

**CATASTROPHIC  
SPORTS INJURY RESEARCH**

**THIRTY-EIGHTH ANNUAL REPORT**

**FALL 1982 - SPRING 2020**

**From the  
National Center for Catastrophic Sport Injury Research  
At The University of North Carolina at Chapel Hill**

**Website: [nccsir.unc.edu](https://nccsir.unc.edu)**

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## INTRODUCTION

In 1931, the American Football Coaches Association (AFCA) initiated the First Annual Survey of Football Fatalities and this research has been conducted at the University of North Carolina at Chapel Hill since 1965. In 1977, the National Collegiate Athletic Association (NCAA) initiated a National Survey of Catastrophic Football Injuries, which is also conducted at the University of North Carolina. As a result of these research projects important contributions to the sport of football have been made. Most notable have been the 1976 rule changes making it illegal to make initial contact with the head and face while blocking and tackling, the National Operating Committee on Standards for Athletic Equipment (NOCSAE) football helmet standard, improved medical care for the participants, and better coaching techniques.

Due to the success of these two football projects the research was expanded to all sports for both men and women, and a National Center for Catastrophic Sports Injury Research (NCCSIR) was established in 1982. The decision to expand this research was based on the following factors:

1. Research based on reliable data is essential if progress is to be made in sports safety.
2. The paucity of information on injuries in all sports.
3. The rapid expansion and lack of injury information in women's sports.

In 1987, a joint endeavor was initiated with the Section on Sports Medicine of the American Association of Neurological Surgeons. The purpose of this collaboration was to enhance the collection of medical data. Dr. Robert C. Cantu, Chairman, Department of Surgery and Chief, Neurosurgery Service, Emerson Hospital, in Concord, MA, is the Medical Director of the NCCSIR and has been responsible for evaluating the medical data. Dr. Cantu is also a Past-President of the American College of Sports Medicine. The NCCSIR was directed for 30 years by Dr. Frederick Mueller. Dr. Mueller retired in the Spring of 2013 and the NCCSIR continues under new direction (Dr. Kucera). The NCCSIR has expanded to become a consortium of universities (University of North Carolina, Boston University, University of Washington, University of Connecticut, University of Colorado, University of Maryland) with expertise in head/neck, cardiac, and heat-related sports medicine (these three areas account for the overwhelming majority of catastrophic events).

**To learn more about NCCSIR please visit:** <http://nccsir.unc.edu/about/>

**To learn more about the Consortium please visit:** <http://nccsir.unc.edu/consortia-and-partners/>  
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## METHODS

### Outcome Definitions

For the purpose of this research the term catastrophic is defined as any severe injury incurred during participation in a school/college sponsored sport. Catastrophic is divided into the following three definitions:

1. **Fatality**
2. **Non-Fatal** - permanent severe functional disability.
3. **Serious** - no permanent functional disability but severe injury. An example would be fractured cervical vertebra with no paralysis.

Sports injuries are also considered traumatic (or direct) or exertional/medical (or indirect). The definition are as follows:

Traumatic injury (**direct**) - Those injuries that resulted directly from participation in the skills of the sport.

Exertional/medical (**indirect**) - Those events that were caused by systemic failure as a result of exertion while participating in a sport activity or by a complication that was secondary to a non-fatal injury.

Note: Beginning in 2014, NCCSIR also collects non sport-related events such as sudden cardiac arrest that occurred outside of sport activity (e.g., during sleep). These events were not included in the tables but are described in the Case Summary sections.

### Data Collection

Data were compiled with the assistance of coaches, athletic trainers, athletic directors, executive officers of state and national athletic organizations, online news reports, and professional associates of the researchers. Data collection would not have been possible without the support of the NCAA, the National Federation of State High School Associations (NFHS),

and the AFCA. Upon receiving information concerning a possible catastrophic sports injury, contact by telephone, email or personal letter and questionnaire was initiated with the injured player's athletic trainer, athletic director, or coach. Data collected included background information on the athlete (age, height, weight, experience, previous injury, etc.), accident information, immediate and post-accident medical care, type injury, and equipment involved. Autopsy reports are used when available. In order to improve overall capture of catastrophic sport injury and illness events, NCCSIR and the Consortium for Catastrophic Injury Monitoring in Sport developed an online portal where anyone can report a catastrophic event:

**<https://www.sportinjuryreport.org>**. The portal was activated in January 2015.

### **Participation in Sport**

Athletes may complete in more than one sport season. Therefore, participation is presented in athlete-seasons. *Note that the majority of schools—high school and collegiate—cancelled their spring 2020 sport seasons due to COVID-19.*

Yearly participation estimates for high school athletes are obtained from NFHS participation reports (available online: <https://www.nfhs.org/ParticipationStatistics/ParticipationStatistics/>). *The NFHS did not collect sport participation data from its member states for academic year 2019/20. Therefore 2019/20 sport participation was imputed based on 2018/19 values.* NFHS high school annual athletic participation for 2018/19 included 7,652,585 athlete-seasons (3,240,756 female-seasons and 4,411,829 male-seasons). Yearly participation estimates for collegiate level athletes are obtained from the National Collegiate Athletic Association (NCAA) participation reports (accessed online: [https://ncaaorg.s3.amazonaws.com/research/sportpart/2018-19RES\\_SportsSponsorshipParticipationRatesReport.pdf](https://ncaaorg.s3.amazonaws.com/research/sportpart/2018-19RES_SportsSponsorshipParticipationRatesReport.pdf)). NCAA participation for 2019/20 in championship sports was 499,213 athlete-seasons. There were 282,411 male-seasons and 221,212 female-seasons. There were also 3,560 males in non-championship sports (archery, badminton, bowling, equestrian, rowing, rugby, sailing, and squash) and 2,830 females participating in emerging sports (archery, badminton, equestrian, rugby, squash, synchronized swimming, team handball, and triathlon).

During the entire 38 year period from the fall of 1982 through the spring of 2020, there were 243,915,722 (97,445,057 female and 146,470,665 male) high school participant-seasons in

the sports covered by this report and approximately 14,068,920 13,568,395 (5,651,768 female and 8,417,152 male) college participant-seasons (Table 12).

Not all high schools and colleges are members of the NFHS and NCAA. Complete data is not available for the non-member schools. Therefore, these participation numbers underestimate the total number of high school and collegiate participants in the United States.

## **Analysis**

Frequencies and incidence rates of catastrophic injury per 100,000 athlete-seasons were calculated over the entire 38-year period and stratified by level (high school and college) and sport. Incidence rates were stratified by traumatic injury (direct) versus exertional/medical (indirect) and by severity. **Note: if there were no events in the sport for a particular year, the year is excluded from the frequency Table. Rates with number of incidents less than 5 should be interpreted with caution.**

It is important to note that information is continually being updated due to the fact that catastrophic injury information may not always reach the NCCSIR in time to be included in the current final report. The report includes data that is reported to the NCCSIR by the NCAA, the NFHS, online reports, colleagues, coaches, and athletic trainers. There may be additional catastrophic injuries that are not reported to the NCCSIR. The authors acknowledge that not every catastrophic injury is included in this report.

## **RESULTS**

### **Current AY2019-2020 Summary**

From July 1, 2019 to June 30, 2020 there were a total of 76 catastrophic injuries/illnesses captured by NCCSIR among high school and college organized sport participants. Of these, 66 events were due to or occurred during sport-related activities (Table 11). There were also 10 catastrophic events that occurred during non-sport related activity (8 cardiac-related, 1 infectious illness, and 1 suspected cardiac): 2 collegiate and 8 high school level; 3 female and 7 males; 9 fatal and 1 nonfatal).



*Sport-related events:* The majority of the sport-related catastrophic events (n=66) were at the high school level (86.4%, n=57) and among males (87.9%, n=58). Member institutions for the 9 collegiate cases included NCAA, NAIA, and junior college. Overall, 28.8% of cases were fatal, 4.5% were nonfatal permanently disabling, 21.2% were serious with recovery, and 13.6% were unknown. Forty-eight percent (n=32) were due to traumatic injury (direct) causes and the majority occurred during competition or practice (42.4% each). The majority of events occurred to athletes participating in the following sports: football (54.5%), basketball (13.6%), track and field (9.1%), wrestling (6.1%), baseball (3.0%), ice hockey (3.0%), soccer (3.0%), and volleyball (3.0%). Areas of the body most commonly affected were heart (47.0%), spine (9.7%), and head/brain (15.2%). Sudden cardiac arrest (45.5%) was the most common type of event followed by spine injury (19.7%), brain trauma (12.1%), and other traumatic injuries (16.7%).

*Traumatic injury (direct) events:* 21.9% of traumatic injury (direct) events were fatal, 6.3% non-fatal permanently disabling, 43.8% serious with recovery, and 28.1% unknown. A greater proportion of traumatic injury (direct) events occurred in competition versus practice (68.8% versus 28.1%) and were due to contact with another player (50.0%), apparatus/object (3.1%), or ground/surface (15.6%). The most frequent activity was tackling/being tackled (28.1%) and a large proportion were unknown (18.8%). The highest proportion was to the spine (37.5%) and head/brain (31.3%) followed by other traumatic injury (25.0%). The majority occurred in football (71.9%) followed by track and field (15.6%), baseball (3.1%), gymnastics (3.1%), and ice hockey (3.1%). There were 5 athletes injured via pedestrian motor vehicle crash related to participation in athletics (e.g. runner struck by car). Four athletes were preparing for a practice run on the sidewalk when they were struck. One athlete was struck while running on the sidewalk. Four of the five athletes died and one athlete was disabled.

*Exertional/medical (indirect) events:* 35.3% of exertional/medical (indirect) events were fatal, 2.9% resulted in permanent disability, and 61.8% recovered. There were fewer fatal events in 2019/20 compared to 2018/19 (n=16 40% versus n=26 52%). The majority occurred during practice (55.9%) followed by competition (17.6%), conditioning sessions and weight training sessions (11.8%), and unaffiliated recreational activity (11.8%). The most frequent activity was conditioning (14.7%) and running (20.5%) and 20.6% were unknown. The majority were cardiac-related (88.2%) and heat-related (5.9%). There were fewer heat stroke events in 2019/20 compared to the previous years (8 in 2017/18 and 10 in 2018/19). Football (38.2%) and

basketball (23.5%) comprised the majority followed by wrestling (11.8%), and volleyball (5.9%).

### **Overall Summary**

During this 38-year period, there were 2,878 catastrophic sport-related injuries/illnesses at high school and college levels (Table 1 – excluding cheerleading, drill team, and rodeo there were 2,757). The majority were non-fatal (64%) and from traumatic or direct mechanisms (63%), and among high school participants (79%). The proportion of fatal (38% versus 34%) and traumatic injury (direct) (64% versus 59%) were not different by high school compared to college level.

The 66 sport-related catastrophic injuries and conditions captured in 2019/20 is lower than the previous two years (82 in 2018/19 and 87 in 2017/18) and a 19.5% decrease from 2018/19—potentially a result of spring sport season cancellations for many high schools and colleges in 2019/20 in response to COVID-19. *Note: see Discussion regarding the interpretation of this percentage difference.*

*Traumatic Injuries (Direct) by Sport:* For high school sports, football had the highest *number* of traumatic injury (direct) catastrophic events, followed by female cheerleading, baseball, wrestling, and male track and field (Table 4a). Accounting for the number of participants in the sport, male and female cheerleading, male gymnastics, football, and male ice hockey had the highest rates per 100,000 participant-seasons (Figure 2, Table 9a). When restricted to fatal events male gymnastics, football, male ice hockey, and female skiing had the highest rates per 100,000 participant-seasons (Figure 1). *Note: see Discussion and Recommendations page xx regarding the interpretation of the injury rates for cheerleading.*

For college sports, football had the highest *number* of traumatic injury (direct) catastrophic events, followed by female cheerleading, baseball, and male track and field (Table 5a). Accounting for the number of participants in the sport, male gymnastics, female skiing, football, male ice hockey, male skiing, female gymnastics, and female equestrian had the highest rates per 100,000 participant-seasons (Figure 4, Table 9b). Similar results were observed when restricted

to fatal events where female skiing, male skiing, equestrian, and female gymnastics had the highest rates per 100,000 participant-seasons (Figure 3).

