CATASTROPHIC

SPORTS INJURY RESEARCH

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Introduction

In 1931 the American Football Coaches Association 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 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, the 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 was established in 1982. The decision to expand the 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.

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 will be 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 direct 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.

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 National Collegiate Athletic Association (NCAA) the National Federation of State High School Associations (NFHS), and the American Football Coaches Association (AFCA). Upon receiving information concerning a possible catastrophic sports injury, contact by telephone, personal letter and questionnaire was made with the injured player's coach or athletic director. 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 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, has been responsible for evaluating the medical data. Dr. Cantu is also a Past-President of the American College of Sports Medicine.

A new NFHS concussion rule for the 2010-2011 sport seasons will apply to all sports and states the following:

"Any player who exhibits signs, symptoms or behaviors consistent with a concussion (such as loss of consciousness, headache, dizziness, confusion or balance problems) shall be immediately removed from the contest or practice and shall not return to play until cleared by an appropriate health-care professional. An athlete with a concussion shall not be allowed to continue playing in a game or practice the same day and may not return to play in subsequent days without being cleared by a medical professional."

Summary

Fall Sports (Tables I - VIII)

Football

As indicated in Tables I through VIII, football is associated with the greatest number of catastrophic injuries. For the 2009 football season there were a total of 34 high school direct catastrophic injuries, which is a decrease of 17 over 2008. College football was associated with eight direct catastrophic injuries in 2009, which is the same as the 2008 data.

In 1990, as shown in the **Annual Survey of Football Injury Research 1931-2009**, there were no fatalities directly related to football. The 1990 football report is historic in that it is the first year, and the only year, since the beginning of the research in 1931 that there has not been a direct fatality in football at any level of play. This clearly illustrates that this type of data collection and constant analysis of the data is important and plays a major role in injury prevention. The 1994 data shows zero fatalities at the high school level and one at the college level. In 2006 there was one high school direct fatality and none at the college level. These numbers are very low when one considers that there were 36 football direct fatalities in 1968.

In addition to the direct fatalities in 2009 there were also 14 indirect fatalities. Twelve of the indirect fatalities were at the high school level and two were at the college level. Heart and heat related deaths continue to be the cause of a majority of indirect deaths.

In addition to the fatalities there were 17 permanent disability injuries in 2009, with 16 at the high school level and one at the college level. Eight were cervical spine injuries and nine were brain injuries. This number is a decrease of five when compared to the 2008 data.

Serious football injuries with no permanent disability accounted for 23 injuries at the high school and college levels in 2009 – 16 at the high school level and seven at the college level.

' High school football in 2009 accounted for a total of 34 catastrophic injuries – two deaths, 16 disability injuries, and 16 catastrophic injuries with recovery. College football accounted for a total of eight catastrophic injuries in 2009 which included one disability injury and seven with recovery. The decrease in catastrophic football injuries during the 1990s illustrates the importance of data collection and being sure that the information is passed on to

those responsible for conducting football programs. A return to the injury levels of the 1960's and 1970's would be detrimental to the game and the participants, but the number of catastrophic injuries continues to be a major concern and must be watched carefully.

Cross Country

High school and college cross country were not associated with any direct fatalities in 2009, but high school cross country was associated with two indirect fatalities. For the 28 years indicated in Tables I through VIII, cross-country was associated with one direct non-fatal injury and 27 indirect fatalities at the high school level, and one indirect fatality at the college level. Twenty-six of the indirect fatalities were heart related, one was caused by a seizure, and the cause of one was unknown. Autopsy reports revealed congenital heart disease in four of these cases. The one indirect serious injury was heat stroke with recovery.

Soccer

Table I shows that high school soccer had one direct catastrophic injury with recovery in 2009 and a total of 17 male and three female direct catastrophic injuries for the past 28 seasons. The three direct catastrophic injuries in 1992 was the highest number in the past 28 years. There was also one high school male soccer indirect fatality in 2009. The death was caused by a stroke during a practice session. In 2009 college soccer was associated with one indirect fatality related to an enlarged heart.

Concussion injuries related to heading is a controversial area in soccer. There are helmet manufacturers that are now making soccer helmets to protect the participants from brain injuries while heading, even though the research indicates that concussion injuries during heading are related to head-to-head or head-to-ground contact and not ball contact. In a special edition of the Journal of Athletic Training, July-September 2001, an article by Donald Kirkendall and William Garrett, Jr. the authors stated that it is difficult to blame purposeful heading for the reported cognitive deficits when actual heading exposure and details of the nature of head-ball impact are unknown. They go on to say that concussions are a common head injury in soccer (mostly from

head-head or head-ground impact) and a factor in cognitive deficits and are probably the mechanism of the reported dysfunction. In October 2001 the Institute of Medicine at the National Academy of Sciences held a one-day conference. Experts on head injuries discussed the potential risk of heading, but reached no firm conclusions. The American Academy of Pediatrics issued the following recommendation in March 2000: "The potential for permanent cognitive impairment from heading the ball needs to be explored further. Currently, there seems to be insufficient published data to support a recommendation that young soccer players completely refrain from heading the ball. However, adults who supervise participants in youth soccer should minimize the use of the technique of heading the ball until the potential for permanent cognitive impairment is further delineated." In July of 2003 the National Federation of State High School Associations approved a rule that will allow soccer players to wear a head guard. Prior to this rule only goalkeepers could wear such a device. The 2010-2011 rules have a new rule related to concussions and a point of emphasis related to concussion management. The National Center will keep abreast of this controversial area.

In 2005 there was another case of a child being struck by the goal post and dying. A 15 year old male was struck in the head by a goal post that fell over and struck him in the head. This type of accident should never happen. The Consumer Product Safety Commission has stated that there have been at least 34 deaths and 51 injuries from falling soccer goal posts between 1979 and 2008 – at least seven deaths since 1998. There have been another 1,800 kids treated in emergency rooms due to injuries from movable soccer goals during that same period of time. The latest was an eight year-old boy who was hit by the goal post cross bar. Most occurred with moveable goal posts and resulted from errors in moving the structures or anchoring them. Soccer goal posts should be anchored to the ground and only moved by responsible adults. Players should not climb on the goal posts or hang on the crossbars.

Field Hockey

In 1988 field hockey was associated with its first catastrophic injury since the study began in 1982. It was listed as a serious injury at the college level. The athlete was struck by the

ball after a free hit. She received a fractured skull, had surgery and has recovered from the injury. The 1996 data showed two field hockey direct injuries at the high school level. Both injuries involved being hit by the ball and resulted in a head and an eye injury. The 1999 data show one non-fatal injury at the high school level and one serious injury at the college level. The high school injury involved the loss of an eye after being hit with the stick during a drill, and the college injury resulted in a fractured skull after being hit by a ball. There were no direct or indirect catastrophic injuries in high school or college field hockey during the 2009 season. There has been only one indirect catastrophic injury in field hockey since the beginning of the study in 1982, and that happened during the 2007 high school season. A player collapsed on the field during a practice and died.

Water Polo

In 1992-93 high school water polo was associated with its first indirect fatality and in 1988-89 college water polo had its first indirect fatality. There have been a total of four high school indirect fatalities in water polo and one at the college level. There were no water polo fatalities in 2009.

Fall Summary

In summary, high school fall sports in 2009 were associated with 35 direct catastrophic injuries, and 34 were associated with football. Football had two fatalities, 16 involved permanent disability and 16 were considered serious. For the 28-year period 1982-1983 – 2009-2010, high school fall sports had 771 direct catastrophic injuries and 747, or 96.9%, were related to football participants. In 2009 high school fall sports were also associated with 15 indirect fatalities. Twelve were in football, two in cross country, and one in soccer. For the period from 1982-1983 – 2009-2010 there was a total of 266 indirect fall high school catastrophic injuries. Two-hundred and sixty-three of the indirect injuries were fatalities and 196 were related to football. Eighteen of the indirect fatalities involved females – seven soccer players, one water

polo player, one field hockey player, and nine cross-country athletes. Females were also associated with six direct catastrophic injuries – three in field hockey and three in soccer.

During the 2009 college fall sports season there were eight direct catastrophic injuries- all eight being in football (one disability and seven recovery). For the 28 years, 1982-2009, there were a total of 163 college direct fall sport catastrophic injuries, and 156 were associated with football. Four were associated with soccer and three with field hockey. There were three indirect college fatalities during the fall of 2009 with two being associated with football and one in soccer. From 1982 through the 2009 fall season there were a total of 56 college fall sport indirect catastrophic injuries, and 54 of them were fatalities. Forty-six of the indirect fatalities were associated with football, eight in soccer, one in cross country, and one in water polo. College females were associated with four direct catastrophic injuries – three in field hockey and one in soccer. College females were also associated with three indirect fatalities in soccer.

High school football accounted for the greatest number of direct catastrophic injuries for the fall sports, but high school football was also associated with the greatest number of participants. There are approximately 1,500,000 high school and middle school football players participating each year. As illustrated in Table II, the 28-year rate of direct injuries per 100,000 high school and middle school football participants was 0.30 fatalities, 0.87 non-fatal injuries and 0.80 serious injuries. These catastrophic injury rates for football are higher than those for both cross-country and soccer, but all three classifications of catastrophic football injuries have an injury rate of less than one per 100,000 participants. Table IV shows that the indirect fatality rates for high school football, soccer and cross country are similar and are also less than one per 100,000 participants. Water polo rates are higher, but are based on only 18 years of data, and water polo has approximately 26,000 male and female participants each year.

College football has approximately 75,000 participants each year and the direct injury rate per 100,000 participants is higher than the other fall sports. The rate for the 28-year period indicated in Table VI, for college football fatalities is less than one per 100,000 participants, but

the rate increases to 1.73 per 100,000 for non-fatal injuries and 7.34 per 100,000 participants for serious injuries.

Indirect fatality rates are similar in college cross-country and soccer, increase in football, with water polo being associated with the highest indirect fatality rate. Based on 22 years of data, water polo has approximately 1,800 participants each year (Table VIII).

There were four college female athletes receiving a direct catastrophic injury in a fall sport for this 28-year period of time. There was one non-fatal injury and two serious injuries in field hockey, and one non-fatal injury in soccer. There were also three female indirect deaths and all three were in soccer.

Incidence rates are based on 28-year participation figures received from the National Federation of State High School Associations and the National Collegiate Athletic Association. (Figure I)

Winter Sports (Tables IX - XVI)

As shown in Table IX, high school winter sports were associated with four direct catastrophic injuries in 2009-2010. All four were associated with ice hockey – one death, two disability, and one recovery. High school winter sports were also associated with four indirect fatalities and three indirect injuries with recovery during the 2009-2010 school year (Table XI). Basketball was associated with all seven indirect injuries. All four of the fatalities were heart related.

College winter sports, Tables XIII - XVI, were associated with two direct catastrophic injuries during the 2009-2010 school year. One was a recovery injury in basketball and one was a disability injury in wrestling. During this same time period there were five indirect fatalities in basketball (one female) and two recovery indirect injuries in basketball (one female).

