

SUMMARY REPORT

NATIONAL HIGH SCHOOL SPORTS-RELATED INJURY SURVEILLANCE STUDY

2008-2009 School Year

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High School RIO™

High School Sports-Related Injury Surveillance Study

presented by the Center for Injury Research & Policy



Acknowledgements

We thank the certified athletic trainers (ATCs) for their hard work and dedication in providing us with complete and accurate data. Without their efforts, this study would not have been possible. We would like to thank the National Federation of State High School Associations (NFHS) for their support of this project. The content of this report was funded in part by the Centers for Disease Control and Prevention (CDC) grants #R49/CE000674-01 and #R49/CE001172-01. The content of this report is solely the responsibility of the authors and does not necessarily represent the official views of the CDC. We would also like to acknowledge the generous research funding contributions of the National Federation of State High School Associations (NFHS) and DonJoy Orthotics.

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 7.4 million in 2008-09. 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.

Since the 2005-06 school year, Dr. R. Dawn Comstock has conducted the National High School Sports-Related Injury 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. This surveillance has been conducted using the time- and cost-efficient RIOTM (Reporting Information One) surveillance system. The first three study years were funded by the Centers for Disease Control, the Research Institute at Nationwide Children's Hospital, DonJoy Orthotics, EyeBlack, and The Ohio State University. Through the generous contributions of the Centers for Disease Control, the National Federation of State High School Associations (NFHS), and DonJoy Orthotics, the National High School Sports-Related Injury Surveillance System was able to be continued during the 2008-09 school year.

1.3 Specific Aims

The continuing objectives of this study are to maintain the National High School Sports-Related Injury Surveillance System among a nationally representative sample of US high schools. The specific aims of this study are:

- 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 the 9 sports of interest.
- 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 from the 2005-06 through the 2008-09 school years.

1.4 Project Design

The National High School Sports-Related Injury Surveillance System defined an injury 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 and
- D) Any fracture, concussion, or dental injury regardless of whether or not it resulted in restriction of the student-athlete's participation.

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 $\leq 1,000$ 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 National High School Sports-Related Injury Surveillance System 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 44 weekly exposure reports: one for each week from August 4, 2008 through June 7, 2009. 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 study staff 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 9.1 and SPSS, version 17.0. Although fractures, concussions, and dental injuries resulting in <1 day time loss were collected, unless otherwise noted, analyses in this report excluded these injuries. 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:

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

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 injury in boys' soccer to the rate of injury in girls' soccer:

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

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:

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

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. Injury rates over time were compared by running a linear regression and testing for trend.

II. Overall Injury Epidemiology

Table 2.1 Injury Rates by Sport and Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Overall total	4,255	2,112,479	2.01	1,248,126
Competition	2,311	570,177	4.05	690,525
Practice	1,944	1,542,302	1.26	557,601
Boys' football total	2,061	588,876	3.50	527,321
Competition	1,121	99,532	11.26	288,637
Practice	940	489,344	1.92	238,684
Boys' soccer total	350	215,699	1.62	149,229
Competition	218	63,636	3.43	87,082
Practice	132	152,063	0.87	62,147
Girls' soccer total	381	184,268	2.07	192,108
Competition	251	54,670	4.59	123,312
Practice	130	129,598	1.00	68,796
Girls' volleyball total	167	188,075	0.89	56,609
Competition	58	64,294	0.90	19,764
Practice	109	123,781	0.88	36,845
Boys' basketball total	319	236,419	1.35	79,230
Competition	160	69,043	2.32	40,152
Practice	159	167,376	0.95	39,078
Girls' basketball total	295	191,871	1.54	64,933
Competition	177	56,555	3.13	38,277
Practice	118	135,316	0.87	26,656
Boys' wrestling total	392	180,641	2.17	88,996
Competition	160	47,770	3.35	39,029
Practice	232	132,871	1.75	49,967
Boys' baseball total	144	185,622	0.78	39,869
Competition	86	65,359	1.32	25,584
Practice	58	120,263	0.48	14,285
Girls' softball total	146	141,008	1.04	49,831
Competition	80	49,318	1.62	28,688
Practice	66	91,690	0.72	21,143

*Only includes injuries resulting in ≥ 1 days time loss.

Table 2.2 Proportion of Injuries Resulting in Time Loss, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

	≥1 days time loss	<1 day time loss	Total
Overall	98.6%	1.4%	100%
Boys' football	98.5%	1.5%	100%
Boys' soccer	98.3%	1.7%	100%
Girls' soccer	99.2%	0.8%	100%
Girls' volleyball	99.4%	0.6%	100%
Boys' basketball	96.6%	3.4%	100%
Girls' basketball	98.6%	1.4%	100%
Boys' wrestling	99.5%	0.5%	100%
Boys' baseball	98.6%	1.4%	100%
Girls' softball	100.0%	0.0%	100%

*By study definition, non-time loss injuries were fractures, concussions, and dental injuries. Because they accounted for less than 2% of all injuries, they are not included in any other analyses.

Table 2.3 Demographic Characteristics of Injured Athletes by Sex, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

	Male	Female
Year in School		
Freshman	176,340 (19.9%)	89,339 (24.6%)
Sophomore	211,262 (23.9%)	102,792 (28.3%)
Junior	231,294 (26.1%)	79,301 (21.8%)
Senior	262,028 (29.7%)	86,481 (23.8%)
Total†	880,924 (100%)	357,913 (100%)
Age (years)		
Minimum	13	13
Maximum	19	19
Mean (St. Dev.)	16.0 (1.3)	15.8 (1.2)
BMI		
Minimum	9.6	15.4
Maximum	49.0	48.8
Mean (St. Dev.)	24.8 (4.4)	22.3 (3.8)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

†Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

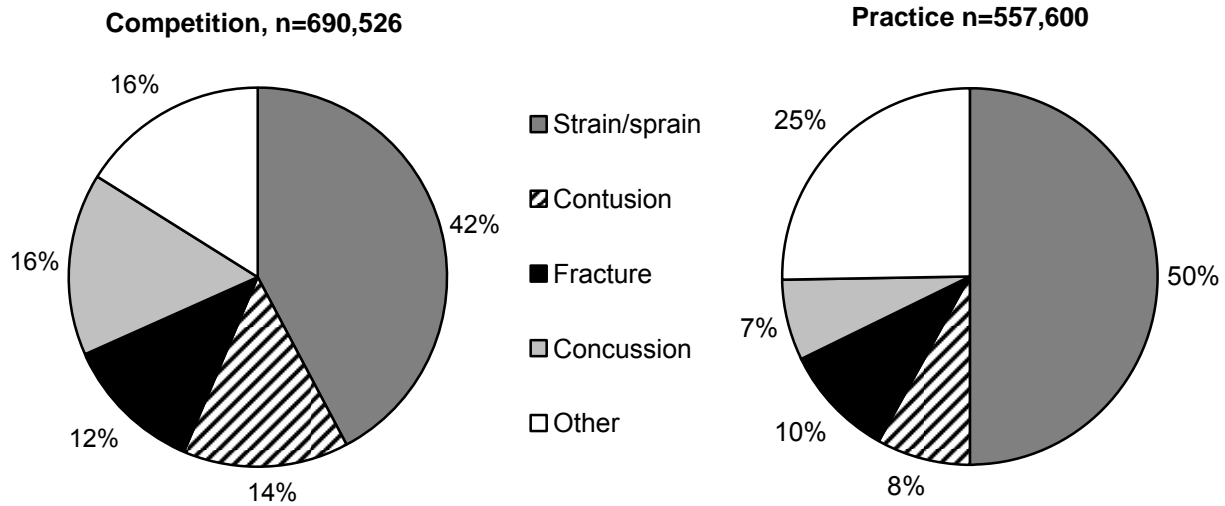


Table 2.4 Body Site of Injury by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	107,559	15.7%	96,689	17.4%	204,248	16.4%
Head/face	137,272	19.9%	53,881	9.7%	191,154	15.4%
Knee	110,844	16.1%	73,795	13.3%	184,639	14.8%
Hip/thigh/upper leg	51,415	7.5%	76,706	13.8%	128,121	10.3%
Hand/wrist	61,214	8.9%	55,473	9.9%	116,687	9.4%
Shoulder	60,412	8.8%	45,148	8.1%	105,560	8.5%
Trunk	38,947	5.6%	42,990	7.7%	81,936	6.5%
Lower leg	38,709	5.6%	33,749	6.1%	72,458	5.8%
Foot	30,899	4.5%	31,975	5.7%	62,874	5.1%
Arm/elbow	29,797	4.4%	21,796	3.9%	51,593	4.2%
Neck	10,001	1.5%	13,240	2.4%	23,241	1.9%
Other	10,194	1.5%	11,323	2.0%	21,517	1.7%
Total	687,263	100%	556,765	100%	1,244,028*	100%

*Totals and n's represent the total weighted 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 2.5 Most Commonly Injured Ankle Structures, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

	Male		Female		Total	
	n	%	n	%	n	%
Ankle Ligament						
Anterior talofibular ligament	96,937	79.7%	69,285	83.8%	166,222	81.4%
Calcaneofibular ligament	34,690	28.5%	25,424	30.7%	60,114	29.4%
Anterior tibiofibular ligament	32,627	26.8%	21,455	25.9%	54,082	26.5%
Posterior talofibular ligament	8,328	6.9%	15,950	19.3%	24,278	11.9%
Posterior tibiofibular ligament	6,920	5.7%	4,889	5.9%	11,809	5.8%
Total	121,556	100%	82,692	100%	204,248	100%

*Multiple responses allowed per injury report.

Table 2.6 Most Commonly Injured Knee Structures, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Male		Female		Total	
	n	%	n	%	n	%
Knee Ligament						
Medial collateral ligament	50,255	38.7%	11,855	21.6%	62,110	33.6%
Torn cartilage (meniscus)	25,069	19.3%	12,907	23.5%	37,976	20.6%
Patella/patellar tendon	23,326	18.0%	12,339	22.5%	35,665	19.0%
Anterior cruciate ligament	22,498	17.3%	12,594	23.0%	35,092	19.0%
Lateral collateral ligament	9,976	7.7%	4,488	8.2%	14,464	7.8%
Posterior cruciate ligament	697	0.5%	1,552	2.8%	2,249	1.2%
Total	129,796	100%	54,842	100%	184,638	100%

*Multiple responses allowed per injury report.

Table 2.7 Ten Most Common Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=687,266		Practice n=556,764		Overall n=1,244,026	
	n	%	n	%	n	%
Ankle Strain/Sprain	100,400	14.6%	87,265	15.7%	187,665	15.1%
Head/Face Concussion	107,063	15.6%	39,060	7.0%	146,123	11.7%
Knee strain/sprain	64,726	9.4%	34,388	6.2%	99,113	8.0%
Hip/thigh/upper leg strain/sprain	33,522	4.9%	62,973	11.3%	96,495	7.8%
Knee other	26,076	3.8%	29,539	5.3%	55,615	4.5%
Shoulder other	27,755	4.0%	21,959	3.9%	49,714	4.0%
Hand/wrist fracture	28,501	4.1%	21,155	3.8%	49,657	4.0%
Shoulder strain/sprain	26,893	3.9%	19,371	3.5%	46,264	3.7%
Hand/wrist strain/sprain	17,148	2.5%	19,267	3.5%	36,416	2.9%
Trunk strain/sprain	13,276	1.9%	21,759	3.9%	35,035	2.8%

Figure 2.2 Time Loss by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

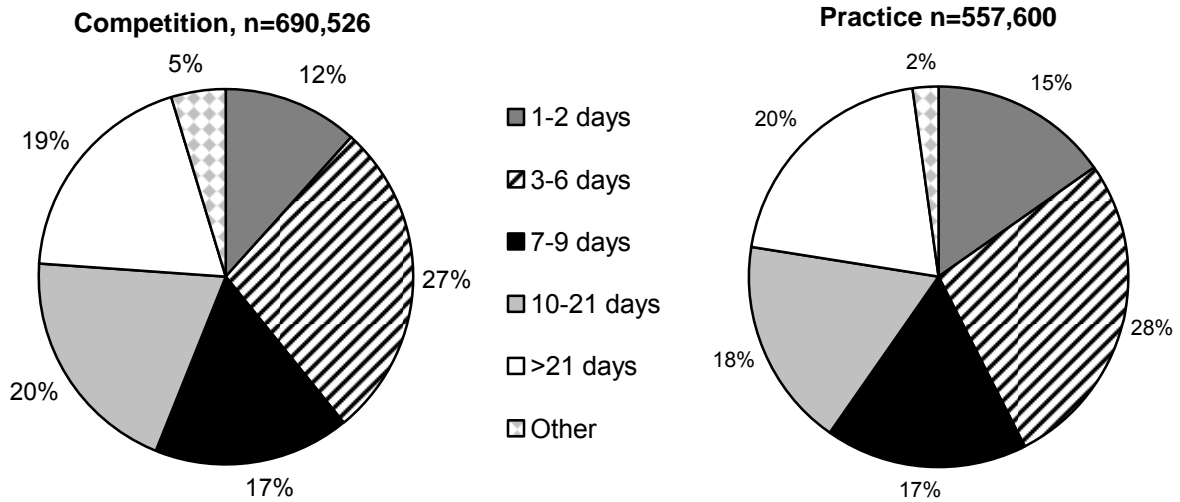


Table 2.8 Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	54,252	8.1%	26,617	4.9%	80,869	6.7%
Did not require surgery	618,266	91.9%	515,303	95.1%	1,133,569	93.3%
Total	672,518	100%	541,920	100%	1,214,438	100%

Figure 2.3 New and Recurring Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

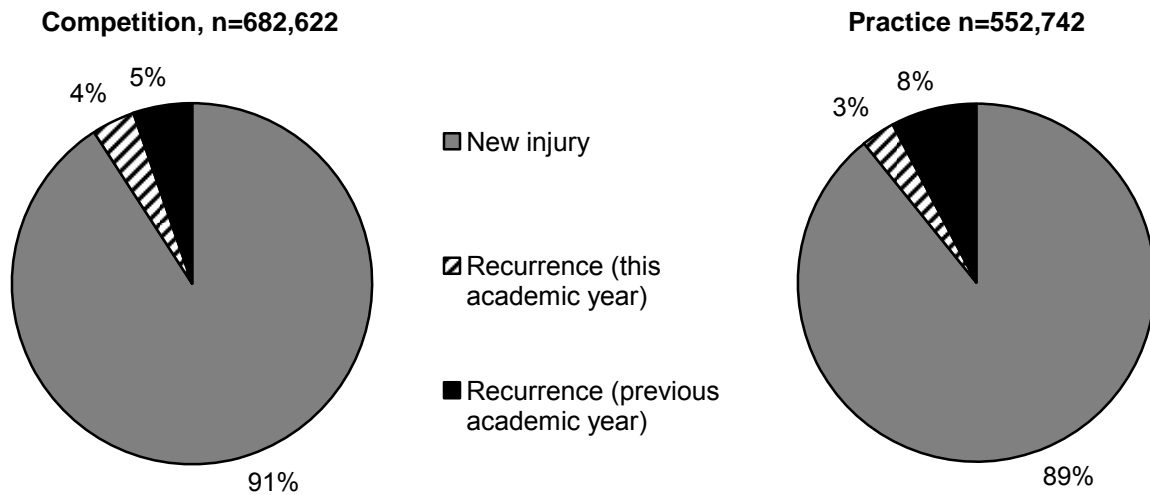


Table 2.9 Time during Season of Injury, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	315,289	25.3%
Regular season	887,866	71.4%
Post season	41,298	3.3%
Total	1,244,453	100%

Table 2.10 Competition-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Injury Related to Foul Play		
No	553,920	86.1%
Yes, and ruled foul play	27,971	4.3%
Yes, but not ruled foul play	29,489	4.6%
Unknown	32,250	5.0%
Total	643,630	100%

Table 2.11 Practice-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	62,213	12.5%
Second 1/2 hour	112,246	22.5%
1-2 hours into practice	251,132	50.3%
>2 hours into practice	73,803	14.8%
Total	499,394	100%

Table 2.12 Methods for Injury Evaluation and Assessment, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
% of Injuries Evaluated by:*		
Certified athletic trainer	1,183,807	54.1%
Physician	465,115	21.3%
Dentist/oral surgeon	5,045	0.2%
Nurse practitioner	10,297	0.5%
Physician's assistant	12,352	0.6%
Other	510,705	23.3%
Total	2,187,321	100%
% of Injuries Assessed by:*		
Evaluation	1,251,594	60.4%
X-ray	550,237	26.6%
MRI	152,234	7.3%
CT-scan	55,099	2.7%
Surgery	17,787	0.9%
Blood work/lab test	20,377	1.0%
Other	23,899	1.2%
Total	2,071,227	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, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	2,061	588,876	3.50	527,321
Competition	1,121	99,532	11.26	288,637
Practice	940	489,344	1.92	238,684

Table 3.2 Demographic Characteristics of Injured Football Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	107,529 (20.5%)
Sophomore	124,352 (23.7%)
Junior	133,108 (25.4%)
Senior	159,938 (30.5%)
Total†	524,927 (100%)
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	16.0 (1.3)
BMI	
Minimum	9.6
Maximum	45.4
Mean (St. Dev.)	25.9 (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 weighted 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, 2008-09 School Year

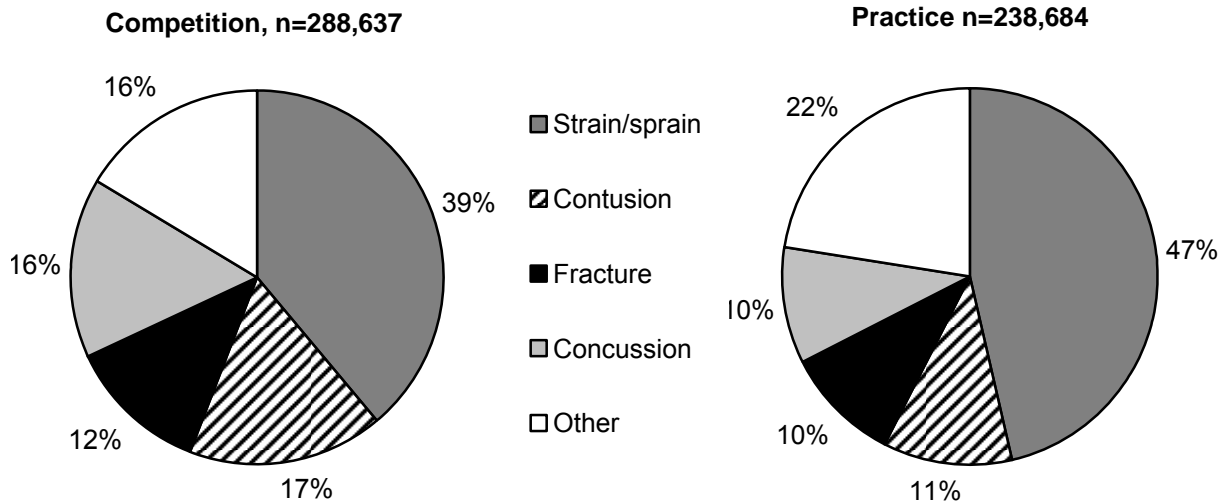


Table 3.3 Body Site of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Knee	56,116	19.5%	32,779	13.7%	88,894	16.9%
Head/face	49,140	17.1%	26,575	11.1%	75,714	14.4%
Ankle	32,364	11.2%	32,184	13.5%	64,548	12.3%
Hand/wrist	32,156	11.2%	25,782	10.8%	57,937	11.0%
Shoulder	32,848	11.4%	23,849	10.0%	56,697	10.8%
Hip/thigh/upper leg	18,041	6.3%	30,536	12.8%	48,577	9.2%
Trunk	22,832	7.9%	21,486	9.0%	44,319	8.4%
Lower leg	14,133	4.9%	11,014	4.6%	25,147	4.8%
Arm/elbow	14,455	5.0%	10,081	4.2%	24,536	4.7%
Foot	8,283	2.9%	7,863	3.3%	16,146	3.1%
Neck	4,825	1.7%	11,036	4.6%	15,861	3.0%
Other	2,883	1.0%	5,500	2.3%	8,383	1.6%
Total	288,074	100%	238,685	100%	526,758	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 3.4 Ten Most Common Football Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=288,633		Practice n= 238,687		Total n= 527,320	
	n	%	n	%	n	%
Head/face concussion	44,316	15.4%	23,850	10.0%	68,166	12.9%
Ankle strain/sprain	29,344	10.2%	27,686	11.6%	57,031	10.8%
Knee strain/sprain	36,975	12.8%	17,142	7.2%	54,116	10.3%
Hip/thigh/upper leg strain/sprain	8,850	3.1%	23,001	9.6%	31,851	6.0%
Shoulder other	17,716	6.1%	11,162	4.7%	28,878	5.5%
Hand/wrist fracture	15,011	5.2%	7,533	3.2%	22,544	4.3%
Shoulder strain/sprain	11,528	4.0%	9,062	3.8%	20,591	3.9%
Knee other	9,937	3.4%	9,539	4.0%	19,476	3.7%
Hand/wrist strain/sprain	7,978	2.8%	9,365	3.9%	17,343	3.3%
Knee contusion	8,490	2.9%	4,540	1.9%	13,030	2.5%

