

**CATASTROPHIC
SPORTS INJURY RESEARCH**

THIRTY-SIXTH ANNUAL REPORT

FALL 1982 - SPRING 2018

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

Website: nccsir.unc.edu

Prepared by:
Kristen L. Kucera, MSPH, PhD, LAT, ATC
University of North Carolina
Chapel Hill, NC 27514

Robert C. Cantu, MD
Medical Director, National Center for Catastrophic Sport Injury Research
Emerson Hospital
Concord, MA 01742

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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/>

To access online reports please visit: <http://nccsir.unc.edu/reports/>

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/systemic (or indirect). The definition for direct and indirect is as follows:

Direct - Those injuries that resulted directly from participation in the skills of the sport.

Indirect - Those injuries 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 injuries 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

Yearly participation estimates for high school athletes are obtained from NFHS participation reports (available online: <https://www.nfhs.org/ParticipationStatistics/ParticipationStatistics/>). NFHS high school annual athletic participation for 2017/18 included 7,677,337 athletes (4,421,063 males and 3,256,274 females). 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/Oct2018RES_2017-18SportsSponsorshipParticipationRatesReport.pdf). NCAA participation for 2017/18 in championship sports was 494,992 athletes. There were 278,614 males and 216,378 females. There were also 3,314 males in non-championship sports (archery, badminton, bowling, equestrian, rowing, rugby, sailing, and squash) and 2,427 females participating in emerging sports (archery, badminton, equestrian, rugby, squash, synchronized swimming, team handball, and triathlon).

During the entire 35 year period from the fall of 1982 through the spring of 2018, there were 228,610,552 high school participant-seasons in the sports covered by this report and approximately 13,069,182 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 participants were calculated over the entire 36-year period and stratified by level (high school and college) and sport. Incidence rates were stratified by direct versus 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 AY2017-2018 Summary

From July 1, 2017 to June 30, 2018 there were a total of 99 catastrophic injuries/illnesses captured by NCCSIR among high school and college organized sport participants. Of these, 85 events were due to or occurred during sport-related activities (Table 11). There were also 14 catastrophic events that occurred during non-sport related activity. All were cardiac-related.

Sport-related events: The majority of the sport-related catastrophic events (n=85) were at the high school level (78%, n=66). Member institutions for collegiate cases included NCAA and National Association of Intercollegiate Athletics (NAIA). Overall 24.7% of cases were fatal, 9.4% were nonfatal, 60.0% were serious with recovery, and 5.9% were unknown. Forty-six percent (n=39) were due to direct (traumatic injury) causes and over half occurred in competition (50.6%) followed by practice (29.4%). The majority of events occurred to athletes participating in the following sports: football (54.1%), basketball (15.3%), soccer (9.4%), baseball (4.7%), cross country (3.5%), lacrosse (3.5%), track and field (2.4%), wrestling (2.4%), swimming (2.4%), cheerleading (1.2%) and ice hockey (1.2%). Areas of the body most commonly affected

were heart (38.8%), spine (21.2%), and head/brain (15.3%). Sudden cardiac arrest (38.8%) was the most common types of events followed by brain trauma (14.1%) and other traumatic injuries (9.4%).

Direct events: 12.8% of direct events were fatal, 20.5% non-fatal, 53.8% serious with recovery, and 12.8% unknown. A greater proportion of direct events occurred in competition versus practice (69.2% versus 25.6%) and were due to contact with another player (56.4%) or apparatus/object (12.8%). The highest proportion was to the spine (46.2%) and head/brain (33.3%) followed by other traumatic injury (15.4%) and commotio cordis (5.1%). The majority occurred in football (79.5%) followed by soccer (5.1%) and baseball (5.1%).

Indirect events: 34.8% of indirect events were fatal and 65.2% were serious with recovery. Similar proportions of indirect events occurred in competition and practice (34.8% versus 32.6%) and 10.8% occurred during conditioning and weight training sessions. The majority were cardiac-related (71.7%), followed by heat related (15.2%) and rhabdomyolysis and other (2.2% each). Football (32.6%) and basketball (28.3%) comprised the majority, followed by soccer (13.0%) and track and field, baseball, lacrosse, cross country, and swimming (4.3% each).

Overall Summary

During this 36-year period, there were 2,686 catastrophic sport-related injuries/illnesses at high school and college levels (Table 1 – excluding cheerleading, drill team, and rodeo there were 2,566). The majority were non-fatal (64%) and from traumatic or direct mechanisms (65%), and among high school participants (79%). The proportion of fatal (38% versus 35%) and direct (65% versus 62%) were not different by high school compared to college level.

The 85 sport-related catastrophic injuries and conditions captured in 2017/18 is not different from the previous year (80 in 2016/17) and a 26% decrease from 2015/16—a result of a lower number of traumatic brain and cervical spine/spinal cord injuries in 2017/18 and 2016/17. *Note: see limitations regarding the interpretation of this percentage difference.*

Traumatic Injuries (Direct) by Sport: For high school sports, football had the highest *number* of traumatic injuries (direct) catastrophic events, followed by female cheerleading, wrestling, baseball, 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 participants (Figure 2, Table 9a). Similar results were observed when restricted to fatal events (Figure 1).

For college sports, football had the highest *number* of traumatic injuries (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, equestrian and female gymnastics had the highest rates per 100,000 participants (Figure 4, Table 9b). Similar results were observed when restricted to fatal events (Figure 3).

Exertional and Systemic Conditions (Indirect) by Sport: For high school sports, football had the highest *number* of exertional and systemic (indirect) catastrophic events, followed by male basketball, male track and field, male soccer, wrestling, baseball, and male cross country (Table 4b). Accounting for the number of participants in the sport, rowing, male basketball, football, male ice hockey, male water polo, and male lacrosse had the highest rates per 100,000 participants (Figure 2, Table 10a). Similar results were observed when restricted to fatal events (Figure 1).

For college sports, football had the highest *number* of exertional and systemic (indirect) catastrophic events, followed by male basketball, wrestling, female basketball, baseball, male soccer, 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). Similar results were observed when restricted to fatal events (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.
- 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 and 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 and systemic (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 & Cisllan, 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. 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>
- Kory Stringer Institute: <https://ksi.uconn.edu/emergency-conditions/cervical-spine-injury/>
- See also Swartz et al. 2009 for information about cervical spinal injury management and prevention:

<http://www.nata.org/sites/default/files/AcuteMgmtOfCervicalSpineInjuredAthlete.pdf>

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.

CASE SUMMARIES AY2017/18

**Compiled from available media reports (n=85 events captured by NCCSIR).*

COLLEGE/UNIVERSITY

Collegiate/University Baseball Indirect

A male 17 year old college sophomore baseball player collapsed at home after finishing a personal workout from hypertrophic cardiomyopathy. He was surrounded by teammates who began CPR until EMS arrived. After being hospitalized, he underwent a heart transplant. A full recovery is expected. He has been diagnosed with the cardiac condition a few years prior but was taking medication and cleared to play baseball.

A male 18 year old collegiate sophomore baseball player collapsed while helping coach a baseball practice. He was throwing pitches in the bullpen when he collapsed. The team's head coach immediately started CPR and continued until EMS arrived. He received three AED shocks during transport to a hospital. He had a defibrillator implanted and a full recovery is expected.

Collegiate/University Basketball Indirect

A male college senior basketball guard collapsed during a game while sitting on the bench from sudden cardiac arrest. He was immediately attended to by the athletic trainer who began CPR while EMS were called. He was revived with an AED. He was transported to the hospital where he underwent surgery to have a defibrillator implanted. Full recovery is expected.

A male 20 year old college junior basketball player collapsed during a scrimmage game. He was revived by coaches and AED before EMS arrived. He was transported to the hospital where he was diagnosed with hypertrophic cardiomyopathy. He underwent surgery to have a defibrillator implanted. A full recovery is expected but he can no longer play basketball.

Collegiate/University Football Direct

A male 22 year old college football quarterback sustained an injury when an opposing player fell on him during a football game. Athlete kept playing until sustaining a mild concussion later in the game. He went to the hospital where he was diagnosed with a lacerated spleen causing internal bleeding. Athlete underwent emergency surgery and is expected to make a full recovery.

A male 21 year old college football offensive lineman complained of not feeling well following a football game. The athlete was transported by EMS to the hospital where he later passed away. Cause of death was cerebral edema with brain death.

A male 18 year old college freshman cornerback sustained a spinal cord injury during a football game. The athlete attempted to tackle the opposing team's wide receiver and was injured as a result of the play. The athlete was transported by EMS to a hospital where he underwent emergency surgery. He is currently paralyzed from the neck down.

A male 19 year old college football cornerback sustained a spinal cord injury and spinal fracture during a football game. The athlete attempted to make a tackle and was injured as a result of the play. The athlete was transported by EMS to a hospital and died three days later.

A male 21 year old college senior football player was sacked during a game. He was diagnosed with a thoracic spine fracture and released from the hospital later that night. A full recovery is expected.

A male college sophomore football tight end was injured in a collision with a teammate in spring practice. The athlete was taken to a hospital with abdominal pain and was diagnosed with a lacerated spleen. The injury did not require surgery and the athlete is expected to make a full recovery.

Collegiate/University Football Indirect

A male 19 year old college football linebacker collapsed during football practice. He complained of not feeling well (dizziness and chest pain), collapsed, and began seizing shortly afterwards. Athletic trainers performed CPR and applied an AED until EMS arrived. The athlete was transported to the hospital where he later died. Cause of death was due to cardiomegaly.

A male 21 year old college junior football player collapsed during a non-contact drill during football practice. He was transported to a hospital where he later died. Cause of death was cardiac tamponade with spontaneous dissection of the ascending aorta.

A male college senior football player suffered heat stroke while in practice. His temperature reached 106 degrees before he was cooled. His organs began shutting down but a full recovery is expected.

A male 18 year old college football player was sick prior to the third day of football practice. He complained of feeling hot and his neck was iced. He eventually collapsed and was transported to the hospital where he was diagnosed with heat stroke and rhabdomyolysis. A full recovery was made.

A male 19 year old collegiate football offensive lineman suffered a heatstroke during an organized team workout. He was tended to by athletic trainers and then transported by EMS to a nearby hospital. He passed away two weeks later from his injuries. Cause of death was from heat stroke.

A male 25 year old collegiate football player suffered rhabdomyolysis during football practice. Towards the end of a practice session, the athlete began cramping severely. An athletic trainer placed him in a cold tub. When condition did not improve, athlete was transported to a hospital for further evaluation. Athlete was diagnosed with rhabdomyolysis complicated by sickle cell trait positive status.