A summary of high school winter sports, 1982-1983 – 2009-2010, show a total of 133 direct catastrophic injuries (8 fatalities, 70 non-fatal, and 55 serious) and 177 indirect (167 fatalities, one disability, and nine serious). Wrestling was associated with 60 or 45.1 % of the

direct injuries. Gymnastics was associated with 13, or 9.8%, of the direct injuries. Basketball was associated with 21 (15.8%), ice hockey was associated with 25 (18.8%), swimming was associated with 13 (9.8%) direct injuries, and volleyball one (0.75%). Basketball accounted for the greatest number of indirect catastrophic injuries with 137, or 77.4%, of the winter total.

College winter sports from 1982-1983 – 2009-2010 were associated with a total of 33 direct catastrophic injuries. Gymnastics was associated with six (18.2%), ice hockey 12 (36.4%), basketball ten (30.3%), swimming one (3.0%), skiing two (6.1%) and wrestling two (6.1%). There were also 57 indirect injuries (52 fatalities) during this time period. Thirty-nine, or 68.4%, were associated with basketball, three in wrestling (5.2%), two in ice hockey (3.5%), nine in swimming (15.8%), one in skiing (1.8%), one in gymnastics (1.8%), and two in volleyball (3.5%).

High school wrestling accounted for the greatest number of winter sport direct injuries, but the injury rate per 100,000 participants was less than one for all three categories. High school wrestling has averaged approximately 240,000 male and 2,100 female participants each year. High school basketball and swimming were also associated with low direct injury rates. As shown in Table X, ice hockey and gymnastics, for both males and females, were associated with the highest direct injury rates for the winter sports. Gymnastics has averaged approximately 3,700 males and 24,000 female participants during the past twenty-eight years. Ice hockey averaged 28,450 male and 3,180 female participants each year. A high percentage of the ice hockey injuries involve a player being hit by an opposing player, usually from behind, and striking the skate rink boards with the top of his/her head.

Indirect high school catastrophic injury rates, as indicated in Table XII, are all below one per 100,000 participants, with men's basketball having the highest fatality rate (0.78).

Catastrophic direct injury rates for college winter sports are higher when compared to high school figures. Gymnastics had five non-fatal and one serious injury for the past twenty-eight years, but the injury rate is 18.79 per 100,000 participants for non-fatal male injuries, and

4.80 per 100,000 for female non-fatal injuries. Participation figures show approximately 570 male and 1,490 female gymnastic participants each year.

College ice hockey was associated with eight serious (one female) and four non-fatal injuries in twenty-eight years, but the injury rate is 3.72 per 100,000 male participants for non-fatal and 6.50 for male serious injuries. There are approximately 3,845 male ice hockey participants each year. The first female college ice hockey player received a direct serious injury during the 1999-2000 season. The serious injury rate for females was 4.71 injuries per 100,000 participants and females averaged approximately 760 participants per year for the past 28 years. Swimming non-fatal incidence rates were not as high as gymnastics or ice hockey, but could be totally eliminated if swimmers would not use the racing dive into the shallow end of pools during practice or meets. In fact there has not been a direct injury in college swimming since the one non-fatal injury in 1982-1983.

College wrestling had only two direct catastrophic injury from the fall of 1982 to the spring of 2010. For this period of time there were 188,272 participants in college wrestling for an average of approximately 6,724 per year. The injury rate for this twenty-eight year period of time was 1.06 per 100,000 participants. College skiing has approximately 764 female participants each year and the one fatality and one disability injury produced a twenty-one year injury rate of 6.23 per 100,000 participants for each injury. These were the only skiing direct catastrophic injuries since the study was initiated for skiing in 1990.

Injury rates for male college indirect fatalities were also high when compared to the high school rates. Basketball had an injury rate of 7.59 fatalities per 100,000 male participants, skiing 5.58, ice hockey 0.93, and swimming 2.72. The year 1997-98 was the first year there were any indirect fatalities in wrestling. There were three deaths due to heat stroke associated with wrestlers trying to make weight for a match. The indirect injury rate for wrestling was 1.59 per 100,000 participants.

The female indirect injury rate for basketball was 1.39 per 100,000 participants, 0.94 for volleyball, 0.78 for swimming and 2.40 for gymnastics.

Spring Sports (Tables XVII - XXIV)

High school spring sports were associated with five direct catastrophic injuries in 2010. There were four catastrophic injuries in baseball and one in lacrosse. High school spring sports were also associated with six indirect catastrophic injuries in 2010 – three in baseball and three in track.

College spring sports were associated with two direct fatalities in track and three recovery injuries in baseball. There were no indirect catastrophic injuries in 2010.

From 1983 through 2010, high school spring sports were associated with 143 direct catastrophic injuries (Table XVII). Thirty-eight were listed as fatalities, 45 as catastrophic non-fatal and 60 as serious. Baseball accounted for 58, track 65, lacrosse 14, and softball six. Injury rates were less than one per 100,000 participants for each sport in all categories, with the exception of male softball that had a fatality rate of 3.02. There were nine direct injuries to females in track, five in softball, and two in lacrosse. There were also 70 indirect fatalities in high school spring sports during this time span (Table XIX). Forty were related to track, 18 in baseball, seven in lacrosse, four in tennis, and one in golf. Six of the indirect fatalities involved female track athletes.

As illustrated in Table XXI, college spring sports were associated with 41 direct catastrophic injuries from 1983 to 2010. Thirteen of these injuries resulted in fatalities, 14 were listed as non-fatal and 14 were listed as serious. Baseball accounted for 15 injuries, lacrosse 11, track 13, softball one, and equestrian one. College females were associated with two non-fatal injuries in lacrosse, one in track, a serious injury in softball, and one fatality in equestrian. Table XXIII shows there were also ten indirect fatalities in college spring sports during this time. Two indirect fatalities were associated with tennis, one was associated with track, two in baseball, three in rowing, and two in lacrosse. There was one female fatality in tennis.

Injury rates for high school spring sport direct injuries were low as illustrated in Table XVIII. Baseball participation reveals an average of approximately 423,000 male players and 900 female players each year, track 518,000 males and 421,000 females, and tennis 142,000 males and 149,000 females. The baseball figures do not include the 318,000 female softball participants each year (plus 1,182 males). Lacrosse has approximately 37,000 male and 25,000 female participants each year. Injury rates, as shown in Table XX, for high school indirect injuries are also low.

College spring sports, Table XXII, are related to low injury rates for direct injuries, with the exception of equestrian and men's lacrosse. Men's lacrosse had four fatalities, three non-fatal and two serious injuries and the injury rates were higher than the other college spring sports. Female lacrosse players were associated with two non-fatal injuries and female track (pole vault) was associated with one non-fatal injury. Equestrian was associated with a female fatality. Participation figures reveal approximately 6,000 men and 4,000 women lacrosse players each year. The 1991 and 2003 injuries were to female lacrosse players.

Rates for indirect college fatalities in baseball, tennis, and track are low with lacrosse being slightly higher. There were two indirect tennis fatalities, one male and one female, but participation figures are low. Men average approximately 7,600 and women 7,900 participants each year. Men's rowing had the highest indirect injury rate at 16.01 injuries per 100,000 male participants and 0.00 for female participants. There are approximately 2,000 male rowers and 6,800 female rowers each year.(Table XXIV)

Discussion

Football is associated with the greatest number of catastrophic injuries for all sports, but the injury rate per 100,000 participants is higher in both gymnastics and ice hockey. There have been dramatic reductions in the number of football fatalities and non-fatal catastrophic injuries since 1976 and the 1990 data illustrated an historic decrease in football fatalities to zero. This is a great accomplishment when compared to the 36 fatalities in 1968. This dramatic reduction can

be directly related to data collected by the American Football Coaches Association Committee on Football Injuries (1931-2010) and the recommendations that were based on that data. Non-fatal football injuries, permanent disability, decreased to one for college football in 1995, 1999, 2004, 2005, 2009 and zero in 2007 and 2008. There was a dramatic reduction in high school football from 13 in 1990 and 1993, and to eight in 2002. The 2006 data show 17 non-fatal injuries (head and neck combined) and one fatality in high school football. The 2008 data show 21 head and neck disability injuries and seven fatalities in high school football. In 2009 there were 16 head and neck injuries in high school football with disability and two deaths. Permanent disability injuries in football have seen dramatic reductions when compared to the data from the late 1960's and early 1970's, but the 2008 and 2009 data are a dramatic increase and a major concern. In addition, there were four serious injuries in high school football in 2006, but a dramatic rise to 19 in 2007 and 23 in 2008 and 16 in 2009. A total of 51 catastrophic injuries in high school football during the 2008 season was a shock and a major concern (seven deaths, 21 disability, and 23 serious). Fifty-one catastrophic injuries is an all time high and a major increase. All of the serious cases involved head or neck injuries and in a number of these cases excellent medical care saved the athlete from permanent disability or death. The number dropped to 34 in 2009 (two deaths, 16 disability, and 16 serious), but this number is still too high. College football in 2009 was associated with a total of eight catastrophic injuries – seven were serious head or neck injuries with full recovery and one involved permanent disability.

Football catastrophic injuries may never be totally eliminated, but progress has been made. Emphasis should again be focused on the preventive measures that received credit for the initial reduction of injuries.

1. The 1976 rule change which prohibited initial contact with the head in blocking and tackling. There must be continued emphasis in this area by coaches and officials.
2. The NOCSAE football helmet standard that went into effect at the college level in 1978 and at the high school level in 1980. There should be continued research in helmet safety.

3. Improved medical care of the injured athlete. An emphasis on placing certified athletic trainers in all high schools and colleges. There should be a written emergency plan for catastrophic injuries both at the high school and college levels.
4. Improved coaching technique when teaching the fundamental skills of blocking and tackling.

Keeping the head out of blocking and tackling!

A major concern in football fatalities has been the number of indirect deaths due to heat stroke, both at the college and high school levels. During the past ten years there have been 29 heat stroke deaths in football. This number is unacceptable since heat stroke deaths are preventable with the proper precautions. Every effort should be made to continuously educate coaches concerning the proper procedures and precautions when practicing or playing in the heat. In the Annual Survey of Football Injury Research – 1931-2009 there are recommendations for safety during football activity in hot weather. New regulations by the National Collegiate Athletic Association for volunteer summer conditioning programs and pre-season football practice went into effect during the 2003 season and it will be very interesting to see how they effect heat related injuries at the college level.

It should be noted that from 1979 to 2008, according to the Consumer Product Safety Commission (CPSC) there have been 34 deaths and 51 injuries from movable soccer goals. The most recent case involved an eight year-old male playing on a soccer goal when it tipped over and hit his head, causing his death. Since 1998 there have been at least seven deaths and another 1,800 kids treated in emergency rooms because of injuries from movable soccer goals. There has been one fatality in this study, which involved a college athlete hanging on a soccer goal and the goal falling and striking the victim's head. The CPSC recommends the following safety measures related to movable soccer goal safety:

1. Teach kids to never climb on the netting or crossbar of a soccer goal

2. Soccer goals should be securely anchored to the ground with stakes, an auger anchor, or counterweights, such as sandbags, and that they are checked before games and practices
3. Place soccer goals on a flat surface, which may make it less likely to tip over
4. When not in use remove soccer goal nets and anchored or chained to a fence post, dugout, or other sturdy fixture, so kids cannot move or play on them without supervision
5. Take soccer goals apart and store at the end of a season so kids cannot play on them

On May 4, 1999, the Consumer Product Safety Commission and the soccer goal industry announced the development of a new safety standard that will reduce the risk of soccer goal tip-over. The 'Provisional Safety Standard and Performance Specification for Soccer Goals" (ASTM-PS-75-99) requires that movable soccer goals, except very lightweight goals, not tip over when the goal is weighted in a downward or horizontal direction. The standard also specifies warning labels must be attached to the goal, such as: "Warning: Always anchor goal. Unsecured goal can fall over causing serious injury or death." For a free copy of : "Guidelines for Movable Soccer Goal Safety," send a postcard to CPSC, Washington, DC 20207. Also available online: http:cpsc.gov.