Figure 3.2 Time Loss of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

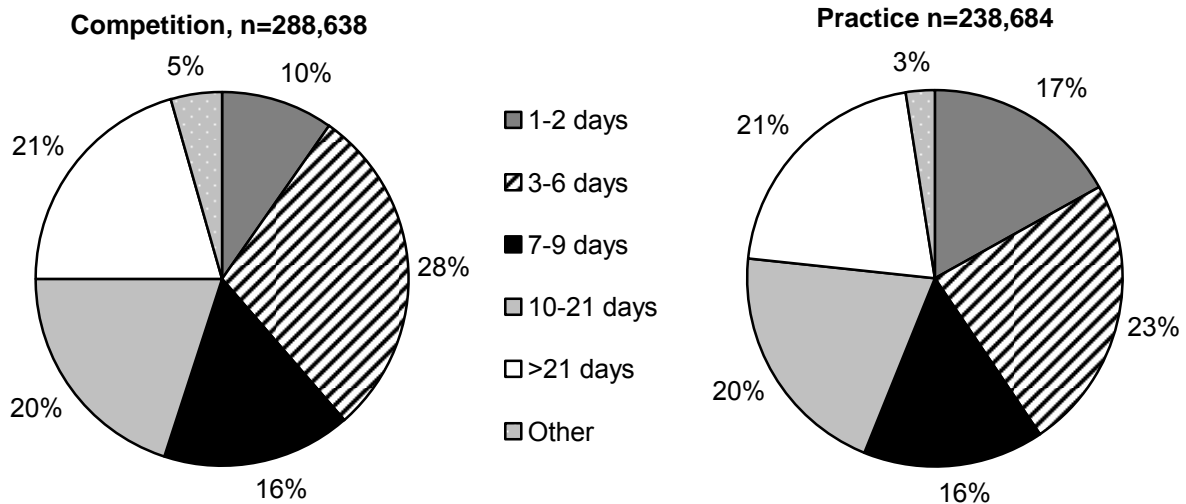


Table 3.5 Football Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	25,694	9.1%	15,385	6.7%	41,078	8.0%
Did not require surgery	256,055	90.9%	215,947	93.3%	472,002	92.0%
Total	281,749	100%	231,332	100%	513,081	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 3.3 History of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

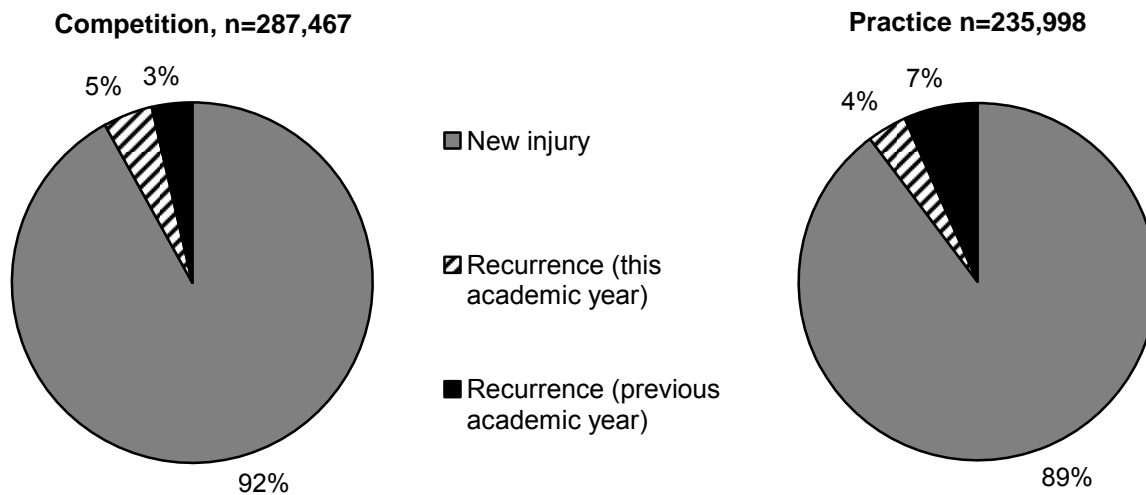


Table 3.6 Time during Season of Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	155,906	29.6%
Regular season	353,907	67.3%
Post season	16,310	3.1%
Total	526,124	100%

Table 3.7 Competition-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	4,246	1.5%
First quarter	36,853	13.4%
Second quarter	81,606	29.7%
Third quarter	87,397	31.8%
Fourth quarter	64,073	23.3%
Overtime	372	0.1%
Total	274,546	100%
Injury Related to Foul Play		
No	242,690	91.8%
Yes, and ruled foul play	5,426	2.1%
Yes, but not ruled foul play	6,754	2.6%
Unknown	9,425	3.6%
Total	264,295	100%
Field Location		
Between the 20 yrd lines	213,048	77.1%
Red zone	55,543	20.1%
End zone	5,350	1.9%
Off the field	2,424	0.9%
Total	276,365	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 3.8 Practice-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	22,390	10.7%
Second 1/2 hour	45,694	21.8%
1-2 hours into practice	107,497	51.3%
>2 hours into practice	34,042	16.2%
Total	209,624	100%

Figure 3.4 Player Position of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

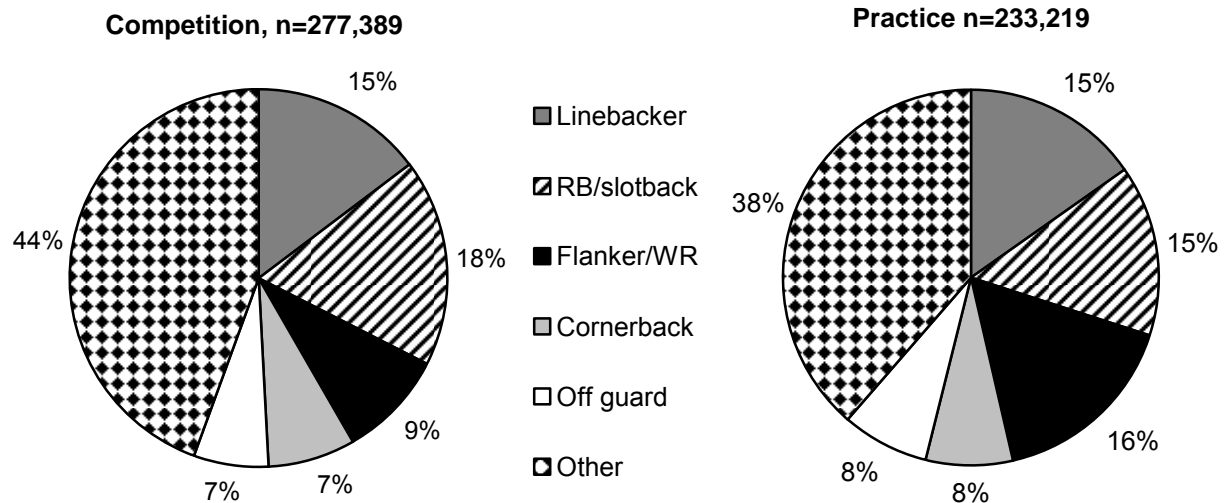
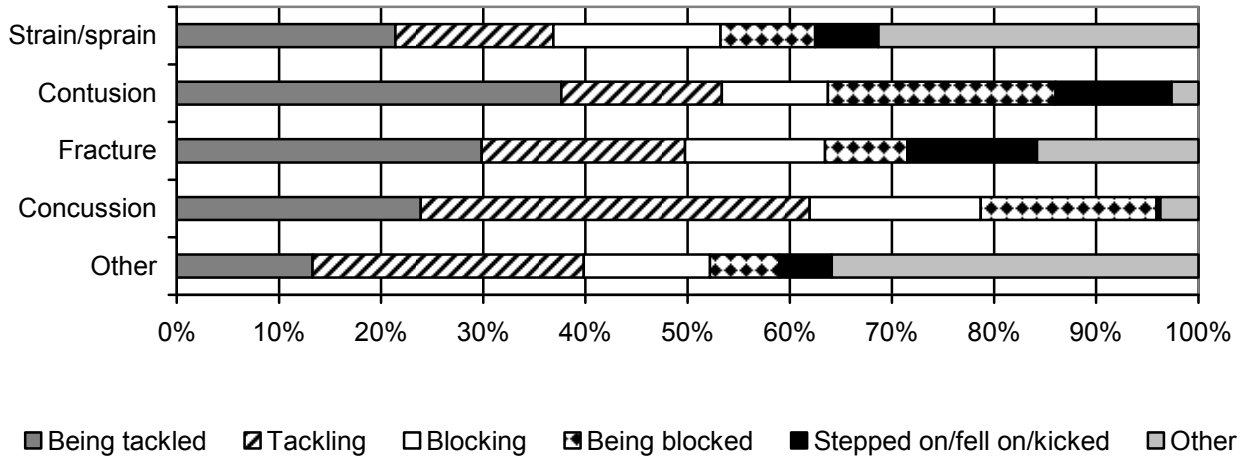


Table 3.9 Activities Leading to Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Being tackled	80,767	28.9%	39,959	17.0%	120,725	23.5%
Tackling	68,770	24.6%	39,149	16.7%	107,919	21.0%
Blocking	40,806	14.6%	33,756	14.4%	74,562	14.5%
Being blocked	41,599	14.9%	17,714	7.5%	59,313	11.5%
N/A, chronic/overuse	4,915	1.8%	42,245	18.0%	47,160	9.2%
Stepped on/fell on/kicked	16,616	5.9%	17,981	7.7%	34,597	6.7%
Rotation around a planted foot	9,350	3.3%	18,383	7.8%	27,733	5.4%
Other	16,734	6.0%	25,728	10.9%	42,463	8.2%
Total	279,557	100%	234,915	100%	514,472	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 3.5 Activity Resulting in Football Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 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, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	350	215,699	1.62	149,229
Competition	218	63,636	3.43	87,082
Practice	132	152,063	0.87	62,147

Table 4.2 Demographic Characteristics of Injured Boys' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	25,276 (17.0%)
Sophomore	33,286 (22.3%)
Junior	39,070 (26.2%)
Senior	51,301 (34.4%)
Total†	148,933 (100%)
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	16.1 (1.2)
BMI	
Minimum	15.2
Maximum	33.7
Mean (St. Dev.)	22.7 (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 weighted 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, 2008-09 School Year

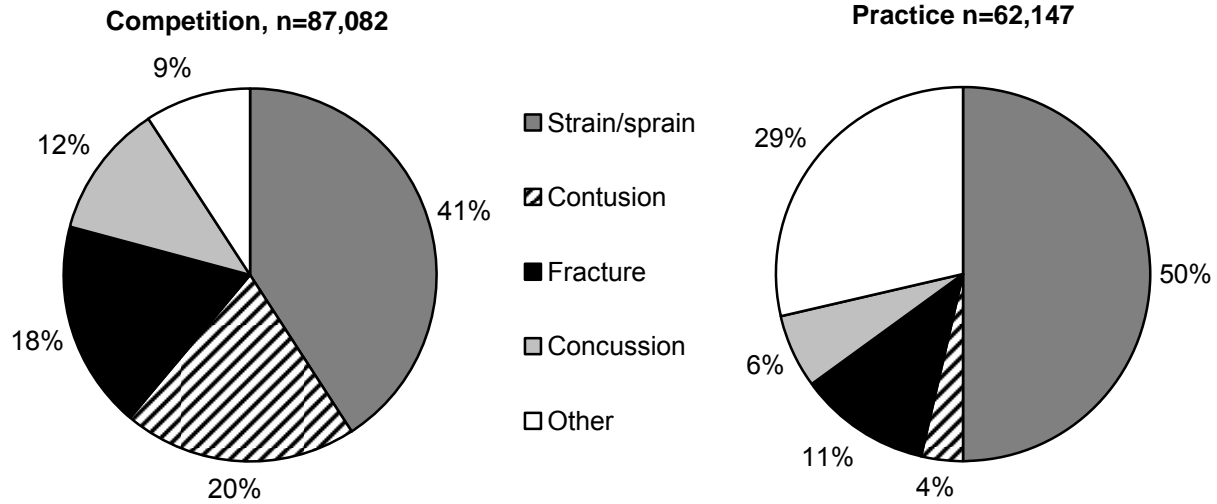


Table 4.3 Body Site of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Hip/thigh/upper leg	10,014	11.5%	16,161	26.0%	26,175	17.5%
Ankle	15,656	18.0%	8,912	14.3%	24,568	16.5%
Lower leg	12,305	14.1%	7,963	12.8%	20,267	13.6%
Head/face	14,210	16.3%	4,294	6.9%	18,504	12.4%
Knee	11,009	12.6%	6,572	10.6%	17,581	11.8%
Foot	6,654	7.6%	7,988	12.9%	14,642	9.8%
Hand/wrist	6,534	7.5%	3,000	4.8%	9,534	6.4%
Trunk	4,100	4.7%	4,588	7.4%	8,688	5.8%
Shoulder	4,414	5.1%	1,202	1.9%	5,616	3.8%
Arm/elbow	1,265	1.5%	1,123	1.8%	2,388	1.6%
Neck	663	0.8%	0	0.0%	663	0.4%
Other	258	0.3%	345	0.6%	602	0.4%
Total	87,082	100%	62,147	100%	149,229	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 4.4 Ten Most Common Boys' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n= 87,081		Practice n= 62,147		Total n=149,228	
	n	%	n	%	n	%
Hip/thigh/upper leg strain/sprain	6,472	7.4%	14,171	22.8%	20,643	13.8%
Ankle strain/sprain	13,800	15.8%	6,699	10.8%	20,499	13.7%
Head/face concussion	10,253	11.8%	3,962	6.4%	14,215	9.5%
Hand/wrist fracture	5,411	6.2%	2,485	4.0%	7,895	5.3%
Knee strain/sprain	4,430	5.1%	3,003	4.8%	7,433	5.0%
Lower leg fracture	4,346	5.0%	2,264	3.6%	6,611	4.4%
Lower leg contusion	5,856	6.7%	258	0.4%	6,114	4.1%
Foot strain/sprain	2,591	3.0%	2,668	4.3%	5,258	3.5%
Knee contusion	4,014	4.6%	539	0.9%	4,553	3.1%
Shoulder sprain/strain	3,076	3.5%	227	0.4%	3,303	2.2%

Figure 4.2 Time Loss of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

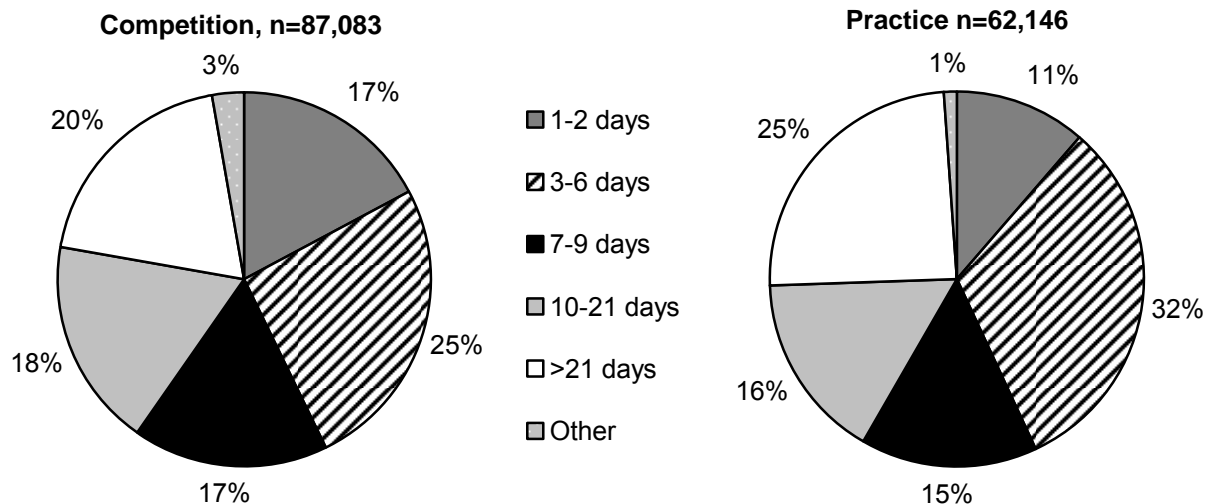


Table 4.5 Boys' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	5,583	6.5%	730	1.2%	6,313	4.3%
Did not require surgery	80,080	93.5%	60,083	98.8%	140,163	95.7%
Total	85,663	100%	60,813	100%	146,476	100%

Figure 4.3 History of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

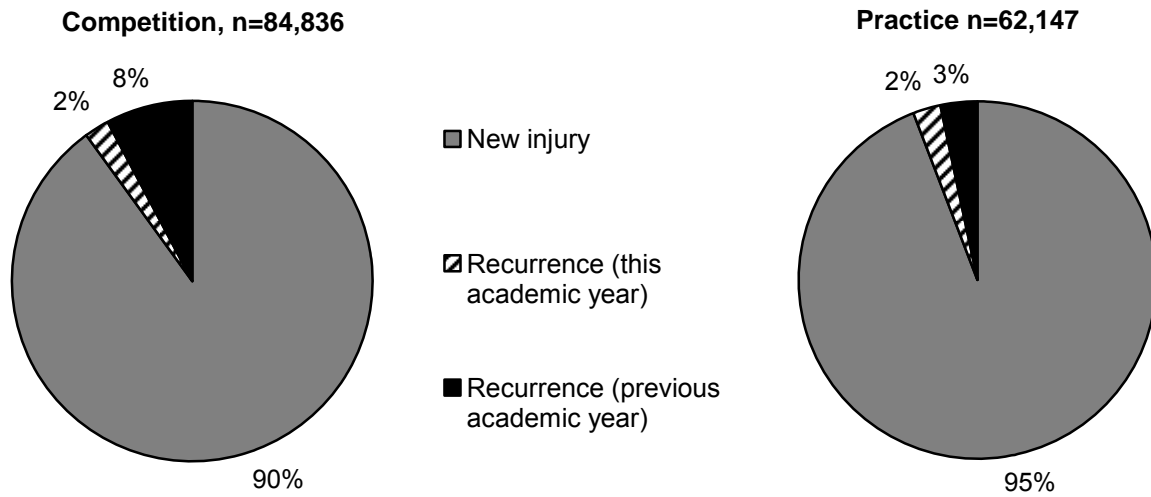


Table 4.6 Time during Season of Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	41,877	28.1%
Regular season	102,338	68.7%
Post season	4,669	3.1%
Total	148,884	100%

Table 4.7 Competition-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	2,889	3.5%
First half	26,878	32.6%
Second half	51,652	62.6%
Overtime	1,106	1.3%
Total	82,526	100%
Injury Related to Foul Play		
No	64,025	76.6%
Yes, and ruled foul play	6,129	7.3%
Yes, but not ruled foul play	8,878	10.6%
Unknown	4,595	5.5%
Total	83,628	100%
Field Location		
Top of goal box extended to center line (offense)	28,141	34.60%
Goal box (defense)	15,206	18.70%
Top of goal box extended to center line (defense)	13,169	16.20%
Side of goal box (offense)	9,639	11.80%
Goal box (offense)	9,120	11.20%
Side of goal box (defense)	4,678	5.70%
Off the field	1,435	1.80%
Total	81,387	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 4.8 Practice-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	2,617	4.6%
Second 1/2 hour	12,248	21.6%
1-2 hours into practice	28,780	50.8%
>2 hours into practice	12,975	22.9%
Total	56,619	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 4.4 Player Position of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

