

**CATASTROPHIC
SPORTS INJURY RESEARCH**

THIRTY-FOURTH ANNUAL REPORT

FALL 1982 - SPRING 2016

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

Website: 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 has been directed for the past 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 2015/16 included approximately 7,866,265 athletes (4,541,959 males and 3,324,306 females). Yearly participation estimates for collegiate level athletes are obtained from the National Collegiate Athletic Association (NCAA) participation reports (accessed online: <https://www.ncaapublications.com/p-4445-2015-16-ncaa-sports-sponsorship-and-participation-rates-report.aspx>). NCAA participation for 2015/16 in championship sports was 486,859 athletes. There were 274,973 males and 211,886 females. There were also 3,472 males in non-championship sports (archery, badminton, bowling, equestrian, rowing, rugby, sailing, and squash) and 2,200 females participating in emerging sports (archery, badminton, equestrian, rugby, sand volleyball, squash, synchronized swimming, and team handball).

During the entire 34 year period from the fall of 1982 through the spring of 2016, there were 213,265,466 high school participant-seasons in the sports covered by this report and approximately 12,306,124 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 34-year period and stratified by level (high school and college) and sport. Incidence rates were stratified by direct versus indirect and by severity. Precision of incident rate estimates expressed by 95% confidence intervals are included in appendix tables.

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 AY2015-2016 Summary

From July 1, 2015 to June 30, 2016 there were a total of 112 catastrophic injuries/illnesses captured by NCCSIR among high school and college organized sport participants. Of these, 101 events were due to or occurred during sport-related activities (Table 11). There were also 11 catastrophic events that occurred during non-sport related activity. All were cardiac-related and are described in the Case Summaries.

Sport-related events: The majority of the sport-related catastrophic events (n=101) were at the high school level (81%, n=82). Member institutions for collegiate cases included NCAA, National Association of Intercollegiate Athletics (NAIA), and National Junior College Athletic Association (NJCAA). Overall 27.7% of cases were fatal, 18.8% were nonfatal, and 53.5% were serious with recovery. Sixty percent (n=61) were due to direct (traumatic injury) causes and over half occurred in competition (59.4%) followed by practice (29.7%). The majority of events occurred to athletes participating in the following sports: football (64.4%), basketball (5.9%),

soccer (5%), track and field (5%), baseball (4%) and swimming (4%). Areas of the body most commonly effected were heart (30.7%), neck/cervical spine (30.7%), and head/brain (20.8%). Fractures (24.6%) were the most common types of events followed by sudden cardiac arrest (11.9%) and other cardiac conditions (11.9%), brain trauma (15.9%), and heat-related illness (6.9%).

Direct events: 14.8% of direct events were fatal, 31.1% non-fatal, and 54.1% serious with recovery. A greater proportion of direct events occurred in competition versus practice (80.3% versus 14.8%). The majority were to the cervical spine (50.8%) and head/brain (31.1%) followed by the heart (including commotio cordis), lumbar/thoracic spine, and eye (4.9% each). The majority occurred in football (83.6%).

Indirect events: 47.5% of indirect events were fatal and 52.5% were serious with recovery. A greater proportion of indirect events occurred in practice versus competition (52.5% versus 27.5%) and 12.5% occurred during conditioning and weight training sessions. The majority were cardiac-related (60%) and heat/exertional related (22.5%). Football (35%), basketball (15%), and soccer (12.5%) comprised the majority, followed by track and field (7.5%), swimming (7.5%), baseball (5%), cross country (5%), and volleyball (5%).

Overall Summary

During this 34-year period, there were 2,477 catastrophic sport-related injuries/illnesses at high school and college levels (Table 1 – excluding cheerleading, drill team, and rodeo there were 2,359). The majority were non-fatal (62%) and from traumatic or direct mechanisms (67%), and among high school participants (80%). The proportion of fatal (39% versus 35%) and direct (67% versus 65%) were not different by high school compared to college level.

The 101 sport-related catastrophic injuries and conditions captured in 2015/16 represents a 20% increase from the previous year and the highest number of catastrophic events captured since 2009/10 when 102 events were captured. The increase was a results of a higher number of traumatic brain and cervical spine/spinal cord injuries in 2015/16. *Note: see limitations regarding the interpretation of this percentage increase.*

Direct by sport: For high school sports, football had the highest *number* of 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, cheerleading, male gymnastics, football, and 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 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, ice hockey, equestrian and male gymnastics had the highest rates per 100,000 participants (Figure 4, Table 9b). Similar results were observed when restricted to fatal events (Figure 3).

Indirect by sport: For high school sports, football had the highest *number* of indirect catastrophic events, followed by male basketball, male track and field, wrestling, male soccer, male cross country, and baseball (Table 4b). Accounting for the number of participants in the sport, wrestling, football, male basketball, male lacrosse, male water polo, and female cheer 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 indirect catastrophic events, followed by male basketball, female basketball, male soccer, male swimming and wrestling (Table 5b). Accounting for the number of participants in the sport, male basketball, male water polo, male wrestling, football, 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 was 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 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 automatic electronic defibrillator (AED) should be available and accessible onsite and 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 indirect cardiac related events has increased over the years and it is recommended that schools have an 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?code=nata-site>) 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 heat illness: <http://ksi.uconn.edu/wp-content/uploads/sites/1222/2015/03/Preventing-Surviving-EHS.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 with 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:** Updated guidelines for the care of the spinal cord injured athlete can be found at the NATA's website: <http://www.nata.org/sites/default/files/Executive-Summary-Spine-Injury-updated.pdf>. The final guidelines "Appropriate Prehospital Management of the Spine-Injured Athlete" will be published in the Journal of Athletic Training when completed.

- See also Swartz et al. 2009 for information about cervical spinal injury management and prevention:
<http://www.nata.org/sites/default/files/AcuteMgmtOfCervicalSpineInjuredAthlete.pdf>

CASE SUMMARIES AY2015/16

**Compiled from available media reports (n=112 events captured by NCCSIR).*

COLLEGE/UNIVERSITY

College/University Baseball Direct

A male 22 year old college baseball pitcher was sitting in the dugout during a game when a foul ball was batted at him. It struck him on his temple. He was transported to the hospital. No other information is known.

College/University Baseball Indirect

A male 19 year old collegiate sophomore baseball player collapsed during a game while he was in his native country and died. Cause of death is unknown but is suspected to be cardiac related.

College/University Baseball Not sport-related

A male 19 year old college freshman baseball player died in his sleep. Cause of death was due to heart failure from cardiomyopathy. He has been diagnosed a month earlier and was not wearing his defibrillator vest.

A male 21 year old college junior baseball player collapsed at a friends house after practice. CPR was administered before EMS arrived. He was diagnosed with Wolff Parkinson White Syndrome. A full recovery is expected.

College/University Basketball Not sport-related

A male 20 year old college junior basketball center collapsed at home. CPR was administered by first responders before he was transported to the hospital. Cause of death is suspected to be related to an enlarged heart.

College/University Football Direct

A 23 year old male college sophomore football linebacker was trying to make a tackle during practice when he injured his neck. He was attended to by athletic trainers before being transported to the hospital. He was diagnosed with a fractured neck and a slipped disc. He underwent surgery and a full recovery is expected.

A male college junior football linebacker collided with another player during the 1st quarter of a game. He was transported to the hospital where he was diagnosed with five fractured vertebrae. He underwent surgery and is slowly regaining feeling. He was transferred to a rehabilitation facility and is paralyzed from the waist down.

A male college junior football wide receiver jumped into the air to catch a pass during the first game of the season. After catching the ball, he crashed into the goalpost. His body went numb

and he was immediately attended to by athletic trainers. He was transported to the hospital where he was diagnosed with a fractured bone in his neck. He wore a neck brace and was out for the season. A full recovery is expected.

A male college redshirt freshman football cornerback sustained a neck injury during a game. He was diagnosed with fractured vertebrae. A full recovery is expected but he is out for the season.

A male college freshman football free safety collided with a teammate during football practice. He fell to the ground and was unconscious and unable to move. He was immediately attended to by athletic trainers before being transported to the hospital. He was diagnosed with a fractured C1 and C2 vertebrae. He underwent surgery and was placed in a halo brace. He has regained feeling and movement in all extremities. He is expected to have a long but full recovery.

A male college sophomore football linebacker sustained a neck injury during practice from a head to head collision. He was transported to the hospital but released the following day with a neck brace. A full recovery is expected.

A male college junior football quarterback sustained a neck injury during a game. He was carted off the field with numbness in his hands. No serious damage was found. A full recovery is expected.

A male college sophomore football wide receiver was attempting to make a block in the 3rd quarter of a game. He did not get up after the play and was immediately attended to by athletic trainers before being transported to the hospital. He underwent surgery on his neck/spine and has regained movement in his upper body. Long term prognosis is unknown.

A male 21 year old college junior quarterback injured his neck during the 4th quarter of a game. He was diagnosed with fractured cervical vertebrae and surgery was recommended. A full recovery is expected.

A male 19 year old college freshman running back was grabbed by his facemask during a game in the 3rd quarter. He was taken off the field on a backboard and transported to the hospital. He underwent surgery on his neck and was released from the hospital two days later. No other information was released but a full recovery is expected.

A male 21 year old college sophomore football offensive lineman was blocking on a field goal attempt during a game when he sustained a neck injury. He was carted off the field and diagnosed with a spinal cord contusion. A full recovery is expected.

A male 21 year old college junior football offensive tackle was participating in a conditioning session when he was hit in the eye with a stretch band. He was taken to the hospital but the injury resulted in vision loss.

College/University Football Indirect

A male 20 year old college sophomore football defensive end had a medical emergency during a team conditioning session. He was transported to the hospital. He died a week later. Cause of death is currently unknown but is suspected to be cardiac related.

College/University Football Not sport-related

A male 20 year old college junior redshirt football player was found unresponsive at his home. He was pronounced dead at the hospital. Cause of death was due to hypertrophic cardiomyopathy.

College/University Rodeo Direct

A male 19 year old college freshman rodeo athlete was competing in a bareback bronc riding event when he was thrown from his horse and trampled. He was attended to by EMS before being transported to the hospital. He died as a result of his injuries. Cause of death is due to blunt force chest trauma (commotio cordis).

College/University Soccer Indirect

A female 21 year old college soccer player collapsed during practice. She was immediately attended to by an athletic trainer and support staff, who administered CPR. She was transported to the hospital where she was diagnosed with right ventricular dysplasia. She underwent surgery to have a defibrillator implanted. A full recovery is expected.