*Exertional/Medical Conditions (Indirect) by Sport:* For high school sports, football had the highest *number* of exertional/medical (indirect) catastrophic events, followed by male basketball, male track and field, male soccer, and wrestling (Table 4b). Accounting for the number of participants in the sport, rowing, male basketball, football, male ice hockey, male lacrosse, and male water polo had the highest rates per 100,000 participant-seasons (Figure 2, Table 10a). When restricted to fatal events male basketball, football, male water polo, male lacrosse, and male ice hockey had the highest rates per 100,000 participant-seasons (Figure 1).

For college sports, football had the highest *number* of exertional/medical (indirect) catastrophic events, followed by male basketball, wrestling, baseball, male soccer, female basketball, and male swimming (Table 5b). Accounting for the number of participants in the sport, male basketball, male water polo, male skiing, football, male wrestling, male ice hockey, male swimming, and male rowing had the highest rates per 100,000 participants (Figure 4, Table 10b). When restricted to fatal events male basketball, male water polo, male skiing, football, male wrestling had the highest rates per 100,000 participants (Figure 3).

## DISCUSSION

The following strengths and limitations should be noted:

- Data have been collected by The National Center for Catastrophic Sport Injury Research for all high school and college sports since 1982 using consistent definitions and methodology over a 30+ year period. These data are provided annually to sport organizations (NCAA, NFHS, AFCA), researchers and the public. Sports medicine advisory committees, sport rules committees, and coaching committees review the reports and have used these data to inform and evaluate safety recommendations, medical care, and rule changes.
- Catastrophic events are primarily captured through publicly available media reports. Therefore, not all catastrophic events are captured. Particularly, for non-fatal

catastrophic events, which may not be reported in the media as comprehensively as fatalities. Under-reporting may also be due to outcome definitions used (e.g. timing of the event) and event locations (e.g. at home, personal conditioning). **In order to improve overall capture of these events, NCCSIR and the Consortium for Catastrophic Injury Monitoring in Sport have developed an online portal where anyone can report a catastrophic event: <https://www.sportinjuryreport.org>.** The online portal was activated in January 2015. Any observed changes in annual number of events may be attributed to these described improvements in data collection methods.

- Details surrounding catastrophic events that are only captured through publicly available media reports may not be completely accurate in the absence of the actual autopsy or medical reports.
- Incidence rates were calculated using participation estimates from NFHS and the NCAA in the rate denominator (Table 12). These participation estimates do not include schools that are not members of these two associations. Participation data were not available for these non-member schools. At present NFHS and NCAA are the only estimates available. Therefore, the participation numbers (rate denominator) in this report are underestimated, which results in an overestimate of the actual incidence rate. Likewise with cheerleading where participation data are not available for collegiate cheerleading and utilizing NFHS participation data for competitive spirit.
- Note: that the majority of schools—high school and collegiate—cancelled their spring 2020 sport seasons due to COVID-19. The NFHS did not collect participation data for their member states in 2019/20; therefore 2018/19 participation estimates were used to estimate 2019/20 participation. Participation has not varied substantially over the past 3-years (7,963,535 in 2016/17; 7,980,886 in 2017/18; and 7,937,491 in 2018/19), but there may be additional variability by individual sport that could impact sport-specific rates.
- It is important to note that catastrophic events are rare and statistical power for some strata comparisons are limited. Rates with number of incidents less than 5 should be interpreted with caution.

## RECOMMENDATIONS

1. Each athlete should have a complete physical examination with a medical history and an annual health history update.
2. All personnel involved with training athletes should emphasize proper, gradual, and sport-specific physical conditioning.
3. Every school should strive to have a certified athletic trainer.
4. Each school should have a written emergency action plan (EAP) in place, all personnel should have copies, and procedures should be reviewed and practiced annually.
  - The Centers for Disease Control and Prevention (CDC) has guidelines and templates for these plans (<http://www.cdc.gov/niosh/docs/2004-101/emrgact/emrgact1.html>).
  - NCAA and the NFHS have guidelines for these plans at the following websites: [www.nfhs.org](http://www.nfhs.org) and [www.ncaa.org](http://www.ncaa.org).
  - **An automated external defibrillator (AED) should be available and accessible onsite and medical and coaching staff should be trained in the use.**
5. There should be an emphasis on employing well trained athletic personnel, providing excellent facilities, and securing the safest and best equipment available.
6. There should be strict enforcement of game rules and administrative regulations to protect the health of the athlete and reduce the risk of catastrophic injury. Coaches and school officials must support the game officials in their rulings during the sporting event.
7. Coaches should be educated on and have the ability to teach the proper fundamental skills of the specific sport. Specific to football, the proper fundamentals of blocking and tackling should be emphasized to help reduce head and neck injuries, especially with keeping the head out of blocking and tackling.
8. Weight loss in wrestling to make weight for a match can be dangerous and cause serious injury or death. Coaches should be aware of safety precautions and rules associated with this practice.
9. There should be continued surveillance and safety research in athletics (rules, facilities, equipment, medical care and procedures).
10. **Sudden cardiac arrest:** The number of exertional/medical (indirect) cardiac related events has increased over the years and it is recommended that schools have and emergency action plan and automated external defibrillators (AED) available and

accessible on-site for emergency situations. Early detection and defibrillation is critical for survival (3-5 minutes recommended). (Casa et al. 2012)

- See also Drezner et al. 2007 for additional information about sudden cardiac arrest preparedness and management: <http://www.nata.org/sites/default/files/sudden-cardiac-arrest-consensus-statement.pdf>

11. **Heat-illness:** All personnel associated with sport participation should be cognizant of the safety measures related to physical activity in hot weather. Heat stroke and heat exhaustion are prevented by careful control of various factors in the conditioning program of the athlete.

- The NATA has a heat illness position statement on their web site (<https://www.nata.org/news-publications/pressroom/statements/position>) with recommendations for prevention: Casa et al. 2015 (<http://natajournals.org/doi/pdf/10.4085/1062-6050-50.9.07>) and Casa & Cislan, 2009 (<http://natajournals.org/doi/pdf/10.4085/1062-6050-44.3.332>)
- Coaches, athletic trainers, and players should refer to the multiple published best practices by the NATA, American College of Sports Medicine (ACSM), NFHS, and NCAA on preventing and managing heat illness. Emergency action plans should be activated.
- Link to the NFHS Sport Medicine Advisory Committee Position Statements: <https://www.nfhs.org/sports-resource-content/nfhs-sports-medicine-position-statements-and-guidelines/>
- Link to handout from the NATA on Heat Illness: <http://www.nfhs.org/media/1015650/2015-nata-heat-illness-handout.pdf>
- Link to handout from the Kory Stringer Institute on exertional heat stroke prevention: <https://ksi.uconn.edu/wp-content/uploads/sites/1222/2018/01/Preventing-Surviving-EHS-September-2017.pdf>

12. **Head Trauma:** When a player has shown signs or symptoms of head trauma (such as a change in the athlete's behavior, thinking, or physical functioning), the player should receive immediate medical attention from an appropriate medical provider and should not be allowed to return to practice or game that day. The athlete should not be allowed to return to practice or game without an evaluation by an appropriate medical provider.

- All athletes and athletic personnel should follow the state, NFHS, and NCAA policies related to concussion and return to play. See the following CDC resource for a list of states and their concussion policies: <https://www.cdc.gov/headsup/policy/index.html>
- For the most up to date information on concussion management please see the updated Consensus Statement on Concussion in Sport: The 5th International Conference on Concussion in Sport held in Berlin, October 2016 (McCrory et al. 2017 available at <http://bjsm.bmj.com/content/51/11/838>).
- Some cases associated with brain trauma reported that players complained of symptoms or had a previous concussion prior to their deaths. The team physician, athletic trainer, or coach should ensure players understand signs and symptoms of concussion and brain trauma. Players should also be encouraged to inform the team physician, athletic trainer, or coach if they are experiencing any of the signs or symptoms of brain trauma outlined by the CDC.
- HEADS UP ON CONCUSSION IN SPORTS:  
Information for Parents, Coaches, and School & Sports Professionals. Available at: <http://www.cdc.gov/headsup/highschoolsports/index.html>

The NFHS Sport Medicine Advisory Committee has developed guidelines for concussion management in sports: <http://www.nfhs.org/media/1014737/suggested-guidelines-for-management-of-a-concussion-in-sports-october-2013-2.pdf>

The NCAA has created several rules to help manage concussion injuries. The NCAA has created a set of best practices that are available in the Sports Medicine Handbook which may be found at: <http://www.ncaapublications.com/>

Every NCAA member school is required to have a concussion-management plan that:

- Requires student-athletes to receive information about the signs and symptoms of concussions. They also are required to sign a waiver that says they are responsible for reporting injuries to the medical staff.
- Mandates that institutions provide a process for removing a student-athlete from play/participation if they exhibit signs of a concussion. Student-athletes exhibiting signs of a concussions must be evaluated by a medical staff member with experience in the evaluation and management of concussions before they return to play.
- Prohibits a student-athlete with concussion symptoms from returning to play on the same day of the activity.

- Requires student-athletes diagnosed with a concussion be cleared by a physician before they are permitted to return.

13. **Spinal injuries:** Early recognition, prompt medical evaluation and management of cervical cord and spine injuries is critical for preventing permanent disability and death. Certified athletic trainers are trained to recognize and manage these injuries and whenever possible should be present for all football practices and games. Best practices recommendations for pre-hospital spine injury emergency management in football were updated in 2020 (Courson et al. 2020). For the most up to date information on management and prevention of these injuries see the following websites:

- National Athletic Trainers Association: <https://www.nata.org/practice-patient-care/health-issues/spine-injury>
- The Spine Injury in Sport Group is comprised of 25 medical bodies and sport organizations and published best practice guidelines for prehospital care and management of football players with suspected spine injuries: <https://meridian.allenpress.com/jat/article/55/6/545/438481/Best-Practices-and-Current-Care-Concepts-in>.
- Kory Stringer Institute: <https://ksi.uconn.edu/emergency-conditions/cervical-spine-injury/>

14. **Internal Organ Injuries:** Like cervical cord and spinal injuries, early recognition and prompt medical evaluation and treatment of internal organ injuries is critical for ensuring the best possible outcome. Emergency action plans, access to certified athletic trainers, and on-site medical services for competitions constitute best practices for these injuries. A better understanding of the activities and mechanisms associated with these injuries and use of protective gear worn is needed for prevention. Wearing protective gear (e.g., padded belt or shirt) that extends beyond the bottom of the shoulder pads to cover the torso may protect internal organs from direct contact.

15. **Lightning-Related Injuries:** Lightning-related injuries can happen during severe weather. In 2018, there were 20 documented lightning-related deaths and 82 nonfatal injuries among the general population in the United States (Insurance Information Institute, n.d.; National Weather Service, 2019). July and August have the highest risk for lightning strike-related injury. A majority of lightning-related deaths are associated with outdoor recreation (Thomson & Howard, 2013). An athlete struck by lightning may



suffer traumatic injuries and sudden cardiac arrest. Prevention measures include monitoring weather conditions and moving to a designated safe location until the threat has passed. This is not only important for athletes, but also for spectators.

16. **Cheerleading Injuries:** The NFHS sponsors competitive spirit and cheerleading participation is estimated from NFHS estimates for competitive spirit. Many high school and colleges have cheerleading programs that are not sponsored by either the NFHS or NCAA. Sport Market Analytics operated by SBnet (<http://www.sportsmarketanalytics.com>) estimates there were 612,680 cheerleaders ages 13-17 participating at least 50 times per year in 2018 compared to NFHS competitive spirit participation of 165,296 in 2018/19. This represents a 3 fold difference in participation estimates and results in higher high school level rates for cheerleading in this report. Cheerleading is not a sponsored sport for NCAA collegiate athletes; however, there is an estimated 144,160 cheerleaders age 18-24 participating at least 50 times per year in 2018. Accurate denominators for competitive cheerleading at the high school and college level are needed. Previous research indicates that fliers comprise the 70% of catastrophic injuries at the high school and collegiate level (Yau et al. 2018). Rule changes in basket toss in 2006/07 resulted in 4-fold reduction in basket toss injuries. Continued surveillance is important for ensuring the continued safety of cheerleading.