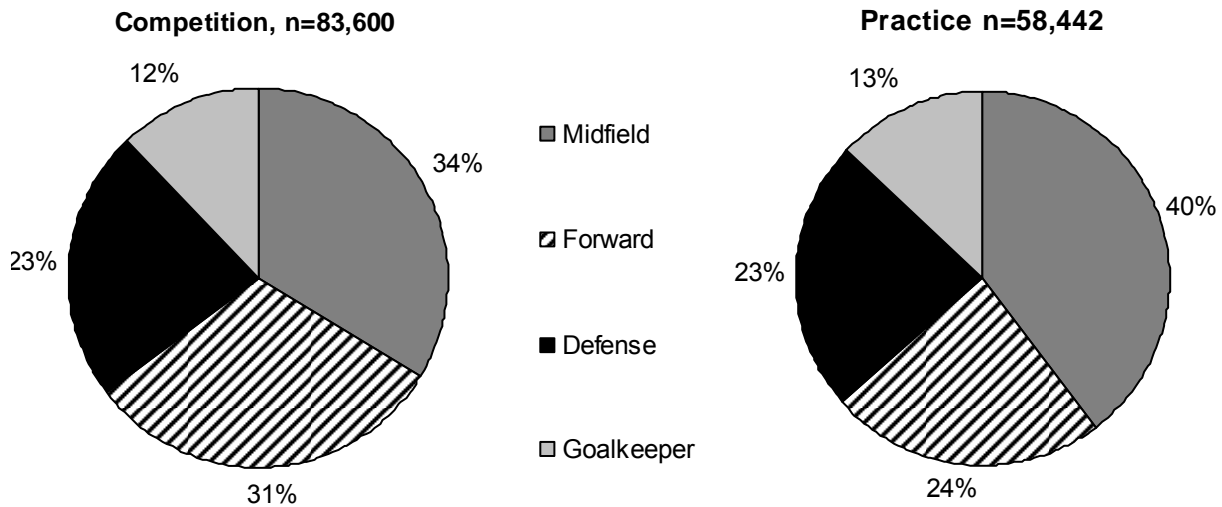
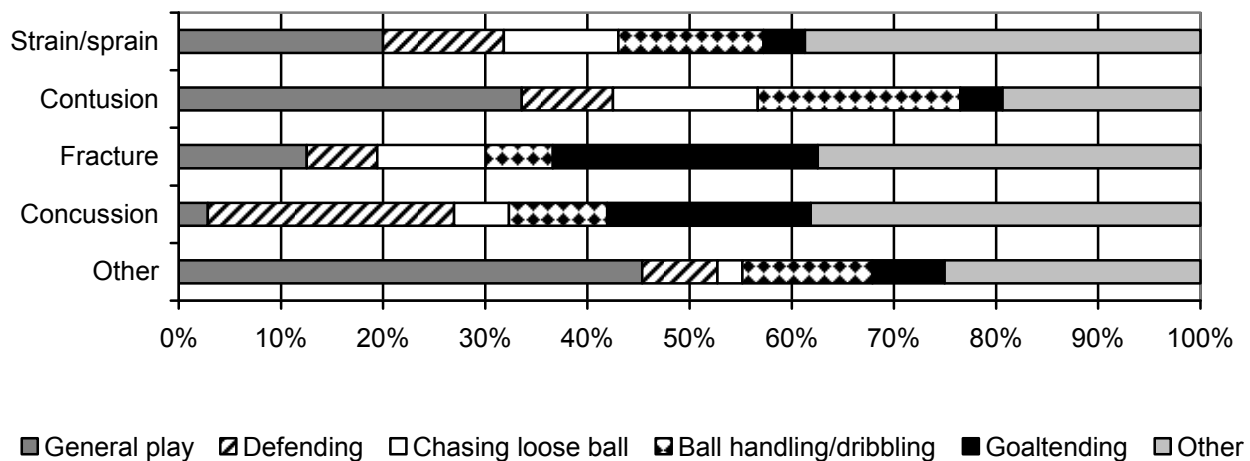


Table 4.9 Activities Leading to Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
General play	12,697	15.4%	20,236	34.1%	32,933	23.2%
Ball handling/dribbling	14,228	17.3%	4,438	7.5%	18,666	13.2%
Defending	9,776	11.9%	6,085	10.3%	15,861	11.2%
Chasing loose ball	9,818	11.9%	3,656	6.2%	13,474	9.5%
Goaltending	7,225	8.8%	6,047	10.2%	13,272	9.4%
Passing (foot)	4,443	5.4%	5,323	9.0%	9,766	6.9%
Shooting (foot)	6,048	7.3%	3,547	6.0%	9,596	6.8%
Heading ball	6,075	7.4%	1,622	2.7%	7,697	5.4%
Receiving pass	3,608	4.4%	1,451	2.4%	5,059	3.6%
Other	8,559	10.3%	6,886	11.6%	15,443	10.8%
Total	82,477	100%	59,291	100%	141,767	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 4.5 Activity Resulting in Boys' Soccer Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 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, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	381	184,268	2.07	192,108
Competition	251	54,670	4.59	123,312
Practice	130	129,598	1.00	68,796

Table 5.2 Demographic Characteristics of Injured Girls' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	42,263 (22.4%)
Sophomore	58,557 (31.1%)
Junior	41,727 (22.1%)
Senior	45,862 (24.3%)
Total[†]	188,409 (100%)
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	15.8 (1.2)
BMI	
Minimum	15.4
Maximum	45.4
Mean (St. Dev.)	21.9 (3.7)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

[†]Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

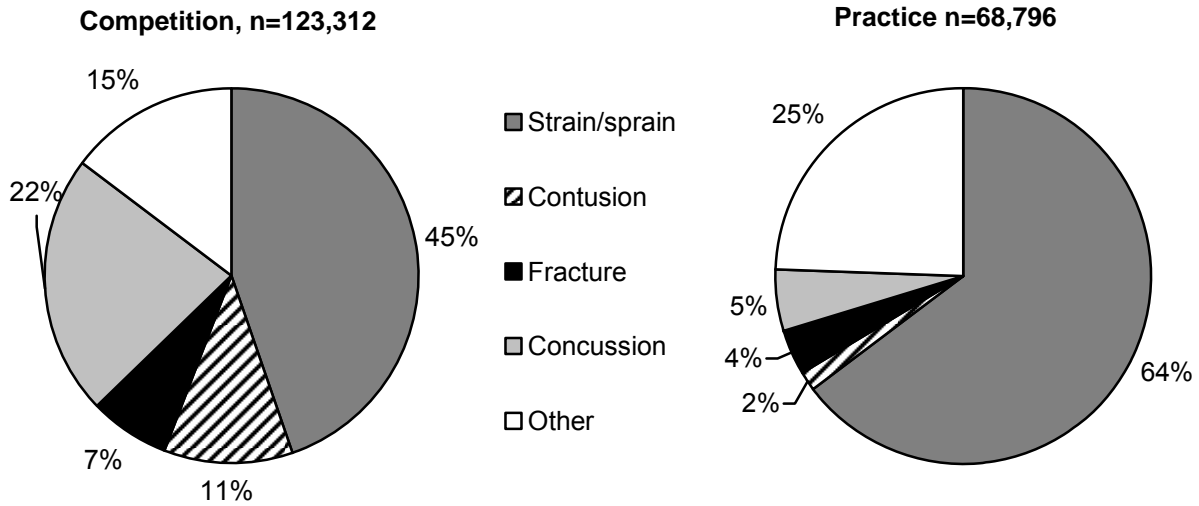


Table 5.3 Body Site of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Head/face	31,654	25.7%	3,873	5.6%	35,527	18.5%
Ankle	19,121	15.5%	15,986	23.2%	35,108	18.3%
Hip/thigh/upper leg	15,703	12.7%	18,168	26.4%	33,871	17.6%
Knee	21,305	17.3%	8,867	12.9%	30,173	15.7%
Foot	8,497	6.9%	5,016	7.3%	13,513	7.0%
Lower leg	5,206	4.2%	6,439	9.4%	11,645	6.1%
Trunk	4,218	3.4%	4,022	5.8%	8,241	4.3%
Hand/wrist	2,857	2.3%	2,261	3.3%	5,118	2.7%
Arm/elbow	3,079	2.5%	866	1.3%	3,946	2.1%
Neck	3,120	2.5%	309	0.4%	3,429	1.8%
Shoulder	1,965	1.6%	558	0.8%	2,522	1.3%
Other	6,585	5.3%	2,430	3.5%	9,015	4.7%
Total	123,312	100%	68,796	100%	192,108	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 5.4 Ten Most Common Girls' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=123,313		Practice n= 68,798		Total n=192,109	
	n	%	n	%	n	%
Ankle strain/sprain	17,214	14.0%	15,856	23.0%	33,070	17.2%
Head/face concussion	27,684	22.5%	3,564	5.2%	31,248	16.3%
Hip/thigh/upper leg strain/sprain	13,802	11.2%	16,324	23.7%	30,126	15.7%
Knee strain/sprain	11,153	9.0%	3,871	5.6%	15,024	7.8%
Knee other	7,758	6.3%	4,735	6.9%	12,493	6.5%
Lower leg other	1,593	1.3%	5,391	7.8%	6,983	3.6%
Trunk strain/sprain	3,707	3.0%	2,430	3.5%	6,136	3.2%
Foot strain/sprain	4,331	3.5%	1,901	2.8%	6,233	3.2%
Foot other	2,020	1.6%	2,446	3.6%	4,466	2.3%
Foot contusion	2,016	1.6%	668	1.0%	2,684	1.4%

Figure 5.2 Time Loss of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

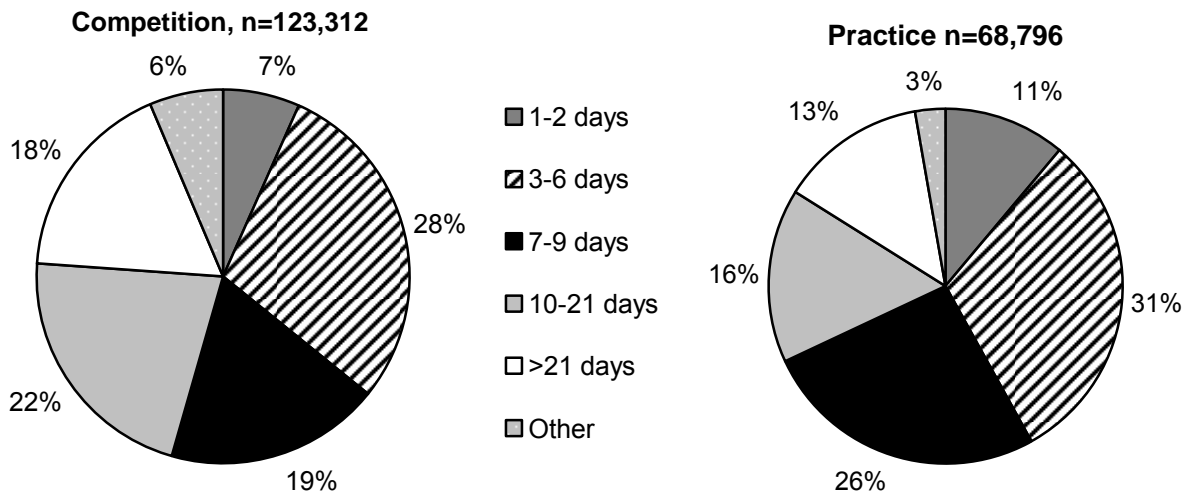


Table 5.5 Girls' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	8,975	7.4%	1,410	2.1%	10,384	5.5%
Did not require surgery	112,559	92.6%	65,434	97.9%	177,993	94.5%
Total	121,534	100%	66,843	100%	188,377	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 5.3 History of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

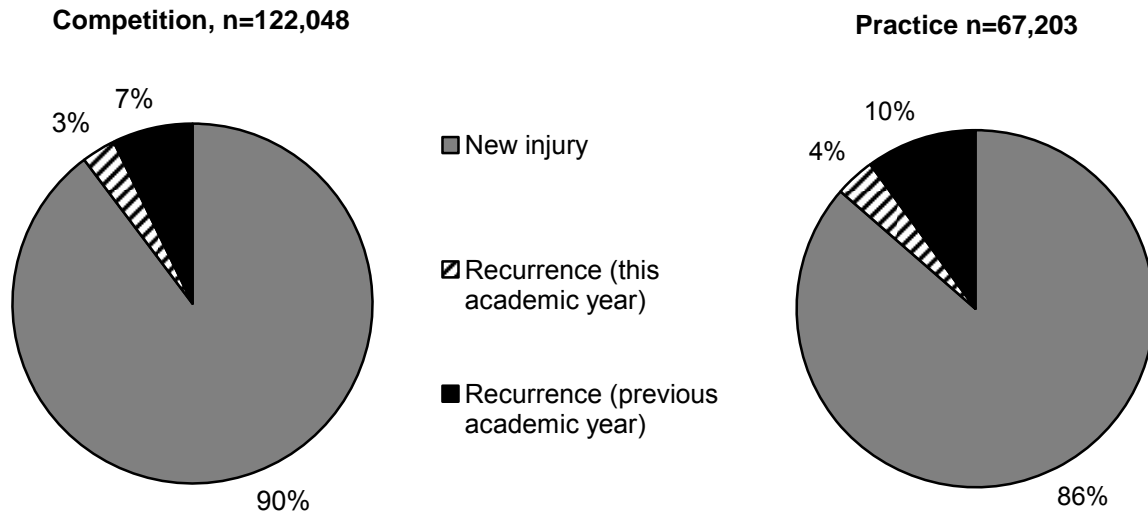


Table 5.6 Time during Season of Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	38,255	19.9%
Regular season	147,297	76.7%
Post season	6,556	3.4%
Total	192,108	100%

Table 5.7 Competition-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,706	1.5%
First half	41,143	36.1%
Second half	71,112	62.3%
Overtime	131	0.1%
Total	114,091	100%
Injury Related to Foul Play		
No	91,373	77.4%
Yes, and ruled foul play	8,966	7.6%
Yes, but not ruled foul play	7,201	6.1%
Unknown	10,448	8.9%
Total	117,988	100%
Field Location		
Top of goal box extended to center line (offense)	36,424	34.1%
Top of goal box extended to center line (defense)	24,861	23.3%
Goal box (defense)	12,955	12.1%
Goal box (offense)	9,550	9.0%
Side of goal box (offense)	9,430	8.8%
Side of goal box (defense)	7,212	6.8%
Off the field	6,239	5.8%
Total	106,671	100%

Table 5.8 Practice-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	10,950	17.8%
Second 1/2 hour	11,969	19.5%
1-2 hours into practice	31,145	50.7%
>2 hours into practice	7,323	11.9%
Total	61,386	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 5.4 Player Position of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

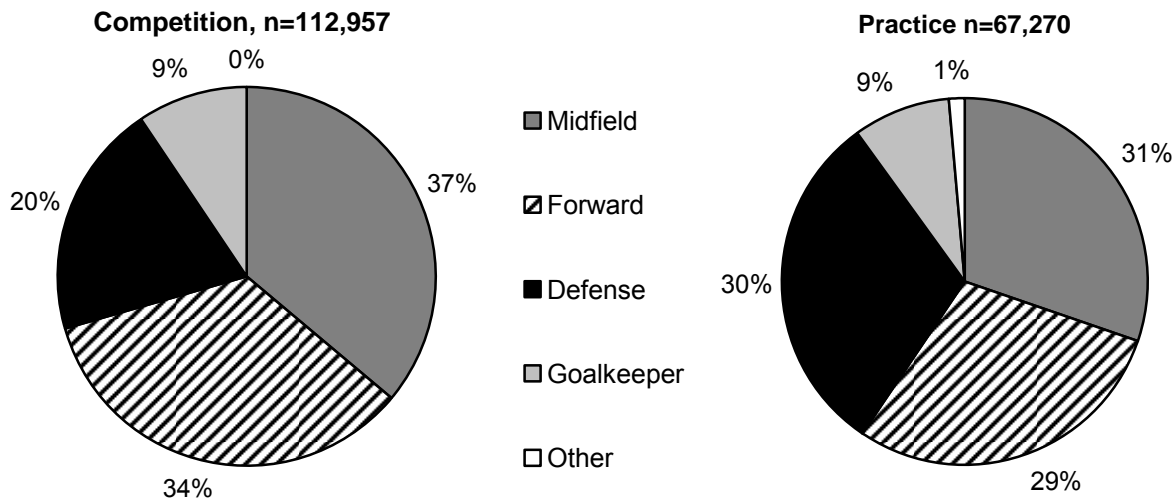
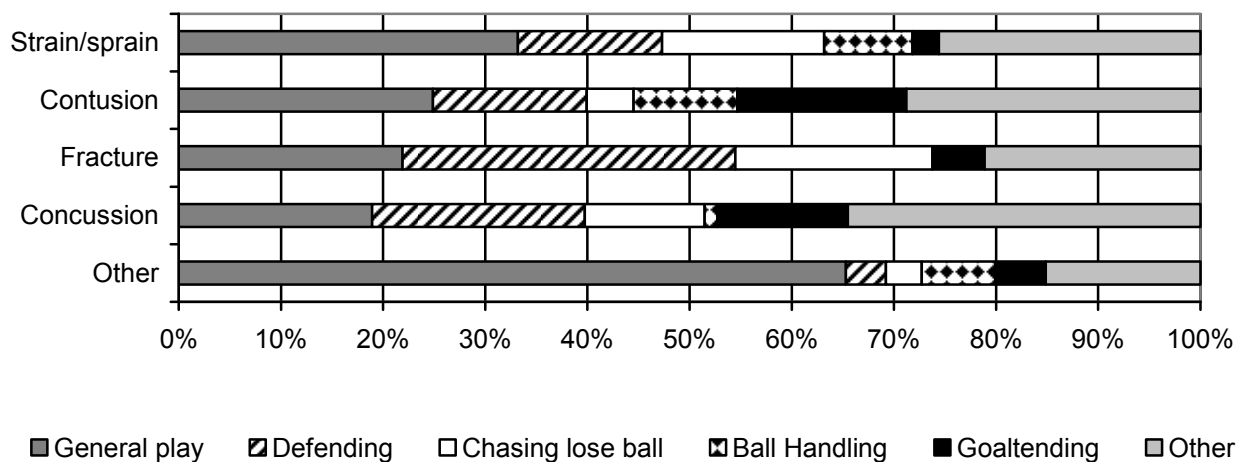


Table 5.9 Activities Leading to Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
General play	34,964	29.6%	31,718	46.6%	66,683	35.8%
Defending	20,622	17.5%	5,859	8.6%	26,481	14.2%
Chasing loose ball	19,566	16.6%	3,165	4.6%	22,731	12.2%
Ball handling/dribbling	10,242	8.7%	2,643	3.9%	12,885	6.9%
Goaltending	7,864	6.7%	2,930	4.3%	10,794	5.8%
Shooting (foot)	2,816	2.4%	7,893	11.6%	10,708	5.8%
Passing (foot)	4,623	3.9%	3,567	5.2%	8,190	4.4%
Receiving pass	5,453	4.6%	2,454	3.6%	7,907	4.2%
Conditioning	0	0.0%	5,193	7.6%	5,193	2.8%
Blocking shot	2,723	2.3%	0	0.0%	2,723	1.5%
Other	9,128	7.7%	2,686	3.9%	11,814	6.3%
Total	118,001	100%	68,108	100%	186,109	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 5.5 Activity Resulting in Girls' Soccer Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year



VI. Volleyball Injury Epidemiology

Table 6.1 Volleyball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	167	188,075	0.89	56,609
Competition	58	64,294	0.90	19,764
Practice	109	123,781	0.88	36,845

Table 6.2 Demographic Characteristics of Injured Volleyball Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	16,969 (30.2%)
Sophomore	14,949 (26.6%)
Junior	12,211 (21.7%)
Senior	12,022 (21.4%)
Total[†]	56,151 (100%)
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.5 (1.3)
BMI	
Minimum	16.6
Maximum	34.1
Mean (St. Dev.)	22.0 (4.0)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

[†]Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

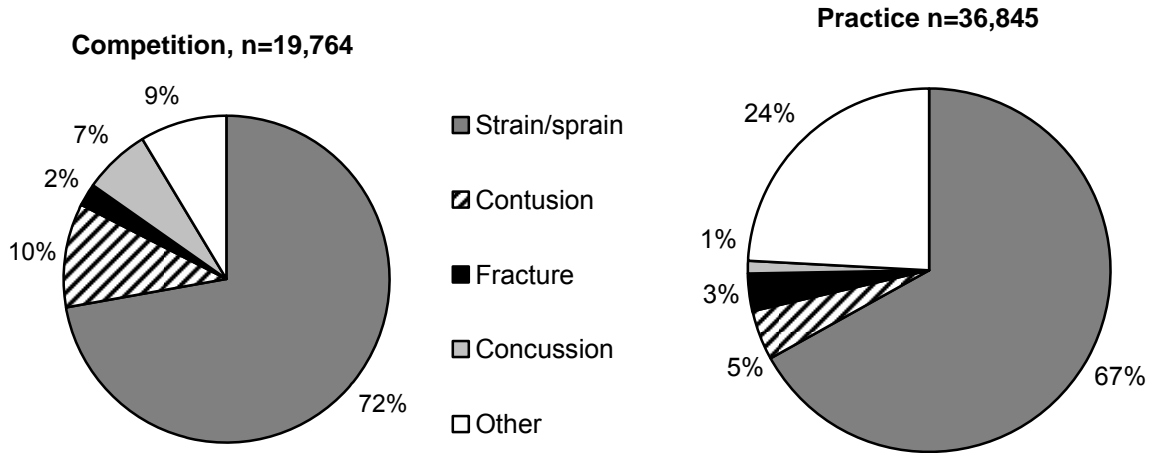


Table 6.3 Body Site of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	8,622	43.6%	11,926	32.4%	20,548	36.3%
Shoulder	694	3.5%	6,018	16.3%	6,712	11.9%
Knee	2,086	10.6%	4,133	11.2%	6,219	11.0%
Hand/wrist	1,475	7.5%	3,734	10.1%	5,209	9.2%
Hip/thigh/upper leg	1,480	7.5%	1,920	5.2%	3,401	6.0%
Lower leg	1,050	5.3%	2,372	6.4%	3,423	6.0%
Trunk	788	4.0%	2,152	5.8%	2,941	5.2%
Arm/elbow	1,457	7.4%	788	2.1%	2,246	4.0%
Head/face	1,327	6.7%	474	1.3%	1,802	3.2%
Foot	314	1.6%	1,481	4.0%	1,795	3.2%
Neck	468	2.4%	379	1.0%	848	1.5%
Other	0	0.0%	1,467	4.0%	1,467	2.6%
Total	19,764	100%	36,845	100%	56,609	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 6.4 Ten Most Common Volleyball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=19,760		Practice n=36,844		Total n=56,606	
	n	%	n	%	n	%
Ankle strain/sprain	8,622	43.6%	11,926	32.4%	20,548	36.3%
Hand/wrist strain/sprain	1,244	6.3%	2,881	7.8%	4,125	7.3%
Shoulder other	379	1.9%	3,326	9.0%	3,705	6.5%
Shoulder strain/sprain	314	1.6%	2,692	7.3%	3,007	5.3%
Knee other	474	2.4%	2,413	6.5%	2,887	5.1%
Knee strain/sprain	1,416	7.2%	1,233	3.3%	2,649	4.7%
Trunk strain/sprain	474	2.4%	1,998	5.4%	2,472	4.4%
Hip/thigh/upper leg strain/sprain	694	3.5%	1,446	3.9%	2,140	3.8%
Lower leg strain/sprain	671	3.4%	1,073	2.9%	1,744	3.1%
Head/face concussion	1,327	6.7%	394	1.1%	1,722	3.0%

