

SUMMARY REPORT

NATIONAL HIGH SCHOOL SPORTS-RELATED INJURY SURVEILLANCE STUDY

2009-2010 School Year

Compiled by:

R. Dawn Comstock, PhD

Christy L. Collins, MA

Natalie M. McIlvain, BS

High School RIOTM

High School Sports-Related Injury Surveillance Study

presented by the Center for Injury Research & Policy



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Note

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

For reprints/further information contact:
R. Dawn Comstock, PhD
Center for Injury Research and Policy
The Research Institute at Nationwide Children's Hospital
700 Children's Drive
Columbus, OH 43205
(614) 722-2400
Dawn.Comstock@NationwideChildrens.org

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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 2009-10. 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 RIO™ (Reporting Information Online) 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), National Operating Committee on Standards for Athletic Equipment (NOCSAE), and DonJoy Orthotics, the National High School Sports-Related Injury Surveillance System was able to be continued during the 2009-10 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 2009-10 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-\$400 honorarium depending on the number of sports reported 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 47 weekly exposure reports: one for each week from July 27, 2009 through June 20, 2010. 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 $\leq 1,000$) west stratum:

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

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, 2009-10 School Year*

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Overall total	3,698	1,763,241	2.10	1,359,897
Competition	2,002	477,673	4.19	754,091
Practice	1,696	1,285,568	1.32	605,805
Boys' football total	1,808	474,929	3.81	581,414
Competition	985	76,085	12.95	322,801
Practice	823	398,844	2.06	258,614
Boys' soccer total	291	166,141	1.75	153,485
Competition	170	50,081	3.39	83,985
Practice	121	116,060	1.04	69,500
Girls' soccer total	298	148,798	2.00	181,159
Competition	210	44,964	4.67	129,754
Practice	88	103,834	0.85	51,405
Girls' volleyball total	158	159,273	0.99	67,760
Competition	53	52,781	1.00	21,728
Practice	105	106,492	0.99	46,032
Boys' basketball total	292	201,706	1.45	85,063
Competition	161	59,157	2.72	46,787
Practice	131	142,549	0.92	38,276
Girls' basketball total	266	168,408	1.58	78,709
Competition	147	51,819	2.84	44,026
Practice	119	116,589	1.02	34,684
Boys' wrestling total	313	158,440	1.98	80,390
Competition	133	42,978	3.09	37,742
Practice	180	115,462	1.56	42,647
Boys' baseball total	134	162,530	0.82	64,053
Competition	74	58,181	1.27	36,502
Practice	60	104,349	0.57	27,551
Girls' softball total	138	123,016	1.12	67,862
Competition	69	41,627	1.66	30,767
Practice	69	81,389	0.85	37,096

*Only includes injuries resulting in ≥ 1 day's time loss.

Table 2.2 Proportion of Injuries Resulting in Time Loss, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

	≥1 days time loss	<1 day time loss	Total
Overall	99.2%	0.8%	100%
Boys' football	99.5%	0.5%	100%
Boys' soccer	97.3%	2.7%	100%
Girls' soccer	99.8%	0.2%	100%
Girls' volleyball	99.2%	0.8%	100%
Boys' basketball	99.7%	0.3%	100%
Girls' basketball	98.3%	1.7%	100%
Boys' wrestling	99.9%	0.1%	100%
Boys' baseball	98.5%	1.5%	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, 2009-10 School Year*

	Male n= 961,165	Female n=393,159
Year in School		
Freshman	20.8%	27.9
Sophomore	23.5%	26.7
Junior	25.8%	24.1
Senior	29.9%	21.3
Total†	100%	100%
Age (years)		
Minimum	13	13
Maximum	19	19
Mean (St. Dev.)	16.0 (1.2)	15.7 (1.2)
BMI		
Minimum	8.1	15.6
Maximum	47.2	54.7
Mean (St. Dev.)	24.9 (4.6)	22.4 (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 2.1 Injury Diagnosis by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