College/University Track and Field Direct

A male college senior track and field pole vaulter sustained an injury during a tournament. He was diagnosed with a fractured orbital bone and bruising to his brain. He is scheduled to undergo surgery and a full recovery is expected. No other details are available.

College/University Volleyball Indirect

A female 20 year old college sophomore collapsed in the locker room during a volleyball game. She had complained of a severe headache and blurred vision. She was transported to the hospital by her parents and rushed into surgery. Cause of collapsed was due to arteriovenous malformation (AVM). A long but full recovery is expected.

HIGH SCHOOL

High School Baseball Direct

A male 17 year old high school baseball player was bunting during a summer league game when he was struck in the chest by the ball, which caused his heart to stop. He was immediately

attended to by bystanders who began CPR. An AED was used to revive him. He was transported to the hospital and a full recovery is expected.

High School Baseball Indirect

A male 14 year old high school freshman baseball player was participating in an afternoon practice when he told the coach he wasn't feeling well (complained of stomach hurting). He was seen by the school nurse before an ambulance took him to the hospital. He passed away two days later. Cause of death was due to rhabdomyolysis associated with sickle cell trait.

High School Basketball Indirect

A male 17 year old high school senior basketball player was lifting weights with his team and collapsed during the following personal conditioning run. Attempts to resuscitate him were unsuccessful. Cause of death is due to sudden cardiac arrest.

A female 14 year old high school freshman basketball player had just completed a track run in practice when she collapsed. She was treated by EMS before being transferred to the hospital where she later died. Cause of death is due to thoracic aorta dissection.

A male 16 year old high school junior basketball player collapsed during practice while going through drills. He was immediately attended to by coaches and first responders until EMS arrived. He was airlifted to the hospital where he went into cardiac arrest multiple times before passing away five days later. Cause of death is unknown but is suspected to be cardiac related.

A male high school freshman basketball player collapsed at half court during the second quarter of the game. He was immediately attended to by coaches and the opposing team's athletic trainer. CPR was started and AED applied within minutes while EMS were called. One shock was administered before EMS arrived. He was transported to the hospital. Cause of collapse is thought to be cardiac in origin. A full recovery is expected.

A male high school junior basketball guard had just finished practice when he collapsed. Coaches immediately began CPR and called 911. EMS arrived within minutes and an onsite AED was administered. He was transported to the hospital where he is recovering. He was diagnosed with an enlarged heart. A full recovery is expected.

A male 19 year old high school senior collapsed while playing pickup basketball. He later died at the hospital. Cause of death was due to hypertrophic cardiomyopathy. He was set to play basketball in college.

High School Basketball Not sport-related

A male 15 year old high school basketball player was found collapsed at his home. He was transported to the hospital where he later died. Cause of death was due to a congenital heart defect.

A male high school senior basketball player complained of feeling ill and was experiencing chest tightness and weakness. His mother took him to the hospital and his heart stopped two days later. He was revived with CPR and defibrillation. Cause of the illness is currently unknown. A full recovery is expected.

A male 18 year old high school senior basketball player was found dead in his room. Cause of death was due to cardiac dysrhythmia.

High School Cheerleading Direct

A female high school freshman cheerleader was practicing for the state finals when another teammate's knee hit her head, causing a skull fracture. Unaware of the injury, she finished the competition. The following day, her parents took her to the hospital where she was diagnosed. A full recovery is expected.

High School 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 Cross Country Indirect

A female 14 year old high school freshman cross country runner had completed a 3 mile run on the second day of tryouts when she collapsed. An athletic trainer witnessed the collapse and EMS were called. Attempts to resuscitate her were unsuccessful. She was transported to the hospital where she later died. Cause of death was due to congenital heart defect.

A male 15 year old high school cross country runner collapsed during practice. He was attended to by his coach/athletic director, who began CPR. He was transported to the hospital and underwent surgery to have a defibrillator implanted. Cause of sudden cardiac arrest is unknown. A full recovery is expected.

High School Cross Country Not sport-related

A male 15 year old high school cross country athlete collapsed at home from sudden cardiac arrest. He was revived by EMS with the AED. He was transported to the hospital where he was diagnosed with Wolff Parkinson White Syndrome. Surgery was scheduled but a full recovery is expected.

High School Field Hockey Indirect

A female 16 year old high school junior field hockey player collapsed during practice. She died shortly after at the hospital. Cause of death was due to an arteriovenous malformation. The family was unaware of any pre-existing conditions.

High School Football Direct

A male 16 year old high school junior cornerback was making a tackle during the third play of a game when he injured his neck. He was able to walk off the field and continued playing until the neck pain became severe. His mother took him to the ER where he underwent x-rays and MRI scans. They revealed a fractured C4 and C5 vertebrae. He underwent surgery but was not allowed to play football for the rest of the season. A full recovery is expected.

A male 15 year old high school freshman on the junior varsity football team collapsed at the end of the game. He was airlifted to the hospital where he underwent brain surgery for a subdural hematoma. He is expected to recover but requires assistance with everyday activities and school.

A male 16 year old high school junior football running back sustained a neck injury during practice from a tackle. He was reported to have injured three vertebrae in his neck. He is currently paralyzed.

A male 16 year old high school sophomore junior varsity football running back was involved in a helmet-to-helmet collision during the opening kickoff of the second half of a game. He was motionless on the field for 20 minutes before being transported to the hospital. He underwent neck surgery to have a metal plate placed near his C4 vertebrae. He is currently paralyzed from the waist down.

A male high school junior football defensive back sustained a neck injury during the last five minutes of a game. He was taken to the hospital with an unspecified neck injury. He underwent surgery and is in stable condition. Athlete has movement in one arm but is paralyzed from the waist down.

A male high school sophomore football defensive and running back sustained a hit during the 2nd quarter of a game. Coaches thought he sustained a concussion but he passed protocols. He walked off the field and to the locker room at half time when he began to feel tingling. His family took him to the hospital where he underwent two surgeries to stabilize fractured vertebrae in his neck. He is expected to fully recover but is not allowed to play football again.

A male 16 year old freshman high school football player was hit by another player during the 4th quarter punt return. Another teammate reported that he tripped and fell into a blocker which caused his head to go backwards. He was immediately attended to by EMS and athletic trainers. He was transported to the hospital but later died. Cause of death is due to a fractured neck.

A male high school junior football player sustained a hard hit during the 2nd quarter of a game. The athletic trainer assessed him for a concussion shortly before he collapsed. The athletic trainers and EMS immediately attended to him before he was airlifted to the hospital where he underwent brain surgery for a traumatic brain injury. He was in the ICU but was alert and talkative. Long term prognosis is undetermined.

A male high school junior football defensive tackle fractured his neck while making a tackle during a game. An ambulance transported him to the hospital where scans indicated that he fractured three vertebrae, two in his neck and one in his upper back. No surgery is required. A full recovery is expected.

A male high school junior linebacker caught an interception during a game. He was tackled and sustained a traumatic brain injury. He was immediately attended to by EMS and was transported to the hospital. He will have a very long but full recovery.

A male 16 year old high school junior football linebacker scored a touchdown during the 4th quarter of a game. He sustained a head injury during a tackle on the kickoff return. He was transported to the hospital where he underwent surgery. He was placed in a medical coma but died a week later. Cause of death is due to subdural hematoma.

A male 16 year old high school football player ran to the sideline, was holding his head, and collapsed during a game. He was transported to the hospital where he underwent surgery for a traumatic brain injury. He was in a medically induced coma for a week before being transferred to a rehab hospital. A long but full recovery is expected.

A male high school senior football defensive lineman was making a routine tackle during a game when he went limp. He lost feeling in his body but eventually regained it. He walked off the field and was transported to the hospital. A MRI determined he had damaged the ligaments between his C1-C2 vertebrae. A full recovery is expected but he is not allowed to play football.

A male high school senior football player collapsed during a game from a severe brain injury that caused a brain bleed. He underwent surgery to relieve swelling. Reports indicate he had sustained a hard hit two games prior, complained of a headache, and continued to play. Long term prognosis is unknown.

A male 14 year old high school freshman football linebacker was pulled out of a game during the 1st quarter by athletic trainers and coaches for a concussion. He was not allowed to return to the game. He was taken to the ER by his parents that evening for vomiting, balance issues, and difficulty swallowing. The following night he was taken back to the ER where he was diagnosed with a stroke. He had suffered a torn blood vessel in his neck that caused a blood clot that traveled to his brain. He has a lengthy recovery and long term prognosis is unknown.

A male high school senior football tight end sustained a neck injury during kickoff return in the 3rd quarter of a game. He was transported by EMS to the hospital where he was found to have a C5 vertebrae fracture and sprained ligaments. He is in a neck brace until the ligaments heal. A full recovery is expected.

A male 18 year old high school senior football long snapper and lineman was covering a punt when he was blindsided by a hit during a game. He was motionless on the field until EMS transported him to a helicopter for transfer to the hospital. He was diagnosed with a severed nerve between his T7 and T8 vertebrae. He is relearning how to walk. Long term prognosis is unknown.

A male high school senior football defensive back made a hit during a game. He initially thought he had a concussion but complained of neck pain. He went to the doctor the next day and an X-ray revealed no damage. He went back a second time and an X-ray revealed a torn C1 ligament. He underwent surgery to fuse his fractured C2 and C3 vertebrae. A full recovery is expected.

A male 17 year old high school senior football quarterback sustained a hit in the 2nd quarter of a game. He walked off the field but appeared disoriented. Around halftime he collapsed on the sidelines. He was transported to the hospital but later died. Cause of death was due to a ruptured spleen.

A male high school freshman football defensive back and wide receiver sustained a blow to the head during practice for the freshman team. He collapsed and was unresponsive. He was immediately attended to by the athletic trainer and coaches before being transported to the hospital by EMS. He was airlifted to another hospital and underwent brain surgery to alleviate swelling. Three days post-injury, he was walking with assistance. A long but full recovery is expected.

A male high school senior football player made a tackle during a game. He went to the sideline complaining of neck pain. His mother transported him to the hospital where he was diagnosed with a fractured C1 and C2 vertebrae. He will spend the next three months in a halo brace. A long but full recovery is expected.

A male high school senior football player injured his neck while making a tackle on a kickoff return. He was immediately attended to by the athletic trainer. He was transported to the hospital where CT scans revealed a C6 fracture. He was released home the next day. No surgery is required and a full recovery is expected.

A male 17 year old high school senior football defensive back was injured while making a tackle during the 4th quarter of a game. He was transported by ambulance to the hospital where he underwent emergency brain surgery. He died three days later. Cause of death was due to blunt force trauma. Reports indicate that he has sustained a concussion about a month prior but was cleared to return to play.