Figure 6.2 Time Loss of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

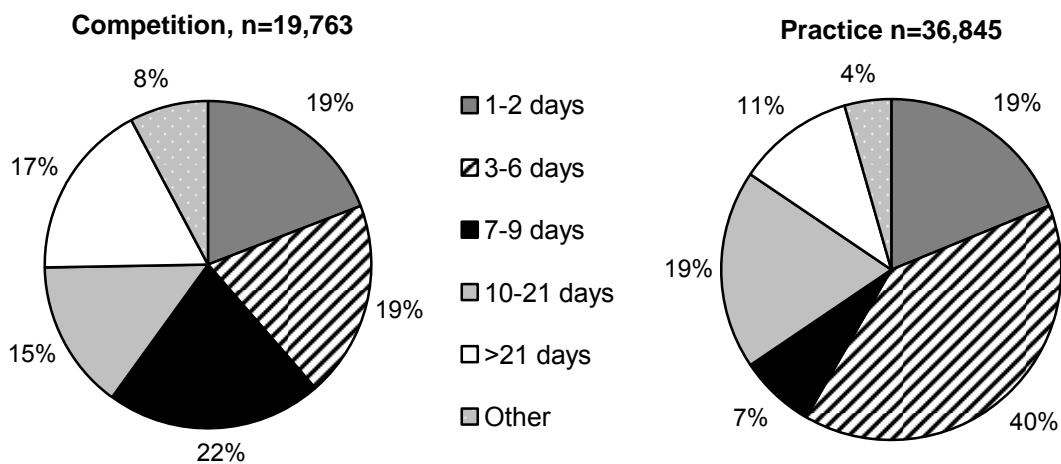


Table 6.5 Volleyball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	788	2.2%	0	0.0%	788	1.4%
Did not require surgery	18,502	97.8%	35,109	100.0%	53,611	98.6%
Total	19,290	100%	35,109	100%	54,399	100%

Figure 6.3 History of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

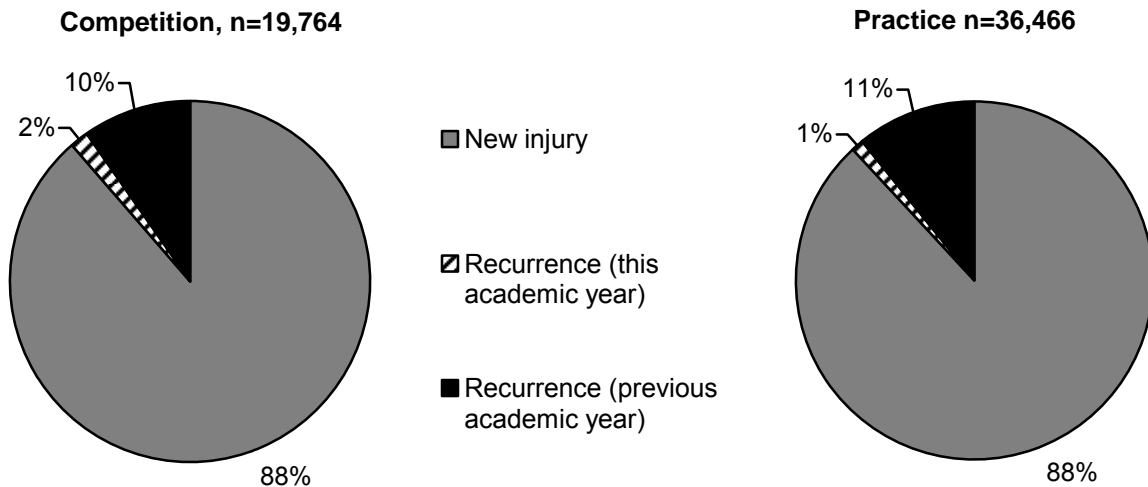


Table 6.6 Time during Season of Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	14,553	25.9%
Regular season	40,021	71.2%
Post season	1,657	2.9%
Total	56,230	100%

Table 6.7 Competition-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	3,170	16.2%
First game	4,122	21.0%
Second game	7,913	40.4%
Third game	4,399	22.4%
Total	19,604	100%
Injury Related to Foul Play		
No	19,305	100.0%
Yes, and ruled foul play	0	0.0%
Yes, but not ruled foul play	0	0.0%
Unknown	0	0.0%
Total	19,305	100%
Court Location		
Middle forward	7,224	39.1%
Right forward	4,987	27.0%
Left back	3,304	17.9%
Left forward	2,517	13.6%
Outside court (your side)	308	1.7%
Right back (server)	116	0.6%
Off the court	0	0.0%
Outside court (opponent's side)	0	0.0%
Total	18,455	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 6.8 Practice-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	3,741	10.9%
Second 1/2 hour	10,858	31.6%
1-2 hours into practice	14,471	42.1%
>2 hours into practice	5,340	15.5%
Total	34,410	100%

Figure 6.4 Player Position of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

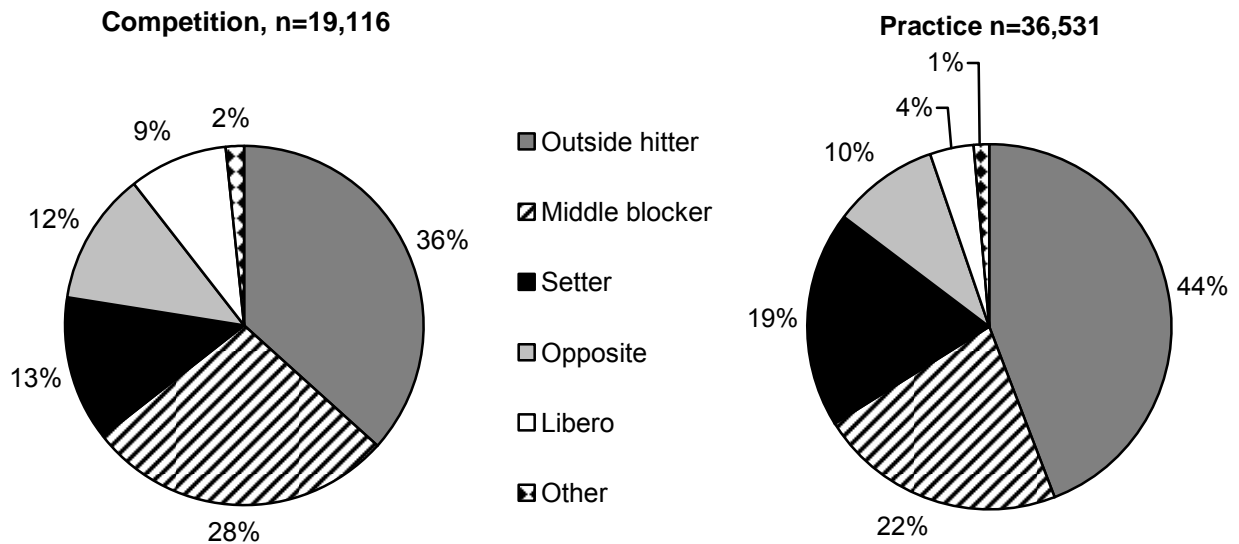
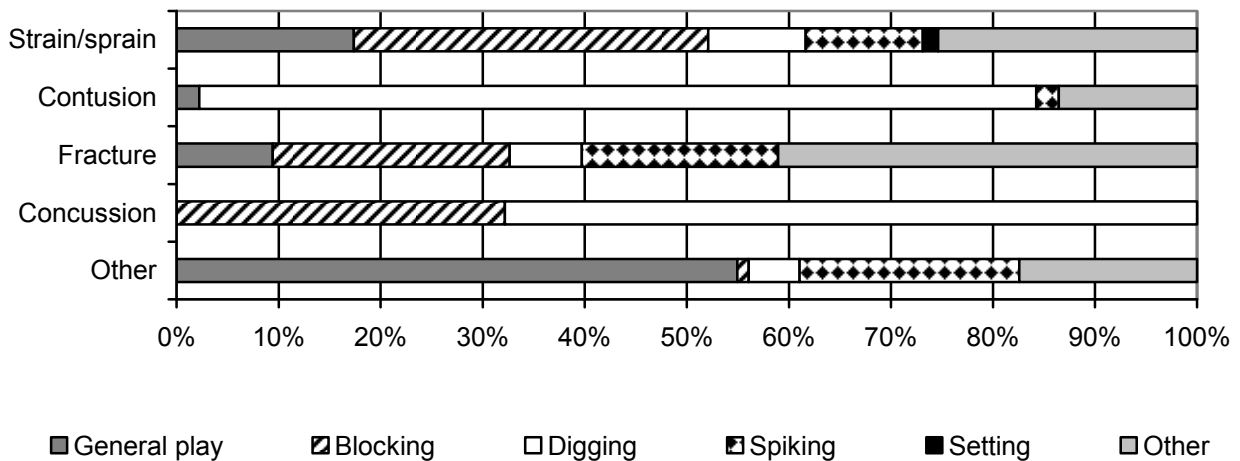


Table 6.9 Activities Leading to Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Blocking	5,638	28.9%	8,698	24.2%	14,336	25.8%
General play	3,173	16.3%	9,339	26.0%	12,511	22.6%
Digging	6,097	31.3%	2,295	6.4%	8,392	15.1%
Spiking	1,971	10.1%	5,033	14.0%	7,004	12.6%
Passing	1,547	7.9%	4,027	11.2%	5,574	10.0%
Serving	0	0.0%	3,034	8.4%	3,034	5.5%
Conditioning	0	0.0%	2,727	7.6%	2,727	4.9%
Setting	575	2.9%	0	0.0%	575	1.0%
Other	488	2.5%	825	2.3%	1,313	2.4%
Total	19,489	100%	35,978	100%	55,467	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Figure 6.5 Activity Resulting in Volleyball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 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, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	319	236,419	1.35	79,230
Competition	160	69,043	2.32	40,152
Practice	159	167,376	0.95	39,078

Table 7.2 Demographic Characteristics of Injured Boys' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	17,446 (22.0%)
Sophomore	18,118 (23.0%)
Junior	24,056 (30.5%)
Senior	19,143 (24.3%)
Total†	78,763 (100%)
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	16.1 (1.2)
BMI	
Minimum	14.3
Maximum	42.3
Mean (St. Dev.)	22.8 (3.1)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

†Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

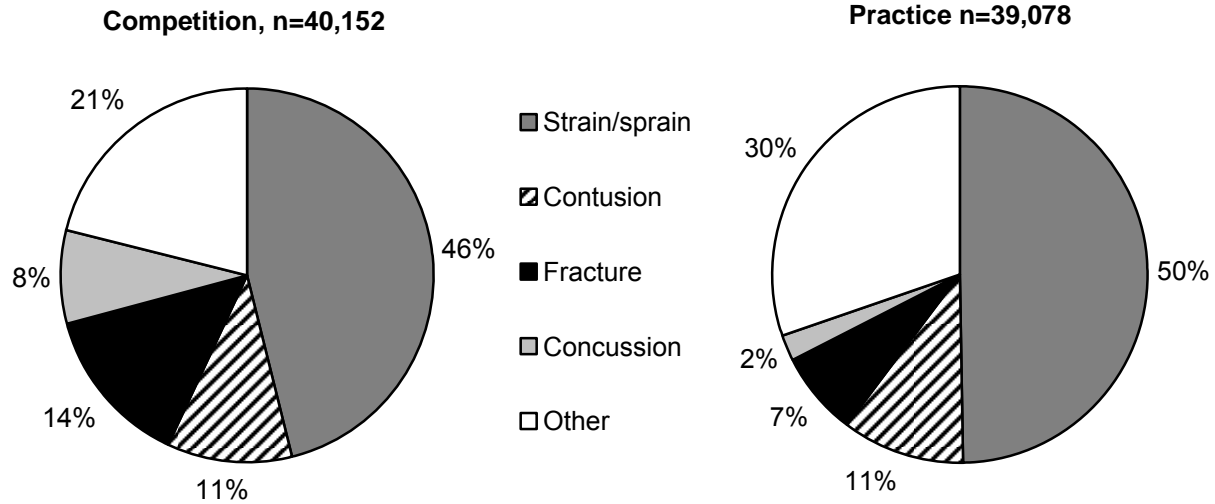


Table 7.3 Body Site of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	12,023	29.9%	11,553	29.6%	23,575	29.8%
Head/face	8,311	20.7%	4,167	10.7%	12,478	15.7%
Knee	4,905	12.2%	5,117	13.1%	10,021	12.6%
Hand/wrist	3,236	8.1%	4,571	11.7%	7,807	9.9%
Hip/thigh/upper leg	2,716	6.8%	3,792	9.7%	6,508	8.2%
Foot	2,800	7.0%	3,599	9.2%	6,399	8.1%
Trunk	1,210	3.0%	2,840	7.3%	4,050	5.1%
Shoulder	1,958	4.9%	1,269	3.2%	3,226	4.1%
Arm/elbow	1,746	4.3%	1,073	2.7%	2,819	3.6%
Lower leg	996	2.5%	633	1.6%	1,629	2.1%
Neck	0	0.0%	0	0.0%	0	0.0%
Other	251	0.6%	466	1.2%	717	0.9%
Total	40,152	100%	39,078	100%	79,230	100%

Table 7.4 Ten Most Common Boys' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=40,151		Practice n=39,075		Total n=79,231	
	n	%	n	%	n	%
Ankle strain/sprain	11,863	29.5%	10,999	28.1%	22,862	28.9%
Knee other	2,393	6.0%	2,543	6.5%	4,936	6.2%
Head/face other	2,703	6.7%	2,232	5.7%	4,936	6.2%
Head/face concussion	3,216	8.0%	808	2.1%	4,024	5.1%
Hip/thigh/upper leg strain/sprain	981	2.4%	2,994	7.7%	3,976	5.0%
Knee strain/sprain	1,972	4.9%	1,738	4.4%	3,710	4.7%
Hand/wrist strain/sprain	1,608	4.0%	1,229	3.1%	2,837	3.6%
Foot other	0	0.0%	2,835	7.3%	2,835	3.6%
Head/face fracture	2,175	5.4%	633	1.6%	2,808	3.5%
Hip/thigh/upper leg contusion	1,735	4.3%	2,994	7.7%	2,532	3.2%

Figure 7.2 Time Loss of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

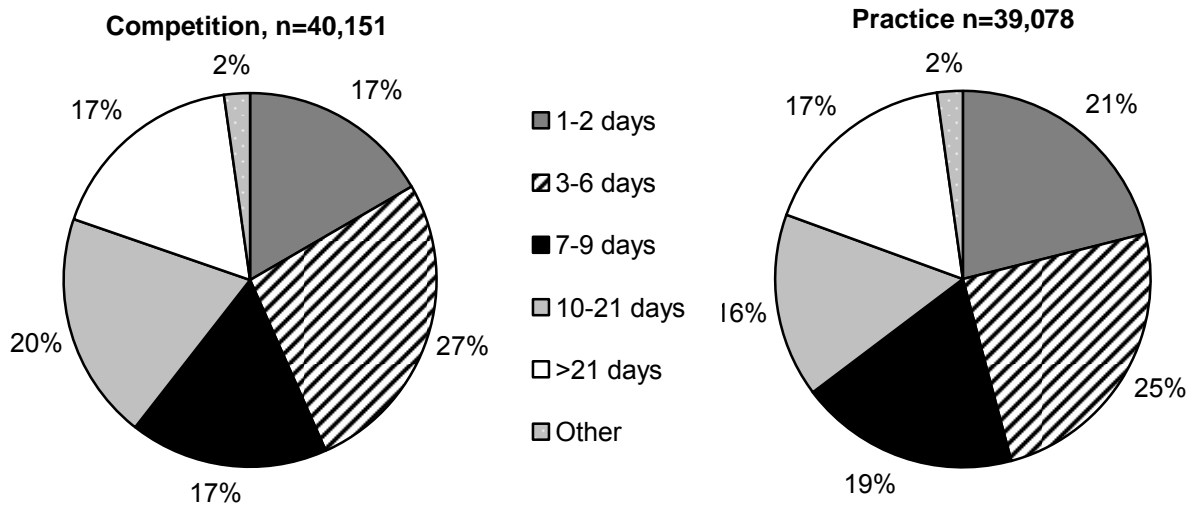


Table 7.5 Boys' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,748	7.1%	2,549	6.8%	5,296	6.9%
Did not require surgery	35,885	92.9%	35,164	93.2%	71,049	93.1%
Total	38,633	100%	37,713	100%	76,346	100%

Figure 7.3 History of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

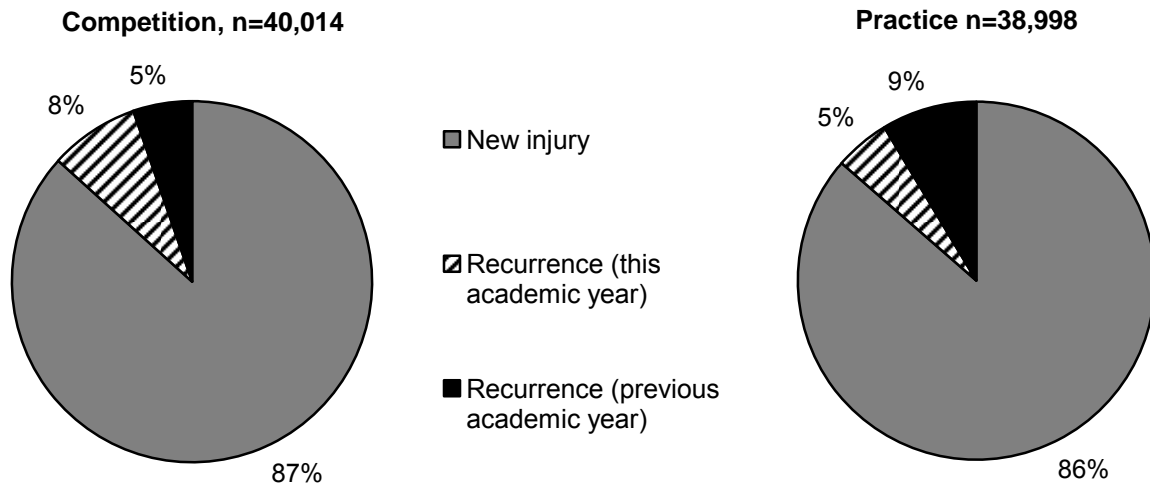


Table 7.6 Time during Season of Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	14,862	18.8%
Regular season	62,870	79.4%
Post season	1,498	1.9%
Total	79,230	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 7.7 Competition-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	745	1.9%
First quarter	4,589	11.5%
Second quarter	9,480	23.8%
Third quarter	14,116	35.4%
Fourth quarter	10,399	26.1%
Overtime	571	1.4%
Total	39,901	100%
Injury Related to Foul Play		
No	30,685	80.9%
Yes, and ruled foul play	4,572	12.0%
Yes, but not ruled foul play	750	2.0%
Unknown	1,941	5.1%
Total	37,948	100%
Court Location		
Inside lane (offense)	10,663	26.8%
Inside lane (defense)	10,648	26.8%
Between 3 pt arc and lane (defense)	4,687	11.8%
Between 3 pt arc and lane (offense)	4,339	10.9%
Outside 3 point arc (defense)	2,964	7.4%
Outside 3 point arc (offense)	2,880	7.2%
Backcourt	2,192	5.5%
Out of bounds	1,420	3.6%
Off the court	0	0.0%
Total	39,793	100%

