SUMMARY REPORT

HIGH SCHOOOL SPORTS-RELATED

INJURY SURVEILLANCE STUDY

2006-2007

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Note

The analyses presented here provide only a brief summary of collected data, with the feasibility of a more detailed presentation limited by the extensive breadth and detail contained in the dataset. The principal investigator, Dr. R. Dawn Comstock, is happy to provide further information or to discuss research partnership opportunities upon request.

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I. Introduction & Methodology

1.1 Project Overview

To combat the epidemic of obesity among youth in the United States (US), adolescents must be encouraged to get up off the couch and participate in physically active sports, recreation, and leisure activities. Participation in high school sports, one of the most popular physical activities among adolescents, has grown rapidly from an estimated 4.0 million participants in 1971-72 to an estimated 7.0 million in 2006-07. While the health benefits of a physically active lifestyle including participating in sports are undeniable, high school athletes are at risk of sports-related injury because a certain endemic level of injury can be expected among participants of any physical activity. The challenge to injury epidemiologists is to reduce injury rates among high school athletes to the lowest possible level without discouraging adolescents from engaging in this important form of physical activity. This goal can best be accomplished by investigating the etiology of preventable injuries; by developing, implementing, and evaluating protective interventions using such science-based evidence; and by responsibly reporting epidemiologic findings while promoting a physically active lifestyle among adolescents.

1.2 Background and Significance

High school sports play an important role in the adoption and maintenance of a physically active lifestyle among millions of US adolescents. Too often injury prevention in this population is overlooked as sports-related injuries are thought to be unavoidable. In reality, sports-related injuries are largely preventable through the application of preventive interventions based on evidence-based science. The morbidity, mortality, and disability caused by high school sports-related injuries can be reduced through the development of effective prevention strategies and through programmatic decisions based on injury prevention. However, such efforts rely upon

accurate national estimates of injury incidence, injury rate calculations, and risk and protective factor data. Previously, no injury surveillance system capable of providing researchers with the needed quality of injury and exposure data for high school sports-related injuries existed.

During the 2005-06 school year, the Centers for Disease Control provided Dr. R. Dawn Comstock with the funding support needed to implement the time- and cost-efficient RIO™ (Reporting Information Online) surveillance system to monitor injuries among US high school athletes participating in boys' football, boys' and girls' soccer, girls' volleyball, boys' and girls' basketball, boys' wrestling, boys' baseball, and girls' softball. Following its initial success, High School RIO was continued during the 2006-07 school year using funds provided by Columbus Children's Center for Injury Research and Policy and the Ohio State University College of Medicine.

1.3 Specific Aims

The objective of this study was to continue the use of High School RIO™ among a nationally representative sample of US high schools. The specific aims of this study were:

A) To determine the incidence (number) of injuries among US high school boys' football, boys' and girls' soccer, girls' volleyball, boys' and girls' basketball, boys' wrestling, boys' baseball, and girls' softball athletes.

B) To calculate the rate of injuries per 1,000 athlete-competitions, per 1,000 athlete-practices, and per 1,000 athlete-exposures for US high school athletes in these 9 sports.

C) To provide detailed information about the injuries sustained by US high school athletes including the type, site, severity, initial and subsequent treatment/care, outcome, etc.

D) To provide detailed information about the injury events including athlete demographics, position played, phase of play/activity, etc.

E) To identify potential risk or protective factors.

F) To compare injury rates and patterns between the 2005-06 and the 2006-07 school years.

1.4 Project Design

RIO™, an internet-based sports injury surveillance system developed by Dr. Comstock at the Center for Injury Research and Policy at Columbus Children's Hospital, was utilized to perform surveillance of injuries sustained by US high school athletes throughout the 2005-06 and the 2006-07 school years. For the purpose of this study, a reportable injury was defined as:

A) An injury that occurred as a result of participation in an organized high school competition or practice and

B) Required medical attention by a team physician, certified athletic trainer, personal physician, or emergency department/urgent care facility and

C) Resulted in restriction of the high school athlete's participation for one or more days beyond the day of injury.

An athlete exposure was defined as one athlete participating in one practice or competition where he or she is exposed to the possibility of athletic injury. Exposure was expressed in two parts:

A) Number of athlete-practices = the sum of the number of athletes at each practice during the past week. For example, if 20 athletes practiced on Monday through Thursday and 18 practiced on Friday, the number of athlete-practices would equal 98.

B) Number of athlete-competitions = the sum of the number of athletes at each competition during the past week. For example, if 9 athletes played in a Freshman game, 12 in a JV game, and 14 in a Varsity game, the number of athlete-competitions would equal 35.

1.5 Sample Recruitment

All eligible schools (i.e., all US high schools with a National Athletic Trainers' Association (NATA) affiliated certified athletic trainer (ATC) willing to serve as a reporter) were categorized into 8 sampling strata by geographic location (northeast, midwest, south, and west) and high school size (enrollment ≤ 1,000 or > 1,000 students). Participant schools were then randomly selected from each substrata to obtain 100 study schools. To maintain a nationally representative sample, if a school dropped out of the study, another school from the same stratum was randomly selected for replacement. Participating ATCs were offered a $300 honorarium along with individualized injury reports following the study's conclusion.

1.6 Data Collection

Each ATC that enrolled their school in High School RIO™ received an email every Monday throughout the study period reminding them to enter their school's data into the surveillance system. Each participating ATC was asked to complete 45 weekly exposure reports: one for each week from July 31, 2006 through June 10, 2007. Exposure reports collected exposure information (number of athlete-competitions and athlete-practices) and the number of reportable injuries sustained by student athletes of each sport that was currently in session at their school. For each reportable injury, the ATC was asked to complete an injury report. The injury report collected detailed information about the injured player (e.g., age, year in school, etc.), the injury (e.g. site, type, severity, etc.) and the injury event (e.g., position played, phase of play, etc.). This internet-based surveillance tool provided ATCs with the ability to view all their submitted data throughout the study and update reports as needed (e.g., need for surgery, days till resuming play, etc.).

1.7 Data Management

In an effort to decrease loss-to follow up, a log of reporters' utilization of the internet-based injury surveillance system was maintained throughout the study period. Reporters who repeatedly failed to log on to complete the weekly exposure and injury reports or who had errors with their reporting were contacted by the Center for Injury Research and Policy and either reminded to report, asked to correct errors, or assessed for their willingness to continue participating in the study.

1.8 Data Analysis

Data were analyzed using SAS software, version 9.0 and SPSS, version 14.0. With the exception of injury rates, data were weighted for all analyses to produce national estimates. For each sport in each stratum, weights account for the total number of US schools offering the sport and the average number of participating study schools reporting each week for that sport. For example, following is the algorithm used to calculate football weights for the small (enrollment ≤ 1,000) west stratum:

$$Weight = \frac{\text{national total \# of small, west US schools offering football}}{\text{average \# of small, west participating schools reporting football each week}}$$

Injury rates were calculated as the ratio of unweighted case counts per 1,000 athlete-exposures, and they were compared using rate ratios (RR) with 95% confidence intervals (CI). Following is an example of the RR calculation comparing the rate of boys' soccer competition injuries to the rate of girls' soccer competition injuries:

$$RR = \frac{\text{\# boys' soccer competition injuries / total \# boys' soccer athlete - competitions}}{\text{\# girls' soccer competition injuries / total \# girls' soccer athlete - competitions}}$$

Injury proportions were compared using injury proportion ratios (IPR) and corresponding confidence intervals calculated using the Complex Samples module of SPSS in order to account

for the sampling weights and the complex sampling design. Following is an example of the IPR calculation comparing the proportion of male soccer concussions to the proportion of female soccer concussions:

$$IPR = \frac{\#\,\text{boys' soccer concussions / total}\,\#\,\text{boys' soccer injuries}}{\#\,\text{girls' soccer concussions / total}\,\#\,\text{girls' soccer injuries}}$$

An RR or IPR >1.00 suggests a risk association while an RR or IPR <1.00 suggests a protective association. CI not including 1.00 were considered statistically significant.

II. Overall Injury Epidemiology

Table 2.1 Injury Rates by Sport and Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Overall total	**4,716**	**1,820,367**	**2.59**	**1,472,849**
Competition	**2,378**	**487,529**	**4.88**	**766,512**
Practice	**2,338**	**1,332,838**	**1.75**	**706,337**
Boys' football total	2,234	502,098	4.45	574,367
Competition	1,109	82,043	13.52	292,316
Practice	1,125	420,055	2.68	282,051
Boys' soccer total	407	179,519	2.27	171,874
Competition	222	51,564	4.31	93,295
Practice	185	127,955	1.45	78,579
Girls' soccer total	410	163,378	2.51	230,769
Competition	259	47,676	5.43	149,231
Practice	151	115,702	1.31	81,538
Girls' volleyball total	220	160,645	1.37	80,493
Competition	74	53,016	1.40	27,423
Practice	146	107,629	1.36	53,069
Boys' basketball total	359	204,897	1.75	96,670
Competition	174	60,561	2.87	46,109
Practice	185	144,336	1.28	50,561
Girls' basketball total	358	171,251	2.09	102,831
Competition	185	51,358	3.60	53,703
Practice	173	119,893	1.44	49,128
Boys' wrestling total	392	156,094	2.51	101,139
Competition	155	40,841	3.80	38,750
Practice	237	115,253	2.06	62,389
Boys' baseball total	203	162,931	1.25	60,296
Competition	117	58,141	2.01	33,494
Practice	86	104,790	0.82	26,802
Girls' softball total	133	119,554	1.11	54,411
Competition	83	42,329	1.96	32,191
Practice	50	77,225	0.65	22,220

Table 2.2 Demographic Characteristics of Injured Athletes by Sex, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

	Male	Female
Year in School		
Freshman	179,263 (18.0%)	109,467 (23.6%)
Sophomore	247,549 (24.9%)	131,079 (28.3%)
Junior	282,684 (28.6%)	118,275 (25.5%)
Senior	284,332 (29.8%)	104,222 (22.5%)
Total†	**993,829 (100%)**	**463,043 (100%)**
Age (years)		
Minimum	13	13
Maximum	19	18
Mean (St. Dev.)	16.1 (1.2)	15.7 (1.2)
BMI		
Minimum	15.1	15.3
Maximum	49.4	49.9
Mean (St. Dev.)	25.0 (4.6)	22.0 (3.5)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 2.1 Injury Diagnosis by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

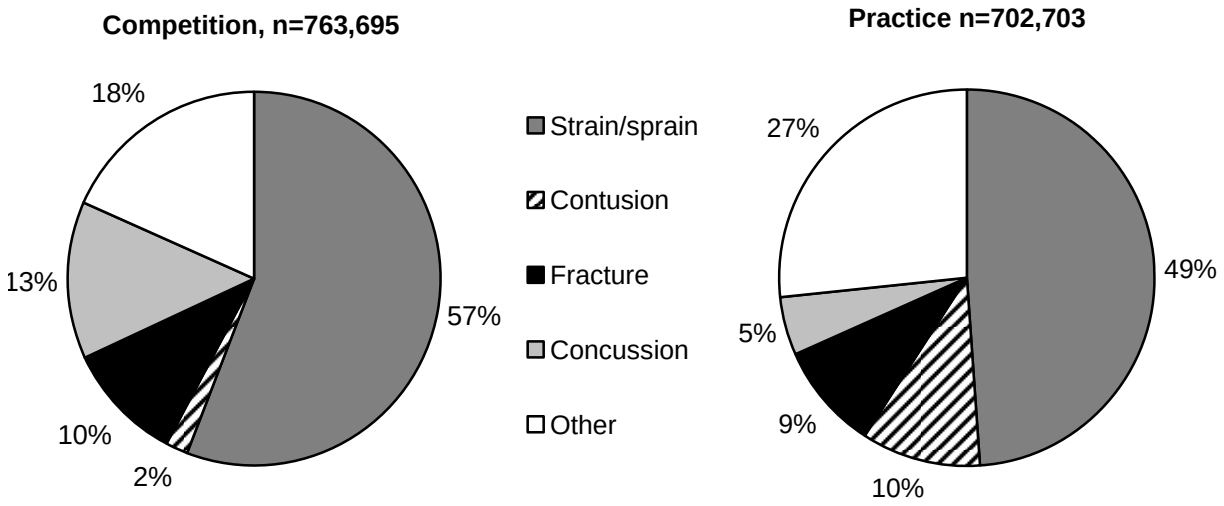


Table 2.3 Body Site of Injury by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	154,534	20.3	135,003	19.2	289,537	19.8
Knee	130,162	17.1	112,825	16.1	242,987	16.6
Head/face	123,215	16.2	58,847	8.4	182,062	12.4
Hip/thigh/upper leg	68,639	9.0	85,585	12.2	154,224	10.5
Shoulder	65,285	8.6	51,205	7.3	116,490	8.0
Hand/wrist	51,783	6.8	57,764	8.2	109,547	7.5
Trunk	48,632	6.4	49,430	7.0	98,062	6.7
Lower leg	36,245	4.8	39,928	5.7	76,173	5.2
Foot	21,668	2.8	36,515	5.2	58,183	4.0
Arm/elbow	26,699	3.5	30,131	4.3	56,830	3.9
Neck	14,579	1.9	13,942	2.0	28,521	1.9
Other	21,388	2.8	30,923	4.4	52,311	3.6
Total	**762,829**	**100**	**702,097**	**100**	**1,464,926**	**100**

Table 2.4 Ten Most Common Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=762,299		Practice n=700,974		Overall n=1,463,273	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	138,219	18.1	122,451	17.5	260,670	17.8
Knee strain/sprain	80,895	10.6	47,369	6.8	128,264	8.8
Head/face concussion	86,612	11.4	36,017	5.1	122,629	8.4
Hip/thigh/upper leg strain/sprain	41,071	5.4	70,900	10.1	111,971	7.7
Knee other	23,484	3.1	47,438	6.8	70,921	4.9
Shoulder other	28,445	3.7	25,378	3.6	53,823	3.7
Hand/wrist fracture	20,437	2.7	28,035	4.0	48,471	3.3
Shoulder strain/sprain	24,607	3.2	17,191	2.5	41,798	2.9
Trunk strain/sprain	20,727	2.7	19,281	2.8	40,008	2.7
Knee contusion	22,215	2.9	15,019	2.1	37,234	2.5

Figure 2.2 Time Loss by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

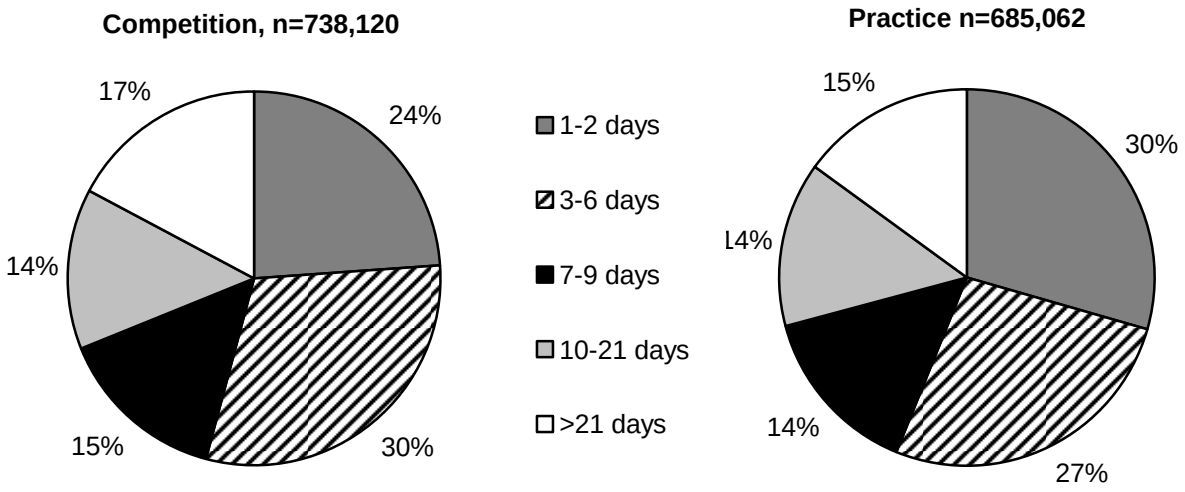


Table 2.5 Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Need for surgery						
Required surgery	55,328	7.5	35,798	5.2	91,126	6.4
Did not require surgery	686,418	92.5	651,415	94.8	1,337,834	93.6
Total	**741,746**	**100**	**687,213**	**100**	**1,428,960**	**100**

Figure 2.3 New and Recurring Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

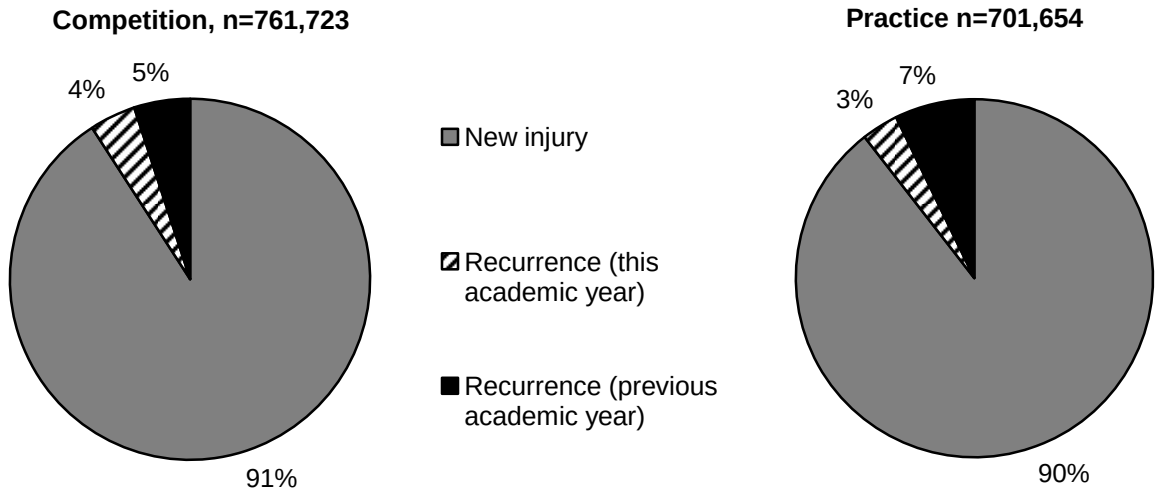


Table 2.6 Time during Season of Injury, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	326,692	24.8
Regular season	931,499	70.6
Post season	60,977	4.6
Total	**1,319,168**	**100**

Table 2.7 Competition-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	15,029	2.2
Beginning	111,791	16.4
Middle	363,449	53.2
End	193,452	28.3
Total	**683,720**	**100**
Competition Location		
Home	340,158	49.5
Away	315,551	45.9
Neutral site	31,131	4.5
Total	**686,840**	**100**
Injury Related to Foul Play		
Yes	50,871	7.6
No	617,823	92.4
Total	**668,694**	**100**

Table 2.8 Practice-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	110,039	18.0
Second 1/2 hour	168,197	27.5
Third 1/2 hour	187,798	30.7
Fourth 1/2 hour	111,148	18.2
>2 hours into practice	33,911	5.6
Total	**611,093**	**100**
Number of Practices		
Single session	510,548	82.2
Double session	100,028	16.1
Triple session	10,497	1.7
Total	**621,073**	**100**
Practice Type		
Noncontact skills practice	160,607	25.6
Noncontact partial numbers scrimmage	11,285	1.8
Noncontact full scrimmage	11,657	1.9
Partial contact skills practice	69,395	11.1
Partial contact partial numbers scrimmage	28,464	4.5
Partial contact full scrimmage	19,871	3.2
Full contact skills practice	162,590	25.9
Full contact partial numbers scrimmage	36,303	5.8
Full contact full scrimmage	97,288	15.5
Other	29,272	4.7
Total	**626,731**	**100**

Table 2.9 Methods for Injury Evaluation and Assessment, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
% of Injuries Evaluated by:*		
Certified athletic trainer	1,144,990	77.7
Physician	692,780	47.0
Dentist/oral surgeon	5,017	0.3
Nurse practitioner	3,855	0.3
Physician's assistant	9,945	0.7
Other	32,643	2.2
Total	**1,472,849**	**100**
% of Injuries Assessed by:*		
Evaluation	1,210,869	82.2
X-ray	494,922	33.6
MRI	131,612	8.9
CT-scan	41,705	2.8
Surgery	23,876	1.6
Blood work/lab test	19,274	1.3
Other	20,443	1.4
Total	**1,472,849**	**100**

*Multiple responses allowed per injury report

III. Boys' Football Injury Epidemiology

Table 3.1 Football Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**2,234**	**502,098**	**4.45**	**574,367**
Competition	1,109	82,043	13.52	292,316
Practice	1,125	420,055	2.68	282,051

Table 3.2 Demographic Characteristics of Injured Football Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	92,724 (16.3%)
Sophomore	144,060 (25.3%)
Junior	167,703 (29.5%)
Senior	164,129 (28.9%)
Total†	568,616 (100%)
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	16.1 (19.7)
BMI	
Minimum	15.6
Maximum	49.4
Mean (St. Dev.)	26.2 (78.6)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 3.1 Diagnosis of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