A Loss Control Bulletin from K & K Insurance Group, Inc., Fort Wayne, IN, suggests the following safeguards:

1. Keep soccer goals supervised and anchored.
2. Never permit hanging or climbing on a soccer goal.
3. Always stand to the rear or side of the goal when moving it - NEVER to the front.
4. Stabilize the goal as best suits the playing surface, but in a manner that does not create other hazards to players.
5. Develop and follow a plan for periodic inspection and maintenance (e.g., dry rot, joints hooks).

6. Advise all field maintenance persons to re-anchor the goal if moved for mowing the grass or other purposes.
7. Remove goals from field no longer in use for the soccer program as the season progresses.
8. Secure goals well from unauthorized access when stored.
9. Educate and remind all players and adult supervisors about the past tragedies of soccer goal fatalities.

There is also a list of guidelines available for movable soccer goal safety and warning labels. To obtain a copy contact the following:

The Coalition to Promote Soccer Goal Safety
C/O Soccer Industry Council of America
200 Castlewood Drive
North Palm Beach, FL 33408

High school wrestling, gymnastics, ice hockey, baseball and track should receive close attention. Wrestling has been associated with 60 direct catastrophic injuries during the past twenty-eight years. Due to the fact that college wrestling was only associated with two catastrophic injury during this same time period, continued research should be focused on the high school level. High school wrestling coaches should be experienced in the teaching of the proper skills of wrestling and should attend coaching clinics to keep up-dated on new teaching techniques and safety measures. They should also have experience and training in the proper conditioning of their athletes. These measures are important in all sports, but there are a number of contact sports, like wrestling, where the experience and training of the coach is of the utmost importance. Full speed wrestling in physical education classes is a questionable practice unless there is proper time for conditioning and the teaching of skills. The physical education teacher should also have expertise in the teaching of wrestling skills. It should also be emphasized that wrestling coaches need to be aware of the dangers associated with athletes making weight. Improper weight reduction can lead to serious injuries and death. During the 1997-1998

academic year there were three college wrestlers that died while trying to make weight for a match. All three died of heat stroke complications. These were the first wrestling deaths associated with weight reduction; however, there is no information on the number of wrestlers who had medical problems associated with weight loss, but recovered. All three of these wrestlers were trying to lose large amounts of weight in a short period of time. All three were also working out in areas of high heat, and were all wearing sweat clothes or rubber suits. Making weight has always been a part of the wrestling culture, but it is dangerous and life threatening. New rule changes went into effect for the 1998-99 high school and college seasons, and hopefully, making weight will be a thing of the past and will never result in the deaths of young high school or college athletes. A significant rule change approved by the NFHS Board of Directors in April 2005, states that in 2006-07 stronger guidelines discouraging rapid weight loss will take effect. The revised rule includes a specific gravity not to exceed 1.025, a body fat assessment no lower than 7 percent (males)/12 percent (females) and a monitored, weekly weight loss plan not to exceed 1.5% a week.

There is also a national trend for an increased number of females participating in wrestling. In 2009-2010 there were 6,134 females in high school wrestling. A new rule in high school wrestling for the 2007-2008 season states that each contestant who has braces or a special orthodontic device on his or her teeth, shall be required to wear a tooth and mouth protector. A rule clarification was made on communicable skin conditions or any other condition, in that the current written documentation from a physician needs to be on an approved form from either the NFHS or a state association. Communicable skin conditions were also a point of emphasis in the 2007-2008 rule book. As stated earlier the concussion rule for all high school sports has been changed.

Men's and women's gymnastics and ice hockey were associated with higher injury rates at both the high school and college levels. Gymnastics needs additional study at both levels of competition. Both levels have seen a dramatic participation reduction and this trend may

continue with the major emphasis being in private clubs. Lacrosse also had a higher injury rate at the college level.

Ice hockey injuries are low in numbers but the injury rate per 100,000 participants is high when compared to other sports. Ice hockey catastrophic injuries usually occur when an athlete is struck from behind by an opponent, slides across the ice in a prone position, and makes contact with the crown of his/her head and the boards surrounding the rink. The results are usually fractured cervical vertebrae with paralysis. The 2010-2011 NFHS rule book states that all players shall wear a tooth and mouth protector. Also Rule 6-8 adds "CONTACT TO THE HEAD" No player shall make contact with an opposing player's head or neck area in any manner. Research in Canada has revealed high catastrophic injury rates with similar results. After an in-depth study of ice hockey catastrophic injuries in Canada, Dr. Charles Tator has made the following recommendations concerning prevention:

1. Enforce current rules and consider new rules against pushing or checking from behind
2. Improve strength of neck muscles.
3. Educate players concerning risk of neck injuries.
4. Continued epidemiological research.

Dr. Tator has also stated that 20% of children on ice hockey teams in Canada suffer concussions.

Catastrophic injuries in swimming were all directly related to the racing dive in the shallow end of pools. There has been a major effort by both schools and colleges to make the racing dive safer and the catastrophic injury data support that effort. There has not been a college injury for the past 27 years. High school swimming has been associated with 13 catastrophic injuries and the racing dive in the shallow end of the pool has been involved in all cases. It is a fact that the swimming community has been made aware of the problem with the racing dive into the shallow end of the pool, and along with rule changes and coach's awareness, there have been no catastrophic injuries in swimming during the past eight years. The competitive racing start has changed and now involves the swimmer getting more depth when entering the water. Practicing or starting competition in the deep end of the pool or being extremely cautious could

eliminate catastrophic injuries caused by the swimmer striking his/her head on the bottom of the pool. The National Federation of State High School Associations Swimming and Diving Rules Book (Rule 2-7-2) states that in pools with water depth less than three and one-half feet at the starting end, swimmers will have to start the race in the water. The rules read that in four feet or more of water, swimmers may use a starting platform up to a maximum of 30 inches above the water, and the pool depth shall be measured for a distance of 16 feet, 5 inches from the end wall. Between three and one-half and less than four feet, swimmers start from the pool deck or in the water. If the water is less than three and one-half feet deep swimmers must start the race in the water. The National Collegiate Athletic Association and USA Swimming have or are in the process of moving standards for use of starting blocks to a minimum depth of five feet. In April 1995 the National Federation revised rule 2-7-2, which now states that starting platforms shall be securely attached to the deck/wall in pools with water depth of four feet or more in the starting end. If they are not, they shall not be used and deck or in-water starts will be required. These new rules point out the importance of constant data collection and analysis. Rules and equipment changes for safety reasons must be based on reliable injury data. The National Center has not received any information concerning high school or college direct catastrophic swimming injuries during the 2009-2010 season.

High school spring sports have been associated with low incidence rates during the past twenty-eight years, but baseball was associated with 58 direct catastrophic injuries and track 65. A majority of the baseball injuries have been caused by the head first slide or by being struck with a thrown or batted ball. If the headfirst slide is going to be used, proper instruction should be involved. Proper protection for batting practice should be provided for the batting practice pitcher and he/she should always wear a helmet. This should also be true for the batting practice coach. In 2010 there were four direct catastrophic injuries in high school baseball – two deaths, one disability injury, and one recovery.

A new rule in fast pitch soft ball will require players to wear batting helmets equipped with NOCSAE approved facemasks/guards. The rule went into effect January 1, 2006.

Effective in the 2010-2011for fast pitch softball the pitching distance will be moved back to 43 feet. State associations are permitted to adopt the 43 feet distance in 2009-2010. It is a safety rule and also will result in fewer strikeouts and more action with more balls being hit into play.

The pole vault has been associated with a majority of the fatal track injuries. In 2010 there were two pole vaulting deaths and both were at the college level. All of these accidents involved the vaulter bouncing out of or landing out of the pit area. The three pole vaulting deaths in 1983 were a major concern and immediate measures were taken by the National Federation of State High School Associations. Beginning with the 1987 season all individual units in the pole vault landing area had to include a common cover or pad extending over all sections of the pit.

In 2001 there was a pole vaulting injury to a female college athlete. The athlete was vaulting indoors, bounced out of the pit, and hit her head on the floor. She had an epidural hematoma and a posterior skull fracture. At the time of the accident it was not possible to determine the extent of any long-term disability.

Whenever there is a pole vaulting death there are more proponents of eliminating the event. The crux of the opposition appears to be the potential liability and also the lack of qualified coaches to teach the pole vault. Additional recommendations in the 1991 rule book included stabilizing the pole-vault standards so they cannot fall into the pit, pad the standards, remove all hazards from around the pit area, and control traffic along the approach. Obvious hazards like concrete or other hard materials around the pit should be eliminated. In the National Federation of State High Schools Track and Field Rules Book, Section 5, Article9, it states as follows: Hard or unyielding surfaces, such as but not limited to concrete, metal, wood or asphalt around the landing pad, or between the planting box and the landing pad, shall be padded or cushioned with a minimum of two (2) inches of dense foam or other suitable material. It is also recommended that any excess material such as asphalt or concrete that extends out from beneath the landing pad be removed.

Due to the numbers of pole vaulting injuries there have also been a number of recommendations stating that pole vaulters should wear helmets. The National Federation of State High School Associations has made the following statement concerning pole vaulting helmet use: The NFHS has been asked if it would be permissible for high school students to wear some type of helmet while pole vaulting and they stated that it would be permissible for an athlete to wear a helmet of his/her choosing without violating the NFHS rules. A helmet designed exclusively for pole vault, the KDMax, was released in October 2004. Six state high school associations already require some type of helmet for pole vaulters, and 30 states indicated on the 2004 NFHS track and field survey that they would support mandatory helmet use if a national standard was in place. In the NCAA helmets will continue to be an option for pole vaulters. The 2010 track and field NFHS rule book has the pole vault listed as one of the points of emphasis.

It has been estimated that there are approximately 25,000 high school pole vaulters annually. If this number were correct, the catastrophic injury rate for high school pole vaulters would be higher than any of the sports included in the research (approximately 5.92 catastrophic injuries per 100,000 participants). An outside group estimates that there may be as many as 77,390 high school male and female pole vaulters. Either number is only an estimate. There is no doubt that if the 77,390 number is used the incidence rate would be less than if the 25,000 number is used. The important point is that there were 43 catastrophic injuries in pole vaulting and needs continued attention. Surveillance should be maintained, and high school coaches and officials should be aware of the National Federation rules pertaining to the pole vault – size of the landing system, weight of competitor and pole rating, etc.

