with 100501, I was greeted by an administrative assistant specifically allocated to the athletic department. I waited in an adjacent room to the participant

while he finished up his phone conversation. When we introduced ourselves, 100501 asked "what are you here to speak about again". I had called to confirm our meeting a day before but only spoke with the administrative assistant. After our introduction, I sat down in a somewhat smaller office at a round table and handed out the consent form. The form was returned with no questions and was signed by 100501. My reiterated request for our conversation to be audio recorded was approved. 100501 then closed the door to the adjacent room so as to create a private room. At one point during the interview, there was interruption from a wakie-talkie belonging to the participant. The page was not directed towards him and he turned down the volume.

Participant 100401 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming.

Date: November 20th, 2014

Participant: 100101

Interview time: 12:00pm

Notes:

I arrived 30 minutes early to my scheduled meeting with 100101. After waiting 20 minutes in the school's lobby, I was greeted by 100101 and asked to come speak with him in his office. His office was small and our interview occurred at his personal desk. I handed out the consent form and 100101 took time to read the whole document before signing, unlike previous participants. He had no questions and the consent form was returned signed. My reiterated request for our conversation to be audio recorded was approved. The recording devices were turned on and interview began.

Participant 100101 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. After the recording devices were turned off, 100101 asked me a question about why I was doing this research. We spoke about why the research was being done but it was not captured on the recording device.

Date: November 20th, 2014

Participant: 100102

Interview time: 2:30pm

Notes:

Participant 100102 was the most interesting interview to date. Upon arrival back at the school, I waited for an extra 15 minutes past our scheduled meeting time. I had contacted 100102 previous to my arrival to confirm our meeting. I made my way through the school to find 100102. After finding him, I followed 100102 to his office which could only be described as a glorified equipment depot smelling fresh of used equipment. The office was all concrete and provided minimal space for me to take interview notes. I presented the consent form to participant 100102 and without reading it he signed it and returned it to me. My reiterated request for our conversation to be audio recorded was approved. During the interview, the heating system can be heard turning off and on with regularity. My interview with 100102 was interrupted once by a student.

Participant 100102 was willing to speak with me concerning the questions I had to ask. However, on several occasions, 100102's response veered quite off topic and it almost seemed that he had a lack of understanding of the questions at hand. Participant 100102 seemingly only wanted to discuss how he felt the additional 5 days symptom free period was, in his words, dangerous, and caused his student athletes to go, quote, underground. At first I was unaware at what this meant. After a few minutes, I realized he was implying that student athletes feared reporting their symptoms to school personnel knowing that any suspected or real concussion could minimally result in a 2 week loss of playing time. Regardless, (Case 1's Coach) was candid and forthcoming when his responses were specific to the questions at hand.

Date: November 20th, 2014

Participant: 100103

Interview time: 3:30pm

Notes:

After speaking with participant 100102, I tried to leave the room without any direction towards 100103 from 100102. However, 100102 was being courteous and decided to walk me over to the office of 100103. This is important to note because of the lack of anonymity this may cause. It appeared all participants from school 1001 were aware of each other's involvement beforehand.

Upon meeting participant 100103, I waited around 5 minutes for him to finish his phone call. During that time I set up my note pad and got out my recording devices. Once 100103 was finished with his phone call, we began the introduction process where the consent form was filled out. 100103 read the consent thoroughly, and without question or hesitation, returned the consent form signed. My reiterated request for our conversation to be audio recorded was approved. Our conversation occurred in 100103 at his desk. The room was medium sized and filled with equipment. At one point in our conversation, 100103 pulled out his own copy of the state policy to address some of the language.

Participant 100103 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. When asked about compliance of other school personnel, there seemed to be a tacit disapproval at participant 100102. He spoke in a whisper and gestured with his eyes and hands towards the direction of where I just come from speaking with participant 100102 so as to imply he was referring to him without saying it.

Date November 21st, 2014

Participant: 100502

Interview time: 9:30am

Notes:

I met with participant 100502 as a last minute meeting. I had a received a call from her late the day before saying was willing to participate on November 21st at 9:30am. I returned her call with a message saying that I would arrive at that time but did not actually confirm the meeting. Upon arrival, 100502 seemed to be ready to speak with me and expected me to show up. Her office was of medium size and I set up my note pad and audio recording devices on her

desk. I passed out the consent form and participant 100502 read it over briefly, signed it, and returned it to me. My reiterated request for our conversation to be audio recorded was approved.