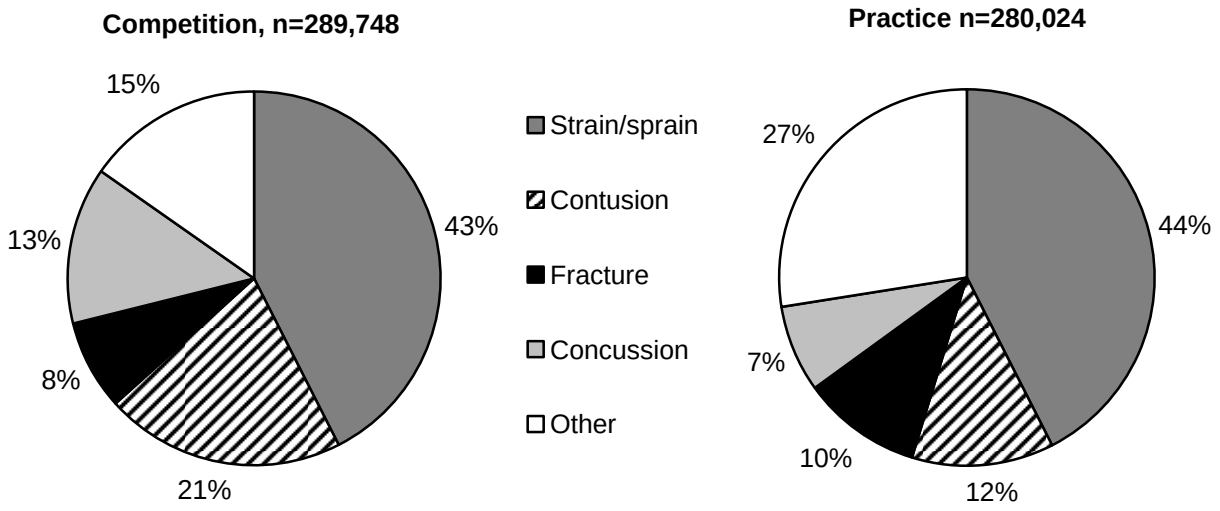


Table 3.3 Body Site of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	42,091	14.6	36,480	13.1	78,571	13.8
Knee	47,644	16.5	41,077	14.7	88,721	15.6
Head/face	41,563	14.4	25,934	9.3	67,497	11.9
Hip/thigh/upper leg	28,640	9.9	33,465	12.0	62,105	10.9
Shoulder	38,455	13.3	25,999	9.3	64,454	11.3
Hand/wrist	20,249	7.0	26,104	9.4	46,353	8.2
Trunk	22,125	7.7	26,000	9.3	48,125	8.5
Lower leg	11,335	3.9	11,565	4.1	22,900	4.0
Foot	5,481	1.9	14,164	5.1	19,645	3.5
Arm/elbow	13,384	4.6	14,135	5.1	27,519	4.8
Neck	10,980	3.8	7,342	2.6	18,322	3.2
Other	7,253	2.5	16,777	6.0	24,030	4.2
Total	**289,202**	**100**	**279,041**	**100**	**568,243**	**100**

Table 3.4 Ten Most Common Football Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=288,671		Practice n=278,510		Total n=567,181	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	37,317	12.9	33,439	12.0	70,756	12.5
Head/face concussion	38,380	13.3	20,772	7.5	59,152	10.4
Knee strain/sprain	32,117	11.1	19,238	6.9	51,354	9.1
Hip/thigh/upper leg strain/sprain	14,348	5.0	24,450	8.8	38,799	6.8
Shoulder other	17,714	6.1	12,134	4.4	29,848	5.3
Knee other	7,167	2.5	14,693	5.3	21,860	3.9
Hand/wrist fracture	6,823	2.4	13,626	4.9	20,449	3.6
Hip/thigh/upper leg contusion	13,565	4.7	5,406	1.9	18,971	3.3
Shoulder strain/sprain	10,811	3.7	7,807	2.8	18,617	3.3
Trunk strain/sprain	7,232	2.5	10,669	3.8	17,902	3.2

Figure 3.2 Time Loss of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

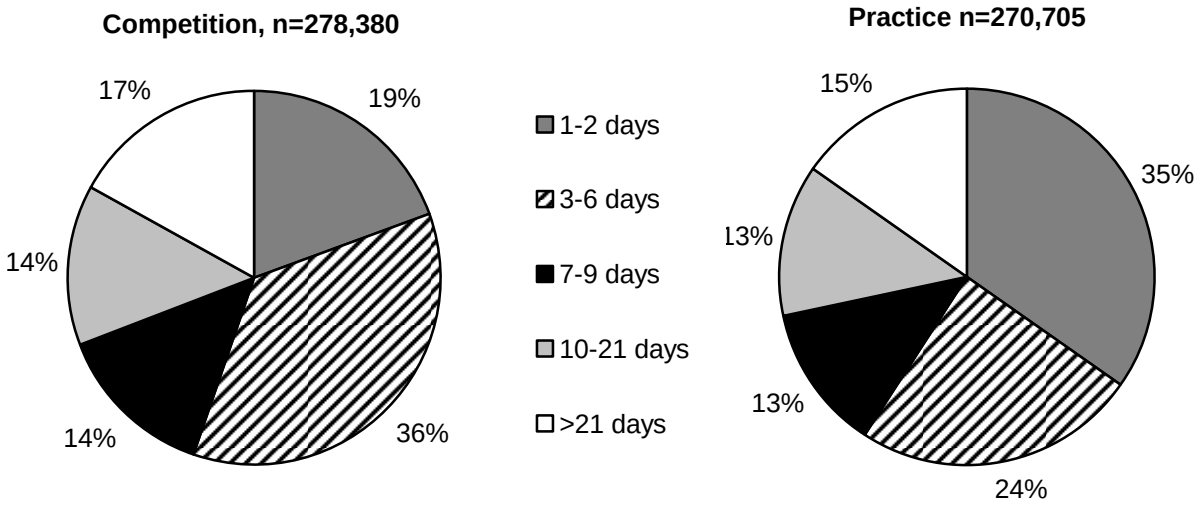


Table 3.5 Football Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	17,233	6.2	14,358	5.3	31,591	5.8
Did not require surgery	259,983	93.8	257,530	94.7	517,513	94.2
Total	**277,216**	**100**	**271,888**	**100**	**549,104**	**100**

Figure 3.3 History of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

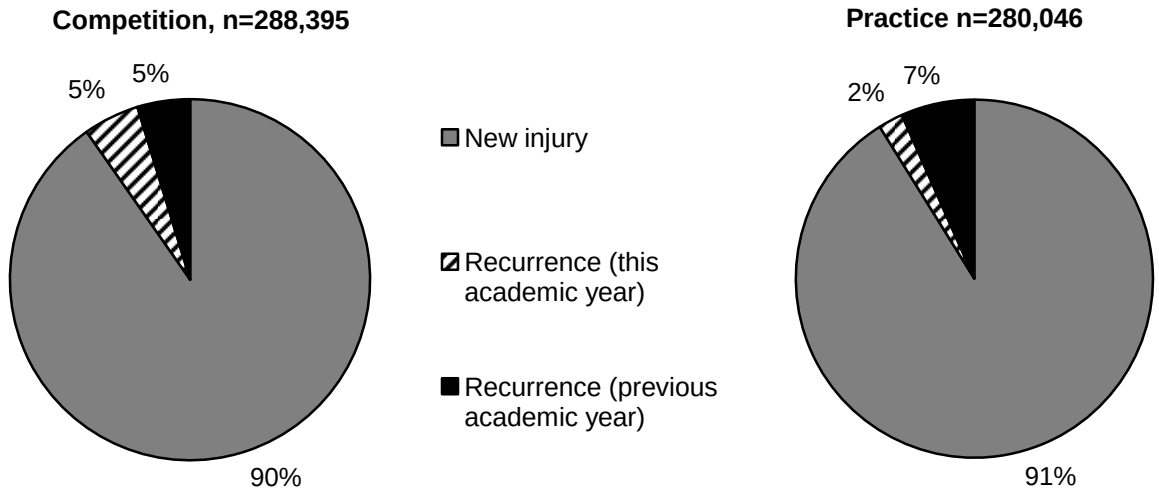


Table 3.6 Time during Season of Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	177,756	31.0
Regular season	368,854	64.2
Post season	27,758	4.8
Total	**574,367**	**100**

Table 3.7 Competition-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	3,638	1.3
Beginning	49,753	17.3
Middle	146,691	51.1
End	87,022	30.3
Total	**287,104**	**100**
Competition Location		
Home	139,831	48.2
Away	140,140	48.3
Neutral site	10,231	3.5
Total	**290,201**	**100**
Injury Related to Foul Play		
Yes	6,017	2.1
No	276,082	97.9
Total	**282,098**	**100**
Field Location		
End zone	4,765	1.7
Red zone	52,391	18.6
Between the 20 yrd lines	220,314	78.3
Off the field	4,056	1.4
Total	**281,526**	**100**

Table 3.8 Practice-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	37,368	13.7
Second 1/2 hour	69,361	25.5
Third 1/2 hour	87,297	32.1
Fourth 1/2 hour	49,030	18.0
>2 hours into practice	28,910	10.6
Total	**271,967**	**100**
Number of Practices		
Single session	193,729	70.2
Double session	74,172	26.9
Triple session	8,213	3.0
Total	**276,113**	**100**
Practice Type		
Noncontact skills practice	46,949	16.8
Noncontact partial numbers scrimmage	2,430	0.9
Noncontact full scrimmage	896	0.3
Partial contact skills practice	43,546	15.6
Partial contact partial numbers scrimmage	12,322	4.4
Partial contact full scrimmage	10,268	3.7
Full contact skills practice	96,220	34.4
Full contact partial numbers scrimmage	18,175	6.5
Full contact full scrimmage	36,853	13.2
Other	12,433	4.4
Total	**280,092**	**100**

Figure 3.4 Player Position of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

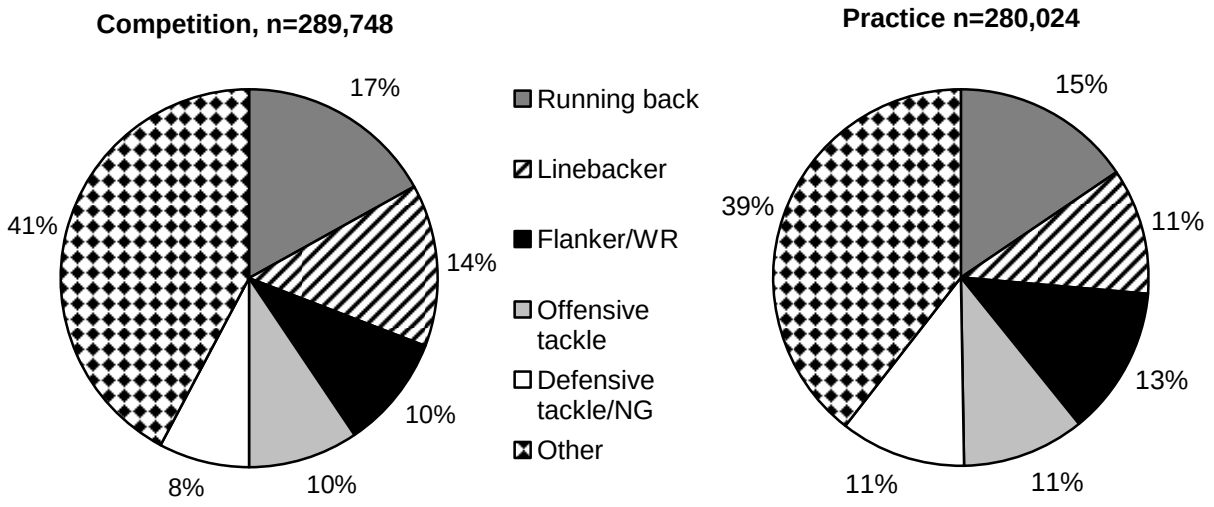
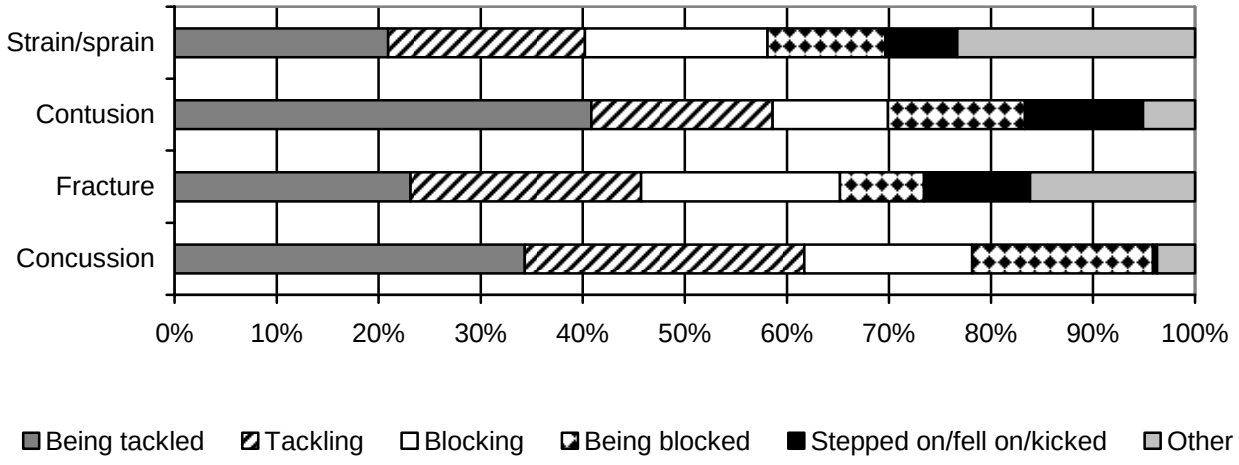


Figure 3.5 Activity Resulting in Football Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



IV. Boys' Soccer Injury Epidemiology

Table 4.1 Boys' Soccer Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**407**	**179,519**	**2.27**	**171,874**
Competition	222	51,564	4.31	93,295
Practice	185	127,955	1.45	78,579

Table 4.2 Demographic Characteristics of Injured Boys' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	32,715 (19.1%)
Sophomore	35,515 (20.8%)
Junior	49,943 (29.2%)
Senior	52,772 (30.9%)
Total†	**170,944 (100%)**
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	16.1 (1.3)
BMI	
Minimum	15.1
Maximum	35.5
Mean (St. Dev.)	22.3 (2.5)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 4.1 Diagnosis of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

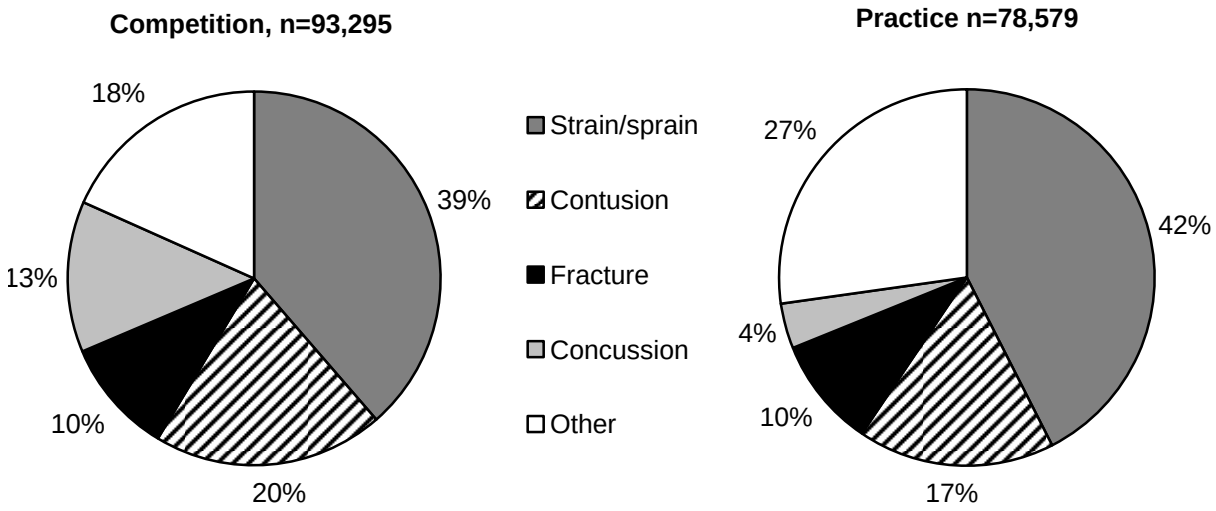


Table 4.3 Body Site of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	20,512	22.1	14,120	18.0	34,632	20.2
Knee	11,967	12.9	16,161	20.6	28,128	16.4
Head/face	18,345	19.7	5,597	7.1	23,942	14.0
Hip/thigh/upper leg	11,308	12.2	16,374	20.8	27,682	16.1
Shoulder	3,183	3.4	1,938	2.5	5,121	3.0
Hand/wrist	4,829	5.2	4,087	5.2	8,916	5.2
Trunk	3,294	3.5	2,919	3.7	6,213	3.6
Lower leg	9,742	10.5	6,454	8.2	16,196	9.4
Foot	3,833	4.1	7,584	9.7	11,417	6.7
Arm/elbow	914	1.0	0	0.0	914	0.5
Neck	319	0.3	1,146	1.5	1,465	0.9
Other	4,731	5.1	2,200	2.8	6,931	4.0
Total	**92,976**	**100**	**78,579**	**100**	**171,555**	**100**

Table 4.4 Ten Most Common Boys' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=92,976		Practice n=78,579		Total n=171,555	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	16,328	17.6	9,184	11.7	25,512	14.9
Hip/thigh/upper leg strain/sprain	5,565	6.0	14,470	18.4	20,036	11.7
Head/face concussion	12,229	13.2	3,039	3.9	15,268	8.9
Knee other	3,657	3.9	8,423	10.7	12,080	7.0
Knee strain/sprain	6,708	7.2	4,539	5.8	11,247	6.6
Lower leg contusion	4,062	4.4	2,611	3.3	6,673	3.9
Hip/thigh/upper leg contusion	4,915	5.3	1,402	1.8	6,317	3.7
Head/face other	4,886	5.3	490	0.6	5,376	3.1
Hand/wrist fracture	2,020	2.2	3,261	4.2	5,280	3.1
Ankle contusion	2,351	2.5	2,645	3.4	4,996	2.9

Figure 4.2 Time Loss of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

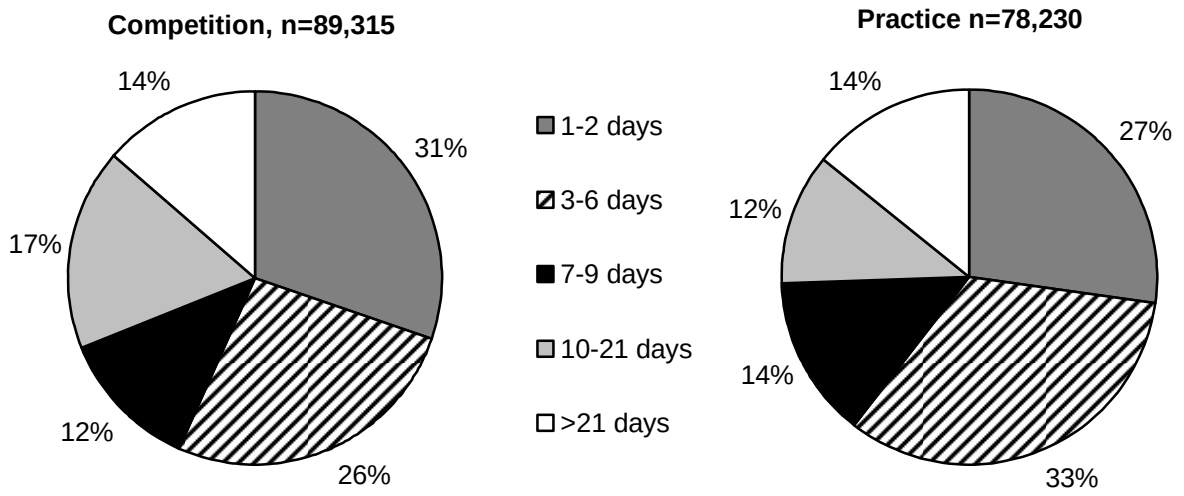


Table 4.5 Boys' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	6,729	7.4	3,106	4.0	9,835	5.8
Did not require surgery	84,367	92.6	74,229	96.0	158,596	94.2
Total	**91,097**	**100**	**77,335**	**100**	**168,432**	**100**

Figure 4.3 History of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

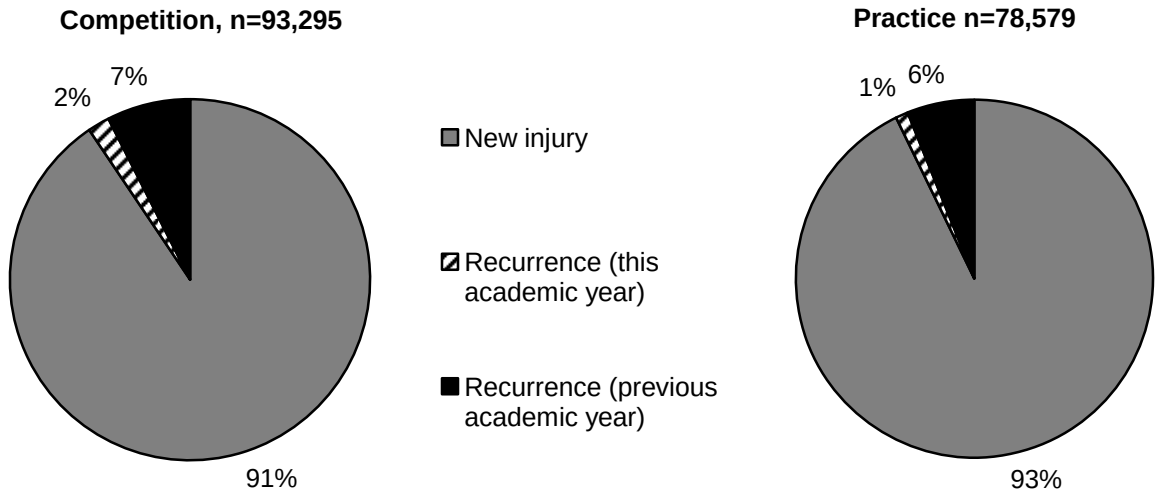


Table 4.6 Time during Season of Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	47,773	27.8
Regular season	120,812	70.3
Post season	3,288	1.9
Total	**171,874**	**100**

Table 4.7 Competition-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	2,150	2.3
Beginning	14,134	15.2
Middle	52,088	55.8
End	24,923	26.7
Total	**93,295**	**100**
Competition Location		
Home	46,410	49.8
Away	44,256	47.4
Neutral site	2,629	2.8
Total	**93,295**	**100**
Injury Related to Foul Play		
Yes	12,032	13.2
No	79,240	86.8
Total	**91,272**	**100**
Field Location		
Goal box (defense)	10,644	13.8
Side of goal box (defense)	8,129	10.6
Goal box (offense)	6,162	8.0
Side of goal box (offense)	7,865	10.2
Top of goal box extended to center line (offense)	22,853	29.7
Top of goal box extended to center line (defense)	19,971	25.9
Off the field	1,341	1.7
Total	**76,964**	**100**

Table 4.8 Practice-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	13,467	17.6
Second 1/2 hour	21,468	28.0
Third 1/2 hour	20,458	26.7
Fourth 1/2 hour	18,890	24.7
>2 hours into practice	2,278	3.0
Total	**76,561**	**100**
Number of Practices		
Single session	59,511	76.2
Double session	16,721	21.4
Triple session	1,828	2.3
Total	**78,060**	**100**
Practice Type		
Noncontact skills practice	20,853	26.7
Noncontact partial numbers scrimmage	2,882	3.7
Noncontact full scrimmage	3,202	4.1
Partial contact skills practice	10,532	13.5
Partial contact partial numbers scrimmage	3,984	5.1
Partial contact full scrimmage	2,832	3.6
Full contact skills practice	7,671	9.8
Full contact partial numbers scrimmage	4,578	5.9
Full contact full scrimmage	17,514	22.5
Other	3,942	5.0
Total	**77,990**	**100**

