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Are Youth Sports Concussion Statutes Working?

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Are Youth Sports Concussion Statutes Working?

*Francis X. Shen**

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I. INTRODUCTION

“The most perplexing omission in youth sports TBI laws is the failure of almost all states to develop a reporting and testing system to evaluate the effectiveness of the laws.”

—Dr. Hosea Harvey¹

All fifty states have now enacted a youth sports concussion law.² But there’s a problem: we don’t know how these laws are actually being implemented.³ More fundamentally, as the epigraph at the top of this Article suggests, most of the state legislation provides few (if any) promising mechanisms to discover if the policies are effective.⁴ Thus, it will be up to the research community, working in partnership with a diverse set of stakeholders, to answer the question: Are state youth sports concussion statutes working?⁵

In this Essay—prepared as part of the Duquesne University School of Law Symposium *Athletes, Veterans, and Neuroscience: A Symposium on Traumatic Brain Injury and Law*—I review what we currently know about the implementation of state youth sports concussion laws. I then look ahead, and discuss the work that I am leading in Minnesota to fill gaps in our knowledge about the effects of youth sports concussion policy.

Brain injury in sports is making headlines.⁶ In 2017, an ESPN broadcaster announced his resignation was due to moral concern about concussions;⁷ the preeminent scientific journal *Nature* led

1. Hosea H. Harvey, *Refereeing the Public Health*, 14 YALE J. HEALTH POL’Y, L. & ETHICS 66, 105 (2014).

2. See discussion in Part II.

3. Jingzhen Yang et al., *New and Recurrent Concussions in High-School Athletes Before and After Traumatic Brain Injury Laws*, 107 AMER. J. PUBLIC HEALTH 1916, 1917 (2017) (noting the limitations of previous research and discussing why more rigorous evaluation research is required). Also, it should be noted that a lack of evaluation does not make youth sports concussion law unique amongst public health laws. Unfortunately, public health laws are often understudied. See Kerri McGowan Lowrey, Stephanie R. Morain & Christine M. Baugh, *Do Ethics Demand Evaluation of Public Health Laws? Shifting Scientific Sands and the Case of Youth Sports-Related Traumatic Brain Injury Laws*, 19 J. HEALTH CARE L. & POLY 99 (2016).

4. Harvey, *supra* note 1.

5. See Yang et al., *supra* note 3, for a recent advance in our understanding of the effect of these laws.

6. See, e.g., Jason Socrates Bardi, *Trickle-Down Safety: Sports Concussions*, INSIDE SCIENCE (Nov. 15, 2017), <https://www.insidescience.org/video/trickle-down-safety-sports-concussions>.

7. John Branch, *ESPN Football Analyst Walks Away, Disturbed by Brain Trauma on Field*, N.Y. TIMES (Aug. 30, 2017), <https://www.nytimes.com/2017/08/30/sports/espn-ed-cunningham-football-concussions.html>.

with an editorial: “Head injuries in sport must be taken more seriously”;⁸ and Dr. Bennet Omalu, the neuropathologist whose critiques of the NFL were featured in the Will Smith movie *Concussion*, repeatedly told audiences that no one under age 18 should participate in boxing, football, ice hockey, mixed martial arts, rugby, or wrestling. Omalu is unequivocal: “There is no reason any child under 18 should play” these contact sports.⁹ Omalu predicts that [s]omeday there will be a district attorney who will prosecute for child abuse [on the football field], and it will succeed.”¹⁰ Framed in the way that Omalu presents it, the risks of brain damage so outweigh the benefits of contact sports, no rational parent or athlete should participate.

But not all neurologists agree with Omalu. Dr. Jeffrey Kutcher, who runs a concussion clinic in Michigan, argues that he cannot support “[s]taying away from sports because of fear of concussions based on bad or incomplete knowledge.”¹¹ This is because “[b]y exposing ourselves to some intrinsic health risks of playing sports, we are also opening ourselves up to incredible opportunities for personal growth and accomplishment.”¹²

Such contrasting views make it difficult for policymakers to know what, exactly, to do. The policy challenge going forward is thus to facilitate accurate communication of risks and benefits to allow for informed athlete and parent decision-making. And to accomplish that, we need to understand the current knowledge base on the effects of concussion statutes, and to think creatively about what comes next.¹³

8. *Head Injuries in Sport Must Be Taken More Seriously*, 548 NATURE 371 (2017).

9. Elliott Almond, ‘Concussion’ Doc’s Six Sports Kids Should Never Play, MERCURY NEWS (Aug. 25, 2017), <https://www.mercurynews.com/2017/08/25/the-concussion-docs-six-sports-kids-should-never-play/>.

10. Scooby Axson, ‘Concussion’ Doctor: Letting Kids Play Football is ‘Definition of Child Abuse’, SPORTS ILLUSTRATED (Aug. 8, 2017), <https://www.si.com/nfl/2017/08/08/bennet-omalu-cte-football>.

11. JEFFREY S. KUTCHER & JOANNE C. GERSTNER, BACK IN THE GAME: WHY CONCUSSION DOESN’T HAVE TO END YOUR ATHLETIC CAREER (2017).

12. *Id.* at 226.

13. The terminology surrounding concussion is confusing. Labels such as “concussion,” “head injury,” “brain injury” are often used interchangeably. McKinlay, A., A. Bishop, and T. McLellan. “Public knowledge of ‘concussion’ and the different terminology used to communicate about mild traumatic brain injury (MTBI).” *Brain injury* 25, no. 7-8 (2011): 761-766. In this Article, I use the term concussion because it is most commonly used in policy and legal domains when discussing brain injury in youth sports. But it is important to note that there are many brain injuries (or head injuries) that are not concussion. Concussion is commonly considered a type of mild Traumatic Brain Injury (mTBI). For instance, the Veterans Administration in official use interchanges the terms mild Traumatic Brain Injury (mTBI) and concussion. STATEMENTS, QUALIFYING. “VA/DoD clinical practice guideline for management of concussion/mild traumatic brain injury.” (2009).

The Article proceeds as follows. Part II briefly summarizes key features of state concussion laws, and discusses common critiques of the statutes. Part III reviews the current knowledge base on the implementation and effects of these state laws. In Part IV, I propose a set of principles to guide further research and policymaking in this area. Part V concludes.

II. STATE CONCUSSION STATUTES: A BRIEF OVERVIEW

The evolution of state youth sports concussion laws, which began with a Washington state statute passed in 2009, has been well documented.¹⁴ All fifty states have now enacted youth sports concussion statutes,¹⁵ and most of these laws are based on the initial Washington statute (nicknamed the “Lystedt Law” in honor of Zackery Lystedt, a high school football player from Spokane who was seriously injured after being returned to play despite having a concussion).¹⁶

There is variation in the laws,¹⁷ but in general, the existing state laws “are organized around three central provisions: education of athletes, parents, and coaches; immediate removal of play of concussed athletes; and medical clearance before returning to play.”¹⁸

Following this “first wave” of concussion legislation, states are beginning to revisit the issue.¹⁹ Since initial passage, 22 states

14. For legislative updates, see *Traumatic Brain Injury Legislation*, NAT'L CONF. OF STATE LEGISLATURES (Nov. 18, 2015), <http://www.ncsl.org/research/health/traumatic-brain-injury-legislation.aspx>; see also Chris Lau, *Leaders and Laggards: Tackling State Legislative Responses to the Youth Sports Concussion Epidemic*, 85 FORDHAM L. REV. 2879, 2889-91 (2017), for a discussion categorizing the laws into different tiers.

15. Kerri McGowan Lowrey, *State Laws Addressing Youth Sports-Related Traumatic Brain Injury and the Future of Concussion Law and Policy*, 10 J. BUS. & TECH. L. 61, 63 (2015) (“As of April 2014, every state and the District of Columbia, has enacted a law that addresses youth sports concussion.”); Andrew W. Albano et al., *The Legal Landscape of Concussion: Implications for Sports Medicine Providers*, 8 SPORTS HEALTH: MULTIDISCIPLINARY APPROACH 465 (2016); Hosea H. Harvey, Dionne L. Koller & Kerri M. Lowrey, *The Four Stages of Youth Sports TBI Policymaking: Engagement, Enactment, Research, and Reform*, 43 J.L. MED. & ETHICS 87, 88 (2015).