Participant 100103 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. She was very knowledgeable about her own schools policy but lacked some knowledge regarding the state level regulation and she often made this clear through statements. She was slightly worried that her lack of state level knowledge made her answer incorrect in some way.

Date November 24th, 2014

Participant: 100202

Interview time: 9:30am

Notes:

Upon arrival in the room of participant 100202, there was clearly a hint of hesitation towards speaking with me. Participant 100202 informed me that she asked participant 100204 to come and speak with her. I informed her that participant in this study involved only one –on-one interviews and that we would need to speak with each willing participant by themselves. This caused more visible hesitation from participant 100202 who seemed very nervous to speak with me. I made it very clear that participating in the study was by no means mandatory and that if she did not wish to speak with all she had to do was say so. She said she was willing and signed the consent form. My reiterated request for our conversation to be audio recorded was approved.

During the interview, participant 100202 had a copy of her schools concussion policy out. When questions were asked about it she began to read aloud from the policy. I informed her that the questions were not meant to be a quiz but rather just your opinion on them. She placed the policy down and I proceeded with my questions in order. Twice the recording had to be stopped in order for participant 100202 to deal with employment matters. The room was small and she insisted that the door remained open during our interview for her to make sure there were not any students she had to take care of.

Participant 100202 answered all of my questions. However, there was a quickness and brevity about her answers that was disconcerting. It would be a stretch to claim that she was forthcoming and candid. The interview was very short because she gave brief answers that left

little room for follow up. She was visible unconformable when speaking with me

Date November 24th, 2014

Participant: 100204

Interview time: 10:30am

Notes:

Participant 100204 was very weary of speaking with me. She was very standoffish when we first met. It appeared that there school had been targeted by some media outlets as a school where concussions were an issue. However, her story of this seemed vague and it was unclear if any of the media inquiries had amounted to anything. Participant 100204 asked many questions before she agreed to speak with me. She asked to see the questions at hand. I explained that I had more of an interview guide that would assist me in asking specific questions and she still requested to examine it. I allowed her to look at it briefly. She then read the consent form and asked why it was necessary to be audio recorded. I explained to her that the audio recordings would be used for later analysis. She informed me that she would only participate in the study if she was not recorded. I honored this request and crossed out the consent from where it said she would be audio recorded and had her initial the paper. I initialed the paper as well.

The participant was semi willing to speak with me and I feel as though she spoke candidly about the questions I asked. I believe that not being recorded allowed her more freedom compared to if she was recorded. Her answers were half brief and half thought out. She was forthcoming about most questions it seemed and often wanted me to repeat back quotes I had written down to ensure their accuracy.

Date November 24th, 2014

Participant: 100201

Interview time: 12:00pm

Notes:

I moved from interviewing participant 100204 to interviewing 100201 on my own accord. Our meeting was scheduled for the afternoon but participant 100201 was ready to speak

with me then and we proceeded to enter his office. His office was medium sized and our interview took place at this desk where I made room for my notepad and audio recording device. After introductions, I present participant 100201 with the consent form. He hastily signed the paper, barely reading what it said. My reiterated request for our conversation to be audio recorded was approved. During the interview, participant 100201 had the radio on a classic rock station. We were not interrupted at any time.

Participant 100201 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. Unlike the previous two school personnel I had just finished interviewing, participant 100201 was unafraid to talk opening about the law and his own schools decision making. However, his answers were brief in nature not having much in the way of substance. His responses were unabashed however they were very brief and left little room for probing. It felt that our conversation was unimportant to him.

Date: November 24th, 2014

Participant: 100203

Interview time: 1:00pm

Notes:

I reached participant 100203 after speaking with all of school 1002's participants. I was directed there when participant 100201 unexpectedly called down to participant 100203 to see if he was available. I informed him this was not necessary however he did not listen and called anyways. After the phone called occurred I made my way through school 1002 to find participant 100203. I reached 100203's office and introduced myself and why I was there. I had sent out recruitment material to participant 100203 previous to our meeting but we had not actually spoken via phone or email. Participant 100203 confirmed he had seen my email but had not read it. After our introduction I presented participant 100203 with a consent form. He briefly looked it over, signed it, and returned it to me. My reiterated request for our conversation to be audio recorded was approved. We were not interrupted during our interview.

The interview with participant 100203 was the longest and least contrived feeling of all of the interviews I had completed that day. I would say that he genuinely seemed to care about

our conversation however he has prone to glance at this computer screen ever so often throughout our conversation. That being said, participant 100203 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming.

