

Top three types of injury--game Strain 27% Sprain 25% Sprain 34% Sprain 38% Sprain 25%
(% of all injuries) Sprain 23% Contusion 24% Strain 26% Strain 17% Contusion 25%
Contusion 21% Strain 13% Contusion 9% Contusion 17% Strain 16%

Safe on First?

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Once upon a time, baseball was a game of wooden bats and grass-stained jeans and carefree summer afternoons. Today, the bats are high-tech metal weapons, and the players seem to be girding for battle, not play.

Just how dangerous is youth baseball?

The truth is, nobody knows. According to Fred Mueller, director of Carolina's National Center for Catastrophic Sports Injury Research, there is very little reliable information about baseball injuries in recreational leagues. In 1996, the Consumer Product Safety Commission reported that 162,100 children were injured playing baseball during the previous year. But Mueller points out that these alarming data were collected in emergency rooms, where an injury may be tagged "baseball" even if it happened outside of organized sports—as when one child whacks another with a bat in the back yard.

In high school and college baseball, catastrophic injuries—those resulting in death or disability—are "almost nonexistent," Mueller says.

Even so, the perception of danger has inspired some leagues to require new kinds of safety equipment. While no one doubts that batting helmets are essential, there isn't much information about the effectiveness of other protective gear. "Right now," Mueller says, "people are asking, 'Should we use a facemask on our batting helmets? Should we use a chest protector for the batter? Should we use a softer ball?' And nobody knows. We're going to try to answer some of those questions."

Mueller and Steve Marshall, a graduate student, are collecting data in a nationwide study of more than

5,400 leagues affiliated with Little League Baseball, Inc. They will correlate injury data with information about the use of protective equipment, to see if they can learn which safety measures are working and which are not. As an official in several national sports organizations, including USA Baseball and the National Collegiate Athletic Association, Mueller is also tracking investigations into the new, high-tech metal bats, which are suspected of causing injuries to pitchers and infielders by launching the ball at high speed.

But the biggest problem in youth-league baseball, Mueller says, may not be the ball or the bat. It may be the coach.

"People volunteer to coach," Mueller says, "and that's great. But many of these volunteer coaches don't know how to teach the fundamental skills—how to play safely, how to get in good condition, and how to warm up."

Mueller advises parents to choose leagues that maintain safe fields and equipment, and to look for good coaches who emphasize fitness and fun. Beware, he says, of coaches whose primary mission is winning.

"In these youth leagues, winning should be the least of your worries," Mueller says. "The important thing is for the kid to participate and have a good time."

—Neil Caudle

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Fatalities and Catastrophic Injuries in High School and College Sports, 1982-1997

Lessons for Improving Safety

Robert C. Cantu, MD; Frederick O. Mueller, PhD

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In Brief: The prohibition of 'spearing' in football and the rules regarding water depth and the racing dive in swimming are examples of how data on deaths and catastrophic injuries can be used to help promote the safety of young athletes. Other preventive measures supported by research include anchoring movable soccer goals to prevent tipping, improved training for high school wrestling coaches, increased awareness of pathogenic weight control in wrestling and gymnastics, rules against pushing or checking from behind in ice hockey, protective helmets for batting-practice pitchers in baseball, and barriers around the discus circle in track and field.

Football has been associated with high numbers of injuries (1-4), but those resulting in permanent disability and death declined dramatically after the early 1970s. In fact, there were 36 fatalities in high school and college football in 1968 and none in 1990. Research by the American Football Coaches Association (AFCA) and the National Collegiate Athletic Association (NCAA) contributed to this decline by providing data to support rule changes that promoted safety in football.

Nevertheless, catastrophic injuries and fatalities still occur in high school and college football and many other sports. Research in these areas has continued through the National Center for Catastrophic Sports Injury (National Center) at the University of North Carolina in Chapel Hill, which publishes data regarding catastrophic injuries and deaths in a variety of high school (grades 9 through 12) and college fall, winter, and spring sports. A summary of these data, beginning in fall 1982 and presented here, forms the basis for recommendations to promote the safety of young athletes.

Background

Data collection. The National Center compiles data through the assistance of coaches, athletic trainers, athletic directors, executive officers of state and national athletic organizations, a national newspaper clipping service, and professional associates of the researchers. After notification of a possible catastrophic sports injury, the National Center contacts the injured player's coach, athletic director, or athletic trainer by telephone, personal letter, and questionnaire. The data collected include demographics, the type and mechanism of injury, the sports equipment involved, and the immediate and subsequent medical care. Autopsy reports are used when available. Data collection is supported by the AFCA, the NCAA, and the National Federation of State High School Associations (NFSH).

Definitions. The National Center uses the following definitions in its research: a *catastrophic injury* is either *nonfatal* (resulting in permanent severe functional brain or spinal cord disability) or *serious* (involving transient brain or spinal cord disability). An example of a serious catastrophic injury is a fractured cervical vertebra with no permanent paralysis, whereas such an injury with quadriplegia is a nonfatal catastrophic injury. *Fatalities* are either *direct* (resulting directly from performing the specific activities of a sport) or *indirect* (caused by systemic failure as a result of exertion while participating in a sport). The deaths of Hank Gathers and Reggie Lewis from cardiac arrhythmia are examples of indirect deaths.

Fall Sports Summary

High school. From the fall of 1982 through the fall of 1996, high school fall sports (table 1) resulted in 387 direct fatalities and catastrophic injuries; 374 (97%) were related to football. Indirect fatalities totaled 115, of which 89 (77%) were related to football.

Table 1. Fall Sports Fatalities and Catastrophic and Serious Injuries in US High Schools and Colleges, 1982-1996

Sport	Total Number of Participants (Percent Male/Female)	Total Fatalities (and Rate per 100,000 Participants)		Total Direct Injuries (and Rate per 100,000 Participants)		Total Direct Fatalities and Injuries (and Rate per 100,000 Participants)
		Direct*	Indirect**	Nonfatal***	Serious****	
High School						
Cross-country	4,063,203 (59/41)	0	10 (0.25)	1 (0.02)	0	1 (0.02)
Football	21,302,466 (99/1)	61 (0.29)	89 (0.42)	147 (0.69)	166 (0.78)	374 (1.76)

Soccer	5,263,083 (64/36)	4 (0.08)	16 (0.30)	2 (0.04)	6 (0.11)	12 (0.23)
Total	30,628,752 (88/12)	65 (0.21)	115 (0.38)	150 (0.49)	172 (0.56)	387 (1.26)
College						
Cross-country	262,050 (56/44)	0	1 (0.38)	0	0	0
Football	1,250,000 (100/0)	5 (0.40)	24 (1.92)	21 (1.68)	62 (4.88)	88 (6.96)
Soccer	331,212 (67/33)	0	2 (0.60)	0	1 (0.30)	1 (0.30)
Total	1,843,262 (88/12)	5 (0.27)	27 (1.47)	21 (1.14)	63 (3.42)	89 (4.84)
Overall	32,472,014	70 (0.22)	142 (0.43)	171 (0.53)	235 (0.72)	476 (1.47)

*Caused by performing the activities of a sport.

**Caused by systemic failure as a result of exertion while participating in a sport.

***Resulting in permanent severe functional spinal cord disability.

****Resulting in transient functional spinal cord disability.

While football had the highest number of direct fatalities and catastrophic injuries among fall sports, the incidence of each of these per 100,000 football players was still less than 1.

College. During the same period, there were 89 direct fatalities and catastrophic injuries in college sports, and 88 (99%) occurred in football. Twenty-four (89%) of 27 indirect fatalities were football-related. Despite these figures, football-related direct fatalities were still fewer than 1 per 100,000 participants. However, the rate is 1.68 for nonfatal injuries and 4.88 for serious injuries.

Indirect fatality rates per 100,000 athletes were less than 1 in cross-country and soccer but higher in football (0.38, 0.60, and 1.92, respectively).

Winter Sports Summary

High school. High school winter sports (table 2) led to 70 direct deaths and catastrophic injuries; 33 (47%) were related to wrestling and 12 (17%) to gymnastics. Basketball

accounted for most of the indirect fatalities, 54 (74%) of 73.

Table 2. Winter Sports Fatalities and Catastrophic and Serious Injuries, US High Schools and Colleges, 1982-1997

Sport	Total Number of Participants (Percent Male/Female)	Total Fatalities (and Rate per 100,000 Participants)		Total Direct Injuries (and Rate per 100,000 Participants)		Total Direct Fatalities and Injuries (and Rate per 100,000 Participants)
		Direct*	Indirect*	Nonfatal*	Serious*	
High School						
Basketball	13,878,343 (56/44)	0	54 (0.39)	2 (0.01)	5 (0.04)	7 (0.05)
Gymnastics	486,597 (14/86)	1 (0.21)	0	7 (1.44)	4 (0.82)	12 (2.46)
Ice hockey	354,135 (98/2)	2 (0.56)	2 (0.56)	4 (1.13)	5 (1.41)	11 (3.11)
Swimming	2,556,181 (46/54)	0	4 (0.16)	4 (0.16)	3 (0.12)	7 (0.27)
Wrestling	3,556,640 (99/1)	2 (0.06)	13 (0.37)	20 (0.56)	11 (0.31)	33 (0.93)
Total	20,831,896 (62/38)	5 (0.02)	73 (0.35)	37 (0.18)	28 (0.13)	70 (0.34)
College						
Basketball	367,225 (54/46)	0	12 (3.27)	1 (0.27)	2 (0.54)	3 (0.81)
Gymnastics	34,543 (33/67)	0	0	5 (14.49)	1 (2.90)	6 (17.39)
Ice hockey	60,603 (96/4)	0	1 (1.65)	4 (6.60)	3 (4.95)	7 (11.55)
Swimming	234,566 (50/50)	0	4 (1.70)	1 (0.43)	0	1 (0.43)
Wrestling	108,673 (100/0)	0	0	1 (0.92)	0	1 (0.92)
Total	805,610 (61/39)	0	17 (2.11)	12 (1.49)	6 (0.74)	18 (2.23)
Overall	21,637,506	5 (0.02)	90 (0.42)	49 (0.23)	34 (0.16)	88 (0.41)

*See table 1 footnotes for definitions.