Figure 4.4 Player Position of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

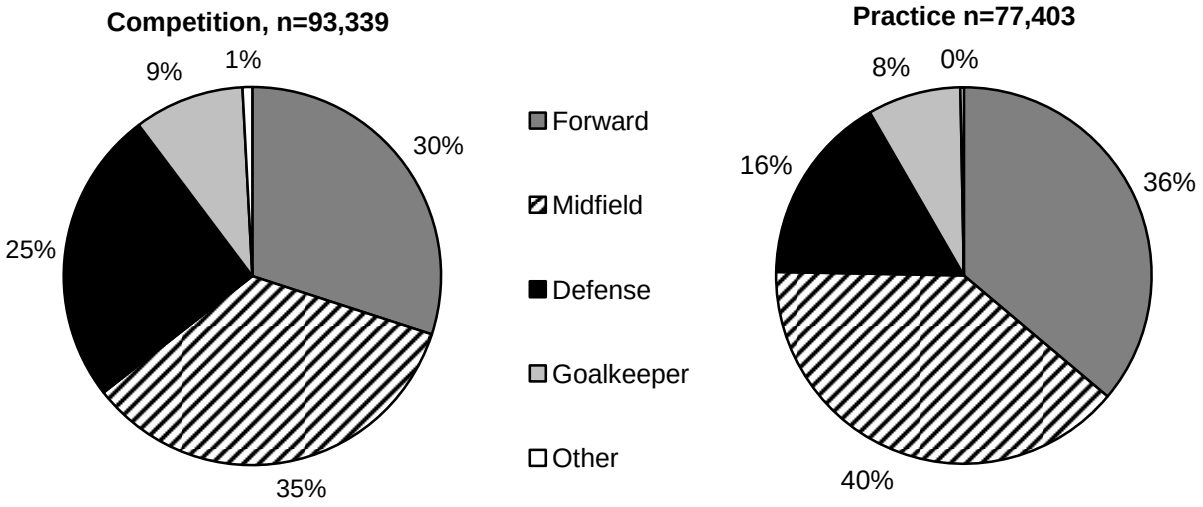
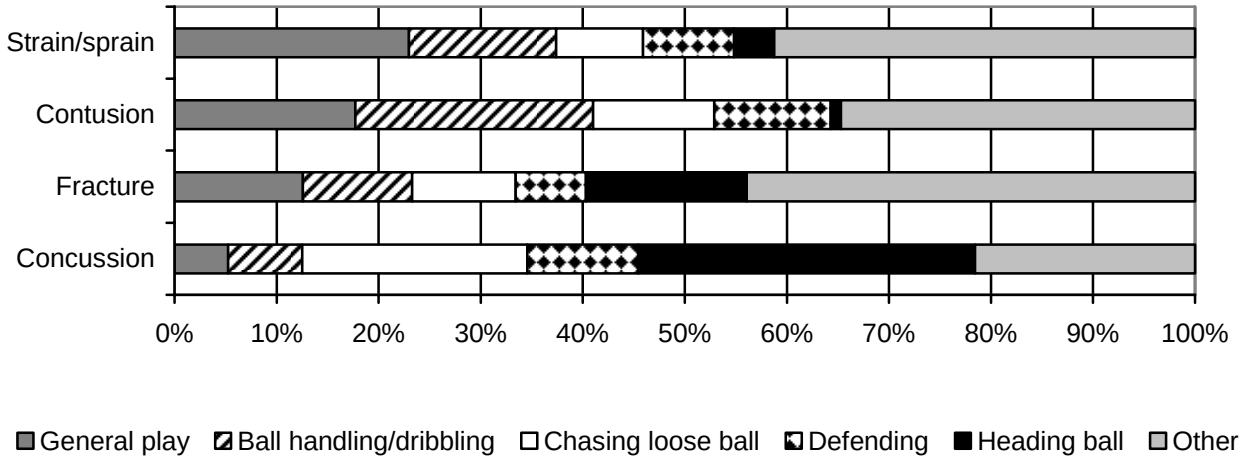


Figure 4.5 Activity Resulting in Boys' Soccer Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



V. Girls' Soccer Injury Epidemiology

Table 5.1 Girls' Soccer Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**410**	**163,378**	**2.51**	**230,769**
Competition	259	47,676	5.43	149,231
Practice	151	115,702	1.31	81,538

Table 5.2 Demographic Characteristics of Injured Girls' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	44,883 (19.5%)
Sophomore	77,687 (33.8%)
Junior	61,263 (26.7%)
Senior	45,866 (20.0%)
Total†	**229,699 (100%)**
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.8 (1.1)
BMI	
Minimum	15.5
Maximum	37.9
Mean (St. Dev.)	22.0 (3.3)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 5.1 Diagnosis of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

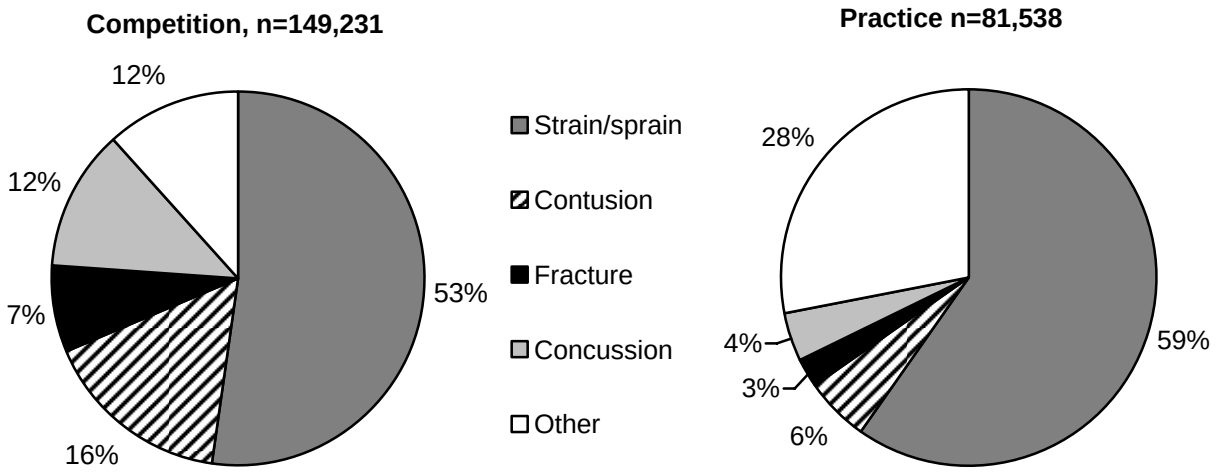


Table 5.3 Body Site of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Ankle	31,923	21.4	13,096	16.1	45,019	19.5
Knee	37,197	24.9	22,857	28.0	60,054	26.0
Head/face	24,586	16.5	4,355	5.3	28,941	12.5
Hip/thigh/upper leg	15,460	10.4	16,751	20.5	32,211	14.0
Shoulder	2,663	1.8	1,461	1.8	4,124	1.8
Hand/wrist	4,483	3.0	1,610	2.0	6,093	2.6
Trunk	6,992	4.7	2,333	2.9	9,325	4.0
Lower leg	10,292	6.9	11,687	14.3	21,979	9.5
Foot	9,309	6.2	5,845	7.2	15,154	6.6
Arm/elbow	3,313	2.2	533	0.7	3,846	1.7
Neck	535	0.4	0	0.0	535	0.2
Other	2,478	1.7	1,010	1.2	3,488	1.5
Total	**149,231**	**100**	**81,538**	**100**	**230,769**	**100**

Table 5.4 Ten Most Common Girls' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=149,231		Practice n=81,538		Total n=230,769	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	27,749	18.6	12,918	15.8	40,666	17.6
Knee strain/sprain	22,661	15.2	12,809	15.7	35,470	15.4
Hip/thigh/upper leg strain/sprain	11,866	8.0	15,318	18.8	27,184	11.8
Head/face concussion	18,188	12.2	3,382	4.2	21,570	9.4
Knee other	5,140	3.4	8,334	10.2	13,474	5.8
Lower leg other	2,132	1.4	8,419	10.3	10,551	4.6
Knee contusion	7,267	4.9	1,714	2.1	8,981	3.9
Foot strain/sprain	4,929	3.3	3,450	4.2	8,379	3.6
Lower leg contusion	4,452	3.0	1,038	1.3	5,490	2.4
Hip/thigh/upper leg contusion	3,595	2.4	1,038	1.3	4,633	2.0

Figure 5.2 Time Loss of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

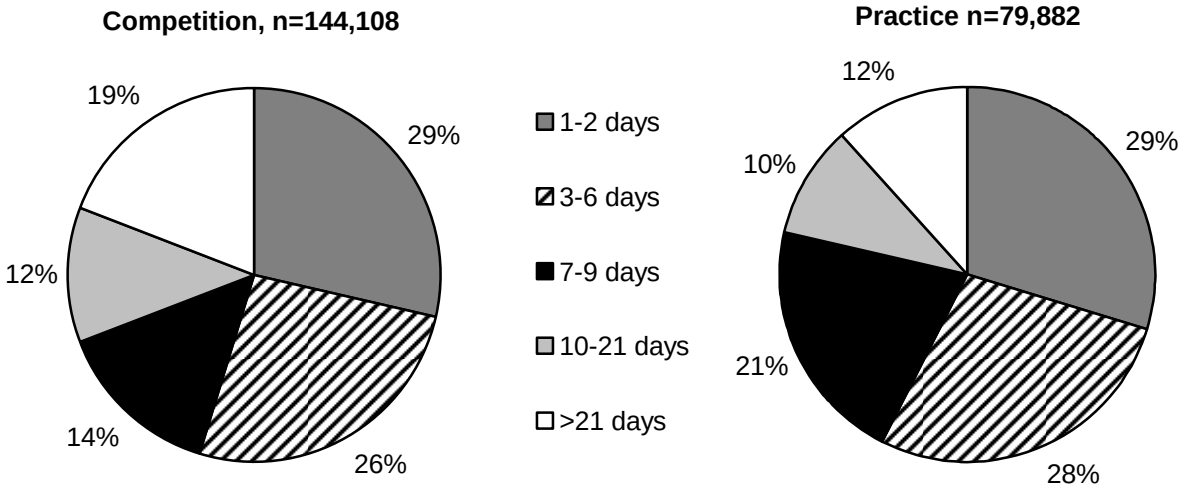


Table 5.5 Girls' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	12,411	8.5	3,918	4.9	16,329	7.2
Did not require surgery	134,208	91.5	76,046	95.1	210,254	92.8
Total	**146,619**	**100**	**79,964**	**100**	**226,583**	**100**

Figure 5.3 History of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

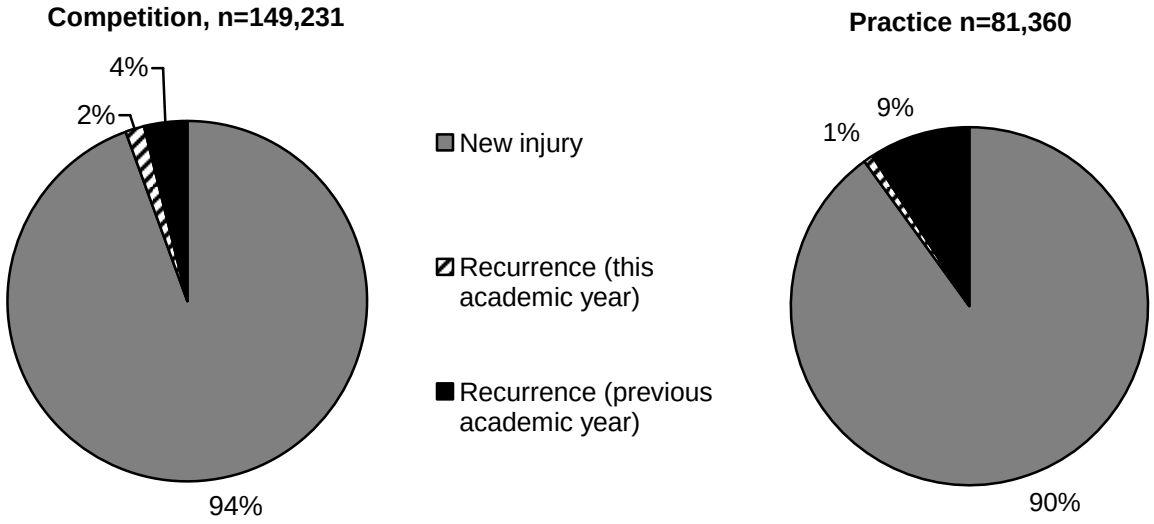


Table 5.6 Time during Season of Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	32,263	14.0
Regular season	186,670	80.9
Post season	11,836	5.1
Total	**230,769**	**100**

Table 5.7 Competition-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	2,977	2.0
Beginning	18,303	12.6
Middle	79,005	54.3
End	45,176	31.1
Total	**145,462**	**100**
Competition Location		
Home	77,974	53.1
Away	60,822	41.4
Neutral site	8,001	5.4
Total	**146,798**	**100**
Injury Related to Foul Play		
Yes	18,150	12.8
No	123,406	87.2
Total	**141,557**	**100**
Field Location		
Goal box (defense)	14,205	10.7
Side of goal box (defense)	13,297	10.0
Goal box (offense)	11,140	8.4
Side of goal box (offense)	15,236	11.5
Top of goal box extended to center line (offense)	46,451	34.9
Top of goal box extended to center line (defense)	28,467	21.4
Off the field	4,114	3.1
Total	**132,910**	**100**

Table 5.8 Practice-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	10,602	13.5
Second 1/2 hour	24,683	31.4
Third 1/2 hour	31,945	40.6
Fourth 1/2 hour	9,922	12.6
>2 hours into practice	1,433	1.8
Total	**78,585**	**100**
Number of Practices		
Single session	74,203	90.2
Double session	8,076	9.8
Total	**82,279**	**100**
Practice Type		
Noncontact skills practice	26,670	32.2
Noncontact partial numbers scrimmage	1,703	2.1
Noncontact full scrimmage	1,151	1.4
Partial contact skills practice	5,645	6.8
Partial contact partial numbers scrimmage	8,754	10.6
Partial contact full scrimmage	2,491	3.0
Full contact skills practice	14,305	17.3
Full contact partial numbers scrimmage	9,949	12.0
Full contact full scrimmage	8,532	10.3
Other	3,642	4.4
Total	**82,842**	**100**

Figure 5.4 Player Position of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

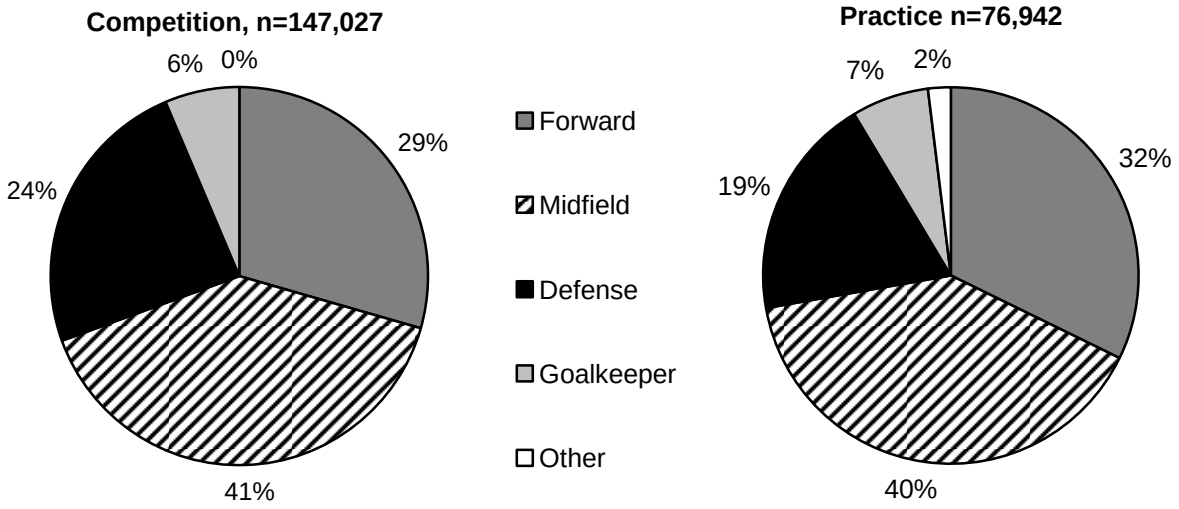
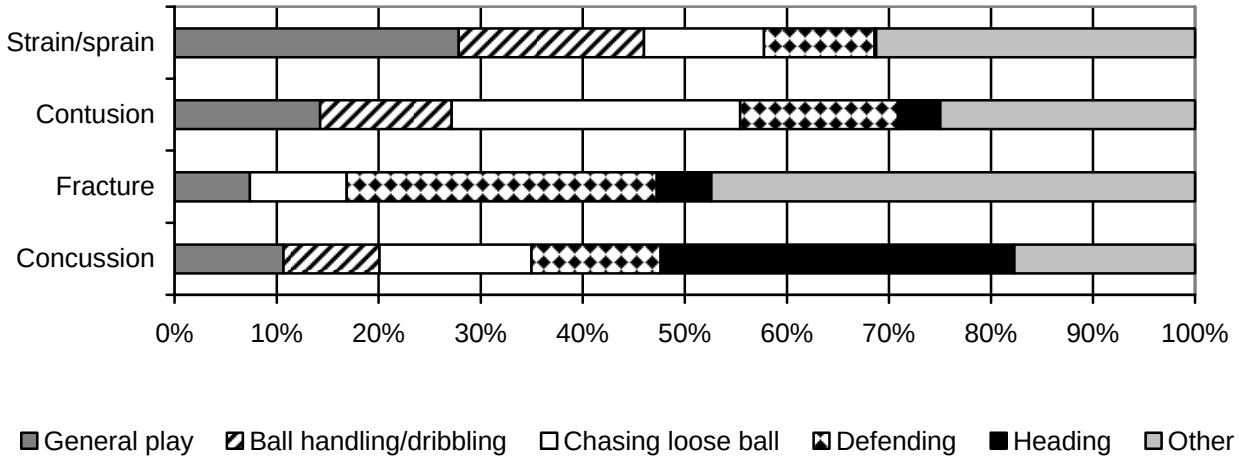


Figure 5.5 Activity Resulting in Girls' Soccer Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



VI. Volleyball Injury Epidemiology

Table 6.1 Volleyball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**220**	**160,645**	**1.37**	**80,493**
Competition	74	53,016	1.40	27,423
Practice	146	107,629	1.36	53,069

Table 6.2 Demographic Characteristics of Injured Volleyball Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	18,338 (22.9%)
Sophomore	15,091 (18.9%)
Junior	22,007 (27.5%)
Senior	24,579 (30.7%)
Total†	**80,016 (100%)**
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.7 (1.2)
BMI	
Minimum	15.8
Maximum	33.7
Mean (St. Dev.)	21.7 (3.3)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 6.1 Diagnosis of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

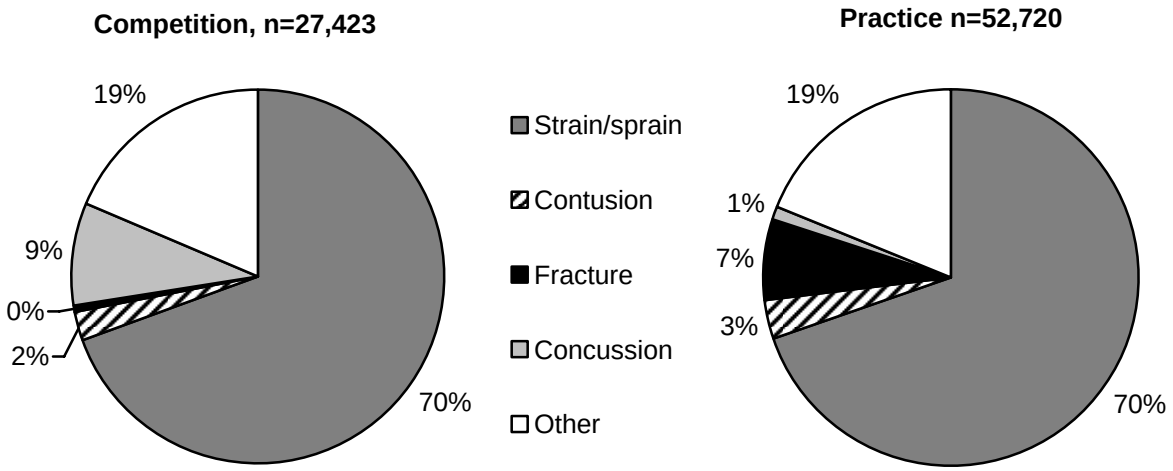


Table 6.3 Body Site of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Ankle	13,015	47.5	26,662	50.2	39,677	49.3
Knee	2,447	8.9	4,457	8.4	6,904	8.6
Head/face	2,588	9.4	697	1.3	3,285	4.1
Hip/thigh/upper leg	221	0.8	2,124	4.0	2,345	2.9
Shoulder	1,620	5.9	4,111	7.8	5,731	7.1
Hand/wrist	3,477	12.7	6,238	11.8	9,715	12.1
Trunk	3,122	11.4	3,280	6.2	6,402	8.0
Lower leg	544	2.0	2,736	5.2	3,280	4.1
Foot	0	0.0	1,123	2.1	1,123	1.4
Arm/elbow	119	0.4	1,019	1.9	1,138	1.4
Neck	0	0	0	0	0	0.0
Other	272	1.0	621	1.2	893	1.1
Total	**27,423**	**100**	**53,069**	**100**	**80,492**	**100**

Table 6.4 Ten Most Common Volleyball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=27,423		Practice n=52,720		Total n=80,143	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	12,810	46.7	24,618	46.7	37,428	46.7
Hand/wrist strain/sprain	2,889	10.5	2,521	4.8	5,411	6.8
Trunk other	2,305	8.4	1,919	3.6	4,224	5.3
Shoulder other	1,178	4.3	2,327	4.4	3,505	4.4
Knee strain/sprain	1,598	5.8	1,679	3.2	3,277	4.1
Head/face concussion	2,469	9.0	493	0.9	2,962	3.7
Knee other	848	3.1	1,738	3.3	2,586	3.2
Lower leg strain/sprain	272	1.0	2,118	4.0	2,390	3.0
Hip/thigh/upper leg strain/sprain	110	0.4	2,124	4.0	2,235	2.8
Trunk strain/sprain	817	3.0	1,360	2.6	2,177	2.7