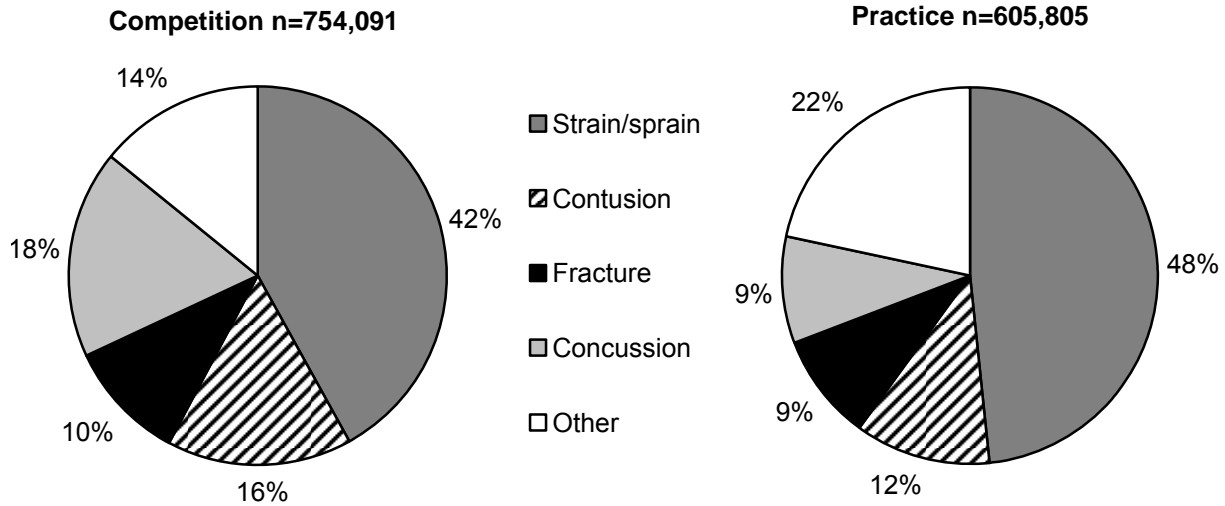


Table 2.4 Body Site of Injury by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	135,368	18.0%	102,727	17.0%	238,095	17.5%
Head/face	158,346	21.1%	75,606	12.5%	233,952	17.2%
Knee	133,729	17.8%	80,018	13.2%	213,747	15.7%
Hand/wrist	67,648	9.0%	72,587	12.0%	140,234	10.3%
Hip/thigh/upper leg	57,536	7.7%	66,818	11.0%	124,354	9.2%
Shoulder	56,595	7.5%	57,659	9.5%	114,253	8.4%
Trunk	41,713	5.5%	37,357	6.2%	79,070	5.8%
Lower leg	32,616	4.3%	30,979	5.1%	63,595	4.7%
Foot	20,416	2.7%	35,819	5.9%	56,235	4.1%
Arm/elbow	32,548	4.3%	21,917	3.6%	54,465	4.0%
Neck	13,612	1.8%	12,242	2.0%	25,854	1.9%
Other	1,745	0.2%	11,934	2.0%	13,679	1.0%
Total*	751,870	100%	605,662	100%	1,357,532	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, 2009-10 School Year*

	Male		Female		Total	
	n	%	n	%	n	%
Ankle Ligament						
Anterior talofibular ligament	96,849	76.0%	92,139	83.5%	189,312	79.5%
Calcaneofibular ligament	29,837	23.4%	28,865	26.2%	58,954	24.8%
Anterior tibiofibular ligament	33,042	25.9%	21,975	19.9%	55,270	23.2%
Posterior talofibular ligament	18,995	14.9%	18,065	16.4%	37,060	15.6%
Deltoid ligament	12,982	10.2%	1,245	1.1%	14,480	6.1%
Posterior tibiofibular ligament	4,942	3.9%	3,433	3.1%	8,376	3.5%
Total	127,393	100%	110,378	100%	238,095	100%

*Multiple responses allowed per injury report.

Table 2.6 Most Commonly Injured Knee Structures, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

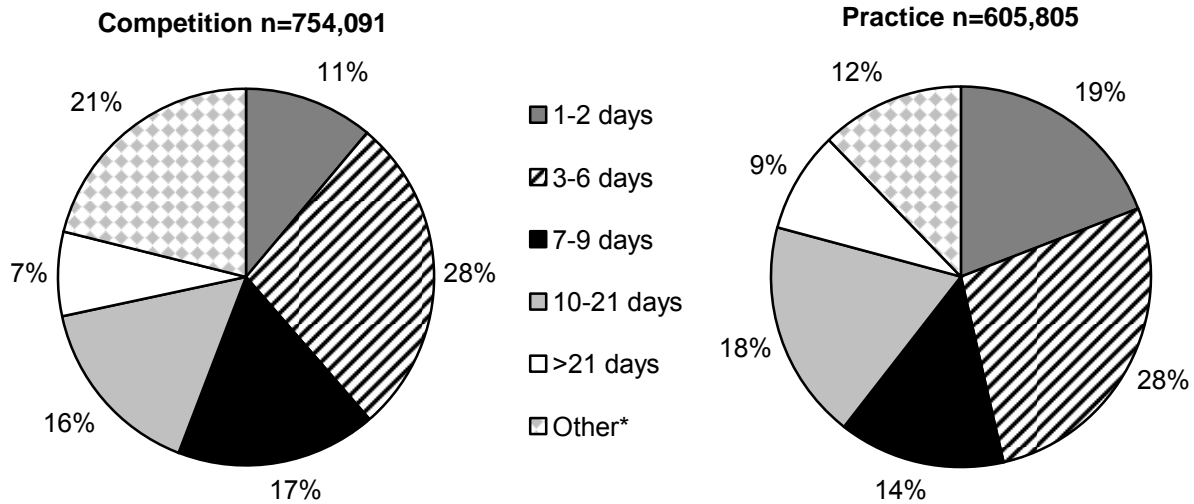
	Male		Female		Total	
	n	%	n	%	n	%
Knee Ligament						
Medial collateral ligament	46,601	32.9%	8,996	12.5%	55,597	26.0%
Anterior cruciate ligament	27,130	19.2%	20,825	28.9%	48,133	22.5%
Patella and/or patellar tendon	25,554	18.1%	21,005	29.1%	46,558	21.8%
Torn cartilage (meniscus)	28,275	20.0%	11,387	15.8%	39,662	18.6%
Lateral collateral ligament	4,932	3.5%	2,133	3.0%	7,065	3.3%
Posterior cruciate ligament	3,989	2.8%	2,448	3.4%	6,437	3.0%
Total	141,435	100%	72,134	100%	213,747	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, 2009-10 School Year