A male high school junior football (JV) player sustained a blow to the head during a game. He walked off the field and collapsed on the sideline. He was transported to the hospital where he underwent brain surgery. He is currently in a medically induced coma. Reports indicate that a long but full recovery is expected.

A male high school sophomore football linebacker was making a tackle during the 4th quarter of a game when he fractured his neck. He was transported to the hospital by EMS. He underwent surgery and is expected to have a full recovery.

A male 16 year old high school junior football wide receiver, quarterback, and safety complained of dizziness before halftime of a game. He then collapsed. He was airlifted to the hospital where he later died. Official cause of death was due to subdural hemorrhage.

A male 14 year old high school football player sustained a head injury during a scrimmage game. He was airlifted to the hospital. Prognosis is unknown and no other information is provided.

A male 17 year old high school senior football player was injured on a kick return play during a playoff game. He was running, was blocked by an opponent and fell to the ground. He got up, complained of a headache, and collapsed on the sideline. He was attended to by EMS before

being transported to the hospital. He died the following morning. Cause of death was due to a blunt force head injury.

A male 16 year old high school junior cornerback and wide receiver took himself out of a game during the 4th quarter due to headaches. He was attended to by the athletic trainer before being airlifted to the hospital. He is in critical condition from a head injury. He spent months in a rehabilitation facility before being sent home. He requires 24/7 care.

A male senior football linebacker was making a tackle during the 1st quarter of a game when he was injured. He was immediately attended to by athletic trainers before being airlifted to the hospital. He sustained three fractured vertebrae in his neck and spine. He underwent surgery but is paralyzed from the chest down.

A male 17 year old high school senior football safety was making a tackle during a game when he sustained a head injury. He walked off the field and collapsed on the sideline. He was transported to the hospital where he underwent emergency surgery to stop bleeding and relieve pressure and swelling in his brain. He was placed in a medically induced coma for a week. Long term prognosis is unknown.

A male 18 year old high school football linebacker was making a tackle when other players landed on top of him during a game. He reported feeling a pinch in his neck and saw the athletic trainer. His parents witnessed the event and onsite EMS directed the parents to take the athlete to the hospital. He was diagnosed with a fractured neck. A full recovery is expected.

A 17 year old male high school junior football player was making a tackle during a game when he fractured his third cervical vertebrae in two spots. He was transported to the hospital where he regained feeling. He was released four days later with a neck brace. A full recovery is expected.

A male high school junior football player was tackled in the 4th quarter of a game after fielding a punt. He was immediately attended to by athletic trainers, who realized he had sustained a neck injury. He was log rolled and his helmet was cut off before he was transported to the hospital. He was diagnosed with a fractured C6 vertebrae. No surgery is required and a full recovery is expected.

A male 17 year old high school football player had just scored a touchdown during a playoff game, walked off the field, and collapsed. He was transported by ambulance to the hospital before being airlifted to another. He was diagnosed with head trauma that cause his brain to swell. He died the following day.

A male 16 year old high school football linebacker was making a tackle during a game when he was hit, fell to the ground, and other players landed on top of him. He was unable to move. He was attended to by paramedics before being transported to the hospital. An MRI revealed no damage and he regained feeling hours later. A full recovery is expected.

A male high school junior football player sustained a neck injury while making a tackle during spring practice. He reports that he heard his neck snap and was unable to feel his arms or legs. He was transported to the hospital and spent time in the ICU. A full recovery is expected.

A male 16 year old high school sophomore quarterback sustained a hit during a scrimmage game and fractured his C6 vertebrae. He was immediately attended by training staff and EMS before being transferred to the hospital. He was transferred to a rehabilitation center and longterm prognosis unknown.

A male 16 year old high school senior football wide receiver was participating in a non-contact game with his team during a football camp. He went to catch a touchdown pass when his head collided with spectators on the sideline. He was transported to the hospital where he was in a medically induced coma. He was released home a few weeks later and a full recovery is expected.

High School Football Indirect

A male 14 year old high school sophomore football offensive lineman collapsed during football practice. He was transported to the hospital where he later died due to complications from heat stroke. His body temperature was reported to have reached 105 degrees.

A male high school football player was at morning football practice when he called his mother complaining of leg cramps. Once he returned home, he collapsed. He was taken to the hospital where doctors diagnosed him with severe heat exhaustion and dehydration. The heat index was reported as 109 at 11:00AM. He is expected to fully recover.

A male 16 year old high school junior football player was at a morning football practice when he began having difficulty breathing. He was transported to the field house and an ambulance was called. He later died at the hospital. Cause of death is due to heat stroke and rhabdomyolysis. Reports indicate that heat index had reached 109° by 11am.

A male 17 year old high school senior football player fell ill during morning practice. He was taken to the locker room where he was cooled with a cold shower before 911 was called. He was transported to a local hospital before being airlifted to another hospital. Reports indicate that he was not feeling well three days prior. He is in the ICU in stable condition. Long term prognosis is unknown.

A male 14 year old high school freshman was participating in a conditioning session with the freshman football team. His mother picked him up after the 3 hour practice and noticed he was in distress. He began having a stroke and foaming at the mouth on the way to the hospital. He spent weeks in a coma and suffered long term brain damage due to heat related illness. The temperature was 80 degrees with 62% humidity.

A male 16 year old high school junior football player was finishing up a morning practice when he collapsed. He was immediately attended to by the athletic trainer. When he arrived at the hospital, he had a 108 degree body temperature and had lost consciousness. He was diagnosed with heat stroke that also caused liver and kidney failure. He is in critical condition but is expected to have a long recovery.

A male 15 year old high school sophomore football defensive tackle passed out at the end of football practice. EMS was called and he was unresponsive with an accelerated heart rate when

he was transported to the hospital. His body temperature was 106 when he arrived. He spent 14 hours in the ICU but a full recovery is expected.

A male 17 year old high school junior offensive lineman collapsed during practice. He was immediately attended to by the athletic trainer who began CPR. He was transported by EMS to the hospital where he died two weeks later. Cause of death is due to pulmonary edema from hypertensive heart disease.

A male high school football player collapsed on the sidelines during the 4th quarter of a game after going into cardiac arrest. He was transported to the hospital and placed in a medically induced coma. Three days later he was breathing on his own and is awaiting surgery for a congenital heart defect. A full recovery is expected.

A male high school freshman football player collapsed during gym class. He was immediately attended to by school staff who began CPR until EMS arrived and used AED to revive him. He was transported to the hospital and placed in a medically induced coma. He was diagnosed with hypertrophic cardiomyopathy. He underwent surgery to have a defibrillator implanted. A full recovery is expected although he is not allowed to participate in contact sports.

A male 17 year old high school football player was lifting weights with his team. He walked into the hallway for a break when he collapsed. He was immediately attended to by an athletic trainer who began CPR while 911 was called. An AED was used to revive him. He was transported to the hospital where he is currently undergoing tests. Cause is suspected to be due to sudden cardiac arrest. A full recovery is expected.

A male 15 year old high school football player collapsed at the end of a preseason practice. He later died at the hospital. Cause of death is pending autopsy but is suspected to be heat related.

A male 14 year old high school freshman was participating in a voluntary football workout when he collapsed. He was taken to the hospital where he later died. Cause of death was due to exertional sickling and rhabdomyolysis.

High School Football Not sport-related

A male 18 year old high school senior football player was found dead at home. Cause of death was due to hypertrophic cardiomyopathy.

High School Gymnastics Direct

A female 14 year old high school gymnast was warming up for practice on the uneven bars when she fell and landed on her back. She was transported to the hospital where it was found she had fractured her T10 vertebrae. She underwent surgery and is expected to recover, but currently is paralyzed from the waist down.

High School Ice Hockey Indirect

A male 16 year old high school junior varsity ice hockey forward collapsed on the bench in the middle of a game. He was unresponsive for 5 minutes before being transported to the hospital. He is undergoing tests and long term prognosis is unknown.

High School Ice Hockey Not sport-related

A male 14 year old high school freshman junior varsity hockey player died in his sleep at home. He had previously played in a game a few hours earlier. Cause of death was due to cardiac arrhythmia.

High School Lacrosse Direct

A male 17 year old high school senior lacrosse midfielder sustained a lacrosse ball to the chest during a game. He picked up the ball and began running before collapsing. He was immediately attended to by an athletic trainer before bystander medical personnel assisted. While 911 was called, AED was retrieved. One shock was advised to get athlete's heart back into normal rhythm. He was taken to the hospital and a full recovery is expected. Cause of collapse is due to commotio cordis.

High School Soccer Indirect

A male 16 year old high school junior soccer goalie collapsed during the first practice of the season. Coaches immediately began CPR and EMS was called. He was transported to the hospital where he later died. Athlete had previous incident during cross country but was medically cleared for play. Cause of death was due to congenital heart defect.

A male high school soccer player collapsed at the end of the last game during a soccer tournament. An athletic trainer and athletic director began CPR and called for the AED while they waited for EMS to arrive. A full recovery is expected.

A female 16 year old high school junior varsity soccer player was playing in a game when she requested to come out. Coaches realized she was having trouble breathing. The athlete took several puffs of her inhaler before she collapsed to the ground. An athletic trainer administered CPR until EMS arrived. She was transported to the hospital where she later died. Cause of death was due to congenital heart defect.

A male high school sophomore soccer player collapsed during summer practice while running sprints. CPR was immediately began by one of the coaches while athletic trainer was summoned. Athletic trainer brought AED and used it to revive athlete. He was transported to the hospital where he underwent tests. A full recovery is expected. Collapsed suspected to be related to hypertrophic cardiomyopathy.

High School Softball Not sport-related

A female 16 year old high school junior suffered a cardiac event while at home. She was taken to the hospital where she died about a week later. Cause of death is suspected to be due to sudden cardiac arrest caused by irregular heart rhythms as a result of a congenital heart defect.

High School Swimming Direct

A male 15 year old high school swimmer slipped while at practice and hit his head on the bottom of the pool. He had to be rescued by his coach who immediately began CPR. He was transported to the hospital where he was diagnosed with a fractured C5 and C6 vertebrae. He spent three months in a rehabilitation facility. He currently is paralyzed from the waist down and has limited movement in his upper extremities.

High School Swimming Indirect

A female 16 year old high school junior swimmer collapsed in the pool after swimming the butterfly during practice. Teammates and the coach pulled her from the pool before the coach started CPR until EMS arrived. She was transported to the hospital and diagnosed with Long QT Syndrome. She underwent surgery to have a defibrillator implanted and a full recovery is expected.

A male 16 year old high school junior swimmer went into sudden cardiac arrest during practice. He later died at the hospital. Cause of death is due to a congenital heart defect.