Although wrestling accounted for the greatest number of direct fatalities and nonfatal and serious injuries, the rates were less than 1 in 100,000 participants. Corresponding rates for basketball and swimming were also low (0.05 and 0.27, respectively), while ice hockey and gymnastics had the highest rates (3.11 and 2.46, respectively).

College. College winter sports caused 18 direct fatalities and catastrophic injuries; 7 (39%) of these occurred in ice hockey and 6 (33%) in gymnastics. There were 17 indirect fatalities, and 12 (71%) were basketball related.

College rates of direct fatalities and catastrophic injuries per 100,000 participants ranged from 0.43 in swimming to 17.39 in gymnastics. Indirect fatality rates ranged from 0 in wrestling and gymnastics to 3.27 in basketball.

Spring Sports Summary

High school. From 1983 through 1997, 68 direct deaths and catastrophic injuries were reported in high school spring sports (table 3); 39 (57%) were reported in track and field and 28 (41%) in baseball. Sixteen of 23 direct fatalities (70%) occurred in track and field.

Table 3. Spring Sports Fatalities and Catastrophic and Serious Injuries, US High Schools and Colleges, 1983-1997

Sport	Total Number of Participants (Percent Male/Female)	Total Fatalities (and Rate per 100,000 Participants)		Total Direct Injuries (and Rate per 100,000 Participants)		Total Direct Fatalities and Injuries (and Rate per 100,000 Participants)
		Direct*	Indirect*	Nonfatal*	Serious*	
High School						
Baseball	6,279,333 (99/1)	6 (0.10)	7 (0.11)	11 (0.18)	11 (0.18)	28 (0.45)
Lacrosse	442,785 (66/34)	1 (0.23)	2 (0.45)	0	0	1 (0.23)
Track and field	12,684,649 (56/44)	16 (0.13)	19 (0.15)	10 (0.08)	13 (0.10)	39 (0.31)
Tennis	3,951,505	0	1 (0.03)	0	0	0

(51/49)

Total	23,358,272 (67/33)	23 (0.10)	29 (0.12)	21 (0.09)	24 (0.10)	68 (0.29)
College						
Baseball	319,679 (100/0)	2 (0.63)	2 (0.63)	1 (0.31)	1 (0.31)	4 (1.25)
Lacrosse	121,114 (61/39)	0	1 (0.83)	2 (1.65)	2 (1.65)	4 (3.30)
Track and field	836,624 (60/40)	2 (0.24)	1 (0.12)	2 (0.24)	3 (0.36)	7 (0.84)
Tennis	227,035 (51/49)	0	2 (0.88)	0	0	0
Total	1,504,452 (67/33)	4 (0.27)	6 (0.40)	5 (0.33)	6 (0.40)	15 (1.0)
Overall	24,862,724	27 (0.11)	35 (0.14)	26 (0.10)	30 (0.12)	83 (0.33)

*See table 1 footnotes for definitions.

The 29 indirect fatalities included 19 (66%) in track and field and 7 (24%) in baseball; four of these involved female track athletes. Direct and indirect fatality and catastrophic injury rates were less than 1 per 100,000 participants in all spring sports.

College. College spring sports had 15 direct fatalities and catastrophic injuries during this period. Track accounted for 7 (47%) of these. The 6 indirect fatalities included 2 each in tennis and baseball and 1 each in track and field and lacrosse.

The rates of direct and indirect fatalities and of nonfatal and serious catastrophic injuries were less than 1 per 100,000 participants in all college spring sports except lacrosse.

Sport-Specific Injury Prevention

These trends provide the background for considering sport-specific and general recommendations to help reduce deaths and catastrophic injuries in scholastic sports. Fatalities and catastrophic injuries in female athletes, especially cheerleaders, deserve particular attention (see "Catastrophic Injuries in Female Athletes: Cheerleading Leads the

List," below).

Football. The number of high school and college football fatalities and nonfatal catastrophic injuries decreased dramatically after 1976. Between 1982 and 1997, the numbers fluctuated but remained much lower than in the 1960s and early 1970s (figure 1: not shown), and deaths reached a historic low of zero in 1990. The improvement has been significant, but further steps are needed. These should emphasize the preventive measures that have already been successful:

- Continued enforcement of the ban on initial contact with the head in blocking and tackling, along with coaching in the proper skills of blocking and tackling;
- Ongoing research on helmet safety, continuing the effort that led to the establishment of a helmet standard by the National Operating Committee on Standards for Athletic Equipment; and
- Improved medical care for injured athletes, including hiring of athletic trainers and the writing of emergency plans for catastrophic injuries at all high schools and colleges.

Soccer. Since 1979, 18 children have died and 14 have been seriously injured when movable soccer goals have fallen on them, according to the US Consumer Product Safety Commission (CPSC). Safety measures include anchoring the goals, warning players to avoid climbing on them, and using proper moving, maintenance, and storage techniques. Guidelines for movable soccer goal safety are available from the CPSC at http://www.cpsc.gov.70/00/CPSC_Pubs/Rec_Sfy/4326.txt.

Wrestling. High school and college wrestling caused 34 direct fatalities and catastrophic injuries between 1982 and 1997. Since only 1 of these occurred at the college level, continued research should focus on high school wrestling. High school coaches should be well-versed in the skills of the sport as well as proper conditioning techniques and safety measures; physical education teachers also need training in wrestling skills. Physical education classes should include full-speed wrestling only if sufficient time is available to teach conditioning and skills.

Another important issue is improper weight reduction, which can lead to serious injury or death. During the 1997-1998 season, three college wrestlers died while trying to make weight. Major rule changes resulted, but wrestling coaches need to be aware of the dangers of pathogenic weight-control behaviors.

Gymnastics. Since male and female gymnasts have high injury rates in high school and college, injury mechanisms and preventive measures should be investigated further at both levels. Participation in both high school and college programs has decreased dramatically and will probably continue to, given the growing role of private clubs in competitive gymnastics.

Ice hockey. The absolute number of ice hockey injuries is low, but the fatality and catastrophic injury rates per 100,000 participants are higher than in many other sports. Catastrophic injuries in ice hockey usually occur when an athlete is struck from behind or falls and hits the crown of his or her head on the boards, resulting in fractured cervical vertebrae and paralysis.

Tator et al (5), who did an extensive survey on catastrophic injuries in Canadian ice hockey, recommended the following:

- Enforce current rules and consider new rules against pushing or checking from behind;
- Develop conditioning programs to help players strengthen their neck muscles;
- Teach players about the risk of neck injury; and
- Continue epidemiologic research.

Swimming. All catastrophic injuries in swimming occurred when swimmers struck their head on the pool bottom while doing a racing dive in the shallow end. After the swimming community was made aware of this fact, rules were changed.

Rules to ensure that swimmers have adequate depth when entering the water were created by the NFSH's Swimming and Diving Rules Committee in the early 1990s. If water depth is

- less than 3 1/2 ft, swimmers must start in the water;
- 3 1/2 to 4 ft, swimmers may start from platforms no higher than 18 in. above the water; and
- 4 or more feet, swimmers may start from platforms up to 30 in. above the water.

In addition, starting platforms must be securely attached to the pool deck and wall; if they are not, in-water starts are required.

These rules have reduced direct fatalities and injuries. In fact, no direct fatality or catastrophic injury has occurred in high school swimming for 7 years or in college swimming for 14 years.

Baseball. From 1983 to 1997, high school baseball caused 28 direct fatalities and catastrophic injuries. Most of these injuries occurred during a head-first slide or when a player was struck with a thrown or batted ball. If the head-first slide is to be allowed in high school, coaches must teach players the safest ways to execute this maneuver. Further, batting-practice pitchers should always wear a helmet.

Track and field. From 1983 through 1997, high school track and field resulted in 16 direct fatalities and 23 catastrophic injuries. The pole vault was associated with 13 (81%) of the direct fatalities, 7 (70%) of the 10 permanent injuries, and 6 (46%) of the 13 serious injuries. All of these occurred when the vaulter bounced or landed out of the pit area.

Three deaths in high school pole vaulting occurred in 1983 and prompted measures by the NFSH. Beginning with the 1987 season, the pole vault landing area had to include a common cover or pad extending over all of the pit. In 1991, additional recommendations called for stabilizing the pole-vault standards so they could not fall into the pit, padding the standards, removing all hazards from the pit area, and controlling traffic along the approach.

Being struck by a thrown discus, shot put, or javelin resulted in 10 direct fatalities or

catastrophic injuries in high school athletes from 1983 to 1997. Safety precautions during practice and competition must be used to eliminate these needless accidents. One step in this direction was the 1993 NFSH rule requiring that the back and sides of the discus circle be fenced off.

Lacrosse. Only one direct death (and no catastrophic injuries) occurred in high school lacrosse in the 15 years of this study. That fatality occurred when a player struck an opponent with the top of his helmet, an illegal move.

Direct catastrophic injury rates are higher in college lacrosse than in other college spring sports, but the number of lacrosse players is so low that even one injury increases the rate dramatically.

General Prevention Recommendations

Besides these sport-specific considerations, the data collected by the National Center suggest the following general safety recommendations: All athletes should be required to undergo a preparticipation physical examination (see "The Preparticipation Physical Evaluation: Steps Toward Consensus and Uniformity," page 29). All schools should provide teams with a qualified trainer; accessible, written emergency procedures; and excellent and safe facilities and equipment. Coaches should be well trained in physical conditioning, the skills of their sport, and the risks of injury and be able to teach these effectively to young athletes. Game officials must enforce rules strictly, and coaches should support officials' efforts to conduct safe competitions. In addition, continued sports-related research will provide the injury data and analysis necessary to formulate changes in rules, facilities, and equipment that can help prevent tragedies.

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Catastrophic Injuries in Female Athletes: Cheerleading Leads the List

From 1982 through 1997, 60 direct fatalities and catastrophic injuries and 25 indirect fatalities occurred among high school and college female athletes, including cheerleaders (table A). Cheerleading, in fact, accounted for 34 (57%) of the direct fatalities and catastrophic injuries. A major factor in these injuries was the change in cheerleading activity, which now involves gymnastic-type stunts such as front and back flips, dives from

mini-trampolines, and pyramid building.