Collegiate/University Soccer Direct

A female 22 year old collegiate soccer midfielder sustained an injury during a soccer game. The athlete leaped to head the ball away during a corner kick when she collided with another player. Following the injury, she was unable to get up. She was transported to the hospital and diagnosed with a spinal cord contusion. One week post-injury, the athlete is paralyzed from the thigh down. A full recovery is expected.

A female collegiate soccer defender was hit in the chest by the ball and experienced commotio cordis during a soccer practice. She was revived by coaches and later transported by EMS to the hospital. The athlete had a pacemaker temporarily implanted and is expected to make a full recovery.

Collegiate/University Wrestling Indirect

A male college redshirt junior collapsed during a wrestling match from sudden cardiac arrest. CPR and AED were used to revive him before he was transported to the hospital. A full recovery is expected.

HIGH SCHOOL

High School Sponsored Baseball Direct

A male 15 year old high school freshman baseball second baseman fractured his skull in baseball practice. The athlete was sprinting to catch a pop fly and when he dove, his head collided with the knee of another player. He was life-flighted to a nearby hospital where he underwent surgery to repair the damages. A full recovery is expected.

A male 17 year old high school senior baseball third baseman was hit in the face by a baseball during a game. On the field he went unconscious and began seizing. EMS was called and the athlete was transported to a hospital. There he was diagnosed with a grade 3 concussion, nasal fracture, and cheekbone fracture. A full recovery is expected.

High School Sponsored Basketball Indirect

A male 17 year old high school basketball player collapsed at a summer basketball camp. Bystanders attempted CPR until paramedics arrived. Athlete was transported by EMS to a nearby hospital where he later died. Cause of death was due to cardiac arrhythmia and hypertrophic cardiomyopathy.

A male 16 year old high school sophomore basketball player collapsed during a scrimmage game from sudden cardiac arrest. An athletic trainer used CPR and AED to revive him. He was transported to the hospital and a full recovery is expected.

A male 14 year old high school freshman basketball player collapsed in the cafeteria after playing basketball with friends during school. He was attended to by the resource officer who used CPR and AED to revive him. He was transported to the hospital and diagnosed with Long QT syndrome. A full recovery is expected.

A male 15 year old high school athlete was trying out for the basketball team when he collapsed from sudden cardiac arrest. He was attended to by coaches who used an AED to revive him. A full recovery is expected.

A male high school junior basketball player collapsed while warming up for practice from sudden cardiac arrest. He was attended to by the athletic trainer who used CPR and AED to revive him before EMS transported him to the hospital. He was diagnosed with ventricular tachycardia. A full recovery is expected.

A male high school senior basketball player collapsed during a game from sudden cardiac arrest. He was administered CPR before being transported to the hospital. A full recovery is expected but he is no longer allowed to play sports.

A male 17 year old high school senior basketball player collapsed during a game. He was transported to the hospital and diagnosed with Long QT Syndrome. A full recovery is expected.

A male 16 year old high school sophomore basketball player collapsed at the school during a pickup game. He was attended to by coaches and the school nurse who used CPR and AED to revive him. He was transported to the hospital and diagnosed with an enlarged heart. A full recovery is expected.

A male 16 year old high school basketball player collapsed during gym class. He was immediately attended to by school staff who revived him with CPR and an AED. He was transported to a hospital and diagnosed with ARVD. He underwent surgery to have a defibrillator implanted. A full recovery is expected.

A male 16 year old high school sophomore basketball player collapsed after a game of pick-up basketball with friends at a recreation center. He was taken to a hospital, where he was pronounced dead. Cause of death was from hypertrophic cardiomyopathy.

A male 17 year old high school basketball player collapsed during basketball practice. He was sitting on the bench getting water when he collapsed. He was immediately attended to by an athletic trainer and police officer who performed CPR and applied an AED. EMS arrived and took over care and transported the athlete to a hospital. A full recovery was made.

High School Sponsored Cheerleading Indirect

A 17 year old female cheerleader suffered a heat stroke during a football game. The athlete was cheering on the sideline during a game while the heat index was over 110. She suffered a heat stroke and was transported to a hospital by EMS. Current prognosis is unknown.

High School Sponsored Cross Country Direct

A female 14 year old high school freshman cross country runner was hit by a car during practice. She died as a result of her injuries.

High School Sponsored Cross Country Indirect

A male high school junior varsity cross country runner collapsed after finishing a race due to heat stroke. His body temperature was measured by athletic trainers and EMS and found to be 107.7 degrees. He was immediately cooled in an ice water tub. He was not transported to the hospital until his body temperature dropped to 101.8 degrees. A full recovery is expected.

A male high school junior varsity cross country runner collapsed during a race due to heat stroke. He was immediately cooled with ice/water before being transported to the hospital. A full recovery is expected.

High School Sponsored Football Direct

A male 16 year old high school junior football player was injured participating in an off season conditioning session. A group of five athletes were completing a drill carrying a 10-foot long 400-pound log when the log fell and struck the athlete in the head. He was transported to the hospital where he was pronounced dead. Cause of death is pending autopsy.

A 15 year old male high school football lineman collapsed while at football practice. EMS arrived at the field and transported him to hospital. He underwent surgery for a traumatic brain injury. Athlete is attending school but long term prognosis is unknown.

A male 17 year old high school football linebacker sustained a head injury during a game. He went to the sideline complaining of a headache before collapsing. He was transported to the hospital where he underwent surgery for brain swelling. He was placed in a medically induced coma for two weeks. He returned to school but long term prognosis is unknown.

A male 17 year old high school football defenseman was attempting to make a tackle during a game. The athlete's head collided with an opposing player's thigh and he immediately collapsed and was unable to move. The athlete was transported to the hospital by EMS. He was diagnosed with a spinal cord injury resulting in partial paralysis below the breastbone. Long term prognosis is unknown.

A male 17 year old high school football linebacker suffered a fractured neck in three places as the result of a head first tackle during a football game. The athlete attempted to sack the opposing quarterback when he sustained the injury. He walked off the field and was later transported to the hospital where he did not require surgery. A full recovery is expected.

A male 17 year old high school football player was injured in a football game. The athlete took a hit early in the game but kept playing. Later in the game, the athlete was down and was kicked in the neck by an opposing player. The athlete was transported to a hospital where he underwent

emergency surgery to relieve a massive brain bleed. The athlete remains in a coma and long term prognosis is unknown at this time.

A male 17 year old high school football player was injured. The athlete scored a touchdown and subsequently walked off the field complaining of his head hurting. The athlete was evaluated by team physician and sent to the hospital for evaluation. The athlete underwent surgery to remove a blood clot and stop the bleeding in his brain. A full recovery is expected.

A male 14 year old high school football player was injured during a game. The athlete landed on a cleat with the spikes facing upward, making contact just below the sternum. The result of the injury was a laceration of the pancreas. The athlete underwent surgery and a full recovery is expected.

A male 16 year old high school football safety was injured during a football game. The athlete attempted to make a tackle and was hit out of bounds, causing the posterior side of his helmet to strike the ground. He was taken to the hospital where a CT scan revealed a subdural hematoma. No surgery was required, and the athlete is expected to make a full recovery.

A male high school football player sustained a catastrophic injury to his right leg during football practice. He was immediately attended to by coaches who called 911. He was transported by EMS to the hospital where he underwent surgery. The doctors were unable to repair the damage and his leg was amputated below the knee.

A male high school senior football running back suffered a traumatic brain injury during a football game. The athlete sustained a hit at some point during the game and was taken by EMS to the hospital after the game. The athlete underwent emergency surgery. A full recovery is expected.

A male high school football wide receiver was injured from apparent severe-head collisions during a football game. The athlete was life-flighted from the football field with what was believed to be a spinal concussion. Athlete regained feeling in his body and is expected to make a full recovery.

A male 17 year old high school football defensive tackle was injured during a football game. The athlete was involved in a tackle and was unable to get up. The athlete was initially paralyzed when examined by ATs and first responders. When he arrived at the hospital, a spinal malformation was discovered that was not structurally protecting the spinal cord. He is no longer paralyzed and will undergo surgery to fuse C1 and C2.

A male 14 year old high school football player was injured during a junior varsity football game. The athlete was being tackled and took a hit to the head, rendering him unconscious. The athlete was taken to the hospital and underwent three emergency surgeries to reduce bleeding and swelling. The athlete was placed in a medically induced coma. A full recovery is expected.

A male 16 year old high school junior football linebacker sustained a traumatic brain injury during a football game. The athlete was being blocked and landed on the ground and hit his head,

and collapsed shortly after the play. He was rushed to the hospital where he passed away the following day. Cause of death was due to blunt force head trauma from a subdural hematoma.

A male 17 year old high school senior football running back was injured during a football game while carrying the ball. He was immediately attended to by first responders and transported to the hospital by EMS. He was diagnosed with transient quadriplegia and he regained full functioning at the hospital after being diagnosed with a spinal cord contusion and cervical spine contusion. A full recovery is expected.

A male high school sophomore junior varsity football wide receiver was injured during practice. He was diving for the ball when his head collided with a teammate's shoulder pads. He immediately went limp. He was attended to and transported to the hospital by EMS. The athlete was diagnosed with central cord syndrome and is experiencing varied levels of paralysis from the neck down, and long term prognosis is unknown.

A male 15 year old high school freshman football linebacker sustained a neck fracture on kickoff return during a football game. He had immediate paralysis and was attended to by his coach and athletic trainers before being transported to the hospital by EMS. He underwent emergency surgery to repair fractured C4 and C5 vertebra. Partial paralysis is present but is suspected to reside with spinal cord healing. Athlete has not fully recovered.

A male 16 year old high school junior free safety was injured during a football scrimmage at preseason camp. He was attempting to make a tackle when a teammate arrived at the same time, worsening the hit. He was paralyzed on the field and unable to move. Emergency personnel transported him to the hospital where he underwent surgery for a fractured C-5 vertebra. He has regained sensation but remains paralyzed from the waist down.

A male 16 year old high school football player was being blocked on kick return when he was hit by an opponent. He collapsed and experienced vomiting. He was immediately attended to by athletic trainer before being transported to the hospital for a brain injury. A full recovery is expected.

A male high school sophomore football quarterback sustained a neck injury during a football game. He was tackled by the opponent while attempting a screen pass and his helmet hit the ground. He was transported to the hospital and was diagnosed with a concussion. He returned to the hospital days later with continued neck pain and was diagnosed with a cervical spine fracture. He was immobilized with a neck brace to wear full time and a full recovery is expected.