Figure 6.2 Time Loss of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

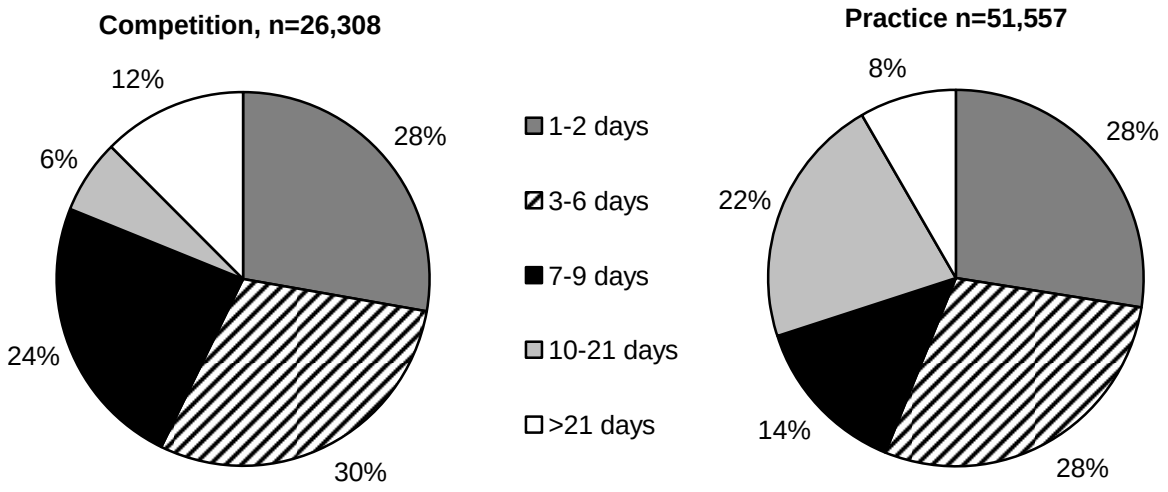


Table 6.5 Volleyball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,338	5.0	695	1.3	2,033	2.6
Did not require surgery	25,663	95.0	51,526	98.7	77,189	97.4
Total	**27,001**	**100**	**52,221**	**100**	**79,222**	**100**

Figure 6.3 History of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

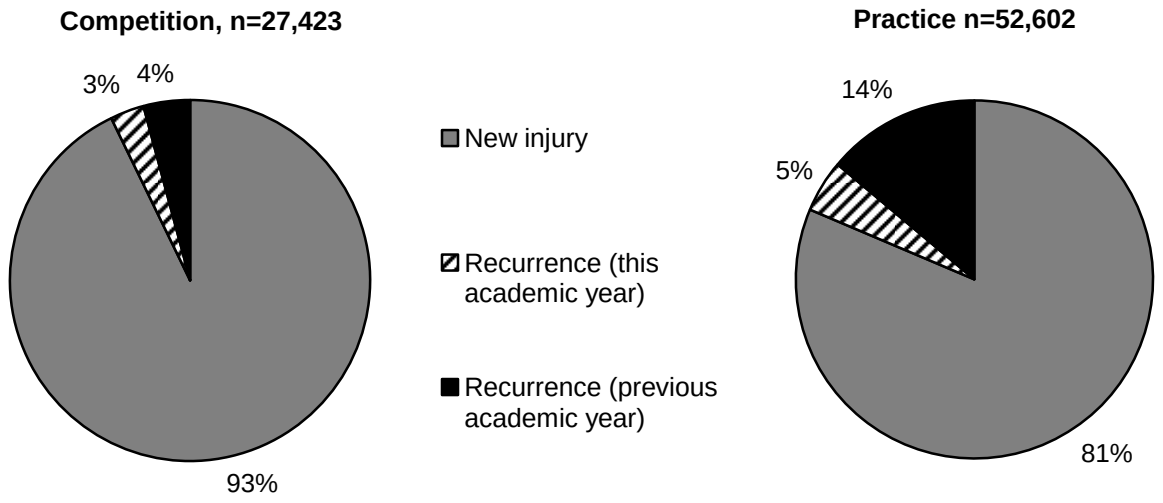


Table 6.6 Time during Season of Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	24,721	30.7
Regular season	49,926	62.0
Post season	5,846	7.3
Total	**80,493**	**100**

Table 6.7 Competition-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	1,469	5.4
Beginning	5,908	21.6
Middle	13,731	50.1
End	6,291	23.0
Total	**27,400**	**100**
Competition Location		
Home	14,564	52.7
Away	11,174	40.4
Neutral site	1,891	6.8
Total	**27,628**	**100**
Injury Related to Foul Play		
Yes	1,077	4.1
No	25,473	95.9
Total	**26,551**	**100**
Court Location		
Right back (server)	2,118	8.5
Right forward	7,162	28.8
Outside court (your side)	205	0.8
Middle forward	9,192	36.9
Left forward	2,577	10.4
Left back	2,654	10.7
Off the court	970	3.9
Total	**24,878**	**100.0**

Table 6.8 Practice-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	16,024	30.3
Second 1/2 hour	15,841	30.0
Third 1/2 hour	11,438	21.6
Fourth 1/2 hour	7,884	14.9
>2 hours into practice	1,661	3.1
Total	**52,849**	**100**
Number of Practices		
Single session	44,548	84.4
Double session	7,900	15.0
Triple session	349	0.7
Total	**52,797**	**100**
Practice Type		
Noncontact skills practice	24,512	46.2
Noncontact partial numbers scrimmage	1,769	3.3
Noncontact full scrimmage	3,427	6.5
Partial contact skills practice	2,338	4.4
Partial contact partial numbers scrimmage	1,545	2.9
Partial contact full scrimmage	554	1.0
Full contact skills practice	10,322	19.4
Full contact partial numbers scrimmage	1,647	3.1
Full contact full scrimmage	3,454	6.5
Other	3,502	6.6
Total	**53,069**	**100**

Figure 6.4 Player Position of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

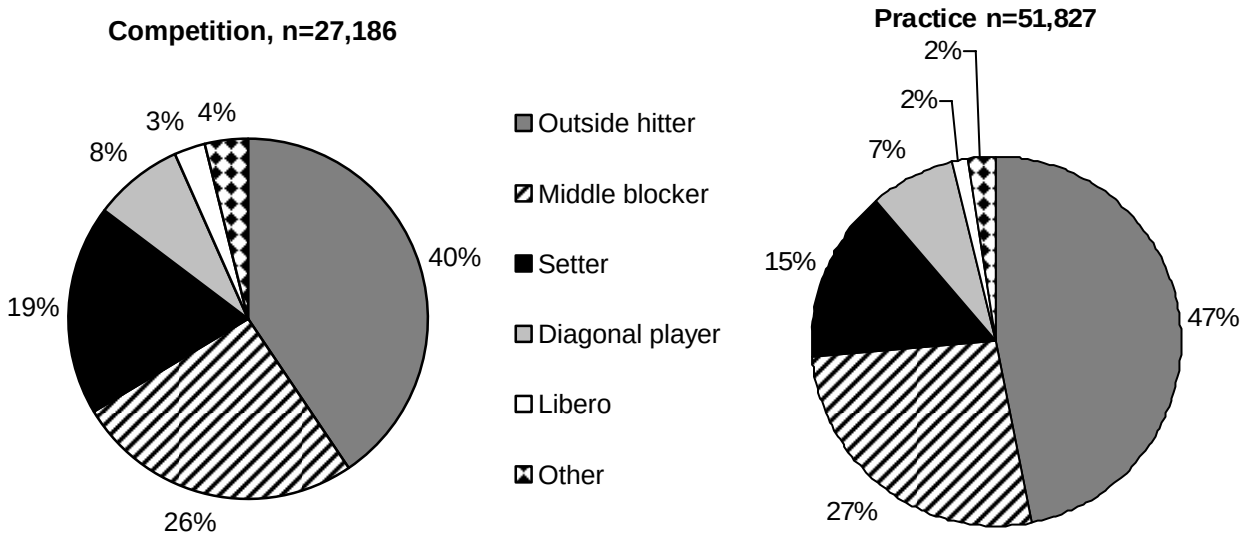
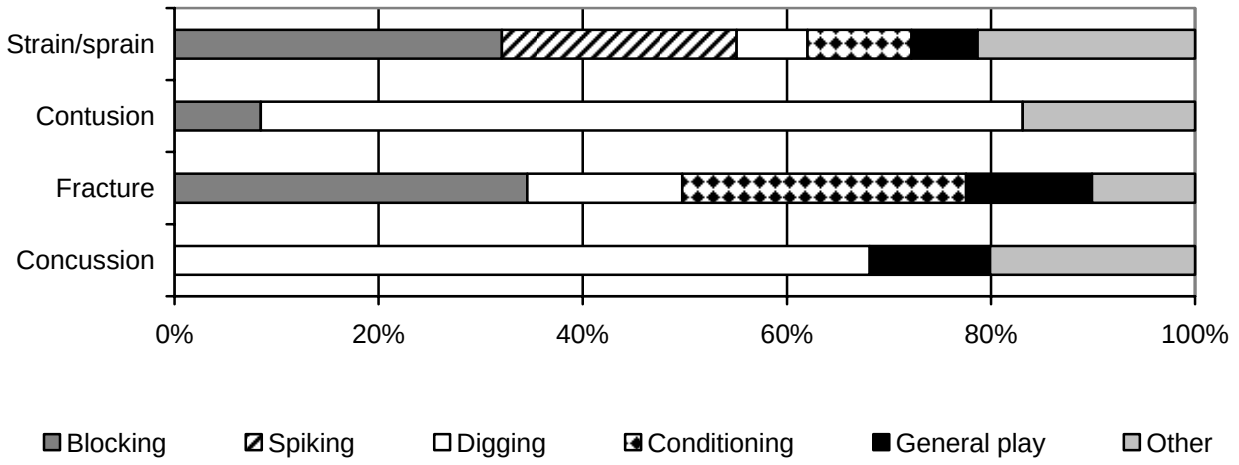


Figure 6.5 Activity Resulting in Volleyball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



VII. Boys' Basketball Injury Epidemiology

Table 7.1 Boys' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**359**	**204,897**	**1.75**	**96,670**
Competition	174	60,561	2.87	46,109
Practice	185	144,336	1.28	50,561

Table 7.2 Demographic Characteristics of Injured Boys' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	14,302 (15.0%)
Sophomore	23,335 (24.4%)
Junior	29,292 (30.7%)
Senior	28,580 (29.9%)
Total†	**95,508 (100%)**
Age (years)	
Minimum	14
Maximum	19
Mean (St. Dev.)	16.2 (1.1)
BMI	
Minimum	15.4
Maximum	32.4
Mean (St. Dev.)	22.5 (2.7)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 7.1 Diagnosis of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

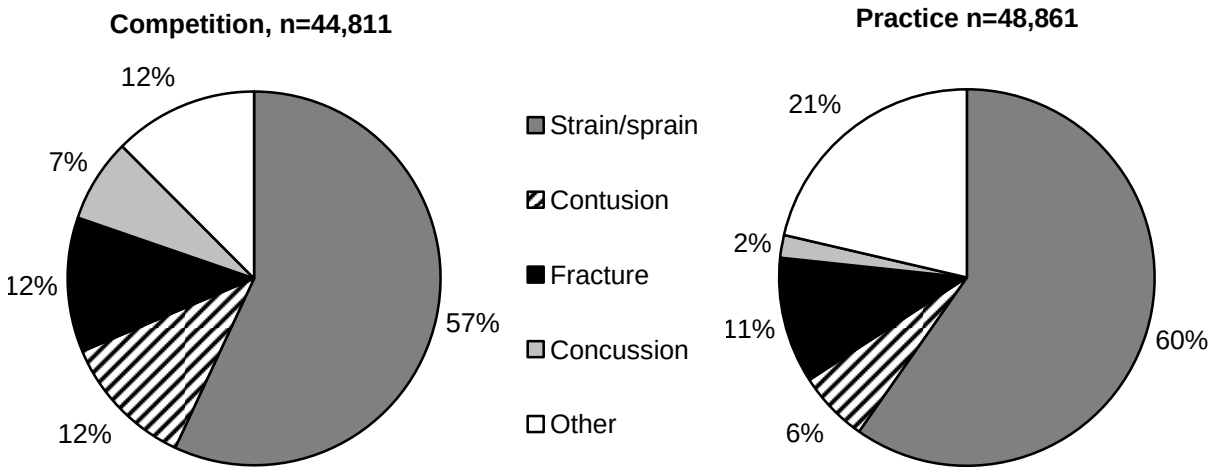


Table 7.3 Body Site of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Ankle	18,158	39.4	17,288	34.2	35,446	36.7
Knee	5,887	12.8	5,380	10.6	11,267	11.7
Head/face	8,349	18.1	4,807	9.5	13,156	13.6
Hip/thigh/upper leg	3,625	7.9	3,635	7.2	7,260	7.5
Shoulder	645	1.4	780	1.5	1,425	1.5
Hand/wrist	2,717	5.9	4,691	9.3	7,408	7.7
Trunk	2,684	5.8	5,668	11.2	8,352	8.6
Lower leg	1,243	2.7	1,863	3.7	3,106	3.2
Foot	806	1.8	3,101	6.1	3,907	4.0
Arm/elbow	569	1.2	460	0.9	1,029	1.1
Neck	512	1.1	214	0.4	726	0.8
Other	915	2.0	2,673	5.3	3,588	3.7
Total	**46,109**	**100**	**50,561**	**100**	**96,670**	**100**

Table 7.4 Ten Most Common Boys' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=46,109		Practice n=50,318		Total n=96,427	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	17,784	38.6	16,905	33.6	34,689	36.0
Hip/thigh/upper leg strain/sprain	2,164	4.7	3,257	6.5	5,421	5.6
Knee strain/sprain	3,186	6.9	1,859	3.7	5,045	5.2
Head/face other	2,598	5.6	2,266	4.5	4,864	5.0
Knee other	2,243	4.9	2,523	5.0	4,766	4.9
Head/face concussion	3,403	7.4	1,049	2.1	4,452	4.6
Hand/wrist fracture	1,372	3.0	1,886	3.8	3,258	3.4
Trunk strain/sprain	865	1.9	2,378	4.7	3,242	3.4
Head/face fracture	1,861	4.0	1,248	2.5	3,110	3.2
Trunk contusion	1,819	4.0	895	1.8	2,714	2.8

Figure 7.2 Time Loss of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

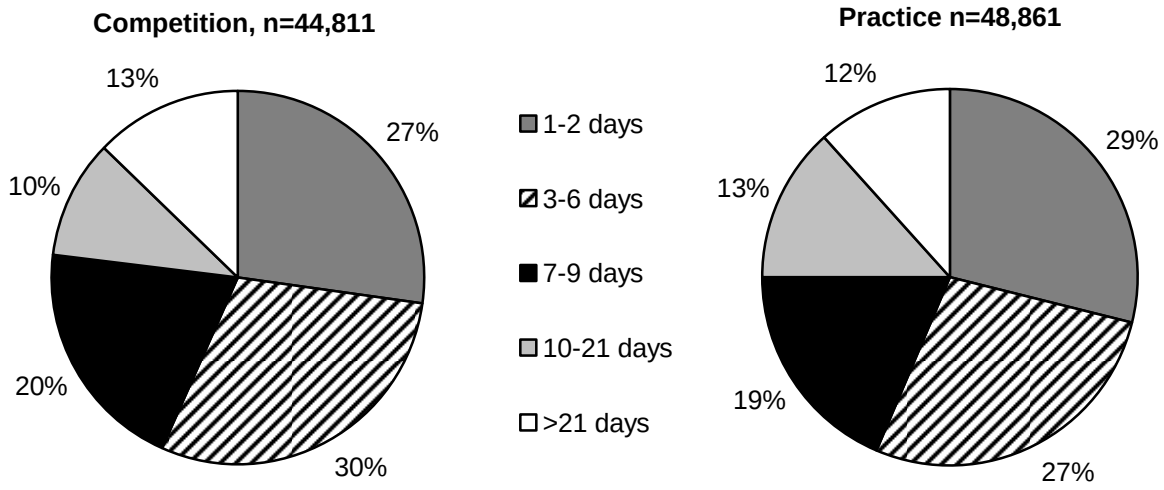


Table 7.5 Boys' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,995	6.6	3,001	6.0	5,996	6.3
Did not require surgery	42,278	93.4	46,834	94.0	89,112	93.7
Total	**45,273**	**100**	**49,835**	**100**	**95,108**	**100**

Figure 7.3 History of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

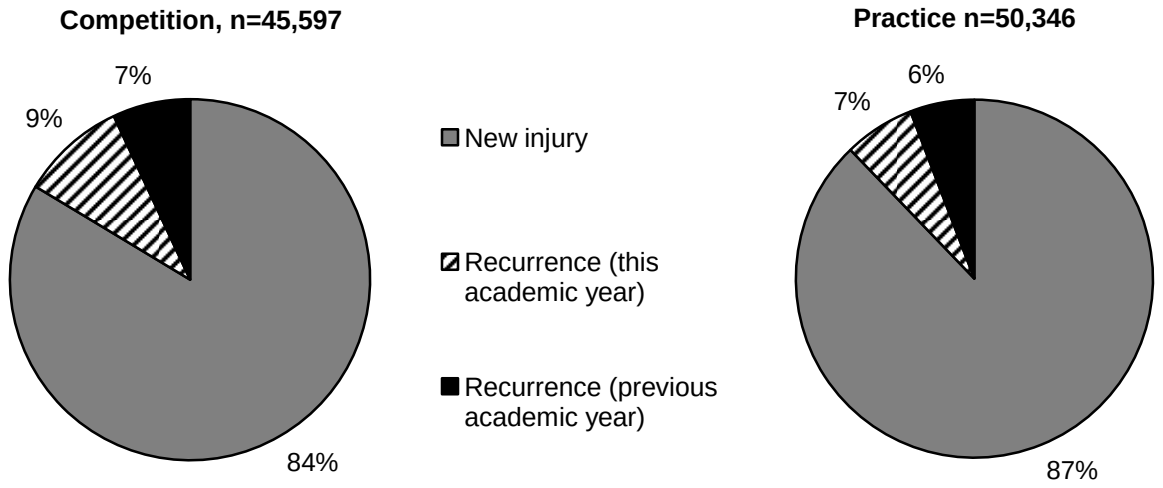


Table 7.6 Time during Season of Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	19,944	20.8
Regular season	71,685	75.0
Post season	4,014	4.2
Total	**95,643**	**100**

Table 7.7 Competition-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	1,025	2.3
Beginning	6,999	15.6
Middle	23,932	53.5
End	12,774	28.6
Total	**44,731**	**100**
Competition Location		
Home	24,039	52.4
Away	19,640	42.8
Neutral site	2,187	4.8
Total	**45,865**	**100**
Injury Related to Foul Play		
Yes	4,590	10.6
No	38,607	89.4
Total	**43,197**	**100**
Court Location		
Inside lane (offense)	12,751	29.9
Inside lane (defense)	15,931	37.4
Between 3 pt arc and lane (offense)	2,541	6.0
Between 3 pt arc and lane (defense)	4,375	10.3
Outside 3 point arc (offense)	3,819	9.0
Outside 3 point arc (defense)	2,376	5.6
Out of bounds	593	1.4
Off the court	214	0.5
Total	**42,600**	**100**

Table 7.8 Practice-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	9,861	19.7
Second 1/2 hour	16,267	32.5
Third 1/2 hour	15,009	30.0
Fourth 1/2 hour	8,022	16.0
>2 hours into practice	858	1.7
Total	**50,018**	**100**
Number of Practices		
Single session	49,533	98.5
Double session	756	1.5
Total	**50,289**	**100**
Practice Type		
Noncontact skills practice	8,878	17.6
Noncontact partial numbers scrimmage	1,891	3.8
Noncontact full scrimmage	2,832	5.6
Partial contact skills practice	4,538	9.0
Partial contact partial numbers scrimmage	2,592	5.2
Partial contact full scrimmage	2,456	4.9
Full contact skills practice	7,818	15.6
Full contact partial numbers scrimmage	5,020	10.0
Full contact full scrimmage	13,027	25.9
Other	1,238	2.5
Total	**50,289**	**100**

Figure 7.4 Player Position of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

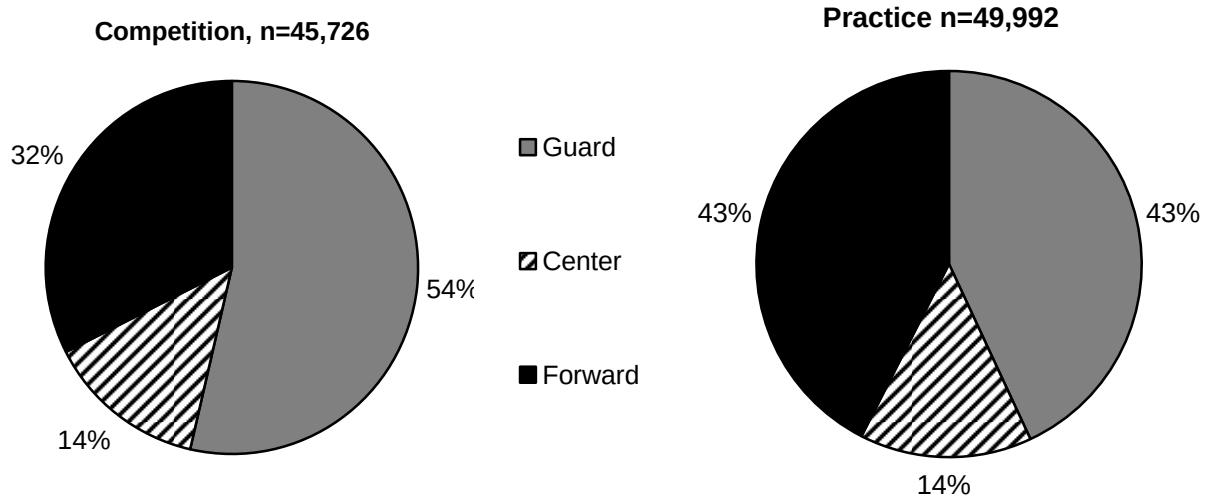
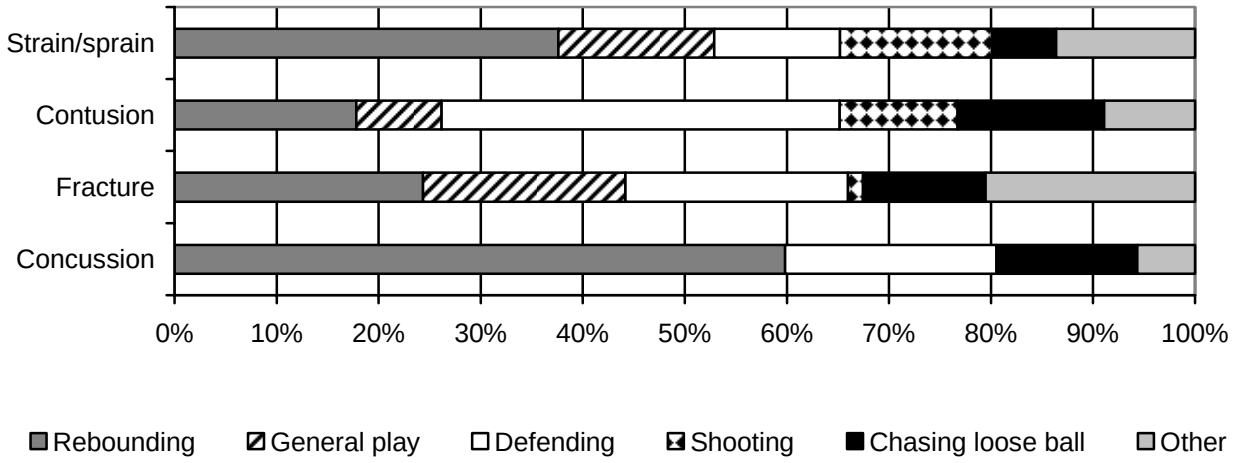