16. Hosea Harvey, *Reducing Traumatic Brain Injuries in Youth Sports: Youth Sports Traumatic Brain Injury State Law, January 2009 to December 2012*, 103 AM. J. PUB. HEALTH 1249 (2013); see also *The Lystedt Law: A Concussion Survivor's Journey*, CENTERS FOR DISEASE CONTROL & PREVENTION, <http://www.cdc.gov/media/subtopic/matte/pdf/031210-Zack-story.pdf> (last visited Oct. 23, 2017); Kerri McGowan Lowrey & Stephanie R. Morain, *State Experiences Implementing Youth Sports Concussion Laws: Challenges, Successes, and Lessons for Evaluating Impact*, 42 J.L. MED. & ETHICS 290 (2014); see also Harvey, *supra* note 14.

17. Sungwon Kim et al., *Legislative Efforts to Reduce Concussions in Youth Sports: An Analysis of State Concussion Statutes*, 27 J. LEGAL ASPECTS SPORT 162 (2017).

18. Lowrey & Morain, *supra* note 15, at 291.

19. *Youth Sports Concussion Laws Resources*, NETWORK FOR PUB. HEALTH LAW, https://www.networkforphl.org/topics_resources/topics_resources/injury_prevention_and_safety/youth_concussions_resources/ (last visited Mar. 8, 2016) (“Now that many of

have amended their laws.²⁰ The “amendments generally fall into three types: (1) expanding coverage of the law (e.g., to include younger grades or recreational sports leagues), (2) tightening or clarifying existing requirements, and (3) efforts to prevent concussions from occurring in the first place (primary prevention) and improve early detection (secondary prevention).”²¹

Even with these amendments, scholars have pointed out a variety of flaws in the statutes. Law professor Hosea Harvey, for instance, has shown that these laws were influenced by the NFL,²² and that they fail to adequately address relevant public health concerns.²³ Law professor Douglas Abrams (who starred in college as a hockey goalie and has been a youth hockey coach for decades) has criticized both the scope and implementation of the laws.²⁴ Others have suggested that the laws could improve: scope of coverage,²⁵ enforcement mechanisms,²⁶ providing resources for implementation,²⁷ greater emphasis on prevention,²⁸ reporting mechanisms,²⁹ and evaluation and definition of concussion.³⁰

these laws have been in effect for a few years, legislatures are revisiting them and making changes according to developments in the field.”)

20. Lowrey et al., *supra* note 3, at 105.

21. *Id.*

22. Harvey, *supra* note 1, at 87 (“The focus of legislative efforts on a more narrowly defined problem, following passage of the Lystedt Law was shaped, in part, by the NFL’s early and visible involvement. Given this proactive effort by an interested and influential private for-profit interest group, it is not surprising that subsequent TBI legislation in many states exhibited remarkable uniformity based on the NFL’s suggestions.”).

23. *Id.* at 113.

24. Douglas E. Abrams, *Confronting the Youth Sports Concussions Crisis: A Central Role for Responsible Local Enforcement of Playing Rules*, 2 MISS. SPORTS L. REV. 75, 88-89 (2013) [hereinafter Abrams, *Confronting the Youth Sports Concussions Crisis*]; Douglas E. Abrams, *Player Safety in Youth Sports: Sportsmanship and Respect as an Injury-Prevention Strategy*, 22 SETON HALL J. SPORTS & ENT. L. 1, 12-13 (2012); Douglas E. Abrams, *Concussion Safety in Children’s Sports: A Central Role for the “Power of the Permit,”* 10 J. BUS. & TECH. L. 1, 13 (2015) [hereinafter Abrams, *Power of the Permit*].

25. Abrams, *Power of the Permit*, *supra* note 23, at 5 (arguing that “[i]n states where concussion legislation does not reach private youth sports organizations that use public facilities, local government should approve private use only by organizations that agree to adhere to the three statewide core mandates”); Taylor Adams, *The Repercussions of Concussions in Youth Football Leagues: An Analysis of Texas’s Concussion Law and Why Reform Is Necessary*, 18 SCHOLAR: ST. MARY’S L. REV. ON SOC. & JUST. 285, 343 (2016).

26. Abrams, *Confronting the Youth Sports Concussions Crisis*, *supra* note 23, at 112.

27. Implementation of State Youth Concussion Laws: Perspectives from the Frontlines [slide 24 notes that this is an unfunded mandate], <https://www.childrendefensafetynetwork.org/sites/childrendefensafetynetwork.org/files/CSNConcussionPolicy012413.pdf>.

28. Harvey, *supra* note 1, at 81; Lau, *supra* note 13, at 2886.

29. Harvey, *supra* note 1, at 79 (noting “the failure of key constituencies to agree on a system for youth athlete TBI reporting and tracking over time.”)

30. Amanda Cook et al., *Where Do We Go From Here?: An Inside Look into the Development of Georgia’s Youth Concussion Law*, 42 J.L. MED. & ETHICS 284 (2014).

It has also been observed by commentators that these statutes often leave few options for legal redress.³¹ For instance:

- In Minnesota, the youth concussion statute makes explicit that the law “does not create any additional liability for, or create any new cause of legal action against, a school or school district or any officer, employee, or volunteer of a school or school district.”³²
- In Texas, the concussion law does not “create any liability for a cause of action against a school district ...” and does not “create any cause of action or liability for a member of a concussion oversight team arising from the injury or death of a student participating in an interscholastic athletics practice or competition, based on service or participation on the concussion oversight team.”³³
- In Indiana, “[a] coach who complies with this chapter and provides coaching services in good faith is not personally liable for damages in a civil action as a result of a concussion or head injury incurred by an athlete participating in an athletic activity in which the coach provided coaching services, except for an act or omission by the coach that constitutes gross negligence or willful or wanton misconduct.”³⁴
- In New Jersey, “[a] school district and nonpublic school shall not be liable for the injury or death of a person due to the action or inaction of persons employed by, or under contract with, a youth sports team organization that operates on school grounds ... if the organization has insurance and complies with the concussion policy.”³⁵

31. Marie-France Wilson, *Young Athletes at Risk: Preventing and Managing Consequences of Sports Concussions in Young Athletes and the Related Legal Issues*, 21 MARQ. SPORTS L. REV. 241, 288 (2010) (noting that, “in the concussion legislation to date, there do not seem to be any provisions that set out sanctions for non-compliance by schools”); Leah G. Concannon, *Effects of Legislation on Sports-Related Concussion*, 27 PHYSICAL MED. & REHABILITATION CLINICS N. AM. 513 (2016) (“No penalties are written into the Lystedt Law for organizations or individuals that fail to comply with the components of the law.”). To be sure, not all states have the same liability framework. Connecticut and Pennsylvania have incorporated some penalties into their legislation.

32. MINN. STAT. ANN. § 121A.38 (2011).

33. TEX. EDUC. CODE ANN. § 38.159 (2011).

34. IND. CODE ANN. § 20-34-7-6 (2016).

35. N.J. STAT. § 18A:40-41.5 (2010).

Statutes vary in their language, but as illustrated by these excerpts, the statutes generally do not create new causes of action.³⁶

Without litigation as a vehicle for accountability, and with few if any statutory requirements for reporting, it should not come as a surprise that we have little idea how these concussion laws are being implemented. We do not know, for instance, if the laws are effective in reducing the incidence of youth sports concussion.³⁷ We also do not know whether the statutory requirements are being implemented as they are (in theory) supposed to be.³⁸

To date, efforts to understand the implementation of these laws have been generally small in scope.³⁹ Nevertheless, they represent an emerging research base on the issue, and the next Part reviews their findings.