There have also been 25 accidents in high school track involving participants being struck by a thrown discus, shot put or javelin, including the female in 2008 who was struck in the head by a discus. In 1992, a female athlete was struck by a thrown discus in practice and died. In 1993, a track manager was struck in the neck by a javelin, but he was lucky and completely recovered from the accident. In 1994, a female track athlete was struck in the face by a javelin

and will recover. In 1995, a male athlete was struck in the head by a shot put during warm-ups and had a fractured skull. In 1997, a male athlete was struck by a discus and died. In 1998 a female athlete was struck by a discus and died, and a male athlete was struck in the head by a shot-put and recovered. In 1999 a male athlete was struck by a javelin and a female athlete was struck by a discus. In 2000 a junior high school athlete was struck in the head by a discus and has permanent disability. In 2001 a high school athlete was struck in the cheek with a javelin during practice. In 2002 there were three athletes struck by a shot putt and one by a discus. In 2002 there was also a coach that was struck by a shot putt. In 2004 a male track athlete was hit in the head with a shot putt and was in critical condition. In 2005 a track athlete was impaled with a javelin in the shoulder. In 2006 a male track athlete was hit in the head with a javelin which went four inches into his brain. He was very lucky and recovered. In 2007 a female track athlete was struck in the ankle by a javelin and needed a bone graft, and another female was struck in the head by a shot put, had surgery, and recovered. In 2010 a high school female track athlete was hit in the face by a discus. There have also been spectators struck by the discus during high school meets. On June 23, 2005, a 77 year old official died after being struck in the head by a shot put while athletes were practicing for the US championships. Safety precautions must be stressed for these events in both practice and competitive meets with the result being the elimination of this type of accident. The National Federation of State High School Associations put a new rule in for the 1993 track season that fenced off the back and sides of the discus circle to help eliminate this type of accident. Good risk management would eliminate these types of accidents. These types of injuries are not acceptable and should never happen.

The 2008 track and field rule book point of emphasis on risk minimization highly recommended emphasis on safety in the following areas:

1. Proper administration and appropriate restricted areas in all throws and jumps
2. Hydration of all athletes
3. Well-marked restricted areas for all running events
4. Well-marshaled areas to encourage positive spectator behavior

5. Schools are encouraged to have a copy of the rule book to serve as a resource to properly train individuals assisting with meet administration

The fatality in high school lacrosse during the 1987 season was associated with a player using his head to strike the opponent. He struck the opponent with the top or crown of his helmet. This technique is prohibited by the lacrosse rules and should be strictly enforced. In 2002 a high school lacrosse player was also blocking and suffered permanent paralysis. Lacrosse has been a fairly safe sport when considering the fact that high school lacrosse has been involved with 14 direct catastrophic injuries in twenty-eight years. A possible new area of concern is the recent lacrosse deaths being associated with players being struck in the chest with the ball and causing death (commotio cordis). There have been eight cases (6 deaths) (three high school, one high school club, three college, and one lacrosse summer camp) in the past 12 years. The most recent commotio cordis accident happened when the player was struck in the chest by a shot while playing defense. Currently there is research being funded by the National Operating Committee for Standards in Athletic Equipment that is studying chest protectors to help reduce commotio cordis fatalities. The lacrosse community will have to keep a close watch on these types of deaths and possibly carry out in-depth evaluations of these injuries.

There was a female college lacrosse player in 1993 that was hit in the eye with a ball and had permanent vision damage. In the spring of 2004 protective eyewear was required for all high school participants in states that follow NFHS rules, and for all competitors at the NCAA championships. In 2005, the requirement was extended to the entire season for all NCAA teams. Early reports indicate a major reduction in eye injuries for female lacrosse players.

College spring sports are also associated with a low injury incidence. Injury rates are slightly higher in lacrosse but the participation figures are so low that even one injury will increase the incidence rate dramatically. It is important to point out that there have been nine college male and two female lacrosse catastrophic injuries during the past twenty-eight years. The college death in 2005 involved a male player being struck in the neck by a ball. In a college club lacrosse game on October 15, 2005, there was a non-fatal catastrophic injury to a male

participant. He was hit with a point blank range shot off of his helmet. The injury was a subdural hematoma and the athlete had surgery. There have been questions concerning the particular helmet the player was wearing at the time. There was one direct serious injury with recovery to a female high school lacrosse player in 2010. It should be mentioned that there is general concern about concussion injuries in lacrosse, and according to a study from Temple University, female lacrosse players have the highest percentage of concussions during a game, followed by women's soccer.

For the twenty-eight year period from the fall of 1982 through the spring of 2010 there have been 1284 direct catastrophic injuries in high school and college sports. High school sports were associated with 166 fatalities, 454 non-fatal and 427 serious injuries for a total of 1047. High school females accounted for two deaths, 20 disability, and 21 serious direct injuries. College sports accounted for 24 fatalities, 68 non-fatal and 145 serious injuries for a total of 237. College females accounted for two deaths, eight disability, and four serious injuries. During this same twenty-eight year period of time there have been a total of 636 indirect injuries and all but 22 resulted in death. Five hundred and thirteen of the indirect injuries were at the high school level (52 females) and 123 were at the college level (16 females).. It should be noted that high school annual athletic participation for 2009-2010 includes approximately 7,628,377 athletes (4,455,740 males and 3,172,637 females). National Collegiate Athletic Association participation for 2009-2010 in championship sports was 430,301 athletes. There were 245,875 males and 184,426 females.

During the twenty- eight year period from the fall of 1982 through the spring of 2010 there have been 169,153,061 high school athletes participating in the sports covered by this report. Using these participation numbers would give a high school direct catastrophic injury rate of 0.62 per 100,000 participants. The indirect injury rate is 0.30 per 100,000 participants. If both direct and indirect injuries were combined the injury rate would be 0.92 per 100,000. This means that approximately one high school athlete out of every 100,000 participating would

receive some type of catastrophic injury. The combined fatality rate would be 0.39 per 100,000, the non-fatal rate 0.27, and the serious rate 0.26.

During this same time period there were approximately 9,327,940 college participants with a total direct catastrophic injury rate of 2.54 per 100,000 participants. The indirect injury rate is 1.32 per 100,000 participants. If both indirect and direct injuries were combined the injury rate would be 3.86. The combined fatality rate would be 1.50, the non-fatal rate 0.75, and the serious rate 1.61.

Female Catastrophic Injuries

There have been a total of 121 direct and 61 indirect catastrophic injuries to high school female athletes from 1982-83 – 2009-2010, which includes cheerleading. College females accounted for 49 direct and 16 indirect catastrophic injuries (including cheerleading) for the same time period. The 121 high school direct injuries included nine in gymnastics, 78 in cheerleading, five in swimming, four in basketball, nine in track, five in softball, three in field hockey, two in ice hockey, two in lacrosse, three in soccer, and one in volleyball. The 61 high school indirect fatalities included 17 in basketball, nine in swimming, six in track, seven in soccer, nine in cross country, two in volleyball, one in water polo, one in field hockey, and nine in cheerleading. The 49 college direct injuries were associated with cheerleading(35), gymnastics(2), field hockey(3), soccer(1), skiing(2), ice hockey(1), track (pole vault)(1), equestrian(1), softball(1), and lacrosse(2). The 16 college indirect fatalities included one in tennis, six in basketball, three in soccer, one in gymnastics, three in swimming, and two in volleyball. Catastrophic injuries to female athletes have increased over the years. As an example, in 1982-83 there was one female catastrophic injury and during the past 28 years there has been an average of 8.8 per year. A major factor in this increase has been the change in cheerleading activity, which now involves gymnastic type stunts. If these cheerleading activities are not taught by a competent coach and keep increasing in difficulty, catastrophic injuries will continue to be a part of cheerleading. High school cheerleading accounted for 64.5% of all high

school direct catastrophic injuries to female athletes (two males not included) and 71.4% at the college level (four males not included). Of the 170 direct catastrophic injuries to high school and college female athletes from 1982-83 – 2009-2010, cheerleading was related to 113 or 66.5%. The cheerleading numbers have been updated from previous reports and male cheerleaders were not included. Read the special section on cheerleading.

Athletic administrators and coaches should place equal emphasis on injury prevention in both female and male athletics. Injury prevention recommendations are made for both male and female athletes.

Athletic catastrophic injuries may never be totally eliminated, but with reliable injury data collection systems and constant analysis of the data these injuries can be dramatically reduced.

TABLE 1

HIGH SCHOOL FEMALE DIRECT CATASTROPHIC INJURIES

1982-83 – 2009-2010

SPORT	FATALITY	NON-FATAL	SERIOUS	TOTAL
Cheerleading*	2	28	48	78
Gymnastics	0	6	3	9
Track	1	2	6	9
Swimming	0	4	1	5
Basketball	0	1	3	4
Ice Hockey	0	0	2	2
Field Hockey	0	3	0	3
Softball	1	2	2	5
Lacrosse	0	0	2	2
Soccer	0	1	2	3
Volleyball	0	1	0	1
TOTAL	**4**	**48**	**69**	**121**

* Cheerleading does not include two males

TABLE 2

HIGH SCHOOL FEMALE INDIRECT CATASTROPHIC INJURIES

1982-83 – 2009-2010

SPORT	FATALITY	NON-FATAL	SERIOUS	TOTAL
Basketball	16	0	1	17
Swimming	7	0	2	9
Cheerleading	7	0	2	9
Cross Country	9	0	0	9
Soccer	6	0	1	7
Track	6	0	0	6
Volleyball	1	1	0	2
Water Polo	1	0	0	1
Field Hockey	1	0	0	1
TOTAL	**54**	**1**	**6**	**61**

TABLE 3

COLLEGE FEMALE DIRECT CATASTROPHIC INJURIES

1982-82 – 2009-2010

SPORT	FATALITY	NON-FATAL	SERIOUS	TOTAL
Cheerleading*	1	11	23	35
Field Hockey	0	1	2	3
Lacrosse	0	2	0	2
Gymnastics	0	2	0	2
Equestrian	1	0	0	1
Soccer	0	1	0	1
Ice Hockey	0	0	1	1
Skiing	1	1	0	2
Track (Pole Vault)	0	1	0	1
Softball	0	0	1	1
TOTAL	**3**	**19**	**27**	**49**

*Cheerleading does not include four males

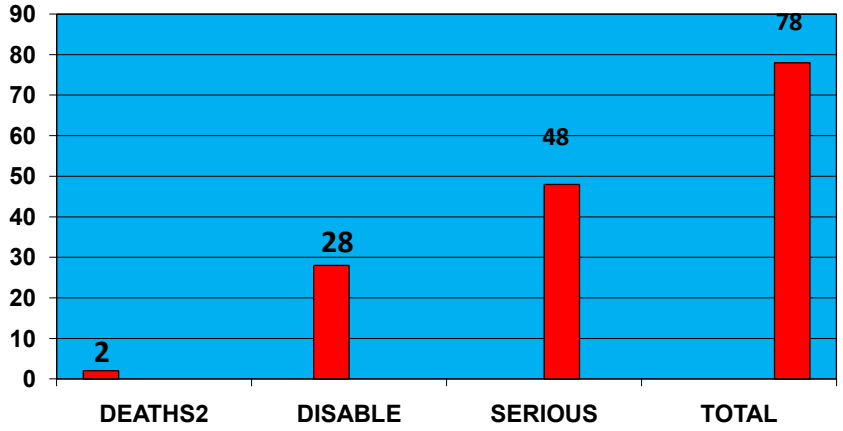
TABLE 4

COLLEGE FEMALE INDIRECT CATASTROPHIC INJURIES

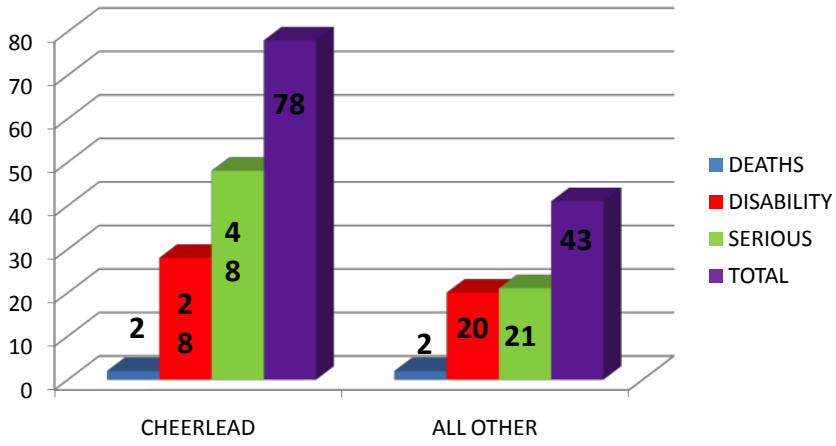
1982-83 – 2009-2010

SPORT	FATALITY	NON-FATAL	SERIOUS	TOTAL
Soccer	3	0	0	3
Basketball	5	0	1	6
Tennis	1	0	0	1
Volleyball	2	0	0	2
Gymnastics	1	0	0	1
Swimming	2	0	1	3
TOTAL	**14**	**0**	**2**	**16**