Figure 7.5 Activity Resulting in Boys' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



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VIII. Girls' Basketball Injury Epidemiology

Table 8.1 Girls' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**358**	**171,251**	**2.09**	**102,831**
Competition	185	51,358	3.60	53,703
Practice	173	119,893	1.44	49,128

Table 8.2 Demographic Characteristics of Injured Girls' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	33,102 (32.8%)
Sophomore	25,049 (24.8%)
Junior	19,865 (19.7%)
Senior	22,949 (22.7%)
Total†	**100,965 (100%)**
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	15.6 (1.1)
BMI	
Minimum	15.8
Maximum	49.9
Mean (St. Dev.)	22.1 (3.5)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 8.1 Diagnosis of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

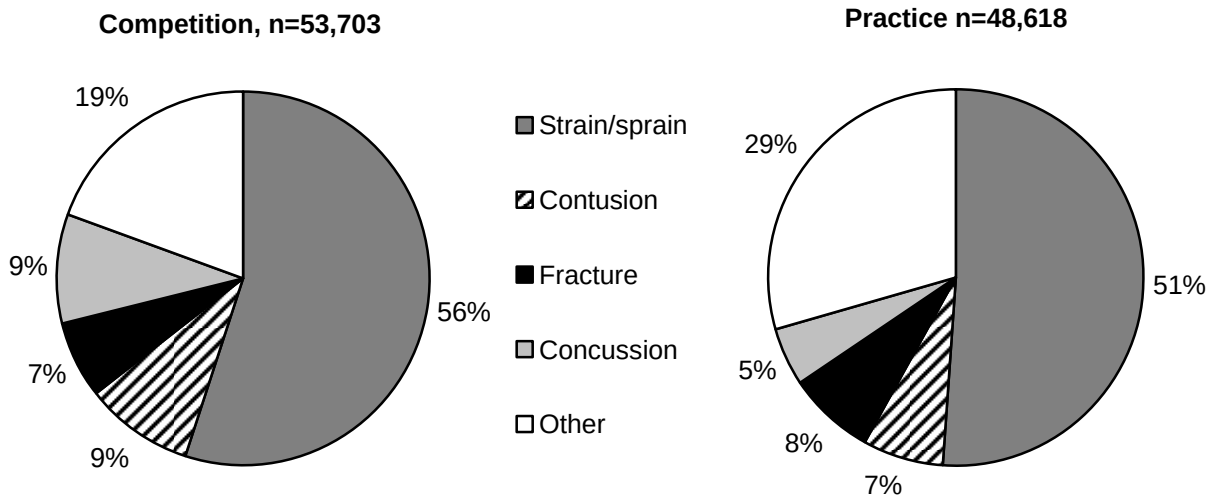


Table 8.3 Body Site of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Ankle	17,343	32.3	11,616	23.9	28,959	28.3
Knee	9,985	18.6	10,930	22.5	20,915	20.4
Head/face	9,759	18.2	3,405	7.0	13,164	12.9
Hip/thigh/upper leg	3,187	5.9	5,574	11.5	8,761	8.6
Shoulder	2,632	4.9	1,751	3.6	4,383	4.3
Hand/wrist	3,984	7.4	5,096	10.5	9,080	8.9
Trunk	2,029	3.8	2,703	5.6	4,732	4.6
Lower leg	1,157	2.2	3,521	7.2	4,678	4.6
Foot	725	1.4	1,325	2.7	2,050	2.0
Arm/elbow	1,787	3.3	266	0.6	2,053	2.0
Neck	376	0.7	652	1.3	1,028	1.0
Other	739	1.4	1,779	3.7	2,518	2.5
Total	**53,703**	**100**	**48,618**	**100**	**102,321**	**100**

Table 8.4 Ten Most Common Girls' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=53,703		Practice n=48,618		Total n=102,321	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	16,387	30.5	11,122	22.9	27,509	26.9
Knee strain/sprain	6,826	12.7	3,433	7.1	10,260	10.0
Knee other	1,427	2.7	6,470	13.3	7,897	7.7
Head/face concussion	5,084	9.5	2,468	5.1	7,552	7.4
Hip/thigh/upper leg strain/sprain	1,429	2.7	4,847	10.0	6,275	6.1
Hand/wrist fracture	1,536	2.9	2,971	6.1	4,507	4.4
Head/face other	3,800	7.1	418	0.9	4,218	4.1
Hand/wrist strain/sprain	2,195	4.1	1,322	2.7	3,517	3.4
Shoulder other	1,451	2.7	1,599	3.3	3,050	3.0
Trunk other	1,469	2.7	1,431	2.9	2,900	2.8

Figure 8.2 Time Loss of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

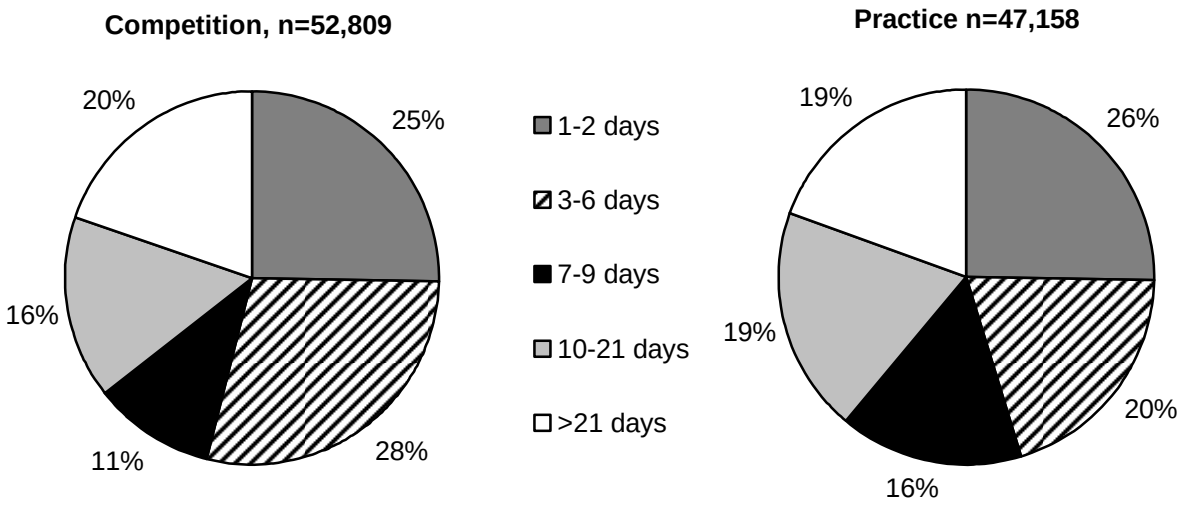


Table 8.5 Girls' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	6,370	11.9	6,029	12.6	12,399	12.2
Did not require surgery	47,181	88.1	41,989	87.4	89,170	87.8
Total	**53,551**	**100**	**48,018**	**100**	**101,569**	**100**

Figure 8.3 History of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

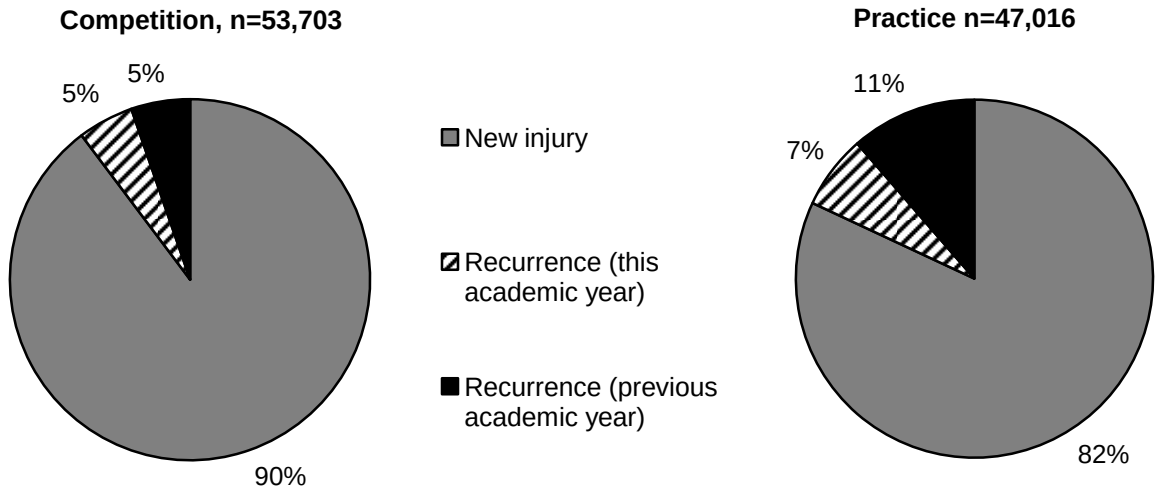


Table 8.6 Time during Season of Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	21,876	21.3
Regular season	78,930	76.8
Post season	2,025	2.0
Total	**102,832**	**100**

Table 8.7 Competition-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	376	0.7
Beginning	6,281	11.8
Middle	31,176	58.4
End	15,531	29.1
Total	**53,365**	**100**
Competition Location		
Home	27,199	50.6
Away	24,672	45.9
Neutral site	1,833	3.4
Total	**53,703**	**100**
Injury Related to Foul Play		
Yes	8,031	15.2
No	44,869	84.8
Total	**52,900**	**100**
Court Location		
Inside lane (offense)	8,500	16.6
Inside lane (defense)	12,066	23.6
Between 3 pt arc and lane (offense)	8,590	16.8
Between 3 pt arc and lane (defense)	5,015	9.8
Outside 3 point arc (offense)	7,665	15.0
Outside 3 point arc (defense)	5,859	11.5
Out of bounds	1,419	2.8
Off the court	1,956	3.8
Total	**51,069**	**100**

Table 8.8 Practice-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	10,738	22.8
Second 1/2 hour	10,832	23.0
Third 1/2 hour	13,584	28.8
Fourth 1/2 hour	11,008	23.4
>2 hours into practice	916	2.0
Total	**47,078**	**100**
Number of Practices		
Single session	48,907	100
Total	**48,907**	**100**
Practice Type		
Noncontact skills practice	15,470	31.6
Noncontact partial numbers scrimmage	112	0.2
Noncontact full scrimmage	1,057	2.2
Partial contact skills practice	3,910	8.0
Partial contact partial numbers scrimmage	1,761	3.6
Partial contact full scrimmage	3,452	7.1
Full contact skills practice	9,644	19.7
Full contact partial numbers scrimmage	1,816	3.7
Full contact full scrimmage	9,085	18.6
Other	2,599	5.3
Total	**48,907**	**100**

Figure 8.4 Player Position of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

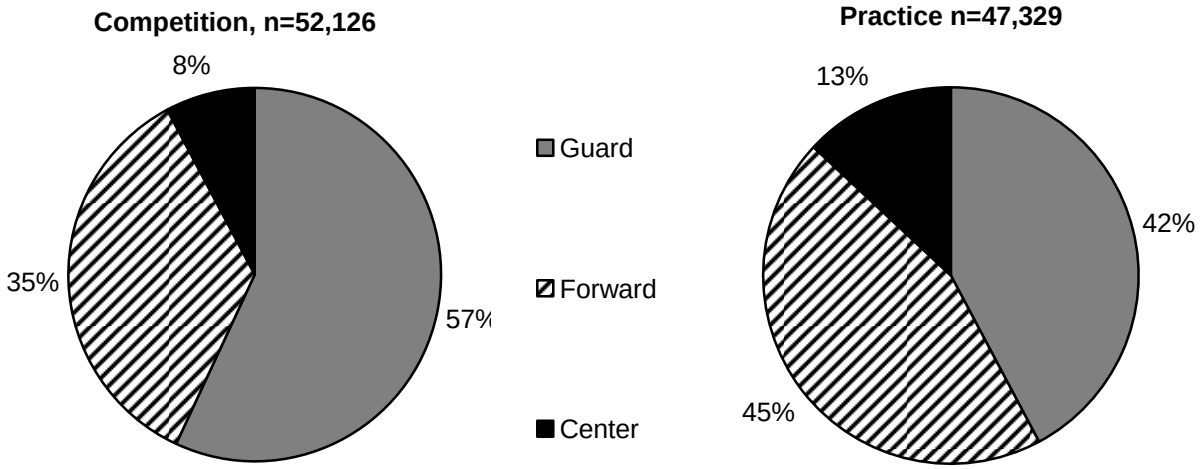
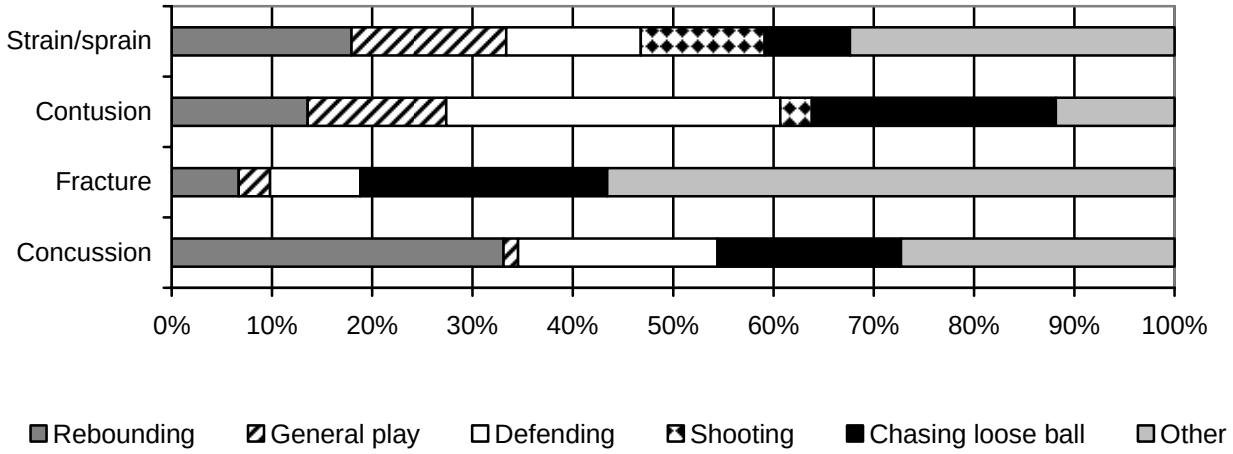


Figure 8.5 Activity Resulting in Girls' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



IX. Wrestling Injury Epidemiology

Table 9.1 Wrestling Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**392**	**156,094**	**2.51**	**101,139**
Competition	155	40,841	3.80	38,750
Practice	237	115,253	2.06	62,389

Table 9.2 Demographic Characteristics of Injured Wrestlers, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	29,192 (29.5%)
Sophomore	28,725 (29.0%)
Junior	20,094 (20.3%)
Senior	20,854 (21.1%)
Total†	**98,866 (100%)**
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.8 (1.2)
BMI	
Minimum	16.0
Maximum	42.7
Mean (St. Dev.)	23.7 (4.5)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 9.1 Diagnosis of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

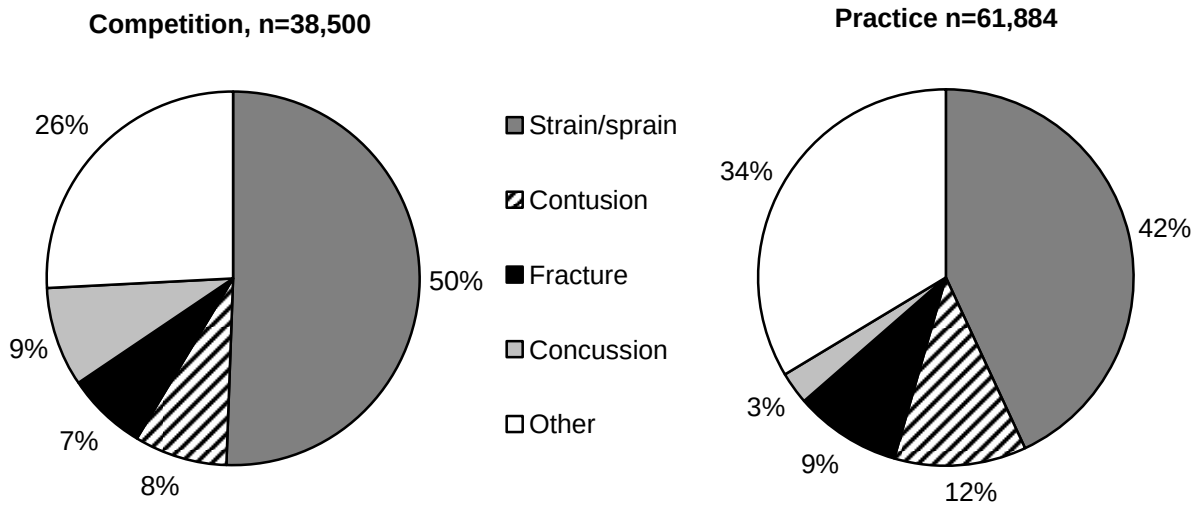


Table 9.3 Body Site of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	1,177	3.1	4,990	8.1	6,167	6.2
Knee	5,810	15.1	8,542	13.9	14,352	14.3
Head/face	5,573	14.5	5,156	8.4	10,729	10.7
Hip/thigh/upper leg	921	2.4	1,979	3.2	2,900	2.9
Shoulder	9,037	23.5	7,915	12.8	16,952	16.9
Hand/wrist	3,391	8.8	5,229	8.5	8,620	8.6
Trunk	3,615	9.4	5,622	9.1	9,237	9.2
Lower leg	863	2.2	1,850	3.0	2,713	2.7
Foot	351	0.9	2,375	3.9	2,726	2.7
Arm/elbow	4,353	11.3	8,828	14.3	13,181	13.2
Neck	1,336	3.5	4,588	7.4	5,924	5.9
Other	2,075	5.4	4,596	7.5	6,671	6.7
Total	**38,500**	**100**	**61,669**	**100**	**100,169**	**100**

Table 9.4 Ten Most Common Wrestling Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=38,500		Practice n=61,669		Total n=100,169	
	n	%	n	%	n	%
Diagnosis						
Shoulder strain/sprain	6,078	15.8	3,508	5.7	9,585	9.6
Arm/elbow other	1,023	2.7	5,078	8.2	6,102	6.1
Arm/elbow strain/sprain	3,222	8.4	2,723	4.4	5,946	5.9
Shoulder other	2,502	6.5	3,439	5.6	5,941	5.9
Ankle strain/sprain	1,177	3.1	4,740	7.7	5,916	5.9
Knee strain/sprain	2,923	7.6	2,852	4.6	5,775	5.8
Head/face concussion	3,210	8.3	1,758	2.9	4,969	5.0
Knee other	1,481	3.9	3,054	5.0	4,535	4.5
Trunk strain/sprain	2,218	5.8	2,299	3.7	4,517	4.5
Head/face other	1,293	3.4	3,127	5.1	4,420	4.4

Figure 9.2 Time Loss of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

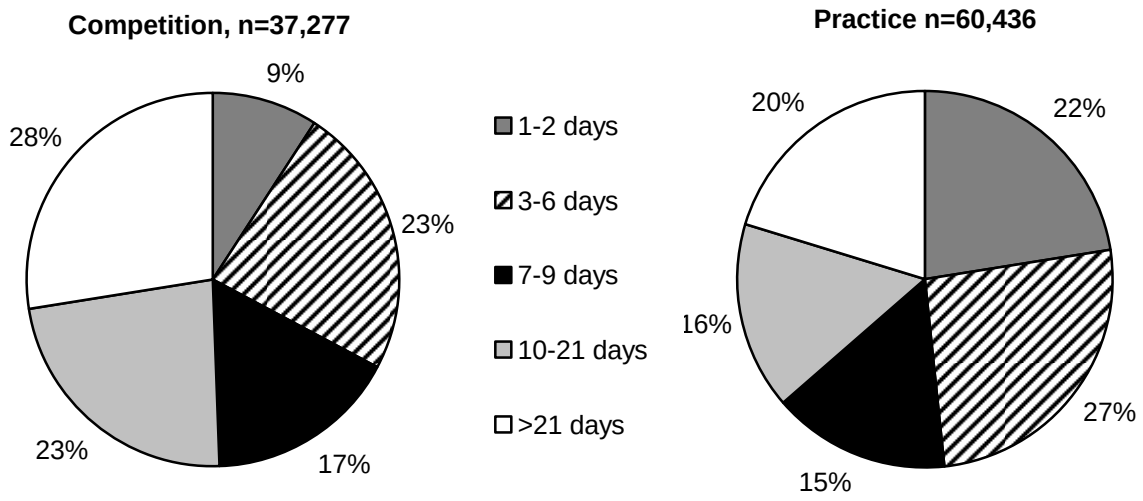


Table 9.5 Wrestling Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,353	9.1	2,728	4.6	6,081	6.3
Did not require surgery	33,499	90.9	56,864	95.4	90,363	93.7
Total	**36,852**	**100**	**59,593**	**100**	**96,445**	**100**