III. WHAT WE KNOW ABOUT IMPLEMENTATION OF STATE CONCUSSION LAWS

As discussed in Part I, the design of state concussion laws has been criticized. It has been recognized that “[s]tudies of the overall impact of state concussion laws are scarce.”⁴⁰ The challenge of evaluating these laws is so daunting that, in the words of Dr. Hosea Harvey, it is “difficult to imagine exactly how the success of these laws will be evaluated.”⁴¹ Keeping in mind that it is a challenging landscape in which to conduct high-quality research, this Part reviews the existing research literature on point. The studies have primarily been state-specific, and so I organize state-by-state (in alphabetical order).⁴²

36. Abrams, *Power of the Permit*, *supra* note 23, at 2 (“Since 2009, all fifty states and the District of Columbia have enacted statutes to improve prevention and treatment of concussions in youth sports.”); see *Traumatic Brain Injury Legislation*, NAT’L CONF. ST. LEGIS., <http://www.ncsl.org/research/health/traumatic-brain-injury-legislation.aspx> (last updated Sept. 10, 2017); see also Lowrey, *supra* note 14.

37. Lowrey & Morain, *supra* note 15, at 294; see also Yang et al., *supra* note 3; see discussion in Part III.

38. Some studies have examined whether high school policies reflect their state law’s requirements. See Kathryn Coxe et al., *Consistency and Variation in School-Level Youth Sports Traumatic Brain Injury Policy Content*, J. ADOLESCENT HEALTH (2017).

39. Yang et al., *supra* note 3.

40. Doucette et al., *infra* note 62, at 511.

41. Harvey, *supra* note 1, at 74.

42. I do not include in this review the many commentaries and anecdotal evaluations that have been published. For instance, in Iowa an attorney writing an op-ed argued that Iowa’s current concussion law actually increased the risk for brain injury because it does not ensure that a student-athlete will be evaluated by a trained professional. Thomas P. Slater, *Iowa’s Concussion Law Increases the Risk of Serious Brain Injury in Sports*, DES MOINES REG. (June 6, 2015), <http://www.desmoinesregister.com/story/opinion/columnists/iowa-view/2015/06/06/brain-injury-sports/28592267/>. In other states, the anecdotes have

Before moving to the state-specific studies, several national evaluations should be mentioned at the outset. First, researchers at the University of Michigan examined pre- and post-legislation health care utilization of privately insured youth athletes aged 12-18.⁴³ They found that there was a significant increase in utilization of health care systems amongst children with concussion, and the statistical analysis attributes this to both the direct and indirect effects of state concussion legislation.⁴⁴ Second, an interdisciplinary research group led by Ohio State and Nationwide Children's Hospital in Ohio found both some consistency and considerable variation in written high school traumatic brain injury policies.⁴⁵ Examining a sample of 71 high schools from 26 states, the researchers used qualitative and quantitative analysis to examine "policy enforcement, policy description, and policy implementation."⁴⁶ The analysis discovered that policies "contained language addressing at least one of the three tenets, [but] the presence and specificity of requirements varied."⁴⁷ The study thus suggests that state laws have had some effect in shaping high school policies on sports concussions—but many questions remain unanswered. For example, what (if any) written policies do youth sports organizations have in place?

A third study, published by the same group in collaboration with colleagues including Dawn Comstock of the University of Colorado, examined whether state laws had an effect on reported sports concussions.⁴⁸ The researchers took advantage of the High School Reporting Injury Online (RIO) dataset. High School RIO is "a prospective, longitudinal Internet-based surveillance system that collects

been more positive. See, e.g., Mike Fornabaio, *State Laws Reduce Concussion Exposure, Increase Accountability*, CONN. POST (Oct. 17, 2015), <http://www.ctpost.com/sports/article/State-laws-reduce-concussion-exposure-increase-6575809.php>; *Officials: Wyoming Concussion Policy Working Well*, BILLINGS GAZETTE (Jan. 14, 2014), http://billingsgazette.com/sports/high-school/officials-wyoming-concussion-policy-working-well/article_9c8494a1-7d52-5bfb-a0cb-7e85c980cf30.html.

43. Teresa B. Gibson et al., *Analyzing the Effect of State Legislation on Health Care Utilization for Children with Concussion*, 169 [J]AMA PEDIATRICS 163 (2015).

44. *Id.* An additional explanatory factor is rising awareness, education, and media attention to the issue of sports concussion. Commenting on the results of the study, senior author Steven Broglio observed: "There are two stories here ... First, the legislation works. The other story is that broad awareness of an injury has an equally important effect. We found large increases in states without legislation, showing that just general knowledge plays a huge part." *New Concussion Laws Result in Big Jump in Concussion Treatment*, MICH. NEWS (Dec. 22, 2014), <http://ns.umich.edu/new/releases/22586-new-concussion-laws-result-in-big-jump-in-concussion-treatment>.

45. Coxe et al., *supra* note 37.

46. *Id.* at 8.

47. *Id.*

48. Yang et al., *supra* note 3.

sport-related injuries and exposures among athletes from a nationally representative sample of US high schools.”⁴⁹ Because the database included concussion reporting both before and after the implementation of state laws, statistical analysis allowed the researchers to estimate the effect of the implementation of laws on concussion reporting.⁵⁰ They found a statistically significant increase in reported concussions after the implementation of the law.⁵¹ It is not clear whether this increase in reported concussions was a result of more concussions, or, more likely, due to greater recognition and reporting of concussions.⁵²

These national studies suggest that concussion laws are having an impact, but there is clearly a need for more research. As a national study carried out by Lowrey and Morain suggested, future policy evaluations should “shed light on which provisions—and in what combination and in which environments—will have the desired impact.”⁵³ There is recognition in the research community that such studies should look beyond the letter of the law and examine “how the law is operationalized in individual jurisdictions.”⁵⁴ In some states, this type of research is underway, and I now review the state-specific studies.

A. *Connecticut*

Connecticut passed its sports concussion law in 2010.⁵⁵ To examine the effect of this law on the reporting of youth sports concussions, researchers examined data from two Level 1 Trauma Center Emergency Departments in the state.⁵⁶ Examining monthly data on youth sports concussions, they compared the pre-law period with the post-law period. They found that sports related concussions in-

49. *Id.* at 1917.

50. *Id.*

51. *Id.*

52. *Id.* (“The increase may be attributable to greater recognition and reporting of concussions by athletic trainers or athletes following the implementation of concussion education requirements of these laws, rather than increased number of injuries.”).

53. Lowrey & Morain, *supra* note 15, at 294.

54. *Id.*

55. CONN. GEN. STAT. § 10-149b (LexisNexis, Lexis Advance through Public Acts 1-244 of 2017 Reg. Sess.) (originally enacted as Act of May 18, 2010, 2010 Conn. Acts 62).

56. Thomas Trojian et al., *The Effects of a State Concussion Law on the Frequency of Sport-Related Concussions as Seen in Two Emergency Departments*, 2 INJ. EPIDEMIOLOGY 2 (2015).

creased from 2.5 cases/month to 5.9 cases/month after implementation of the law.⁵⁷ Further statistical analysis revealed that the overall increase was driven by an increase in the number of reported concussions in high school aged athletes.⁵⁸

B. *Massachusetts*

Massachusetts passed its sports concussion law in 2010.⁵⁹ Massachusetts is unique in that it requires middle schools and high schools to annually report concussion information to the State Department of Public Health.⁶⁰ Researchers at the Massachusetts Department of Public Health examined the first wave of the data, and concluded that “schools are making progress in the implementation of state regulations,” but that “nearly half of the student athletes who reported symptoms of a concussion did not stop playing,” suggesting that “further work is needed to improve student safety.”⁶¹

Several qualitative case studies have explored the local implementation of the law in Massachusetts.⁶² One study employed focus groups with school nurses and athletic trainers.⁶³ The focus group participants were generally supportive of the Massachusetts law, but recognized the following challenges: physicians without ade-

57. *Id.*

58. *Id.*

59. Linda Brown et al., *Head Injury and Concussion Management in Extracurricular Sports: A Multi-Pronged Evaluation of the Massachusetts 2010 Legislation*, 21 INJ. PREVENTION A5, A6 (2015).