## REFERENCES

- Casa, D., & Csillan, D. (2009). Preseason heat-acclimatization guidelines for secondary school athletics. *Journal of Athletic Training*, 44(3), 332-333. doi: 10.4085/1062-6050-44.3.332
- Casa, D. J., J. K. DeMartini, M. F. Bergeron, D. Csillan, E. R. Eichner, R. M. Lopez, M. S. Ferrara, K. C. Miller, F. G. O'Connor, M. N. Sawka and S. W. Yeargin (2015). "National Athletic Trainers' Association position statement: Exertional heat illness." *Journal of Athletic Training* 50(9): 986-1000.
- Casa, D., Guskiewicz, K., Anderson, S., Courson, R., Heck, J., Jimenez, C., et al. (2012). National athletic trainers' association position statement: preventing sudden death in sports. *Journal of Athletic Training* 47(1), 96-118.
- Courson R, Ellis J, Herring SA, et al (2020). "Best Practices and Current Care Concepts in Prehospital Care of the Spine-Injured Athlete in American Tackle Football March 2-3, 2019; Atlanta, GA." *Journal of Athletic Training* 55(6): 545-562. doi:10.4085/1062-6050-430-19

Drezner, J. A., Courson, R. W., Roberts, W. O., Mosesso, V. N., Link, M. S., & Maron, B. J. (2007). Inter-Association Task Force Recommendations on Emergency Preparedness and Management of Sudden Cardiac Arrest in High School and College Athletic Programs: A Consensus Statement. *Journal of Athletic Training*, 42(1), 143–158.

Insurance Information Institute. (n.d.). Facts + Statistics" Lightning. Retrieved October 21, 2019, from <https://www.iii.org/fact-statistic/facts-statistics-lightning>

McCrory, P., W. Meeuwisse, J. Dvořák, M. Aubry, J. Bailes, S. Broglio, et al. (2017). "Consensus statement on concussion in sport—the 5<sup>th</sup> international conference on concussion in sport held in Berlin, October 2016." *British Journal of Sports Medicine* 51(11): 838-847.

Thomson, E. M., & Howard, T. M. (2013). Lightning injuries in sports and recreation. *Current Sports Medicine Reports*, 12(2), 120–124. <https://doi.org/10.1249/JSR.0b013e318287728f>

Yau, R. K., Dennis, S. G., Boden, B. P., Cantu, R. C., Lord, J. A., & Kucera, K. L. (2019). Catastrophic High School and Collegiate Cheerleading Injuries in the United States: An Examination of the 2006-2007 Basket Toss Rule Change. *Sports health*, 11(1), 32–39. DOI: 10.1177/1941738118807122.

## CASE SUMMARIES AY2019/20

*\*Case Summaries have been redacted from publicly available reports. Please email NCCSIR at [nccsir@unc.edu](mailto:nccsir@unc.edu) to request case summaries.*

## **TABLES AND FIGURES**

**Table 1: Number of All catastrophic traumatic injuries (direct) and exertional/medical conditions (indirect) by year: All sports combined, all levels (high school and college)**

	Collegiate/		High School		All	
	N	%	N	%	N	%
1982-1983	11	18.0%	50	82.0%	61	100.0%
1983-1984	13	21.0%	49	79.0%	62	100.0%
1984-1985	9	17.6%	42	82.4%	51	100.0%
1985-1986	16	27.6%	42	72.4%	58	100.0%
1986-1987	18	25.7%	52	74.3%	70	100.0%
1987-1988	15	17.9%	69	82.1%	84	100.0%
1988-1989	17	23.0%	57	77.0%	74	100.0%
1989-1990	11	14.5%	65	85.5%	76	100.0%
1990-1991	15	24.2%	47	75.8%	62	100.0%
1991-1992	11	23.4%	36	76.6%	47	100.0%
1992-1993	9	15.0%	51	85.0%	60	100.0%
1993-1994	11	16.7%	55	83.3%	66	100.0%
1994-1995	12	23.1%	40	76.9%	52	100.0%
1995-1996	8	15.4%	44	84.6%	52	100.0%
1996-1997	9	13.6%	57	86.4%	66	100.0%
1997-1998	15	20.0%	60	80.0%	75	100.0%
1998-1999	10	12.8%	68	87.2%	78	100.0%
1999-2000	9	12.7%	62	87.3%	71	100.0%
2000-2001	19	26.8%	52	73.2%	71	100.0%
2001-2002	14	17.3%	67	82.7%	81	100.0%
2002-2003	16	25.8%	46	74.2%	62	100.0%
2003-2004	18	24.3%	56	75.7%	74	100.0%
2004-2005	10	14.7%	58	85.3%	68	100.0%
2005-2006	12	21.8%	43	78.2%	55	100.0%
2006-2007	14	18.2%	63	81.8%	77	100.0%
2007-2008	15	18.3%	67	81.7%	82	100.0%
2008-2009	19	17.1%	92	82.9%	111	100.0%
2009-2010	27	27.6%	71	72.4%	98	100.0%
2010-2011	17	21.8%	61	78.2%	78	100.0%
2011-2012	24	27.3%	64	72.7%	88	100.0%
2012-2013	16	32.0%	34	68.0%	50	100.0%
2013-2014	18	21.7%	65	78.3%	83	100.0%
2014-2015	17	20.5%	66	79.5%	83	100.0%
2015-2016	20	18.7%	87	81.3%	107	100.0%
2016-2017	33	37.1%	56	62.9%	89	100.0%
2017-2018	24	27.6%	63	72.4%	87	100.0%
2018-2019	18	22.0%	64	78.0%	82	100.0%
2019-2020	9	13.6%	57	86.4%	66	100.0%
<b>Total</b>	579	21.0%	2178	79.0%	2757	100.0%
<b>Total*</b>	614	21.3%	2264	78.7%	2878	100.0%

\*Includes Cheerleading, Drill Team, Rodeo

**Table 2: Number of Traumatic (direct) catastrophic injuries by year: All sports combined, all levels (high school and college)**

	Collegiate/		High School		All	
	N	%	N	%	N	%
1982-1983	5	12.5%	35	87.5%	40	100.0%
1983-1984	8	19.0%	34	81.0%	42	100.0%
1984-1985	9	22.5%	31	77.5%	40	100.0%
1985-1986	15	30.6%	34	69.4%	49	100.0%
1986-1987	14	26.9%	38	73.1%	52	100.0%
1987-1988	8	12.3%	57	87.7%	65	100.0%
1988-1989	13	23.2%	43	76.8%	56	100.0%
1989-1990	7	13.5%	45	86.5%	52	100.0%
1990-1991	11	28.2%	28	71.8%	39	100.0%
1991-1992	6	17.6%	28	82.4%	34	100.0%
1992-1993	7	17.9%	32	82.1%	39	100.0%
1993-1994	6	13.6%	38	86.4%	44	100.0%
1994-1995	9	23.7%	29	76.3%	38	100.0%
1995-1996	6	17.6%	28	82.4%	34	100.0%
1996-1997	7	14.0%	43	86.0%	50	100.0%
1997-1998	6	12.0%	44	88.0%	50	100.0%
1998-1999	10	18.2%	45	81.8%	55	100.0%
1999-2000	9	20.9%	34	79.1%	43	100.0%
2000-2001	14	31.8%	30	68.2%	44	100.0%
2001-2002	5	9.6%	47	90.4%	52	100.0%
2002-2003	10	26.3%	28	73.7%	38	100.0%
2003-2004	12	22.2%	42	77.8%	54	100.0%
2004-2005	6	18.2%	27	81.8%	33	100.0%
2005-2006	7	21.9%	25	78.1%	32	100.0%
2006-2007	8	16.3%	41	83.7%	49	100.0%
2007-2008	9	16.7%	45	83.3%	54	100.0%
2008-2009	10	12.5%	70	87.5%	80	100.0%
2009-2010	16	27.1%	43	72.9%	59	100.0%
2010-2011	11	21.6%	40	78.4%	51	100.0%
2011-2012	9	16.4%	46	83.6%	55	100.0%
2012-2013	8	36.4%	14	63.6%	22	100.0%
2013-2014	3	8.6%	32	91.4%	35	100.0%
2014-2015	6	20.0%	24	80.0%	30	100.0%
2015-2016	15	23.4%	49	76.6%	64	100.0%
2016-2017	7	22.6%	24	77.4%	31	100.0%
2017-2018	9	22.5%	31	77.5%	40	100.0%
2018-2019	5	12.8%	34	87.2%	39	100.0%
2019-2020	3	9.4%	29	90.6%	32	100.0%
<b>Total</b>	319	19.1%	1350	80.9%	1669	100.0%
<b>Total*</b>	364	19.9%	1461	80.1%	1825	100.0%

\*Includes Cheerleading, Drill Team, Rodeo

**Table 3: Number of Exertional/medical (indirect) catastrophic conditions by year: All sports combined, all levels (high school and college)**

	Collegiate/		High School		All	
	N	%	N	%	N	%
1982-1983	6	28.6%	15	71.4%	21	100.0%
1983-1984	5	25.0%	15	75.0%	20	100.0%
1984-1985	0	0	11	100.0%	11	100.0%
1985-1986	1	11.1%	8	88.9%	9	100.0%
1986-1987	4	22.2%	14	77.8%	18	100.0%
1987-1988	7	36.8%	12	63.2%	19	100.0%
1988-1989	4	22.2%	14	77.8%	18	100.0%
1989-1990	4	16.7%	20	83.3%	24	100.0%
1990-1991	4	17.4%	19	82.6%	23	100.0%
1991-1992	5	38.5%	8	61.5%	13	100.0%
1992-1993	2	9.5%	19	90.5%	21	100.0%
1993-1994	5	22.7%	17	77.3%	22	100.0%
1994-1995	3	21.4%	11	78.6%	14	100.0%
1995-1996	2	11.1%	16	88.9%	18	100.0%
1996-1997	2	12.5%	14	87.5%	16	100.0%
1997-1998	9	36.0%	16	64.0%	25	100.0%
1998-1999	0	0	23	100.0%	23	100.0%
1999-2000	0	0	28	100.0%	28	100.0%
2000-2001	5	18.5%	22	81.5%	27	100.0%
2001-2002	9	31.0%	20	69.0%	29	100.0%
2002-2003	6	25.0%	18	75.0%	24	100.0%
2003-2004	6	30.0%	14	70.0%	20	100.0%
2004-2005	4	11.4%	31	88.6%	35	100.0%
2005-2006	5	21.7%	18	78.3%	23	100.0%
2006-2007	6	21.4%	22	78.6%	28	100.0%
2007-2008	6	21.4%	22	78.6%	28	100.0%
2008-2009	9	29.0%	22	71.0%	31	100.0%
2009-2010	11	28.2%	28	71.8%	39	100.0%
2010-2011	6	22.2%	21	77.8%	27	100.0%
2011-2012	15	45.5%	18	54.5%	33	100.0%
2012-2013	8	28.6%	20	71.4%	28	100.0%
2013-2014	15	31.3%	33	68.8%	48	100.0%
2014-2015	11	20.8%	42	79.2%	53	100.0%
2015-2016	5	11.6%	38	88.4%	43	100.0%
2016-2017	26	44.8%	32	55.2%	58	100.0%
2017-2018	15	31.9%	32	68.1%	47	100.0%
2018-2019	13	30.2%	30	69.8%	43	100.0%
2019-2020	6	17.6%	28	82.4%	34	100.0%
<b>Total</b>	250	24.0%	791	76.0%	1041	100.0%
<b>Total*</b>	250	23.7%	803	76.3%	1053	100.0%

\*Includes Cheerleading, Drill Team, Rodeo

**Table 4a: Number of Traumatic (direct) catastrophic injuries by severity by sport: High school all years combined 1982/83 to 2019/20**