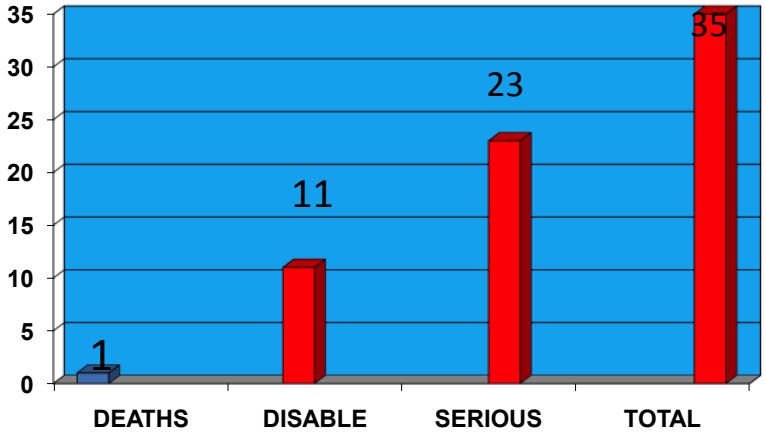
HIGH SCHOOL



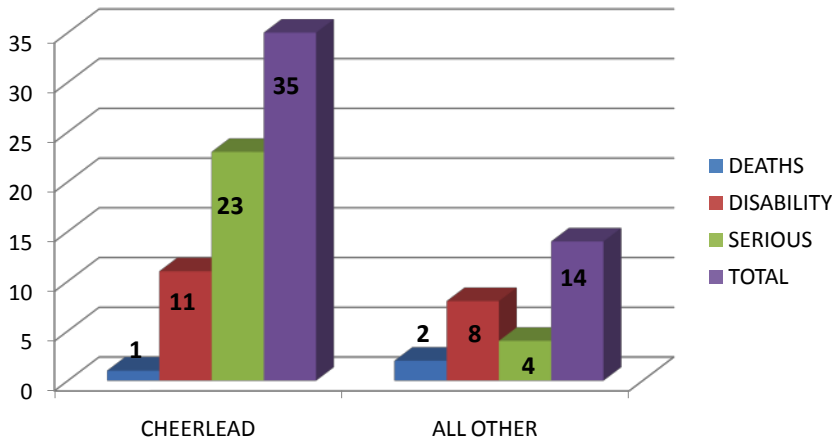
HIGH SCHOOL FEMALE CATASTROPHIC INJURIES 1982-83 – 2009-10



COLLEGE



COLLEGE FEMALE CATASTROPHIC INJURIES 1982-83 – 2009-10



Recommendations for Prevention

1. Mandatory medical examinations and a medical history taken before allowing an athlete to participate.
2. All personnel concerned with training athletes should emphasize proper, gradual and complete physical conditioning in order to provide the athlete with optimal readiness for the rigors of the sport.
3. Every school should strive to have a certified athletic trainer who is a regular member of the faculty and is adequately prepared and qualified. There should be a written emergency procedure plan to deal with the possibility of a catastrophic injury.
4. There should be an emphasis on employing well trained athletic personnel, providing excellent facilities and securing the safest and best equipment available.
5. There should be strict enforcement of game rules and administrative regulations should be enforced to protect the health of the athlete. Coaches and school officials must support the game officials in their conduct of the athletic contests.
6. Coaches should know and have the ability to teach the proper fundamental skills of the sport. This recommendation includes all sports, not only football. The proper fundamentals of blocking and tackling should be emphasized to help reduce head and neck injuries in football. **Keep the head out of blocking and tackling.**
7. There should be continued safety research in athletics (rules, facilities, equipment).
8. Strict enforcement of the rules of the game by both coaches and game officials will help reduce serious injuries.
9. When an athlete has experienced or shown signs of head trauma (loss of consciousness, visual disturbance, headache, inability to walk correctly, obvious disorientation, memory loss) he/she should receive immediate medical attention and should not be allowed to return to practice or game without permission from the proper medical authorities. It is important for a physician to observe the head injured athlete for several days following

the injury. Coaches should encourage athletes to let them know if they have any of the above mentioned symptoms (that can't be seen by others, such as headaches) and why it is important. Follow the NFHS and NCAA policies related to concussion and return to play.

10. Athletes and their parents should be warned of the risks of injuries.
11. Coaches should not be hired if they do not have the training and experience needed to teach the skills of the sport and to properly train and develop the athletes for competition.
12. 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.

The NCAA has created several rules to help prevent concussion injuries. Every NCAA member school is required to have a concussion-management plan that:

- Requires student-athletes 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 institutions provide a process for removing a student-athlete that exhibits 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 day of the activity.
- Requires student-athletes diagnosed with a concussion be cleared by a physician or a physician's designee before they are permitted to return.
- The NCAA has created a set of best practices that are available in the Sports Medicine handbook.

*****SPECIAL NOTE*****

All of the information has been thoroughly checked and the data cleaned. Some of the numbers in Tables I - XXIV have been changed due to this process. All of the data in this report now meet the stated definition of injury for high school and college sports. It is important to note that information is constantly being updated due to the fact that catastrophic injury information may not always reach the center 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 Center.

References

1. TATOR CH, EDMONDS VE: National Survey of Spinal Injuries in Hockey Players, Canada Medical Association 1984; 130: 875-880.

CASE STUDIES

FOOTBALL

High school and college case studies in football are not duplicated for this report. They are included in the football reports on the www site – www.unc.edu/depts/nccsi

CROSS COUNTRY (HIGH SCHOOL)

A male junior high school athlete collapsed on the track during a second warm-up lap and died at the hospital. An AED was administered by the police at the scene. Death was caused by cardiac arrest.

A male high school athlete collapsed and died after a race in 107 degree temperature. He was in a coma for three days after the collapse. Cause of death was unknown.

SOCCER (HIGH SCHOOL)

High school female goalie blocked a shot and collided with opposing player. Player lost consciousness for 20 seconds. She suffered a fractured skull, had surgery, and had a titanium plate in her head. She is back in school and had a recovery.

A male player suffered a stroke during a practice session. He had a physical exam before the season. He was in intensive care and at this time recovery was incomplete. The rate of strokes for individuals under the age of 18 is 6/100,000.

2006 UPDATE – A male soccer player had head contact with opposing player and suffered a concussion. Fell off bike year earlier and never recovered from that concussion. Will not play anymore soccer.

2008 UPDATE – A male player had a collision with another player and suffered a brain bleed. Contact was head to hip of opposing player (goalie). Returned to play following year and wears a helmet required by physician.

SOCCER (COLLEGE)

A male soccer player collapsed at practice on 8/18/2009 and died from an enlarged heart. School was an NCAA Division III institution.

FIELD HOCKEY

NONE

ICE HOCKEY (HIGH SCHOOL)

A senior ice hockey player lost his balance playing defense and crashed into the boards. He suffered a severe concussion and was unconscious for several hours. He had a recovery from the injury, but not sue if he will play again.

A high school sophomore suffered fractures to CV 3-4 and recovery was incomplete. He was injured during a collision when he crashed into the boards.

A 17 year old player was paralyzed during a game. Cause of injury was unknown.

A high school player suffered head trauma during a game and died. The coroner stated that death was due to head trauma during an ice hockey game resulting in a subdural hematoma.

A 15 year old ice hockey player from Canada was checked form behind into the boards and fractured CV 5-6. He is quadriplegic. This case from Canada was included to point out the dangers of checks from behind.

SWIMMING

NONE

BASKETBALL (HIGH SCHOOL)

A high school male collapsed in the locker room at halftime of a game and died. Cause of death was cardiac arrest.

A high school male collapsed during a game and died. Death was heart related.

A high school male collapsed during a game and was taken to the hospital. He was stable in the hospital and had a full recovery.

A high school male collapsed during a game and CPR and AED were administered. He was stable in the hospital and had a full recovery.

A high school male collapsed on the bench during a game and died. He was cleared to played by a physician.

A high school male collapsed at practice and CPR and AED were administered and he recovered. He did have an automatic defibrillator installed and was advised to not play anymore sports.

A high school male collapsed during tryouts and died from cardiac arrest. He passed a physical exam before his death.

2005 UPDATE – A high school male died in his sleep after playing a game that night. Cause of death was cardiomyopathy.

2008 UPDATE – A high school male collapsed during a game and died. Cause of death was heart related.

2009 UPDATE – A high school male was playing in a summer league game when he collapsed and died. Cause of death was heart related.

2009 UPDATE – A female middle school player collapsed during a practice session and died at the hospital. Death was heart related.

2009 UPDATE -- A 13 year old male collapsed during a game and died. The school had an AED but it was not near the accident and was not used.

BASKETBALL (COLLEGE)

A college male collapse during a game and died. Death was due to an enlarged heart. NCAA Division II school.

A college player suffered a fracture of the transverse process on lumbar vertebrae 2-3 after falling to the floor. He fell to the floor after hanging on the rim of the basket during a game. He will recover from the injury. NCAA Division I school.

A college female underwent surgery to implant a defibrillator to treat a rare heart disorder. She recovered but will not play anymore basketball. NCAA Division I school.

A college male collapsed during an off season workout after running four miles in the heat and humidity on 8/14/09. He died from heat stroke. NCAA Division I school.

A college senior died in his sleep after participating in a pick-up game and lifting weights. Death was related to an undetectable heart defect.NCAA Division I school.

A college male collapsed while lifting weights and lost consciousness. He was revived with an AED and had an automatic defibrillator implanted. He recovered but will no longer play.

A community college male player went for a rebound and collapsed. He died at the hospital. Death was heart related.

2007 UPDATE - A college male collapsed from heat stroke after a five mile run in the heat. He claims he was denied water. Recover was incomplete as health issues forced him to leave school. NAIA school.

2008 UPDATE – College female community college player died during game. Cause of death was an irregular coronary artery.

WRESTLING (COLLEGE)

A college male wrestler was injured during a match. He injured two cervical vertebrae and had damage to a major artery. How the injury happened was unknown. At this time recovery is incomplete.