A female high school senior swimmer had just finished swimming in a relay race when she did not resurface after going underwater. She was pulled from the pool. CPR and AED used. She was transported to the hospital where she underwent surgery to have a defibrillator implanted. A full recovery is expected.

High School Track and Field Direct

A male 18 year old high school senior was participating in the USA Track and Field meet when he was warming up for an event. He had thrown the javelin and was retrieving it when he tripped and fell. The javelin pierced his head through the eye. He was transported to the hospital. A full recovery is expected.

High School Track and Field Indirect

A male high school track and field athlete collapsed during track practice. He was immediately attended to by a coach, who started CPR and had other athletes run to get the athletic trainer and the AED. One shock was administered before paramedics arrived. He received another shock before being transported to the hospital. No other information is known at this time.

A male 16 year old high school track and field athlete collapsed during practice. He was immediately attended to by the athletic trainer who administered CPR and used an AED. He was transported to the hospital where he underwent numerous tests before being diagnosed with myocarditis. A full recovery is expected.

A male 15 year old high school freshman track and field runner collapsed after crossing the finish line during the 3200 meter run of the regional meet. He was immediately attended to by coaches and bystanders before EMS arrived. He was administered CPR and AED was used. He was transported to the hospital where he later died. Cause of death is unknown but is suspected to be cardiac related.

High School Volleyball Indirect

A female 17 year old high school senior volleyball player collapsed on the court during a match. She was immediately attended to by an athletic trainer and first responders, who started CPR. She was revived with an AED. She was transported by EMS to the hospital where she was diagnosed with ventricular fibrillation. A full recovery is expected.

High School Wrestling Indirect

A male 18 year old high school senior 220-pound wrestler complained of shortness of breath during a tournament before collapsing. He was transported to the hospital where he later died. Cause of death was due to congenital heart defect.

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Table 1: Number of All catastrophic injuries/illnesses by year: All sports combined, all levels (high school and college)

	College		High school		All	
	N	%	N	%	N	%
1982-1983	10	16.70%	50	83.30%	60	100.00%
1983-1984	13	21.00%	49	79.00%	62	100.00%
1984-1985	9	17.60%	42	82.40%	51	100.00%
1985-1986	16	28.10%	41	71.90%	57	100.00%
1986-1987	18	25.70%	52	74.30%	70	100.00%
1987-1988	15	17.90%	69	82.10%	84	100.00%
1988-1989	17	23.00%	57	77.00%	74	100.00%
1989-1990	10	13.30%	65	86.70%	75	100.00%
1990-1991	14	23.00%	47	77.00%	61	100.00%
1991-1992	11	23.40%	36	76.60%	47	100.00%
1992-1993	10	16.40%	51	83.60%	61	100.00%
1993-1994	11	17.50%	52	82.50%	63	100.00%
1994-1995	12	24.50%	37	75.50%	49	100.00%
1995-1996	8	15.70%	43	84.30%	51	100.00%
1996-1997	9	13.60%	57	86.40%	66	100.00%
1997-1998	15	20.00%	60	80.00%	75	100.00%
1998-1999	10	12.80%	68	87.20%	78	100.00%
1999-2000	9	12.90%	61	87.10%	70	100.00%
2000-2001	17	24.60%	52	75.40%	69	100.00%
2001-2002	14	17.30%	67	82.70%	81	100.00%
2002-2003	16	25.80%	46	74.20%	62	100.00%
2003-2004	18	24.30%	56	75.70%	74	100.00%
2004-2005	9	13.80%	56	86.20%	65	100.00%
2005-2006	12	21.80%	43	78.20%	55	100.00%
2006-2007	13	17.60%	61	82.40%	74	100.00%
2007-2008	15	18.50%	66	81.50%	81	100.00%
2008-2009	17	15.70%	91	84.30%	108	100.00%
2009-2010	27	28.10%	69	71.90%	96	100.00%
2010-2011	15	20.50%	58	79.50%	73	100.00%
2011-2012	15	19.50%	62	80.50%	77	100.00%
2012-2013	12	30.00%	28	70.00%	40	100.00%
2013-2014	16	22.50%	55	77.50%	71	100.00%
2014-2015	17	21.30%	63	78.80%	80	100.00%
2015-2016	18	18.20%	81	81.80%	99	100.00%
Total	468	24.75%	1891	80.16%	2359	100.00%
Total*	503	25.48%	1974	79.69%	2477	100.00%

*Includes Cheerleading, Drill Team, Rodeo

Table 2: Number of Direct catastrophic injuries/illnesses by year: All sports combined, all levels (high school and college)

	College		High school		All	
	N	%	N	%	N	%
1982-1983	4	10.30%	35	89.70%	39	100.00%
1983-1984	8	19.00%	34	81.00%	42	100.00%
1984-1985	9	22.50%	31	77.50%	40	100.00%
1985-1986	15	30.60%	34	69.40%	49	100.00%
1986-1987	14	26.90%	38	73.10%	52	100.00%
1987-1988	8	12.30%	57	87.70%	65	100.00%
1988-1989	13	22.80%	44	77.20%	57	100.00%
1989-1990	8	14.80%	46	85.20%	54	100.00%
1990-1991	10	26.30%	28	73.70%	38	100.00%
1991-1992	6	17.60%	28	82.40%	34	100.00%
1992-1993	8	20.00%	32	80.00%	40	100.00%
1993-1994	6	14.30%	36	85.70%	42	100.00%
1994-1995	9	25.00%	27	75.00%	36	100.00%
1995-1996	6	18.80%	26	81.30%	32	100.00%
1996-1997	7	14.00%	43	86.00%	50	100.00%
1997-1998	6	12.00%	44	88.00%	50	100.00%
1998-1999	10	18.20%	45	81.80%	55	100.00%
1999-2000	9	20.50%	35	79.50%	44	100.00%
2000-2001	12	28.60%	30	71.40%	42	100.00%
2001-2002	5	9.60%	47	90.40%	52	100.00%
2002-2003	10	26.30%	28	73.70%	38	100.00%
2003-2004	12	22.20%	42	77.80%	54	100.00%
2004-2005	5	15.60%	27	84.40%	32	100.00%
2005-2006	7	21.90%	25	78.10%	32	100.00%
2006-2007	7	14.60%	41	85.40%	48	100.00%
2007-2008	9	17.00%	44	83.00%	53	100.00%
2008-2009	10	12.20%	72	87.80%	82	100.00%
2009-2010	16	27.60%	42	72.40%	58	100.00%
2010-2011	9	19.10%	38	80.90%	47	100.00%
2011-2012	8	15.40%	44	84.60%	52	100.00%
2012-2013	5	29.40%	12	70.60%	17	100.00%
2013-2014	2	6.50%	29	93.50%	31	100.00%
2014-2015	6	20.00%	24	80.00%	30	100.00%
2015-2016	14	23.70%	45	76.30%	59	100.00%
Total	293	18.95%	1253	81.05%	1546	100.00%
Total*	328	19.85%	1324	80.15%	1652	100.00%

*Includes Cheerleading, Drill Team, Rodeo

Table 3: Number of Indirect catastrophic injuries/illnesses by year: All sports combined, all levels (high school and college)

	College		High school		All	
	N	%	N	%	N	%
1982-1983	6	28.60%	15	71.40%	21	100.00%
1983-1984	5	25.00%	15	75.00%	20	100.00%
1984-1985	0	0	11	100.00%	11	100.00%
1985-1986	1	12.50%	7	87.50%	8	100.00%
1986-1987	4	22.20%	14	77.80%	18	100.00%
1987-1988	7	36.80%	12	63.20%	19	100.00%
1988-1989	4	23.50%	13	76.50%	17	100.00%
1989-1990	2	9.50%	19	90.50%	21	100.00%
1990-1991	4	17.40%	19	82.60%	23	100.00%
1991-1992	5	38.50%	8	61.50%	13	100.00%
1992-1993	2	9.50%	19	90.50%	21	100.00%
1993-1994	5	23.80%	16	76.20%	21	100.00%
1994-1995	3	23.10%	10	76.90%	13	100.00%
1995-1996	2	10.50%	17	89.50%	19	100.00%
1996-1997	2	12.50%	14	87.50%	16	100.00%
1997-1998	9	36.00%	16	64.00%	25	100.00%
1998-1999	0	0	23	100.00%	23	100.00%
1999-2000	0	0	26	100.00%	26	100.00%
2000-2001	5	18.50%	22	81.50%	27	100.00%
2001-2002	9	31.00%	20	69.00%	29	100.00%
2002-2003	6	25.00%	18	75.00%	24	100.00%
2003-2004	6	30.00%	14	70.00%	20	100.00%
2004-2005	4	12.10%	29	87.90%	33	100.00%
2005-2006	5	21.70%	18	78.30%	23	100.00%
2006-2007	6	23.10%	20	76.90%	26	100.00%
2007-2008	6	21.40%	22	78.60%	28	100.00%
2008-2009	7	26.90%	19	73.10%	26	100.00%
2009-2010	11	28.90%	27	71.10%	38	100.00%
2010-2011	6	23.10%	20	76.90%	26	100.00%
2011-2012	7	28.00%	18	72.00%	25	100.00%
2012-2013	7	30.40%	16	69.60%	23	100.00%
2013-2014	14	35.00%	26	65.00%	40	100.00%
2014-2015	11	22.00%	39	78.00%	50	100.00%
2015-2016	4	10.00%	36	90.00%	40	100.00%
Total	175	21.53%	638	78.47%	813	100.00%
Total*	175	21.24%	649	78.76%	824	100.00%

*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		All	
		N	%	N	%	N	%	N	%
Baseball	Male	23	35.90%	26	40.60%	15	23.40%	64	100.00%
Basketball	Female	3	50.00%	3	50.00%	0	0	6	100.00%
	Male	8	53.30%	6	40.00%	1	6.70%	15	100.00%
Cheerleading	Female	42	60.00%	27	38.60%	1	1.40%	70	100.00%
	Male	1	50.00%	1	50.00%	0	0	2	100.00%
Cross Country	Female	0	0	0	0	1	100.00%	1	100.00%
	Male	0	0	1	50.00%	1	50.00%	2	100.00%
Field Hockey	Female	0	0	3	100.00%	0	0	3	100.00%
Football	Male	380	41.10%	412	44.50%	133	14.40%	925	100.00%
Golf	Male	0	0	1	100.00%	0	0	1	100.00%
Gymnastics	Female	3	30.00%	7	70.00%	0	0	10	100.00%
	Male	1	25.00%	2	50.00%	1	25.00%	4	100.00%
Ice Hockey	Female	2	66.70%	1	33.30%	0	0	3	100.00%
	Male	7	26.90%	15	57.70%	4	15.40%	26	100.00%
Lacrosse	Female	2	66.70%	1	33.30%	0	0	3	100.00%
	Male	6	35.30%	9	52.90%	2	11.80%	17	100.00%
Skiing	Female	0	0	0	0	1	100.00%	1	100.00%
Soccer	Female	5	71.40%	1	14.30%	1	14.30%	7	100.00%
	Male	6	37.50%	3	18.80%	7	43.80%	16	100.00%
Softball	Female	6	85.70%	1	14.30%	0	0	7	100.00%
Swimming	Female	1	16.70%	5	83.30%	0	0	6	100.00%
	Male	3	30.00%	6	60.00%	1	10.00%	10	100.00%
Track and Field	Female	6	66.70%	2	22.20%	1	11.10%	9	100.00%
	Male	12	22.60%	20	37.70%	21	39.60%	53	100.00%
Wrestling	Male	21	33.30%	40	63.50%	2	3.20%	63	100.00%