		Serious		Non-fatal		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%	N	%
<b>Baseball</b>	<b>Male</b>	30	44.1%	21	30.9%	15	22.1%	2	2.9%	68	100.0%
<b>Basketball</b>	<b>Female</b>	3	50.0%	3	50.0%	0	0	0	0	6	100.0%
	<b>Male</b>	11	64.7%	4	23.5%	1	5.9%	1	5.9%	17	100.0%
<b>Cheerleading</b>	<b>Female</b>	42	58.3%	23	31.9%	1	1.4%	6	8.3%	72	100.0%
	<b>Male</b>	1	50.0%	1	50.0%	0	0	0	0	2	100.0%
<b>Cross Country</b>	<b>Female</b>	0	0	0	0	2	100.0%	0	0	2	100.0%
	<b>Male</b>	0	0	2	66.7%	1	33.3%	0	0	3	100.0%
<b>Field Hockey</b>	<b>Female</b>	0	0	1	33.3%	0	0	2	66.7%	3	100.0%
<b>Football</b>	<b>Male</b>	430	42.1%	421	41.2%	142	13.9%	29	2.8%	1022	100.0%
<b>Golf</b>	<b>Male</b>	1	100.0%	0	0	0	0	0	0	1	100.0%
<b>Gymnastics</b>	<b>Female</b>	4	36.4%	7	63.6%	0	0	0	0	11	100.0%
	<b>Male</b>	1	25.0%	2	50.0%	1	25.0%	0	0	4	100.0%
<b>Ice Hockey</b>	<b>Female</b>	2	66.7%	1	33.3%	0	0	0	0	3	100.0%
	<b>Male</b>	12	38.7%	14	45.2%	4	12.9%	1	3.2%	31	100.0%
<b>Lacrosse</b>	<b>Female</b>	2	66.7%	0	0	0	0	1	33.3%	3	100.0%
	<b>Male</b>	11	50.0%	7	31.8%	2	9.1%	2	9.1%	22	100.0%
<b>Skiing</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Soccer</b>	<b>Female</b>	6	66.7%	1	11.1%	2	22.2%	0	0	9	100.0%
	<b>Male</b>	7	41.2%	2	11.8%	7	41.2%	1	5.9%	17	100.0%
<b>Softball</b>	<b>Female</b>	6	85.7%	1	14.3%	0	0	0	0	7	100.0%
<b>Swimming</b>	<b>Female</b>	1	16.7%	5	83.3%	0	0	0	0	6	100.0%
	<b>Male</b>	3	30.0%	6	60.0%	1	10.0%	0	0	10	100.0%
<b>Track and Field</b>	<b>Female</b>	7	58.3%	2	16.7%	3	25.0%	0	0	12	100.0%
	<b>Male</b>	17	27.9%	17	27.9%	23	37.7%	4	6.6%	61	100.0%
<b>Volleyball</b>	<b>Male</b>	0	0	1	100.0%	0	0	0	0	1	100.0%
<b>Wrestling</b>	<b>Male</b>	24	35.8%	39	58.2%	3	4.5%	1	1.5%	67	100.0%



**Table 4b: Number of Exertional/medical (indirect) catastrophic conditions by severity by sport: High school all years combined 1982/83 to 2019/20**

		Serious		Non-fatal		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%	N	%
<b>Baseball</b>	<b>Male</b>	7	25.9%	0	0	20	74.1%	0	0	27	100.0%
<b>Basketball</b>	<b>Female</b>	2	10.0%	0	0	18	90.0%	0	0	20	100.0%
	<b>Male</b>	37	21.0%	0	0	138	78.4%	1	0.6%	176	100.0%
<b>Cheerleading</b>	<b>Female</b>	4	33.3%	0	0	8	66.7%	0	0	12	100.0%
<b>Cross Country</b>	<b>Female</b>	4	26.7%	0	0	11	73.3%	0	0	15	100.0%
	<b>Male</b>	5	19.2%	0	0	21	80.8%	0	0	26	100.0%
	<b>Unknown</b>	0	0	0	0	0	0	1	100.0%	1	100.0%
<b>Dance</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Field Hockey</b>	<b>Female</b>	0	0	0	0	2	100.0%	0	0	2	100.0%
<b>Football</b>	<b>Male</b>	54	17.4%	3	1.0%	251	81.0%	2	0.6%	310	100.0%
<b>Ice Hockey</b>	<b>Male</b>	3	37.5%	0	0	5	62.5%	0	0	8	100.0%
<b>Lacrosse</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
	<b>Male</b>	2	16.7%	0	0	10	83.3%	0	0	12	100.0%
<b>Other</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Rowing</b>	<b>Male</b>	1	100.0%	0	0	0	0	0	0	1	100.0%
<b>Running/Jogging</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
	<b>Male</b>	1	100.0%	0	0	0	0	0	0	1	100.0%
<b>Soccer</b>	<b>Female</b>	3	21.4%	0	0	11	78.6%	0	0	14	100.0%
	<b>Male</b>	8	19.0%	1	2.4%	31	73.8%	2	4.8%	42	100.0%
<b>Softball</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Swimming</b>	<b>Female</b>	2	16.7%	0	0	9	75.0%	1	8.3%	12	100.0%
	<b>Male</b>	1	12.5%	0	0	7	87.5%	0	0	8	100.0%
<b>Tennis</b>	<b>Female</b>	0	0	0	0	2	100.0%	0	0	2	100.0%
	<b>Male</b>	0	0	0	0	4	100.0%	0	0	4	100.0%
<b>Track and Field</b>	<b>Female</b>	0	0	1	12.5%	7	87.5%	0	0	8	100.0%
	<b>Male</b>	9	19.1%	0	0	38	80.9%	0	0	47	100.0%
<b>Volleyball</b>	<b>Female</b>	3	60.0%	0	0	2	40.0%	0	0	5	100.0%
<b>Water Polo</b>	<b>Female</b>	1	50.0%	0	0	1	50.0%	0	0	2	100.0%
	<b>Male</b>	0	0	0	0	3	100.0%	0	0	3	100.0%
<b>Wrestling</b>	<b>Male</b>	8	20.0%	0	0	31	77.5%	1	2.5%	40	100.0%

**Table 5a: Number of Traumatic (direct) catastrophic injuries by severity by sport: College all years combined 1982/83 to 2019/20**

		Serious		Non-fatal		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%	N	%
<b>Baseball</b>	<b>Male</b>	9	45.0%	7	35.0%	3	15.0%	1	5.0%	20	100.0%
<b>Basketball</b>	<b>Male</b>	9	81.8%	1	9.1%	1	9.1%	0	0	11	100.0%
<b>Cheerleading</b>	<b>Female</b>	13	46.4%	13	46.4%	1	3.6%	1	3.6%	28	100.0%
	<b>Male</b>	3	60.0%	2	40.0%	0	0	0	0	5	100.0%
<b>Equestrian</b>	<b>Female</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Field Hockey</b>	<b>Female</b>	2	66.7%	0	0	0	0	1	33.3%	3	100.0%
<b>Football</b>	<b>Male</b>	151	68.6%	52	23.6%	17	7.7%	0	0	220	100.0%
<b>Gymnastics</b>	<b>Female</b>	0	0	2	66.7%	1	33.3%	0	0	3	100.0%
	<b>Male</b>	2	66.7%	1	33.3%	0	0	0	0	3	100.0%
	<b>Unknown</b>	0	0	1	100.0%	0	0	0	0	1	100.0%
<b>Ice Hockey</b>	<b>Female</b>	1	100.0%	0	0	0	0	0	0	1	100.0%
	<b>Male</b>	7	58.3%	5	41.7%	0	0	0	0	12	100.0%
<b>Lacrosse</b>	<b>Female</b>	0	0	2	100.0%	0	0	0	0	2	100.0%
	<b>Male</b>	3	37.5%	1	12.5%	4	50.0%	0	0	8	100.0%
<b>Rodeo</b>	<b>Male</b>	0	0	0	0	2	100.0%	0	0	2	100.0%
<b>Rowing</b>	<b>Male</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Rugby</b>	<b>Male</b>	1	25.0%	3	75.0%	0	0	0	0	4	100.0%
<b>Skiing</b>	<b>Female</b>	0	0	1	50.0%	1	50.0%	0	0	2	100.0%
	<b>Male</b>	0	0	0	0	1	100.0%	0	0	1	100.0%
<b>Soccer</b>	<b>Female</b>	2	40.0%	2	40.0%	0	0	1	20.0%	5	100.0%
	<b>Male</b>	2	66.7%	1	33.3%	0	0	0	0	3	100.0%
<b>Softball</b>	<b>Female</b>	3	75.0%	0	0	0	0	1	25.0%	4	100.0%
<b>Swimming</b>	<b>Male</b>	0	0	1	100.0%	0	0	0	0	1	100.0%
<b>Track and Field</b>	<b>Female</b>	1	50.0%	1	50.0%	0	0	0	0	2	100.0%
	<b>Male</b>	6	33.3%	6	33.3%	6	33.3%	0	0	18	100.0%
<b>Wrestling</b>	<b>Male</b>	1	33.3%	2	66.7%	0	0	0	0	3	100.0%

**Table 5b: Number of Exertional/medical (indirect) catastrophic conditions by severity by sport: College all years combined 1982/83 to 2019/20**

		Serious		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%
<b>Baseball</b>	<b>Male</b>	2	20.0%	7	70.0%	1	10.0%	10	100.0%
<b>Basketball</b>	<b>Female</b>	3	37.5%	5	62.5%	0	0	8	100.0%
	<b>Male</b>	18	31.0%	40	69.0%	0	0	58	100.0%
<b>Cross Country</b>	<b>Female</b>	0	0	1	100.0%	0	0	1	100.0%
	<b>Male</b>	2	50.0%	2	50.0%	0	0	4	100.0%
<b>Field Hockey</b>		1	100.0%	0	0	0	0	1	100.0%
<b>Football</b>	<b>Male</b>	21	22.6%	71	76.3%	1	1.1%	93	100.0%
<b>Gymnastics</b>	<b>Female</b>	0	0	1	100.0%	0	0	1	100.0%
<b>Ice Hockey</b>	<b>Male</b>	3	75.0%	1	25.0%	0	0	4	100.0%
<b>Lacrosse</b>	<b>Female</b>	6	100.0%	0	0	0	0	6	100.0%
	<b>Male</b>	0	0	2	100.0%	0	0	2	100.0%
<b>Other</b>	<b>Male</b>	0	0	2	100.0%	0	0	2	100.0%
<b>Rowing</b>	<b>Male</b>	0	0	1	100.0%	0	0	1	100.0%
<b>Skiing</b>	<b>Male</b>	1	25.0%	3	75.0%	0	0	4	100.0%
<b>Soccer</b>	<b>Female</b>	3	33.3%	6	66.7%	0	0	9	100.0%
	<b>Male</b>	1	25.0%	3	75.0%	0	0	4	100.0%
<b>Swimming</b>	<b>Female</b>	1	11.1%	8	88.9%	0	0	9	100.0%
	<b>Male</b>	0	0	1	100.0%	0	0	1	100.0%
<b>Tennis</b>	<b>Female</b>	0	0	1	100.0%	0	0	1	100.0%
	<b>Male</b>	1	100.0%	0	0	0	0	1	100.0%
<b>Track and Field</b>	<b>Male</b>	4	66.7%	2	33.3%	0	0	6	100.0%
<b>Volleyball</b>	<b>Female</b>	10	83.3%	2	16.7%	0	0	12	100.0%
<b>Water Polo</b>	<b>Male</b>	0	0	2	100.0%	0	0	2	100.0%
<b>Wrestling</b>	<b>Male</b>	4	40.0%	6	60.0%	0	0	10	100.0%

**Table 6a: Number of catastrophic traumatic injuries (direct) and exertional/medical conditions (indirect) by Severity by year: High school**