Date: November 25th, 2014

Participant: 100104

Interview time: 9:30am

Notes:

I arrived for our meeting on time to find participant 100104 very busy with her work. There seemed to be a situation where a coworker was supposed to be in working at the time of our meeting however she had not shown up yet. I waited in participants 100104's office for her while she took care of her business. Once there was a lull in the work, participant 100104 was ready to begin the interview process. We proceeded to go into another room where there was more privacy. Once there, I presented participant 100104 a consent form. She took her time going over the piece of paper, signed it, and returned it to me. My reiterated request for our conversation to be audio recorded was approved. Participant 100104's counterpart arrived half way through the interview and was present through the rest of our conversation so that participant 100104 did not have to be interrupted. The door was closed once participant 100104's coworker arrived.

Participant 100203 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. Participant 100104 was seemingly eager to speak with me concerning the state concussion policy. She had several suggestions that seemed to create a thesis of a point through out every answer she gave, as though she had really only one thing to say concerning the matter. Nonetheless, she was very grateful I was speaking with her concerning the policy because she felt she had a lot to say.

Date: 12/15/14

Participant: 100301

Interview time: 10:30am

Notes:

I arrived just on time for the interview. The campus was strewn about the city landscape and I had to walk around for quite some time before I found the correct building. However, I found it on time and prepared myself for the interview. Participant 100301's office was large and of nice quality. Participant 100301 was ready to speak immediately as I entered his office; he gave off a sense of eagerness for the interview. After thanking him for his involvement I passed out the consent form and informed him to take his time reading it over. 100301 did so, taking a good amount of time looking it over; not completely thoroughly but more than a glance over. After he returned it signed I, in turn followed suit. My reiterated request for our conversation to be audio recorded was approved. We were not interrupted during our interview, although his phone did vibrate several times throughout the interview. He was not fazed by the noise and kept his attention on our interview.

Participant 100301 was willing and able to speak to all questions I asked. No sense of hesitation existed in his answers and they seemed candid and forthcoming. I left our conversation feeling that he had little actual hands on experience with dealing with the law. What I mean by that is, I feel that he relied on other school personnel to ensure aspects of the law were in place. He was knowledgeable about the law and his school's implementation process. But it was all very much at an almost artificial level. His answers were mostly generalized when I asked him specifically about his school.

NOTE: in the interview he kept referring to CTE as PCT. That is what he meant but I did not correct him

Date: 12/15/14

Participant: 100302

Interview time: 1:30pm

Notes:

This was the second of two interviews on the day. I was more prepared then other times for the rigor of completing multiple interviews in one day. I knew I had to keep my mind a blank

slate free of fatigue as it would ultimately compromise my interview if I let it. I was in the waiting area for some time before Participant 100302 arrived. When she did arrive she knew immediately who I was, although the reverse cannot be said for me. We walked back towards her office which was located with very close proximity to the men's locker room. Her office was small, with an old computer and little desk space of which to place my notepad. She was nice and did not dismiss the future conversation we were about to have as routine. Once she was settled, I handed out the consent form wherein it was read thoroughly. . After he returned it signed I, in turn followed suit. My reiterated request for our conversation to be audio recorded was approved. We were not interrupted during our interview.

Participant 100302 was willing and able to speak to all questions I asked. No sense of hesitation existed in her answers and they seemed candid and forthcoming. There was sense that participant 100302 did not realize that her school having two trainers was very much not the norm. When confronted about this issue, her response centered on the amount of athletes they had. Which was around the same number of athletes other schools have had, but her challenge was aided by an additional trainer. She was very knowledgable about the physiology around head injuries as well.

Date: 12/18/14

Participant: 100503

Interview time: 1:00

Notes:

Upon meeting participate 100503, she did not seem entirely happy about speaking with me. Words were minimally exchanged between the two of us as we walked to the back of the school/her office. In fact, at a certain point, she walked noticeably a head of me with what appeared to be a purposeful gait. It appeared odd and almost standoffish. When we got to her office, she did not offer me a chair or place to write on her desk. I pulled a wheeled stool from several feet away to place myself at her desk. I thanked her for agreeing to speak with me and handed her the consent form. She signed it after briefly reading it. I asked for her permission to record our conversation and she approved.

Participant 100503's demeanor was very serious in the way she answered questions. She

was often quick was answers and it was tough to ask certain follow up questions. To her, the regulation represented validation. Several times she reiterated that they had already been doing most of the regulation and that it really only added legal backing to her stance on concussions. She also said, at one point that male fathers were more likely to put up a fight in regards to their children coming out because of, and this is in my own words, the machismo sounding sport and males. I non-verbally agreed with that statement although the interview transcripts do not reflex that. She answered all my questions and seemed to be forthcoming and honest.