60. 105 CMR 201.00: *Head Injuries and Concussions in Extracurricular Athletic Activities*, MASS. DEPT PUB. HEALTH, <https://mdph.checkboxonline.com/2016-2017HeadInjuryYearEndReporting.aspx> (“105 CMR 201.00 requires that all public middle and high schools (including charter schools) serving grades 6 through 12 with extracurricular athletic activities, as well as all private schools that are members of the Massachusetts Interscholastic Athletic Association (MIAA), provide data to the Department of Public Health annually on the number of Report of Head Injury Forms received by the school and the number of those forms that indicate that the injury occurred during interscholastic athletics. ...The regulations specify that, unless school policies dictate otherwise, the Athletic Director is responsible for reporting these annual statistics to the Department of Public Health [105 CMR 201.012(C)(7)].”).

61. Linda Brown et al., *Head Injury and Concussion Management in Extracurricular Sports: A Multi-Pronged Evaluation of the Massachusetts 2010 Legislation*, 21 INJ. PREVENTION A5, A6 (2015).

62. Jonathan Howland et al., *Evaluation of Implementation of Massachusetts Sports Concussion Regulations: Results of Focus Groups with School Nurses and Athletic Trainers*, J. SCH. NURSING (2017); Mitchell L. Doucette et al., *The Massachusetts School Sports Concussions Law: A Qualitative Study of Local Implementation Experiences*, 44 J.L. MED. & ETHICS 503 (2016); Michael R. Flaherty et al., *Impact of a State Law on Physician Practice in Sports-Related Concussions*, 178 J. PEDIATRICS 268 (2016).

63. Jonathan Howland et al., *Evaluation of Implementation of Massachusetts Sports Concussion Regulations: Results of Focus Groups with School Nurses and Athletic Trainers*, J. SCH. NURSING (2017).

quate training in concussion care; difficulties with parental resistance to concussion policy; a need for more education on the concussion law with stakeholders; and coverage for away games.⁶⁴

Another study used semi-structured interviews with school level actors from five Massachusetts schools.⁶⁵ The researchers found that each school surveyed employed neurocognitive baseline testing, empowered athletic trainers with the ability to make removal-from-play and return-to-play decisions, and used the state-approved concussion education video to train school personnel, parents, and students.⁶⁶ Challenges to implementation included resources to hire certified athletic trainers, and resistance from some student-athletes and parents to be forthcoming.⁶⁷ Consistent with other studies, all stakeholders in these interviews desired more concussion education for parents, athletes, and school personnel.⁶⁸ Similarly, a survey of primary care physicians in Massachusetts found that the state's physicians are almost all supportive of the concussion law's major provisions.⁶⁹ The study found some variation in adherence to the statutory requirements, and suggested that further physician training may be necessary to improve compliance.⁷⁰

C. *Minnesota*

In 2011, Governor Dayton signed into law a new set of protocols to govern the treatment of concussions experienced by youth athletes in both high school and youth sport leagues in Minnesota.⁷¹ The Minnesota Department of Health (MDH) has noted that “[b]eing able to measure the number and rate of concussions in high school athletes is an important step in assessing the potential overall impact of concussion and evaluating our progress toward preventing them.”⁷² To that end, MDH examined 36 schools in the

64. *Id.*

65. Doucette et al., *supra* note 61.

66. *Id.*

67. *Id.*

68. *Id.*

69. Flaherty et al., *supra* note 61, at 268.

70. *Id.*

71. MINN. STAT. ANN. § 121A.38 (2011); Eric Roper, *New Concussion Law Aims to Protect Young Athletes*, STAR TRIB. (June 9, 2011), <http://www.startribune.com/new-concussion-law-aims-to-protect-young-athletes/123509574/>.

72. Sarah Dugan, Leslie Seymour, Jon Roesler, Lori Glover & Mark Kinde, *This is Your Brain on Sports: Measuring Concussions in High School Athletes in the Twin Cities Metropolitan Area*, MINN. MED., Sept. 2014, at 43, 45.

Twin Cities area for the 2013-14 academic year.⁷³ The study estimated a total number of 2,974 concussions statewide occurred during the study period, but noted that this was a “pilot study” and that they were extrapolating statewide based on a convenience sample of just 36 schools.⁷⁴

In addition to the MDH study, a 2014 media investigation is instructive.⁷⁵ A joint MPR News / KARE 11 study, spanning about 100 Minnesota school districts, found “rapid change in recent years [in response to the concussion law], but it also made clear some schools have taken more steps than others.”⁷⁶

D. Montana

Montana passed its youth sports concussion law in 2013.⁷⁷ The legislature commissioned an evaluation of the law in 2015,⁷⁸ and in 2017 amended and expanded the law.⁷⁹ The report, published in 2016, was based on 215 respondents to a survey sent to all the superintendents, principals, and athletic directors in Montana.⁸⁰ Some of the key findings from the report include:

- Only 50% of schools have direct access to a Certified Athletic Trainer or a School Nurse.⁸¹
- “Primary care physicians and athletic trainers were identified as the health care providers most responsible for making return to play decisions.”⁸²

73. *Id.* at 44.

74. *Id.* The Minnesota Department of Health also published a follow-up Data Brief in 2016, in which they found that with a sample of 39 schools, there were 704 sports-related concussions. Minnesota Dept. of Health, *Data Brief: Sports-Related Concussions in Minnesota High School Athletes, 2014-15*, http://www.health.state.mn.us/divs/healthimprovement/content/documents/2014_15SportsConcussionFactSheet.pdf.

75. Trisha Volpe, *Focus on Concussions Transforms High School Football in Minnesota*, MPR NEWS (Sept. 30, 2014), <http://www.mprnews.org/story/2014/09/30/high-school-concussions-transform-high-school-football-in-minnesota>.

76. *Id.*

77. Dylan Steigers Protection of Youth Athletes Act, MONT. CODE ANN. §§ 20-7-1301-20-7-1304 (2017) (originally enacted as Act of Apr. 22, 2013, 2013 Mont. Laws 260).

78. VALERIE MOODY ET AL., ASSESSMENT OF IMPLEMENTATION OF THE DYLAN STEIGERS PROTECTION OF YOUTH ATHLETES ACT: A DESCRIPTIVE STUDY 2 (2016), [http://leg.mt.gov/content/Committees/Interim/2015-2016/Education-and-Local-Government/Meetings/Jan-2016/Executive%20Summary%20Report%20HJ%2026%20\(4\).pdf](http://leg.mt.gov/content/Committees/Interim/2015-2016/Education-and-Local-Government/Meetings/Jan-2016/Executive%20Summary%20Report%20HJ%2026%20(4).pdf).

79. Montana MacLachlan, *Governor Signs Updated Dylan Steigers Bill into Law*, NBC MONT. (July 10, 2017), <http://www.nbcmontana.com/news/keci/governor-signs-updated-dylan-steigers-bill-into-law/584925657>.

80. MOODY ET AL., *supra* note 77, at 4 (noting a response rate of 29%).

81. *Id.*

82. *Id.*

- 84% of respondents had a concussion policy, but most policies did not contain all of the required components.⁸³
- “Parents were identified as a significant barrier to implementation because of under reporting or disclosing concussions when they occur in their children, not following return to play protocols, or ‘doctor shopping.’”⁸⁴

E. Nebraska

Nebraska passed its state concussion law in 2012.⁸⁵ Soon after, the Brain Injury Alliance of Nebraska created the Nebraska Concussion Coalition.⁸⁶ Supported in part by the Nebraska Department of Health and Human Services Injury Prevention Program, the Coalition has carried out several studies.⁸⁷ In 2013, 2015, and 2016 members of the Nebraska Concussion Coalition surveyed schools across Nebraska to determine how the state concussion law had affected schools’ concussion management policies and practices.⁸⁸

In 2013 and 2015, an online self-report survey was administered to organized sports head coaches, high school athletic directors, and youth who had sustained a concussion in Nebraska schools.⁸⁹ The survey explored concussion management policies, as well as compliance with the law.⁹⁰ By administering the survey once in 2013 (soon after the law’s passage) and again in 2015 (after a few years had passed), the study was able to gauge longitudinal change.