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

		Serious		Non-fatal		Fatal		All	
		N	%	N	%	N	%	N	%
Baseball	Male	4	17.40%	0	0	19	82.60%	23	100.00%
Basketball	Female	1	5.60%	0	0	17	94.40%	18	100.00%
	Male	15	11.00%	1	0.70%	120	88.20%	136	100.00%
Cheerleading	Female	1	10.00%	1	10.00%	8	80.00%	10	100.00%
Cross Country	Female	3	21.40%	1	7.10%	10	71.40%	14	100.00%
	Male	2	8.70%	1	4.30%	20	87.00%	23	100.00%
	Unknown	1	100.00%	0	0	0	0	1	100.00%
Drill Team	Female	0	0	0	0	1	100.00%	1	100.00%
Field Hockey	Female	0	0	0	0	2	100.00%	2	100.00%
Football	Male	24	9.30%	2	0.80%	233	90.00%	259	100.00%
Ice Hockey	Male	2	33.30%	0	0	4	66.70%	6	100.00%
Lacrosse	Male	0	0	0	0	8	100.00%	8	100.00%
Rowing	Male	1	100.00%	0	0	0	0	1	100.00%
Soccer	Female	1	10.00%	1	10.00%	8	80.00%	10	100.00%
	Male	3	9.40%	2	6.30%	27	84.40%	32	100.00%
Softball	Female	0	0	0	0	1	100.00%	1	100.00%
Swimming	Female	2	20.00%	1	10.00%	7	70.00%	10	100.00%
	Male	0	0	0	0	5	100.00%	5	100.00%
Tennis	Male	0	0	0	0	4	100.00%	4	100.00%
Track and Field	Female	0	0	1	14.30%	6	85.70%	7	100.00%
	Male	2	5.30%	0	0	36	94.70%	38	100.00%
Volleyball	Female	1	33.30%	1	33.30%	1	33.30%	3	100.00%
Water Polo	Female	0	0	0	0	1	100.00%	1	100.00%
	Male	0	0	0	0	3	100.00%	3	100.00%
Wrestling	Male	4	12.10%	1	3.00%	28	84.80%	33	100.00%

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

		Serious		Non-fatal		Fatal		All	
		N	%	N	%	N	%	N	%
Baseball	Male	7	35.00%	10	50.00%	3	15.00%	20	100.00%
Basketball	Male	8	80.00%	1	10.00%	1	10.00%	10	100.00%
Cheerleading	Female	13	46.40%	14	50.00%	1	3.60%	28	100.00%
	Male	3	60.00%	2	40.00%	0	0	5	100.00%
Equestrian	Female	0	0	0	0	1	100.00%	1	100.00%
Field Hockey	Female	2	66.70%	1	33.30%	0	0	3	100.00%
Football	Male	141	70.10%	47	23.40%	13	6.50%	201	100.00%
Gymnastics	Female	0	0	2	100.00%	0	0	2	100.00%
	Male	2	66.70%	1	33.30%	0	0	3	100.00%
	Unknown	0	0	1	100.00%	0	0	1	100.00%
Ice Hockey	Female	1	100.00%	0	0	0	0	1	100.00%
	Male	7	58.30%	5	41.70%	0	0	12	100.00%
Lacrosse	Female	0	0	2	100.00%	0	0	2	100.00%
	Male	1	16.70%	1	16.70%	4	66.70%	6	100.00%
Rodeo	Male	0	0	0	0	2	100.00%	2	100.00%
Rowing	Male	0	0	0	0	1	100.00%	1	100.00%
Rugby	Male	1	50.00%	1	50.00%	0	0	2	100.00%
Skiing	Female	0	0	1	50.00%	1	50.00%	2	100.00%
	Male	0	0	0	0	1	100.00%	1	100.00%
Soccer	Female	0	0	2	100.00%	0	0	2	100.00%
	Male	2	66.70%	1	33.30%	0	0	3	100.00%
Softball	Female	2	100.00%	0	0	0	0	2	100.00%
Swimming	Male	0	0	1	100.00%	0	0	1	100.00%
Track and Field	Female	0	0	1	100.00%	0	0	1	100.00%
	Male	2	14.30%	6	42.90%	6	42.90%	14	100.00%
Wrestling	Male	0	0	2	100.00%	0	0	2	100.00%

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

		Serious		Non-fatal		Fatal		All	
		N	%	N	%	N	%	N	%
Baseball	Male	0	0	1	16.70%	5	83.30%	6	100.00%
Basketball	Female	3	37.50%	0	0	5	62.50%	8	100.00%
	Male	9	19.10%	3	6.40%	35	74.50%	47	100.00%
Cross Country	Female	0	0	0	0	1	100.00%	1	100.00%
	Male	0	0	0	0	2	100.00%	2	100.00%
Football	Male	3	4.90%	0	0	58	95.10%	61	100.00%
Gymnastics	Female	0	0	0	0	1	100.00%	1	100.00%
Ice Hockey	Male	1	33.30%	1	33.30%	1	33.30%	3	100.00%
Lacrosse	Male	0	0	0	0	2	100.00%	2	100.00%
Rowing	Male	0	0	0	0	2	100.00%	2	100.00%
Skiing	Male	0	0	0	0	1	100.00%	1	100.00%
Soccer	Female	1	25.00%	0	0	3	75.00%	4	100.00%
	Male	0	0	2	25.00%	6	75.00%	8	100.00%
Swimming	Female	1	33.30%	0	0	2	66.70%	3	100.00%
	Male	0	0	0	0	7	100.00%	7	100.00%
Tennis	Female	0	0	0	0	1	100.00%	1	100.00%
	Male	0	0	0	0	1	100.00%	1	100.00%
Track and Field	Male	1	33.30%	0	0	2	66.70%	3	100.00%
Volleyball	Female	3	60.00%	0	0	2	40.00%	5	100.00%
Water Polo	Male	0	0	0	0	2	100.00%	2	100.00%
Wrestling	Male	2	28.60%	0	0	5	71.40%	7	100.00%

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	14	0.27	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	21	0.38	16	0.29	15	0.27
1994-1995	12	0.21	13	0.23	12	0.21
1995-1996	19	0.32	16	0.27	8	0.13
1996-1997	24	0.40	20	0.33	13	0.21
1997-1998	24	0.38	24	0.38	12	0.19
1998-1999	31	0.48	14	0.22	23	0.36
1999-2000	33	0.51	17	0.26	11	0.17
2000-2001	26	0.39	16	0.24	10	0.15
2001-2002	28	0.43	22	0.34	17	0.26
2002-2003	21	0.31	13	0.19	12	0.18
2003-2004	17	0.25	24	0.36	15	0.22
2004-2005	33	0.48	17	0.25	6	0.09
2005-2006	20	0.29	15	0.21	8	0.11
2006-2007	21	0.29	24	0.34	16	0.22
2007-2008	23	0.32	16	0.22	27	0.37
2008-2009	28	0.38	32	0.44	31	0.42
2009-2010	24	0.32	19	0.26	26	0.35
2010-2011	22	0.30	18	0.24	18	0.24
2011-2012	22	0.30	23	0.31	17	0.23
2012-2013	16	0.21	7	0.09	5	0.07
2013-2014	19	0.26	10	0.14	26	0.36
2014-2015	22	0.29	11	0.15	29	0.38
2015-2016	25	0.33	15	0.20	41	0.54

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	6	2.34	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	5	1.89
1990-1991	5	1.82	6	2.18	3	1.09
1991-1992	5	1.78	2	0.71	4	1.43
1992-1993	3	1.05	0	0	7	2.46
1993-1994	7	2.39	0	0	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	2	0.59	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	7	1.89	5	1.35	5	1.35
2001-2002	10	2.74	1	0.27	3	0.82
2002-2003	6	1.60	4	1.07	6	1.60
2003-2004	9	2.39	4	1.06	5	1.33
2004-2005	4	1.04	3	0.78	2	0.52
2005-2006	5	1.27	5	1.27	2	0.51
2006-2007	6	1.48	1	0.25	6	1.48
2007-2008	5	1.21	2	0.48	8	1.93
2008-2009	5	1.18	2	0.47	10	2.37
2009-2010	13	3.01	2	0.46	12	2.78
2010-2011	4	0.90	8	1.80	3	0.67
2011-2012	7	1.54	0	0	8	1.76
2012-2013	6	1.29	3	0.65	3	0.65
2013-2014	6	1.26	0	0	10	2.11
2014-2015	4	0.83	1	0.21	12	2.48
2015-2016	2	0.41	4	0.82	12	2.46

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	14	0.27	11	0.21
1987-1988	5	0.10	25	0.48	27	0.52
1988-1989	8	0.15	19	0.37	17	0.33
1989-1990	5	0.10	26	0.5	15	0.29
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	16	0.29	15	0.27
1994-1995	2	0.04	13	0.23	12	0.21
1995-1996	4	0.07	15	0.25	7	0.12
1996-1997	10	0.16	20	0.33	13	0.21
1997-1998	8	0.13	24	0.38	12	0.19
1998-1999	8	0.13	14	0.22	23	0.36
1999-2000	7	0.11	17	0.26	11	0.17
2000-2001	4	0.06	16	0.24	10	0.15
2001-2002	9	0.14	21	0.32	17	0.26
2002-2003	3	0.04	13	0.19	12	0.18
2003-2004	3	0.04	24	0.36	15	0.22
2004-2005	5	0.07	16	0.23	6	0.09
2005-2006	4	0.06	14	0.20	7	0.10
2006-2007	2	0.03	23	0.32	16	0.22
2007-2008	2	0.03	16	0.22	26	0.36
2008-2009	10	0.14	31	0.42	31	0.42
2009-2010	2	0.03	18	0.24	22	0.30
2010-2011	5	0.07	17	0.23	16	0.22
2011-2012	4	0.05	23	0.31	17	0.23
2012-2013	3	0.04	5	0.07	4	0.05
2013-2014	8	0.11	9	0.12	12	0.16
2014-2015	6	0.08	10	0.13	7	0.09
2015-2016	8	0.11	15	0.20	22	0.29