A male high school junior football running back was injured during football practice. The athlete lowered his head to make a block and received a hard hit. He was then attended to by EMS and transported to the hospital where he was diagnosed with a fractured C5 vertebrae. He underwent surgery and is paralyzed from the chest down.

A male high school football player was making a tackle during a game when his chin hit another players knee, causing his head to snap back. He sustained a concussion and a lumbar spine contusion. Full recovery expected.

A male 14 year old high school freshman junior varsity football player suffered a cervical spinal fracture during a routine drill at practice. He underwent three surgeries but is paralyzed from the neck down.

A male 16 year old high school football player was injured during a special teams play in a football game. He collided with an opposing player and landed on his head, pushing all of his weight onto his head. He was transported to a hospital and underwent surgery to repair fractured C3, C4, and C5 vertebra. There was no paralysis and a full recovery is expected.

High School Sponsored Football Indirect

A male 14 year old high school football player collapsed after practice due to heat stroke. He was immediately attended to by the coach and athletic trainer who began cooling him using ice and a tarp after temperature of 108 was measured. EMS arrived and administered an IV. He was transported to the hospital when his temperature dropped to 102. A full recovery is expected.

A male 14 year old high school freshman football player collapsed 30 minutes in to a voluntary conditioning session. Coaches immediately began CPR and used an AED. He was transported to the hospital where he later died. Cause of death is pending autopsy but is suspected to be cardiac related.

A male 14 year old high school freshman junior varsity football player collapsed while running sprints during practice. He was immediately attended to by the coach who began CPR. He was transported to the hospital where he later died. Cause of death is pending autopsy.

A male 15 year old freshman football player collapsed on the field while running sprints at a voluntary football workout. CPR was administered, and athlete was transported to a hospital. Efforts to revive him were unsuccessful and he was pronounced dead at the hospital. Cause of death was due to cardiac arrhythmia.

A male 16 year old football player collapsed during a weight lifting session at school. Athlete was transported by EMS to the hospital. Athlete passed away two days later. Cause of death was due to nontraumatic subarachnoid hemorrhage.

A male 16 year old high school football wide receiver collapsed during a football game. He was attended to by an athletic trainer and paramedic who initiated CPR and applied an AED. He was revived on field, and then transported to a hospital by EMS. He was diagnosed with a cardiac condition at birth, which could have contributed to his collapse. A full recovery is expected.

A male 14 year old high school freshman football player collapsed during practice. He was transported by EMS to the hospital where he later died. Cause of death was due to complications of sudden cardiac arrest.

A male high school football player collapsed during practice from sudden cardiac arrest. He was revived with an AED. No other information is known.

A male 14 year old high school football player complained of not feeling well during team drills. He was escorted to the locker room where he collapsed. He was attended to by coaches and the athletic trainer who used CPR and AED to revive him. He was transported to the hospital and diagnosed with ventricular fibrillation. He underwent surgery to have a defibrillator implanted. A full recovery is expected.

High School Sponsored Ice Hockey Direct

A male high school senior ice hockey player sustained a hit in the 3rd period of the game that left him with two fracture eye sockets and a broken nose. He was transported to the hospital and underwent neurosurgery. A full recovery is expected.

High School Sponsored Lacrosse Direct

A male 16 year old high school lacrosse player was hit in the chest by a ball during practice. Teammates called 911 and performed CPR until EMS arrived and transported him to a hospital. He was diagnosed with commotio cordis and a full recovery is expected.

High School Sponsored Lacrosse Indirect

A male 16 year old high school lacrosse player collapsed during a lacrosse game at a university field. CPR was performed by EMS and the athlete was transported to the hospital where he died. Cause of death was due to arrhythmogenic right ventricular dysplasia.

A male 15 year old high school freshman lacrosse player collapsed following an alumni lacrosse game. He was diagnosed with arteriovenous malformation of the brain, which ruptured and caused a stroke. He underwent neurosurgery but never recovered.

High School Sponsored Soccer Indirect

A female 17 year old soccer player collapsed while taking a kick during a home soccer game. She was resuscitated on the field by a bystander and later transported to a nearby hospital by EMS personnel. Athlete died later that night as a result of a brain aneurysm.

A male 16 year old high school soccer player collapsed during practice after complaining of not feeling well. He was immediately attended to by the athletic trainer who began CPR before EMS arrived. He was revived with use of AED and transported to the hospital. Cause of collapse was due to sudden cardiac arrest. A full recovery is expected.

A male 16 year old high school sophomore soccer player reported having trouble breathing during a soccer game. He was transported to the hospital where he suffered sudden cardiac arrest. He died shortly after.

A female 15 year old high school freshman junior varsity soccer player collapsed on the field. She was transported to the hospital where she later died. Cause of death was due to a congenital heart disease.

A male high school senior soccer player collapsed during a tournament from sudden cardiac arrest. He was administered CPR until EMS transported him to the hospital. He underwent surgery to have a defibrillator implanted and a full recovery is expected.

A male high school soccer player collapsed during a game from sudden cardiac arrest. He was immediately attended to by an athletic trainer who administered CPR and used an AED to revive him. He was transported to the hospital where he underwent surgery to have a defibrillator implanted. A full recovery is expected.

High School Sponsored Swimming Indirect

A male 16 year old high school football player collapsed from sudden cardiac arrest while in his swimming pool. His mother performed CPR before EMS arrived with AED and transported him to the hospital. He underwent surgery to have a defibrillator implanted and a full recovery is expected.

A male 17 year old high school junior swimmer did not come up from under water during an open swim session. He was unable to be revived by medical personnel. He was transported to the hospital where he underwent testing to determine why his heart stopped. He died a few days later. Cause of death was due to accidental drowning.

High School Sponsored Track and Field Indirect

A male 17 year old high school track and field athlete collapsed at a regional meet where he was participating in the discus throw. He was resuscitated on scene with CPR and a defibrillator. A cardioverter defibrillator was implanted into his chest a few days later.

A male 17 year old high school junior track and field athlete collapsed after finishing his 400-meter race from cardiac arrest. He was immediately attended to by the athletic trainer and a teammate, who began CPR and used an AED to revive him. He was transported to hospital via EMS. A full recovery is expected.

High School Sponsored Wrestling Direct

A male 16 year old high school sophomore wrestler sustained an injury during a wrestling match. He was taken down and put in a hold, and was unable to move after being released. The athlete was transported by EMS to a hospital. He was diagnosed with a spinal cord injury at the C-4 level and is paralyzed from the neck down. Long term prognosis is currently unknown.

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Table 1: Number of All catastrophic injuries/illnesses 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	10	13.3%	65	86.7%	75	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	16.9%	54	83.1%	65	100.0%
1994-1995	12	23.5%	39	76.5%	51	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	12.9%	61	87.1%	70	100.0%
2000-2001	17	24.6%	52	75.4%	69	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	9	13.4%	58	86.6%	67	100.0%
2005-2006	12	21.8%	43	78.2%	55	100.0%
2006-2007	13	17.3%	62	82.7%	75	100.0%
2007-2008	15	18.3%	67	81.7%	82	100.0%
2008-2009	17	15.7%	91	84.3%	108	100.0%
2009-2010	27	27.6%	71	72.4%	98	100.0%
2010-2011	15	20.0%	60	80.0%	75	100.0%
2011-2012	17	21.0%	64	79.0%	81	100.0%
2012-2013	16	32.7%	33	67.3%	49	100.0%
2013-2014	17	21.5%	62	78.5%	79	100.0%
2014-2015	16	19.5%	66	80.5%	82	100.0%
2015-2016	20	19.0%	85	81.0%	105	100.0%
2016-2017	23	29.1%	56	70.9%	79	100.0%
2017-2018	19	23.2%	65	77.4%	84	100.0%
Total	519	20.2%	2047	79.8%	2566	100.0%
Total*	554	20.6%	2132	79.4%	2686	100.0%

*Includes Cheerleading, Drill Team, Rodeo

Table 2: Number of Direct catastrophic injuries/illnesses 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	14.0%	37	86.0%	43	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	12	28.6%	30	71.4%	42	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	5	15.6%	27	84.4%	32	100.0%
2005-2006	7	21.9%	25	78.1%	32	100.0%
2006-2007	7	14.9%	40	85.1%	47	100.0%
2007-2008	9	16.7%	45	83.3%	54	100.0%
2008-2009	9	11.5%	69	88.5%	78	100.0%
2009-2010	16	27.1%	43	72.9%	59	100.0%
2010-2011	9	18.4%	40	81.6%	49	100.0%
2011-2012	9	16.4%	46	83.6%	55	100.0%
2012-2013	7	35.0%	13	65.0%	20	100.0%
2013-2014	2	6.1%	31	93.9%	33	100.0%
2014-2015	6	20.7%	23	79.3%	29	100.0%
2015-2016	15	23.8%	48	76.2%	63	100.0%
2016-2017	6	20.7%	23	79.3%	29	100.0%
2017-2018	8	20.5%	31	79.5%	39	100.0%
Total	310	19.1%	1316	80.9%	1626	100.0%
Total*	345	19.9%	1389	80.1%	1734	100.0%

*Includes Cheerleading, Drill Team, Rodeo

Table 3: Number of Indirect catastrophic injuries/illnesses 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	0.0%	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	3	13.0%	20	87.0%	23	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	23.1%	10	76.9%	13	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	0.0%	23	100.0%	23	100.0%
1999-2000	0	0.0%	27	100.0%	27	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	8	26.7%	22	73.3%	30	100.0%
2009-2010	11	28.2%	28	71.8%	39	100.0%
2010-2011	6	23.1%	20	76.9%	26	100.0%
2011-2012	8	30.8%	18	69.2%	26	100.0%
2012-2013	9	31.0%	20	69.0%	29	100.0%
2013-2014	15	32.6%	31	67.4%	46	100.0%
2014-2015	10	18.9%	43	81.1%	53	100.0%
2015-2016	5	11.9%	37	88.1%	42	100.0%
2016-2017	17	34.0%	33	66.0%	50	100.0%
2017-2018	11	25.6%	34	75.6%	43	100.0%
Total	209	22.3%	731	77.8%	940	100.0%
Total*	209	22.0%	743	78.0%	952	100.0%

*Includes Cheerleading, Drill Team, Rodeo

Table 4a: Number of Direct catastrophic injuries/illnesses by severity by sport: High school all years combined