VOLLEYBALL

NONE

LACROSSE (HIGH SCHOOL)

A female goalie was hit in the head by a shot during a game and suffered a severe concussion. She had to miss the next two games and reported headaches, nausea, and sound and light sensitivity.

BASEBALL (HIGH SCHOOL)

A 15 year-old high school baseball player was hit in the torso by a line drive while catching balls in the outfield during practice. He died in the hospital. He had CPR within 30 seconds and EMT within two minutes. Autopsy did not find cause of death.

A baseball pitcher was hit in the head by a batted ball during a game. He was in a medically induced come after surgery to reduce swelling in the brain. At the present time recover is incomplete.

A high school pitcher was hit in the head by a batted ball on 5/4/10 and died on 5/8/10. He was 13 years old and was pitching against the varsity team in a practice game. Cause of death was a brain injury.

A baseball player was hit in the head by a batted ball while pitching in a practice session. He suffered a fractured skull and was in an induced coma. A recover is expected.

A high school baseball player collapsed and died after practice at his home. Cause of death was cardiomyopathy.

An 18 year old baseball player collapsed at home after practice and died at the hospital. Cause of death was cardiac arrest.

A high school baseball player collapsed at practice from cardiac arrest. He was treated with an AED and recovered, but did have a defibrillator implanted.

2009 UPDATES

A high school pitcher was hit in the head by a batted ball and suffered a brain bleed and two skull fractures. He was in the hospital for two weeks and recovery was incomplete.

A high school pitcher was hit in the head by a batted ball during a game. He had surgery to relieve pressure on the brain and was in a medically induced coma. He was in the hospital for six weeks and had eight months of therapy. Recover is incomplete.

BASEBALL (COLLEGE)

A pitcher was hit in the head by a batted ball during an inter-squad game. He had a fractured skull and damaged ear drum. He was in the hospital for four days. He has recovered from those injuries and was back pitching. In 2005 playing high school baseball he was struck in the face by a batted ball during a game. He played for an NCAA division I school.

A college pitcher was hit in the head by a batted ball during a game and suffered a fractured skull and a brain bruise. He recovered from his injuries. He played for an NCAA division I school.

A college pitcher was hit in the head by a batted ball and suffered a fractured skull. He recovered from his injury and was back playing. He played for an NCAA division I school.

TRACK (HIGH SCHOOL)

A high school track athlete collapsed at practice on April 7, 2010 and died on April 15, 2010. Cause of death was heart related and a possible genetic defect.

A high school track athlete collapsed after practice during a school scavenger hunt and died. Cause of death was cardiac arrthmia.

A high school male collapsed at practice and died. Death was heart related

TRACK (COLLEGE)

A college pole vaulter was injured during a rope drill when he missed the mat and hit his head on concrete. He died at the hospital.

A college pole vaulter was injured during a meet and died three days later. He suffered from a fractured skull and brain hemorrhage. On his landing he missed the mat and hit his head.

2008 UPDATE

A college pole vaulter was injured during practice when he hit his head on the floor after the landing. They were using high jump mats indoors. Recovery was incomplete.

Special Section on Cheerleading

The Consumer Product Safety Commission (CPSC) reported an estimated 4,954 hospital emergency room visits in 1980 caused by cheerleading injuries. By 1986 the number had increased to 6,911, in 1994 the number increased to approximately 16,000, in 1999 the number increased to 21,906, and in 2004 the number increased to 28,414. In 2006 the numbers were down to 25,966, and in 2007 were up slightly to 26,786. An important part of the CPSC cheerleading data is that in 2007 head and neck injuries accounted for 15.1% of the total cheerleading injuries. Facial injuries accounted for 8.9% and 7.6% respectively. In 2006 head injuries were associated with 1,070 concussions, 200 contusions, 15 fractures, and 1,157 internal injuries. In 2007 head injuries were associated with 783 concussions, 308 contusions, 69 lacerations, and 1,122 internal injuries. The number of concussions was down in 2007, which is a good sign. Neck injuries in 2006 accounted for 79 contusions, 60 fractures, and 1,325 sprains/strains. In 2007 neck injuries were associated with 303 contusions, 5 fractures, and 1,281 sprains/strains. It is also important to note that in both years approximately 98% of the cheerleading injuries in the CPSC data were treated and released. Even though the numbers for being treated and released were high for both years, there were still 221 athletes hospitalized, 217 treated and transferred to another hospital, and 64 held for observation. The reduction of serious head and neck injuries in 2007 is a good sign, and hopefully this trend will continue. The goal for cheerleading coaches and organizations should be to eliminate head and neck injuries. One catastrophic injury is too many. Granted, the number of cheerleaders has also increased dramatically during this time frame. It is important to stress that catastrophic injuries have also been a part of cheerleading during the last 28 years and coaches and administrators should be aware of the situation.

The National Center for Catastrophic Sports Injury Research has been collecting cheerleading catastrophic injury data during the past twenty-eight years, 1982-83 – 2009-2010 (see Tables 5 and 6). There were two direct high school cheerleading catastrophic injuries during the 2009-2010 school year. A high school cheerleader collided with another cheerleader during

a tumbling pass during half-time of a basketball game. She had a brain injury and had surgery. Recovery at this time was incomplete. The second high school cheerleader was the flyer in a basket toss and was dropped by her teammates. She suffered a cervical sprain, disc impingment, and a serious concussion. She know suffers from post concussion syndrome and recovery is incomplete. High school cheerleading was also associated with an indirect death when the athlete collapsed at practice and died. The medical examiner called a death related to natural causes. College cheerleading was associated with one direct injury during 2009-2010. The female collided with a male cheerleader from the other school while both were tumbling. She suffered a fractured cervical and thoracic vertebrae. There was no surgery and recovery included the wearing of a neck brace. Recovery was complete.

Following is a sample review of the data:

1. In the early 1980's a female college cheerleader fractured her skull after falling from a human pyramid. She recovered and returned to cheerleading after several weeks in the hospital.
2. In 1983 two female college cheerleaders received concussions within a period of five days in the same gymnasium. One struck her head on the floor after falling from a pyramid and the second cheerleader struck her head on the floor after falling backward from the shoulders of a male partner.
3. In the summer of 1984 a female high school cheerleader was injured at practice when she fell from a pyramid. She was partially paralyzed.
4. A male college cheerleader was injured in a tumbling accident during a basketball game in December 1983. He fractured and dislocated several cervical vertebrae and was paralyzed. He received his injuries after diving over a mini-trampoline and several cheerleaders. The stunt is called a dive into a forward roll. He has made progress and can now walk unaided for several blocks and is able to feed himself.
5. In 1985 a female high school cheerleader was paralyzed from the chest down after attempting a back flip off the back of another cheerleader.

6. In 1985 a female college cheerleader fractured her skull after a fall from the top of a pyramid striking her head on the gym floor. She was in critical condition for a period of time but has made progress and is back in school. She is now involved in occupational therapy.
7. A male college cheerleader was paralyzed after a fall in practice. He was attempting a front flip from a mini-trampoline. He dislocated several cervical vertebrae and is now quadriplegic.
8. In 1986 a female college cheerleader fell from a pyramid and was knocked unconscious after striking the floor. Her status was unknown at the time of this writing.
9. In 1986 a college female cheerleader died from injuries suffered in a cheerleading accident. She suffered multiple skull fractures and massive brain damage after falling from the top of a pyramid type stunt and striking her head on the gym floor.
10. In 1987 a 17-year-old high school cheerleader fell from a pyramid. She was tossed into the air by two other cheerleaders and was supposed to flip backwards and land on the shoulders of two other girls. Her spinal cord was not severed but she is paralyzed from the waist down.
11. During the 1987-1988 school year a female cheerleader suffered a fractured collarbone, a damaged eardrum and a basal skull fracture. She was practicing a pyramid and was six feet off the gym floor with no spotters. She has suffered partial hearing loss and has to wear special glasses for reading.
12. In January 1988 a female cheerleader fell from a pyramid and landed on her face and shoulder. She suffered a fractured collarbone and head injuries. She was in a light coma in the hospital but complete recovery is expected.
13. In January 1989 a high school cheerleader fractured a cervical vertebra after falling from a mount in practice. She will recover with no permanent disability.
14. On July 11, 1989 a 16-year-old high school cheerleader fractured a cervical vertebra and is quadriplegic. She slipped while doing a series of back flips on damp grass.

15. On March 10, 1990 a female high school cheerleader was thrown into the air by two other cheerleaders. She fell to the floor onto her neck and was in the hospital for one week. The routine was called a basket toss. She has recovered and is back in school.
16. On March 1, 1990 a 21-year-old male college cheerleader was injured at practice. In attempting to do a back flip he hit his head against a wall. He was taken to the hospital by ambulance. He has since recovered and the injuries were not serious.
17. In June of 1991 a 15-year-old cheerleader suffered injuries to the head. She was struck in the head by her falling partner and also after striking the ground. The injury took place in a cheerleading camp. The cheerleader was taken to the hospital but her condition is not known at this time.
18. A middle school cheerleader was injured in October 1991 and died the next week. She fell from a double level cheerleading stance during practice. She hit her head on the gym floor.
19. A 20-year-old college cheerleader suffered a head injury while practicing a cheerleading stunt in which she was thrown into the air but was not caught by her teammates. She landed on the gym floor. She was in critical condition but has been upgraded to serious and is expected to recover.
20. In May of 1992 a college cheerleader was doing a tumbling sequence when she landed on her back and fractured T-12. The practice was not supervised. There was a complete recovery.
21. A high school cheerleader was injured during a basketball game doing a back handspring tuck. She hit her head on the floor. She had surgery to remove a blood clot. Her condition is not known at this time.
22. A high school cheerleader was tossed in the air during a routine, was not caught, and fell hitting her face on the basketball floor. She remained motionless for approximately 30 minutes. She is expected to recover. The accident happened in December 1993.

23. A high school cheerleader fell and hit her head on the basketball floor while being lifted by the feet by two other cheerleaders. She was taken to the hospital for observation and is expected to recover. The accident happened in December 1993.
24. A college cheerleader was doing a tumbling run when he lost control and fell on his head. He fractured a cervical vertebra and is expected to recover. The accident happened in August 1994.
25. A college cheerleader was injured in a cheerleading competition in April 1994. She struck another cheerleader while doing a backflip and fell to the floor. She suffered a fractured cervical vertebra and is expected to recover.
26. A female college cheerleader received a fractured skull during warm-ups for a performance of stunts for a Christmas parade. She was injured in a four man back tuck basket toss. She landed on her head. There was no permanent disability, but she was in rehabilitation for memory. The injury occurred in November 1994.
27. A high school cheerleader was kicked in the face by a teammate who was falling from the top of a pyramid. The injured cheerleader suffered convulsions and was transported to the hospital. She was in stable condition and was expected to recover. The injury occurred in January 1995.
28. A high school cheerleader received a closed head injury in March 1995 during a basket toss stunt. She landed on a hard rubberized basketball court. There was no permanent disability.
29. A college cheerleader was paralyzed in April 1995 after being injured while performing a double flip during a basket toss. At the present time she is quadriplegic.
30. A high school cheerleader was injured during a stunt when a fellow cheerleader fell on her head. She has had permanent medical problems since the accident. This was an update from November 1993.
31. In 1997, a high school cheerleader suffered a 15-foot fall. She had spinal cord trauma and is paralyzed. No other information was available.