Figure 9.3 History of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

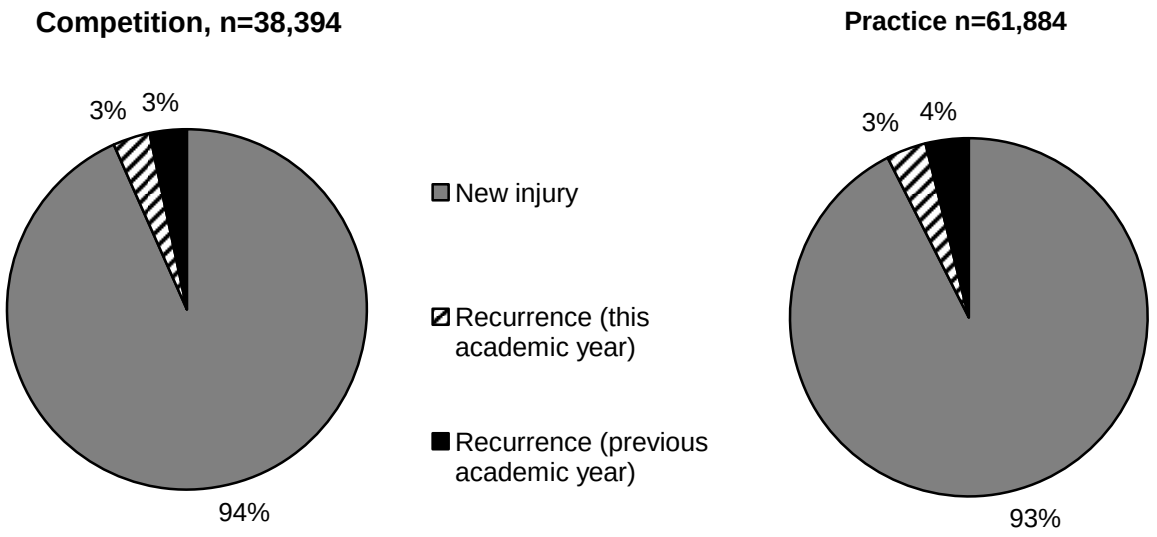


Table 9.6 Time during Season of Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	18,548	18.4
Regular season	77,840	77.0
Post season	4,644	4.6
Total	**101,032**	**100**

Table 9.7 Competition-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

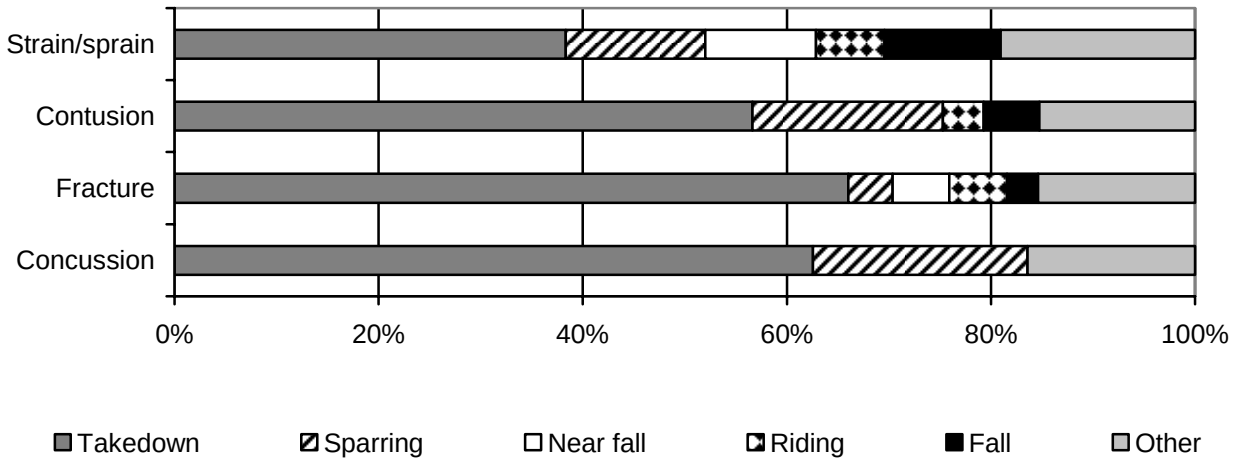
	n	%
Time in Competition		
Warm-ups	515	1.4
Beginning	5,672	15.2
Middle	18,411	49.4
End	12,706	34.1
Total	**37,304**	**100**
Competition Location		
Home	10,257	27.0
Away	25,129	66.0
Neutral site	2,663	7.0
Total	**38,049**	**100**
Injury Related to Foul Play		
Yes	1,336	3.6
No	35,880	96.4
Total	**37,216**	**100**
Mat Location*		
Within circle	90,044	91.6
Out of bounds	3,343	3.4
Off mat	4,920	5.0
Total	**98,307**	**100**

*ATCs were asked to provide the mat location for both competition- and practice-related wrestling injuries.

Table 9.8 Practice-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	8,512	14.4
Second 1/2 hour	16,855	28.6
Third 1/2 hour	19,852	33.6
Fourth 1/2 hour	12,929	21.9
>2 hours into practice	879	1.5
Total	**59,027**	**100**
Number of Practices		
Single session	61,018	99.7
Double session	165	0.3
Total	**61,182**	**100**
Practice Type		
Noncontact skills practice	1,083	1.8
Noncontact partial numbers scrimmage	5,215	8.4
Noncontact full scrimmage	165	0.3
Partial contact skills practice	464	0.8
Partial contact partial numbers scrimmage	37,286	60.2
Partial contact full scrimmage	715	1.2
Full contact skills practice	14,203	23.0
Full contact partial numbers scrimmage	2,753	4.4
Full contact full scrimmage	1,083	1.8
Other	5,215	8.4
Total	**61,884**	**100**

Figure 9.5 Activity Resulting in Wrestling Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



X. Baseball Injury Epidemiology

Table 10.1 Baseball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**203**	**162,931**	**1.25**	**60,296**
Competition	117	58,141	2.01	33,494
Practice	86	104,790	0.82	26,802

Table 10.2 Demographic Characteristics of Injured Baseball Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	10,330 (17.2%)
Sophomore	15,914 (26.6%)
Junior	15,652 (26.1%)
Senior	17,999 (30.0%)
Total†	**59,894 (100%)**
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	16.3 (1.2)
BMI	
Minimum	17.4
Maximum	34.9
Mean (St. Dev.)	24.0 (3.2)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 10.1 Diagnosis of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

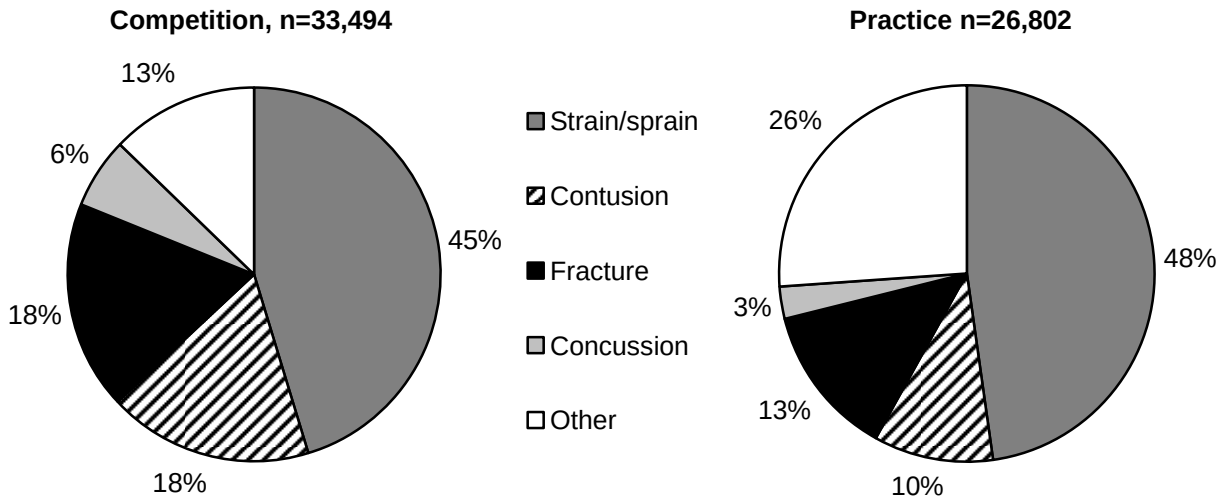


Table 10.3 Body Site of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Ankle	5,871	17.5	4,563	17.0	10,434	17.3
Knee	3,539	10.6	1,969	7.4	5,508	9.1
Head/face	6,245	18.7	4,441	16.6	10,686	17.7
Hip/thigh/upper leg	2,094	6.3	3,210	12.0	5,304	8.8
Shoulder	4,069	12.2	5,001	18.7	9,070	15.0
Hand/wrist	3,883	11.6	2,935	11.0	6,818	11.3
Trunk	2,141	6.4	907	3.4	3,048	5.1
Lower leg	269	0.8	253	0.9	522	0.9
Foot	951	2.8	280	1.1	1,231	2.0
Arm/elbow	2,260	6.8	3,243	12.1	5,503	9.1
Neck	521	1.6	0	0	521	0.9
Other	1,652	4.9	0	0	1,652	2.7
Total	**33,494**	**100**	**26,802**	**100**	**60,296**	**100**

Table 10.4 Ten Most Common Baseball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=33,493		Practice n=26,802		Total n=87,098	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	4,938	14.7	3,641	13.6	8,578	14.2
Hip/thigh/upper leg strain/sprain	2,094	6.3	3,099	11.6	5,193	8.6
Shoulder strain/sprain	2,181	6.5	2,340	8.7	4,521	7.5
Shoulder other	1,755	5.2	2,661	9.9	4,416	7.3
Arm/elbow strain/sprain	1,868	5.6	1,879	7.0	3,747	6.2
Hand/wrist fracture	1,892	5.7	1,419	5.3	3,312	5.5
Head/face other	1,159	3.5	1,871	7.0	3,030	5.0
Head/face concussion	1,982	5.9	765	2.9	2,747	4.6
Knee strain/sprain	1,672	5.0	960	3.6	2,632	4.4
Head/face contusion	1,185	3.5	1,419	5.3	2,604	4.3

Figure 10.2 Time Loss of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

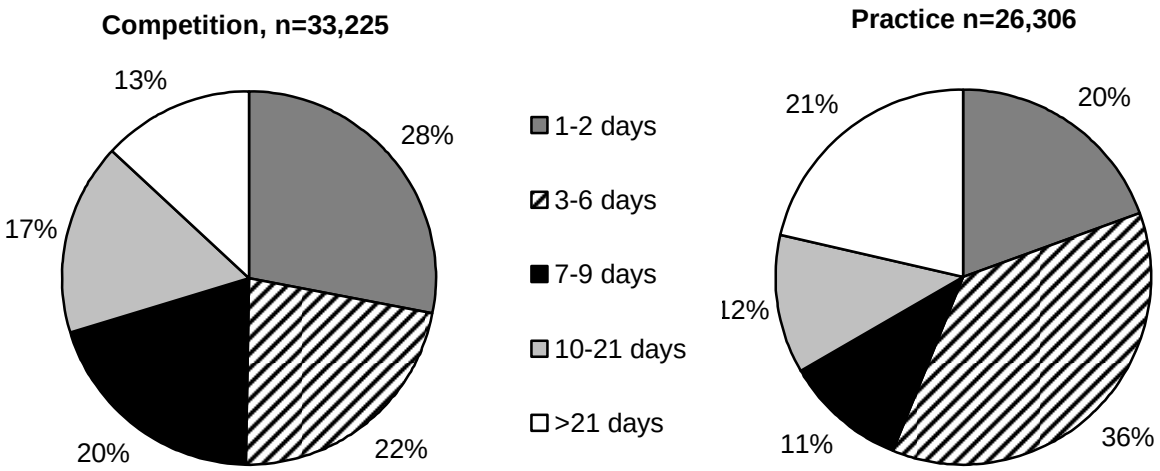


Table 10.5 Baseball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,491	7.6	1,963	7.4	4,454	7.5
Did not require surgery	30,062	92.4	24,481	92.6	54,543	92.5
Total	**32,553**	**100**	**26,444**	**100**	**58,997**	**100**

Figure 10.3 History of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

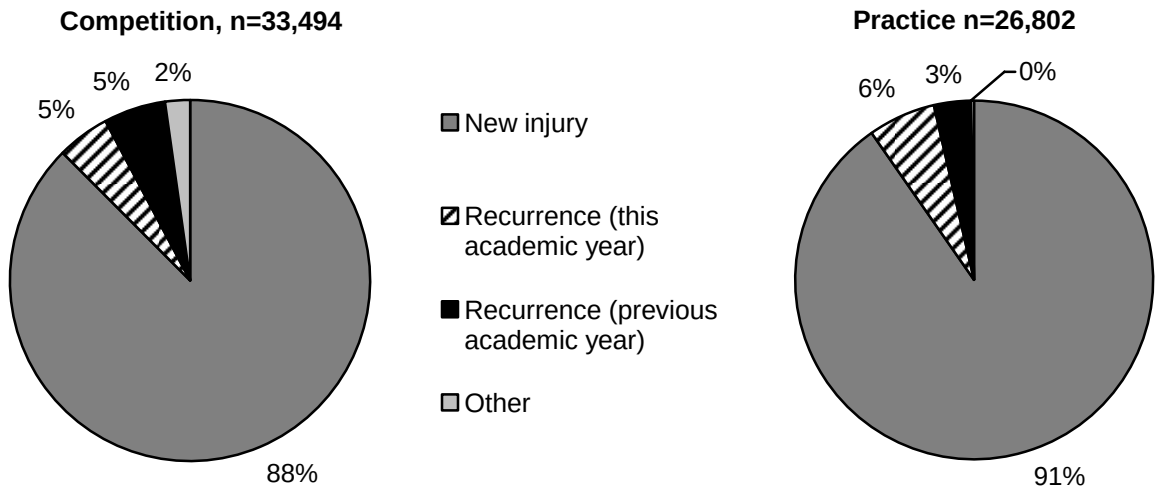


Table 10.6 Time during Season of Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	13,889	23.0
Regular season	44,883	74.4
Post season	1,523	2.5
Total	**60,296**	**100**

Table 10.7 Competition-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	1,660	5.0
Beginning	6,849	20.7
Middle	19,137	57.8
End	5,461	16.5
Total	**33,106**	**100**
Competition Location		
Home	21,169	62.7
Away	10,988	32.5
Neutral site	1,617	4.8
Total	**33,774**	**100**
Injury Related to Foul Play		
Yes	1,429	4.4
No	31,303	95.6
Total	**32,732**	**100**
Field Location		
Home plate	6,681	20.1
First base	3,096	9.3
Second base	6,779	20.4
Third base	4,028	12.1
Infield	664	2.0
Pitchers mound	3,643	11.0
Outfield	6,661	20.1
Foul territory	1,150	3.5
Other	485	1.5
Total	**33,187**	**100**

Table 10.8 Practice-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	7,371	28.4
Second 1/2 hour	7,272	28.1
Third 1/2 hour	7,788	30.0
Fourth 1/2 hour	2,714	10.5
>2 hours into practice	770	3.0
Total	**25,915**	**100**
Number of Practices		
Single session	26,691	100
Total	**26,691**	**100**
Practice Type		
Noncontact skills practice	18,146	67.7
Noncontact partial numbers scrimmage	252	0.9
Noncontact full scrimmage	385	1.4
Partial contact skills practice	1,508	5.6
Partial contact partial numbers scrimmage	3,856	14.4
Partial contact full scrimmage	729	2.7
Full contact skills practice	870	3.2
Full contact partial numbers scrimmage	1,055	3.9
Full contact full scrimmage	18,146	67.7
Other	252	0.9
Total	**26,802**	**100**

Figure 10.4 Player Position of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

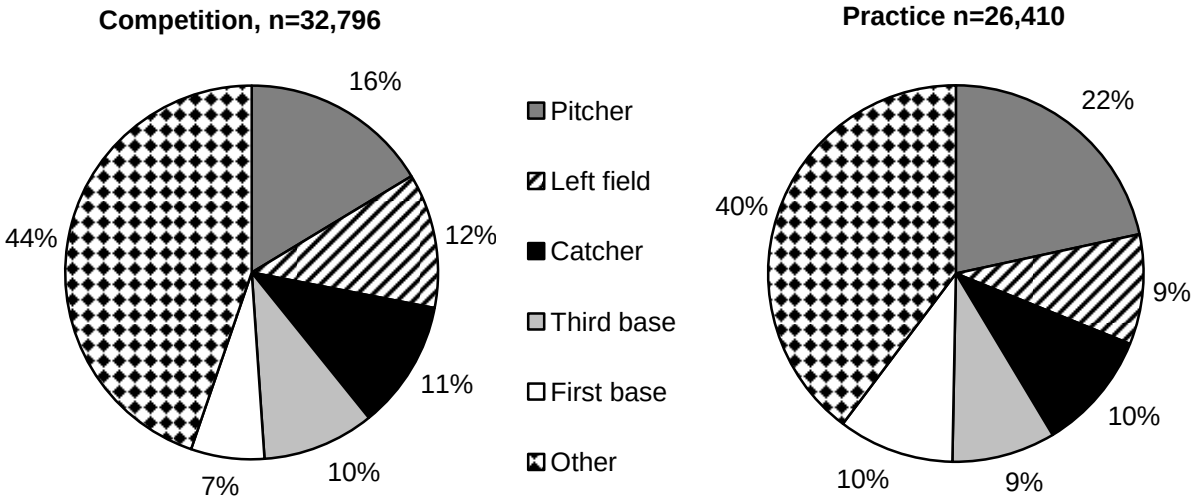
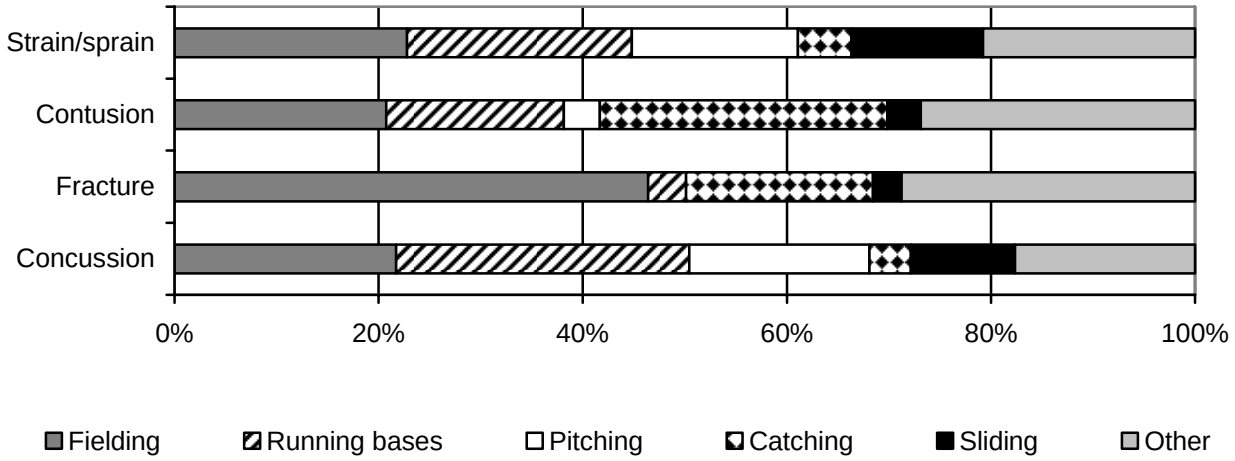


Figure 10.5 Activity Resulting in Baseball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



XI. Softball Injury Epidemiology

Table 11.1 Softball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**133**	**119,554**	**1.11**	**54,411**
Competition	83	42,329	1.96	32,191
Practice	50	77,225	0.65	22,220

Table 11.2 Demographic Characteristics of Injured Softball Athletes, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year*

Year in School	
Freshman	13,144 (25.1%)
Sophomore	13,252 (25.3%)
Junior	15,140 (28.9%)
Senior	10,828 (20.7%)
Total†	**52,363 (100%)**
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.8 (1.3)
BMI	
Minimum	15.3
Maximum	44.4
Mean (St. Dev.)	22.7 (4.6)

*All remaining analyses in this chapter present data weighted to provide national injury estimates
†Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Figure 11.1 Diagnosis of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

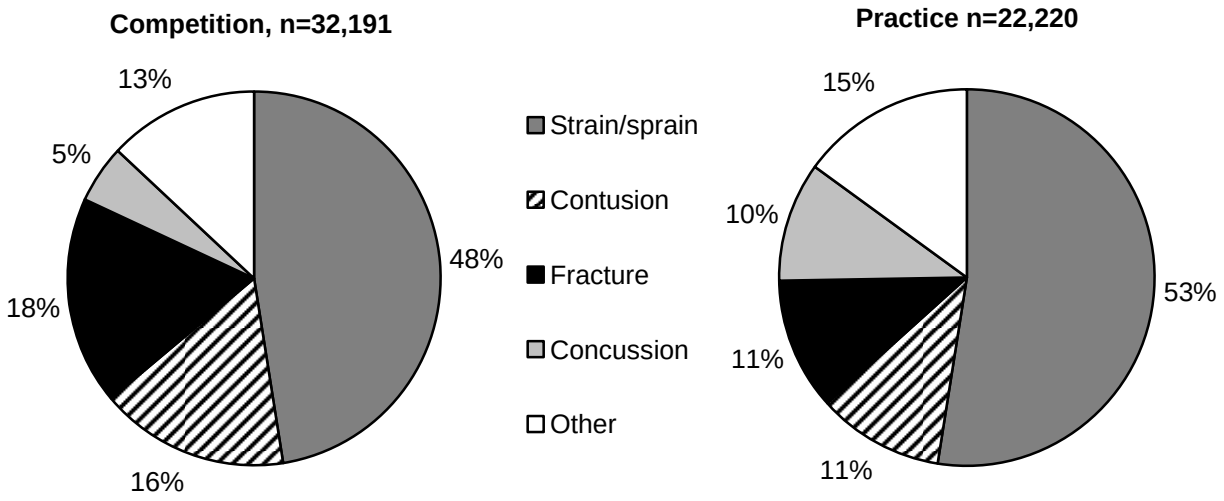


Table 11.3 Body Site of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	4,446	13.8	6,189	27.9	10,635	19.5
Knee	5,687	17.7	1,452	6.5	7,139	13.1
Head/face	6,208	19.3	4,455	20.1	10,663	19.6
Hip/thigh/upper leg	3,183	9.9	2,472	11.1	5,655	10.4
Shoulder	2,981	9.3	2,248	10.1	5,229	9.6
Hand/wrist	4,771	14.8	1,773	8.0	6,544	12.0
Trunk	2,629	8.2	0	0	2,629	4.8
Lower leg	801	2.5	0	0	801	1.5
Foot	212	0.7	716	3.2	928	1.7
Arm/elbow	0	0	1,648	7.4	1,648	3.0
Neck	0	0	0	0	0	0
Other	1,272	4.0	1,267	5.7	2,539	4.7
Total	**32,191**	**100**	**22,220**	**100**	**54,411**	**100**