		Serious		Non-fatal		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%	N	%
Baseball	Male	28	42.4%	21	31.8%	15	22.7%	2	3.0%	66	100.0%
Basketball	Female	3	50.0%	3	50.0%	0	0.0%	0	0.0%	6	100.0%
	Male	9	60.0%	4	26.7%	1	6.7%	1	6.7%	15	100.0%
Cheerleading	Female	42	59.2%	23	32.4%	1	1.4%	5	7.0%	71	100.0%
	Male	1	50.0%	1	50.0%	0	0.0%	0	0.0%	2	100.0%
Cross Country	Female	0	0.0%	0	0.0%	2	100.0%	0	0.0%	2	100.0%
	Male	0	0.0%	2	66.7%	1	33.3%	0	0.0%	3	100.0%
Field Hockey	Female	0	0.0%	1	33.3%	0	0.0%	2	66.7%	3	100.0%
Football	Male	403	41.5%	411	42.3%	137	14.1%	20	2.1%	971	100.0%
Golf	Male	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Gymnastics	Female	4	36.4%	7	63.6%	0	0.0%	0	0.0%	11	100.0%
	Male	1	25.0%	2	50.0%	1	25.0%	0	0.0%	4	100.0%
Ice Hockey	Female	2	66.7%	1	33.3%	0	0.0%	0	0.0%	3	100.0%
	Male	11	37.9%	14	48.3%	4	13.8%	0	0.0%	29	100.0%
Lacrosse	Female	2	66.7%	0	0.0%	0	0.0%	1	33.3%	3	100.0%
	Male	9	50.0%	6	33.3%	2	11.1%	1	5.6%	18	100.0%
Skiing	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Soccer	Female	5	62.5%	1	12.5%	2	25.0%	0	0.0%	8	100.0%
	Male	7	41.2%	2	11.8%	7	41.2%	1	5.9%	17	100.0%
Softball	Female	6	85.7%	1	14.3%	0	0.0%	0	0.0%	7	100.0%
Swimming	Female	1	16.7%	5	83.3%	0	0.0%	0	0.0%	6	100.0%
	Male	3	30.0%	6	60.0%	1	10.0%	0	0.0%	10	100.0%
Track and Field	Female	7	70.0%	2	20.0%	1	10.0%	0	0.0%	10	100.0%
	Male	14	25.9%	17	31.5%	21	38.9%	2	3.7%	54	100.0%
Volleyball	Male	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
Wrestling	Male	24	35.8%	39	58.2%	3	4.5%	1	1.5%	67	100.0%

Table 4b: Number of Indirect catastrophic injuries/illnesses by severity by sport: High school all years combined

		Serious		Non-fatal		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%	N	%
Baseball	Male	5	19.2%	0	0.0%	21	80.8%	0	0.0%	26	100.0%
Basketball	Female	2	11.1%	0	0.0%	16	88.9%	0	0.0%	18	100.0%
	Male	29	17.8%	0	0.0%	133	82.1%	1	0.6%	163	100.0%
Cheerleading	Female	4	33.3%	0	0.0%	8	66.7%	0	0.0%	12	100.0%
Cross Country	Female	4	28.6%	0	0.0%	10	71.4%	0	0.0%	14	100.0%
	Male	5	19.2%	0	0.0%	21	80.8%	0	0.0%	26	100.0%
	Unknown	0	0.0%	0	0.0%	0	0.0%	1	100.0%	1	100.0%
Field Hockey	Female	0	0.0%	0	0.0%	2	100.0%	0	0.0%	2	100.0%
Football	Male	40	14.1%	2	0.7%	241	84.6%	2	0.7%	285	100.0%
Ice Hockey	Male	3	37.5%	0	0.0%	5	62.5%	0	0.0%	8	100.0%
Lacrosse	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
	Male	1	9.1%	0	0.0%	10	90.9%	0	0.0%	11	100.0%
Other	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Rowing	Male	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Running/Jogging	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Soccer	Female	2	15.4%	0	0.0%	11	84.6%	0	0.0%	13	100.0%
	Male	8	19.5%	1	2.4%	30	73.2%	2	4.9%	41	100.0%
Softball	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Swimming	Female	2	18.2%	0	0.0%	8	72.7%	1	9.1%	11	100.0%
	Male	1	12.5%	0	0.0%	7	87.5%	0	0.0%	8	100.0%
Tennis	Female	0	0.0%	0	0.0%	2	100.0%	0	0.0%	2	100.0%
	Male	0	0.0%	0	0.0%	4	100.0%	0	0.0%	4	100.0%
Track and Field	Female	0	0.0%	1	14.3%	6	85.7%	0	0.0%	7	100.0%
	Male	6	14.0%	0	0.0%	37	86.0%	0	0.0%	43	100.0%
Volleyball	Female	2	66.7%	0	0.0%	1	33.3%	0	0.0%	3	100.0%
Water Polo	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
	Male	0	0.0%	0	0.0%	3	100.0%	0	0.0%	3	100.0%
Wrestling	Male	5	13.9%	0	0.0%	30	83.3%	1	2.8%	36	100.0%

Table 5a: Number of Direct catastrophic injuries/illnesses by severity by sport: College all years combined

		Serious		Non-fatal		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%	N	%
Baseball	Male	9	45.0%	7	35.0%	3	15.0%	1	5.0%	20	100.0%
Basketball	Male	9	81.8%	1	9.1%	1	9.1%	0	0.0%	11	100.0%
Cheerleading	Female	13	46.4%	13	46.4%	1	3.6%	1	3.6%	28	100.0%
	Male	3	60.0%	2	40.0%	0	0.0%	0	0.0%	5	100.0%
Equestrian	Female	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Field Hockey	Female	2	66.7%	0	0.0%	0	0.0%	1	33.3%	3	100.0%
Football	Male	145	69.0%	48	22.9%	17	8.1%	0	0.0%	210	100.0%
Gymnastics	Female	0	0.0%	2	100.0%	0	0.0%	0	0.0%	2	100.0%
	Male	2	66.7%	1	33.3%	0	0.0%	0	0.0%	3	100.0%
	Unknown	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
Ice Hockey	Female	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
	Male	7	58.3%	5	41.7%	0	0.0%	0	0.0%	12	100.0%
Lacrosse	Female	0	0.0%	2	100.0%	0	0.0%	0	0.0%	2	100.0%
	Male	1	16.7%	1	16.7%	4	66.7%	0	0.0%	6	100.0%
Rodeo	Male	0	0.0%	0	0.0%	2	100.0%	0	0.0%	2	100.0%
Rowing	Male	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Rugby	Male	1	33.3%	2	66.7%	0	0.0%	0	0.0%	3	100.0%
Skiing	Female	0	0.0%	1	50.0%	1	50.0%	0	0.0%	2	100.0%
	Male	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Soccer	Female	2	50.0%	2	50.0%	0	0.0%	0	0.0%	4	100.0%
	Male	2	66.7%	1	33.3%	0	0.0%	0	0.0%	3	100.0%
Softball	Female	3	75.0%	0	0.0%	0	0.0%	1	25.0%	4	100.0%
Swimming	Male	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
Track and Field	Female	1	50.0%	1	50.0%	0	0.0%	0	0.0%	2	100.0%
	Male	2	14.3%	6	42.9%	6	42.9%	0	0.0%	14	100.0%
Wrestling	Male	1	33.3%	2	66.7%	0	0.0%	0	0.0%	3	100.0%

Table 5b: Number of Indirect catastrophic injuries/illnesses by severity by sport: College all years combined

		Serious		Fatal		Unknown		All	
		N	%	N	%	N	%	N	%
Baseball	Male	2	25.0%	5	62.5%	1	12.5%	8	100.0%
Basketball	Female	3	37.5%	5	62.5%	0	0.0%	8	100.0%
	Male	17	32.1%	36	67.9%	0	0.0%	53	100.0%
Cross Country	Female	0	0.0%	1	100.0%	0	0.0%	1	100.0%
	Male	1	33.3%	2	66.7%	0	0.0%	3	100.0%
Football	Male	13	16.3%	66	82.5%	1	1.3%	80	100.0%
Gymnastics	Female	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Ice Hockey	Male	3	75.0%	1	25.0%	0	0.0%	4	100.0%
Lacrosse	Male	0	0.0%	2	100.0%	0	0.0%	2	100.0%
Rowing	Male	0	0.0%	2	100.0%	0	0.0%	2	100.0%
Skiing	Male	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Soccer	Female	1	25.0%	3	75.0%	0	0.0%	4	100.0%
	Male	2	25.0%	6	75.0%	0	0.0%	8	100.0%
Swimming	Female	1	25.0%	3	75.0%	0	0.0%	4	100.0%
	Male	0	0.0%	8	100.0%	0	0.0%	8	100.0%
Tennis	Female	0	0.0%	1	100.0%	0	0.0%	1	100.0%
	Male	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Track and Field	Male	3	60.0%	2	40.0%	0	0.0%	5	100.0%
Volleyball	Female	2	50.0%	2	50.0%	0	0.0%	4	100.0%
Water Polo	Male	0	0.0%	2	100.0%	0	0.0%	2	100.0%
Wrestling	Male	3	33.3%	6	66.7%	0	0.0%	9	100.0%

Table 6a: Number of Catastrophic injuries/illnesses by Severity by year: High school

	Fatal		Non-fatal		Serious	
	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
1982-1983	25	0.49	10	0.20	15	0.30
1983-1984	23	0.46	15	0.30	11	0.22
1984-1985	17	0.34	13	0.26	12	0.24
1985-1986	10	0.20	15	0.29	16	0.31
1986-1987	26	0.51	12	0.23	12	0.23
1987-1988	17	0.33	25	0.48	27	0.52
1988-1989	21	0.40	19	0.37	17	0.33
1989-1990	24	0.46	26	0.50	15	0.29
1990-1991	23	0.44	15	0.29	9	0.17
1991-1992	12	0.23	9	0.17	15	0.28
1992-1993	23	0.43	14	0.26	14	0.26
1993-1994	22	0.40	14	0.25	16	0.29
1994-1995	12	0.21	14	0.25	13	0.23
1995-1996	19	0.32	13	0.22	9	0.15
1996-1997	24	0.40	16	0.26	14	0.23
1997-1998	24	0.38	23	0.37	12	0.19
1998-1999	31	0.48	13	0.20	23	0.36
1999-2000	33	0.51	16	0.25	11	0.17
2000-2001	26	0.39	15	0.23	11	0.17
2001-2002	28	0.43	19	0.29	17	0.26
2002-2003	21	0.31	11	0.16	13	0.19
2003-2004	17	0.25	23	0.34	15	0.22
2004-2005	34	0.50	15	0.22	7	0.10
2005-2006	20	0.29	12	0.17	11	0.16
2006-2007	21	0.29	23	0.32	18	0.25
2007-2008	23	0.32	15	0.21	29	0.40
2008-2009	28	0.38	30	0.41	33	0.45
2009-2010	24	0.32	21	0.28	26	0.35
2010-2011	23	0.31	16	0.22	21	0.28
2011-2012	22	0.30	24	0.32	18	0.24
2012-2013	21	0.28	6	0.08	6	0.08
2013-2014	24	0.33	9	0.12	25	0.34
2014-2015	24	0.32	7	0.09	33	0.44
2015-2016	28	0.37	10	0.13	43	0.57
2016-2017	16	0.21	5	0.07	32	0.42
2017-2018	16	0.21	7	0.09	37	0.48