32. A college cheerleader was injured in 1997 during a tumbling routine and is now quadriplegic. She was attempting a back handspring into a single back tuck during practice and landed on her head.
33. In 1997, two cheerleaders collapsed and died - one during a game and one in tryouts. Cause of death was heart related.
34. A high school junior cheerleader was doing a warm-up for a stunt in a state cheerleading competition. The stunt involved the cheerleader doing a flip off the hands of a teammate into the arms of several teammates. The teammates failed to catch her and she landed on her back. She suffered a fractured elbow, a concussion, and a back injury that later required spinal fusion. She was not able to return to school and had to be tutored her final high school years. (This case was a 1992 update)
35. On September 11, 1998 a 17-year-old high school cheerleader was cheering at a football game. She attempted a back flip, slipped on wet artificial turf, and landed on her head. She had spinal cord shock and temporary paralysis. Recovery was going to take approximately six months.
36. A 17-year-old high school cheerleader was injured in practice while practicing a pyramid formation. She fell and bruised her spinal column. She has recovered from the injury and is back cheering.
37. A 14-year-old high school cheerleader was injured while doing a dance routine at practice. She slipped on some water, fell and hit her head, and was taken to the hospital. She was in intensive care but has recovered.
38. A middle school cheerleader fell during a stunt while practicing with her squad before a game. She injured the ligaments around her spinal cord and was placed in a halo brace. She is prohibited from participating in contact sports, but will recover.
39. While cheerleading at a basketball game the athlete collided with a player chasing a loose ball. She received a fractured skull and had a blood clot removed. Full recovery was expected.

40. Squad was practicing a new stunt and the athlete was up in an extension of her partner's arm when she fell and landed on her head. She had a fractured skull and was on a ventilator for 12 hours. Full recovery was expected.
41. Athlete was on the third level of a pyramid during practice and fell on her head. She had a fractured skull and full recovery was expected.
42. During the 2001-2002 academic year three high school cheerleaders and one college cheerleader had catastrophic injuries. All four involved fractured skulls.
43. In August of 2005 a 14 year-old female high school cheerleader died after being thrown into the air and landing chest down in the arms of her teammates. She died of a lacerated spleen caused by blunt abdominal trauma.
44. A 16 year-old high school female cheerleader suffered spinal shock on 9/24/05 after fall onto her back from the shoulders of a teammate. She had a full recovery.
45. A 14 year old high school female cheerleader fell on her head during a cheerleading stunt on October 27, 2005, and was taken to the hospital. No other information was available.
46. A college female cheerleader fractured a cervical vertebra and suffered a concussion on March 5, 2006, performing a stunt during a basketball game. She fell 15 feet onto her head. A recovery was expected.
47. A male 18 year-old high school cheerleader landed on his neck after performing a standing back tuck on September 12, 2005. It was during a practice session. The injury was a fractured cervical vertebra and he is recovering. He was 6' 2" tall and weighed 215 pounds.
48. A 14 year-old female high school cheerleader suffered a fractured skull on November 15, 2005, when her teammates did not catch her during a stunt. She has recovered.
49. A female high school cheerleader fractured her skull on January 2, 2006, during a basket toss in the school cafeteria. She landed on her head and was taken to the hospital. She has recovered.

50. A 14 year-old female high school cheerleader collapsed and died during a cheerleading practice. She collapsed after being the flyer on a basket toss. Cause of death was cardiac arrest. A defibrillator was used after the accident.
51. In 2002 a 16 year-old male high school cheerleader was injured during a practice session. He fractured a cervical vertebra and is quadriplegic.
52. In January 2007 a 15 year-old high school cheerleader was performing a double front flip into a cushioned landing when she took an odd bounce and landed on her neck. She had damage to cervical vertebrae 6-7 and had a five hour surgery. She has a permanent titanium plate and screws along her spine. She has recovered, but will not participate in cheering again.
53. An 18 year-old college cheerleader fractured her neck in two places when she fell head first from a height of about 15 feet. She was a flyer during practice. She had a halo brace bolted to her skull for two months. She has recovered, but will not cheer again and her movements are highly restricted.
54. In March of 2007 a college cheerleader fractured her neck, had a concussion, and bruised a lung after falling 15 feet from a pyramid during a basketball game. She lost her balance and fell to the floor.

Cheerleading has changed dramatically in the past twenty-eight years and now has two distinctive purposes; 1) of a service-oriented leader of Cheer on the sideline; and 2) as a highly skilled competing athlete. A number of schools, both high schools and colleges, across the country have limited the types of stunts that can be attempted by their cheerleaders. Rules and safety guidelines now apply to both practice and competition. As already stated in this report, high school and college cheerleaders account for approximately two-thirds of the catastrophic injuries to female athletes. Inexperienced and untrained coaches should not attempt to teach stunts with a higher level of difficulty than their team is capable of achieving or they have the knowledge and ability to teach.

The basic question that has to be asked is what is the role of the cheerleader and should cheer competition be called cheerleading. I think it should not be called cheerleading since it has nothing to do with cheerleading. It is an activity with gymnastic type stunts. Approximately 20-25 states have a state championship for competitive cheer and it is not clear how many states consider cheerleading a sport. The 2009-2010 high school participation survey for competitive spirit squads shows 123,644 females and 2,746 males cheerleaders. The National Federation of State High School Associations had a news release on May 21, 2009 that stated there are approximately 400,000 individuals participating in high school cheerleading, but did not distinguish between competitive and other. The release stated that the 400,000 included freshman, junior varsity, and varsity levels. College participation numbers are hard to find since cheerleading is not an NCAA sport.

The catastrophic incidence rate per 100,000 cheerleading participants would be reduced with the new participation numbers. The two catastrophic injuries in 2009-2010 would have a competitive cheer incidence rate of 1.62 per 100,000 participants, and with the new participation numbers the cheer incidence rate would be 0.50 per 100,000 participants. The important point, no matter the injury rate, is that high school cheerleaders were associated with 66% of all female catastrophic injuries. It will be important for future injury data collection to know whether it was a competitive cheer injury or regular cheer injury. It is also important to mention that all other high school female sports were associated with two direct catastrophic injuries (one in soccer and one in lacrosse) in 2009-2010. The other female sports with catastrophic injuries had 424,884 participants, and a catastrophic injury incidence rate of 0.47 per 100,000 participants. The most important number is that high school cheerleading accounted for 66.5% of all catastrophic injuries to high school female athletes from 1982-83 – 2009-2010. This figure emphasizes the importance of safety regulations and rules for cheerleading. The state of Florida treated cheerleaders for more injuries than any other sport, and a University in Florida had an increase of insurance rates for cheerleading from $30,000 to $75,000 a year. Progress has been slow, but there has been an increased emphasis on cheerleading safety. Continued data collection on all

types of cheerleading injuries will hopefully show that these safety measures are working to reduce injuries.

An additional area of concern in all sports, including cheerleading, is concussions. The Sports Concussion Institute in Los Angeles states that cheerleading is a sport that does not receive the attention it deserves, and they see dozens of cheerleading concussions each year. An athletic trainer in a New jersey high school stated that cheerleading is a big deal when it comes to concussions and head injuries are an issue- especially with the competitive teams. Cheer squads should all follow the new NFHS Concussion Guidelines whether they are considered a sport or not.

Is cheerleading an activity that leads the spectators in cheers or is it a sport? If the answer is to entertain the crowd and to be in competition with other cheerleading squads, then there must be safety guidelines initiated. The authors of this research question why it is called cheerleading, when competitive cheer has nothing to do with leading the crowds at athletic events in cheering for the athletic teams on the playing field. Following are a list of sample guidelines that may help prevent cheerleading injuries:

1. Cheerleaders should have medical examinations before they are allowed to participate. Included would be a complete medical history.
2. Cheerleaders should be trained by a qualified coach with training in gymnastics and **partner stunting**. This person should also be trained in the proper methods for spotting and other safety factors.
3. Cheerleaders should be exposed to proper conditioning programs and trained in proper spotting techniques.
4. Cheerleaders should receive proper training before attempting gymnastic and partner type stunts and should not attempt stunts they are not capable of completing. A qualification system demonstrating mastery of stunts is recommended.
5. Coaches should supervise all practice sessions in a safe facility.
6. Mini-trampolines and flips or falls off of pyramids and shoulders should be prohibited.

7. Pyramids over two high should not be performed. Two high pyramids should not be performed without mats and other safety precautions.
8. If it is not possible to have a physician or certified athletic trainer at games and practice sessions, emergency procedures must be provided. The emergency procedure should be in writing and available to all staff and athletes.
9. There should be continued research concerning safety in cheerleading.
10. Cheerleading coaches should follow the concussion policy and guidelines published by the NFHS.
11. Cheerleading coaches should have some type of safety certification.
12. The NFHS should make cheerleading a sport, which will place cheerleading under the same restrictions and safety rules as all other high school sports (physical exams, qualified coaches, safe facility, athletic trainers, practice limits, and starting and ending dates for practice and games or competitions). The NCAA should follow this same recommendation.

According to the National Federation of State High School Associations, a primary purpose of sideline spirit groups (dance, pom, drill or cheer) is to serve as support groups for the interscholastic athletic programs within the school. A primary purpose for competitive spirit groups is to represent the school in organized competition. Today, emphasis is placed not only on the stunting athlete, but also on the base and the spotter. Proper conditioning and attentiveness will help minimize the risk involved in a competition. Information concerning new rules and updates are available from the National Federation of State High School Associations in Indianapolis, Indiana. The contact person is Susan Loomis.

The NFHS Spirit Rules Book (2011-2012) has just been published and is available from the NFHS. The new book includes Points of Emphasis and one of those is a section on concussions. The book also illustrates what stunts are legal and what stunts are illegal. All coaches should be familiar with the NFHS Rules Book, should read it, and should always have it available for a reference.

On July 1, 2006, the Missouri State High School Activities Association no longer sanctioned cheerleaders to take part in regional or state competitions. The association will maintain jurisdiction over sideline cheerleading at school athletic events. Squads that want to compete must do so as a club. In the fall of 2007 the South Dakota High School Activities Association will sanction competitive cheerleading and dance, and compete for state championships. The decision was made from a student interest survey, and female four top sports were cheer, dance, softball, and soccer.

In July 2006 the National Collegiate Athletic Association (NCAA) and Varsity Brands have formed an alliance to enhance cheerleading safety at NCAA institutions by creating the College Cheerleading Safety Initiative. An important part of this program is the safety program developed by the American Association of Cheerleading Coaches and Administrators (AACCA). All college coaches should have a copy of this safety manual and be familiar with its contents.

In 2005 the NCAA Insurance program stated that 25% of money spent on student athlete injuries resulted from cheerleading. The rate of cheerleaders to football players is 12 to 100. It is the opinion of the authors that following cheerleading rules and safety manual guidelines that are written by cheerleading experts is an excellent way to help prevent cheerleading injuries. The new restrictions can be found on the AACCA web site www.aacca.org. The web site also has safety measures for high school cheerleading and other safety information. There is also a publication on the website called "A Parents Guide to Cheerleading Safety" which offers the five top questions parents should be asking when their child joins a school cheerleading squad. In May of 2010 AACCA announced new rules for elementary, middle, and junior high schools which prohibits all basket tosses and double full twisting dismounts, regardless of the surface. AACCA urges associations that govern elementary, middle, and junior high school cheerleaders to adopt these restrictions regardless of whether they follow the NFHS or AACCA Cheerleading Rules.