*Totals and n's are not always equal due to slight rounding of weighted number of injuries

Table 7.8 Practice-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	4,716	13.2%
Second 1/2 hour	9,605	26.8%
1-2 hours into practice	17,313	48.4%
>2 hours into practice	4,140	11.6%
Total	35,774	100%

Figure 7.4 Player Position of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

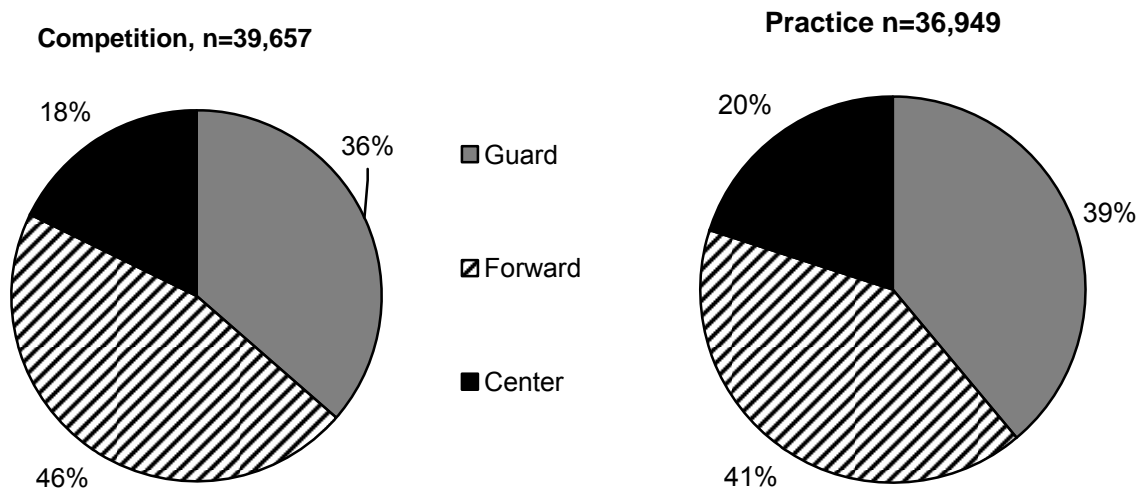
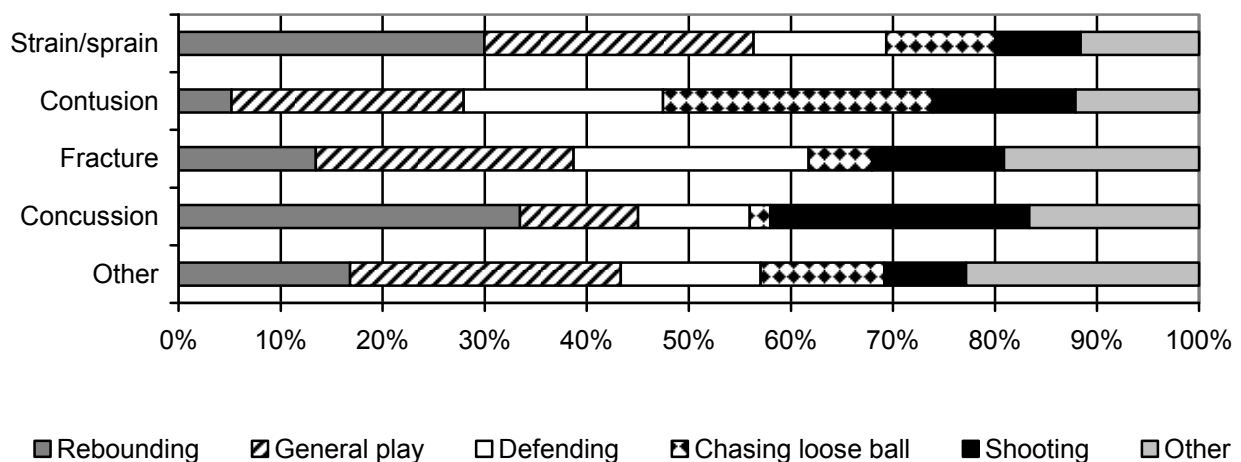


Table 7.9 Activities Leading to Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
General play	4,866	12.1%	14,701	39.0%	19,566	25.1%
Rebounding	10,982	27.4%	6,494	17.2%	17,476	22.5%
Defending	5,956	14.8%	5,592	14.8%	11,549	14.8%
Chasing loose ball	7,034	17.5%	2,177	5.8%	9,211	11.8%
Shooting	5,310	13.2%	2,659	7.1%	7,969	10.2%
Ball handling/dribbling	3,342	8.3%	1,511	4.0%	4,853	6.2%
Receiving pass	188	0.5%	2,237	5.9%	2,425	3.1%
Conditioning	251	0.6%	1,108	2.9%	1,359	1.7%
Passing	246	0.6%	108	0.3%	354	0.5%
Other	1,976	4.9%	1,094	2.9%	3,070	3.9%
Total	40,152	100%	37,680	100%	77,832	100%

Figure 7.5 Activity Resulting in Boys' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year



VIII. Girls' Basketball Injury Epidemiology

Table 8.1 Girls' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	295	191,871	1.54	64,933
Competition	177	56,555	3.13	38,277
Practice	118	135,316	0.87	26,656

Table 8.2 Demographic Characteristics of Injured Girls' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	16,184 (25.3%)
Sophomore	15,619 (24.4%)
Junior	15,361 (24.0%)
Senior	16,920 (26.4%)
Total[†]	64,084 (100%)
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.9 (1.3)
BMI	
Minimum	16.9
Maximum	40.4
Mean (St. Dev.)	22.5 (3.6)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

[†]Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

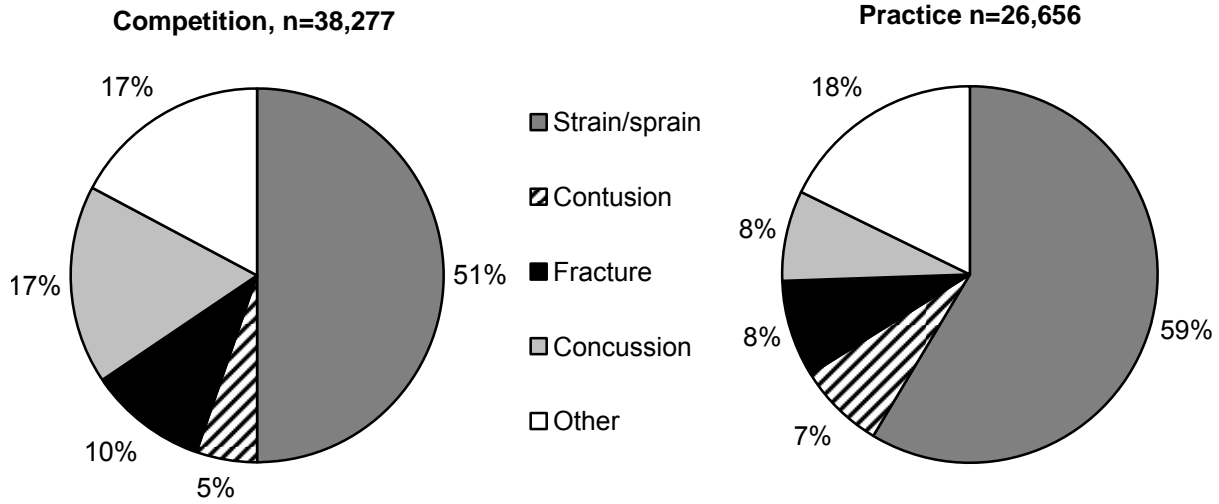


Table 8.3 Body Site of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	12,440	32.5%	7,765	29.1%	20,206	31.1%
Head/face	10,134	26.5%	2,512	9.4%	12,646	19.5%
Knee	5,455	14.3%	5,267	19.8%	10,722	16.5%
Hand/wrist	3,296	8.6%	2,788	10.5%	6,084	9.4%
Lower leg	1,925	5.0%	1,362	5.1%	3,286	5.1%
Shoulder	1,833	4.8%	1,264	4.7%	3,097	4.8%
Foot	903	2.4%	1,926	7.2%	2,829	4.4%
Trunk	907	2.4%	1,583	5.9%	2,490	3.8%
Hip/thigh/upper leg	396	1.0%	1,576	5.9%	1,972	3.0%
Neck	277	0.7%	251	0.9%	529	0.8%
Arm/elbow	349	0.9%	0	0.0%	349	0.5%
Other	360	0.9%	360	1.4%	721	1.1%
Total	38,277	100%	26,656	100%	64,932	100%

Table 8.4 Ten Most Common Girls' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=38,275		Practice n=26,651		Total n=64,931	
	n	%	n	%	n	%
Ankle strain/sprain	12,368	32.3%	7,350	27.6%	19,718	30.4%
Head/face concussion	6,643	17.4%	2,057	7.7%	8,700	13.4%
Knee strain/sprain	3,643	9.5%	3,270	12.3%	6,913	10.6%
Hand/wrist fracture	1,718	4.5%	903	3.4%	2,621	4.0%
Shoulder other	1,418	3.7%	808	3.0%	2,226	3.4%
Head/face other	2,229	5.8%	0	0.0%	2,229	3.4%
Hand/wrist strain/sprain	714	1.9%	1,429	5.4%	2,143	3.3%
Knee other	972	2.5%	924	3.5%	1,896	2.9%
Knee contusion	731	1.9%	1,073	4.0%	1,804	2.8%
Hip/thigh/upper leg strain/sprain	324	0.8%	1,324	5.0%	1,648	2.5%

Figure 8.2 Time Loss of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

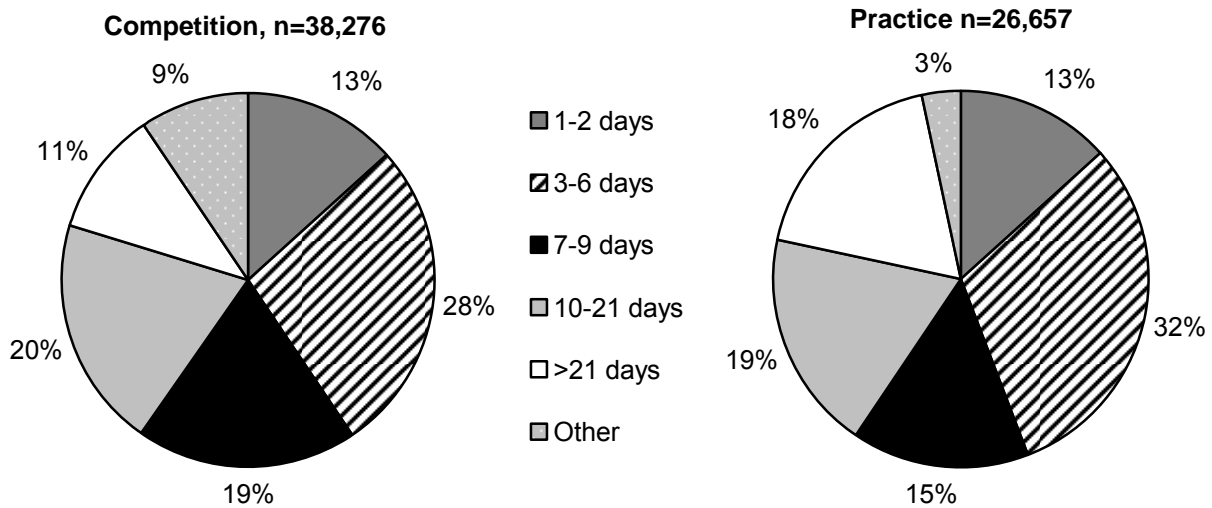


Table 8.5 Girls' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,414	9.2%	2,131	8.3%	5,545	8.8%
Did not require surgery	33,619	90.8%	23,629	91.7%	57,248	91.2%
Total	37,033	100%	25,760	100%	62,793	100%

Figure 8.3 History of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

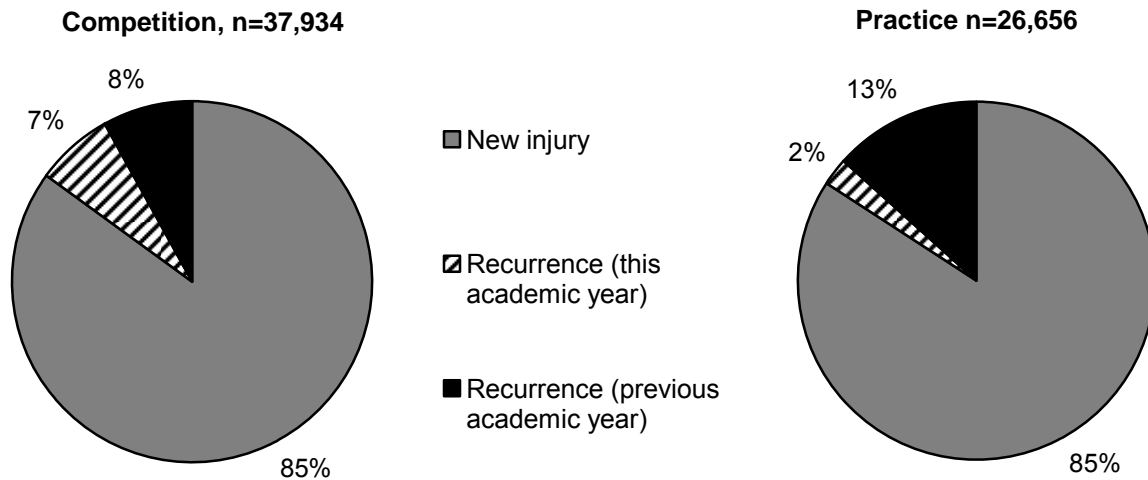


Table 8.6 Time during Season of Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	13,822	21.3%
Regular season	49,131	75.7%
Post season	1,979	3.0%
Total	64,932	100%

Table 8.7 Competition-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,022	2.7%
First quarter	4,310	11.6%
Second quarter	10,947	29.4%
Third quarter	10,151	27.2%
Fourth quarter	10,850	29.1%
Total	37,280	100%
Injury Related to Foul Play		
No	30,764	86.2%
Yes, and ruled foul play	1,770	5.0%
Yes, but not ruled foul play	1,921	5.4%
Unknown	1,249	3.5%
Total	35,705	100%
Court Location		
Inside lane (defense)	8,384	23.2%
Inside lane (offense)	8,255	22.8%
Outside 3 point arc (offense)	4,915	13.6%
Between 3 pt arc and lane (offense)	4,731	13.1%
Outside 3 point arc (defense)	4,388	12.1%
Between 3 pt arc and lane (defense)	3,191	8.8%
Backcourt	1,672	4.6%
Out of bounds	627	1.7%
Off the court	0	0.0%
Total	36,165	100%

Table 8.8 Practice-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	4,958	20.1%
Second 1/2 hour	6,490	26.3%
1-2 hours into practice	12,100	49.0%
>2 hours into practice	1,137	4.6%
Total	24,686	100%

Figure 8.4 Player Position of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

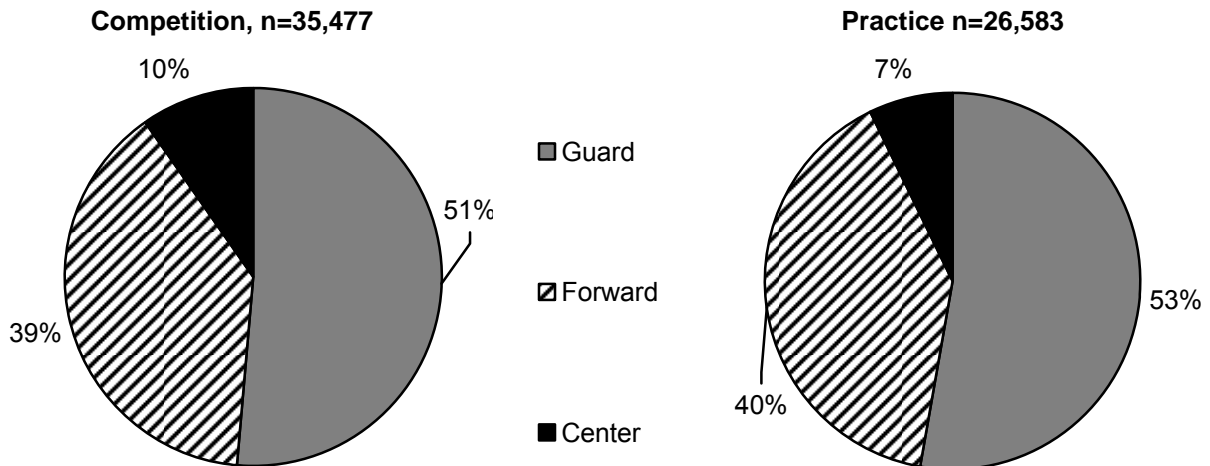
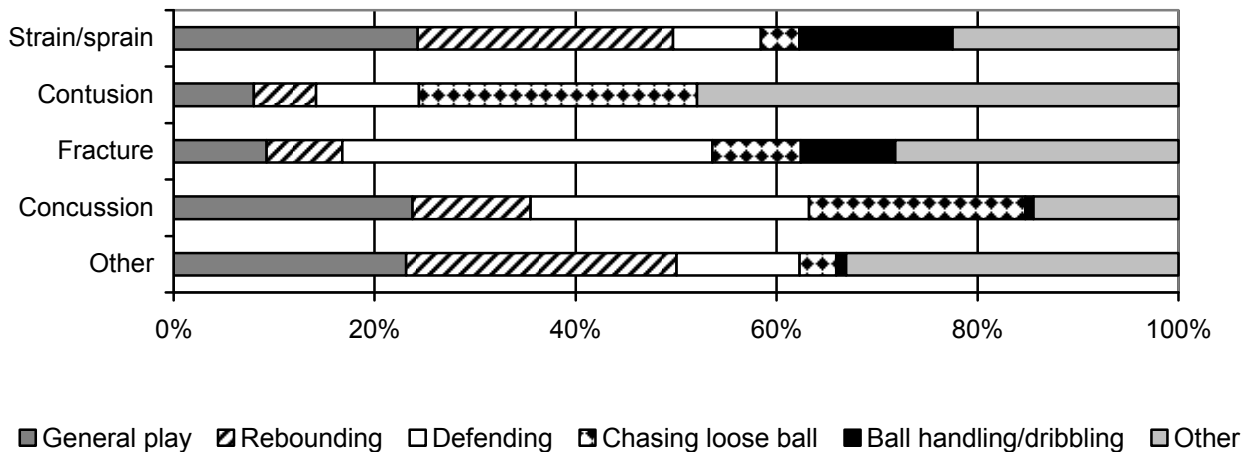


Table 8.9 Activities Leading to Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Rebounding	8,071	21.2%	5,867	22.1%	13,939	21.6%
General play	6,348	16.7%	7,171	27.0%	13,519	20.9%
Defending	5,472	14.4%	3,970	14.9%	9,442	14.6%
Shooting	4,440	11.7%	1,598	6.0%	6,038	9.4%
Receiving pass	3,646	9.6%	2,224	8.4%	5,870	9.1%
Chasing loose ball	4,577	12.1%	679	2.6%	5,257	8.1%
Ball handling/dribbling	3,426	9.0%	866	3.3%	4,292	6.6%
Other	2,007	5.3%	4,208	15.8%	6,213	9.6%
Total	37,987	100%	26,583	100%	64,570	100%

Figure 8.5 Activity Resulting in Girls' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year



IX. Wrestling Injury Epidemiology

Table 9.1 Wrestling Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	392	180,641	2.17	88,996
Competition	160	47,770	3.35	39,029
Practice	232	132,871	1.75	49,967

Table 9.2 Demographic Characteristics of Injured Wrestlers, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	18,109 (20.5%)
Sophomore	24,064 (27.2%)
Junior	23,310 (26.3%)
Senior	23,024 (26.0%)
Total[†]	88,507 (100%)
Age (years)	
Minimum	14
Maximum	19
Mean (St. Dev.)	16.1 (1.3)
BMI	
Minimum	17.2
Maximum	49.0
Mean (St. Dev.)	23.7 (4.4)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