The surveys are notable for their sample size. The survey of athletic directors was completed by 164 respondents in 2013, and by 261 in 2015.⁹¹ The survey of head coaches was completed by 1,074

83. *Id.*

84. *Id.*

85. Erin Andersen, *Officials Say New Concussion Law Will Protect Nebraska Athletes of All Ages*, LINCOLN J. STAR (July 1, 2012), http://journalstar.com/news/local/education/officials-say-new-concussion-law-will-protect-nebraska-athletes-of/article_5ac15bf9-dd36-5ab2-aa74-55e4169f3be5.html.

86. NEBRASKA CONCUSSION COALITION, <http://biane.org/concussion/concussioncoalition.html> (last visited Nov. 12, 2017).

87. *Id.* (“The coalition, which is comprised of representatives from key government agencies, healthcare providers, club sport programs, educators and non-profit agencies, is taking the lead in implementing action-oriented steps to improve concussion awareness and change the culture of concussion management at play, school and home.”).

88. WILL SCHMEECKLE, NEBRASKA CONCUSSION COALITION, 2013 NEBRASKA SPORTS CONCUSSION SURVEY RESULTS: YOUTH SURVEY (2013) [hereinafter SCHMEECKLE, 2013]; WILL SCHMEECKLE, NEBRASKA CONCUSSION COALITION, 2015 NEBRASKA SPORTS CONCUSSION SURVEY RESULTS (2015) [hereinafter SCHMEECKLE, 2015].

89. *Id.*

90. *Id.*

91. *Id.*

high school head coaches in 2013 and 1,333 coaches in 2015.⁹² Notably, survey responses came from schools of all four size designations in Nebraska (from the largest Class A schools, to the smallest Class D schools).⁹³

Key findings from the Nebraska study include:

- *Presence of Athletic Trainers:* 36% of schools employed a certified athletic trainer (AT) in 2013, and 28% of schools employed an AT in 2015. ATs were most often available for team practices for the sports of football, wrestling, and girls and boys basketball, and a higher percentage of ATs were available for all sports surveyed for competitions. Larger (class A and B) schools were more likely to have an AT as a member of their staff than smaller schools.⁹⁴
- *Baseline Cognitive Screening:* From 2013 to 2015, the percentage of schools employing baseline screening for athletes rose from 58% to 71%.⁹⁵ Most of this increase is attributed to increased use of baseline screening in smaller (class C or D) schools.⁹⁶
- *Sideline Evaluation:* 93% of respondents reported that they would conduct a “sideline evaluation or assessment for athletes suspected of sustaining a concussion,” which was an improvement from the 81% who reported such in 2013.⁹⁷
- *Record Keeping:* 86.4% of 2015 survey respondents noted that their schools kept concussion histories for student athletes on file, which was an improvement from the 76% who reported such in 2013.⁹⁸
- *Return-to-play Decisions:* In 2015, 81.8% of respondents reported always removing an athlete with a suspected

92. *Id.*

93. *Id.*

94. *Id.* If an ATC was not available, then an individual with basic first aid training was available between 67% and 78% of the time.

95. *Id.*

96. *Id.*

97. *Id.*

98. *Id.*

concussion from play, up from 76% in 2013.⁹⁹ 97% of respondents required a concussed athlete to be cleared by a medical professional prior to return to play.¹⁰⁰

- *Concussion Education:* In 2015, almost 100% of respondents reported making concussion training programs available to all coaches at the school, and further reported that 96% of these coaches actually completed the training.¹⁰¹
- *Return-to-Learn:* From 2013 to 2015, there was a large increase in the percentage of schools that educated their teachers about signs and symptoms of concussion and return-to-learn accommodations, jumping from 33% of respondents in 2013 to 72% of respondents in 2015.¹⁰² Only 6.1% of schools reported having a written return-to-learn policy regarding concussed students in 2013; this number rose to 70.8% of respondents who reported having such a policy in 2015.¹⁰³
- *Athlete and Parent Resistance:* Coaches reported that both athletes and their parents were resistant at times to following protocols.¹⁰⁴ 27% of coaches reported knowing that an athlete did not honestly report symptoms in order to continue play and 31% of coaches reported that an athlete they coached resisted being removed from play following a suspected concussion.¹⁰⁵ 12% of respondents also reported that a parent attempted to stop them from removing their child from play following a suspected concussion, and 23% of respondents stated that a parent attempted to have their child return to play without proper medical clearance.¹⁰⁶

As a follow-up to the 2013 and 2015 surveys, in 2016 the Nebraska Concussion Coalition conducted a survey to assess how concussions are managed by schools and the sports staff (N = 276 respondents). The survey found that in general, implementation of the concussion law was quite good. For instance, by 2016:

99. *Id.*

100. *Id.* Respondents also reported a variety of responses regarding difficulties with this requirement, including: medical professional displacing decision made by training staff, difficulty with follow-up cognitive testing and re-evaluation, and confusion surrounding the return-to-play process.

101. SCHMEECKLE, 2015, *supra* note 87, at 12.

102. *Id.* at 18.

103. *Id.*

104. *Id.*

105. *Id.*

106. *Id.*

- 90% of schools had a formal written policy for removal and return to play for athletes who sustained concussion (compared to 74.3% in 2015).¹⁰⁷
- 84% of schools provided accommodation to student athletes with suspected concussion in their return to learn policies (compared to 71% in 2015).¹⁰⁸
- Changes regarding coaching methodology also occurred, with 83.9% of respondents reporting that coaches have changed drills to reduce the risk of head injury.¹⁰⁹
- A majority of athletes (95% of respondents) in football, basketball, and volleyball complete baseline testing, and 94% of schools offer baseline testing for their athletes. IMPACT neurocognitive testing is used by 98.1% of respondents' schools.¹¹⁰

F. *New York*

New York passed its youth sports concussion law in 2011.¹¹¹ In a study published in 2017, researchers examined retrospective emergency department (ED) data to see if introduction of the law increased ED utilization for concussion.¹¹² The study found that there was a 0.5% increase in utilization for concussion, suggesting that the law had an effect.¹¹³ However, the study also found that the greatest rise in utilization occurred *before* passage of the New York statute, suggesting that other factors (such as high-profile media coverage) also affected the uptick in ED utilization.¹¹⁴

G. *Rhode Island*

Rhode Island passed its youth sports concussion law in 2010.¹¹⁵ In 2014, researchers from the Injury Prevention Center at Rhode Island Hospital published a study based on a survey of high school

107. *Id.*

108. *Id.*

109. *Id.*

110. *Id.*

111. David Baker et al., *Effects of the New York State Lystedt Law on Concussion-Related Emergency Healthcare Visits among Adolescents*, 88 NEUROLOGY P6.145 (2017).

112. *Id.*

113. *Id.*

114. *Id.*

115. 16 R.I. GEN. LAWS § 16-91-3 (2012).

athletic directors and directors of some community sports organizations.¹¹⁶ In total, 38 surveys were completed.¹¹⁷ Due to a low response rate, the researchers were cautious in their conclusions.¹¹⁸ Nevertheless, they found that the mandated portions of the Rhode Island law were generally being followed, but that the suggested aspects of the law were not as regularly implemented.¹¹⁹ Respondents also noted that parents were, at times, not compliant with the concussion policy.¹²⁰

H. Washington State

In 2009, the state of Washington became the first state in the nation to pass a youth sports concussion law.¹²¹ Because of its status as the first state to adopt a concussion law, a number of studies have been conducted on the effect of the law. A study one year after the law's passage found that the public was aware of the law, but gaps in knowledge remained.¹²² In a study of high school coaches, Sara Chrisman, Frederick Rivara, and colleagues found that coaches' concussion education levels were quite high, and that coaches had the requisite concussion knowledge.¹²³ They also found that athlete knowledge was not quite as robust.¹²⁴ In another study, using focus groups with high school varsity athletes, they identified a conundrum: although athletes recognized the risks of concussion, in hypothetical scenarios many reported that they would continue to play.¹²⁵

116. Dina Morrissey et al., *Statewide Assessment of the Rhode Island School and Youth Programs Concussion Act*, 77 J. TRAUMA ACUTE CARE SURGERY S8 (2014).