Table A. Fatalities and Catastrophic and Serious Injuries in US Female Student-Athletes, 1982-1997

		Direct Fatalities* and Catastrophic Injuries**	Indirect Fatalities***	
High School	Cheerleading	18	Basketball	8
	Gymnastics	9	Swimming	5
	Track	3	Track	4
	Swimming	2	Cheerleading	3
	Basketball	2	Soccer	1
	Softball	2	Cross country	1
	Field hockey	2	Volleyball	1
	Volleyball	1		
	Total	39		23
College	Cheerleading	16	Tennis	1
	Gymnastics	2	Basketball	1
	Field hockey	1		
	Downhill skiing	1		
	Lacrosse	1		
	Total	21		2

*Caused by performing the activities of a sport.

**Resulting in transient or permanent severe functional spinal cord disability.

***Caused by systemic failure as a result of exertion while participating in a sport.

Many state high school associations have responded to these changes and the increase in injuries by banning stunts such as pyramid building and the tossing of cheerleaders. Others have designated cheerleading as a sport. The American Association of Cheerleading Coaches and Advisors implemented a Safety Certification Program, which has certified

over 500 coaches and been adopted by some states and some college conferences.

Safety initiatives have resulted in a number of recommendations, including the following:

- Coaches should supervise all practices and be safety certified;
- Cheerleaders should have a preparticipation exam, be trained in gymnastics, spotting, and conditioning, and participate only in stunts that they have mastered;
- Stunts should be limited; eg, pyramids should be limited to two levels and performed on mats;
- Emergency procedures should be written and available; and
- Cheerleaders who have signs of head trauma should receive immediate medical attention and return to cheerleading only with permission from a physician.

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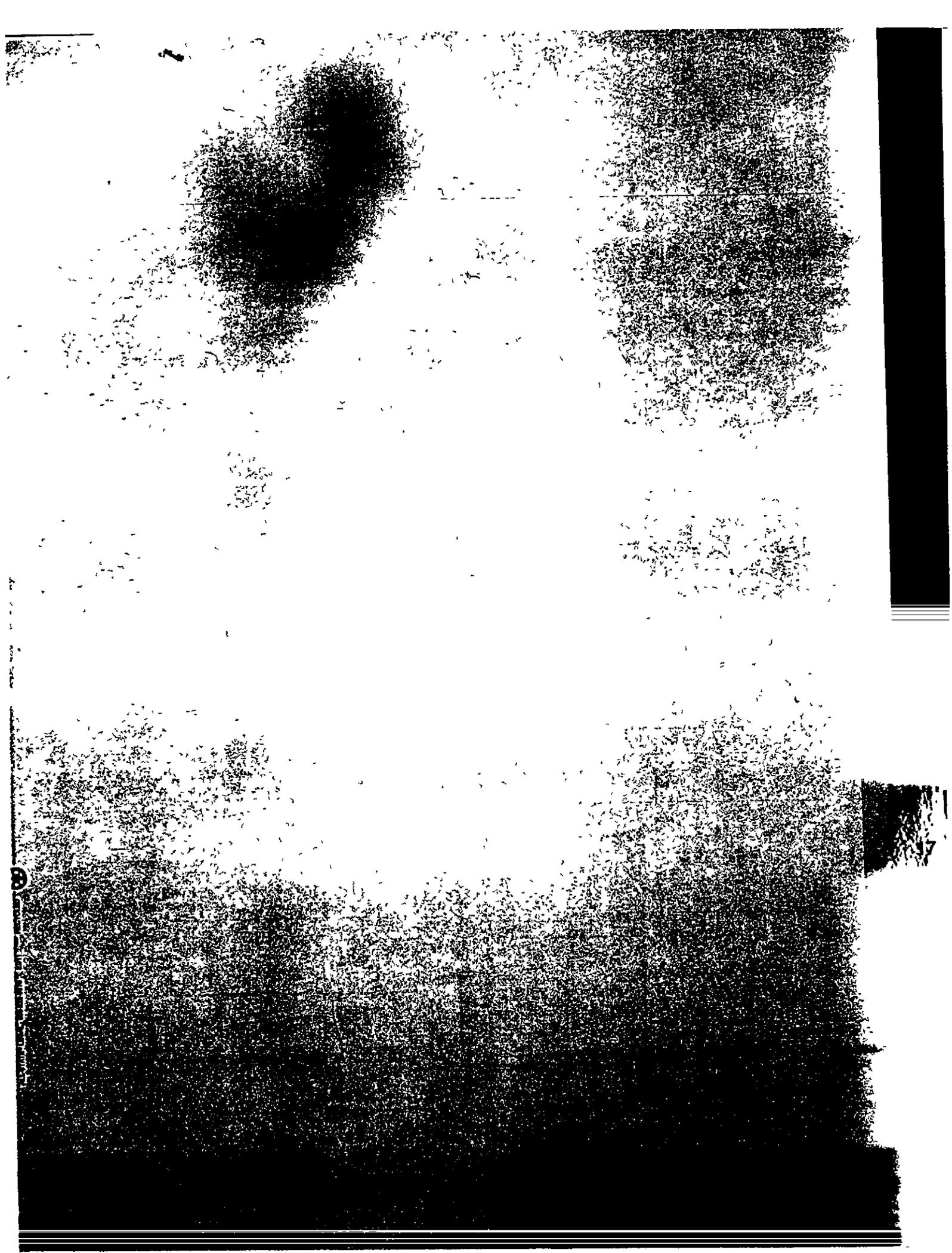
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**National Center for Catastrophic
Sport Injury Research
Data Tables**

Sixteenth Annual Report
Fall 1982 - Spring 1998

Director: Frederick O. Mueller, Ph.D.
Medical Director: Robert C. Cantu, M. D.

Research Funded by a Grant from the
National Collegiate Athletic Association
American Football Coaches Association

National Federation of State High School Associations

This page contains several data tables. Use the following table to scroll to a specific data table:

	<u>Direct Injuries</u>	<u>Indirect Injuries</u>	<u>Direct Injury Rates</u>	<u>Indirect Injury Rates</u>
High School:	<u>Fall Sports</u>	<u>Fall Sports</u>	<u>Fall Sports</u>	<u>Fall Sports</u>
	<u>Winter Sports</u>	<u>Winter Sports</u>	<u>Winter Sports</u>	<u>Winter Sports</u>
	<u>Spring Sports</u>	<u>Spring Sports</u>	<u>Spring Sports</u>	<u>Spring Sports</u>
	<u>Cheerleading</u>			
College:	<u>Fall Sports</u>	<u>Fall Sports</u>	<u>Fall Sports</u>	<u>Fall Sports</u>
	<u>Winter Sports</u>	<u>Winter Sports</u>	<u>Winter Sports</u>	<u>Winter Sports</u>
	<u>Spring Sports</u>	<u>Spring Sports</u>	<u>Spring Sports</u>	<u>Spring Sports</u>
	<u>Cheerleading</u>			

Overall participation figures are also available.

**HIGH SCHOOL CHEERLEADING
DIRECT INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
CHEERLEADING	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	1	0	1
	1985-86	0	1	0	1
	1986-87	0	0	0	0
	1987-88	0	2	1	3
	1988-89	0	0	1	1
	1989-90	0	1	1	2
	1990-91	0	0	1	1

	1991-92	1	0	0	1
	1992-93	0	0	1	1
	1993-94	0	0	2	2
	1994-95	0	1	2	3
	1995-96	0	0	0	0
	1996-97	0	1	1	2
	1997-98	0	0	0	0
	TOTAL	1	7	10	18

**COLLEGE CHEERLEADING
DIRECT INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
CHEERLEADING	1982-83	0	1	1	2
	1983-84	0	0	2	2
	1984-85	0	1	0	1
	1985-86	1	1	0	2
	1986-87	0	0	1	1
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	1	1
	1990-91	0	0	0	0
	1991-92	0	0	1	1
	1992-93	0	0	0	0
	1993-94	0	0	2	2
	1994-95	0	1	1	2
	1995-96	0	0	0	0
	1996-97	0	1	1	2
	1997-98	0	0	0	0
	TOTAL	1	5	10	16

**HIGH SCHOOL FALL SPORTS
DIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
CROSS COUNTRY	1982-83	0	0	0	0
	1983-84	0	1	0	1
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
		TOTAL	0	1	0
FOOTBALL	1982-83	7	7	9	23
	1983-84	4	11	11	26
	1984-85	4	10	8	22
	1985-86	4	10	12	26
	1986-87	11	5	12	28
	1987-88	4	11	22	37
	1988-89	7	14	11	32
	1989-90	4	18	10	32
	1990-91	0	13	7	20
	1991-92	3	4	10	17
	1992-93	1	7	8	16
	1993-94	3	13	18	34
	1994-95	0	5	11	16
	1995-96	4	8	10	22
	1996-97	5	11	7	23
	1997-98	6	14	9	29
		TOTAL	67	161	175
SOCCER	1982-83	0	0	1	1
	1983-84	1	0	0	1
	1984-85	0	0	1	1

	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	1	0	1	2
	1991-92	0	0	1	1
	1992-93	2	0	1	3
	1993-94	0	0	0	0
	1994-95	0	1	0	1
	1995-96	0	1	0	1
	1996-97	0	0	1	1
	1997-98	0	0	0	0
	TOTAL	4	2	6	12
FIELD HOCKEY	1996-97	0	2	0	2
	1997-98	0	0	0	0
TOTAL		71	166	181	418

**HIGH SCHOOL FALL SPORTS
DIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.00	0.04	0.00
FOOTBALL	0.29	0.71	0.77
SOCCER	0.11	0.05	0.16

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.00	0.00	0.00
FOOTBALL	0.00	0.00	0.00
SOCCER	0.00	0.00	0.00
FIELD HOCKEY	0.00	0.24	0.00