Date: 12/22/14

Participant: 100402

Interview time: 10:30am

Notes:

This was the first of three interviews to be conducted on the 22nd of December. I arrived on time for my interview and was surprised to find participant 100402 was also a teacher, who was in the middle of teaching, or so it seemed. We went to what seemed like a teacher's office/ supply closet where I set up for the interview. It seemed like she was leaving her class to come talk to me but she did not have a rushed feeling in her voice, which I found a little unsettling. I did not inquire about whether she was leaving her classroom to speak with me. I informed her of the proposed length of the interview and she said that was fine. I passed out the consent form and she signed it without more than a quick glance at each page. I signed the paper in turn and then ask for her personal approval to record our conversations. She obliged.

Participant 100402 had a very blasé outlook towards the regulation. The education portion, especially, seemed like a joke to her which I took as a reflection of her time as a teacher. Little comments here and there lead me to that assumption. It was more a nuisance then anything. She seemed very unknowledgeable concerning the return and removal from play aspects, which was unsettling as she was a coach in a sport where there is a high incidence of concussion. Her interaction with the regulation was very minimal. While it was clear that coaches within the school had to fill out incidence forms she never once hinted that that had every occurred. The regulation to her did not mean much because most of the administrative

work happened elsewhere

.

Date: 12/22/14

Participant: 100403

Interview time: 12:00pm

Notes:

This was the second of three interviews for the 22nd of December. I had left the school for an hour and half and came back. Participant 100403 brought me from the front office to her office. I asked to speak in a private area however Participant 100403 insisted our current position of in the middle of the nurse's office was sufficient. Other school personal was located in an office off of the main nurses office. No students were present in the room. Two during the interview you can hear someone flushing a toilet as a private bathroom was located adjacent to the table we were speaking at. This traffic did not seem to influence our interview at all. Participant 100403 never was interrupted by anyone or seemed to be distracted by any school personal that may have walked through the room. No students came in during our interview. I passed out the consent form to participant 100403 and she read through it thoroughly. She signed and returned it wherein I followed suit. I then asked her permission to record our conversation for analysis purposes later. She consented.

Participant 100403 was willing and able to speak to all questions I asked. No sense of hesitation existed in her answers and they seemed candid and forthcoming. There was definitely distaste for the amount of work related to the regulation. But the distaste she had was conveyed in a matter of fact and almost polite way, so as to not come off as angry or even overworked.

Date 12/22/14

Participant: 100404

Interview time: 1:30pm

Notes:

This was the third of three interviews conducted on 12/22/14. When I met with her, she was in the middle of cleaning her room for the day. She wanted to start the interview while she was cleaning. I declined and respectfully stated I would prefer to wait till she was done and then asked if she needed any help. She declined my assistance and we made small talk until she was done cleaning. We did not discuss the regulation before we started the interview in her classroom. Several times during the interview another teacher came in and asked her a question. I did not turn off the recording device during their discussions but attempted to muffle the voices.

Participant 100404 was willing and able to speak to all questions I asked. No sense of hesitation existed in her answers and they seemed candid and forthcoming. She was very opinionated and did her answers reflect that.

Date 1/6/14

Participant: 100504

Interview time: 1:15pm

Notes:

I arrived on time for the interview and waited for 100504 in the office. After several minutes he arrived and we talked down to the teacher's lounge. He asked me if this area would be ok for the interview and I replied in a way that conveyed that we would need a room with privacy if possible. We sat down in the room alone and I handed out the consent form to him. It appeared as if he was going to be using his computer during the duration of our interview however, at the last minute, he closed it. Barely reading the consent form, he signed and handed back the paper to me. I followed suit and asked his person to record our conversation approved and the interview began.

This interview presented two challenges I had yet to face during my previous interviews. About 3 or 4 minutes into our interview, the room was flooded with other teachers or school staff and at one point several special needs children and their accompanied aids. A lot of noise pollution exists in the audio recording however at no real point do you lose what the participant is saying as a result. The other challenge relates to the participants knowledge of the regulation.