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

Table 6b: Number of Catastrophic injuries/illnesses by Severity by year: College

	Fatal		Non-fatal		Serious	
	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
1982-1983	7	2.73	3	1.17	1	0.39
1983-1984	5	1.85	2	0.74	6	2.22
1984-1985	1	0.35	3	1.04	5	1.73
1985-1986	4	1.38	4	1.38	8	2.75
1986-1987	5	1.80	2	0.72	11	3.96
1987-1988	7	2.64	1	0.38	7	2.64
1988-1989	4	1.49	4	1.49	9	3.34
1989-1990	3	1.14	2	0.76	4	1.51
1990-1991	5	1.82	6	2.18	4	1.45
1991-1992	5	1.78	1	0.36	5	1.78
1992-1993	3	1.05	0	0.00	6	2.11
1993-1994	7	2.39	0	0.00	4	1.37
1994-1995	3	1.01	3	1.01	6	2.02
1995-1996	2	0.60	4	1.19	2	0.60
1996-1997	3	0.91	5	1.51	1	0.30
1997-1998	9	2.68	1	0.30	5	1.49
1998-1999	2	0.56	3	0.84	5	1.40
1999-2000	2	0.56	2	0.56	5	1.40
2000-2001	7	1.89	4	1.08	6	1.62
2001-2002	10	2.74	1	0.27	3	0.82
2002-2003	6	1.60	3	0.80	7	1.87
2003-2004	9	2.39	4	1.06	5	1.33
2004-2005	4	1.04	1	0.26	4	1.04
2005-2006	5	1.27	4	1.01	2	0.51
2006-2007	6	1.48	1	0.25	6	1.48
2007-2008	5	1.21	1	0.24	9	2.17
2008-2009	5	1.18	1	0.24	11	2.60
2009-2010	13	3.01	2	0.46	12	2.78
2010-2011	4	0.90	7	1.57	3	0.67
2011-2012	9	1.98	0	0.00	8	1.76
2012-2013	8	1.72	3	0.65	4	0.86
2013-2014	6	1.26	0	0.00	11	2.32
2014-2015	4	0.83	1	0.21	11	2.27
2015-2016	3	0.62	3	0.62	13	2.67
2016-2017	5	1.02	1	0.20	17	3.45
2017-2018	5	1.01	1	0.20	13	2.63

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

Table 7a: Rate of direct catastrophic injuries/illnesses by severity by year: High school

	Fatal		Non-fatal		Serious	
	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
1982-1983	10	0.20	10	0.20	15	0.30
1983-1984	8	0.16	15	0.30	11	0.22
1984-1985	6	0.12	13	0.26	12	0.24
1985-1986	3	0.06	15	0.29	16	0.31
1986-1987	13	0.25	12	0.23	11	0.21
1987-1988	5	0.10	25	0.48	27	0.52
1988-1989	8	0.15	19	0.37	16	0.31
1989-1990	5	0.10	26	0.50	14	0.27
1990-1991	4	0.08	15	0.29	9	0.17
1991-1992	4	0.08	9	0.17	15	0.28
1992-1993	4	0.08	14	0.26	14	0.26
1993-1994	5	0.09	14	0.25	16	0.29
1994-1995	2	0.04	14	0.25	13	0.23
1995-1996	4	0.07	13	0.22	9	0.15
1996-1997	10	0.16	16	0.26	14	0.23
1997-1998	8	0.13	23	0.37	12	0.19
1998-1999	8	0.13	13	0.20	23	0.36
1999-2000	7	0.11	16	0.25	10	0.16
2000-2001	4	0.06	15	0.23	11	0.17
2001-2002	9	0.14	19	0.29	17	0.26
2002-2003	3	0.04	11	0.16	13	0.19
2003-2004	3	0.04	23	0.34	15	0.22
2004-2005	5	0.07	15	0.22	6	0.09
2005-2006	4	0.06	12	0.17	9	0.13
2006-2007	2	0.03	22	0.31	16	0.22
2007-2008	2	0.03	15	0.21	28	0.39
2008-2009	10	0.14	30	0.41	29	0.40
2009-2010	2	0.03	20	0.27	21	0.28
2010-2011	6	0.08	16	0.22	18	0.24
2011-2012	4	0.05	24	0.32	18	0.24
2012-2013	4	0.05	5	0.07	4	0.05
2013-2014	8	0.11	9	0.12	12	0.16
2014-2015	6	0.08	6	0.08	9	0.12
2015-2016	8	0.11	10	0.13	27	0.36
2016-2017	2	0.03	5	0.07	14	0.18
2017-2018	3	0.04	7	0.09	16	0.21

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

Table 7b: Rate of direct catastrophic injuries/illnesses by severity by year: College

	Fatal		Non-fatal		Serious	
	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
1982-1983	1	0.39	3	1.17	1	0.39
1983-1984	0	0.00	2	0.74	6	2.22
1984-1985	1	0.35	3	1.04	5	1.73
1985-1986	3	1.03	4	1.38	8	2.75
1986-1987	1	0.36	2	0.72	11	3.96
1987-1988	0	0.00	1	0.38	7	2.64
1988-1989	0	0.00	4	1.49	9	3.34
1989-1990	1	0.38	2	0.76	4	1.51
1990-1991	1	0.36	6	2.18	4	1.45
1991-1992	1	0.36	1	0.36	4	1.43
1992-1993	1	0.35	0	0.00	6	2.11
1993-1994	2	0.68	0	0.00	4	1.37
1994-1995	0	0.00	3	1.01	6	2.02
1995-1996	0	0.00	4	1.19	2	0.60
1996-1997	1	0.30	5	1.51	1	0.30
1997-1998	1	0.30	1	0.30	4	1.19
1998-1999	2	0.56	3	0.84	5	1.40
1999-2000	2	0.56	2	0.56	5	1.40
2000-2001	2	0.54	4	1.08	6	1.62
2001-2002	1	0.27	1	0.27	3	0.82
2002-2003	1	0.27	3	0.80	6	1.60
2003-2004	3	0.80	4	1.06	5	1.33
2004-2005	1	0.26	1	0.26	3	0.78
2005-2006	0	0.00	4	1.01	2	0.51
2006-2007	0	0.00	1	0.25	6	1.48
2007-2008	0	0.00	1	0.24	8	1.93
2008-2009	0	0.00	1	0.24	8	1.89
2009-2010	4	0.93	2	0.46	10	2.32
2010-2011	0	0.00	7	1.57	2	0.45
2011-2012	2	0.44	0	0.00	7	1.54
2012-2013	0	0.00	3	0.65	3	0.65
2013-2014	1	0.21	0	0.00	1	0.21
2014-2015	0	0.00	1	0.21	5	1.03
2015-2016	0	0.00	3	0.62	11	2.26
2016-2017	0	0.00	1	0.20	5	1.02
2017-2018	2	0.40	1	0.20	5	1.01

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

Table 8a: Rate of indirect catastrophic injuries/illnesses by severity by year: High School

	Fatal		Non-fatal		Serious	
	N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
1982-1983	15	0.3	0	0	0	0
1983-1984	15	0.3	0	0	0	0
1984-1985	11	0.22	0	0	0	0
1985-1986	7	0.14	0	0	0	0
1986-1987	13	0.25	0	0	1	0.02
1987-1988	12	0.23	0	0	0	0
1988-1989	13	0.25	0	0	1	0.02
1989-1990	19	0.37	0	0	1	0.02
1990-1991	19	0.36	0	0	0	0
1991-1992	8	0.15	0	0	0	0
1992-1993	19	0.36	0	0	0	0
1993-1994	17	0.31	0	0	0	0
1994-1995	10	0.18	0	0	0	0
1995-1996	15	0.25	0	0	0	0
1996-1997	14	0.23	0	0	0	0
1997-1998	16	0.26	0	0	0	0
1998-1999	23	0.36	0	0	0	0
1999-2000	26	0.4	0	0	1	0.02
2000-2001	22	0.33	0	0	0	0
2001-2002	19	0.29	0	0	0	0
2002-2003	18	0.27	0	0	0	0
2003-2004	14	0.21	0	0	0	0
2004-2005	29	0.42	0	0	1	0.01
2005-2006	16	0.23	0	0	2	0.03
2006-2007	19	0.27	1	0.01	2	0.03
2007-2008	21	0.29	0	0	1	0.01
2008-2009	18	0.25	0	0	4	0.05
2009-2010	22	0.3	1	0.01	5	0.07
2010-2011	17	0.23	0	0	3	0.04
2011-2012	18	0.24	0	0	0	0
2012-2013	17	0.23	1	0.01	2	0.03
2013-2014	16	0.22	0	0	13	0.18
2014-2015	18	0.24	1	0.01	24	0.32
2015-2016	20	0.26	0	0	16	0.21
2016-2017	14	0.18	0	0	18	0.23
2017-2018	13	0.17	0	0	21	0.27

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

Table 8b: Rate of indirect catastrophic injuries/illnesses by severity by year: College

	N	Fatal Rate per 100,000	N	Serious Rate per 100,000
1982-1983	6	2.34	0	0
1983-1984	5	1.85	0	0
1985-1986	1	0.34	0	0
1986-1987	4	1.44	0	0
1987-1988	7	2.64	0	0
1988-1989	4	1.49	0	0
1989-1990	2	0.76	0	0
1990-1991	4	1.45	0	0
1991-1992	4	1.43	1	0.36
1992-1993	2	0.7	0	0
1993-1994	5	1.71	0	0
1994-1995	3	1.01	0	0
1995-1996	2	0.6	0	0
1996-1997	2	0.6	0	0
1997-1998	8	2.38	1	0.3
2000-2001	5	1.35	0	0
2001-2002	9	2.47	0	0
2002-2003	5	1.34	1	0.27
2003-2004	6	1.59	0	0
2004-2005	3	0.78	1	0.26
2005-2006	5	1.27	0	0
2006-2007	6	1.48	0	0
2007-2008	5	1.21	1	0.24
2008-2009	5	1.18	3	0.71
2009-2010	9	2.08	2	0.46
2010-2011	4	0.9	1	0.22
2011-2012	7	1.54	1	0.22
2012-2013	8	1.72	1	0.22
2013-2014	5	1.05	10	2.11
2014-2015	4	0.83	6	1.24
2015-2016	3	0.62	2	0.41
2016-2017	5	1.02	12	2.44
2017-2018	3	0.61	8	1.62