**HIGH SCHOOL FALL SPORTS
INDIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
CROSS COUNTRY	1982-83	2	0	0	2
	1983-84	1	0	0	1
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	1	0	0	1
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	1	0	0	1
	1991-92	0	0	0	0
	1992-93	2	0	0	2
	1993-94	1	0	0	1
	1994-95	1	0	0	1
	1995-96	1	0	0	1
1996-97	0	0	0	0	
1997-98	1	0	0	1	
	TOTAL	11	0	0	11
FOOTBALL	1982-83	7	0	0	7
	1983-84	6	0	0	6
	1984-85	3	0	0	3
	1985-86	1	0	0	1
	1986-87	6	0	1	7
	1987-88	4	0	0	4
	1988-89	10	0	0	10
	1989-90	9	0	0	9
	1990-91	3	0	0	3
	1991-92	3	0	0	3
	1992-93	9	0	0	9
	1993-94	8	0	0	8
	1994-95	2	0	0	2
	1995-96	7	0	0	7
1996-97	10	0	0	10	
1997-98	7	0	0	7	
	TOTAL	88	0	1	89
SOCCER	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0

	1985-86	1	0	0	1
	1986-87	3	0	0	3
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	1	0	0	1
	1990-91	2	0	0	2
	1991-92	1	0	0	1
	1992-93	1	0	0	1
	1993-94	4	0	0	4
	1994-95	1	0	0	1
	1995-96	1	0	0	1
	1996-97	1	0	0	1
	1997-98	0	0	0	0
	TOTAL	16	0	0	16
WATER POLO	1992-93	1	0	0	1
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	1	0	0	1
	1996-97	1	0	0	1
	1997-98	0	0	0	0
	TOTAL	3	0	0	3
TOTAL		117	0	1	118

**HIGH SCHOOL FALL SPORTS
INDIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.39	0.00	0.00
FOOTBALL	0.42	0.00	0.01
SOCCER	0.41	0.00	0.00
WATER POLO (1992-94)	4.60	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.06	0.00	0.00
FOOTBALL	0.00	0.00	0.00
SOCCER	0.05	0.00	0.00
WATER POLO (1992-94)	0.00	0.00	0.00

**COLLEGE FALL SPORTS
DIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
CROSS COUNTRY	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
1996-97	0	0	0	0	
	1997-980	0	0	0	0
	TOTAL	0	0	0	0
FOOTBALL	1982-83	0	2	1	3
	1983-84	0	1	4	5
	1984-85	1	2	4	7
	1985-86	1	4	8	13
	1986-87	1	0	8	9
	1987-88	0	0	4	4
	1988-89	0	1	7	8
	1989-90	0	2	4	6
	1990-91	0	2	3	5
	1991-92	0	1	2	3
1992-93	0	0	4	4	

	1993-94	1	0	4	5
	1994-95	1	2	5	8
	1995-96	0	1	3	4
	1996-97	0	3	1	4
	1997-98	1	2	3	6
	TOTAL	6	23	65	94
SOCCER	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	1	1
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	1	1
FIELD HOCKEY	1988-89	0	0	1	1
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	1	1
TOTAL		6	23	67	96

COLLEGE FALL SPORTS

**DIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.00	0.00	0.00
FOOTBALL	0.5	1.92	5.42
SOCCER	0.00	0.00	0.42
FIELD HOCKEY	0.00	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.00	0.00	0.00
FOOTBALL	0.00	0.00	0.00
SOCCER	0.00	0.00	0.00
FIELD HOCKEY	0.00	0.00	1.22

**COLLEGE FALL SPORTS
INDIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
CROSS COUNTRY	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	1	0	0	1
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	1
FOOTBALL	1982-83	3	0	0	3

	1983-84	3	0	0	3
	1984-85	0	0	0	0
	1985-86	1	0	0	1
	1986-87	1	0	0	1
	1987-88	4	0	0	4
	1988-89	0	0	0	0
	1989-90	2	0	0	2
	1990-91	3	0	0	3
	1991-92	1	0	0	1
	1992-93	1	0	0	1
	1993-94	1	0	0	1
	1994-95	2	0	0	2
	1995-96	1	0	0	1
	1996-97	1	0	0	1
	1997-98	0	0	0	0
	TOTAL	24	0	0	24
SOCCER	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	1	0	0	1
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	1	0	0	1
	1996-97	0	0	0	0
	1997-98	1	1	0	2
	TOTAL	3	1	0	4
WATER POLO	1988-89	1	0	0	1
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0

	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	1
TOTAL		29	1	0	30

**COLLEGE FALL SPORTS
INDIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.64	0.00	0.00
FOOTBALL	2.00	0.00	0.00
SOCCER	0.83	0.42	0.00
WATER POLO	6.08	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
CROSS COUNTRY	0.00	0.00	0.00
FOOTBALL	0.00	0.00	0.00
SOCCER	0.81	0.00	0.00
WATER POLO	0.00	0.00	0.00

**HIGH SCHOOL WINTER SPORTS
DIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASKETBALL	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	1	0	1
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	1	1
	1988-89	0	1	1	2
	1989-90	0	0	0	0
	1990-91	0	0	0	0

	1991-92	0	0	0	0
	1992-93	0	0	1	1
	1993-94	0	0	1	1
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	1	1
	1997-98	1	1	1	3
	TOTAL	1	3	6	10
GYMNASTICS	1982-83	0	0	1	1
	1983-84	0	1	0	1
	1984-85	0	2	1	3
	1985-86	0	0	0	0
	1986-87	0	1	0	1
	1987-88	1	1	1	3
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	1	0	1
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	1	1	2
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	7	4	12
ICE HOCKEY	1982-83	0	0	1	1
	1983-84	0	1	0	1
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	2	0	2
	1987-88	0	0	1	1
	1988-89	1	0	0	1
	1989-90	0	0	0	0
	1990-91	0	1	0	1
	1991-92	0	0	1	1
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	1	0	2	3
	1995-96	0	0	0	0

	1996-97	0	0	0	0
	1997-98	0	1	0	1
	TOTAL	2	5	5	12
SWIMMING	1982-83	0	0	2	2
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	1	1
	1987-88	0	2	0	2
	1988-89	0	1	0	1
	1989-90	0	1	0	1
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	1	0	1
	TOTAL	0	5	3	8
WRESTLING	1982-83	0	2	0	2
	1983-84	1	1	1	3
	1984-85	0	1	2	3
	1985-86	1	0	2	3
	1986-87	0	3	0	3
	1987-88	0	1	1	2
	1988-89	0	3	2	5
	1989-90	0	1	0	1
	1990-91	0	1	0	1
	1991-92	0	3	1	4
	1992-93	0	0	0	0
	1993-94	0	2	1	3
	1994-95	0	1	0	1
	1995-96	0	0	1	1
	1996-97	0	1	0	1
	1997-98	0	2	2	4
	TOTAL	2	22	13	37
VOLLEYBALL	1994-95	0	1	0	1

	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	1	0	1
TOTAL		6	43	31	80

**HIGH SCHOOL WINTER SPORTS
DIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.01	0.02	0.06
GYMNASTICS	1.36	1.36	1.36
ICE HOCKEY	0.53	1.33	1.33
SWIMMING	0.00	0.24	0.24
WRESTLING	0.05	0.58	0.34

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.00	0.02	0.02
GYMNASTICS	0.00	1.37	0.69
ICE HOCKEY	0.00	0.00	0.00
SWIMMING	0.00	0.13	0.00
WRESTLING	0.00	0.00	0.00
VOLLEYBALL	0.00	0.07	0.00

**HIGH SCHOOL WINTER SPORTS
INDIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASKETBALL	1982-83	4	0	0	4
	1983-84	3	0	0	3
	1984-85	3	0	0	3
	1985-86	1	0	0	1
	1986-87	3	0	0	3
	1987-88	4	0	0	4
	1988-89	2	0	0	2
	1989-90	4	0	0	4

	1990-91	7	0	0	7
	1991-92	6	0	0	6
	1992-93	3	0	0	3
	1993-94	7	0	0	7
	1994-95	4	0	1	5
	1995-96	0	0	0	0
	1996-97	3	0	0	3
	1997-98	8	0	0	8
	TOTAL	62	0	1	63
GYMNASTICS	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	0	0
ICE HOCKEY	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	1	0	0	1
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	1	0	0	1

	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	2	0	0	2
SWIMMING	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	1	0	0	1
	1987-88	1	0	0	1
	1988-89	1	0	0	1
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	1	0	1	2
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	4	0	1	5
WRESTLING	1982-83	0	0	0	0
	1983-84	4	0	0	4
	1984-85	2	0	0	2
	1985-86	2	0	0	2
	1986-87	1	0	0	1
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	1	0	0	1
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	1	0	0	1
	1994-95	0	0	0	0
	1995-96	2	0	0	2
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	13	0	0	13

VOLLEYBALL	1993-94	1	0	0	1
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	1
TOTAL		82	0	2	84

**HIGH SCHOOL WINTER SPORTS
INDIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.65	0.00	0.00
GYMNASTICS	0.00	0.00	0.00
ICE HOCKEY	0.53	0.00	0.53
SWIMMING	0.00	0.00	0.00
WRESTLING	0.34	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.12	0.00	0.02
GYMNASTICS	0.00	0.00	0.00
ICE HOCKEY	0.00	0.00	0.00
SWIMMING	0.27	0.00	0.07
WRESTLING	0.07	0.00	0.00
VOLLEYBALL	0.00	0.00	0.00

**COLLEGE WINTER SPORTS
DIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASKETBALL	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	1	1
	1986-87	0	0	0	0
	1987-88	0	0	0	0

	1988-89	0	0	1	1
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	1	0	1
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	1	2	3
GYMNASTICS	1982-83	0	0	0	0
	1983-84	0	1	1	2
	1984-85	0	0	0	0
	1985-86	0	1	0	1
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	1	0	1
	1989-90	0	0	0	0
	1990-91	0	1	0	1
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	1	0	1
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	5	1	6
ICE HOCKEY	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	1	1
	1987-88	0	0	0	0
	1988-89	0	1	0	1
	1989-90	0	0	0	0
	1990-91	0	0	1	1
	1991-92	0	0	1	1
	1992-93	0	0	0	0

	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	2	0	2
	1996-97	0	1	0	1
	1997-98	0	0	0	0
	TOTAL	0	4	3	7
SWIMMING	1982-83	0	1	0	1
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	TOTAL	0	1	0	1
WRESTLING	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	1	0	1
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	TOTAL	0	1	0	1

SKIING	1989-90	1	0	0	1
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	TOTAL	1	0	0	1
TOTAL		1	12	6	19