	<b>Fatal</b>		<b>Non-fatal</b>		<b>Serious</b>	
	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>
<b>1982-1983</b>	25	0.49	10	0.20	15	0.30
<b>1983-1984</b>	23	0.46	15	0.30	11	0.22
<b>1984-1985</b>	17	0.34	13	0.26	12	0.24
<b>1985-1986</b>	10	0.20	15	0.29	16	0.31
<b>1986-1987</b>	26	0.51	12	0.23	12	0.23
<b>1987-1988</b>	17	0.33	25	0.48	27	0.52
<b>1988-1989</b>	21	0.40	19	0.37	17	0.33
<b>1989-1990</b>	24	0.46	26	0.50	15	0.29
<b>1990-1991</b>	23	0.44	15	0.29	9	0.17
<b>1991-1992</b>	12	0.23	9	0.17	15	0.28
<b>1992-1993</b>	23	0.43	14	0.26	14	0.26
<b>1993-1994</b>	22	0.40	15	0.27	16	0.29
<b>1994-1995</b>	13	0.23	14	0.25	13	0.23
<b>1995-1996</b>	19	0.32	13	0.22	9	0.15
<b>1996-1997</b>	24	0.40	16	0.26	14	0.23
<b>1997-1998</b>	24	0.38	23	0.37	12	0.19
<b>1998-1999</b>	31	0.48	13	0.20	23	0.36
<b>1999-2000</b>	33	0.51	16	0.25	12	0.19
<b>2000-2001</b>	26	0.39	15	0.23	11	0.17
<b>2001-2002</b>	28	0.43	19	0.29	17	0.26
<b>2002-2003</b>	21	0.31	11	0.16	13	0.19
<b>2003-2004</b>	17	0.25	23	0.34	15	0.22
<b>2004-2005</b>	34	0.50	15	0.22	7	0.10
<b>2005-2006</b>	20	0.29	12	0.17	11	0.16
<b>2006-2007</b>	21	0.29	23	0.32	19	0.27
<b>2007-2008</b>	23	0.32	15	0.21	29	0.40
<b>2008-2009</b>	28	0.38	31	0.42	33	0.45
<b>2009-2010</b>	24	0.32	21	0.28	26	0.35
<b>2010-2011</b>	24	0.32	16	0.22	21	0.28
<b>2011-2012</b>	22	0.30	24	0.32	18	0.24
<b>2012-2013</b>	21	0.28	6	0.08	6	0.08
<b>2013-2014</b>	25	0.34	9	0.12	27	0.37
<b>2014-2015</b>	23	0.31	7	0.09	34	0.45
<b>2015-2016</b>	28	0.37	10	0.13	45	0.59
<b>2016-2017</b>	16	0.21	5	0.07	32	0.42
<b>2017-2018</b>	14	0.18	8	0.10	37	0.48
<b>2018-2019</b>	16	0.21	6	0.08	38	0.50
<b>2019-2020</b>	17	0.22	3	0.04	28	0.37

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 6b: Number of catastrophic traumatic injuries (direct) and exertional/medical conditions (indirect) by Severity by year: College**

	<b>Fatal</b>		<b>Non-fatal</b>		<b>Serious</b>	
	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>
<b>1982-1983</b>	7	2.73	3	1.17	1	0.39
<b>1983-1984</b>	5	1.85	2	0.74	6	2.22
<b>1984-1985</b>	1	0.35	3	1.04	5	1.73
<b>1985-1986</b>	4	1.38	4	1.38	8	2.75
<b>1986-1987</b>	5	1.80	2	0.72	11	3.96
<b>1987-1988</b>	7	2.64	1	0.38	7	2.64
<b>1988-1989</b>	4	1.49	4	1.49	9	3.34
<b>1989-1990</b>	4	1.51	2	0.76	4	1.51
<b>1990-1991</b>	5	1.82	6	2.18	4	1.45
<b>1991-1992</b>	5	1.78	1	0.36	5	1.78
<b>1992-1993</b>	3	1.05	0	0	6	2.11
<b>1993-1994</b>	7	2.39	0	0	4	1.37
<b>1994-1995</b>	3	1.01	3	1.01	6	2.02
<b>1995-1996</b>	2	0.60	4	1.19	2	0.60
<b>1996-1997</b>	3	0.91	5	1.51	1	0.30
<b>1997-1998</b>	9	2.68	1	0.30	5	1.49
<b>1998-1999</b>	2	0.56	3	0.84	5	1.40
<b>1999-2000</b>	2	0.56	2	0.56	5	1.40
<b>2000-2001</b>	7	1.89	4	1.08	8	2.16
<b>2001-2002</b>	10	2.74	1	0.27	3	0.82
<b>2002-2003</b>	6	1.60	3	0.80	7	1.87
<b>2003-2004</b>	9	2.39	4	1.06	5	1.33
<b>2004-2005</b>	4	1.04	2	0.52	4	1.04
<b>2005-2006</b>	5	1.27	4	1.01	2	0.51
<b>2006-2007</b>	6	1.48	1	0.25	7	1.73
<b>2007-2008</b>	5	1.21	1	0.24	9	2.17
<b>2008-2009</b>	5	1.18	1	0.24	13	3.07
<b>2009-2010</b>	13	3.01	2	0.46	12	2.78
<b>2010-2011</b>	4	0.90	9	2.02	3	0.67
<b>2011-2012</b>	10	2.20	0	0	14	3.08
<b>2012-2013</b>	7	1.51	3	0.65	5	1.08
<b>2013-2014</b>	6	1.26	0	0	12	2.53
<b>2014-2015</b>	4	0.83	1	0.21	12	2.48
<b>2015-2016</b>	3	0.62	3	0.62	13	2.67
<b>2016-2017</b>	5	1.02	2	0.41	26	5.28
<b>2017-2018</b>	5	1.01	1	0.20	18	3.64
<b>2018-2019</b>	9	1.80	1	0.20	7	1.40
<b>2019-2020</b>	2	0.40	0	0	7	1.39

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 7a: Rate of traumatic (direct) catastrophic injuries by severity by year: High school**

	<b>Fatal</b>		<b>Non-fatal</b>		<b>Serious</b>	
	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>
<b>1982-1983</b>	10	0.20	10	0.20	15	0.30
<b>1983-1984</b>	8	0.16	15	0.30	11	0.22
<b>1984-1985</b>	6	0.12	13	0.26	12	0.24
<b>1985-1986</b>	3	0.06	15	0.29	16	0.31
<b>1986-1987</b>	13	0.25	12	0.23	11	0.21
<b>1987-1988</b>	5	0.10	25	0.48	27	0.52
<b>1988-1989</b>	8	0.15	19	0.37	16	0.31
<b>1989-1990</b>	5	0.10	26	0.50	14	0.27
<b>1990-1991</b>	4	0.08	15	0.29	9	0.17
<b>1991-1992</b>	4	0.08	9	0.17	15	0.28
<b>1992-1993</b>	4	0.08	14	0.26	14	0.26
<b>1993-1994</b>	5	0.09	15	0.27	16	0.29
<b>1994-1995</b>	2	0.04	14	0.25	13	0.23
<b>1995-1996</b>	4	0.07	13	0.22	9	0.15
<b>1996-1997</b>	10	0.16	16	0.26	14	0.23
<b>1997-1998</b>	8	0.13	23	0.37	12	0.19
<b>1998-1999</b>	8	0.13	13	0.20	23	0.36
<b>1999-2000</b>	7	0.11	16	0.25	10	0.16
<b>2000-2001</b>	4	0.06	15	0.23	11	0.17
<b>2001-2002</b>	9	0.14	19	0.29	17	0.26
<b>2002-2003</b>	3	0.04	11	0.16	13	0.19
<b>2003-2004</b>	3	0.04	23	0.34	15	0.22
<b>2004-2005</b>	5	0.07	15	0.22	6	0.09
<b>2005-2006</b>	4	0.06	12	0.17	9	0.13
<b>2006-2007</b>	2	0.03	22	0.31	17	0.24
<b>2007-2008</b>	2	0.03	15	0.21	28	0.39
<b>2008-2009</b>	10	0.14	31	0.42	29	0.40
<b>2009-2010</b>	2	0.03	20	0.27	21	0.28
<b>2010-2011</b>	6	0.08	16	0.22	18	0.24
<b>2011-2012</b>	4	0.05	24	0.32	18	0.24
<b>2012-2013</b>	4	0.05	5	0.07	4	0.05
<b>2013-2014</b>	8	0.11	9	0.12	13	0.18
<b>2014-2015</b>	6	0.08	6	0.08	10	0.13
<b>2015-2016</b>	8	0.11	10	0.13	28	0.37
<b>2016-2017</b>	2	0.03	5	0.07	15	0.20
<b>2017-2018</b>	3	0.04	8	0.10	16	0.21
<b>2018-2019</b>	3	0.04	6	0.08	21	0.27
<b>2019-2020</b>	6	0.08	2	0.03	12	0.16

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 7b: Rate of traumatic (direct) catastrophic injuries by severity by year: College**

	<b>Fatal</b>		<b>Non-fatal</b>		<b>Serious</b>	
	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>
<b>1982-1983</b>	1	0.39	3	1.17	1	0.39
<b>1983-1984</b>	0	0	2	0.74	6	2.22
<b>1984-1985</b>	1	0.35	3	1.04	5	1.73
<b>1985-1986</b>	3	1.03	4	1.38	8	2.75
<b>1986-1987</b>	1	0.36	2	0.72	11	3.96
<b>1987-1988</b>	0	0	1	0.38	7	2.64
<b>1988-1989</b>	0	0	4	1.49	9	3.34
<b>1989-1990</b>	1	0.38	2	0.76	4	1.51
<b>1990-1991</b>	1	0.36	6	2.18	4	1.45
<b>1991-1992</b>	1	0.36	1	0.36	4	1.43
<b>1992-1993</b>	1	0.35	0	0	6	2.11
<b>1993-1994</b>	2	0.68	0	0	4	1.37
<b>1994-1995</b>	0	0	3	1.01	6	2.02
<b>1995-1996</b>	0	0	4	1.19	2	0.60
<b>1996-1997</b>	1	0.30	5	1.51	1	0.30
<b>1997-1998</b>	1	0.30	1	0.30	4	1.19
<b>1998-1999</b>	2	0.56	3	0.84	5	1.40
<b>1999-2000</b>	2	0.56	2	0.56	5	1.40
<b>2000-2001</b>	2	0.54	4	1.08	8	2.16
<b>2001-2002</b>	1	0.27	1	0.27	3	0.82
<b>2002-2003</b>	1	0.27	3	0.80	6	1.60
<b>2003-2004</b>	3	0.80	4	1.06	5	1.33
<b>2004-2005</b>	1	0.26	2	0.52	3	0.78
<b>2005-2006</b>	0	0	4	1.01	2	0.51
<b>2006-2007</b>	0	0	1	0.25	7	1.73
<b>2007-2008</b>	0	0	1	0.24	8	1.93
<b>2008-2009</b>	0	0	1	0.24	9	2.13
<b>2009-2010</b>	4	0.93	2	0.46	10	2.32
<b>2010-2011</b>	0	0	9	2.02	2	0.45
<b>2011-2012</b>	2	0.44	0	0	7	1.54
<b>2012-2013</b>	0	0	3	0.65	4	0.86
<b>2013-2014</b>	1	0.21	0	0	2	0.42
<b>2014-2015</b>	0	0	1	0.21	5	1.03
<b>2015-2016</b>	0	0	3	0.62	11	2.26
<b>2016-2017</b>	0	0	2	0.41	5	1.02
<b>2017-2018</b>	2	0.40	1	0.20	6	1.21
<b>2018-2019</b>	0	0	1	0.20	3	0.60
<b>2019-2020</b>	1	0.20	0	0	2	0.40

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 8a: Rate of exertional/medical (indirect) catastrophic conditions by severity by year:  
High School**

	<b>Fatal</b>		<b>Non-fatal</b>		<b>Serious</b>	
	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>
<b>1982-1983</b>	15	0.30	0	0	0	0
<b>1983-1984</b>	15	0.30	0	0	0	0
<b>1984-1985</b>	11	0.22	0	0	0	0
<b>1985-1986</b>	7	0.14	0	0	0	0
<b>1986-1987</b>	13	0.25	0	0	1	0.02
<b>1987-1988</b>	12	0.23	0	0	0	0
<b>1988-1989</b>	13	0.25	0	0	1	0.02
<b>1989-1990</b>	19	0.37	0	0	1	0.02
<b>1990-1991</b>	19	0.36	0	0	0	0
<b>1991-1992</b>	8	0.15	0	0	0	0
<b>1992-1993</b>	19	0.36	0	0	0	0
<b>1993-1994</b>	17	0.31	0	0	0	0
<b>1994-1995</b>	11	0.19	0	0	0	0
<b>1995-1996</b>	15	0.25	0	0	0	0
<b>1996-1997</b>	14	0.23	0	0	0	0
<b>1997-1998</b>	16	0.26	0	0	0	0
<b>1998-1999</b>	23	0.36	0	0	0	0
<b>1999-2000</b>	26	0.40	0	0	2	0.03
<b>2000-2001</b>	22	0.33	0	0	0	0
<b>2001-2002</b>	19	0.29	0	0	0	0
<b>2002-2003</b>	18	0.27	0	0	0	0
<b>2003-2004</b>	14	0.21	0	0	0	0
<b>2004-2005</b>	29	0.42	0	0	1	0.01
<b>2005-2006</b>	16	0.23	0	0	2	0.03
<b>2006-2007</b>	19	0.27	1	0.01	2	0.03
<b>2007-2008</b>	21	0.29	0	0	1	0.01
<b>2008-2009</b>	18	0.25	0	0	4	0.05
<b>2009-2010</b>	22	0.30	1	0.01	5	0.07
<b>2010-2011</b>	18	0.24	0	0	3	0.04
<b>2011-2012</b>	18	0.24	0	0	0	0
<b>2012-2013</b>	17	0.23	1	0.01	2	0.03
<b>2013-2014</b>	17	0.23	0	0	14	0.19
<b>2014-2015</b>	17	0.23	1	0.01	24	0.32
<b>2015-2016</b>	20	0.26	0	0	17	0.22
<b>2016-2017</b>	14	0.18	0	0	17	0.22
<b>2017-2018</b>	11	0.14	0	0	21	0.27
<b>2018-2019</b>	13	0.17	0	0	17	0.22
<b>2019-2020</b>	11	0.14	1	0.01	16	0.21

Note: Rates with number of incidents less than 5 should be interpreted with caution.