[†]Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

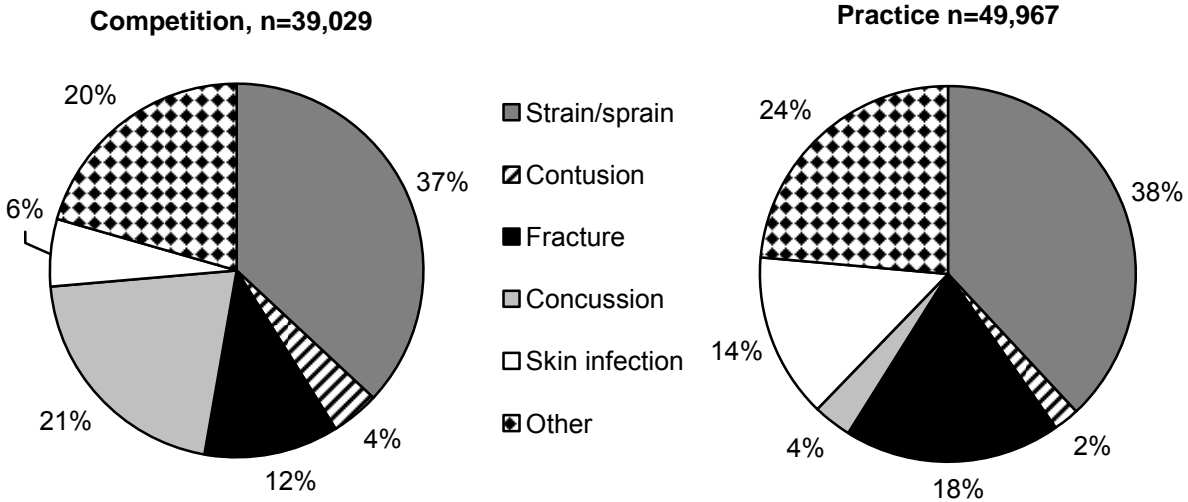


Table 9.3 Body Site of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Shoulder	9,517	24.4%	7,106	14.2%	16,623	18.7%
Head/face	10,032	25.7%	5,201	10.4%	15,234	17.1%
Knee	3,294	8.4%	7,837	15.7%	11,130	12.5%
Hand/wrist	2,204	5.6%	8,385	16.8%	10,589	11.9%
Arm/elbow	2,900	7.4%	4,556	9.1%	7,457	8.4%
Trunk	2,905	7.4%	4,293	8.6%	7,198	8.1%
Ankle	2,434	6.2%	4,259	8.5%	6,693	7.5%
Foot	2,290	5.9%	2,536	5.1%	4,826	5.4%
Lower leg	0	0.0%	2,476	5.0%	2,476	2.8%
Neck	309	0.8%	1,187	2.4%	1,496	1.7%
Hip/thigh/upper leg	589	1.5%	679	1.4%	1,268	1.4%
Other	2,555	6.5%	1,451	2.9%	4,006	4.5%
Total	39,029	100%	49,967	100%	88,996	100%

Table 9.4 Ten Most Common Wrestling Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=39,029		Practice n=49,966		Total n=88,995	
	n	%	n	%	n	%
Shoulder strain/sprain	6,722	17.2%	4,663	9.3%	11,384	12.8%
Head/face concussion	8,086	20.7%	1,771	3.5%	9,858	11.1%
Ankle strain/sprain	2,364	6.1%	3,544	7.1%	5,908	6.6%
Knee other	1,474	3.8%	3,951	7.9%	5,425	6.1%
Head/face other	1,876	4.8%	3,311	6.6%	5,187	5.8%
Hand/wrist fracture	160	0.4%	4,989	10.0%	5,150	5.8%
Shoulder other	2,795	7.2%	2,325	4.7%	5,120	5.8%
Knee strain/sprain	1,567	4.0%	3,455	6.9%	5,022	5.6%
Hand/wrist other	1,382	3.5%	2,153	4.3%	3,535	4.0%
Arm/elbow other	695	1.8%	2,609	5.2%	3,304	3.7%

Figure 9.2 Time Loss of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

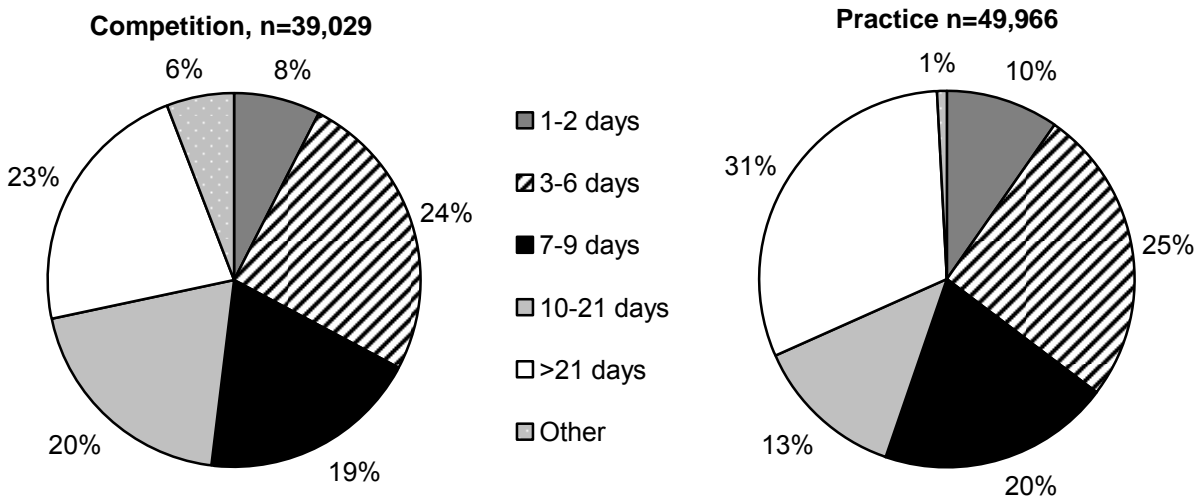


Table 9.5 Wrestling Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,090	5.7%	2,872	5.9%	4,961	5.8%
Did not require surgery	34,275	94.3%	46,198	94.1%	80,473	94.2%
Total	36,365	100%	49,070	100%	85,435	100%

Figure 9.3 History of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

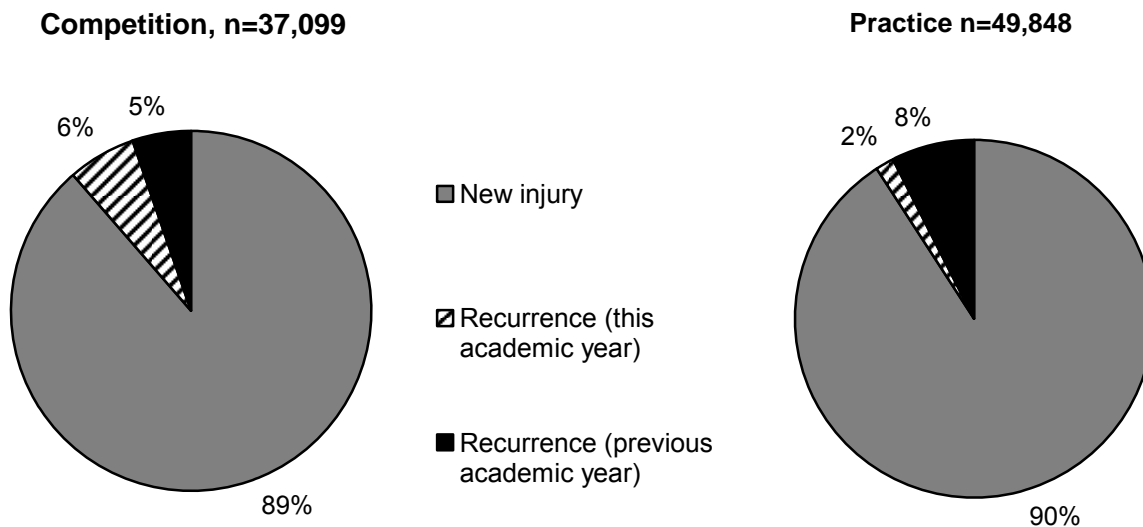


Table 9.6 Time during Season of Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	16,551	19.0%
Regular season	67,052	76.9%
Post season	3,642	4.2%
Total	87,244	100%

Table 9.7 Competition-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	611	1.7%
First period	5,971	16.7%
Second period	19,127	53.6%
Third period	9,483	26.6%
Overtime	462	1.3%
Total	35,655	100%
Injury Related to Foul Play		
No	27,461	81.0%
Yes, and ruled foul play	0	0.0%
Yes, but not ruled foul play	3,283	9.7%
Unknown	3,147	9.3%
Total	33,892	100%
Mat Location*		
Within circle	72,995	85.4%
Out of bounds	5,450	6.4%
Off mat	7,053	8.2%
Total	85,498	100%

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

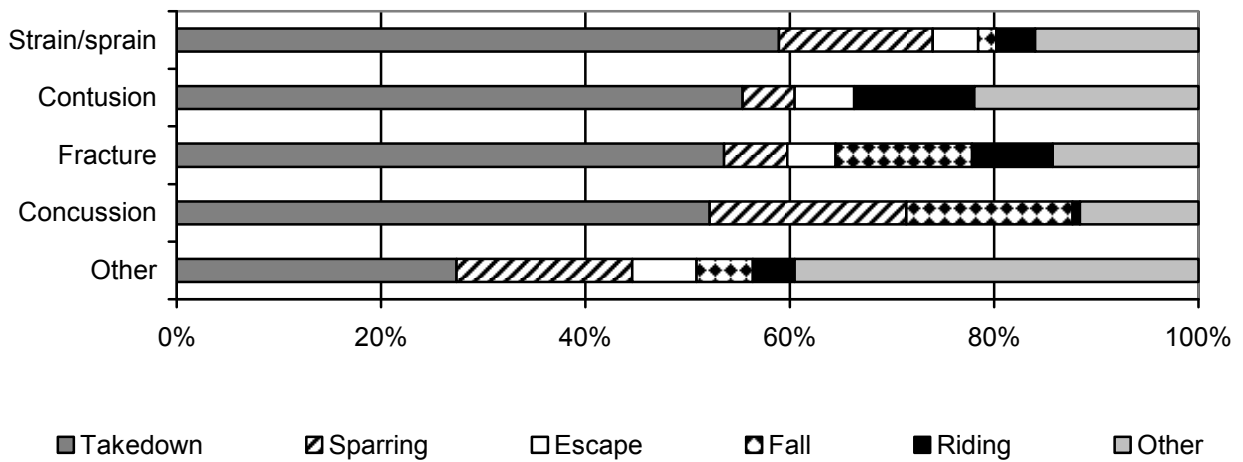
Table 9.8 Practice-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	4,266	9.5%
Second 1/2 hour	9,430	21.1%
1-2 hours into practice	26,412	59.0%
>2 hours into practice	4,643	10.4%
Total	44,750	100%

Table 9.9 Activities Leading to Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Takedown	18,492	50.3%	22,523	45.2%	41,014	47.3%
Sparring	3,527	9.6%	9,042	18.1%	12,569	14.5%
N/A (Skin infection, heat illness)	571	1.6%	6,815	13.7%	7,386	8.5%
Fall	3,412	9.3%	2,098	4.2%	5,510	6.4%
Escape	1,763	4.8%	2,226	4.5%	3,989	4.6%
Riding	1,706	4.6%	2,123	4.3%	3,830	4.4%
Conditioning	372	1.0%	2,898	5.8%	3,270	3.8%
Reversal	393	1.1%	1,372	2.8%	1,765	2.0%
Other	6,562	17.8%	751	1.5%	7,313	8.4%
Total	36,798	100%	49,848	100%	86,646	100%

Figure 9.4 Activity Resulting in Wrestling Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year



X. Baseball Injury Epidemiology

Table 10.1 Baseball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	144	185,622	0.78	39,869
Competition	86	65,359	1.32	25,584
Practice	58	120,263	0.48	14,285

Table 10.2 Demographic Characteristics of Injured Baseball Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	7,980 (20.1%)
Sophomore	11,441 (28.8%)
Junior	11,750 (29.5%)
Senior	8,622 (21.7%)
Total[†]	39,793 (100%)
Age (years)	
Minimum	14
Maximum	19
Mean (St. Dev.)	16.2 (1.1)
BMI	
Minimum	18.7
Maximum	38.1
Mean (St. Dev.)	24.9 (3.7)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

[†]Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

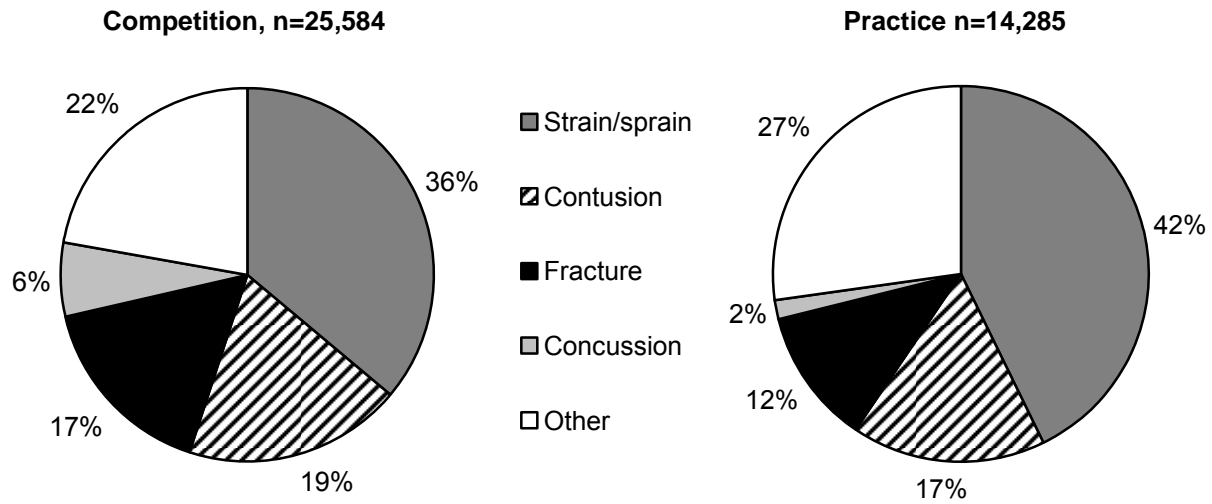


Table 10.3 Body Site of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Head/face	6,276	24.5%	2,967	20.8%	9,243	23.2%
Shoulder	4,210	16.5%	3,057	21.4%	7,267	18.2%
Hand/wrist	3,720	14.5%	2,377	16.6%	6,097	15.3%
Arm/elbow	3,636	14.2%	644	4.5%	4,280	10.7%
Hip/thigh/upper leg	1,463	5.7%	1,640	11.5%	3,103	7.8%
Ankle	1,601	6.3%	570	4.0%	2,171	5.4%
Knee	1,467	5.7%	702	4.9%	2,169	5.4%
Lower leg	1,863	7.3%	208	1.5%	2,071	5.2%
Trunk	769	3.0%	983	6.9%	1,752	4.4%
Foot	580	2.3%	920	6.4%	1,500	3.8%
Neck	0	0.0%	77	0.5%	77	0.2%
Other	0	0.0%	141	1.0%	141	0.4%
Total	25,584	100%	14,285	100%	39,870	100%

Table 10.4 Ten Most Common Baseball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=25,583		Practice n=14,284		Total n=39,869	
	n	%	n	%	n	%
Shoulder strain/sprain	2,796	10.9%	1,917	13.4%	4,713	11.8%
Head/face contusion	2,713	10.6%	1,336	9.4%	4,049	10.2%
Hip/thigh/upper leg strain/sprain	1,255	4.9%	1,344	9.4%	2,600	6.5%
Arm/elbow strain/sprain	1,883	7.4%	503	3.5%	2,386	6.0%
Hand/wrist fracture	1,253	4.9%	1,045	7.3%	2,297	5.8%
Ankle strain/sprain	1,601	6.3%	570	4.0%	2,171	5.4%
Shoulder other	856	3.3%	1,140	8.0%	1,996	5.0%
Head/face concussion	1,637	6.4%	221	1.5%	1,858	4.7%
Knee other	1,259	4.9%	561	3.9%	1,820	4.6%
Head/face other	946	3.7%	765	5.4%	1,711	4.3%

Figure 10.2 Time Loss of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

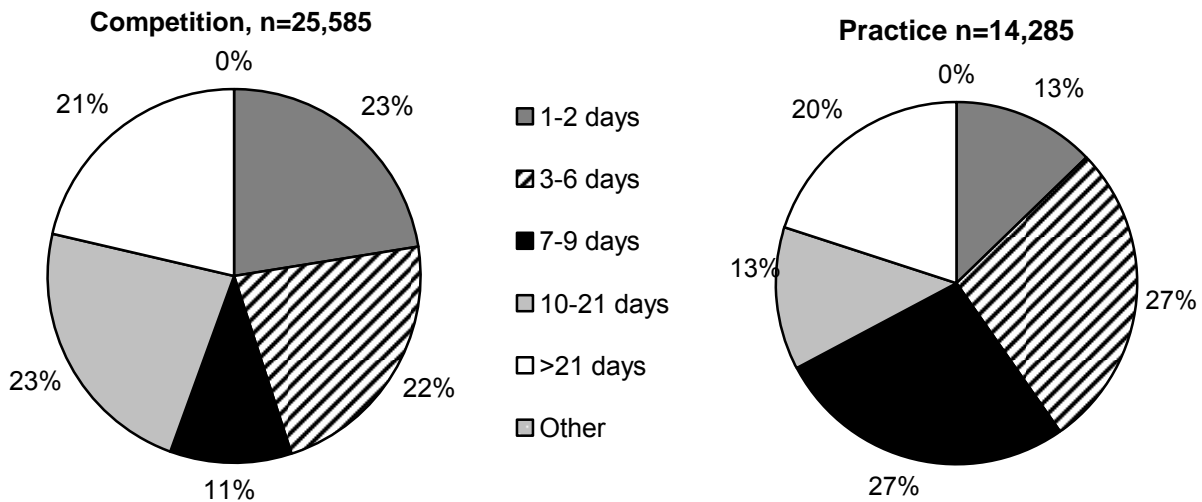


Table 10.5 Baseball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,929	7.8%	1,467	10.3%	3,397	8.7%
Did not require surgery	22,799	92.2%	12,818	89.7%	35,617	91.3%
Total	24,728	100%	14,285	100%	39,013	100%

Figure 10.3 History of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

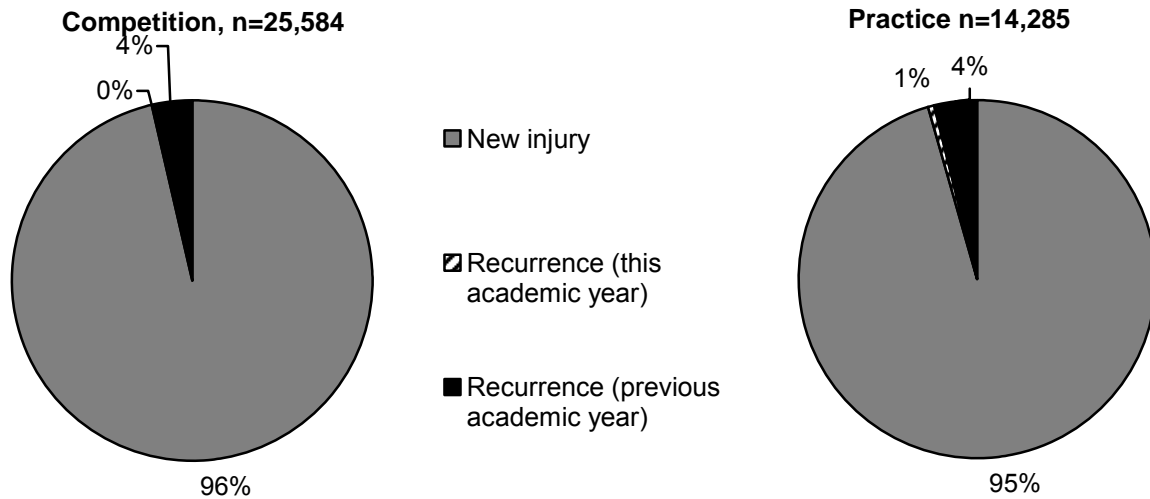


Table 10.6 Time during Season of Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	8,349	20.9%
Regular season	29,558	74.1%
Post season	1,963	4.9%
Total	39,870	100%

Table 10.7 Competition-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	608	2.4%
First inning	3,038	11.9%
Second inning	2,511	9.8%
Third inning	4,529	17.8%
Fourth inning	5,820	22.8%
Fifth inning	4,289	16.8%
Sixth inning	2,806	11.0%
Seventh inning	1,906	7.5%
Total	25,508	100%
Injury Related to Foul Play		
No	22,582	95.8%
Yes, and ruled foul play	295	1.3%
Yes, but not ruled foul play	702	3.0%
Unknown	0	0.0%
Total	23,580	100%
Field Location		
First base	5,132	20.1%
Home plate	3,929	15.4%
Second base	3,876	15.2%
Third base	3,604	14.1%
Outfield	3,407	13.4%
Pitcher's mound	2,896	11.4%
Infield	1,807	7.1%
Foul territory	0	0.0%
Other	856	3.4%
Total	25,508	100%

Table 10.8 Practice-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	1,500	11.7%
Second 1/2 hour	1,345	10.5%
1-2 hours into practice	8,032	62.8%
>2 hours into practice	1,905	14.9%
Total	12,782	100%

Figure 10.4 Player Position of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