**COLLEGE WINTER SPORTS
DIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.00	0.47	0.94
GYMNASTICS	0.00	25.51	8.50
ICE HOCKEY	0.00	6.50	4.97
SWIMMING	0.00	0.79	0.00
WRESTLING	0.00	0.87	0.00
SKIING	0.00	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.00	0.00	0.00
GYMNASTICS	0.00	8.16	0.00
ICE HOCKEY	0.00	0.00	0.00
SWIMMING	0.00	0.00	0.00
WRESTLING	0.00	0.00	0.00
SKIING	12.50	0.00	0.00

**COLLEGE WINTER SPORTS
INDIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASKETBALL	1982-83	1	0	0	1
	1983-84	1	0	0	1
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	3	0	0	3
	1988-89	1	0	0	1
	1989-90	1	0	0	1
	1990-91	0	0	0	0
	1991-92	1	0	0	1
	1992-93	1	0	0	1
	1993-94	1	0	0	1
	1994-95	2	0	0	2
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	2	0	0	2
		TOTAL	14	0	0
GYMNASTICS	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
		TOTAL	0	0	0
ICE HOCKEY	1982-83	0	0	0	0
	1983-84	1	0	0	1
	1984-85	0	0	0	0

	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	1	0	1
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	1	0	2
SWIMMING	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	1	0	0	1
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	1	0	0	1
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	1	0	0	1
	1996-97	1	0	0	1
	1997-98	0	0	0	0
	TOTAL	4	0	0	4
WRESTLING	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0

	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	3	0	0	3
	TOTAL	3	0	0	3
SKIING	1995-96	1	0	0	1
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	1
TOTAL		24	1	0	25

**COLLEGE WINTER SPORTS
INDIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	6.08	0.00	0.00
GYMNASTICS	0.00	0.00	0.00
ICE HOCKEY	1.62	1.62	0.00
SWIMMING	3.14	0.00	0.00
WRESTLING	2.60	0.00	0.00
SKIING	8.61	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASKETBALL	0.55	0.00	0.00
GYMNASTICS	0.00	0.00	0.00
ICE HOCKEY	0.00	0.00	0.00
SWIMMING	0.00	0.00	0.00
WRESTLING	0.00	0.00	0.00
SKIING	2.10	0.00	0.00

**HIGH SCHOOL SPRING SPORTS
DIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASEBALL	1982-83	0	1	2	3
	1983-84	2	0	0	2
	1984-85	0	0	0	0
	1985-86	0	1	3	4
	1986-87	0	0	0	0
	1987-88	0	1	0	1
	1988-89	0	2	1	3
	1989-90	0	2	0	2
	1990-91	1	0	0	1
	1991-92	0	0	0	0
	1992-93	0	0	3	3
	1993-94	0	0	1	1
	1994-95	1	3	0	4
	1995-96	0	0	0	0
	1996-97	2	1	1	4
	1997-98	1	1	2	4
		TOTAL	7	12	13
LACROSSE	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	1	0	0	1
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
1995-96	0	0	0	0	
1996-97	0	0	0	0	
1997-98	0	0	0	0	
	TOTAL	1	0	0	1
TRACK	1982-83	3	0	0	3

	1983-84	0	1	0	1
	1984-85	1	0	0	1
	1985-86	0	1	0	1
	1986-87	1	0	1	2
	1987-88	0	0	2	2
	1988-89	0	0	1	1
	1989-90	1	0	2	3
	1990-91	2	2	0	4
	1991-92	1	2	0	3
	1992-93	0	2	2	4
	1993-94	2	1	2	5
	1994-95	1	0	1	2
	1995-96	0	0	0	0
	1996-97	4	1	2	7
	1997-98	1	0	2	3
	TOTAL	17	10	15	42
TENNIS	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	0	0
SOFTBALL	1993-94	0	1	0	1
	1994-95	0	1	0	1
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	2	0	2

TOTAL		25	25	28	78
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**HIGH SCHOOL SPRING SPORTS
DIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98**

MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASEBALL	0.10	0.18	0.19
LACROSSE	0.31	0.31	0.00
TRACK	0.21	0.13	0.16
TENNIS	0.00	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASEBALL	0.00	0.00	0.00
SOFTBALL	0.00	0.05	0.00
LACROSSE	0.00	0.00	0.00
TRACK	0.02	0.00	0.05
TENNIS	0.00	0.00	0.00

**HIGH SCHOOL SPRING SPORTS
INDIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASEBALL	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	2	0	0	2
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	1	0	0	1
	1989-90	1	0	0	1
	1990-91	1	0	0	1
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	1	0	0	1
1995-96	0	0	0	0	
1996-97	1	0	0	1	

	1997-98	0	0	0	0
	TOTAL	7	0	0	7
LACROSSE	1982-83	1	0	0	1
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	1	0	0	1
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	2	0	0	2
TRACK	1982-83	3	0	0	3
	1983-84	0	0	0	0
	1984-85	2	0	0	2
	1985-86	1	0	0	1
	1986-87	0	0	0	0
	1987-88	1	0	0	1
	1988-89	1	0	0	1
	1989-90	3	0	0	3
	1990-91	2	0	0	2
	1991-92	0	0	0	0
	1992-93	3	0	0	3
	1993-94	1	0	0	1
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	2	0	0	2
	1997-98	0	0	0	0
	TOTAL	19	0	0	19
TENNIS	1982-83	0	0	0	0
	1983-84	0	0	0	0

	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	1	0	0	1
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	1
SOFTBALL	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	0	0
TOTAL		29	0	0	29

**HIGH SCHOOL SPRING SPORTS
INDIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98
MALE**

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASEBALL	0.11	0.00	0.00
LACROSSE	0.63	0.00	0.00
TRACK	0.20	0.00	0.00
TENNIS	0.05	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASEBALL	0.00	0.00	0.00
SOFTBALL	0.00	0.00	0.00
LACROSSE	0.00	0.00	0.00
TRACK	0.07	0.00	0.00
TENNIS	0.00	0.00	0.00

**COLLEGE SPRING SPORTS
DIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASEBALL	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	1	0	0	1
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	1	1
	1990-91	0	0	0	0
	1991-92	1	0	0	1
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	1	0	1
	1997-98	0	0	0	0
		TOTAL	2	1	1
LACROSSE	1982-83	0	1	1	2
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	1	0	1
	1991-92	0	0	0	0
	1992-93	0	0	1	1
	1993-94	0	0	0	0
	1994-95	0	0	0	0
1995-96	0	0	0	0	
1996-97	0	0	0	0	
1997-98	0	0	0	0	

	TOTAL	0	2	2	4
TRACK	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	1	1
	1985-86	0	0	0	0
	1986-87	0	1	0	1
	1987-88	0	0	0	0
	1988-89	0	0	1	1
	1989-90	1	0	0	1
	1990-91	0	1	0	1
	1991-92	0	0	0	0
	1992-93	1	0	0	1
	1993-94	0	0	0	0
	1994-95	0	0	1	1
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	1	0	1
	TOTAL	2	3	3	8
SOFTBALL	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	0	0
TOTAL		4	6	6	16

COLLEGE SPRING SPORTS
DIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98
MALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
BASEBALL	0.58	0.29	0.29
LACROSSE	0.00	1.25	2.50
TRACK	0.37	0.55	0.55
TENNIS	0.00	0.00	0.00

FEMALE

SPORT	FATALITIES	NON-FATAL	SERIOUS
SOFTBALL	0.00	0.00	0.00
LACROSSE	0.00	1.97	0.00
TRACK	0.00	0.00	0.00
TENNIS	0.00	0.00	0.00

**COLLEGE SPRING SPORTS
INDIRECT CATASTROPHIC INJURIES
1982-83 - 1997-98**

SPORT	YEAR	FATALITIES	NON-FATAL	SERIOUS	TOTAL
BASEBALL	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	1	0	0	1
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	1	0	0	1
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	2	0	0	2
LACROSSE	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	0	0	0	0
	1987-88	0	0	0	0
	1988-89	1	0	0	1
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0

	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	0
TRACK	1982-83	0	0	0	0
	1983-84	0	0	0	0
	1984-85	0	0	0	0
	1985-86	0	0	0	0
	1986-87	1	0	0	1
	1987-88	0	0	0	0
	1988-89	0	0	0	0
	1989-90	0	0	0	0
	1990-91	0	0	0	0
	1991-92	0	0	0	0
	1992-93	0	0	0	0
	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	1	0	0	1
SOFTBALL	1993-94	0	0	0	0
	1994-95	0	0	0	0
	1995-96	0	0	0	0
	1996-97	0	0	0	0
	1997-98	0	0	0	0
	TOTAL	0	0	0	0
TOTAL		6	0	0	6

COLLEGE SPRING SPORTS
INDIRECT INJURIES PER 100,000 PARTICIPANTS
1982-83 - 1997-98
MALE

<u>SPORT</u>	<u>FATALITIES</u>	<u>NON-FATAL</u>	<u>SERIOUS</u>
BASEBALL	0.58	0.00	0.00
LACROSSE	1.25	0.00	0.00
TRACK	0.18	0.00	0.00
TENNIS	0.81	0.00	0.00

FEMALE

<u>SPORT</u>	<u>FATALITIES</u>	<u>NON-FATAL</u>	<u>SERIOUS</u>
SOFTBALL	0.00	0.00	0.00
LACROSSE	0.00	0.00	0.00
TRACK	0.00	0.00	0.00
TENNIS	0.84	0.00	0.00

PARTICIPATION FIGURES

1982-83 - 1997-98

	<u>HIGH SCHOOL</u>		<u>COLLEGE</u>	
	<u>MEN</u>	<u>WOMEN</u>	<u>MEN</u>	<u>WOMEN</u>
FOOTBALL	22,800,000	3,238	1,200,000	0
CROSS COUNTRY	2,566,274	1,808,447	156,910	125,384
SOCCER	3,681,907	2,137,347	239,842	122,962
BASKETBALL	8,339,177	6,492,629	213,748	181,798
GYMNASTICS	73,635	437,536	11,758	24,496
ICE HOCKEY	375,783	8,613	61,576	2,878
SWIMMING	1,272,224	1,493,800	127,317	126,542
WRESTLING	3,780,295	7,428	115,172	0
BASEBALL	6,720,776	9,716	344,334	0
SOFTBALL	13,856	4,380,769	0	164,852
LACROSSE	320,184	171,282	80,028	50,768
TRACK	7,625,824	6,013,045	540,604	360,361
TENNIS	2,138,347	2,102,524	123,966	119,201
FIELD HOCKEY	200	818,913	0	81,691
SKIING	42,142 (94-98)	34,984 (94-98)	11,608	8,001
WATER POLO	65,159	25,729	16,448	0
VOLLEYBALL	127,929 (94-98)	1,441,928 (94-98)	3,921 (94-98)	47,642 (94-98)
TOTAL	59,943,712	27,387,928	3,247,232	1,416,576

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National Center for Catastrophic Sport 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 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. 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 a 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 which resulted directly from participation in the skills of the sport.