**Table 8b: Rate of exertional/medical (indirect) catastrophic conditions by severity by year:  
College**

	<b>Fatal</b>		<b>Serious</b>	
	<b>N</b>	<b>Rate per 100,000</b>	<b>N</b>	<b>Rate per 100,000</b>
<b>1982-1983</b>	6	2.34	0	0
<b>1983-1984</b>	5	1.85	0	0
<b>1985-1986</b>	1	0.34	0	0
<b>1986-1987</b>	4	1.44	0	0
<b>1987-1988</b>	7	2.64	0	0
<b>1988-1989</b>	4	1.49	0	0
<b>1989-1990</b>	3	1.14	0	0
<b>1990-1991</b>	4	1.45	0	0
<b>1991-1992</b>	4	1.43	1	0.36
<b>1992-1993</b>	2	0.70	0	0
<b>1993-1994</b>	5	1.71	0	0
<b>1994-1995</b>	3	1.01	0	0
<b>1995-1996</b>	2	0.60	0	0
<b>1996-1997</b>	2	0.60	0	0
<b>1997-1998</b>	8	2.38	1	0.30
<b>2000-2001</b>	5	1.35	0	0
<b>2001-2002</b>	9	2.47	0	0
<b>2002-2003</b>	5	1.34	1	0.27
<b>2003-2004</b>	6	1.59	0	0
<b>2004-2005</b>	3	0.78	1	0.26
<b>2005-2006</b>	5	1.27	0	0
<b>2006-2007</b>	6	1.48	0	0
<b>2007-2008</b>	5	1.21	1	0.24
<b>2008-2009</b>	5	1.18	4	0.95
<b>2009-2010</b>	9	2.08	2	0.46
<b>2010-2011</b>	4	0.90	1	0.22
<b>2011-2012</b>	8	1.76	7	1.54
<b>2012-2013</b>	7	1.51	1	0.22
<b>2013-2014</b>	5	1.05	10	2.11
<b>2014-2015</b>	4	0.83	7	1.45
<b>2015-2016</b>	3	0.62	2	0.41
<b>2016-2017</b>	5	1.02	21	4.27
<b>2017-2018</b>	3	0.61	12	2.42
<b>2018-2019</b>	9	1.80	4	0.80
<b>2019-2020</b>	1	0.20	5	0.99

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 9a: Rate of Traumatic (direct) catastrophic injuries by level and severity by sport:  
High school 1982/83 to 2019/20**

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
<b>Baseball</b>	<b>Male</b>	15	0.09	21	0.12	30	0.18
<b>Basketball</b>	<b>Female</b>	0	0	3	0.02	3	0.02
	<b>Male</b>	1	0.00	4	0.02	11	0.05
<b>Cheerleading</b>	<b>Female</b>	1	0.04	23	0.86	42	1.58
	<b>Male</b>	0	0	1	1.51	1	1.51
<b>Cross Country</b>	<b>Female</b>	2	0.03	0	0	0	0
	<b>Male</b>	1	0.01	2	0.03	0	0
<b>Field Hockey</b>	<b>Female</b>	0	0	1	0.05	0	0
<b>Football</b>	<b>Male</b>	142	0.37	421	1.10	430	1.13
<b>Golf</b>	<b>Male</b>	0	0	0	0	1	0.02
<b>Gymnastics</b>	<b>Female</b>	0	0	7	0.81	4	0.46
	<b>Male</b>	1	0.82	2	1.63	1	0.82
<b>Ice Hockey</b>	<b>Female</b>	0	0	1	0.55	2	1.09
	<b>Male</b>	4	0.35	14	1.22	12	1.04
<b>Lacrosse</b>	<b>Female</b>	0	0	0	0	2	0.13
	<b>Male</b>	2	0.09	7	0.33	11	0.52
<b>Skiing</b>	<b>Female</b>	1	0.32	0	0	0	0
<b>Soccer</b>	<b>Female</b>	2	0.02	1	0.01	6	0.06
	<b>Male</b>	7	0.06	2	0.02	7	0.06
<b>Softball</b>	<b>Female</b>	0	0	1	0.01	6	0.05
<b>Swimming</b>	<b>Female</b>	0	0	5	0.10	1	0.02
	<b>Male</b>	1	0.03	6	0.15	3	0.08
<b>Track and Field</b>	<b>Female</b>	3	0.02	2	0.01	7	0.04
	<b>Male</b>	23	0.11	17	0.08	17	0.08
<b>Volleyball</b>	<b>Male</b>	0	0	1	0.07	0	0
<b>Wrestling</b>	<b>Male</b>	3	0.03	39	0.42	24	0.26

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 9b: Rate of Traumatic (direct) catastrophic injuries by level and severity by sport:  
College 1982/83 to 2019/20**

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
Baseball	Male	3	0.29	7	0.68	9	0.88
Basketball	Male	1	0.17	1	0.17	9	1.51
Cheerleading*	Female	1	0	13	0	13	0
	Male	0	0	2	0	3	0
Equestrian	Female	1	3.50	0	0	0	0
Field Hockey	Female	0	0	0	0	2	0.97
Football	Male	17	0.75	52	2.31	151	6.71
Gymnastics	Female	1	1.76	2	3.51	0	0
	Male	0	0	1	5.18	2	10.37
Ice Hockey	Female	0	0	0	0	1	2.25
	Male	0	0	5	3.35	7	4.69
Lacrosse	Female	0	0	2	0.87	0	0
	Male	4	1.32	1	0.33	3	0.99
Rowing	Male	1	1.21	0	0	0	0
Rugby		0	0	3	1829.27	1	609.76
Skiing	Female	1	5.36	1	5.36	0	0
	Male	1	4.44	0	0	0	0
Soccer	Female	0	0	2	0.31	2	0.31
	Male	0	0	1	0.14	2	0.28
Softball	Female	0	0	0	0	3	0.54
Swimming	Male	0	0	1	0.32	0	0
Track and Field	Female	0	0	1	0.07	1	0.07
	Male	6	0.38	6	0.38	6	0.38
Wrestling	Male	0	0	2	0.77	1	0.38

Note: Rates with number of incidents less than 5 should be interpreted with caution.

\*Unable to compute, Number of collegiate cheerleaders unknown

**Table 10a: Exertional/medical (indirect) catastrophic conditions by level and severity: High school 1982/83 to 2019/20**

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
Baseball	Male	20	0.12	0	0	7	0.04
Basketball	Female	18	0.11	0	0	2	0.01
	Male	138	0.68	0	0	37	0.18
Cheerleading	Female	8	0.30	0	0	4	0.15
Cross Country	Female	11	0.18	0	0	4	0.07
	Male	21	0.29	0	0	5	0.07
Field Hockey	Female	2	0.09	0	0	0	0
Football	Male	251	0.66	3	0.01	54	0.14
Ice Hockey	Male	5	0.43	0	0	3	0.26
Lacrosse	Female	1	0.06	0	0	0	0
	Male	10	0.47	0	0	2	0.09
Rowing	Male	0	0	0	0	1	1.63
Soccer	Female	11	0.11	0	0	3	0.03
	Male	31	0.25	1	0.01	8	0.07
Softball	Female	1	0.01	0	0	0	0
Swimming	Female	9	0.18	0	0	2	0.04
	Male	7	0.18	0	0	1	0.03
Tennis	Female	2	0.03	0	0	0	0
	Male	4	0.07	0	0	0	0
Track and Field	Female	7	0.04	1	0.01	0	0
	Male	38	0.18	0	0	9	0.04
Volleyball	Female	2	0.01	0	0	3	0.02
Water Polo	Female	1	0.23	0	0	1	0.23
	Male	3	0.53	0	0	0	0
Wrestling	Male	31	0.33	0	0	8	0.09

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 10b: Exertional/medical (indirect) catastrophic conditions by level and severity:  
College 1982/83 to 2019/20**

		<b>N</b>	<b>Fatal Rate per 100,000</b>	<b>N</b>	<b>Serious Rate per 100,000</b>
<b>Baseball</b>	<b>Male</b>	7	0.68	2	0.20
<b>Basketball</b>	<b>Female</b>	5	0.95	3	0.57
	<b>Male</b>	40	6.73	18	3.03
<b>Cross Country</b>	<b>Female</b>	1	0.23	0	0
	<b>Male</b>	2	0.45	2	0.45
<b>Field Hockey</b>		0	0	1	0.48
<b>Football</b>	<b>Male</b>	71	3.15	21	0.93
<b>Gymnastics</b>	<b>Female</b>	1	1.76	0	0
<b>Ice Hockey</b>	<b>Male</b>	1	0.67	3	2.01
<b>Lacrosse</b>	<b>Female</b>	0	0	6	2.61
	<b>Male</b>	2	0.66	0	0
<b>Rowing</b>	<b>Male</b>	2	2.42	0	0
<b>Skiing</b>	<b>Male</b>	1	4.44	0	0
<b>Soccer</b>	<b>Female</b>	3	0.47	1	0.16
	<b>Male</b>	6	0.84	3	0.42
<b>Swimming</b>	<b>Female</b>	3	0.78	1	0.26
	<b>Male</b>	8	2.53	1	0.32
<b>Tennis</b>	<b>Female</b>	1	0.32	0	0
	<b>Male</b>	1	0.34	0	0
<b>Track and Field</b>	<b>Female</b>	0	0	1	0.07
	<b>Male</b>	2	0.13	4	0.26
<b>Volleyball</b>	<b>Female</b>	2	0.40	10	2.00
<b>Water Polo</b>	<b>Male</b>	2	5.31	0	0
<b>Wrestling</b>	<b>Male</b>	6	2.31	4	1.54

Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Table 11: Characteristics of all sport-related catastrophic traumatic injuries (direct) and exertional/medical conditions (indirect) during AY 2019-2020**

	Traumatic injury (Direct)		Exertional/Medical (Indirect)		All	
	N	%	N	%	N	%
<b>Total</b>	32	100.0%	34	100.0%	66	100.0%
<b>Sport Level</b>						
Collegiate/University	3	9.4%	6	17.6%	9	13.6%
High School Sponsored	29	90.6%	28	82.4%	57	86.4%
<b>College sponsorship</b>						
Not applicable	--	--	--	--	--	--
NCAA	0	0	2	33.3%	2	22.2%
Other	3	100%	4	66.7%	7	88.8%
<b>Severity</b>						
Serious	14	43.8%	21	61.8%	35	53.0%
Non-fatal	2	6.3%	1	2.9%	3	4.5%
Fatal	7	21.9%	12	35.3%	19	28.8%
Unknown	9	28.1%	0	0	9	13.6%
<b>Sex</b>						
Female	3	9.4%	5	14.7%	8	12.1%
Male	29	90.6%	29	85.3%	58	87.9%
<b>Month</b>						
Jul-Aug	8	25.0%	6	17.6%	14	21.2%
Sep-Oct	12	37.5%	8	23.5%	20	30.3%
Nov-Dec	5	15.6%	7	20.6%	12	18.2%
Jan-Feb	5	15.6%	7	20.6%	12	18.2%
Mar-Apr	2	6.3%	4	11.8%	6	9.1%
May-Jun	0	0	2	5.9%	2	3.0%
<b>Sport</b>						
Baseball	1	3.1%	1	2.9%	2	3.0%
Basketball	1	3.1%	8	23.5%	9	13.6%
Field Hockey	0	0	1	2.9%	1	1.5%
Football	23	71.9%	13	38.2%	36	54.5%
Gymnastics	1	3.1%	0	0	1	1.5%
Ice Hockey	1	3.1%	1	2.9%	2	3.0%
Soccer	0	0	1	2.9%	1	1.5%
Swimming	0	0	2	5.9%	2	3.0%
Track and Field	5	15.6%	1	2.9%	6	9.1%
Volleyball	0	0	2	5.9%	2	3.0%
Wrestling	0	0	4	11.8%	4	6.1%
<b>Sponsored activity</b>						
Official school or team related ATHLETIC activity	32	100.0%	29	85.3%	61	92.4%
Personal athletic activity	0	0	5	14.7%	5	7.6%
<b>Location</b>						
Athlete's Home	0	0	3	8.8%	3	4.5%