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

**Table 9a: Rate of Direct catastrophic injuries/illnesses by level and severity by sport:
High school**

		N	Fatal Rate per 100,000	N	Non-fatal Rate per 100,000	N	Serious Rate per 100,000
Baseball	Male	15	0.09	21	0.13	28	0.17
Basketball	Female	0	0	3	0.02	3	0.02
	Male	1	0.01	4	0.02	9	0.05
Cheerleading	Female	1	0.04	23	0.98	42	1.8
	Male	0	0	1	1.71	1	1.71
Cross Country	Female	2	0.04	0	0	0	0
	Male	1	0.02	2	0.03	0	0
Field Hockey	Female	0	0	1	0.05	0	0
Football	Male	137	0.38	411	1.14	403	1.12
Golf	Male	0	0	0	0	1	0.02
Gymnastics	Female	0	0	7	0.85	4	0.48
	Male	1	0.84	2	1.68	1	0.84
Ice Hockey	Female	0	0	1	0.61	2	1.22
	Male	4	0.37	14	1.3	11	1.02
Lacrosse	Female	0	0	0	0	2	0.14
	Male	2	0.11	6	0.32	9	0.48
Skiing	Female	1	0.33	0	0	0	0
Soccer	Female	2	0.02	1	0.01	5	0.06
	Male	7	0.06	2	0.02	7	0.06
Softball	Female	0	0	1	0.01	6	0.05
Swimming	Female	0	0	5	0.11	1	0.02
	Male	1	0.03	6	0.16	3	0.08
Track and Field	Female	1	0.01	2	0.01	7	0.04
	Male	21	0.11	17	0.09	14	0.07
Volleyball	Male	0	0	1	0.08	0	0
Wrestling	Male	3	0.03	39	0.44	24	0.27

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

**Table 9b: Rate of Direct catastrophic injuries/illnesses by level and severity by sport:
College**

		N	Fatal Rate per 100,000	N	Non-fatal Rate per 100,000	N	Serious Rate per 100,000
Baseball	Male	3	0.32	7	0.74	9	0.95
Basketball	Male	1	0.18	1	0.18	9	1.62
Cheerleading	Female	1	0	13	0	13	0
	Male	0	0	2	0	3	0
Equestrian	Female	1	3.88	0	0	0	0
Field Hockey	Female	0	0	0	0	2	1.03
Football	Male	17	0.81	48	2.28	145	6.89
Gymnastics	Female	0	0	2	3.72	0	0
	Male	0	0	1	5.37	2	10.74
Ice Hockey	Female	0	0	0	0	1	2.54
	Male	0	0	5	3.56	7	4.98
Lacrosse	Female	0	0	2	0.98	0	0
	Male	4	1.46	1	0.36	1	0.36
Rowing	Male	1	1.28	0	0	0	0
Skiing	Female	1	5.59	1	5.59	0	0
	Male	1	4.62	0	0	0	0
Soccer	Female	0	0	2	0.34	2	0.34
	Male	0	0	1	0.15	2	0.3
Softball	Female	0	0	0	0	3	0.58
Swimming	Male	0	0	1	0.34	0	0
Track and Field	Female	0	0	1	0.08	1	0.08
	Male	6	0.41	6	0.41	2	0.14
Wrestling	Male	0	0	2	0.81	1	0.41

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

Table 10a: Indirect catastrophic events by level and severity: High school

		N	Fatal Rate per 100,000	N	Non-fatal Rate per 100,000	N	Serious Rate per 100,000
Baseball	Male	21	0.13	0	0	5	0.03
Basketball	Female	16	0.1	0	0	2	0.01
	Male	133	0.69	0	0	29	0.15
Cheerleading	Female	8	0.34	0	0	4	0.17
Cross Country	Female	10	0.18	0	0	4	0.07
	Male	21	0.32	0	0	5	0.08
Field Hockey	Female	2	0.1	0	0	0	0
Football	Male	241	0.67	2	0.01	40	0.11
Ice Hockey	Male	5	0.46	0	0	3	0.28
Lacrosse	Female	1	0.07	0	0	0	0
	Male	10	0.53	0	0	1	0.05
Rowing	Male	0	0	0	0	1	1.79
Soccer	Female	11	0.12	0	0	2	0.02
	Male	30	0.26	1	0.01	8	0.07
Softball	Female	1	0.01	0	0	0	0
Swimming	Female	8	0.17	0	0	2	0.04
	Male	7	0.19	0	0	1	0.03
Tennis	Female	2	0.04	0	0	0	0
	Male	4	0.08	0	0	0	0
Track and Field	Female	6	0.04	1	0.01	0	0
	Male	37	0.19	0	0	6	0.03
Volleyball	Female	1	0.01	0	0	2	0.02
Water Polo	Female	1	0.26	0	0	0	0
	Male	3	0.57	0	0	0	0
Wrestling	Male	30	0.34	0	0	5	0.06

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

Table 10b: Indirect catastrophic events by level and severity: College

		N	Fatal Rate per 100,000	N	Serious Rate per 100,000
Baseball	Male	5	0.53	2	0.21
Basketball	Female	5	1.02	3	0.61
	Male	36	6.46	17	3.05
Cross Country	Female	1	0.25	0	0
	Male	2	0.49	1	0.24
Football	Male	66	3.14	13	0.62
Gymnastics	Female	1	1.86	0	0
Ice Hockey	Male	1	0.71	3	2.13
Lacrosse	Male	2	0.73	0	0
Rowing	Male	2	2.57	0	0
Skiing	Male	1	4.62	0	0
Soccer	Female	3	0.51	1	0.17
	Male	6	0.9	2	0.3
Swimming	Female	3	0.84	1	0.28
	Male	8	2.7	0	0
Tennis	Female	1	0.34	0	0
	Male	1	0.36	0	0
Track and Field	Male	2	0.14	3	0.21
Volleyball	Female	2	0.43	2	0.43
Water Polo	Male	2	5.63	0	0
Wrestling	Male	6	2.44	3	1.22

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

Table 11: Characteristics of all sport-related catastrophic events during AY 2017-2018

	Direct		Indirect		All	
	N	%	N	%	N	%
Total	39	100.0%	46	100.0%	85	100.0%
Sport Level						
Collegiate/University	8	20.5%	11	23.9%	19	22.4%
High School Sponsored	31	79.5%	35	76.1%	66	77.6%
Severity						
Serious	21	53.8%	30	65.2%	51	60.0%
Non-fatal	8	20.5%	0	0.0%	8	9.4%
Fatal	5	12.8%	16	34.8%	21	24.7%
Unknown	5	12.8%	0	0.0%	5	5.9%
Sex						
Female	3	7.7%	3	6.5%	6	7.1%
Male	36	92.3%	43	93.5%	79	92.9%
Month						
Jul-Aug	5	12.8%	10	21.7%	15	17.6%
Sep-Oct	28	71.8%	13	28.3%	41	48.2%
Nov-Dec	0	0.0%	7	15.2%	7	8.2%
Jan-Feb	2	5.1%	6	13.0%	8	9.4%
Mar-Apr	1	2.6%	4	8.7%	5	5.9%
May-Jun	3	7.7%	6	13.0%	9	10.6%
Sport						
Baseball	2	5.1%	2	4.3%	4	4.7%
Basketball	0	0.0%	13	28.3%	13	15.3%
Cheerleading	0	0.0%	1	2.2%	1	1.2%
Cross Country	1	2.6%	2	4.3%	3	3.5%
Football	31	79.5%	15	32.6%	46	54.1%
Ice Hockey	1	2.6%	0	0.0%	1	1.2%
Lacrosse	1	2.6%	2	4.3%	3	3.5%
Soccer	2	5.1%	6	13.0%	8	9.4%
Swimming	0	0.0%	2	4.3%	2	2.4%
Track and Field	0	0.0%	2	4.3%	2	2.4%
Wrestling	1	2.6%	1	2.2%	2	2.4%
Sponsored activity						
Official school or team related ATHLETIC activity (e.g. official practice, team strength/fitness training or competition)	39	100.0%	37	80.4%	76	89.4%
Personal athletic activity (e.g. individual strength/fitness or practice, non-team related)	0	0.0%	9	19.6%	9	10.6%
Location						
Athlete's Home	0	0.0%	2	4.3%	2	2.4%
Competitive Venue (e.g. arena, stadium, track, field)	33	84.6%	22	47.8%	55	64.7%

	Direct		Indirect		All	
	N	%	N	%	N	%
Other Private Property	0	0.0%	1	2.2%	1	1.2%
Public Park or Street	1	2.6%	1	2.2%	2	2.4%
School Athletic Facility (e.g. weight room, practice field)	5	12.8%	19	41.3%	24	28.2%
School Campus (not at an athletic facility)	0	0.0%	1	2.2%	1	1.2%
Event Type						
Competition/Game	27	69.2%	16	34.8%	43	50.6%
Conditioning Session	1	2.6%	3	6.5%	4	4.7%
Other	0	0.0%	1	2.2%	1	1.2%
Practice	10	25.6%	15	32.6%	25	29.4%
Scrimmage	1	2.6%	3	6.5%	4	4.7%
Strength/Weight Session	0	0.0%	2	4.3%	2	2.4%
Unaffiliated Recreational Activity	0	0.0%	6	13.0%	6	7.1%
Player action						
5,000 m/3mi	0	0.0%	2	4.3%	2	2.4%
Being blocked	2	5.1%	0	0.0%	2	2.4%
Being tackled	5	12.8%	0	0.0%	5	5.9%
Blocking	2	5.1%	1	2.2%	3	3.5%
Conditioning (land)	1	2.6%	10	21.7%	11	12.9%
Conditioning (water)	0	0.0%	1	2.2%	1	1.2%
Defending	1	2.6%	0	0.0%	1	1.2%
Fielding	2	5.1%	0	0.0%	2	2.4%
Fitness - Other	0	0.0%	1	2.2%	1	1.2%
General play	2	5.1%	11	23.9%	13	15.3%
Heading ball	1	2.6%	0	0.0%	1	1.2%
Other	0	0.0%	3	6.5%	3	3.5%
Penalty shot	0	0.0%	1	2.2%	1	1.2%
Receiving pass	1	2.6%	0	0.0%	1	1.2%
Running	1	2.6%	0	0.0%	1	1.2%
Running (middle/long distance)	1	2.6%	0	0.0%	1	1.2%
Running (sprints)	0	0.0%	1	2.2%	1	1.2%
Tackling	9	23.1%	0	0.0%	9	10.6%
Takedown	1	2.6%	0	0.0%	1	1.2%
Throwing	0	0.0%	1	2.2%	1	1.2%
Throwing - discus	0	0.0%	1	2.2%	1	1.2%
Unknown	10	25.6%	12	26.1%	22	25.9%
Weights	0	0.0%	1	2.2%	1	1.2%
Basic Mechanism						
Contact with Another Player	22	56.4%	0	0.0%	22	25.9%
Contact with Apparatus or Object	5	12.8%	0	0.0%	5	5.9%
Contact with Ground/Surface	4	10.3%	0	0.0%	4	4.7%
Environmental (e.g., lightning strike)	0	0.0%	6	13.0%	6	7.1%
Infection or Illness	0	0.0%	37	80.4%	37	43.5%