Indirect - Those injuries which were caused by systemic failure as a result of exertion while participating in a sport activity or by a complication which was secondary

to a non-fatal injury.

Data Collection

Data were compiled with the assistance of coaches, athletic directors, executive officers of state and national athletic organizations, a national newspaper clipping service and professional associates of the researchers. Data collection would not have been possible without the support of the National Collegiate Athletic Association, the National Federation of State High School Associations and the American Football Coaches Association. 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 contacting the physician involved in each case and for collecting the medical data. Dr. Cantu is also the Past-President of the American College of Sports Medicine.

Summary

Fall Sports(Tables I - VIII)

As indicated in Tables I through VIII, football is associated with the greatest number of catastrophic injuries. For the 1997 football season there was a total of 29 high school direct catastrophic injuries, which is an increase of six from 1996, but a dramatic decrease when compared to the 1993 season. This is the fourth highest number since 1982, and future reports should be monitored closely. College football was associated with six direct catastrophic injuries in 1997, which is an increase of two when compared to 1995 and 1996.

In 1990 there were no fatalities directly related to football. The 1990 football report is historic in that it is the first year since the beginning of the research, 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, with a slight rise in 1995 to four and zero. These numbers are very low when one considers that there were 36 football direct fatalities in 1968.

In addition to the direct fatalities in 1997 there were also eight indirect fatalities. Seven of the indirect fatalities were at the high school level and none at the college level. Six of the high school indirect fatalities were heart related and one was heat related. One indirect death was associated with sandlot football and was heart related.

In addition to the fatalities there were nine permanent paralysis cervical spine injuries in 1997. This number is low when compared to the 25 to 30 cases every year in the early 1970's. Seven injuries were at the high school level, one at the college level, and one in sandlot football. Football in

1997 was also associated with cerebral injuries that resulted in permanent disability. Seven injuries were at the high school level and one at the college level.

Serious football injuries with no permanent disability accounted for 12 injuries in 1997 - nine in high school and three in college. High school athletes were associated with five cervical spine fractures and four subdural hematoma injuries with full recovery. College athletes were associated with one cervical spine contusion, one herniated cervical disc, and one with transient cord symptoms.

This decrease in catastrophic football injuries 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 it's participants.

Cross country was associated with one indirect injury in 1997. For the sixteen years indicated in Tables I through VIII, cross country was associated with one direct non-fatal injury and 11 indirect fatalities at the high school level and one indirect fatality at the college level. All eleven of the indirect injuries were heart related fatalities. Autopsy reports revealed congenital heart disease in three of these cases.

Table I shows that high school soccer had no direct serious injury in 1997 and a total of 12 catastrophic injuries for the past sixteen seasons. The three direct catastrophic injuries in 1992 was the highest number in the past sixteen years. There were no high school soccer indirect fatalities in 1997. In 1997 college soccer was not associated with any direct catastrophic injuries, but was associated with two indirect injuries. One of the indirect injuries was a heart death, and the other involved a player being struck by lightning with permanent disability.

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 shows 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. There were no field hockey injuries in 1997.

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 were no water polo injuries in 1997.

In summary, high school fall sports in 1997 were associated with 29 direct catastrophic injuries. All 29 were associated with football. There were six fatalities, 14 involved permanent disability, and nine were considered serious. For the sixteen year period 1982-1997, high school fall sports had 418 direct catastrophic injuries and 374 or 96.4% were related to football participants. In 1997 high school fall sports were also associated with seven football indirect fatalities, and one in cross country for a total of eight indirect fatalities. For the period from 1982-1997 there was a total of 126 indirect fall high school catastrophic injuries. One hundred and twenty-five of the indirect injuries were fatalities and 95 were related to football. Two of the indirect fatalities involved females - a soccer player in 1986 and a cross country runner in 1992.

During the 1997 college fall sports season there was a total of six direct catastrophic injuries and all six were in football. For the sixteen years, 1982-1997, there was a total of 96 college direct fall sport catastrophic injuries and 94 were associated with football. There were two indirect college fatality during the fall of 1997. Both, one fatality and one disability, were associated with soccer.

From 1982 through the 1997 season there was a total of 30 college fall sport indirect catastrophic fatalities. Twenty-four were associated with football.

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 junior high school football players participating each year. As illustrated in Table II, the sixteen year rate of direct injuries per 100,000 high school and junior high school football participants was 0.29 fatalities, 0.71 non-fatal injuries and 0.77 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 high, but are based on only six years of data, and water polo has approximately 10,000 participants each year.

College football has approximately 75,000 participants each year and the direct injury rate per 100,000 participants is higher than college soccer and field hockey. The rate, for the sixteen year period indicated in Table VI, for college football fatalities is less than one per 100,000 participants, but the rate increases to 1.92 per 100,000 for non-fatal injuries and 5.42 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. Water polo has approximately 1000 participants each year (Table VIII). There were two college female athletes receiving a direct or indirect catastrophic injury in a fall sport for this sixteen year period of time. One was a serious injury in field hockey, and the other was an indirect death in soccer.

Incidence rates are based on sixteen 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 nine direct catastrophic injuries in 1997-1998. Three injuries were related to basketball, one to ice hockey, one to swimming, and four to wrestling.

High school winter sports were also associated with eight indirect injuries during the 1997-1998 school year (Table XI). All of the injuries were fatalities, and all were associated with basketball. Five of the fatalities were heart related, one was listed as natural causes, one was related to asthma, one was listed as unknown. One of the eight was a female, and her death was heart related.

College winter sports, Tables XIII - XVI, did not have any direct catastrophic injury during the 1997-1998 season. College sports were also associated with six indirect fatalities during the 1997-1998 school year. Two were in basketball, three in wrestling, and one in volleyball. The two basketball deaths were heart related, all three wrestling deaths were heart related and associated with weight reduction, and the volleyball death was a female and heart related.

A summary of high school winter sports, 1982-1998, show a total of 80 direct catastrophic

injuries (6 fatalities, 43 non-fatal, and 31 serious) and 84 indirect. Wrestling was associated with 37 or 45.7 percent of the direct injuries. Gymnastics was associated with 12 or 14.8 percent of the direct injuries. Ice hockey was associated with 12, swimming was associated with eight direct injuries, volleyball one, and basketball ten. Basketball accounted for the greatest number of indirect fatalities with 62 or 73.8 percent of the winter total.

College winter sports from 1982-1998 were associated with a total of 19 direct catastrophic injuries. Gymnastics was associated with six, ice hockey seven, basketball three, swimming one, skiing one and wrestling one. There were also 25 indirect injuries during this time period. Fourteen or 56% were associated with basketball, three in wrestling, two in ice hockey, four in swimming, one in skiing, and one in volleyball.

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 injury categories. High school wrestling has approximately 237,000 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 were associated with the highest injury rates for the winter sports. Gymnastics has averaged approximately 4,600 male and 27,300 female participants during the past sixteen years. Ice hockey averages 23,000 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.

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 sixteen years, but the injury rate is 25.51 per 100,000 participants for non-fatal male injuries and 8.16 per 100,000 for female non-fatal injuries. Participation figures show approximately 735 male and 1530 female gymnastic participants each year.

College ice hockey was associated with three serious and four non-fatal injuries in sixteen years, but the injury rate is 6.50 per 100,000 participants for non-fatal and 4.97 for serious injuries. There are approximately 4000 ice hockey participants each year. 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 one catastrophic injury from the fall of 1982 to the spring of 1998. For this period of time there were 115,172 participants in college wrestling for an average of approximately 7,198 per year. The injury rate for this sixteen year period of time was 0.87 per 100,000 participants. College skiing has approximately 505 female participants each year and the one fatality in 1989-1990 produced a sixteen year injury rate of 12.50 per 100,000 participants. This was the only skiing direct fatality since the study was initiated.

Injury rates for college indirect fatalities were high when compared to the high school rates. Basketball had an injury rate of 6.08 fatalities per 100,000 male participants, skiing 8.61, ice hockey 1.62 and swimming 3.14. The female indirect injury rate for basketball was 0.55 per 100,000 participants, and 2.10 per 100,000 for volleyball. This is the first year where there were any indirect

incidence of injury 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 (1931-1998) and the recommendations that were based on that data. Non-fatal football injuries, permanent disability, decreased to one for college football in 1995. There was a dramatic reduction in high school football from 15 in 1990 to four in 1991. There was an increase to ten in 1992 and 13 in 1993, but a reduction to five in 1994. The 1997 data show an increase to fourteen. Permanent disability injuries in football have seen dramatic reductions when compared to the data from the late 1960's and early 1970's, but a continued effort must be made to eliminate these injuries. In addition, there were 12 serious injuries in football in 1997 - nine in high school and three in college. 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.

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 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 football!

It should be noted that since 1979, according to the Consumer Product Safety Commission, there have been at least 18 deaths and 14 serious injuries to children when movable soccer goals have fallen on them. The most recent case involved a 10 year old male in May 1998. A soccer goal frame fell on his head while he was helping move it. The injury left him paralyzed. According to the Consumer Product Safety Commission, climbing and hanging on the goals, as well as high winds, can cause the goals to tip. The Commission suggests that goals be anchored and that participants be warned not to climb on the 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. 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 fields 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 37 direct catastrophic injuries during the past sixteen years, but the injury rate per 100,000 participants is lower than both gymnastics and ice hockey. Due to the fact that college wrestling was only associated with one 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 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, but 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 and college athletes.