117. *Id.*

118. *Id.*

119. *Id.*

120. *Id.*

121. Christian Shenouda, Peter Hendrickson, Kathleen Davenport, Jason Barber & Kathleen R. Bell, *The Effects of Concussion Legislation One Year Later—What Have We Learned: A Descriptive Pilot Survey of Youth Soccer Player Associates*, 4 AM. ACAD. PHYSICAL MED. & REHABILITATION 427, 429 (2012).

122. *Id.*

123. Sara P. Chrisman, Melissa A. Schiff, Shana K. Chung, Stanley A. Herring & Frederick P. Rivara, *Implementation of Concussion Legislation and Extent of Concussion Education for Athletes, Parents, and Coaches in Washington State*, 42 AM. J. SPORTS MED. 1190, 1190-96 (2014); see also Frederick P. Rivara, Melissa A. Schiff, Sara P. Chrisman, Shana K. Chung, Richard G. Ellenbogen & Stanley A. Herring, *The Effect of Coach Education on Reporting of Concussions Among High School Athletes After Passage of a Concussion Law*, 42 AM. J. SPORTS MED. 1197, 1197-1203 (2014).

124. Chrisman et al., *supra* note 122, at 1190-96.

125. Sara P. Chrisman, Celeste Quitiquit & Frederick P. Rivara, *Qualitative Study of Barriers to Concussive Symptom Reporting in High School Athletics*, 52 J. ADOLESCENT HEALTH 330, 330-35 (2013).

Researchers have also evaluated the effects of the Lystedt law on reported concussion incidence in high school sports.¹²⁶ In the sampled public high schools, the implementation of the Lystedt law in 2009 was associated with a more than doubled reported count and incidence rate of concussions.¹²⁷

I. *Wisconsin*

Wisconsin passed its youth sports concussion law in 2012.¹²⁸ A 2016 study evaluated how the Wisconsin law affected reported concussion incidence rates, and probed athlete knowledge of Wisconsin's concussion law.¹²⁹ Most respondents were football players, and the authors compared the survey results from the 2013 high school football players with results from football players from an earlier study (which used the same design, before the law had been enacted).¹³⁰ Approximately similar proportions of high school football players in 2013 and in 1999-2002 reported a prior concussion (31% versus 30% respectively) and a concussion in the previous season (17% versus 15% respectively).¹³¹ However, during 2013, there was significantly better reporting than in 1999-2002 –71% of high school football players self-reporting a concussion in 2013 also reported that concussion to another individual, versus only 47% in 1999-2002.¹³²

Overall, despite being required to sign a waiver regarding concussion information prior to play, only 60% of high school athletes reported being aware of the Wisconsin State law.¹³³ In addition, although non-concussed high school athletes with knowledge of the law reported they would be more likely to report a concussion, the majority of athletes who experienced a concussion (after the law

126. Viviana Bompadre, Thomas M. Jinguji, N. David Yanez, Emma K. Satchell, Kaiulani Gilbert, Monique Burton, Ernest U. Conrad III & Stanley A. Herring, *Washington State's Lystedt Law in Concussion Documentation in Seattle Public High Schools*, 49 J. ATHLETIC TRAINING 486, 487 (2014).

127. *Id.* at 486. The authors retrospectively took data from the 2008-2009 academic year (prior to the law's implementation), and compared it with the 2009-2010 and 2010-2011 years.

128. Ashley A. LaRoche, Lindsay D. Nelson, Peter K. Connelly, Kevin D. Walter & Michael A. McCrea, *Sport-Related Concussion Reporting and State Legislative Effects*, 26 CLINICAL J. SPORT MED. 33, 33 (2016).

129. *Id.*

130. *Id.*; Michael McCrea, Thomas Hammeke, Gary Olsen, Peter Leo & Kevin Guskiewicz, *Unreported Concussion in High School Football Players: Implications for Prevention*, 14 CLINICAL J. SPORTS MED. 13, 13-17 (2004).

131. *Id.* at 37.

132. *Id.*

133. *Id.* at 33.

was implemented) said the law made no difference in their likelihood of reporting or not reporting.¹³⁴

J. Summary

Taken together, what does this collection of studies tell us about the implementation of youth sports concussion laws? Five conclusions become apparent, each of which is consistent with my personal experience working in Minnesota on these issues:

1. *Buy in:* Although they may not know the specifics of how the law works, there is generally widespread acceptance and appreciation of the concussion laws by key stakeholders, as well as the public.¹³⁵
2. *Protocols in place for high schools:* In general, it appears that most high schools have implemented a concussion protocol (roughly) consistent with the major provisions of the law in its state.¹³⁶
3. *Resistance:* At the same time, parents (and sometimes athletes) may be resistant to concussion protocols when following those protocols is perceived to be at odds with the advancement of an athletic goal, or when necessary monetary and staffing resources are not available.¹³⁷
4. *Increase in reported concussions:* It appears that state concussion laws, as well as rising awareness about sports concussions, have jointly contributed to an increase in the number of reported concussions (and thus, presumably, to overall improvement in concussion care.)¹³⁸
5. *More education needed:* Across multiple states, survey respondents consistently voice a need for more education dissemination. Many parents, athletes, and school / youth sports personnel are not yet adequately informed by the law.¹³⁹

Although studies of these laws are emerging, there remain large gaps in knowledge. As Kerri McGowan Lowrey, and colleagues have recently observed, “[m]any facets of youth sports-related TBI

134. *Id.* at 38.

135. See discussion to follow in Part III.

136. Coxe et al., *supra* note 37.

137. See, e.g., Howland et al., *supra* note 61.

138. See, e.g., Yang et al., *supra* note 3; Gibson et al., *supra* note 42.

139. See discussion to follow in Part III.

laws are untested. ... [and] effectiveness is unknown ... ”¹⁴⁰ Moreover, almost all of the research just reviewed in Part III concerns organized school sports, either high school or middle school. We know virtually nothing systematic about the implementation of the laws in non-school youth leagues, and the scientific knowledge base on elementary age athletes remains limited.

These gaps in our knowledge make it difficult to determine which policies are most important to pursue. To fill this knowledge gap, I am working with multiple collaborators and stakeholders in the state Minnesota to generate new research. In the next Part, I discuss the approach we are taking.

IV. A MINNESOTA MODEL TO IMPROVE YOUTH SPORTS CONCUSSION POLICY

Public health scholars Kerri McGowan Lowrey, Stephanie Morain, and Christien Baugh have argued that there is an ethical duty for legislators and public health officials to “to monitor and evaluate both the health condition targeted by the policy and the specific effects of policy,” and then revise the law as needed.¹⁴¹ I agree.

I also agree with Hosea Harvey that “[i]f policymakers are serious about using the force of the law to have an impact on public health, they must also create evaluative metrics to ensure that their law-making has the desired effect on public health outcomes.”¹⁴² This is why in the 2017 Minnesota legislative session, I helped to lead a collaborative, bipartisan effort to revisit and evaluate Minnesota’s youth concussion law.

Those efforts, which I reflect upon here, lead me to address the question: how can such an evaluation be undertaken, especially given the (often severe) resource constraints facing state agencies, school districts, and local youth sports organizations?