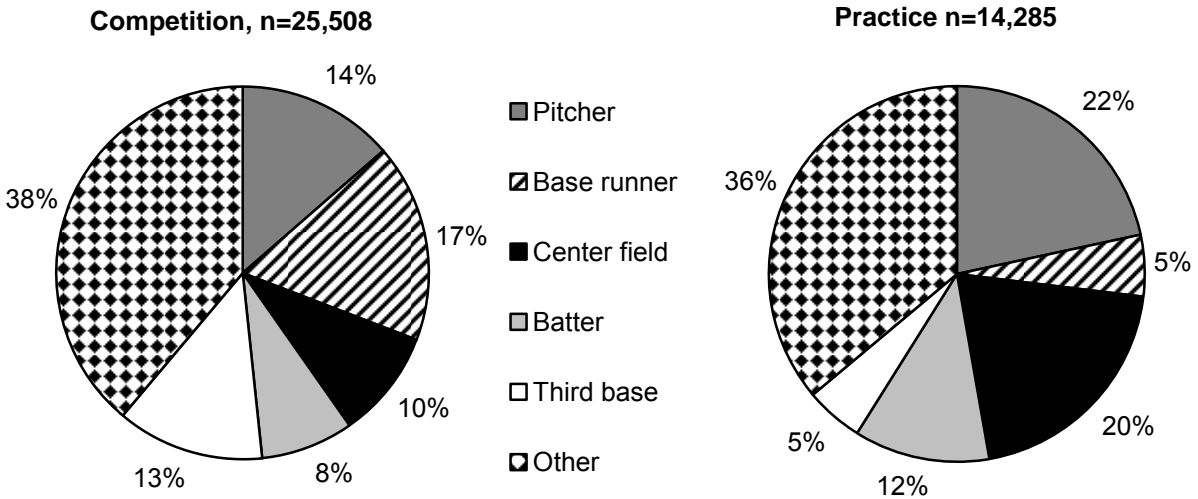
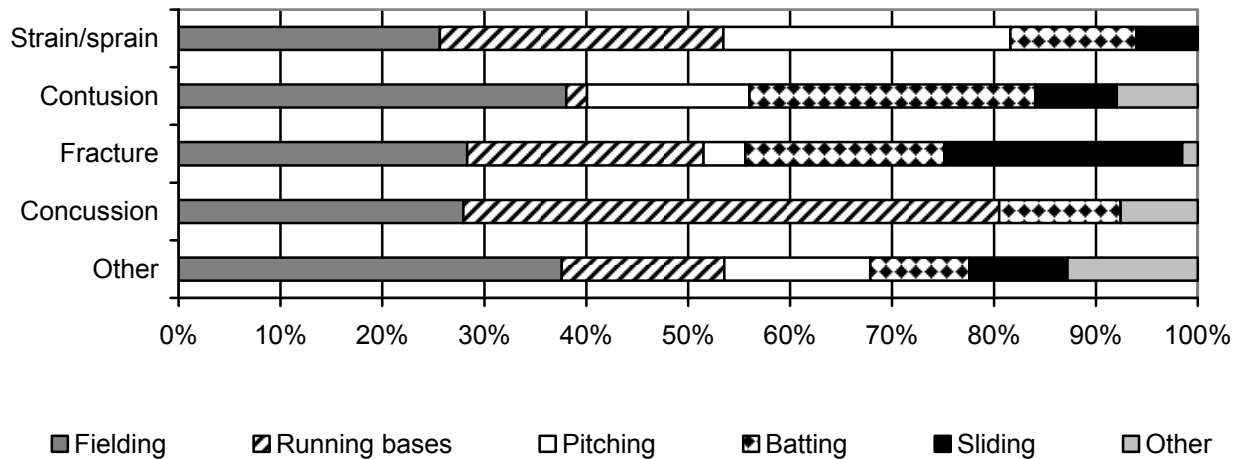


Table 10.9 Activities Leading to Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Fielding	6,981	27.3%	3,732	26.3%	10,713	26.9%
Running bases	5,449	21.3%	1,458	10.3%	6,907	17.4%
Pitching	2,612	10.2%	3,242	22.8%	5,854	14.7%
Batting	3,715	14.5%	1,723	12.1%	5,437	13.7%
Sliding	2,873	11.2%	361	2.5%	3,235	8.1%
General play	1,320	5.2%	1,433	10.1%	2,752	6.9%
Throwing (not pitching)	1,390	5.4%	567	4.0%	1,957	4.9%
Catching	0	0.0%	578	4.1%	578	1.5%
Conditioning	0	0.0%	557	3.9%	557	1.4%
Other	1,244	4.9%	558	3.9%	1,803	4.5%
Total	25,584	100%	14,209	100%	39,793	100%

Figure 10.5 Activity Resulting in Baseball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year



XI. Softball Injury Epidemiology

Table 11.1 Softball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	146	141,008	1.04	49,831
Competition	80	49,318	1.62	28,688
Practice	66	91,690	0.72	21,143

Table 11.2 Demographic Characteristics of Injured Softball Athletes, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year*

Year in School	
Freshman	13,923 (28.3%)
Sophomore	13,668 (27.7%)
Junior	10,001 (20.3%)
Senior	11,678 (23.7%)
Total†	49,270 (100%)
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	15.9 (1.3)
BMI	
Minimum	16.8
Maximum	34.1
Mean (St. Dev.)	23.4 (3.7)

*All remaining analyses in this chapter present data weighted to provide national injury estimates.

†Throughout this chapter, totals and n's represent the total weighted 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, 2008-09 School Year

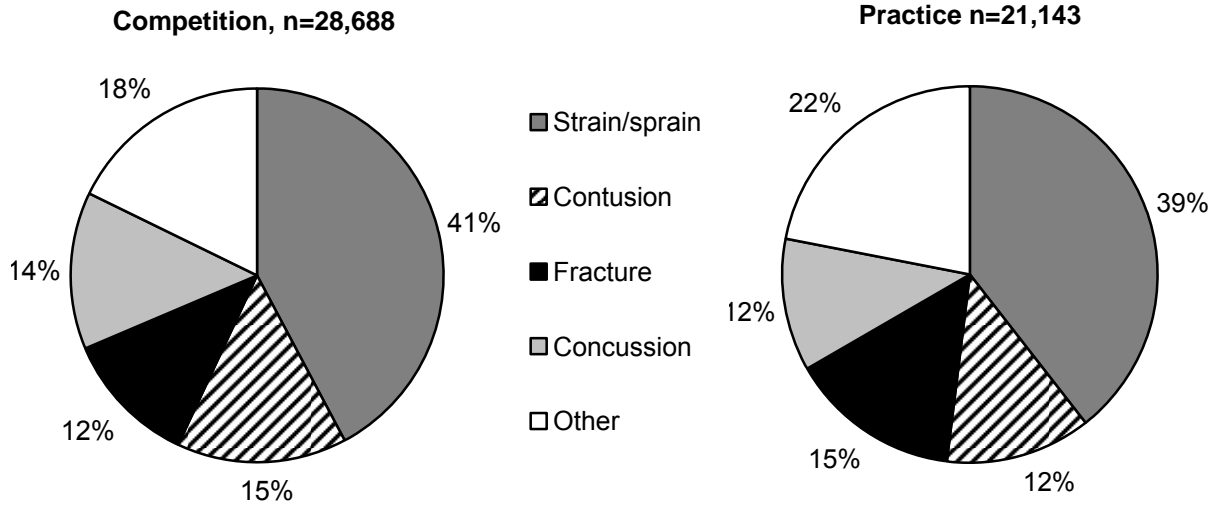


Table 11.3 Body Site of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Head/face	6,189	21.6%	3,818	18.1%	10,007	20.1%
Hand/wrist	5,736	20.0%	2,575	12.2%	8,311	16.7%
Knee	5,207	18.1%	2,521	11.9%	7,728	15.5%
Ankle	3,297	11.5%	3,534	16.7%	6,831	13.7%
Shoulder	2,975	10.4%	826	3.9%	3,800	7.6%
Arm/elbow	910	3.2%	2,663	12.6%	3,573	7.2%
Hip/thigh/upper leg	1,013	3.5%	2,234	10.6%	3,247	6.5%
Lower leg	1,231	4.3%	1,284	6.1%	2,515	5.0%
Trunk	1,216	4.2%	1,041	4.9%	2,257	4.5%
Foot	576	2.0%	647	3.1%	1,223	2.5%
Neck	340	1.2%	0	0.0%	340	0.7%
Other	0	0.0%	0	0.0%	0	0.0%
Total	28,688	100%	21,143	100%	49,831	100%

Table 11.4 Ten Most Common Softball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Diagnosis	Competition n=28,688		Practice n=21,142		Total n=49,829	
	n	%	n	%	n	%
Head/face concussion	3,901	13.6%	2,432	11.5%	6,332	12.7%
Ankle strain/sprain	3,223	11.2%	2,634	12.5%	5,857	11.8%
Hand/wrist fracture	2,340	8.2%	2,088	9.9%	4,428	8.9%
Knee strain/sprain	3,362	11.7%	676	3.2%	4,038	8.1%
Knee other	1,165	4.1%	1,845	8.7%	3,010	6.0%
Hand/wrist strain/sprain	2,451	8.5%	413	2.0%	2,864	5.7%
Hip/thigh/upper leg strain/sprain	673	2.3%	1,998	9.5%	2,671	5.4%
Shoulder other	1,822	6.4%	826	3.9%	2,648	5.3%
Head/face contusion	1,239	4.3%	1,386	6.6%	2,625	5.3%
Trunk strain/sprain	599	2.1%	1,041	4.9%	1,640	3.3%

Figure 11.2 Time Loss of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

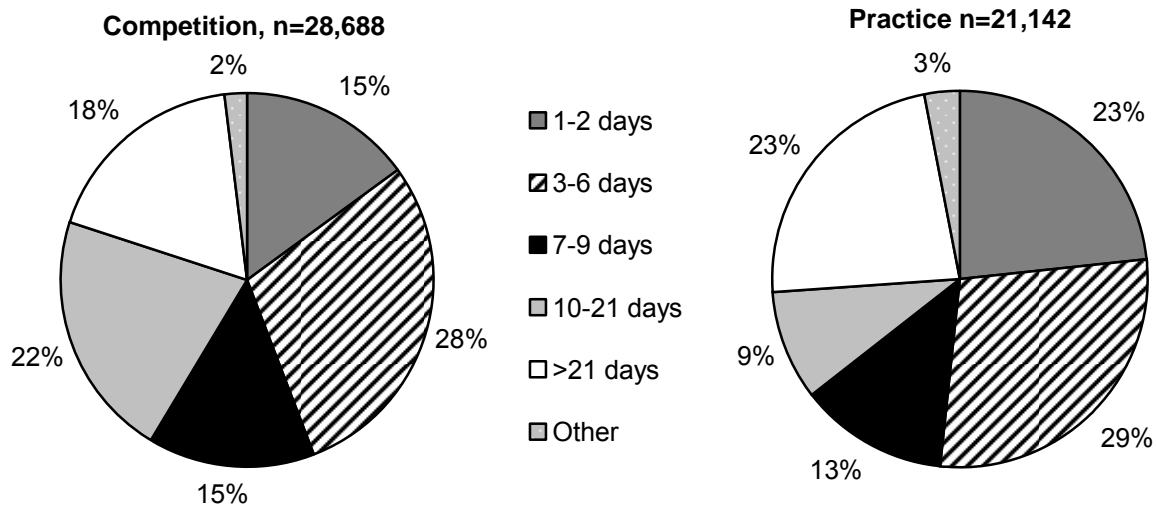


Table 11.5 Softball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,032	11.0%	74	0.4%	3,105	6.4%
Did not require surgery	24,491	89.0%	20,921	99.6%	45,413	93.6%
Total	27,523	100%	20,995	100%	48,518	100%

Figure 11.3 History of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

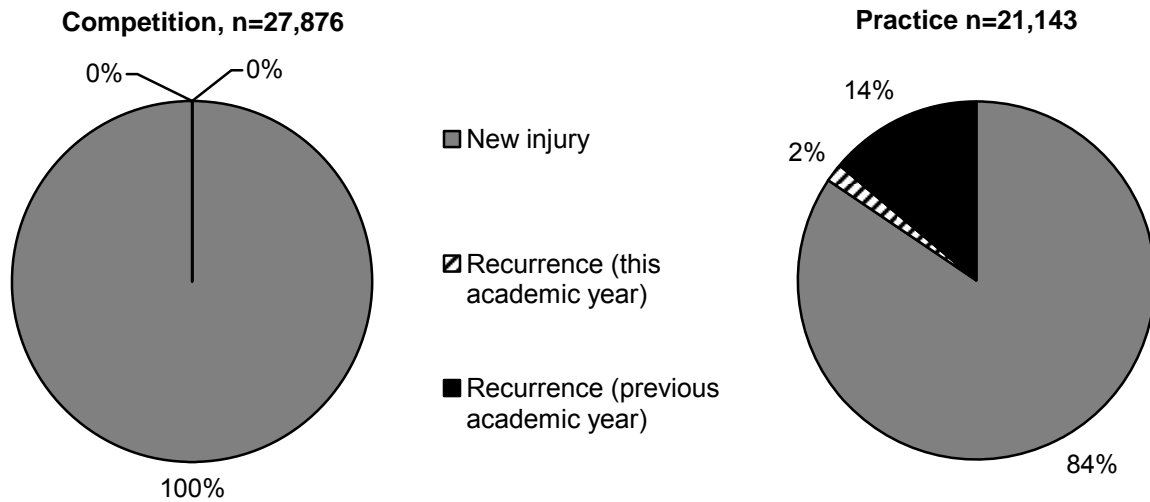


Table 11.6 Time during Season of Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Season		
Preseason	11,115	22.3%
Regular season	35,691	71.6%
Post season	3,025	6.1%
Total	49,831	100%

Table 11.7 Competition-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	487	1.7%
First inning	2,801	10.0%
Second inning	791	2.8%
Third inning	7,425	26.6%
Fourth inning	7,384	26.5%
Fifth inning	3,840	13.8%
Sixth inning	3,407	12.2%
Seventh inning	1,770	6.3%
Total	27,905	100%
Injury Related to Foul Play		
No	25,034	91.7%
Yes, and ruled foul play	813	3.0%
Yes, but not ruled foul play	0	0.0%
Unknown	1,443	5.3%
Total	27,290	100%
Field Location		
Home plate	10,711	37.8%
Second base	4,623	16.3%
Third base	3,772	13.3%
Outfield	3,728	13.2%
Pitcher's mound	2,503	8.8%
First base	2,270	8.0%
Infield	699	2.5%
Foul territory	0	0.0%
Other	0	0.0%
Total	28,305	100%

Table 11.8 Practice-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	n	%
Time in Practice		
First 1/2 hour	7,076	36.5%
Second 1/2 hour	4,606	23.8%
>2 hours into practice	2,298	11.9%
1-2 hours into practice	5,382	27.8%
Total	19,362	100%

Figure 11.4 Player Position of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

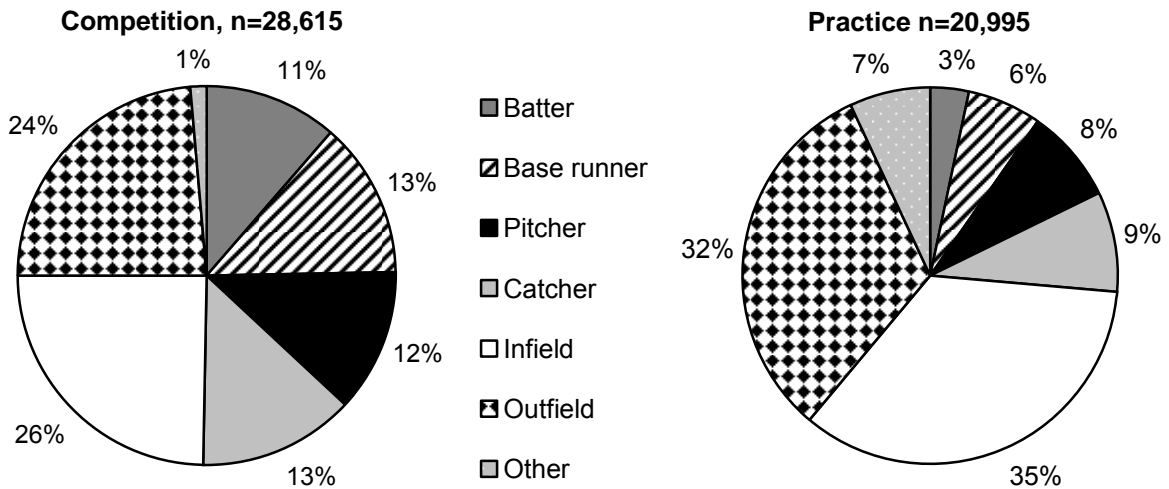
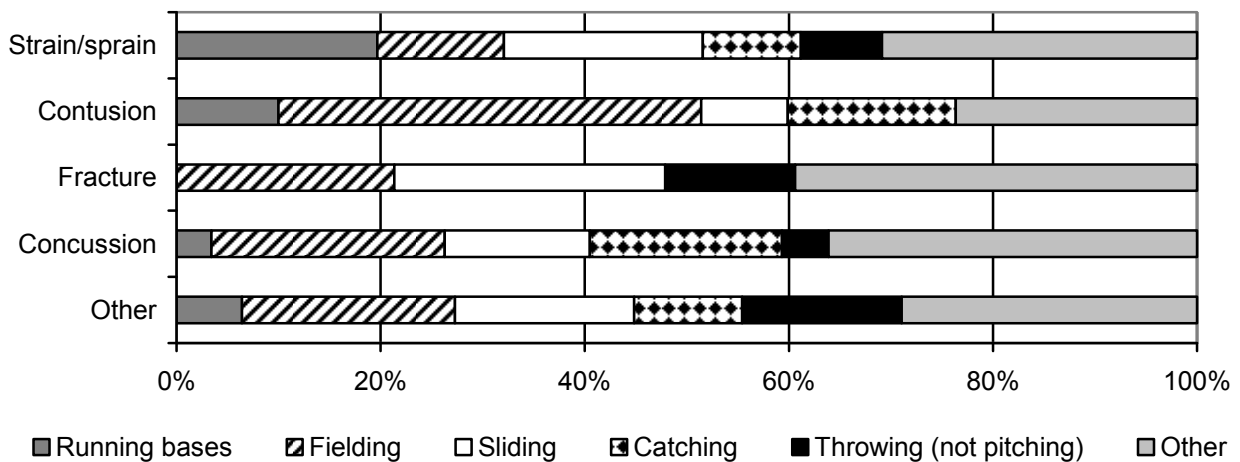


Table 11.9 Activities Leading to Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Fielding	5,863	20.5%	4,320	20.5%	10,183	20.5%
Sliding	7,342	25.7%	1,535	7.3%	8,877	17.9%
Batting	4,628	16.2%	1,927	9.1%	6,554	13.2%
Running bases	2,735	9.6%	2,807	13.3%	5,542	11.2%
Catching	3,705	12.9%	1,582	7.5%	5,287	10.6%
Throwing (not pitching)	1,090	3.8%	3,160	15.0%	4,250	8.6%
Pitching	2,225	7.8%	576	2.7%	2,802	5.6%
Conditioning	0	0.0%	1,783	8.5%	1,783	3.6%
General play	337	1.2%	957	4.5%	1,293	2.6%
Other	690	2.4%	2,422	11.5%	3,113	6.3%
Total	28,615	100%	21,069	100%	49,684	100%

Figure 11.5 Activity Resulting in Softball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2008-09 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, 2008-09 School Year

	Boys' soccer	Girls' soccer*	RR (95% CI) [†]
Total	1.62	2.07	1.27 (1.10-1.47)
Competition	3.43	4.59	1.34 (1.12-1.61)
Practice	0.87	1.00	1.16 (0.91-1.47)

*Throughout this chapter, rate ratios (RR) and injury proportion ratios (IPR) compare the gender with a higher injury rate/proportion (bolded) to the gender with a lower injury rate/proportion.

[†]Throughout this chapter, statistically significant RR and IPR are bolded.