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	0	0	3	1.17	1	0.39
1983-1984	0	0	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	1	0.38	7	2.64
1988-1989	0	0	4	1.49	9	3.34
1989-1990	1	0.38	2	0.76	5	1.89
1990-1991	1	0.36	6	2.18	3	1.09
1991-1992	1	0.36	1	0.36	4	1.43
1992-1993	1	0.35	0	0	7	2.46
1993-1994	2	0.68	0	0	4	1.37
1994-1995	0	0	3	1.01	6	2.02
1995-1996	0	0	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	5	1.35	5	1.35
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	2	0.52	2	0.52
2005-2006	0	0	5	1.27	2	0.51
2006-2007	0	0	1	0.25	6	1.48
2007-2008	0	0	1	0.24	8	1.93
2008-2009	0	0	1	0.24	9	2.13
2009-2010	4	0.93	2	0.46	10	2.32
2010-2011	0	0	7	1.57	2	0.45
2011-2012	1	0.22	0	0	7	1.54
2012-2013	0	0	3	0.65	2	0.43
2013-2014	1	0.21	0	0	1	0.21
2014-2015	0	0	1	0.21	5	1.03
2015-2016	0	0	4	0.82	10	2.05

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	0.30	0	0	0	0
1983-1984	15	0.30	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	0	0
1989-1990	19	0.37	0	0	0	0
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	16	0.29	0	0	0	0
1994-1995	10	0.18	0	0	0	0
1995-1996	15	0.25	1	0.02	1	0.02
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	0.40	0	0	0	0
2000-2001	22	0.33	0	0	0	0
2001-2002	19	0.29	1	0.02	0	0
2002-2003	18	0.27	0	0	0	0
2003-2004	14	0.21	0	0	0	0
2004-2005	28	0.41	1	0.01	0	0
2005-2006	16	0.23	1	0.01	1	0.01
2006-2007	19	0.27	1	0.01	0	0
2007-2008	21	0.29	0	0	1	0.01
2008-2009	18	0.25	1	0.01	0	0
2009-2010	22	0.30	1	0.01	4	0.05
2010-2011	17	0.23	1	0.01	2	0.03
2011-2012	18	0.24	0	0	0	0
2012-2013	13	0.17	2	0.03	1	0.01
2013-2014	11	0.15	1	0.01	14	0.19
2014-2015	16	0.21	1	0.01	22	0.29
2015-2016	17	0.22	0	0	19	0.25

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	Non-fatal Rate per 100,000	N	Serious Rate per 100,000
1982-1983	6	2.34	0	0	0	0
1983-1984	5	1.85	0	0	0	0
1985-1986	1	0.34	0	0	0	0
1986-1987	4	1.44	0	0	0	0
1987-1988	7	2.64	0	0	0	0
1988-1989	4	1.49	0	0	0	0
1989-1990	2	0.76	0	0	0	0
1990-1991	4	1.45	0	0	0	0
1991-1992	4	1.43	1	0.36	0	0
1992-1993	2	0.70	0	0	0	0
1993-1994	5	1.71	0	0	0	0
1994-1995	3	1.01	0	0	0	0
1995-1996	2	0.60	0	0	0	0
1996-1997	2	0.60	0	0	0	0
1997-1998	8	2.38	1	0.30	0	0
2000-2001	5	1.35	0	0	0	0
2001-2002	9	2.47	0	0	0	0
2002-2003	5	1.34	1	0.27	0	0
2003-2004	6	1.59	0	0	0	0
2004-2005	3	0.78	1	0.26	0	0
2005-2006	5	1.27	0	0	0	0
2006-2007	6	1.48	0	0	0	0
2007-2008	5	1.21	1	0.24	0	0
2008-2009	5	1.18	1	0.24	1	0.24
2009-2010	9	2.08	0	0	2	0.46
2010-2011	4	0.90	1	0.22	1	0.22
2011-2012	6	1.32	0	0	1	0.22
2012-2013	6	1.29	0	0	1	0.22
2013-2014	5	1.05	0	0	9	1.90
2014-2015	4	0.83	0	0	7	1.45
2015-2016	2	0.41	0	0	2	0.41

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**

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
Baseball	Male	15	0.10	26	0.17	23	0.15
Basketball	Female	0	0	3	0.02	3	0.02
	Male	1	0.01	6	0.03	8	0.04
Cheerleading	Female	1	0.05	27	1.33	42	2.07
	Male	0	0	1	1.92	1	1.92
Cross Country	Female	1	0.02	0	0	0	0
	Male	1	0.02	1	0.02	0	0
Field Hockey	Female	0	0	3	0.16	0	0
Football	Male	133	0.39	412	1.21	380	1.12
Golf	Male	0	0	1	0.02	0	0
Gymnastics	Female	0	0	7	0.89	3	0.38
	Male	1	0.86	2	1.73	1	0.86
Ice Hockey	Female	0	0	1	0.69	2	1.38
	Male	4	0.4	15	1.48	7	0.69
Lacrosse	Female	0	0	1	0.08	2	0.17
	Male	2	0.12	9	0.54	6	0.36
Skiing	Female	1	0.35	0	0	0	0
Soccer	Female	1	0.01	1	0.01	5	0.06
	Male	7	0.07	3	0.03	6	0.06
Softball	Female	0	0	1	0.01	6	0.05
Swimming	Female	0	0	5	0.12	1	0.02
	Male	1	0.03	6	0.18	3	0.09
Track and Field	Female	1	0.01	2	0.01	6	0.04
	Male	21	0.11	20	0.11	12	0.06
Wrestling	Male	2	0.02	40	0.48	21	0.25

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**

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
Baseball	Male	3	0.34	10	1.14	7	0.80
Basketball	Male	1	0.19	1	0.19	8	1.54
Equestrian	Female	1	4.33	0	0	0	0
Field Hockey	Female	0	0	1	0.55	2	1.09
Football	Male	13	0.66	47	2.40	141	7.20
Gymnastics	Female	0	0	2	3.94	0	0
	Male	0	0	1	5.57	2	11.13
Ice Hockey	Female	0	0	0	0	1	2.88
	Male	0	0	5	3.78	7	5.30
Lacrosse	Female	0	0	2	1.11	0	0
	Male	4	1.63	1	0.41	1	0.41
Rowing	Male	1	1.37	0	0	0	0
Skiing	Female	1	5.86	1	5.86	0	0
	Male	1	4.81	0	0	0	0
Soccer	Female	0	0	2	0.38	0	0
	Male	0	0	1	0.16	2	0.32
Softball	Female	0	0	0	0	2	0.42
Swimming	Male	0	0	1	0.36	0	0
Track and Field	Female	0	0	1	0.09	0	0
	Male	6	0.45	6	0.45	2	0.15
Wrestling	Male	0	0	2	0.87	0	0

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

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
Baseball	Male	19	0.13	0	0	4	0.03
Basketball	Female	17	0.12	0	0	1	0.01
	Male	120	0.66	1	0.01	15	0.08
Cheerleading	Female	8	0.39	1	0.05	1	0.05
Cross	Female	10	0.19	1	0.02	3	0.06
Country	Male	20	0.33	1	0.02	2	0.03
Field Hockey	Female	2	0.10	0	0	0	0
Football	Male	233	0.68	2	0.01	24	0.07
Ice Hockey	Male	4	0.40	0	0	2	0.20
Lacrosse	Male	8	0.48	0	0	0	0
Rowing	Male	0	0	0	0	1	1.97
Soccer	Female	8	0.10	1	0.01	1	0.01
	Male	27	0.26	2	0.02	3	0.03
Softball	Female	1	0.01	0	0	0	0
Swimming	Female	7	0.17	1	0.02	2	0.05
	Male	5	0.15	0	0	0	0
Tennis	Male	4	0.08	0	0	0	0
Track and Field	Female	6	0.04	1	0.01	0	0
	Male	36	0.19	0	0	2	0.01
Volleyball	Female	1	0.01	1	0.01	1	0.01
Water Polo	Female	1	0.29	0	0	0	0
	Male	3	0.62	0	0	0	0
Wrestling	Male	28	0.33	1	0.01	4	0.05

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

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

		Fatal		Non-fatal		Serious	
		N	Rate per 100,000	N	Rate per 100,000	N	Rate per 100,000
Baseball	Male	5	0.57	1	0.11	0	0
Basketball	Female	5	1.09	0	0	3	0.65
	Male	35	6.74	3	0.58	9	1.73
Cross Country	Female	1	0.27	0	0	0	0
	Male	2	0.52	0	0	0	0
Football	Male	58	2.96	0	0	3	0.15
Gymnastics	Female	1	1.97	0	0	0	0
Ice Hockey	Male	1	0.76	1	0.76	1	0.76
Lacrosse	Male	2	0.81	0	0	0	0
Rowing	Male	2	2.73	0	0	0	0
Skiing	Male	1	4.81	0	0	0	0
Soccer	Female	3	0.57	0	0	1	0.19
	Male	6	0.97	2	0.32	0	0
Swimming	Female	2	0.60	0	0	1	0.30
	Male	7	2.53	0	0	0	0
Tennis	Female	1	0.36	0	0	0	0
	Male	1	0.38	0	0	0	0
Track and Field	Male	2	0.15	0	0	1	0.07
Volleyball	Female	2	0.47	0	0	3	0.70
Water Polo	Male	2	5.97	0	0	0	0
Wrestling	Male	5	2.16	0	0	2	0.87