The studies reviewed in Part III are a start. In addition, multi-state projects such as those utilizing the Public Health Law Research Policy Surveillance Web Portal, pave the way for future research.¹⁴³ But the future of youth sports concussion policy evaluation requires new perspectives and partnerships.

140. Lowrey et al., *supra* note 3, at 6.

141. Lowrey, *supra* note 4.

142. Harvey, *supra* note 1, at 115.

143. Harvey, *supra* note 1, at 88. Other innovations will emerge as well. For instance, in Texas there are efforts to create a statewide concussion registry data collection system. *Texas Sports Concussion Registry*, U. TEX. SW. MED. CTR. <http://www.utsouthwestern.edu/research/brain-injury/research/con-tex.html> (last visited Nov. 12, 2017).

I hope that our work in Minnesota is illustrative of what these new partnerships might look like. My view is that the following foundational principles should ground concussion evaluation:

1. *Collaborative*: The evaluation system should aim to be designed collaboratively, with input from multiple stakeholders.
2. *Feasible*: The evaluation system should aim to provide an economically, politically, and culturally feasible mechanism for regular data collection and assessment.
3. *Scientifically Sound*: The evaluation system should aim to be consistent with scientific knowledge of concussions, and should systematically analyze concussion policy across the full universe of ages, sports, and regions.
4. *Fidelity of Implementation*: The evaluation system should aim to closely investigate fidelity of the implementation.
5. *Alignment of Incentives*: The evaluation system should aim to align with the incentives of schools and youth leagues to maintain high levels of participation, with the incentives of youth athletes and parents to be informed of relevant risks and benefits.
6. *Recognize Benefits*: The evaluation system should recognize that governance of youth sports relies upon careful cost-benefit considerations. Although there are potential health costs to contact sports participation, there are also likely benefits, for which the evaluation system should account.
7. *Inclusive*: The evaluation system should be inclusive by collecting data on concussion incidence by sex, region, race, class, and the like. Such data will inform analysis of possible inequities in the implementation of the law.

Guided by these principles, in 2017 we generated significant support for legislation that would have funded an evaluative study of Minnesota's concussion law.¹⁴⁴ I testified three times in the Minnesota legislature, and the bill was passed by the Minnesota House of Representatives.¹⁴⁵ Although the bill was not ultimately funded, our work continues with support from a grant from the University of Minnesota. In May 2017, we hosted a stakeholder meeting that garnered support across multiple regions, professions, and viewpoints.

144. H.B. 1714, 90th Leg., Reg. Sess. (Minn. 2017); S.B. 1477, 90th Leg., Reg. Sess. (Minn. 2017).

145. See H.B. 1714, 90th Leg., Reg. Sess. (Minn. 2017).

Some of our partners in these efforts include individuals from the University of Minnesota Law School, Medical School, School of Public Health, School of Kinesiology, Athletic Department, and Athletic Medicine; CentraCare Project BrainSafe at St. Cloud Hospital, Mayo Clinic Sports Medicine; Sanford Health; Minnesota Brain Injury Alliance; National Sports Center Foundation; Minnesota Youth Athletic Services; Player's Health, and Hennepin County Medical Center. Additional collaborators have continued to join in what we hope will eventually become a statewide effort.

As the dialogue unfolds, we recognize that the foundational principles are at times at odds with one another. For instance, an economically feasible study will likely require curtailing the scope of research. This is why each principle is described as "should aim to," rather than "must."

These principles also do not solve fundamental problems such as how to define and measure concussion. For example: what is a "concussion" for Minnesota statute reporting purposes? Answering this question is not as straightforward as it may seem.¹⁴⁶ The Minnesota law defines concussion,¹⁴⁷ but in practice coaches and trainers apply their best judgement in deciding whether an athlete "exhibits signs, symptoms, or behaviors consistent with a concussion" or more generally "is suspected of sustaining a concussion."¹⁴⁸ That is, often lay individuals will be making the initial decision about whether a cluster of symptoms suggests concussion.

Perhaps the most difficult information to collect concerns the fidelity of implementation. That is, how is the stated policy actually being carried out in practice? At the professional level, we know that what's written down is not what's always followed. For instance, in on-going National Hockey League litigation, it has come to light that even the medical staff may diverge from concussion protocol in high-pressure playoff situations.¹⁴⁹ At the youth level,

146. As I explore with coauthors in my Law and Neuroscience textbook, how to define and measure "concussion" is contested. See OWEN D. JONES, JEFFREY D. SCHALL & FRANCIS X. SHEN, *LAW AND NEUROSCIENCE* 317 (2014) ("Defining and diagnosing 'brain injury' is difficult, especially when no direct evidence of brain function is available.")

147. As written in the statute, "'Concussion' means a complex pathophysiological process affecting the brain, induced by traumatic biokinetic forces caused by a direct blow to either the head, face, or neck, or elsewhere on the body with an impulsive force transmitted to the head that may involve the rapid onset of short-lived impairment of neurological function and clinical symptoms, loss of consciousness, or prolonged post-concussive symptoms." MINN. STAT. ANN. § 121A.38 (2011).

148. *Id.*

149. Rick Westhead, *NHL Doctor Slams 'Situational Ethics' on Concussions in Unsealed Lawsuit Documents*, TSN (Mar. 28, 2017), <http://www.tsn.ca/nhl-doctor-slams-situational-ethics-on-concussions-in-unsealed-lawsuit-documents-1.708729> (in which an NHL team physician argues that his colleagues are engaging in situational ethics).

we should expect significant variation and must design our research accordingly.

We should also be aware of regional, socioeconomic, and racial variation in the implementation of concussion policy. In general, there are stark differences in health outcomes and access to health care across geographies.¹⁵⁰ Research on sports concussions suggests that urban and suburban school students may have different levels of concussion knowledge.¹⁵¹ Race and socioeconomic status may also play a role in concussion knowledge and incidence.¹⁵²

In short: we should expect variance across the state—and we should develop research strategies that will capture that variation. One way we've accomplished this in Minnesota is to take advantage of research opportunities at the Minnesota State Fair.

The Minnesota State Fair is the largest per-capita state fair in the country. It is called the “Great Minnesota Get Together,” and over 12 days in 2017, nearly 2 million people attended.¹⁵³ The University of Minnesota maintains a dedicated research building (the “Driven to Discover” or D2D building), allowing researchers to directly interact with these Fairgoers. My lab participated in 2017 to carry out “The Great Minnesota Sports Concussion Study.”

We worked a total of 23 hours at the Fair in four separate shifts; two of which were five-hour shifts and two of which were six-and-a-half-hour shifts. Across this period, a total of 319 parent participants who had school-aged children that participated in organized sports and 401 youth athlete participants (under the age of 22) completed the survey. Each target group completed their own group-specific survey, but there was some overlap in survey items from the two separate surveys.¹⁵⁴

150. Adler, Nancy E., David M. Cutler, J. E. Jonathan, S. Galea, M. Glymour, H. K. Koh, and D. Satcher, *Addressing Social Determinants of Health and Health Disparities. Discussion Paper, Vital Directions for Health and Health Care Series. National Academy of Medicine*, Washington, DC. <https://nam.edu/wp-content/uploads/2016/09/addressing-social-determinantsof-health-and-health-disparities.pdf> (2016).

151. Jessica Wallace et al., *Concussion Knowledge and Reporting Behavior Differences Between High School Athletes at Urban and Suburban High Schools*, 87 J. SCH. HEALTH 665 (2017).

152. See Anthony P. Kontos et al., *Exploring Differences in Computerized Neurocognitive Concussion Testing Between African American and White Athletes*, 25 ARCHIVES CLINICAL NEUROPSYCHOLOGY 734, 748 (2010); Zac Houck et al., *Socioeconomic Status and Race Outperform Concussion History and Sport Participating in Prediction Collegiate Athlete Baseline Neurocognitive Scores*, J. INT'L NEUROPSYCHOLOGICAL SOC'Y, 1, 1 (2017).