	Direct		Indirect		All	
	N	%	N	%	N	%
No Direct or Indirect Contact	0	0.0%	2	4.3%	2	2.4%
Other	1	2.6%	1	2.2%	2	2.4%
Unknown	7	17.9%	0	0.0%	7	8.2%
Major Injury Category						
Head Injury	13	33.3%	0	0.0%	13	15.3%
Heat-related injury	0	0.0%	8	17.4%	8	9.4%
Hit in the Chest	2	5.1%	0	0.0%	2	2.4%
Other	0	0.0%	4	8.7%	4	4.7%
Other Traumatic Injury	6	15.4%	0	0.0%	6	7.1%
Spinal Cord Injury	18	46.2%	0	0.0%	18	21.2%
Sudden Cardiac Arrest	0	0.0%	33	71.7%	33	38.8%
Unknown at this time	0	0.0%	1	2.2%	1	1.2%
Detailed Injury Category						
Cardiac/Sudden Cardiac Arrest (not Commotio Cordis)	0	0.0%	33	71.7%	33	38.8%
Commotio Cordis (external blunt chest wall impact resulting in Cardiac Arrest)	2	5.1%	0	0.0%	2	2.4%
Heat-Related Injury (e.g. Heatstroke)	0	0.0%	7	15.2%	7	8.2%
Other	0	0.0%	5	10.9%	5	5.9%
Other Traumatic Injury (e.g. Ruptured Spleen)	7	17.9%	0	0.0%	7	8.2%
Rhabdomyolysis	0	0.0%	1	2.2%	1	1.2%
Spinal Cord Injury with a Fracture	6	15.4%	0	0.0%	6	7.1%
Spinal Cord Injury without Spine Fracture	7	17.9%	0	0.0%	7	8.2%
Spine Fracture	5	12.8%	0	0.0%	5	5.9%
Traumatic Brain Injury (e.g. subdural hematoma)	12	30.8%	0	0.0%	12	14.1%
Injury Outcome						
Fatality/Sudden Death	5	12.8%	16	34.8%	21	24.7%
Non-trauma Survivor (e.g. sudden cardiac arrest, heat stroke, exertional sickling)	0	0.0%	30	65.2%	30	35.3%
Trauma-related Non-Fatality - Disability unknown/uncertain	5	12.8%	0	0.0%	5	5.9%
Trauma-related Non-Fatality with Permanent Disability	8	20.5%	0	0.0%	8	9.4%
Trauma-related Non-Fatality with Temporary Disability (full recovery expected or confirmed)	21	53.8%	0	0.0%	21	24.7%

Table 12. Participation numbers, 1982/83 to 2017/18

	High School ¹		College ²	
	Female	Male	Female	Male
Baseball	34,773	16,144,184	--	950,070
Basketball	15,372,149	19,235,256	491,881	556,893
Cheerleading³	2,338,643	58,423	--	--
Cross Country	5,633,433	6,659,059	406,777	411,912
Equestrian⁴	23,176	3,856	25,790	1,066
Field Hockey	2,046,821	5,220	194,935	--
Football	34,033	36,127,067	--	2,104,403
Golf	1,912,143	5,164,308	110,089	276,796
Gymnastics	825,004	119,240	53,833	18,625
Ice Hockey	163,692	1,080,963	39,439	140,620
Lacrosse	1,393,614	1,886,197	204,678	274,102
Rowing⁴	63,741	55,913	172,888	77,824
Skiing	301,388	360,539	17,875	21,667
Soccer	8,913,763	11,376,702	586,314	667,259
Softball	11,926,428	54,805	514,901	--
Swimming/Diving	4,572,514	3,653,574	357,602	296,230
Tennis	5,609,619	5,210,170	293,098	279,919
Track and Field⁵	16,174,896	19,834,884	1,259,684	1,451,603
Volleyball⁶	13,092,111	1,242,277	462,984	42,520
Water Polo	382,639	525,064	23,792	35,535
Wrestling	148,965	8,849,306	--	245,578

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

²NCAA accessed online: https://ncaaorg.s3.amazonaws.com/research/sportpart/Oct2018RES_2017-18SportsSponsorshipParticipationRatesReport.pdf

³Cheerleading is not an official sport for NCAA collegiate athletes.

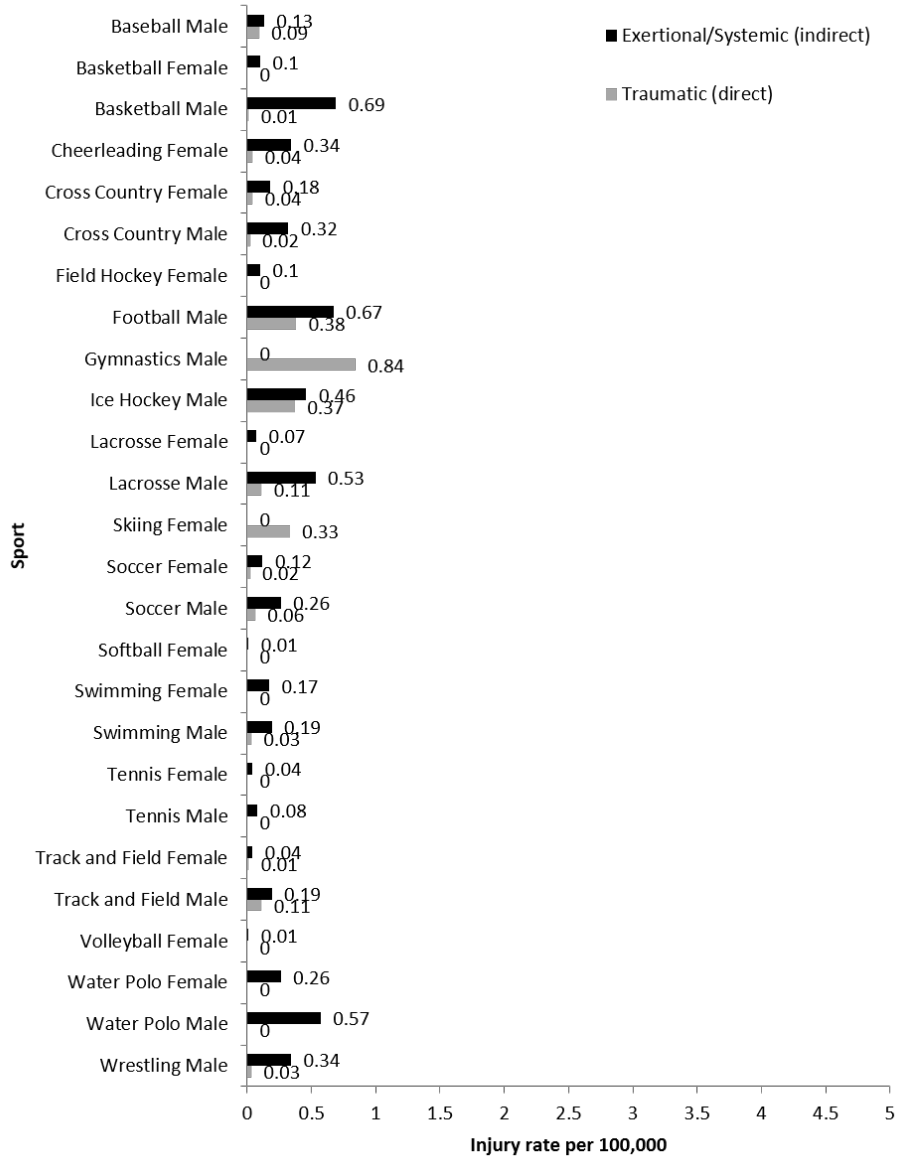
⁴Equestrian (male and female) and rowing (males) are non-championship NCAA collegiate sports.

⁵Includes both indoor and outdoor track and field.

⁶Includes sand volleyball.