In 2008 the National Center for Catastrophic Sports Injury Research (NCCSIR) was contacted by Ms. Kimberly Archie, Director of the National Cheer Safety Foundation. The National Cheer Safety Foundation was created by parents for parents, and is interested in cheer safety and the collection of cheerleading injury data. Cheer injuries can be reported to www.cheerinjuryreport.com. Krista Parks is the Executive Director.

The Foundation was interested in collecting cheerleading injury data from across the United States and was interested in collaborating with the NCCSIR. The NCCSIR was interested in working with the Foundation since it is always an asset to get as much injury data as possible for all sports from all sources. Ms. Archie sent me an initial list of 86 cheerleading injuries, of which NCCSIR had only a small number. After going through the list, a decision was made to include 30 of the injuries and to combine them with the NCCSIR data. A recommendation was also made to the Foundation as to the kinds of data that should be collected for catastrophic cheerleading injuries in the future. It is expected that future data will meet all of the requirements. As an example, the NCCSIR did not include concussion injuries unless they were severe brain injuries and created ongoing medical problems. The Center also did not include injuries that could not be verified. Catastrophic injuries as defined by the NCCSIR can be found in the introduction to this report.

At the present time the National Cheer Safety Foundation is the leader in cheerleading safety and will soon have a coaches certification program that will also be one of the best in the country.

The authors of this report thought it was important to mention that there are some cheerleading organizations that continue to make excuses for the number of injuries (catastrophic and others) that are associated with the sport. If it was not for the data collection

system initiated by the National Center for Catastrophic Sports Injury Research, none of these organizations would be involved with the safety of cheerleading. What all cheerleading organizations should do is realize that cheerleading has had injury related problems, and strict safety measures should be adopted to remedy the situation. An important safety measure is the continuation of injury data collection systems that point out the problem areas and emphasize the importance of rule changes, safety equipment, teaching techniques, medical care and coverage at practice and contests, and a written emergency plan available to all personnel and athletes. An excellent sample emergency plan can be found at the National Cheer Foundation web site – click on emergency plan. The National Center for Catastrophic Sports Injury Research has played a major role in cheerleading safety since we collected the first catastrophic cheerleading injury data in 1982-83. The authors of this report feel that cheerleading is an excellent activity for both males and females, and if the proper safety measures are followed it can also be a safe activity. We will continue to collect catastrophic cheerleading injury data and report the results shown by the data.

A recent article dated June 23, 2011, stated that in New Jersey legislation released by the Assembly Education Committee would include cheerleading in the student-athlete head injury safety training program. The bill would extend the training requirement to cheerleading coaches in public and non-public school interscholastic sports programs. It continued by saying these students run a risk of serious injury when they perform and deserve the same level of protection given to other students involved in school athletics.

TABLE 5

HIGH SCHOOL CHERLEADING

DIRECT CATASTROPHIC INJURIES

1882-1983 - 2009-2010

YEAR	FATALITY	NON-FATAL	SERIOUS	TOTAL
1982-1983	0	0	0	0
1983-1984	0	0	0	0
1984-1985	0	2	0	2
1985-1986	0	1	0	1
1986-1987	0	0	1	1
1987-1988	0	2	1	3
1988-1989	0	0	1	1
1989-1990	0	1	1	2
1990-1991	0	1	1	2
1991-1992	1	1	0	2
1992-1993	0	0	1	1
1993-1994	0	0	2	2
1994-1995	0	2	2	4
1995-1996	0	0	1	1
1996-1997	0	1	1	2
1997-1998	0	1	0	1
1998-1999	0	0	5	5
1999-2000	0	0	4	4
2000-2001	0	1	1	2
2001-2002	0	4	3	7
2002-2003	0	2	2	4
2003-2004	0	3	3	6
2004-2005	0	0	4	4
2005-2006	1	0	10	11
2006-2007	0	0	3	3
2007-2008	0	3	0	3
2008-2009	0	1	1	2
2009-2010	0	2	0	2
TOTAL	2	28	48	78

TABLE 6

COLLEGE CHEERLEADING

DIRECT CATASTROPHIC INJURIES

1982-1983 – 2009-2010

YEAR	FATALITY	NON-FATAL	SERIOUS	TOTAL
1982-1983	0	1	1	2
1983-1984	0	1	2	3
1984-1985	0	1	0	1
1985-1986	1	1	0	2
1986-1987	0	0	1	1
1987-1988	0	0	0	0
1988-1989	0	0	0	0
1989-1990	0	0	1	1
1990-1991	0	0	0	0
1991-1992	0	0	1	1
1992-1993	0	0	0	0
1993-1994	0	0	2	2
1994-1995	0	1	1	2
1995-1996	0	0	0	0
1996-1997	0	1	1	2
1997-1998	0	0	1	1
1998-1999	0	1	0	1
1999-2000	0	0	1	1
2000-2001	0	1	0	1
2001-2002	0	1	2	3
2002-2003	0	0	0	0
2003-2004	0	2	0	2
2004-2005	0	0	0	0
2005-2006	0	0	1	1
2006-2007	0	0	3	3
2007-2008	0	0	2	2
2008-2009	0	0	2	2
2009-2010	0	0	1	1
TOTAL	1	11	23	35

Table 7 illustrates high school female catastrophic injuries for the past 28 years – including cheerleading. High school female sports accounted for 121 direct catastrophic injuries during this time period, and 78 of those injuries were to cheerleaders. Of the 121 injuries, 4 resulted in death, 48 with permanent disability, and 69 were serious injuries with recovery. The 78 cheerleading injuries accounted for two deaths, 28 permanent disability injuries, and 48 serious injuries with recovery. High school cheerleaders accounted for 64.5% of all female sports direct catastrophic injuries. The three charts at the end of the report illustrate the number of female cheerleading injuries versus all other female sports injuries at the high school level.

TABLE 7

HIGH SCHOOL FEMALE DIRECT CATASTROPHIC INJURIES

1982-83 – 2009-10

SPORT	FATALITY	NON-FATAL	SERIOUS	TOTAL
Cheerleading*	2	28	48	78
Gymnastics	0	6	3	9
Track	1	2	6	9
Swimming	0	4	1	5
Basketball	0	1	3	4
Ice Hockey	0	0	2	2
Field Hockey	0	3	0	3
Softball	1	2	2	5
Lacrosse	0	0	2	2
Soccer	0	1	2	3
Volleyball	0	1	0	1
TOTAL	**4**	**48**	**69**	**121**

Table 8 illustrates college female direct catastrophic injuries for all sports for the past 28 years. There were a total of 49 catastrophic injuries which included three deaths, 19 permanent disability injuries, and 27 serious injuries with recovery. Cheerleading accounted for 35 catastrophic injuries which included one death, 11 permanent disability injuries, and 23 serious injuries with recovery. College cheerleading was associated with 71.4% of all college female sports direct catastrophic injuries for the 28 years of data collection.

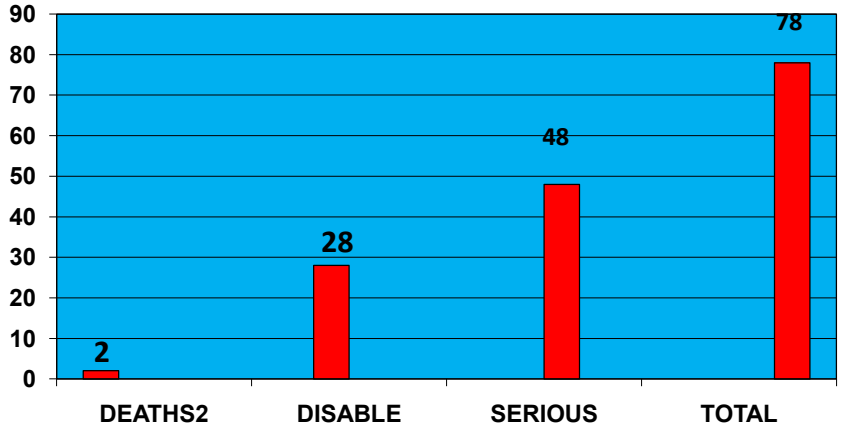
TABLE 8

COLLEGE FEMALE DIRECT CATASTROPHIC INJURIES

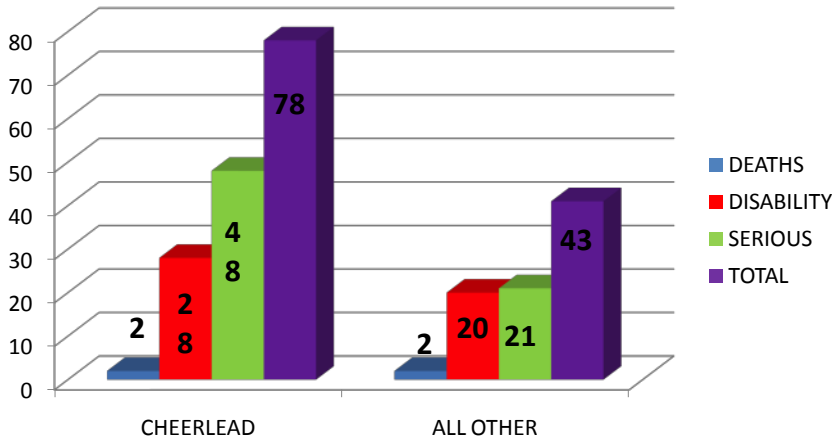
1982-1983 – 2009-2010

SPORT	FATALITY	NON-FATAL	SERIOUS	TOTAL
Cheerleading*	1	11	23	35
Field hockey	0	1	2	3
Lacrosse	0	2	0	2
Gymnastics	0	2	0	2
Equestrian	1	0	0	1
Soccer	0	1	0	1
Ice Hockey	0	0	1	1
Skiing	1	1	0	2
Track (Pole Vault)	0	1	0	1
Softball	0	0	1	1
TOTAL	**3**	**19**	**27**	**49**

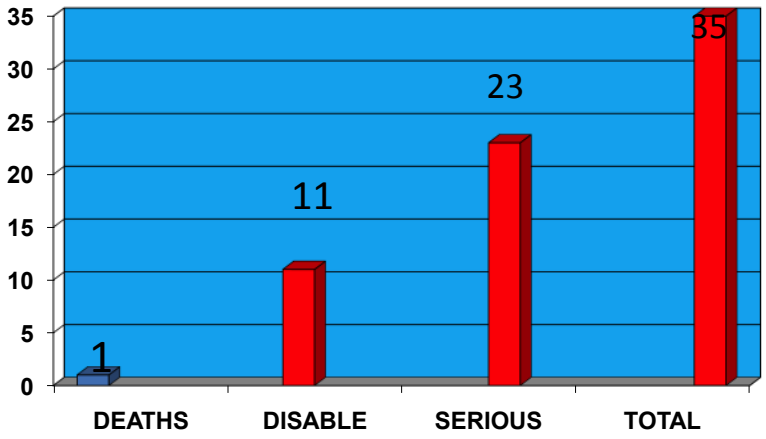
HIGH SCHOOL



HIGH SCHOOL FEMALE CATASTROPHIC INJURIES 1982-83 – 2009-10



COLLEGE



COLLEGE FEMALE CATASTROPHIC INJURIES 1982-83 – 2009-10