153. *New Attendance Record at the Minnesota State Fair? You Betcha*, PIONEER PRESS (Sept. 5, 2017, 01:38 PM), <http://www.twincities.com/2017/09/05/minnesota-state-fair-record-attendance-2017-how-many-people-attended>.

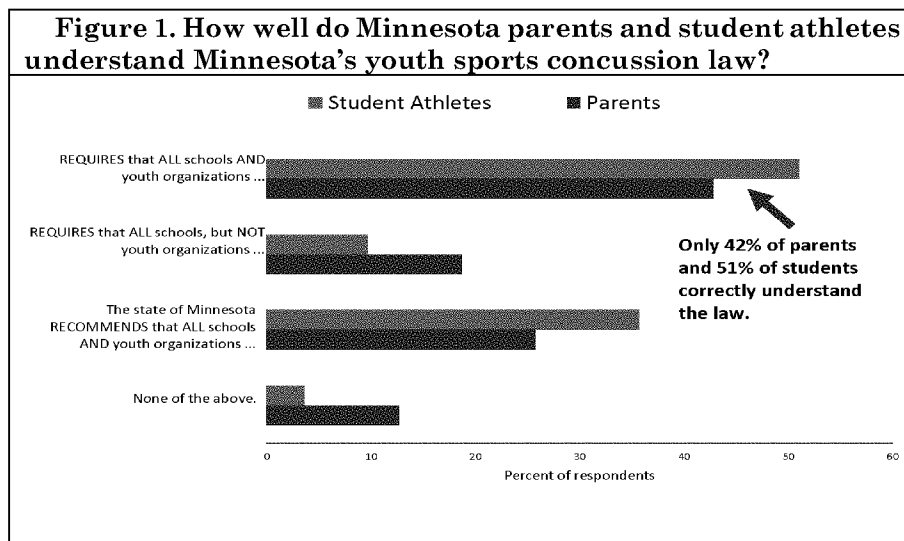
154. The parent survey took about 15 minutes on average and the youth survey took about 10 minutes on average. Subjects received a complimentary drawstring backpack for their participation. Parent subjects either self-completed the survey using an iPad or were aided

Full analysis of the results will be presented in a future publication, but I focus here on two data points of note. First, to gauge knowledge of the sports concussion law, we asked parents and student-athletes a multiple-choice question: *Which best describes the current Minnesota sports concussion law?*

- A. The state of Minnesota **REQUIRES** that **ALL** schools **AND** youth organizations supply parents and students with information about concussions.
- B. The state of Minnesota **REQUIRES** that **ALL** schools, but **NOT** youth organizations supply parents and students with information about concussions.
- C. The state of Minnesota **RECOMMENDS** that **ALL** schools **AND** youth organizations supply parents and students with information about concussions.
- D. None of the above.

The correct answer is (A). But as seen in Figure 1, only 42% of parents and 51% of students correctly understand the law. This data suggests that although parents and athletes may be aware of concussions, and even aware that the state has a law, they do not really understand its content. This raises concerns about the extent to which youth athletes and parents are being properly informed by youth leagues and schools.

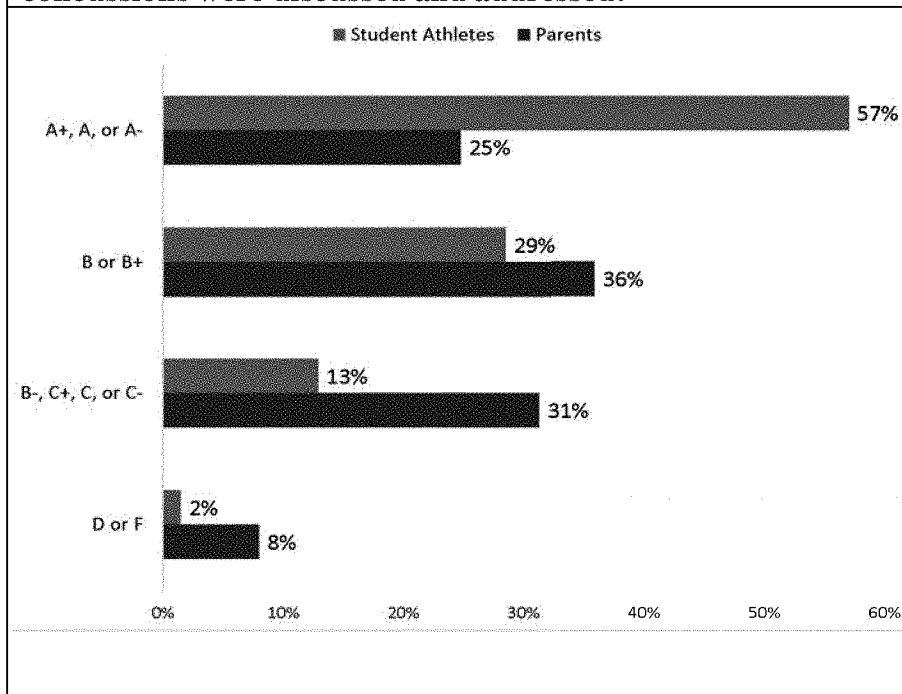
by research assistants also using an iPad. In this case, survey items were read aloud to subjects and their responses denoted by the research assistant using the iPad. The survey was completed through the Qualtrics interface.



In addition to asking about knowledge of the law, we asked parents and athletes to provide an overall grade of the quality of concussion care and policy. Both parents and athletes were asked: “Overall, what letter grade would you assign to the coaching staff, trainers, and other officials throughout the season(s) for the way that concussions were discussed and addressed?”

Figure 2 shows that parents and athletes diverged in their assessments. Nearly 60% of athletes gave a grade of A, compared to only 25% of parents. 31% of parents graded in the C- to B- range, and 8% of parents graded D or F. Further analysis is required to understand these differences, as well as the factors that lead some respondents to offer quite positive grades, while others to rate much lower. Such analysis is at the core of our work going forward, and we hope it will align with emerging work in other states.

Figure 2. Parent and student athlete responses to: Overall, what letter grade would you assign to the coaching staff, trainers, and other officials throughout the season(s) for the way that concussions were discussed and addressed?



V. CONCLUSION

During a discussion of sports concussions at the *Athletes, Veterans, and Neuroscience* symposium, a panelist asked audience members to raise their hands if they would let their child play football. Most hands remained down. But sitting in the front row, I made a point of vigorously raising my arm. Yes, I would certainly let my children play football.

After the panel, several people asked me about the reasoning for my answer. They could not reconcile my professed love of brain science with a policy stance that they thought promoted brain damage. My response, which motivated the present essay, is that I let the evidence be my guide.

As I have recently argued elsewhere, the available evidence on the incidence and magnitude of youth sports concussions suggests that most athletes will not be concussed, and those that do will not

experience long-lasting symptoms.¹⁵⁵ This is not to say that there aren't risks—there are, and the risks may be understated by some research methodologies. But there are also many benefits to be derived from participation in sports, and I would allow my children to make an informed decision about how to weigh those risks and benefits.

The available, if limited, research on current state legislation suggests that they have done well in promoting better concussion management policies and in increasing the recognition of concussion. Yet there are limits to legislation. In particular, the inability (at present) to objectively identify a concussion, the lack of medical expertise available for most youth sports leagues, and the heavy reliance on volunteers seems to me to suggest that outside the high school context (and perhaps even within it) it will be difficult for researchers to access the information they would need to properly evaluate current policy.

Moving forward, the answer may not be more legislation, but rather more creative research. In our Minnesota work, we aim for policy that is designed collaboratively, feasible, scientifically sound, sensitive to fidelity of implementation, aligned with the incentives of youth leagues and schools, accounts for the benefits of sports, and promotes inclusive data collection. It will not be easy to achieve all of these aims. But they are all, at least in part, achievable.

155. Carly Rasmussen et al., *How Dangerous are Youth Sports for the Brain?: A Review of the Evidence*, BERKELEY J. ENT. & SPORTS L. (forthcoming 2018).