Table 11.4 Ten Most Common Softball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition n=32,191		Practice n=22,220		Total n=54,411	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	3,730	11.6	5,886	26.5	9,616	17.7
Hip/thigh/upper leg strain/sprain	2,925	9.1	2,472	11.1	5,397	9.9
Head/face concussion	1,667	5.2	2,290	10.3	3,957	7.3
Hand/wrist fracture	3,154	9.8	670	3.0	3,824	7.0
Knee strain/sprain	3,204	10.0	0	0	3,204	5.9
Head/face contusion	1,290	4.0	1,862	8.4	3,152	5.8
Shoulder strain/sprain	1,747	5.4	1,055	4.8	2,803	5.2
Shoulder other	1,233	3.8	1,193	5.4	2,426	4.5
Head/face fracture	2,110	6.6	303	1.4	2,414	4.4
Trunk strain/sprain	2,337	7.3	0	0	2,337	4.3

Figure 11.2 Time Loss of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

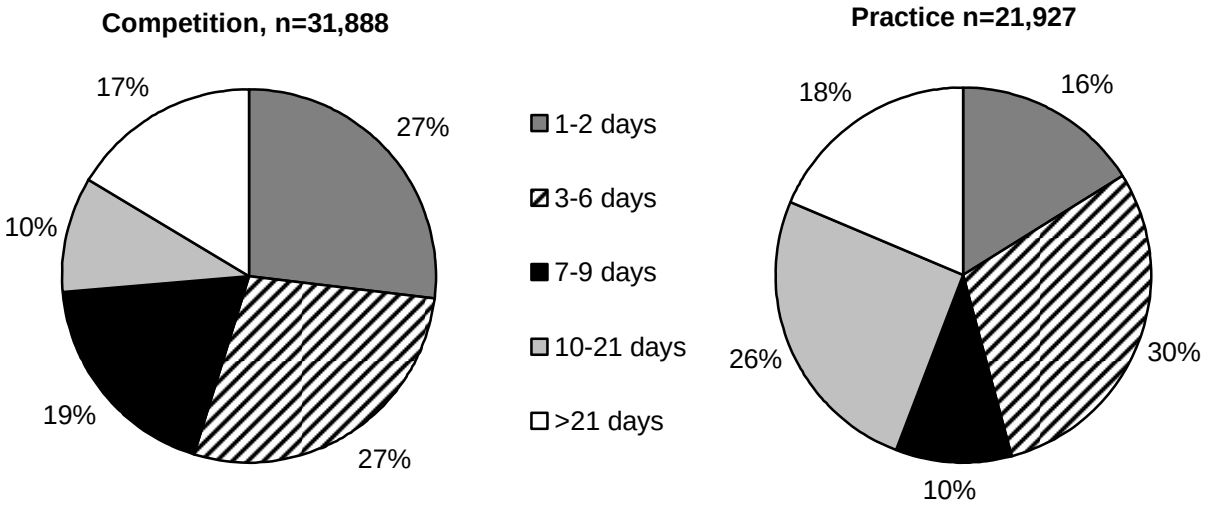


Table 11.5 Softball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,408	7.6	0	0	2,408	4.5
Did not require surgery	29,177	92.4	21,917	100	51,094	95.5
Total	**31,585**	**100**	**21,917**	**100**	**53,502**	**100**

Figure 11.3 History of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

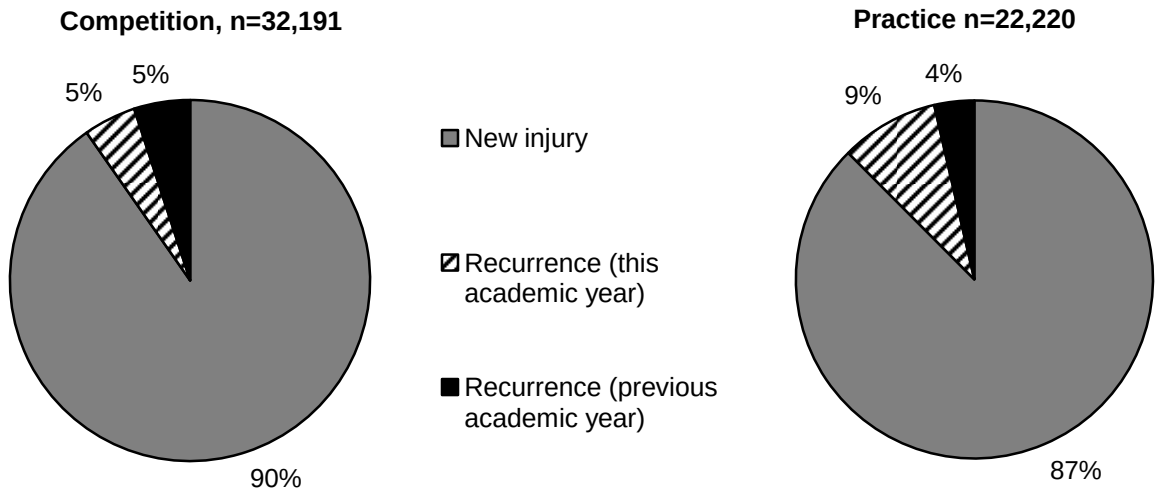


Table 11.6 Time during Season of Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Season		
Preseason	8,805	16.2
Regular season	42,076	77.3
Post season	3,530	6.5
Total	**54,411**	**100**

Table 11.7 Competition-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Competition		
Warm-ups	2,034	6.3
Beginning	5,870	18.2
Middle	19,687	61.2
End	4,601	14.3
Total	**32,191**	**100**
Competition Location		
Home	13,944	43.3
Away	16,850	52.3
Neutral site	1,398	4.3
Total	**32,191**	**100**
Injury Related to Foul Play		
Yes	0	0
No	32,083	100
Total	**32,083**	**100**
Field Location		
Home plate	7,087	22.5
First base	2,088	6.6
Second base	6,128	19.4
Third base	3,550	11.2
Infield	2,429	7.7
Pitchers mound	5,539	17.5
Outfield	3,807	12.1
Foul territory	216	0.7
Other	716	2.3
Total	**31,561**	**100**

Table 11.8 Practice-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	n	%
Time in Practice		
First 1/2 hour	5,498	26.1
Second 1/2 hour	3,946	18.7
Third 1/2 hour	5,402	25.6
Fourth 1/2 hour	5,528	26.2
>2 hours into practice	716	3.4
Total	**21,090**	**100**
Number of Practices		
Single session	20,567	97.0
Double session	0	0
Triple session	631	3.0
Total	**21,198**	**100**
Practice Type		
Noncontact skills practice	12,238	55.1
Noncontact partial numbers scrimmage	716	3.2
Noncontact full scrimmage	0	0
Partial contact skills practice	1,234	5.6
Partial contact partial numbers scrimmage	0	0
Partial contact full scrimmage	0	0
Full contact skills practice	3,912	17.6
Full contact partial numbers scrimmage	0	0
Full contact full scrimmage	607	2.7
Other	3,513	15.8
Total	**22,220**	**100**

Figure 11.4 Player Position of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

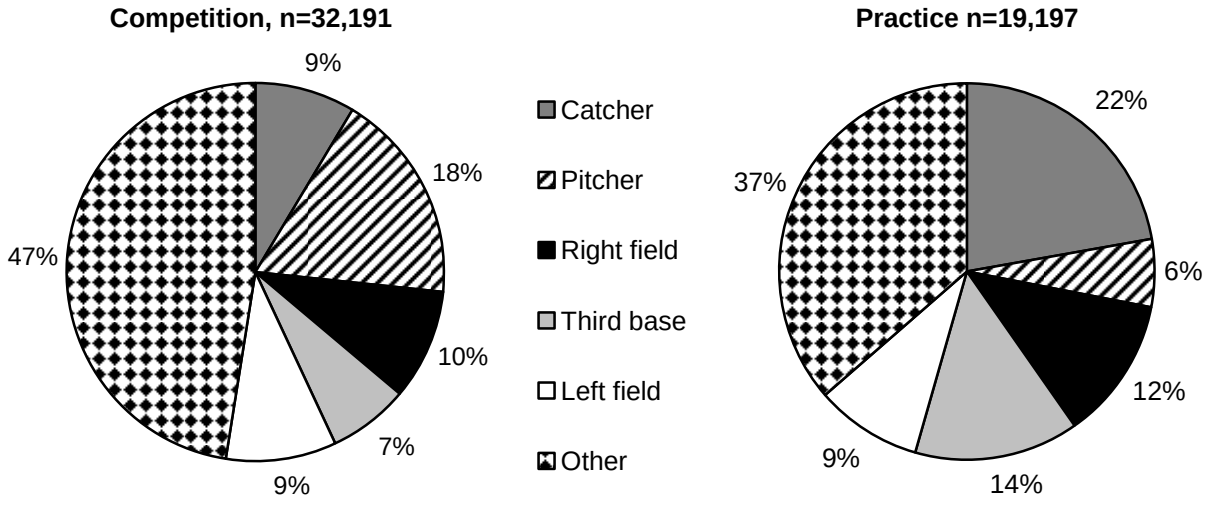
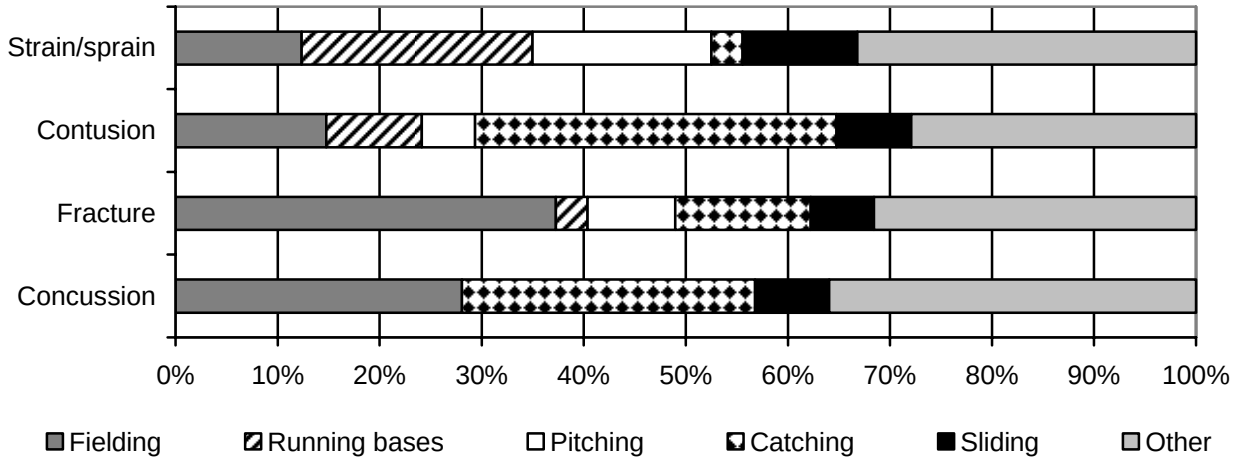


Figure 11.5 Activity Resulting in Softball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year



XII. Gender Differences within Sports

12.1 Boys' and Girls' Soccer

Table 12.1 Comparison of Boys' and Girls' Soccer Injury Rates, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' soccer	Girls' soccer	RR (95% CI)*
Total			
# Injuries	407	410	
# Exposures	179,519	163,378	
Injury rate (per 1,000 AE)	2.27	**2.51**	1.11 (0.97-1.27)
Competition			
# Injuries	222	259	
# Exposures	51,564	47,676	
Injury rate (per 1,000 AE)	4.31	**5.43**	**1.26 (1.06-1.51)**†
Practice			
# Injuries	185	151	
# Exposures	127,955	115,702	
Injury rate (per 1,000 AE)	**1.45**	1.31	1.11 (0.89-1.37)

*Throughout this chapter, rate ratios (RR) compare the gender with a higher injury rate (bolded) to the gender with a lower injury rate
†Throughout this chapter, statistically significant RR are bolded

Table 12.2 Comparison of Body Sites of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' soccer		Girls' soccer		IPR (95% CI)
	n	%	n	%	
Body Site					
Ankle	**34,632**	**20.2**	45,019	19.5	1.04 (0.74-144)
Knee	28,128	16.4	**60,054**	**26.0**	**1.59 (1.13-2.24)** †
Head/face	**23,942**	**14.0**	28,941	12.5	1.12 (0.72-1.71)
Hip/thigh/upper leg	**27,682**	**16.1**	32,211	14.0	1.15 (0.78-1.71)
Shoulder	**5,121**	**3.0**	4,124	1.8	1.67 (0.46-6.07)
Hand/wrist	**8,916**	**5.2**	6,093	2.6	2.00 (0.88-4.38)
Trunk	6,213	3.6	**9,325**	**4.0**	1.11 (0.54-2.30)
Lower leg	16,196	9.4	**21,979**	**9.5**	1.01 (0.62-1.67)
Foot	**11,417**	**6.7**	15,154	6.6	1.02 (0.53-1.93)
Arm/elbow	914	0.5	**3,846**	**1.7**	3.40 (0.44-22.3)
Neck	**1,465**	**0.9**	535	0.2	4.50 (0.67-20.0)
Other	**6,931**	**4.0**	3,488	1.5	2.67 (0.90-7.94)
Total	**171,555**	**100**	**230,769**	**100**	

*Throughout this chapter, injury proportion ratios (IPR) compare the gender with a higher proportion (bolded) to the gender with the lower proportion
†Throughout this chapter, statistically significant IPR are bolded

Table 12.3 Comparison of Diagnoses of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' soccer		Girls' soccer		IPR (95% CI)
	n	%	n	%	
Diagnosis					
Strain/sprain	69,575	40.5	**126,726**	**54.9**	**1.36 (1.14-1.62)**
Contusion	**31,733**	**18.5**	28,783	12.5	**1.48 (1.03-2.13)**
Fracture	**16,756**	**9.7**	13,326	5.8	1.69 (0.92-3.08)
Concussion	15,355	8.9	**21,570**	**9.3**	1.05 (0.61-1.79)
Other	**38,455**	**22.4**	40,364	17.5	1.23 (0.91-1.79)
Total	**171,874**	**100**	**230,769**	**100**	

Table 12.4 Most Common Boys' and Girls' Soccer Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' Soccer n=171,555		Girls' Soccer n=230,769		IPR (95% CI)
	n	%	n	%	
Diagnosis					
Ankle strain/sprain	25,512	14.9	**40,666**	**17.6**	1.19 (0.81-1.73)
Hip/thigh/upper leg strain/sprain	20,036	11.7	**27,184**	**11.8**	1.01 (0.64-1.60)
Head/face concussion	15,268	8.9	**21,570**	**9.4**	1.05 (0.61-1.81)
Knee other	**12,080**	**7.0**	13,474	5.8	1.20 (0.62-2.34)
Knee strain/sprain	11,247	6.6	**35,470**	**15.4**	**2.35 (1.36-4.05)**

*Only includes diagnoses accounting for >5% of boys' or girls' soccer injuries

Table 12.5 Comparison of Time Loss of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' soccer		Girls' soccer		IPR (95% CI)
	n	%	n	%	
Time Loss					
<1 Week	**97,993**	**58.5**	125,089	55.8	1.05 (0.90-1.22)
1-3 Weeks	46,197	27.6	**62,061**	**27.7**	1.00 (0.76-1.32)
>3 Weeks	23,355	13.9	**36,839**	**16.4**	1.18 (0.76-1.81)
Total	167,545	100	223,990	100	

Table 12.6 Comparison of Mechanisms of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' soccer		Girls' soccer		IPR (95% CI)
	n	%	n	%	
Mechanism					
Contact with another person	**78,939**	**46.2**	81,969	35.6	**1.29 (1.06-1.58)**
No contact	30,472	17.8	**51,998**	**22.6**	1.27 (0.92-1.76)
Contact with playing surface	26,236	15.3	**42,432**	**18.4**	1.21 (0.81-1.79)
Overuse/chronic	**20,148**	**11.8**	25,128	10.9	1.08 (0.67-1.72)
Contact with playing apparatus	10,931	6.4	**22,285**	**9.7**	1.52 (0.84-2.75)
Illness	1,416	0.8	**2,594**	**1.1**	1.36 (0.25-7.34)
Other	2,817	1.6	**3,940**	**1.7**	1.04 (0.30-3.61)
Total	**170,960**	**100**	**230,346**	**100**	

Table 12.7 Comparison of Activities of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' soccer		Girls' soccer		IPR (95% CI)
	n	%	n	%	
Activity					
General play	38,129	22.4	**61,215**	**26.9**	1.20 (0.89-1.61)
Ball handling/dribbling	22,573	13.3	**30,568**	**13.4**	1.01 (0.64-1.59)
Chasing loose ball	18,342	10.8	**30,787**	**13.5**	1.25 (0.81-1.94)
Defending	16,946	10.0	**27,083**	**11.9**	1.19 (0.73-1.95)
Heading ball	**12,653**	**7.4**	10,077	4.4	1.69 (0.83-3.42)
Conditioning	**11,367**	**6.7**	12,776	5.6	1.20 (0.66-2.16)
Goaltending	**9,713**	**5.7**	9,948	4.4	1.31 (0.67-2.55)
Passing (foot)	8,477	5.0	**13,126**	**5.8**	1.15 (0.59-2.24)
Other	**31,804**	**18.7**	31,769	14.0	1.34 (0.90-2.00)
Total	**170,004**	**100**	**227,349**	**100**	

12.2 Boys' and Girls' Basketball

Table 12.8 Comparison of Boys' and Girls' Basketball Injury Rates, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball	Girls' basketball	RR (95% CI)*
Total			
# Injuries	359	358	
# Exposures	204,897	171,251	
Injury rate (per 1,000 AE)	1.75	**2.09**	**1.19 (1.03-1.38)**†
Competition			
# Injuries	174	185	
# Exposures	60,561	51,358	
Injury rate (per 1,000 AE)	2.87	**3.60**	**1.25 (1.02-1.54)**
Practice			
# Injuries	185	173	
# Exposures	144,336	119,893	
Injury rate (per 1,000 AE)	1.28	**1.44**	1.13 (0.92-1.39)

Table 12.9 Comparison of Body Sites of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball		Girls' basketball		IPR (95% CI)
	n	%	n		
Body Site					
Ankle	**35,446**	**36.7**	28,959	28.3	**1.30 (1.01-1.68)**
Knee	11,267	11.7	**20,915**	**20.4**	**1.74 (1.17-2.60)**
Head/face	**13,156**	**13.6**	13,164	12.9	1.05 (0.69-1.64)
Hip/thigh/upper leg	7,260	7.5	**8,761**	**8.6**	1.15 (0.62-2.09)
Shoulder	1,425	1.5	**4,383**	**4.3**	**2.87 (1.09-7.67)**
Hand/wrist	7,408	7.7	**9,080**	**8.9**	1.16 (0.64-2.07)
Trunk	**8,352**	**8.6**	4,732	4.6	1.87 (0.92-3.84)
Lower leg	3,106	3.2	**4,678**	**4.6**	1.44 (0.65-3.10)
Foot	**3,907**	**4.0**	2,050	2.0	2.00 (0.86-4.79)
Arm/elbow	1,029	1.1	**2,053**	**2.0**	1.82 (0.53-6.65)
Neck	726	0.8	**1,028**	**1.0**	1.25 (0.21-8.29)
Other	**3,588**	**3.7**	2,518	2.5	1.48 (0.64-3.59)
Total	**96,670**	**100**	**102,321**	**100**	

Table 12.10 Comparison of Diagnoses of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball		Girls' basketball		IPR (95% CI)
	n	%	n	%	
Diagnosis					
Strain/sprain	**56,329**	**58.4**	54,361	53.1	1.10 (0.94-1.29)
Contusion	**8,458**	**8.8**	8,437	8.2	1.07 (0.59-1.91)
Fracture	**10,763**	**11.2**	7,352	7.2	1.56 (0.91-2.66)
Concussion	4,452	4.6	**7,552**	**7.4**	1.60 (0.82-3.12)
Other	16,424	17.0	**24,620**	**24.1**	**1.41 (1.01-1.98)**
Total	**96,426**	**100**	**102,322**	**100**	

Table 12.11 Most Common Boys' and Girls' Basketball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball n=96,427		Girls' basketball n=102,321		IPR (95% CI)
	n	%	n	%	
Diagnosis					
Ankle strain/sprain	**34,689**	**36.0**	27,509	26.9	**1.34 (1.03-1.74)**
Hip/thigh/upper leg strain/sprain	5,421	5.6	**6,275**	**6.1**	1.09 (0.52-2.29)
Knee strain/sprain	5,045	5.2	**10,260**	**10.0**	**1.91 (1.03-3.54)**
Head/face other	**4,864**	**5.0**	4,218	4.1	1.23 (0.52-2.91)
Knee other	4,766	4.9	**7,897**	**7.7**	1.56 (0.82-2.97)
Head/face concussion	4,452	4.6	**7,552**	**7.4**	1.60 (0.82-3.12)

*Only includes diagnoses accounting for >5% of boys' or girls' basketball injuries

Table 12.12 Comparison of Time Loss of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball		Girls' basketball		IPR (95% CI)
	n	%	n	%	
Time Loss					
<1 Week	**52,875**	**56.4**	49,944	50.0	1.13 (0.95-1.33)
1-3 Weeks	**29,398**	**31.4**	30,532	30.5	1.03 (0.79-1.32)
>3 Weeks	11,399	12.2	**19,491**	**19.5**	**1.60 (1.07-2.41)**
Total	**93,672**	**100**	**99,967**	**100**	

Table 12.13 Comparison of Mechanisms of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball		Girls' basketball		IPR (95% CI)
	n	%	n	%	
Mechanism					
Contact with another person	**43,025**	**44.7**	35,554	35.4	**1.29 (1.04-1.60)**
Contact with playing surface	21,004	21.8	**27,966**	**27.8**	1.25 (0.92-1.70)
No contact	17,963	18.7	**20,596**	**20.5**	1.08 (0.76-1.52)
Overuse/chronic	5,373	5.6	**7,160**	**7.1**	1.25 (0.68-2.32)
Contact with playing apparatus	**4,967**	**5.2**	5,156	5.1	1.02 (0.47-2.24)
Illness	**2,261**	**2.4**	1,919	1.9	1.25 (0.35-4.46)
Other	1,565	1.6	**2,136**	**2.1**	1.28 (0.42-3.87)
Total	**96,158**	**100**	**100,487**	**100**	