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 2015-2016

	Direct		Indirect		All	
	N	%	N	%	N	%
Total	61	100.00%	40	100.00%	101	100.00%
Level						
College	15	24.60%	4	10.00%	19	18.80%
High school	46	75.40%	36	90.00%	82	81.20%
Severity						
Serious	33	54.10%	21	52.50%	54	53.50%
Non-fatal	19	31.10%	0	0	19	18.80%
Fatal	9	14.80%	19	47.50%	28	27.70%
Sex						
Female	3	4.90%	9	22.50%	12	11.90%
Male	58	95.10%	31	77.50%	89	88.10%
Month						
Jul-Aug	4	6.60%	13	32.50%	17	16.80%
Sep-Oct	42	68.90%	7	17.50%	49	48.50%
Nov-Dec	4	6.60%	5	12.50%	9	8.90%
Jan-Feb	1	1.60%	6	15.00%	7	6.90%
Mar-Apr	1	1.60%	3	7.50%	4	4.00%
May-Jun	9	14.80%	6	15.00%	15	14.90%
Sponsored activity						
Official school or team athletic activity	61	100.00%	36	90.00%	97	96.00%
Personal athletic activity	0	0	4	10.00%	4	4.00%
Type of Activity						
Competition/Game	49	80.30%	11	27.50%	60	59.40%
Practice	9	14.80%	21	52.50%	30	29.70%
Scrimmage	2	3.30%	0	0	2	2.00%
Strength/Weight Session	0	0	1	2.50%	1	1.00%
Conditioning Session	1	1.60%	4	10.00%	5	5.00%
Other	0	0	3	7.50%	3	3.00%
Location						
Competitive Venue	51	83.60%	14	35.00%	65	64.40%
Public Park or Street	1	1.60%	3	7.50%	4	4.00%
School Athletic Facility	9	14.80%	21	52.50%	30	29.70%
School Campus	0	0	2	5.00%	2	2.00%
Type of injury						
Bleed/hemorrhage	4	6.60%	0	0	4	4.00%
Cardiac arrest	0	0	12	30.00%	12	11.90%
Cardiac arrhythmia	0	0	1	2.50%	1	1.00%
Cardiomyopathy	0	0	4	10.00%	4	4.00%
Commotio cordis	3	4.90%	0	0	3	3.00%
Congenital heart	0	0	7	17.50%	7	6.90%
Contusion	1	1.60%	0	0	1	1.00%

	Direct		Indirect		All	
	N	%	N	%	N	%
Fracture	25	41.00%	0	0	25	24.80%
Heat stroke	0	0	7	17.50%	7	6.90%
Other	0	0	3	7.50%	3	3.00%
Other trauma	10	16.40%	0	0	10	9.90%
Rhabdomyolysis	0	0	2	5.00%	2	2.00%
Spinal cord	2	3.30%	0	0	2	2.00%
Stroke	1	1.60%	0	0	1	1.00%
Subdural hematoma	2	3.30%	0	0	2	2.00%
Traumatic brain injury, NS	10	16.40%	0	0	10	9.90%
Unknown	3	4.90%	4	10.00%	7	6.90%
Body part						
Head/brain	19	31.10%	2	5.00%	21	20.80%
Neck	31	50.80%	0	0	31	30.70%
Heart	3	4.90%	28	70.00%	31	30.70%
Total body	1	1.60%	9	22.50%	10	9.90%
Unknown	0	0	1	2.50%	1	1.00%
Eye	3	4.90%	0	0	3	3.00%
Internal organ	1	1.60%	0	0	1	1.00%
Lumbar/thoracic spine	3	4.90%	0	0	3	3.00%
Sport						
Baseball	2	3.30%	2	5.00%	4	4.00%
Basketball	0	0	6	15.00%	6	5.90%
Cheerleading	1	1.60%	0	0	1	1.00%
Cross Country	1	1.60%	2	5.00%	3	3.00%
Field Hockey	0	0	1	2.50%	1	1.00%
Football	51	83.60%	14	35.00%	65	64.40%
Gymnastics	1	1.60%	0	0	1	1.00%
Ice Hockey	0	0	1	2.50%	1	1.00%
Lacrosse	1	1.60%	0	0	1	1.00%
Rodeo	1	1.60%	0	0	1	1.00%
Soccer	0	0	5	12.50%	5	5.00%
Swimming	1	1.60%	3	7.50%	4	4.00%
Track and Field	2	3.30%	3	7.50%	5	5.00%
Volleyball	0	0	2	5.00%	2	2.00%
Wrestling	0	0	1	2.50%	1	1.00%

NS=not specified

Table 12. Participation numbers, 1982-1983 to 2015-2016

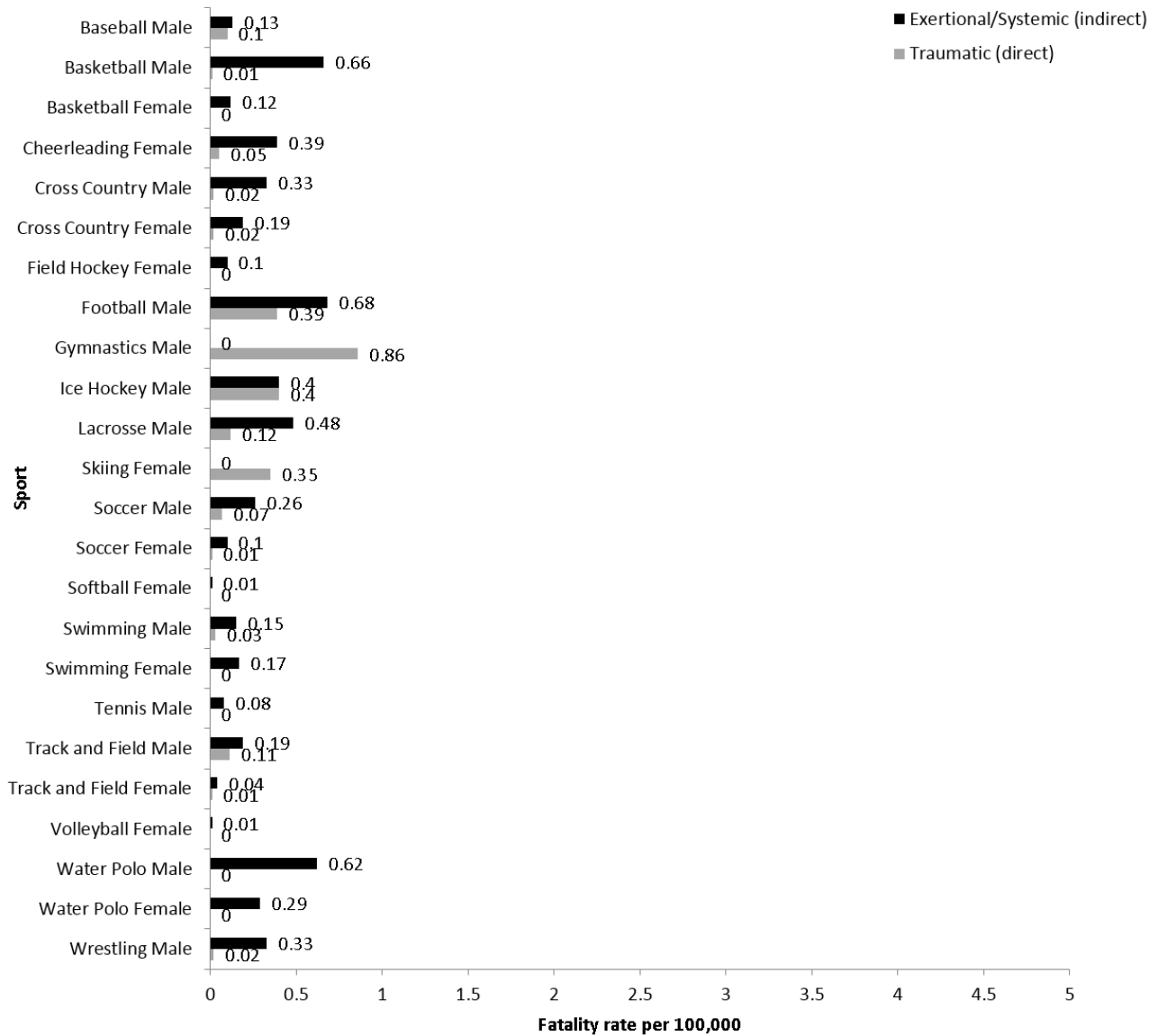
	High School ¹		College ²	
	Female	Male	Female	Male
Baseball	31,866	15,165,297	--	879,630
Basketball	14,529,374	18,133,578	458,735	519,365
Cheerleading	2,031,731	52,067	--	--
Cross Country	5,183,876	6,122,693	375,179	383,292
Equestrian	20,511	3,522	23,076	1,038
Field Hockey	1,926,416	4,660	182,766	--
Football	29,779	34,032,843	--	1,957,783
Golf	1,757,757	4,878,818	99,342	259,660
Gymnastics	788,222	115,631	50,763	17,964
Ice Hockey	144,484	1,010,693	34,684	132,192
Lacrosse	1,203,237	1,661,042	180,865	245,893
Rowing	59,213	50,745	158,166	73,249
Skiing	282,792	340,914	17,069	20,802
Soccer	8,134,942	10,470,106	530,865	617,201
Softball	11,177,148	51,832	474,586	--
Swimming	4,226,123	3,376,275	332,070	276,842
Tennis	5,231,332	4,893,848	275,754	264,124
Track and Field	15,046,743	18,471,725	1,144,140	1,342,408
Volleyball	12,200,749	1,124,092	428,126	38,350
Water Polo	340,759	481,277	21,417	33,475
Wrestling	117,816	8,358,938	--	231,164

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

²NCAA accessed online: <https://www.ncaapublications.com/p-4445-2015-16-ncaa-sports-sponsorship-and-participation-rates-report.aspx>