It was the first time that a participant answer 'no' to the question of 'are you aware of the Massachusetts concussion regulation'. That being said, I had a specific effort to ask about the laws components in a different manor. I attempted to get at the specific components of the law by asking about his interactions with the processes themselves. I did not mention them as if they were part of the regulation, rather I asked about them matter of factly. This tactic worked well and he was familiar with all the regulations aspects. It may have been a miscommunication between the participant and myself as to why he answered 'no' to the first question. However, as the interview progressed, it was clear to me he had very little knowledge about the regulation or what his role in it was. For instance, he could not remember the last time he did the education training. He did not know whether his students participated in ImPACT testing (which they do), he knew no details concerning the return to play and removal from components and at point even said, 'I don't care really', referring to the fact that whatever the trainer told him about his players was what mattered.

That being said, the participant was forthcoming and honest with my questions. I did not feel any hesitation in how he answered questions..

Date: 1/14/15

Participant: 100303:

Interview time: 3:00pm

Notes:

I arrived on time for my interview with participant 100303. He was waiting for me in the reception area in the athletic building on the school's campus. He asked if speaking in a conference room was suitable, to which I replied yes. We went to the conference room, sat down, and I handed him the consent form. Participant 100303 spent a good deal of time reading the consent form, signed it and then handed it back to me. I, in turn, signed it as well. I reiterated the request to record our conversation and the participant had no objections.

This was most certainly my best interview. For reasons concerning both my abilities as an interview and the openness with which the participant answered the questions. The participant was very conscious of the differences between schools of high and low socioeconomic status and his answered reflexed his concern for how schools with limited resources were able to implement the regulation. I felt the participant answered all questions honestly.

APPENDIX F

ARCHIVAL ANALYSIS CODE BOOK*

Variable Name	**Implm**
Definition	Policy 1: Designation of individual responsible for implementing regulation's policies and procedures
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Train**
Definition	Policy 2: Annual concussion education training
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Phycal**
Definition	Policy 3: Documentation of medical physical
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Obtain**
Definition	Policy 4: Acquire pre-participation forms for all athletes concerning prior history of head injury
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Review**
Definition	Policy 5: Review of pre-participation form by medical or nursing staff for prior history of head injury
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**HdIn**
Definition	Policy 6: Procedure to examining head injury forms that occur during the season
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Report**

Definition	Policy 7: Procedure for reporting head injury or suspected concussions that occur during extracurricular athletic activities
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Idtify**
Definition	Policy 8: Procedure for identifying a head injury, removing athlete from field of play, and referring for medical evaluation
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**MdClear**
Definition	Policy 9: Protocol for medical clearance for return-to-play
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Entry**
Definition	Policy 10: Procedure for developing and implementing post-concussion graduated reentry plans
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Infrma**
Definition	Policy 11: Procedure for providing information to all parents and athletes
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Hbook**
Definition	Policy 12: School concussion policy must be included in student and parent handbook
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**LmtEng**
Definition	Policy 13: Procedure for communicating with parents with limited English proficiency
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Out**
Definition	Policy 14: Procedure for outreach to parents who do not return completed forms required for students to participate in extracurricular sports
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Share**
Definition	Policy 15: Procedure for sharing information concerning an athlete's history of head injury and concussion, recuperation, reentry plan, and authorization to return to play and academic activities on a need to know basis consistent with requirements of 105 CMR 201.000
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Instrct**
Definition	Policy 16: Instructions to coaches, certified athletic trainers, trainers and volunteers concerning safety tips
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Pnlty**
Definition	Policy 17: Indicate what the penalties are for lack of compliance with regulation
Data Type	Binary (0 = 'not present'; 1 = 'present')

Variable Name	**Baseln**
Definition	School regulation discusses use of neurological baseline testing
Data Type	Binary (0 = 'not present'; 1 = 'present')

*All policies are in reference to APPENDIX B

APPENDIX G

RESULTS OF WRITTEN POLICY CODING*

	Case No.				
Variables	**#1**	**#2**	**#3**	**#4**	**#5**
Implm	1	0	1	0	0
Train	1	1	1	1	0
Phycal	1	1	1	1	0
Obtain	1	1	1	1	0
Review	1	1	1	1	0
HdInj	1	1	1	1	0
Report	1	1	1	1	0
Idtify	1	1	1	1	0
MdClear	1	1	1	1	0
Entry	1	1	1	1	0
Infrma	1	1	1	1	0
Hbook	1	0	1	1	0
LmtEng	1	0	1	1	0
Out	1	0	1	0	0
Share	1	1	1	1	0
Instrct	1	1	1	0	0
Pnlity	1	0	1	0	0
Baseln	1	0	1	1	0

* '0' indicates that variable is not present within Case's written policy
'1' indicates that variables is present within Case's written policy

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