Table 12.14 Comparison of Activities of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball		Girls' basketball		IPR (95% CI)
	n	%	n	%	
Activity					
Rebounding	**30,258**	**31.7**	18,327	18.3	**1.76 (1.30-2.38)**
General play	**15,796**	**16.6**	15,870	15.9	1.06 (0.72-1.56)
Defending	**14,444**	**15.1**	14,122	14.1	1.09 (0.72-1.65)
Shooting	**10,615**	**11.1**	7,736	7.7	1.46 (0.79-2.69)
Chasing loose ball	8,371	8.8	**11,821**	**11.8**	1.33 (0.82-2.16)
Ball handling/dribbling	4,834	5.1	**13,460**	**13.5**	0.92 (0.86-0.97)
Receiving pass	4,184	4.4	**4,790**	**4.8**	1.08 (0.48-2.41)
Conditioning	4,068	4.3	**10,272**	**10.3**	**2.37 (1.24-4.54)**
Other	2,802	2.9	**3,615**	**3.6**	1.21 (0.46-3.23)
Total	**95,372**	**100**	**100,013**	**100**	

12.3 Boys' Baseball and Girls' Softball

Table 12.15 Comparison of Boys' Baseball and Girls' Softball Injury Rates, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' baseball	Girls' softball	RR (95% CI)*
Total			
# Injuries	203	133	
# Exposures	162,931	119,554	
Injury rate (per 1,000 AE)	**1.25**	1.11	1.12 (0.90-1.39)
Competition			
# Injuries	117	83	
# Exposures	58,141	42,329	
Injury rate (per 1,000 AE)	**2.01**	1.96	1.03 (0.77-1.36)
Practice			
# Injuries	86	50	
# Exposures	104,790	77,225	
Injury rate (per 1,000 AE)	**0.82**	0.65	1.27 (0.89-1.80)

Table 12.16 Comparison of Body Sites of Boys' Baseball and Girls' Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' baseball		Girls' softball		IPR (95% CI)
	n	%	n	%	
Body Site					
Ankle	10,434	17.3	**10,635**	**19.5**	1.13 (0.64-1.99)
Knee	5,508	9.1	**7,139**	**13.1**	1.44 (0.72-2.85)
Head/face	10,686	17.7	**10,663**	**19.6**	1.11 (0.64-1.90)
Hip/thigh/upper leg	5,304	8.8	**5,655**	**10.4**	1.18 (0.50-2.79)
Shoulder	**9,070**	**15.0**	5,229	9.6	1.57 (0.77-3.18)
Hand/wrist	6,818	11.3	**6,544**	**12.0**	1.06 (0.56-2.01)
Trunk	**3,048**	**5.1**	2,629	4.8	1.05 (0.30-3.60)
Lower leg	522	0.9	**801**	**1.5**	1.70 (0.29-9.95)
Foot	**1,231**	**2.0**	928	1.7	1.20 (0.20-7.31)
Arm/elbow	**5,503**	**9.1**	1,648	3.0	3.01 (0.82-11.0)
Neck	**521**	**0.9**	0	0	N/A
Other	1,652	2.7	**2,539**	**4.7**	1.70 (0.59-4.90)
Total	**60,296**	**100**	**54,411**	**100**	

Table 12.17 Comparison of Diagnoses of Boys' Baseball and Girls' Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' baseball		Girls' softball		IPR (95% CI)
	n	%	n	%	
Diagnosis					
Strain/sprain	27,973	46.4	**26,985**	**49.6**	1.07 (0.82-1.40)
Contusion	**8,711**	**14.4**	7,666	14.1	1.02 (0.57-1.830
Fracture	**9,586**	**15.9**	8,313	15.3	1.04 (0.59-1.83)
Concussion	2,747	4.6	**3,957**	**7.3**	1.60 (0.52-4.94)
Other	**11,278**	**18.7**	7,491	13.8	1.36 (0.76-2.42)
Total	**60,296**	**100**	**54,411**	**100**	

Table 12.18 Most Common Boys' Baseball and Girls' Softball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' baseball n=60,295		Girls' softball n=54,411		IPR (95% CI)
	n	%	n	%	
Diagnosis					
Ankle strain/sprain	8,578	14.2	**9,616**	**17.7**	1.24 (0.67-2.29)
Hip/thigh/upper leg strain/sprain	5,193	8.6	**5,397**	**9.9**	1.15 (0.47-2.80)
Shoulder strain/sprain	**4,521**	**7.5**	2,803	5.2	1.46 (0.52-4.06)
Shoulder other	**4,416**	**7.3**	2,426	4.5	1.64 (0.58-4.69)
Arm/elbow strain/sprain	**3,747**	**6.2**	1,432	2.6	2.36 (0.53-10.6)
Hand/wrist fracture	3,312	5.5	**3,824**	**7.0**	1.28 (0.51-3.21)
Head/face other	**3,030**	**5.0**	1,140	2.1	2.40 (0.54-10.7)
Head/face concussion	2,747	4.6	**3,957**	**7.3**	1.60 (0.52-4.94)
Knee strain/sprain	2,632	4.4	**3,204**	**5.9**	1.35 (0.47-3.87)
Head/face contusion	2,604	4.3	**3,152**	**5.8**	1.60 (0.90-1.04)

*Only includes diagnoses accounting for >5% of boys' baseball or girls' softball injuries

Table 12.19 Comparison of Time Loss of Boys' Baseball and Girls' Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' baseball		Girls' softball		IPR (95% CI)
	n	%	n	%	
Time Loss					
<1 Week	**31,441**	**52.8**	27,484	51.1	1.03 (0.80-1.33)
1-3 Weeks	18,187	30.6	**17,013**	**31.6**	1.03 (0.70-1.53)
>3 Weeks	9,902	16.6	**9,319**	**17.3**	1.04 (0.61-1.79)
Total	59,530	100	53,816	100	

Table 12.20 Comparison of Mechanisms of Boys' Baseball and Girls' Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' baseball		Girls' softball		IPR (95% CI)
	n	%	n	%	
Mechanism					
Contact with playing apparatus	**19,488**	**32.6**	16,107	30.2	1.09 (0.75-1.59)
No contact	**13,593**	**22.7**	6,703	12.6	1.83 (0.96-3.50)
Contact with playing surface	10,735	18.0	**15,089**	**28.3**	1.56 (0.96-2.51)
Overuse/chronic	7,170	12.0	**7,381**	**13.8**	1.14 (0.57-2.28)
Contact with another person	5,542	9.3	**6,362**	**11.9**	1.27 (0.61-2.65)
Contact with out of bounds object	**973**	**1.6**	401	0.8	2.2 (0.35-13.8)
Other	**2,257**	**3.8**	1,347	2.5	1.51 (0.30-7.51)
Total	**59,758**	**100**	**53,389**	**100**	

Table 12.21 Comparison of Activities of Boys' Baseball and Girls' Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Year

	Boys' basketball		Girls' basketball		IPR (95% CI)
	n	%	n	%	
Activity					
Fielding	**15,755**	**26.4**	9,394	17.6	1.51 (0.92-2.49)
Running bases	**8,718**	**14.6**	7,077	13.3	1.11 (0.58-2.13)
Pitching	**7,552**	**12.7**	6,561	12.3	1.04 (0.49-2.19)
Catching	**7,430**	**12.5**	6,005	11.2	1.12 (0.57-2.19)
Sliding	5,195	8.7	**5,545**	**10.4**	1.18 (0.55-2.56)
Batting	4,842	8.1	**4,649**	**8.7**	1.06 (0.46-2.49)
Throwing (not pitching)	4,033	6.8	**4,049**	**7.6**	1.11 (0.44-2.78)
Other	6,056	10.2	**10,109**	**18.9**	1.66 (0.56-4.90)
Total	**59,581**	**100**	**53,389**	**100**	

XIII. Trends over Time

Table 13.1 Injury Rates by Sport, Type of Exposure, and Year, High School Sports-Related Injury Surveillance Study, US, 2005-07 School Years

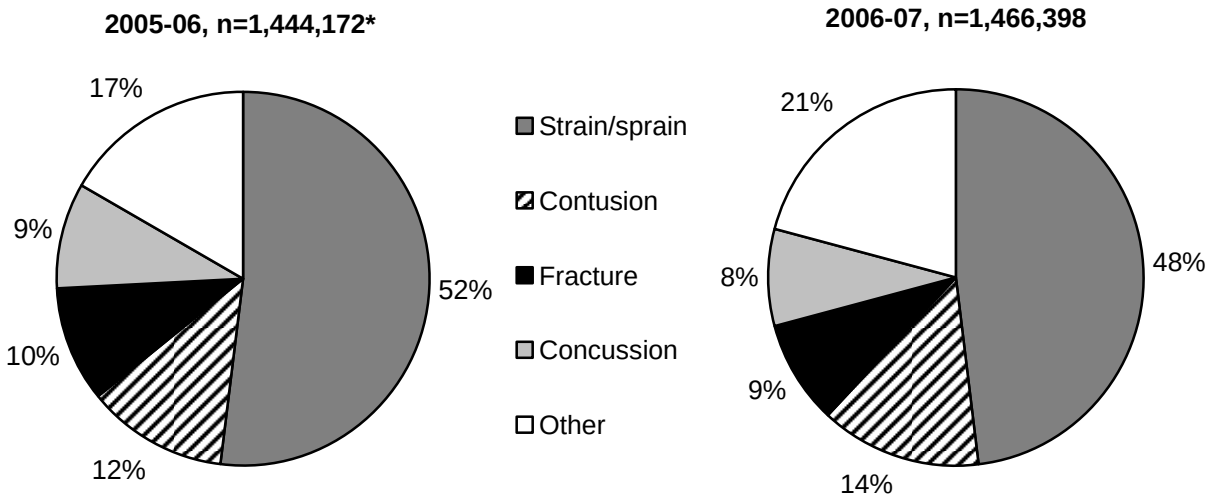
	2005-06	2006-07	RR (95% CI)*
Overall total	2.51	2.59	1.03 (0.99-1.07)
Competition	4.63	4.88	1.05 (1.00-1.12)
Practice	1.69	1.75	1.04 (0.98-1.10)
Boys' football total	4.36	4.45	1.02 (0.96-1.09)
Competition	12.09	13.5	**1.12 (1.03-1.22)**
Practice	2.54	2.68	1.05 (0.96-1.15)
Boys' soccer total	2.43	2.27	0.93 (0.81-1.08)
Competition	4.22	4.31	1.02 (0.84-1.23)
Practice	1.58	1.45	0.92 (0.74-1.13)
Girls' soccer total	2.36	2.51	1.06 (0.92-1.23)
Competition	5.21	5.43	1.04 (0.87-1.25)
Practice	1.10	1.31	1.19 (0.93-1.52)
Girls' volleyball total	1.64	1.37	0.83 (0.69-1.01)
Competition	1.92	1.40	**0.73 (0.53-0.99)**†
Practice	1.48	1.36	0.91 (0.72-1.17)
Boys' basketball total	1.89	1.75	0.93 (0.81-1.07)
Competition	2.98	2.87	0.96 (0.78-1.18)
Practice	1.46	1.28	0.88 (0.73-1.07)
Girls' basketball total	2.01	2.09	1.04 (0.90-1.20)
Competition	3.60	3.60	1.00 (0.82-1.22)
Practice	1.37	1.44	1.05 (0.86-1.30)
Boys' wrestling total	2.50	2.51	1.01 (0.88-1.15)
Competition	3.93	3.80	0.97 (0.77-1.21)
Practice	2.04	2.06	1.01 (0.85-1.20)
Boys' baseball total	1.19	1.25	1.04 (0.86-1.27)
Competition	1.77	2.01	1.14 (0.88-1.47)
Practice	0.87	0.82	0.94 (0.70-1.25)
Girls' softball total	1.13	1.11	0.98 (0.78-1.24)
Competition	1.78	1.96	1.10 (0.81-1.50)
Practice	0.79	0.65	0.82 (0.57-1.17)

**Rate ratios (RR) compare 2006-07 with 2005-06
†Statistically significant RR are bolded

Table 13.2 Nationally Estimated Number of Injuries by Sport, Type of Exposure, and Year, High School Sports-Related Injury Surveillance Study, US, 2005-07 School Years

	2005-06	2006-07
Overall total	1,442,533	1,472,849
Competition	759,334	766,512
Practice	683,199	706,337
Boys' football total	516,150	574,367
Competition	280,919	292,316
Practice	235,231	282,051
Boys' soccer total	218,760	171,874
Competition	119,703	93,295
Practice	99,058	78,579
Girls' soccer total	185,770	230,769
Competition	122,803	149,231
Practice	62,967	81,538
Girls' volleyball total	81,813	80,493
Competition	32,677	27,423
Practice	49,136	53,069
Boys' basketball total	100,058	96,670
Competition	44,826	46,109
Practice	55,232	50,561
Girls' basketball total	103,566	102,831
Competition	53,812	53,703
Practice	49,753	49,128
Boys' wrestling total	105,542	101,139
Competition	36,259	38,750
Practice	69,283	62,389
Boys' baseball total	67,560	60,296
Competition	33,639	33,494
Practice	33,922	26,802
Girls' softball total	63,313	54,411
Competition	34,696	32,191
Practice	28,618	22,220

Figure 13.1 Injury Diagnosis by Year, High School Sports-Related Injury Surveillance Study, US, 2005-07 School Years



*Throughout this chapter, totals and n's represent the total number of injury reports containing a valid response for the particular question. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005-07 School Years

	2005-06		2006-07	
	n	%	n	%
Body Site				
Ankle	326,128	22.7	289,537	19.8
Knee	203,900	14.2	242,987	16.6
Head/face	176,763	12.3	182,062	12.4
Hip/thigh/upper leg	155,055	10.8	154,224	10.5
Shoulder	113,444	7.9	116,490	8.0
Hand/wrist	114,460	8.0	109,547	7.5
Trunk	88,616	6.2	98,062	6.7
Lower leg	65,744	4.6	76,173	5.2
Foot	57,554	4.0	58,183	4.0
Arm/elbow	58,133	4.1	56,830	3.9
Neck	30,880	2.2	28,521	1.9
Other	45,276	3.2	52,311	3.6
Total	**1,435,954**	**100**	**1,464,926**	**100**

Table 13.4 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2006-07 School Years

	2005-06 n=1,435,954		2006-07 n=1,463,273	
	n	%	n	%
Diagnosis				
Ankle strain/sprain	295,254	20.6	260,670	17.8
Head/face concussion	129,116	9.0	122,629	8.4
Knee strain/sprain	109,483	7.6	128,264	8.8
Hip/thigh/upper leg strain/sprain	113,476	7.9	111,971	7.7
Knee other	61,912	4.3	70,921	4.9
Shoulder other	44,190	3.1	53,823	3.7
Hand/wrist fracture	45,686	3.2	48,471	3.3
Shoulder strain/sprain	48,271	3.4	41,798	2.9
Trunk strain/sprain	40,745	2.8	40,008	2.7
Hand/wrist strain/sprain	43,842	3.1	36,007	2.5

Figure 13.2 Time Loss of Injuries by Year, High School Sports-Related Injury Surveillance Study, US, 2005-07 School Years

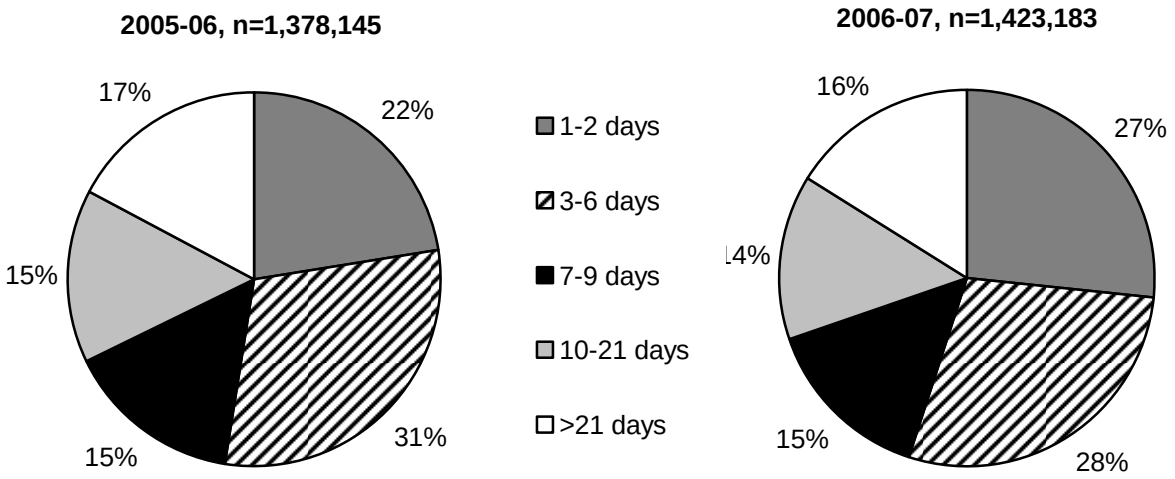


Table 13.5 Injuries Requiring Surgery by Year, High School Sports-Related Injury Surveillance Study, US, 2005-07 School Years

	2005-06		2006-07	
	n	**%**	**n**	**%**
Need for surgery				
Required surgery	75,271	5.3	91,126	6.4
Did not require surgery	1,353,802	94.7	1,337,834	93.6
Total	**1,429,072**	**100**	**1,428,960**	**100**

IX. Reporter Demographics & Compliance

Prior to the start of the 2006-07 High School RIO™ study, participating ATCs were asked to complete a short demographics survey. Three-quarters (77%) of participating high schools were public schools, with the remainder being private. Almost all (99%) participating ATCs provided services to athletes of their high school on 5 or more days each week. Over half (60%) of ATCs participating in High School RIO™ 2006-07 had participated in High School RIO™ during the 2005-06 school year.

During the 2006-07 school year, all 100 participating ATCs logged into High School RIO™ at least once to report injury data. Of these 100 ATCs, 86 (86%) completed a weekly exposure report for each week of the study. There were 9 ATCs (9%) that missed 1 or more weeks of reporting but remained in the study, and there were only 5 ATCs (5%) who dropped out of the study prematurely. The non-response rate of questions in the injury report was low, with most questions having a non-response rate of less than 2%. Questions asking about the injury (e.g., injury diagnosis, body site, etc.) had the highest response, while demographical questions (e.g., injured athlete's age, height, weight, etc.) had the most missing responses.

An online "End of Season" survey gave all participating ATCs the opportunity to provide feedback on their experiences with High School RIO™. This survey was completed by 52 ATCs (52%). Average reporting time burdens were 15.0 minutes for the weekly exposure report and 6.3 minutes for the injury report form. Using a 5 point Likert scale, RIO™ was overwhelmingly reported to be either very easy (76.5%) or somewhat easy (21.6%) to use (5 and 4 on the Likert scale, respectively), with ATCs being either very satisfied (74.5%) or somewhat satisfied (23.5%) with the study (5 and 4 on the Likert scale, respectively). Suggestions provided by ATCs, such as the addition or clarification of questions or answer choices, will used to improve High School RIO™ for the 2007-08 school year.

X. Summary

High school sports play an important role in the adoption and maintenance of a physically active lifestyle among millions of US adolescents. Too often injury prevention in this population is overlooked as sports-related injuries are thought to be unavoidable. In reality, sports-related injuries are largely preventable through the application of evidence-based preventive interventions. Such preventive interventions can include educational campaigns, introduction of new/improved protective equipment, rule changes, other policy changes, etc. The morbidity, mortality, and disability caused by high school sports-related injuries can be reduced through the development and implementation of improved injury diagnosis and treatment modalities as well as through effective prevention strategies. However, surveillance of exposure based injury rates in a nationally representative sample of high school athletes and subsequent epidemiologic analysis of patterns of injury are needed to drive evidence-based prevention practices.

Prior to the implementation of the High School Sports-Related Injury Surveillance Study by Dr. Comstock, the study of high school sports-related injuries had largely been limited by an inability to calculate injury rates due to a lack of exposure data (i.e., frequency of participation in athletic activities including training, practice, and competition), an inability to compare findings across groups (i.e., sports/activities, genders, schools, and levels of competition), or an inability to generalize findings from small non-representative samples. The value of national injury surveillance studies that collect injury, exposure, and risk factor data from representative samples has been well demonstrated by the National Collegiate Athletic Association's Injury Surveillance System (NCAA ISS). Data collected by the NCAA ISS since 1982 has been used to develop preventive interventions including changes in coaching habits, increased use of protective equipment, and rule changes which have had proven success in reducing injuries among collegiate athletes. For example, NCAA ISS data has been used to develop several interventions

intended to reduce the number of preseason heat-related football injuries including the elimination of consecutive days of multiple practices, daily hour limitations, and a gradual increase in equipment for conditioning and heat acclimation. Additionally, several committees have considered NCAA ISS data when making recommendations including the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports' recommendation for mandatory eye protection in women's lacrosse, the NCAA Men's Ice Hockey Rules Committee's recommendation for stricter penalties for hitting from behind, checking into the boards, and not wearing a mouthpiece, and the NCAA Men's Basketball Rules Committee's recent discussions of widening the free-throw lane to prevent injuries related to player contact. Unfortunately, because an equivalent injury surveillance system to collect injury and exposure data from a nationally representative sample of high school athletes had not previously existed, injury prevention efforts targeted to reduce injury rates in this population were based largely upon data collected from collegiate athletes. This is unacceptable because distinct biophysiological differences (e.g., lower muscle mass, immature growth plates, etc.) means high school athletes are not merely miniature versions of their collegiate counterparts.

The successful implementation and maintenance of High School RIO™ (Reporting Information Online) demonstrates the value of a national injury surveillance system at the high school level. Dr. Comstock and her research staff are committed to maintaining a permanent national high school sports injury surveillance system. Although the Ohio State University and the Center for Injury Research and Policy at Columbus Children's Hospital funded the second year of High School RIO™, funds must immediately be found to continue this important, permanent high school injury surveillance system.

While the health benefits of a physically active lifestyle including sports participation are undeniable, participants are at risk of injury because a certain endemic level of injury can be expected during any physical activity, especially those with a competitive component. However, injury rates among high school athletes should be reduced to the lowest possible level without discouraging adolescents from engaging in this important form of physical activity. This goal can best be accomplished by monitoring injury rates and patterns of injury among high school athletes over time; investigating the etiology of preventable injuries; and developing, implementing, and evaluating evidence-based preventive interventions. Surveillance systems such as the model used for this study are critical in achieving these goals.