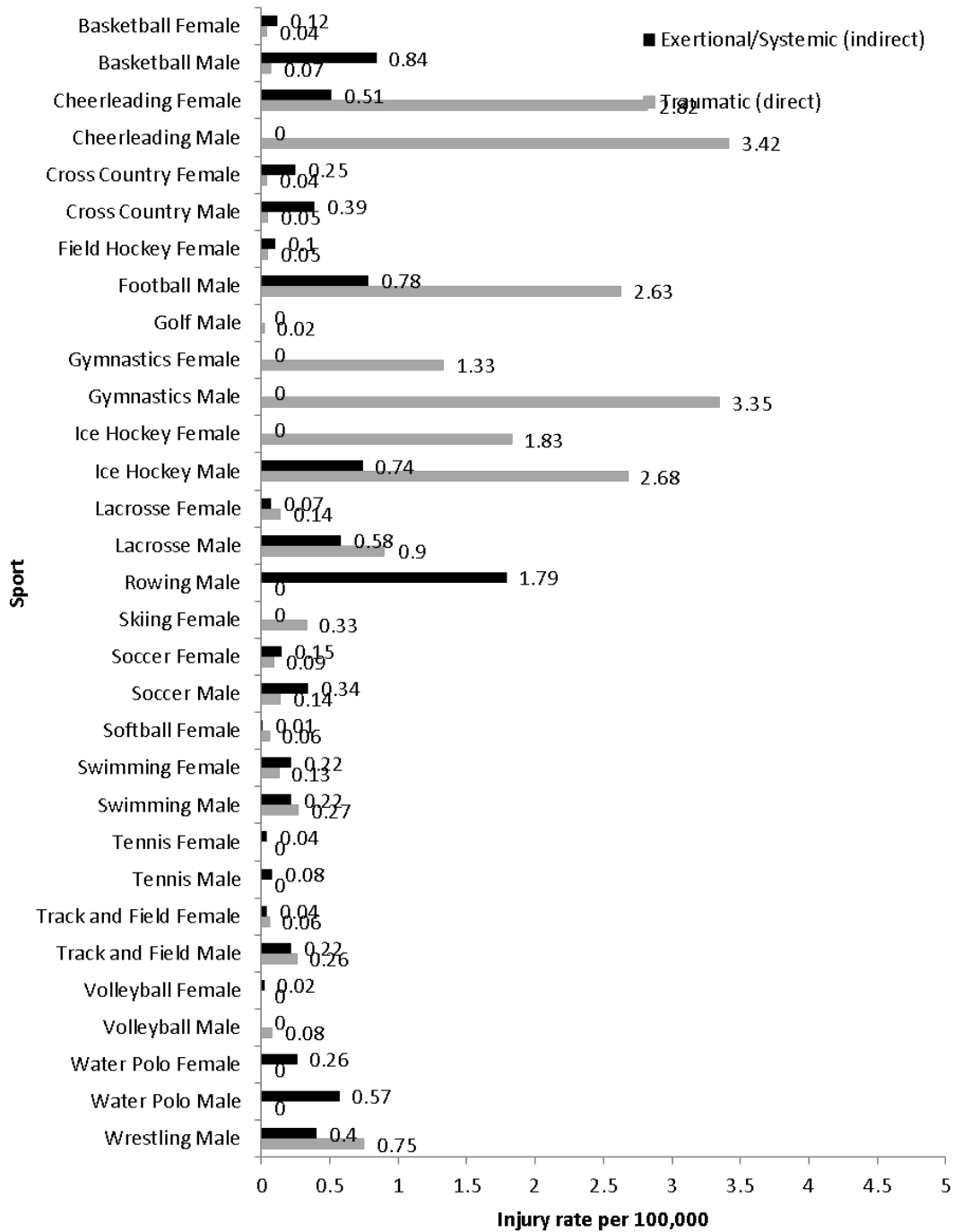
Note: Not all high schools and colleges are members of the NFHS and NCAA. Complete data are not available for the non-member schools. Therefore, these participation numbers underestimate the total number of high school and collegiate participants in the United States.

Figure 1: Rates of fatal catastrophic direct and indirect injuries/illnesses by sport-gender among high school participants, 1982/83-2017/18



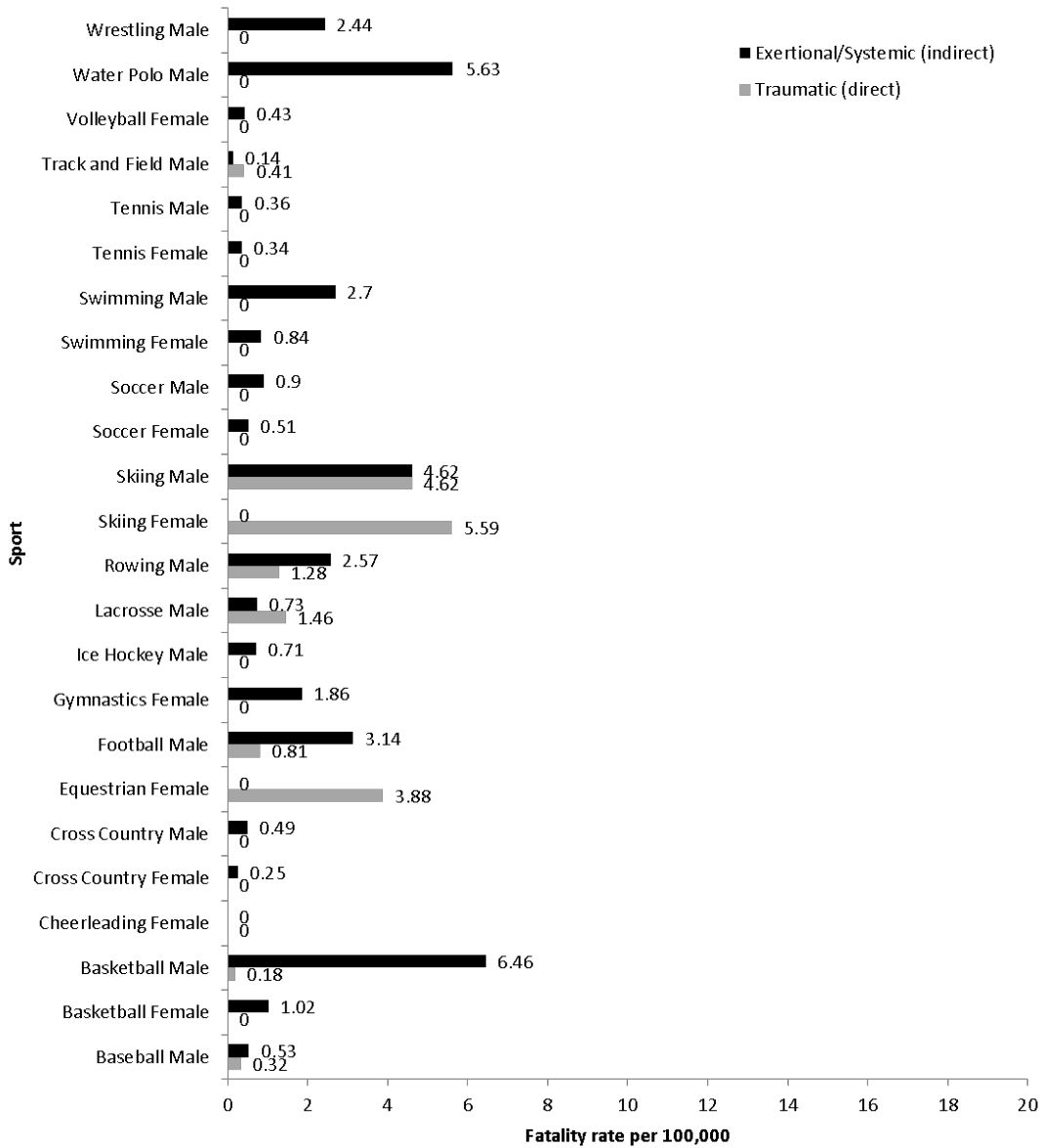
Note: Rates with number of incidents less than 5 should be interpreted with caution.

Figure 2: Rates of all catastrophic direct and indirect injuries/illnesses by sport-gender among high school participants, 1982/83-2017/18



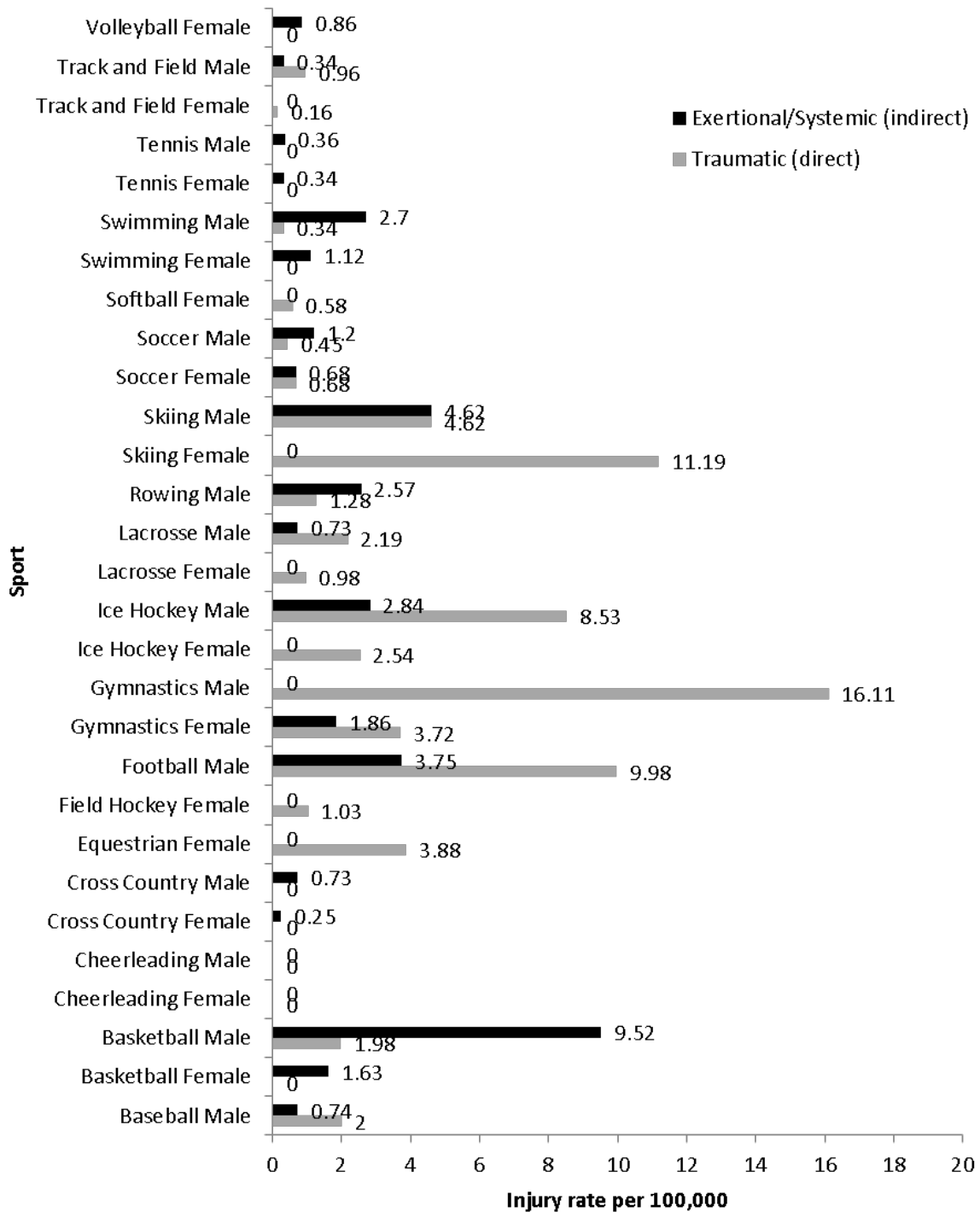
Note: Rates with number of incidents less than 5 should be interpreted with caution.

Figure 3: Rates of fatal catastrophic direct and indirect injuries/illnesses by sport-gender among collegiate participants, 1982/83-2017/18



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

Figure 4: Rates of all catastrophic direct and indirect injuries/illnesses by sport-gender among collegiate participants, 1982/83-2017/18



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