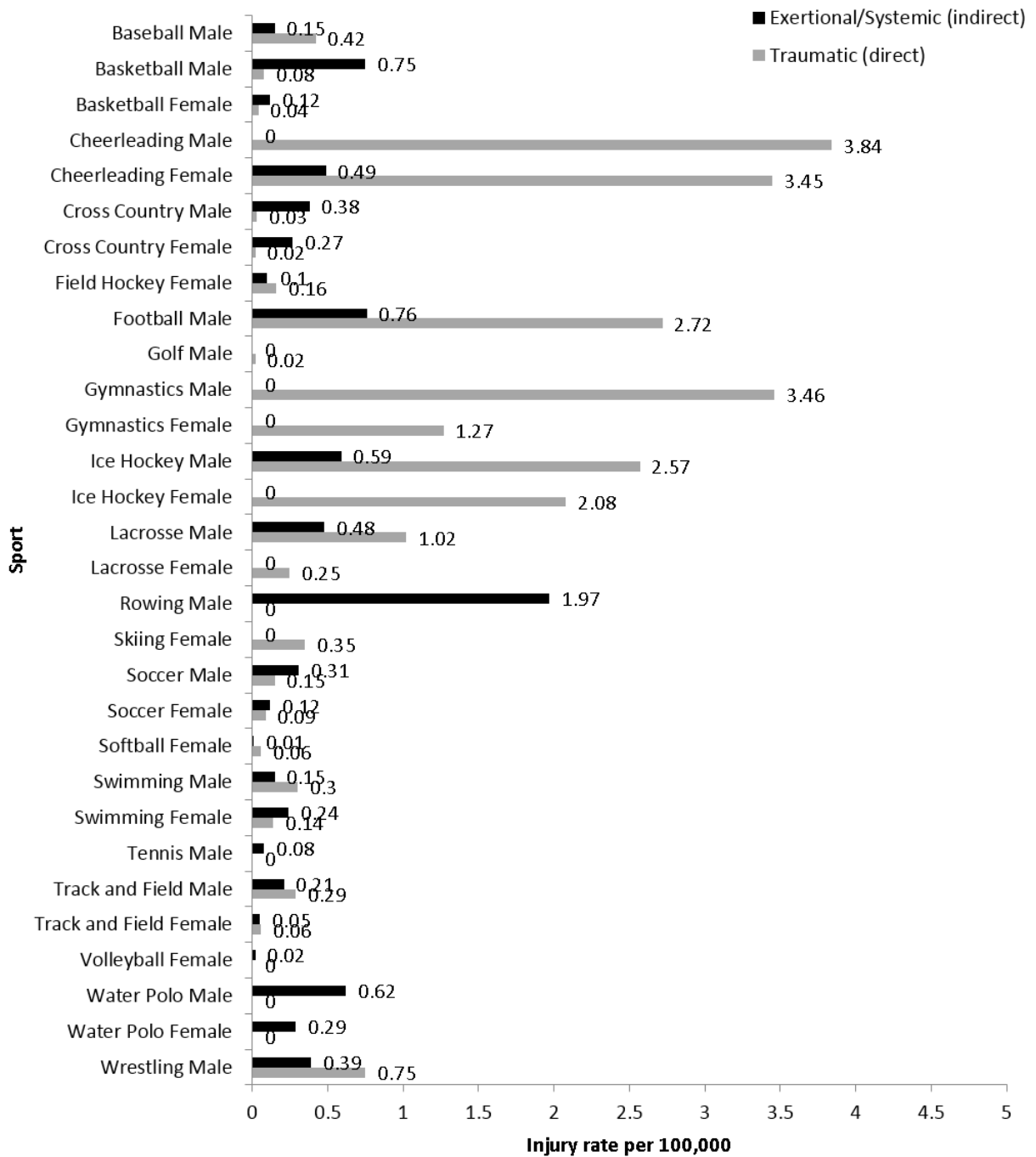
Note: Not all high schools and colleges are members of the NFHS and NCAA. Complete data is not available for the non-member schools. Therefore, these participation numbers underestimate the total number of high school and collegiate participants in the United States.

Figure 1: Rates of fatal catastrophic direct and indirect injuries/illnesses by sport-gender among high school participants, 1982/83-2015/16



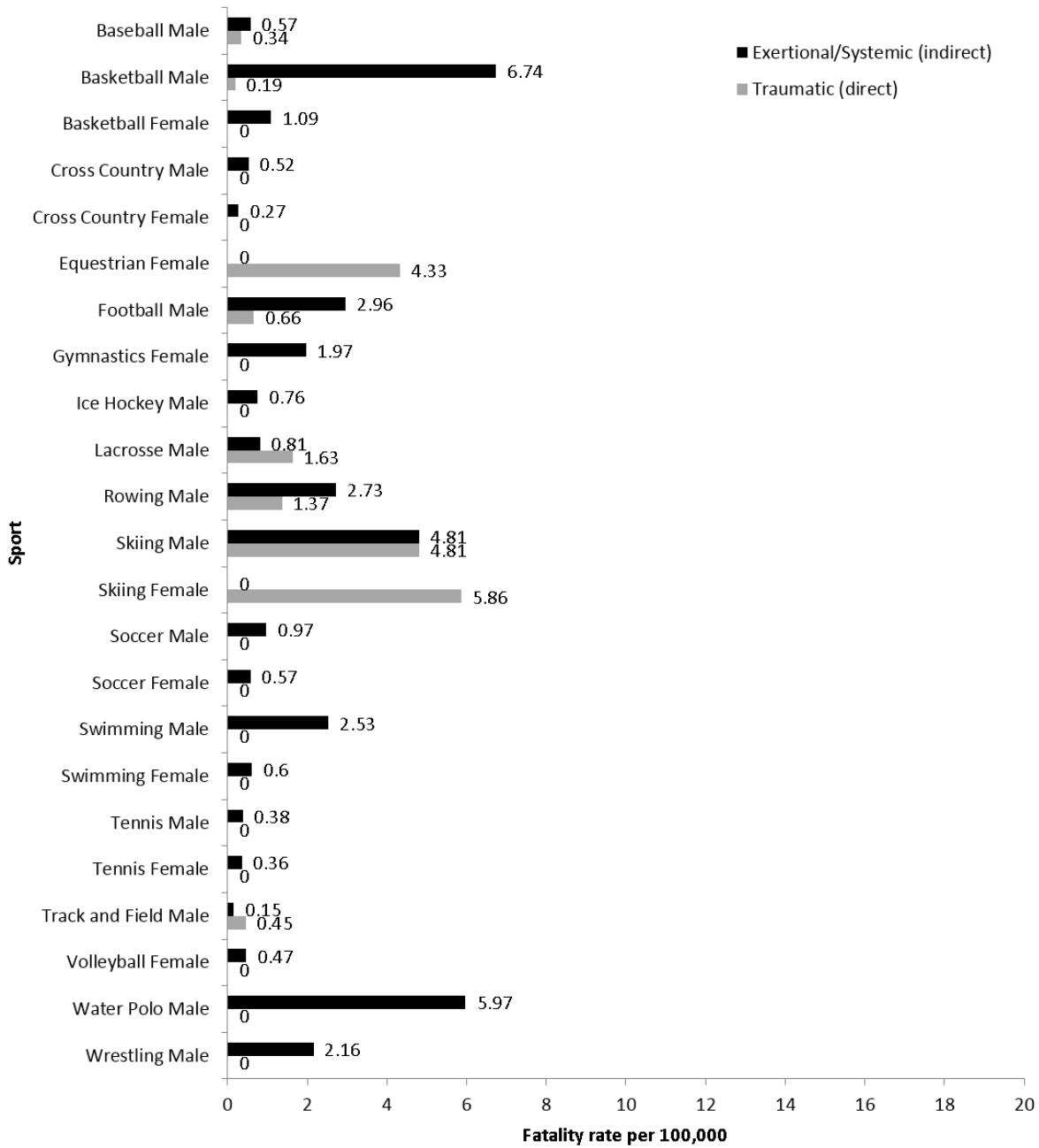
Note: Rates with number of incidents less than 5 should be interpreted with caution.

Figure 2: Rates of all catastrophic direct and indirect injuries/illnesses by sport-gender among high school participants, 1982/83-2015/16



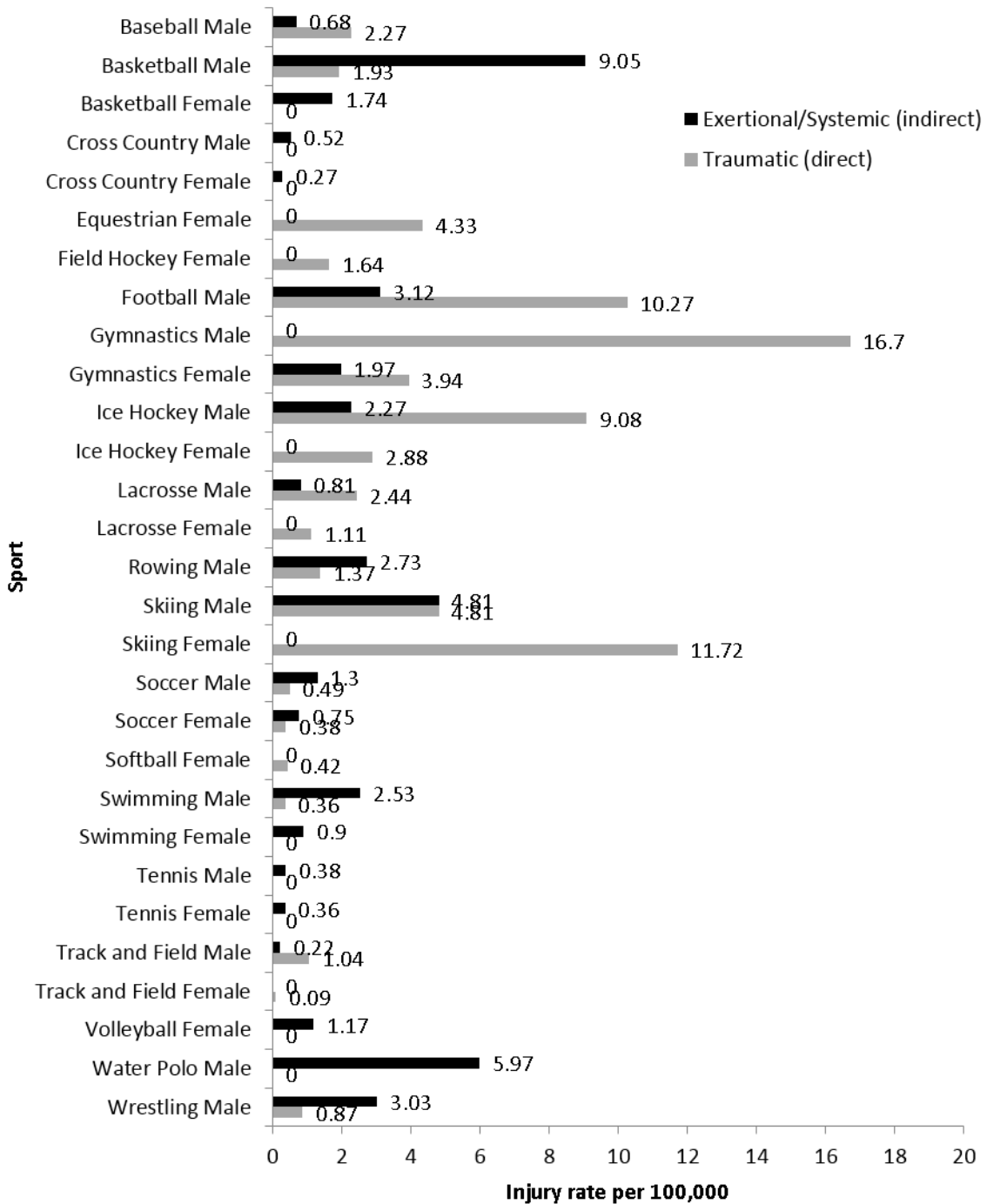
Note: Rates with number of incidents less than 5 should be interpreted with caution.

Figure 3: Rates of fatal catastrophic direct and indirect injuries/illnesses by sport-gender among collegiate participants, 1982/83-2015/16



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, 1982/83-2015/16



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