	Traumatic injury (Direct)		Exertional/Medical (Indirect)		All	
	N	%	N	%	N	%
Competitive Venue	24	75.0%	19	55.9%	43	65.2%
Other Private Property	1	3.1%	1	2.9%	2	3.0%
Public Park	4	12.5%	0	0	4	6.1%
School Athletic Facility	1	3.1%	10	29.4%	11	16.7%
School Campus (non-athletic facility)	2	6.3%	1	2.9%	3	4.5%
<b>Event Type</b>						
Competition/Game	22	68.8%	6	17.6%	28	42.4%
Conditioning Session	0	0	4	11.8%	4	6.1%
Other Team Activity	0	0	1	2.9%	1	1.5%
Practice	9	28.1%	19	55.9%	28	42.4%
Scrimmage	1	3.1%	0	0	1	1.5%
Strength/Weight Session	0	0	4	11.8%	4	6.1%
<b>Player action</b>						
Ball/puck handling	1	3.1%	0	0	1	1.5%
Being tackled	4	12.5%	0	0	4	6.1%
Blocking	3	9.4%	0	0	3	4.5%
Conditioning (land)	0	0	3	8.8%	3	4.5%
Conditioning (water)	0	0	2	5.9%	2	3.0%
Fielding	1	3.1%	0	0	1	1.5%
Fitness - Other	0	0	1	2.9%	1	1.5%
General play	1	3.1%	4	11.8%	5	7.6%
Other	6	18.8%	9	26.5%	15	22.7%
Passing	0	0	1	2.9%	1	1.5%
Rebounding	1	3.1%	0	0	1	1.5%
Receiving pass	2	6.3%	0	0	2	3.0%
Running	1	3.1%	6	17.6%	7	10.6%
Running (middle/long distance)	1	3.1%	1	2.9%	2	3.0%
Tackling	5	15.6%	0	0	5	7.6%
Unknown	6	18.8%	7	20.6%	13	19.7%
<b>Basic Mechanism</b>						
Contact with Another Player	16	50.0%	0	0	16	24.2%
Contact with Apparatus or Object	1	3.1%	0	0	1	1.5%
Contact with Ground/Surface	5	15.6%	0	0	5	7.6%
Environmental (e.g., lightning strike)	0	0	4	11.8%	4	6.1%
Infection or Illness	0	0	29	85.3%	29	43.9%
Other	5	15.6%	1	2.9%	6	9.1%
Unknown	5	15.6%	0	0	5	7.6%
<b>Major Injury Category</b>						
Head Injury	10	31.3%	0	0	10	15.2%
Heat-related injury	0	0	2	5.9%	2	3.0%

	Traumatic injury (Direct)		Exertional/Medical (Indirect)		All	
	N	%	N	%	N	%
Hit in the Chest	2	6.3%	0	0	2	3.0%
Other	0	0	2	5.9%	2	3.0%
Other Traumatic Injury	8	25.0%	0	0	8	12.1%
Spinal Cord Injury	12	37.5%	0	0	12	18.2%
Sudden Cardiac Arrest	0	0	30	88.2%	30	45.5%
<b>Detailed Injury Category</b>						
Cardiac/Sudden Cardiac Arrest (not Commotio Cordis)	1	3.1%	0	0	1	1.5%
Heat-Related Injury (e.g. Heatstroke)	0	0	2	5.9%	2	3.0%
Other	0	0	2	5.9%	2	3.0%
Pedestrian motor vehicle crash related to participation in athletics	5	15.6%	0	0	5	7.6%
Other Traumatic Injury (e.g. Ruptured Spleen)	5	15.6%	0	0	5	7.6%
Spinal Cord Injury with a Fracture	1	3.1%	0	0	1	1.5%
Spinal Cord Injury without Spine Fracture	8	25.0%	0	0	8	12.1%
Spine Fracture	4	12.5%	0	0	4	6.1%
Traumatic Brain Injury (e.g. subdural hematoma)	8	25.0%	0	0	8	12.1%
<b>Injury Outcome</b>						
Fatality/Sudden Death	7	21.9%	12	35.3%	19	28.8%
Non-trauma Survivor (e.g. sudden cardiac arrest, heat stroke, exertional sickling)	0	0	21	61.8%	21	31.8%
Trauma-related Non-Fatality - Disability unknown/uncertain	9	28.1%	0	0	9	13.6%
Trauma-related Non-Fatality with Permanent Disability	2	6.3%	1	2.9%	3	4.5%
Trauma-related Non-Fatality with Temporary Disability (full recovery expected or confirmed)	14	43.8%	0	0	14	21.2%



**Table 12. Participation numbers, 1982/83 to 2019/20**

	High School <sup>1</sup>		College <sup>2</sup>	
	Female	Male	Female	Male
<b>Baseball</b>	37,341	17,109,664	-	1,022,092
<b>Basketball</b>	16,170,283	20,316,794	524,899	594,525
<b>Cheerleading<sup>3</sup></b>	2,661,359	66,299	--	--
<b>Cross Country</b>	6,072,123	7,197,649	438,025	440,518
<b>Equestrian<sup>4</sup></b>	25,528	4,140	28,580	1,088
<b>Field Hockey</b>	2,168,469	5,644	207,173	--
<b>Football</b>	39,241	38,201,535	--	2,251,827
<b>Golf</b>	2,071,785	5,450,708	120,961	293,766
<b>Gymnastics</b>	862,320	122,400	56,917	19,291
<b>Ice Hockey</b>	182,992	1,151,529	44,501	149,266
<b>Lacrosse</b>	1,593,114	2,113,601	229,582	303,308
<b>Rowing<sup>4</sup></b>	69,137	61,199	187,476	82,504
<b>Skiing</b>	310,618	371,507	18,651	22,529
<b>Soccer</b>	9,701,973	12,294,856	642,934	718,257
<b>Softball</b>	12,663,708	59,195	555,739	--
<b>Swimming/Diving</b>	4,918,690	3,926,850	383,562	315,828
<b>Tennis</b>	5,988,491	5,528,798	310,290	295,489
<b>Track and Field<sup>5</sup></b>	17,292,836	21,204,692	1,376,298	1,561,777
<b>Volleyball<sup>6</sup></b>	13,997,727	1,369,403	499,856	47,230
<b>Water Polo</b>	426,109	570,014	26,226	37,679
<b>Wrestling</b>	191,213	9,344,188	98	260,178

<sup>1</sup>NFHS available online: <https://www.nfhs.org/ParticipationStatistics/ParticipationStatistics/>

<sup>2</sup>NCAA accessed online: [https://ncaaorg.s3.amazonaws.com/research/sportpart/2019-20RES\\_SportsSponsorshipParticipationRatesReport.pdf](https://ncaaorg.s3.amazonaws.com/research/sportpart/2019-20RES_SportsSponsorshipParticipationRatesReport.pdf)

<sup>3</sup>Cheerleading is not a sponsored sport for NCAA collegiate athletes. High school cheerleading participation is estimated from NFHS competitive spirit participation. Many schools have cheerleading programs that are not sponsored by NFHS. Therefore, high school cheerleading participation is an underestimate.

<sup>4</sup>Equestrian (male and female) and rowing (males) are non-championship NCAA collegiate sports.

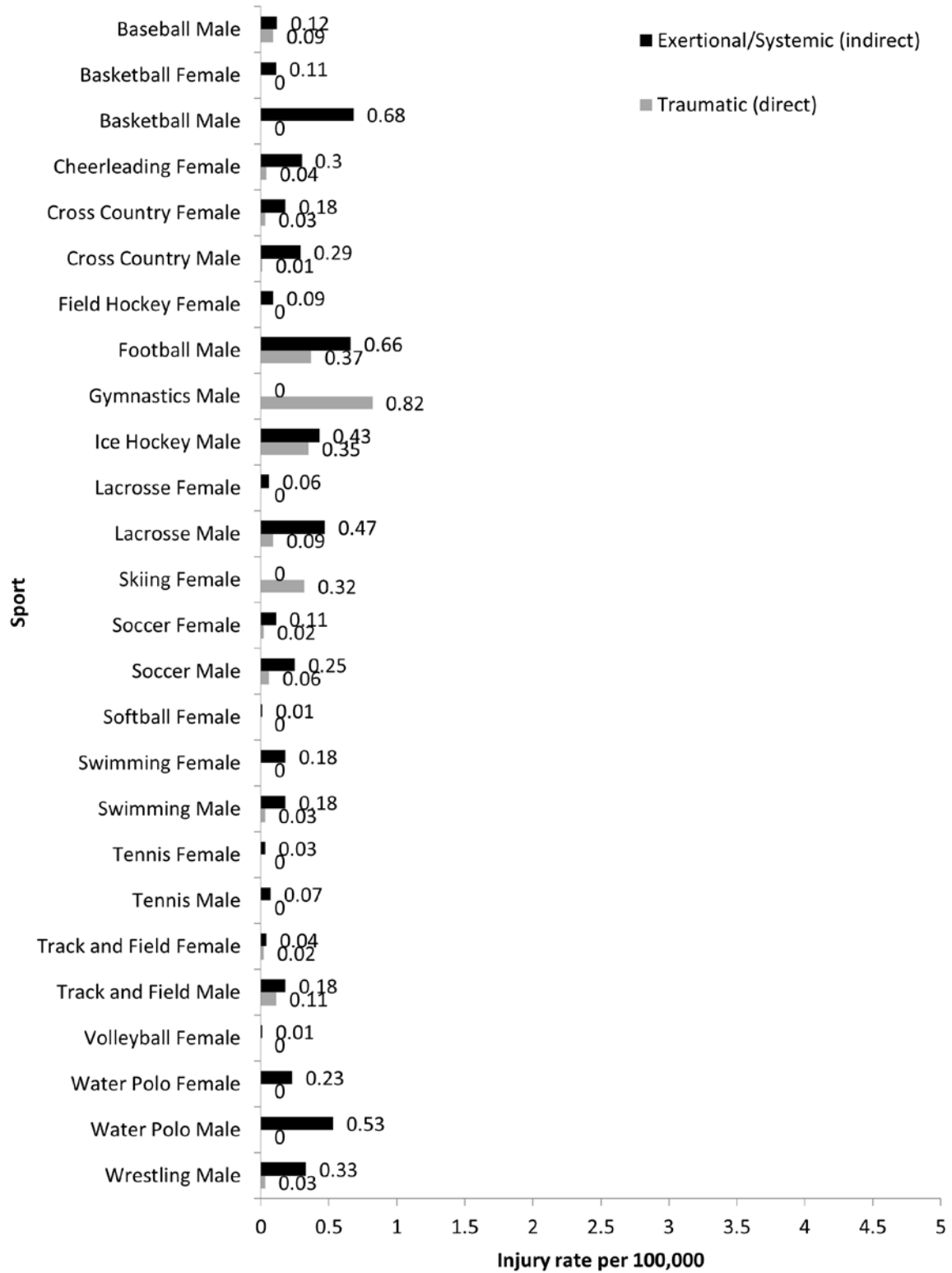
<sup>5</sup>Includes both indoor and outdoor track and field.

<sup>6</sup>Includes sand volleyball.

Note: Not all high schools and colleges are members of the NFHS and NCAA. Complete data are not available for the non-member schools. Therefore, these participation numbers underestimate the total number of high school and collegiate participants in the United States.