Men and women gymnastics were associated with high 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.

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 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. 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.

Catastrophic injuries in swimming were all directly related to the racing dive in the shallow ends 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 15 years, but in 1997-98 a high school swimmer was paralyzed after diving into the shallow end of a pool while practicing a racing dive. It is a fact that since the swimming community was made aware of this fact, and along with rule changes and coaches awareness, the number of direct catastrophic injuries in swimming has been reduced. 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 Committee voted 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. This rule change is a refinement of a 1991-1992 rule change and took effect in the 1992-1993 season. The new 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. Between three and one-half and four feet, swimmers may start no higher than 18 inches above the water. Less than that, it's in the pool. 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. 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.

High school spring sports have been associated with low incidence rates during the past sixteen years, but baseball was associated with 32 direct catastrophic injuries and track 42. A majority of the baseball injuries have been caused by the head first slide or by being struck with a thrown or batted ball. The 1998 data show one player paralyzed after sliding head first into home plate. If the head first 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. During the 1998 baseball season a high school coach was struck in the head by a batted ball and died. There are always a number of non-school baseball injuries and the cause of injury is usually the same.

The pole vault was associated with a majority of the fatal track injuries. There have been fourteen high school fatal pole vaulting injuries from 1983 to 1998. This does not include the coach who was demonstrating in 1998, bounced out of the pit, struck his head on concrete, and died. In addition to the fatalities there were also seven permanent disability and six serious injuries. All 27 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.

Every time there is a pole vaulting death there are more proponents of eliminating the event. The crux of the opposition to the event 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: stabilize 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. The state of Ohio has developed a program to teach proper techniques to coaches. It has been estimated that there are approximately 25,000 high school pole vaulters. If this number is true, the catastrophic injury rate for high school pole vaulters would be higher than any of the sports included in the research.

There have also been twelve accidents in high school track involving participants being struck by a thrown discus, shot putt or javelin. 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 but recovered. There have also been spectators struck by the discus during high school meets. 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 should eliminate these type of accidents. Good risk management should eliminate these type of accidents. These types of injuries are not acceptable and should never happen.

The one 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. Lacrosse has been a safe sport when considering the fact that high school lacrosse has only been involved with two catastrophic injuries in sixteen years.

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 only three college male lacrosse catastrophic injuries during the past sixteen years. One injury was the first in women's lacrosse.

For the sixteen year period from the fall of 1982 through the spring of 1998 there have been 707 direct catastrophic injuries in high school and college sports. High school sports were associated with 102 fatalities, 234 non-fatal and 240 serious injuries for a total of 576. College sports accounted for 11 fatalities, 41 non-fatal and 79 serious injuries for a total of 131. During this same sixteen year period of time there has been a total of 300 indirect injuries and all but five resulted in death. Two hundred and thirty-nine of the indirect injuries were at the high school level and 61 were at the college level. It should be noted that high school annual athletic participation for 1997-1998 includes approximately 6,333,453 athletes (3,763,120 males and 2,570,333 females). National Collegiate Athletic Association participation for 1997-1998 was unknown at the time of this writing. College participation for 1997-98 used the 1996-1997 numbers (331,282 athletes: 201,997 males and 129,285 females).

During the sixteen year period from the fall of 1982 through the spring of 1998 there have been 87,331,640 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 0.66 per 100,000 participants. The indirect injury rate is 0.27 per 100,000 participants. If both direct and indirect injuries were combined the injury rate would be 0.93 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 0.28.

During this same time period there were a total of 4,663,808 college participants with a total direct catastrophic injury rate of 2.81 per 100,000 participants. The indirect injury rate is 1.31 per 100,000 participants. If both indirect and direct injuries were combined the injury rate would be 4.21. The combined fatality rate would be 1.50, the non-fatal rate 0.92, and the serious rate 1.69.

Female Catastrophic Injuries

There have been a total of 62 direct and 28 indirect catastrophic injuries to high school and college female athletes from 1982-83 - 1997-98, which includes cheerleading. Forty-one of these were direct injuries at the high school level and 21 at the college level. The 41 high school direct injuries included nine in gymnastics, 19 in cheerleading, two in swimming, two in basketball, four in track, two in softball, two in field hockey, and one in volleyball. The 24 high school indirect fatalities included nine in basketball, five in swimming, four in track, one in soccer, one in cross country, one in volleyball, and three in cheerleading. The 21 college direct injuries were associated with cheerleading (16), gymnastics (2), field hockey (1), skiing (1) and lacrosse (1). The four college indirect fatalities included one in tennis, one in basketball, one in soccer, and one 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 15 years there has been an average of 6.0 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 are going to be a part of cheerleading. High school cheerleading accounted for 46.3% of all high school direct catastrophic injuries to female athletes and 76.2% at the college level. Of the 62 direct catastrophic injuries to female athletes from 1982-83 - 1997-1998, cheerleading was related to 35 or 56.5%. The cheerleading numbers have been updated from previous reports. 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.

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 team 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 catastrophic injuries.

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 and 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 football.
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.
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.

*****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.

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

A 16 year old high school football player collapsed and died during the second quarter of a game on October 17, 1997. He was 6-1 and weighed 250 pounds. He was a defensive lineman at the time of the accident, when he received a blow to the chest while being blocked. According to the autopsy cause of death was commotio cordis (cardiac arrest) due to the blow to the chest.

A 17 year old high school football player received a brain injury during the third quarter of a game while making a tackle on the goal line. The accident took place on October 18, 1997.

He died late that night in the hospital. During the tackle the tackler's head made contact with the knee of the running back. Cause of death was a brain injury.

A 15 year old junior high school football player was injured in a game on September 18, 1997. He collapsed after the game while sitting on the team bench. He died on September 24, 1997. The activity at the time of the injury was unknown. Cause of death was a subdural hematoma.

A 17 year old high school football player was injured in a game on September 19, 1997 and died on September 23, 1997. The activity at the time of the injury was unknown. The injured player was a fullback. Cause of death was a subdural hematoma.

A 14 year old middle school football player received a brain injury during a game on October 2, 1997. He collapsed at the end of the game and was taken to the hospital where he died the next day, October 3, 1997. The activity at the time of the injury was unknown. Cause of death was a brain injury.

A high school freshman football player was injured in a scrimmage on September 6, 1997. He was a linebacker and a running back. He came out of the scrimmage complaining of a headache. Activity at the time of the injury was unknown. The player died in the hospital on September 12, 1997. Cause of death was a brain injury.

A 15 year old high school football player collapsed during wind sprints at the end of practice on August 5, 1997. He was rushed to the hospital where he died a few hours later. Cause of death was due to a congenital heart defect.

A 15 year old high school football player collapsed while running wind sprints on July 31, 1997. He died later at the hospital. Cause of death was heart related.

A 17 year old high school football player collapsed on the field shortly after practice on August 11, 1997. He died later the same day at the hospital. Cause of death was dilated cardiomyopathy.

A 17 year old high school football player collapsed at a team meeting after practice. He was given CPR and was taken to the hospital where he later died. Cause of death was heart related.

A 14 year old high school football player caught a touchdown pass during a game on October 28, 1997. Six plays later he ran to the sideline, collapsed, and was taken to the hospital. He died on October 30, 1997. Cause of death was heart related.

An 18 year old high school football player died on August 10, 1997. He was running sprints with the team after the first practice in full pads. He collapsed and was taken to the locker room where he was placed in a whirlpool of cold water. He was taken to the hospital by ambulance where he later died. Practice was in the early afternoon in 93 degree heat. Cause of death was heat stroke.

A 13 year old high school football player collapsed in the dressing room after practice. No other information was available. Death was heart related.

A 17 year old high school football player was injured while tackling in a game on September 5, 1997. He was playing linebacker at the time. The exact activity at the time of the injury was unknown. He had surgery on a fractured cervical vertebra and at the present time is quadriplegic.

A 17 year old high school football player injured his neck while being tackled. He was playing quarterback and was tackled head on. As he was going down he was hit by a second tackler. At the present time recovery is incomplete. The injury took place on October 18, 1997.

A 17 year old high school football player fractured his 6th cervical vertebra while blocking on a kick off return. He hit the opponent with his head down. Surgery was performed and at the present time recovery is incomplete. The injury took place on August 21, 1997.

A 16 year old high school football player fractured a cervical vertebra while tackling in a practice scrimmage in August 1997. At the present time he is quadriplegic.

A 16 year old high school football player injured his 5th and 6th cervical vertebrae while tackling in a game on October 24, 1997. Surgery was performed and at the present time he is quadriplegic.

A high school football player fractured a cervical vertebra while tackling on a kick off. He was tackling with his head down and the top of his head hit a teammate in the hip. At the present time he

is quadriplegic. The injury happened on September 12, 1997.

On November 7, 1998 a high school football player fractured two cervical vertebrae while tackling with his head down in a game. He was playing safety and his head hit the hip of the ball carrier. At the present time recovery is incomplete.

A 16 year old high school football player was attempting to block an extra point in a game on October 10, 1997. As he hit the ground the top of his head made contact with the ground. At the present time he is quadriplegic.

An 18 year old high school football player injured his neck in a game on September 27, 1997. He did not inform his coaches of the injury and played in a game on October 3, 1997. On October 4th he suffered a stroke. At the present time recovery is incomplete.

A 16 year old high school football player was injured while blocking in a practice drill on August 12, 1997. He was in a coma after surgery for a subdural hematoma. He did complain of a headache after a routine hit. Recovery is incomplete.

A 17 year old high school football player was in a coma for 11 days after being injured in a preseason practice on September 3, 1997. He has been released from the hospital and recovery is incomplete.

A 17 year old high school football player had a brain injury and was in a coma after a collision in a game on September 12, 1997. He may have suffered a concussion in the previous weeks game. Recovery is incomplete.

A high school football player was injured in a scrimmage game on August 12, 1997. He came off the field complaining of a headache and collapsed on the sideline. He had surgery for a subdural hematoma and recovery is incomplete.

A 17 year old high school football player collapsed on the sideline during a game on September 26, 1997. Surgery was performed and recovery is incomplete. The exact activity at the time of the injury was unknown.