Table 12.2 Comparison of Body Sites of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Boys' soccer	Girls' soccer	IPR (95% CI)
Ankle	16.5%	18.3%	1.11 (0.75-1.64)
Knee	11.8%	15.7%	1.33 (0.87-2.05)
Head/face	12.4%	18.5%	1.49 (0.99-2.25)
Hip/thigh/upper leg	17.5%	17.6%	1.01 (0.69-1.47)
Hand/wrist	6.4%	2.7%	2.40 (0.93-6.22)
Shoulder	3.8%	1.3%	2.87 (1.09-7.55)
Trunk	5.8%	4.3%	1.36 (0.58-3.19)
Lower leg	13.6%	6.1%	2.24 (1.25-4.01)
Arm/elbow	1.6%	2.1%	1.28 (0.36-4.61)
Foot	9.8%	7.0%	1.40 (0.73-2.66)
Neck	0.4%	1.8%	4.02 (0.61-26.59)
Other	0.4%	4.7%	11.63 (3.07-43.97)
Total	100%	100%	---

Table 12.3 Comparison of Diagnoses of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Strain/sprain	44.7%	51.8%	1.16 (0.96-1.40)
Contusion	13.2%	7.9%	1.68 (1.03-2.75)
Fracture	15.3%	5.7%	2.67 (1.50-4.72)
Concussion	9.5%	16.3%	1.71 (1.07-2.73)
Other	17.2%	18.3%	1.06 (0.71-1.59)
Total	100%	100%	---

Table 12.4 Most Common Boys' and Girls' Soccer Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	13.7%	17.2%	1.25 (0.83-1.90)
Head/face concussion	9.5%	16.3%	1.71 (1.07-2.73)
Hip/thigh/upper leg strain/sprain	13.8%	15.7%	1.13 (0.75-1.72)
Knee strain/sprain	5.0%	7.8%	1.57 (0.83-2.97)
Hand/wrist fracture	5.3%	1.0%	5.33 (1.17-24.33)

*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, 2008-09 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Time Loss			
1-2 days	15.1%	8.5%	1.77 (1.11-2.80)
3-6 days	28.4%	30.7%	1.08 (0.81-1.44)
7-9 days	16.5%	22.2%	1.35 (0.92-1.97)
10-21 days	17.3%	20.2%	1.16 (0.81-1.68)
22 days or more	16.7%	10.0%	1.67 (1.04-2.68)
Other	6.0%	8.3%	1.39 (0.73-2.65)
Total	100%	100%	---

Table 12.6 Comparison of Mechanisms of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Mechanism			
Contact with another player	29.1%	31.5%	1.08 (0.83-1.42)
Stepped on/fell on/kicked	11.4%	8.9%	1.28 (0.76-2.15)
Rotation around a planted foot/inversion	13.8%	12.1%	1.14 (0.70-1.87)
Overuse, heat illness, conditioning, etc.	16.3%	22.3%	1.37 (0.92-2.04)
Contact with ball	11.0%	11.2%	1.02 (0.60-1.71)
Uneven playing surface	2.7%	1.7%	1.55 (0.63-3.82)
Slide tackle	8.7%	3.5%	2.47 (1.37- 4.46)
Contact with goal	0.5%	0.0%	---
Other	6.5%	8.7%	1.35 (0.76-2.41)
Total	100%	100%	---

Table 12.7 Comparison of Activities of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Activity			
General play	23.2%	35.8%	1.54 (1.14-2.09)
Defending	11.2%	14.2%	1.27 (0.79-2.04)
Chasing loose ball	9.5%	12.2%	1.29 (0.91-1.03)
Ball handling/dribbling	13.2%	6.9%	1.92 (1.13-3.22)
Goaltending	9.4%	5.8%	1.64 (0.89-2.93)
Shooting (foot)	6.8%	5.8%	1.18 (0.57-2.42)
Heading ball	5.4%	4.2%	1.30 (0.62-2.74)
Passing (foot)	6.9%	4.4%	1.57 (0.70-3.48)
Receiving pass	3.6%	4.2%	1.19 (0.54-2.61)
Other	10.8%	6.4%	1.69 (1.01-2.85)
Total	100%	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, 2008-09 School Year

	Boys' basketball	Girls' basketball	RR (95% CI)*
Total	1.35	1.54	1.14 (0.97-1.33)
Competition	2.32	3.13	1.35 (1.09-1.67)
Practice	0.95	0.87	1.09 (0.86-1.38)

Table 12.9 Comparison of Body Sites of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Boys' basketball	Girls' basketball	IPR (95% CI)
Ankle	29.8%	31.1%	1.05 (0.81-1.35)
Knee	12.6%	16.5%	1.31 (0.86-2.00)
Head/face	15.7%	19.5%	1.24 (0.85-1.79)
Hip/thigh/upper leg	8.2%	3.0%	2.71 (1.49-4.92)
Hand/wrist	9.9%	9.4%	1.05 (0.61-1.82)
Shoulder	4.1%	4.8%	1.71 (0.52-2.66)
Trunk	5.1%	3.8%	1.33 (0.59-3.04)
Lower leg	2.1%	5.1%	2.46 (0.94-6.43)
Arm/elbow	3.6%	0.5%	6.61 (2.16-20.21)
Foot	8.1%	4.4%	1.85 (0.90-3.84)
Neck	0.0%	0.8%	---
Other	0.9%	1.1%	1.23 (0.31-4.90)
Total	100%	100%	---

Table 12.10 Comparison of Diagnoses of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Strain/sprain	47.9%	53.5%	1.12 (0.95-1.32)
Contusion	10.8%	6.3%	1.73 (0.93-3.21)
Fracture	10.5%	9.4%	1.11 (0.65-1.90)
Concussion	5.1%	13.4%	2.64 (1.53-4.54)
Other	25.7%	17.4%	1.48 (1.06-2.08)
Total	100%	100%	---

Table 12.11 Most Common Boys' and Girls' Basketball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	28.9%	30.4%	1.05 (0.81-1.36)
Knee other	6.2%	2.9%	2.13 (1.00-4.58)
Head/face other	6.2%	3.4%	1.82 (0.82-4.04)
Head/face concussion	5.1%	13.4%	2.64 (1.53-4.54)
Knee strain/sprain	4.7%	10.6%	2.27 (1.17-4.43)

*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, 2008-09 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Time Loss			
1-2 days	19.2%	14.2%	1.35 (0.92-1.98)
3-6 days	26.1%	30.8%	1.18 (0.89-1.56)
7-9 days	18.3%	18.8%	1.03 (0.72-1.47)
10-21 days	18.2%	21.0%	1.15 (0.83-1.62)
22 days or more	13.3%	8.4%	1.58 (0.95-2.62)
Other	4.9%	6.8%	1.37 (0.73-2.57)
Total	100%	100%	---

Table 12.13 Comparison of Mechanisms of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Mechanism			
Collision with another player	26.7%	26.2%	1.02 (0.77-1.35)
Jumping/landing	25.9%	22.3%	1.16 (0.86-1.58)
Overuse, heat illness, conditioning, etc.	8.8%	9.2%	1.04 (0.62-1.74)
Rotation around a planted foot/inversion	9.4%	15.6%	1.66 (1.08-2.54)
Stepped on/fell on/kicked	8.1%	6.4%	1.27 (0.73-2.22)
Contact with ball	3.6%	8.1%	2.22 (1.04-4.72)
Other	17.5%	12.3%	1.42 (0.92-2.18)
Total	100%	100%	---

Table 12.14 Comparison of Activities of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Activity			
Rebounding	22.5%	21.6%	1.04 (0.76-1.42)
General play	25.1%	20.9%	1.20 (0.88-1.64)
Defending	14.8%	14.6%	1.02 (0.66-1.55)
Chasing loose ball	11.8%	8.1%	1.45 (0.89-2.36)
Shooting	10.2%	9.4%	1.10 (0.62-1.93)
Conditioning	1.7%	4.2%	2.39 (1.05-5.45)
Ball handling/dribbling	6.2%	6.6%	1.07 (0.58-1.96)
Receiving pass	3.1%	9.1%	2.92 (1.29-6.60)
Other	4.4%	5.4%	1.24 (0.61-2.53)
Total	100%	100%	---

12.3 Boys' Baseball and Girls' Softball

Table 12.15 Comparison of Baseball and Softball Injury Rates, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Baseball	Softball	RR (95% CI)
Total	0.78	1.04	1.34 (1.06-1.68)
Competition	1.32	1.62	1.23 (0.91-1.67)
Practice	0.48	0.72	1.49 (1.05-2.12)

Table 12.16 Comparison of Body Sites of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

Body Site	Baseball	Softball	IPR (95% CI)
Ankle	5.4%	13.7%	2.52 (1.13-5.62)
Knee	5.4%	15.5%	2.85 (1.12-7.24)
Head/face	23.2%	20.1%	1.15 (0.71-1.87)
Hip/thigh/upper leg	7.8%	6.5%	1.19 (0.54-2.63)
Hand/wrist	15.3%	16.7%	1.09 (0.61-1.96)
Shoulder	18.2%	7.6%	2.39 (1.15-4.98)
Trunk	4.4%	4.5%	1.03 (0.30-3.55)
Lower leg	5.2%	5.0%	1.03 (0.38-2.81)
Arm/elbow	10.7%	7.2%	1.50 (0.70-3.21)
Foot	3.8%	2.5%	1.53 (0.52-4.56)
Neck	0.2%	0.7%	3.54 (0.68-18.43)
Other	0.4%	0.0%	---
Total	100%	100%	---

Table 12.17 Comparison of Diagnoses of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Strain/sprain	38.4%	41.1%	1.07 (0.79-1.45)
Contusion	18.1%	13.8%	1.32 (0.74-2.33)
Fracture	14.8%	13.0%	1.14 (0.61-2.13)
Concussion	4.7%	12.7%	2.73 (1.19-6.27)
Other	23.9%	19.4%	1.23 (0.76-2.01)
Total	100%	100%	---

Table 12.18 Most Common Baseball and Softball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	5.4%	11.8%	2.16 (0.96-4.87)
Hand/wrist fracture	5.8%	8.9%	1.54 (0.63-3.77)
Head/face contusion	10.2%	5.3%	1.93 (0.69-5.39)
Hip/thigh/upper leg strain/sprain	6.5%	5.4%	1.22 (0.49-3.00)
Shoulder strain/sprain	13.4%	0.0%	5.11 (1.24-21.16)

*Only includes diagnoses accounting for >5% of baseball or softball injuries.

Table 12.19 Comparison of Time Loss of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Baseball	Softball	IPR (95% CI)
Time Loss			
1-2 days	19.0%	18.6%	1.02 (0.60-1.75)
3-6 days	24.2%	28.9%	1.20 (0.80-1.78)
7-9 days	16.6%	13.8%	1.20 (0.68-2.13)
10-21 days	19.3%	16.5%	1.18 (0.70-1.98)
22 days or more	15.6%	12.3%	1.27 (0.64-2.52)
Other	5.3%	9.9%	1.87 (0.71-4.96)
Total	100%	100%	---

Table 12.20 Comparison of Mechanisms of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Mechanism			
Overuse, heat illness, conditioning, etc.	10.9%	11.2%	1.02 (0.49-2.13)
Contact with another player	15.9%	18.5%	1.16 (0.65-2.08)
Contact with bases	8.8%	11.8%	1.35 (0.68-2.70)
Throwing - not pitching	5.3%	4.0%	1.33 (0.52-3.43)
Throwing - pitching	7.9%	5.1%	1.56 (0.56-4.33)
Contact with thrown ball (non-pitch)	5.6%	10.4%	1.84 (0.78-4.34)
Rotation around a planted foot/inversion	4.0%	3.3%	1.22 (0.44-3.35)
Hit by batted ball	17.9%	6.6%	2.71 (1.36-5.41)
Hit by pitch	3.8%	7.3%	1.93 (0.77-4.87)
Other	20.0%	22.0%	1.10 (0.67-1.79)
Total	100%	100%	---

Table 12.21 Comparison of Activities of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2008-09 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Activity			
Fielding a batted ball	22.3%	12.7%	1.76 (1.03-2.99)
Fielding a thrown ball	4.7%	7.8%	1.68 (0.59-4.74)
Running bases	17.4%	11.2%	1.56 (0.83-2.93)
Pitching	14.7%	5.6%	2.61 (1.16-5.89)
Batting	13.7%	13.2%	1.04 (0.56-1.92)
Sliding	8.1%	17.9%	2.20 (1.09-4.42)
Throwing (not pitching)	4.9%	8.6%	1.74 (0.76-3.98)
General play	6.9%	2.6%	2.66 (1.10-6.45)
Conditioning	1.4%	3.6%	2.56 (0.32-20.54)
Catching	1.5%	10.6%	7.33 (2.57-20.92)
Other	4.5%	6.3%	1.38 (0.44-4.37)
Total	100%	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, 2005-09 School Years

	2005-06	2006-07	2007-08	2008-09	p-value for trend*
Overall total	2.51	2.59	2.31	2.01	0.111
Competition	4.63	4.88	4.45	4.05	0.198
Practice	1.69	1.75	1.52	1.26	0.106
Boys' football total	4.36	4.45	4.18	3.50	0.114
Competition	12.09	13.50	12.80	11.26	0.571
Practice	2.54	2.68	2.47	1.92	0.198
Boys' soccer total	2.43	2.27	1.75	1.62	0.031
Competition	4.22	4.31	3.63	3.43	0.092
Practice	1.58	1.45	0.96	0.87	0.040
Girls' soccer total	2.36	2.51	2.35	2.07	0.276
Competition	5.21	5.43	5.15	4.59	0.227
Practice	1.10	1.31	1.16	1.00	0.552
Girls' volleyball total	1.64	1.37	1.22	0.89	0.009
Competition	1.92	1.40	1.43	0.90	0.061
Practice	1.48	1.36	1.12	0.88	0.010
Boys' basketball total	1.89	1.75	1.39	1.35	0.041
Competition	2.98	2.87	2.23	2.32	0.109
Practice	1.46	1.28	1.04	0.95	0.013
Girls' basketball total	2.01	2.09	1.61	1.54	0.121
Competition	3.60	3.60	3.30	3.13	0.052
Practice	1.37	1.44	0.90	0.87	0.127
Boys' wrestling total	2.50	2.51	2.27	2.17	0.064
Competition	3.93	3.80	3.70	3.35	0.044
Practice	2.04	2.06	1.76	1.75	0.114
Boys' baseball total	1.19	1.25	0.93	0.78	0.094
Competition	1.77	2.01	1.37	1.32	0.222
Practice	0.87	0.82	0.68	0.48	0.031
Girls' softball total	1.13	1.11	1.29	1.04	0.890
Competition	1.78	1.96	1.86	1.62	0.479
Practice	0.79	0.65	0.98	0.72	0.891

*Statistically significant tests for trend 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, 2005-09 School Years

	2005-06	2006-07	2007-08	2008-09
Overall total	1,442,533	1,472,849	1,419,723	1,248,126
Competition	759,334	766,512	763,034	690,525
Practice	683,199	706,337	656,689	557,601
Boys' football total	516,150	574,367	616,665	527,321
Competition	280,919	292,316	311,780	288,637
Practice	235,231	282,051	304,885	238,684
Boys' soccer total	218,760	171,874	159,351	149,229
Competition	119,703	93,295	99,785	87,082
Practice	99,058	78,579	59,566	62,147
Girls' soccer total	185,770	230,769	215,850	192,108
Competition	122,803	149,231	146,102	123,312
Practice	62,967	81,538	69,748	68,796
Girls' volleyball total	81,813	80,493	72,261	56,609
Competition	32,677	27,423	26,539	19,764
Practice	49,136	53,069	45,722	36,845
Boys' basketball total	100,058	96,670	82,612	79,230
Competition	44,826	46,109	36,766	40,152
Practice	55,232	50,561	45,846	39,078
Girls' basketball total	103,566	102,831	73,283	64,933
Competition	53,812	53,703	45,236	38,277
Practice	49,753	49,128	28,047	26,656
Boys' wrestling total	105,542	101,139	91,625	88,996
Competition	36,259	38,750	40,698	39,029
Practice	69,283	62,389	50,927	49,967
Boys' baseball total	67,560	60,296	44,760	39,869
Competition	33,639	33,494	22,803	25,584
Practice	33,922	26,802	21,957	14,285
Girls' softball total	63,313	54,411	63,316	49,831
Competition	34,696	32,191	33,325	28,688
Practice	28,618	22,220	29,991	21,143

Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005-09 School Years*

	2005-06 n=1,480,557	2006-07 n=1,464,926	2007-08 n=1,411,621	2008-09 n=1,248,126
Body Site				
Ankle	22.7%	19.8%	18.5%	16.4%
Knee	14.2%	16.6%	14.6%	14.8%
Head/face	12.3%	12.4%	12.4%	15.3%
Hip/thigh/upper leg	10.8%	10.5%	10.2%	10.3%
Shoulder	7.9%	8.0%	10.1%	9.3%
Hand/wrist	8.0%	7.5%	9.1%	8.5%
Trunk	6.2%	6.7%	6.5%	6.6%
Lower leg	4.6%	5.2%	5.7%	5.8%
Arm/elbow	4.1%	3.9%	4.6%	4.1%
Foot	4.0%	4.0%	4.2%	5.0%
Neck	2.2%	1.9%	1.8%	1.9%
Other	3.2%	3.6%	2.4%	2.1%
Total	100%	100%	100%	100%

*Throughout this chapter, 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 13.4 Injury Diagnosis by Year, High School Sports-Related Injury Surveillance Study, US, 2005-09 School Years

	2005-06, n=1,444,172	2006-07, n=1,466,398	2007-08 n=1,414,139	2008-09 n=1,248,126
Diagnosis				
Strain/sprain	52.0%	48.2%	48.3%	45.7%
Contusion	12.2%	13.7%	12.4%	11.5%
Fracture	9.8%	8.9%	10.2%	10.9%
Concussion	9.1%	8.4%	9.2%	11.8%
Other	16.8%	20.9%	19.9%	20.2%
Total	100%	100%	100%	100%

Table 13.5 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2005-09 School Years

	2005-06 n=1,435,954	2006-07 n=1,463,273	2007-08 n=1,410,654	2008-09 n= 1,248,126
Diagnosis				
Ankle strain/sprain	20.6%	17.8%	17.3%	15.0%
Head/face concussion	9.0%	8.4%	9.2%	11.7%
Knee strain/sprain	7.6%	8.8%	7.8%	7.9%
Hip/thigh/upper leg strain/sprain	7.9%	7.7%	7.3%	7.7%
Knee other	4.3%	4.9%	4.7%	4.5%
Shoulder other	3.1%	3.7%	4.1%	4.0%
Hand/wrist fracture	3.2%	3.3%	4.0%	4.0%
Shoulder strain/sprain	3.4%	2.9%	3.4%	3.7%
Trunk strain/sprain	2.8%	2.7%	3.2%	2.8%
Hand/wrist strain/sprain	3.1%	2.5%	3.8%	2.9%

Table 13.6 Time Loss of Injuries by Year, High School Sports-Related Injury Surveillance Study, US, 2005-09 School Years

	2005-06 n=1,378,145	2006-07 n=1,423,183	2007-08 n=1,355,981	2008-09 n= 1,248,126
Time Loss				
1-2 days	22.5%	26.6%	22.8%	13.7%
3-6 days	30.0%	28.5%	28.8%	28.5%
7-9 days	15.3%	14.7%	15.8%	17.7%
10-21 days	14.9%	14.1%	16.7%	19.7%
22 days or more	17.2%	16.1%	15.9%	20.3%
Total	100%	100%	100%	100%

Table 13.7 Injuries Requiring Surgery by Year, High School Sports-Related Injury Surveillance Study, US, 2005-09 School Years

	2005-06 n=1,429,072	2006-07 n=1,428,960	2007-08 n=1,380,872	2008-09 n= 1,248,126
Need for surgery				
Required surgery	5.3%	6.4%	6.1%	6.7%
Did not require surgery	94.7%	93.6%	93.9%	93.3%
Total	100%	100%	100%	100%

IX. Reporter Demographics & Compliance

During the 2008-09 school year, 118 ATCs were invited to participate in the study at the beginning of the school year. In addition, 5 ATCs were invited to participate during the school year to replace a previously enrolled ATC who was no longer able to participate. ATCs were expected to report for every week in which they were enrolled. For example, an ATC who joined the study as a replacement school in week 10 was not expected to report for weeks 1-9. Overall, 107 enrolled ATCs reported an average of 42 study weeks. The majority of ATCs (90%) reported all the weeks during which they were enrolled, with only 8 ATCs (7%) missing over 10 weeks. Internal validity checks yielded 100% sensitivity, 99.6% specificity, a positive predictive value of 96.7%, and a negative predictive value of 100%.

Prior to the start of the 2008-09 High School RIO™ study, participating ATCs were asked to complete a short demographics survey. Three-quarters (80%) of participating high schools were public schools, with the remainder being private. All but 2 participating ATCs provided services to athletes of their high school on 5 or more days each week. Nearly 90% (88.8%) of ATCs participating during the 2008-09 study year had previously participated in the High School RIO™ study.

An online “End of Season” survey gave all participating ATCs (both in the original study as well as in the expanded study) the opportunity to provide feedback on their experiences with High School RIO™. This survey was completed by 110 ATCs (64%). Average reporting time burdens were 17 minutes for the weekly exposure report and 7 minutes for the injury report form. Using a 5 point Likert scale, RIO™ was overwhelmingly reported to be either very easy (62.7%) or somewhat easy (30.9%) to use (5 and 4 on the Likert scale, respectively), with ATCs being either very satisfied (64.5%) or somewhat satisfied (31.8%) 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 be used to improve the National High School Sports-Related Injury Surveillance Study for the 2009-10 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 the National High School Sports-Related Injury Surveillance Study 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.

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.