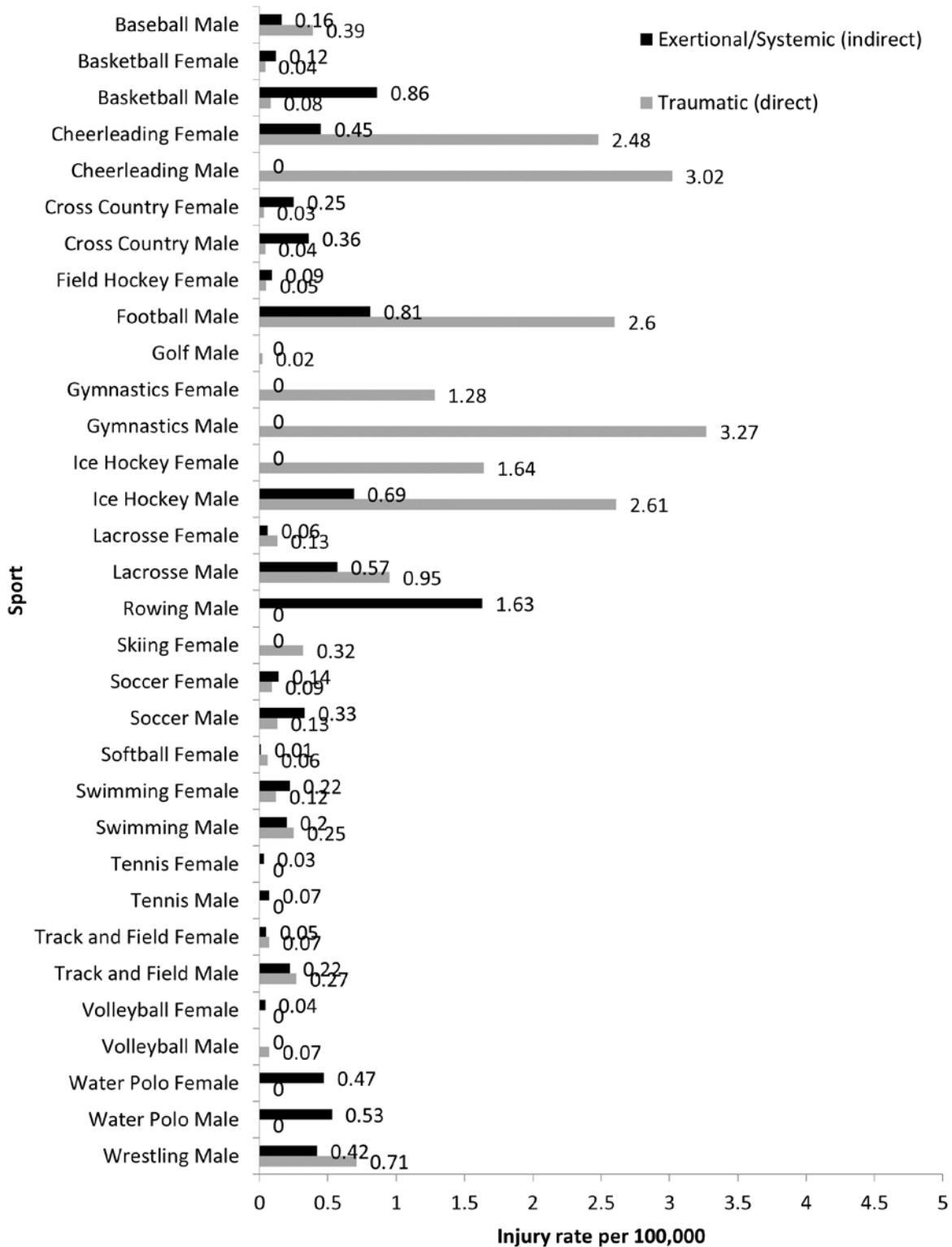
Note: the NFHS did not collect participation data from member states in 2019/20 due to COVID-10. Therefore participation from 2018/19 was used to estimate participation for 2019/20. In addition, all high school and collegiate spring sport seasons were cancelled in March of 2020 due to COVID-19 stay at home orders.

**Figure 1: Rates of fatal catastrophic traumatic injury (direct) and exertional/medical (indirect) conditions by sport-gender among high school participants, 1982/83-2019/20**



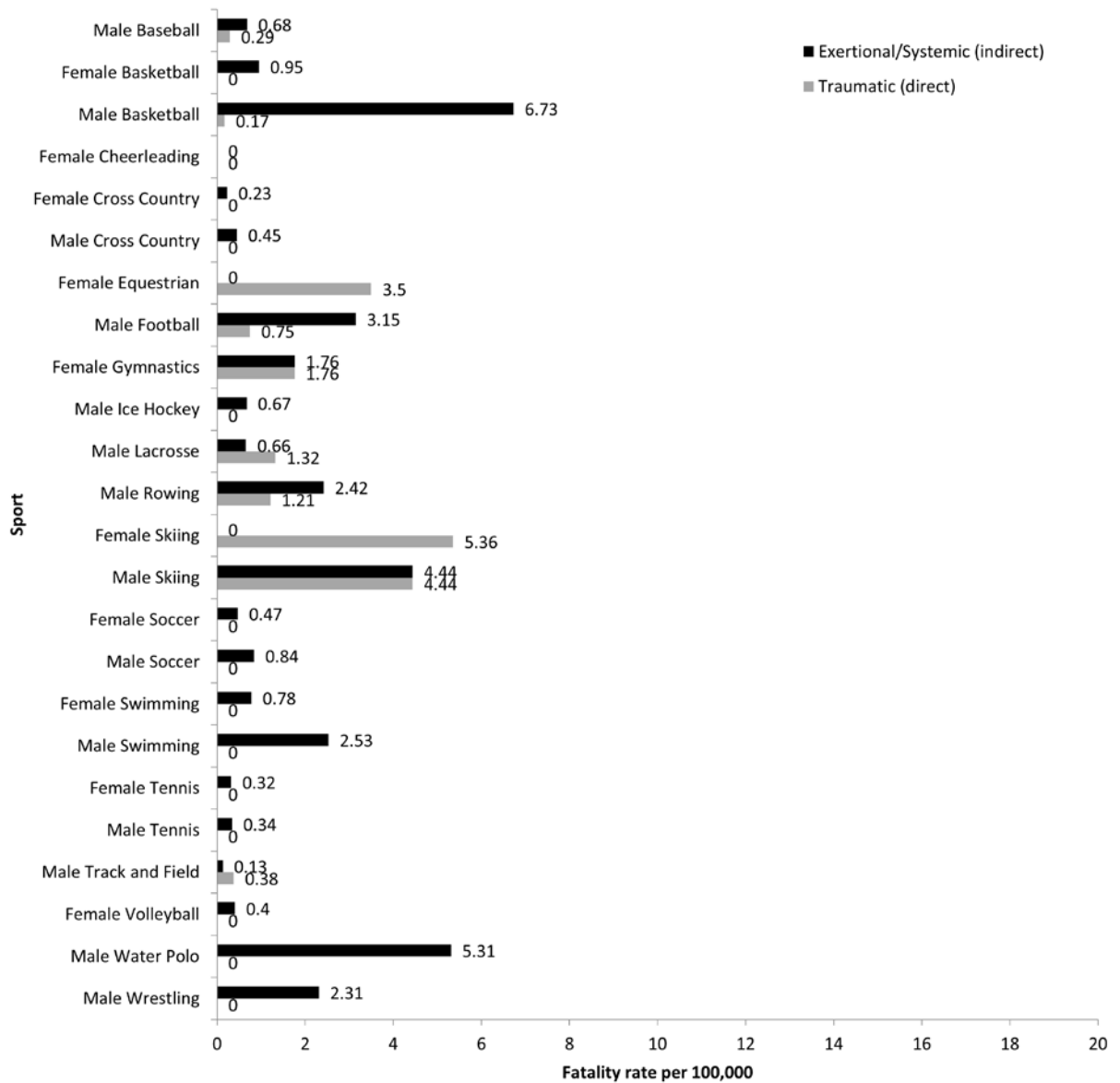
Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Figure 2: Rates of all catastrophic traumatic injury (direct) and exertional/medical (indirect) conditions by sport-gender among high school participants, 1982/83-2019/20**



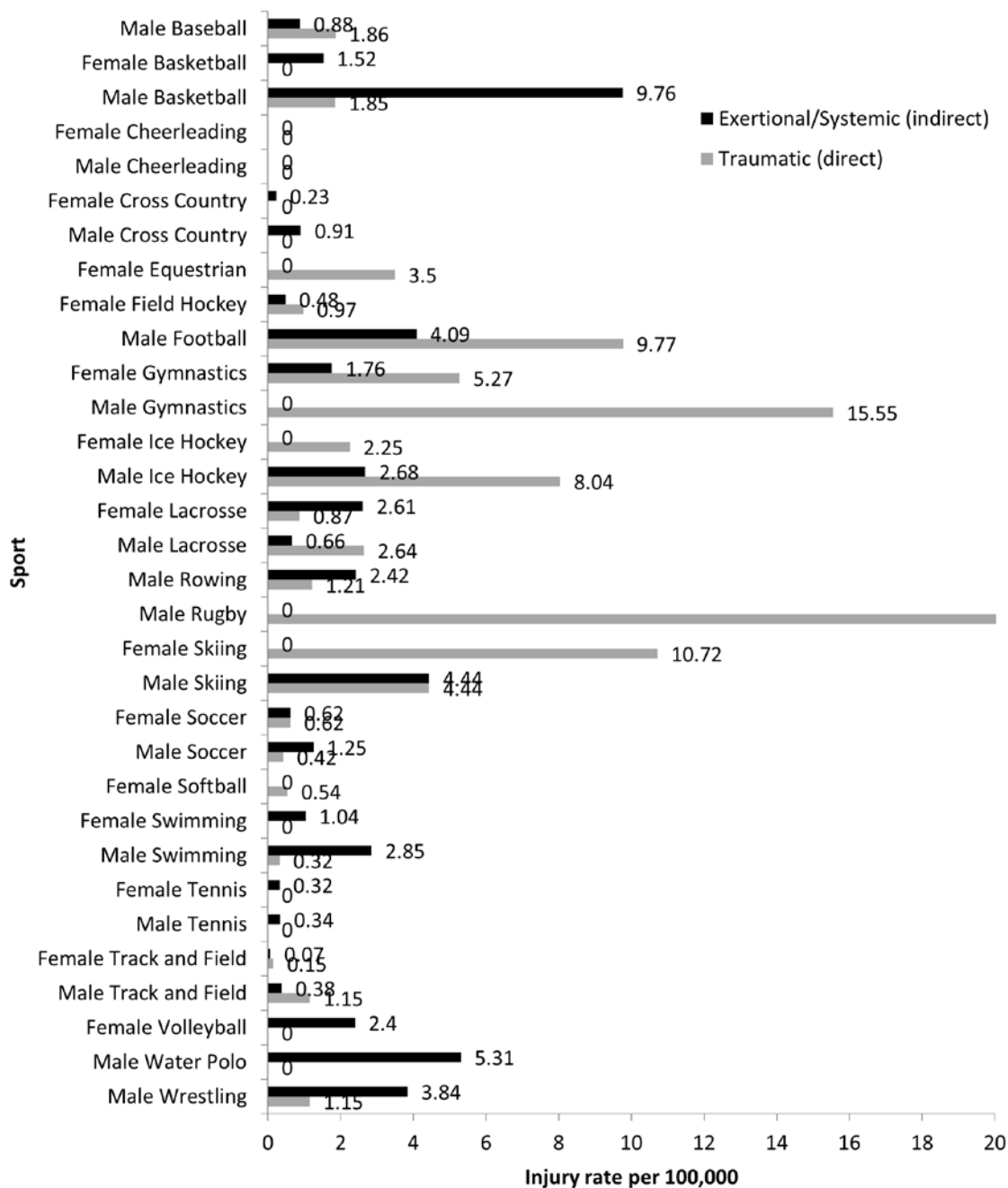
Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Figure 3: Rates of fatal catastrophic traumatic injury (direct) and exertional/medical (indirect) conditions by sport-gender among collegiate participants, 1982/83-2019/20**



Note: Rates with number of incidents less than 5 should be interpreted with caution.

**Figure 4: Rates of all catastrophic traumatic injury (direct) and exertional/medical (indirect) conditions by sport-gender among collegiate participants, 1982/83-2019/20**



Note: Rates with number of incidents less than 5 should be interpreted with caution.