A 17 year old high school football player was injured in a game on September 26, 1997 while being blocked covering a punt. He was playing eight man football. He was in a coma and in critical condition, and recovery is incomplete.

A high school football player suffered a subdural hematoma in a game on November 26, 1997. He woke up the next morning with blurred vision, a headache, and vomiting. He had complete recovery.

A high school football player received a severe concussion during a scrimmage game on August 21, 1997. He was unconscious and motionless on the field for twenty minutes. Recovery was complete.

An 18 year old high school football player was injured in a game in late October 1997. He had headaches for a couple of days after the game. On November 31, 1997 he received another hit to the head in a game and suffered a subdural hematoma. Recovery was complete.

A 17 year old high school football player was injured in a game in October 1997. He fractured cervical vertebra 1 while tackling with his head down. He had complete recovery, but will not be able to play anymore football.

An 18 high school football player fractured his 6th cervical vertebra while blocking on a kickoff. His head hit into the chest of the opponent. Recovery was complete.

A high school football player fractured his 1st cervical vertebra while making a tackle in the open field. He made contact with his head. Recovery is complete.

A high school football player fractured a cervical vertebra in an August 1997 practice. He was tackling with his head down at the time. After surgery recovery was complete.

A 14 year old high school football player was tackling on a kickoff in a game and fractured cervical vertebrae 6 and 7. Recovery was complete.

1996 update - A high school football player suffered a head injury in preseason practice and suffered headaches for a period of time. In a game on September 4, 1996 he suffered another hit to the head and a subdural hematoma. He had surgery and recovery was complete.

COLLEGE

A 21 year old college football player injured cervical vertebrae 3, 4, and 5, in a game on November 15, 1997. He was tackled while running with the ball at the quarterback position. He was hit by two tacklers after he vaulted over another player. At the present time recovery is incomplete.

A college football player had emergency surgery for a subdural hematoma on April 12, 1997, and recovery is incomplete. He suffered a concussion in practice two weeks earlier.

A college football player was injured in preseason practice in 1997. His injury was to the cervical vertebrae and the injury was transient paralysis. No other information was available.

A college football player received a herniated disk in practice and recovery was complete. The player was out for the season.

A college football player was injured in October 1997 during a game. He was playing defensive tackle and the offensive player's knee hit him on top of the head. He suffered a spinal contusion and recovery was complete.

CROSS COUNTRY

HIGH SCHOOL

A 17 year old high school cross country athlete collapsed while running with the cross country team on October 9, 1997. He was taken to the hospital where he died. Cause of death was an undiagnosed heart abnormality - hypertrophic cardiomyopathy.

SOCCER

COLLEGE

A 21 year old college female soccer player collapsed and died during an exhibition game on campus. She was rushed to the hospital where she died. The accident took place on March 28, 1998. Pending an autopsy, cause of death was unknown.

A 22 year old college male soccer player was struck by lightning as a storm forced his team to end practice early. He was picking up cones and balls when struck. The accident took place on April 16, 1998. He has nerve damage and a long scar on his body, but full recovery is expected. At least 100 people are killed each year by lightning.

VOLLEYBALL

COLLEGE

An 18 year old college female volleyball player felt chest pains during a match, left the court, and passed out on the sidelines. She died later when emergency technicians could not revive her. Cause of death was hypertrophic cardiomyopathy.

ICE HOCKEY

HIGH SCHOOL

A 15 year old male high school ice hockey player crashed head first into the boards and suffered a fracture dislocation of cervical vertebrae five and six. It was a junior varsity game and the player was a defenseman. At the time of this writing he is paralyzed.

SWIMMING

HIGH SCHOOL

On January 30, 1998, a 16 year old high school swimmer was completing a warm-up racing start dive in the shallow end of the pool. He hit his head on the bottom of the pool and fractured the 5th cervical vertebra. At the present time recovery is incomplete. Water depth was 42 inches and he was using the starting blocks.

BASKETBALL

HIGH SCHOOL

A 16 year old high school basketball player collapsed on the court during a game. He later died at the hospital. Cause of death was heart related.

A 16 year old high school basketball player collapsed after an off-season workout on August 19, 1997. The athlete died and cause of death was heart related.

A 17 year old high school male basketball player collapsed in the locker room after practice. The athlete died and cause of death was heart related.

A 13 year old middle school male basketball player collapsed at practice and died on the gym floor. Autopsy results showed the athlete died from a bronchial asthma attack.

A 17 year old female high school basketball player collapsed on December 5, 1997, during a game. The athlete died and cause of death was a congenital heart defect.

A 13 year old middle school male basketball player was chasing a player on a fast break, blocked the shot, and fell hitting his head into a padded mat on the gym wall. He fractured cervical vertebrae 1 and 2. The athlete died.

A 16 year old male high school basketball player collapsed during warm-ups prior to a game. The athlete died and cause of death was listed as natural causes.

A 17 year old male high school basketball player collapsed during a tournament game on March 16, 1998. The athlete died at the hospital and cause of death was unknown.

A 16 year old male high school basketball player collapsed and died during a game on January 30, 1998. Cause of death was unknown.

A 15 year old male high school basketball player dove for a loose ball during practice and hit into a padded wall. He fractured a cervical vertebra and is paralyzed.

A 14 year old male high school basketball player was rebounding during a game on February 6, 1998. The opposing player fell on him. The athlete received a fractured skull, blood clot on the brain, and had surgery. The athlete has recovered.

COLLEGE

A 21 year old male college basketball player collapsed during practice and died. Cause of death was idiopathic hypertrophic subaortic stenosis of the heart.

An 18 year old male college basketball player collapsed during stretching exercises on October 19, 1997. He died later at the hospital. Cause of death was hypertrophic cardiomyopathy.

WRESTLING

HIGH SCHOOL

(1997 update) A male high school wrestler was injured while wrestling in 1997. He fractured his 6th cervical vertebra and recovered. There was no information about how or exactly when the accident happened. He did wrestle in 1998.

A 17 year old male high school wrestler was injured in a match after falling to the mat on his head and shoulders. He was flown to the hospital and placed in ICU. At this time recovery is incomplete.

An 18 year old male high school wrestler was injured in a state tournament meet. He had surgery on a fractured cervical vertebra. There was no information on how it happened. Recovery is incomplete.

A high school wrestler was taken to the hospital with a neck injury after being injured in a meet. No other information was available.

COLLEGE

A 21 year old college wrestler died from excessive training while trying to make weight. According to the autopsy results he was trying to lose too much weight too fast. He was engaged in a two hour workout in a 92 degree room while dressed in a rubberized suit. He was trying to lose 17 pounds in one day in order to wrestle in the 150 pound class.

A senior college wrestler collapsed and died after a four hour workout to bring his weight down for a match the next day. He was pedaling an exercise bike in a steam filled room while wearing a rubber suit and a sweatsuit to sweat off weight.

A 19 year old college wrestler collapsed and died while exercising in an effort to lose six pounds. He worked to exhaustion during the workout that started at 2 AM. Cause of death was related to the exercise.

LACROSSE

HIGH SCHOOL

(1997 update) A 17 year old high school male lacrosse player was injured on April 10, 1997 during a game. He was playing goalie at the time. He came out of the goal area to get the ball and during a collision with an opponent received a knee to the head. He fractured cervical vertebrae 3,4, and 5. The athlete is quadriplegic.

BASEBALL

HIGH SCHOOL

A 16 year old high school baseball player was injured on February 26, 1998. He was hit in the chest with a pitched ball after turning toward the pitcher to bunt. He died of cardiac arrest.

A high school baseball player was struck in the head with a batted ball while pitching during an intersquad game on June 9, 1998. He was in a coma for 1 1/2 days. He had a fractured skull and surgery. He had a full recovery.

A high school baseball player was injured in a game on April 3, 1998, while sliding head first into home plate and striking his head against the catchers chest. He had a fractured cervical vertebra and

surgery. Recovery is incomplete.

A 17 year old high school baseball player was injured on March 31, 1998, during pick-off practice. He was struck in the neck by the ball and had to have three surgeries for aneurysms and bleeding in the skull cavity. He did have a full recovery.

An high school coach was hit in the head by a line drive during batting practice. He died two days later.

TRACK

HIGH SCHOOL

A volunteer high school track coach died in a pole vaulting accident on March 2, 1998. He was demonstrating the pole vault when he bounced out of the landing mat and struck his head on concrete. He was taken to the hospital but never regained consciousness.

A 14 year old middle school track athlete walked into the danger zone to pick up a discus, and was struck in the back of the head by a thrown discus. She had a fractured skull, but recovered.

A 16 year old high school track athlete died on May 4, 1998, after bouncing out of the pole vault pit to a hard surface. He struck his head on the hard surface.

A 16 year old track athlete was struck in the head during practice by a shot put. He was bent over picking up his shot when he was struck by another throwers shot. He was in critical care at the hospital, but has had a full recovery.

COLLEGE

A college freshman pole vaulter died from injuries suffered after doing a handstand on an 11 foot observation tower. He planned to drop to the mats below, but his back hit the platform and he fell forward into metal supporting pipes. He severed an artery near his heart and had liver damage.

Special Section on Cheerleading

The Consumer Product Safety Commission reported an estimated 4,954 hospital emergency room visits in 1980 caused by cheerleading injuries. By 1986 the number had increased to 6,911 and in 1994 the number increased to approximately 16,000. Granted, the number of cheerleaders has also increased dramatically during this time frame. It is important to stress that catastrophic injuries have been a part of cheerleading during the last 16 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 fifteen years, 1982-83 - 1997-98. There were no injuries during the 1997-1998 school year. 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 ear drum 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.
32. A college cheerleader was injured in 1997 during a tumbling routine and is now quadriplegic. She was attempting a back hand spring 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 student 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.)

Cheerleading has changed dramatically in the past sixteen years and is now a pseudo-gymnastics program. 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. The Illinois State High School Association has banned the basket toss. The rule states, "cheerleaders cannot toss another squad member into the air during any part of a cheer, performance, routine or other activity. Illinois has already banned pyramid formations higher than two levels. As already stated in this report, high school and college cheerleaders account for almost one-half of the catastrophic injuries to female athletes.