Diagnosis	Competition n=		Practice n=		Overall n=	
	n	%	n	%	n	%
Ankle Strain/Sprain	121,404	16.3%	93,770	15.6%	215,174	16.0%
Head/Face Concussion	131,579	17.6%	55,848	9.3%	187,427	13.9%
Knee strain/sprain	74,851	10.0%	33,306	5.5%	108,157	8.0%
Hip/thigh/upper leg strain/sprain	30,743	4.1%	56,919	9.5%	87,663	6.5%
Knee other	34,853	4.7%	34,950	5.8%	69,802	5.2%
Hand/wrist fracture	31,500	4.2%	25,436	4.2%	56,936	4.2%
Shoulder other	22,612	3.0%	22,155	3.7%	44,767	3.3%
Shoulder strain/sprain	22,258	3.0%	22,572	3.8%	44,830	3.3%
Hand/wrist strain/sprain	17,901	2.4%	19,262	3.2%	37,163	2.8%
Trunk strain/sprain	12,217	1.6%	22,111	3.7%	34,329	2.5%

Figure 2.2 Time Loss by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year



*Other category is made up of medical disqualification for season, medical disqualification for career, athlete chooses not to continue, and season ended before athlete returned to play

Table 2.8 Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	69,103	9.3%	37,683	6.3%	106,786	8.0%
Did not require surgery	673,577	90.7%	558,162	93.7%	1,231,739	92.0%
Total	742,680	100%	595,845	100%	1,338,525	100%

Figure 2.3 New and Recurring Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

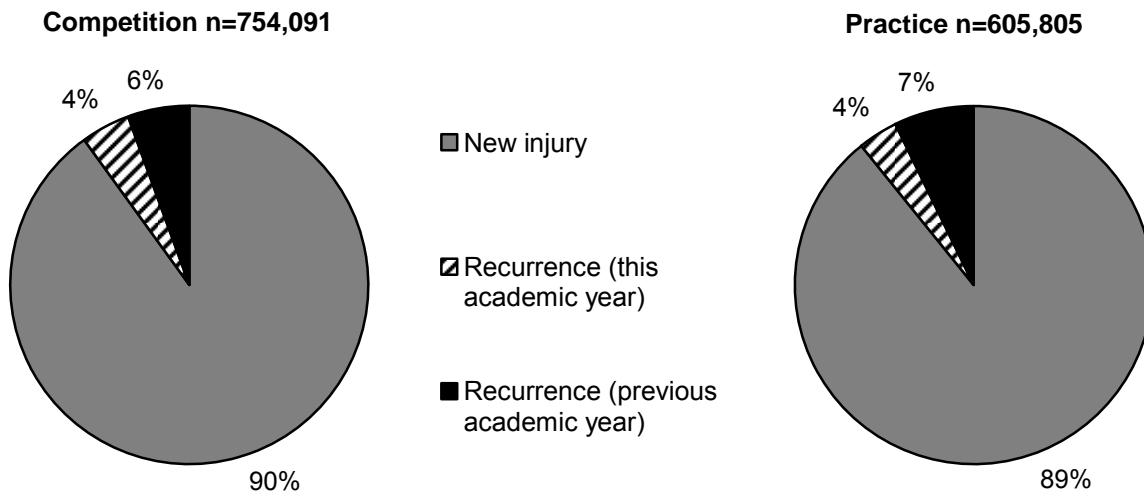


Table 2.9 Time during Season of Injury, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	311,176	22.9%
Regular season	991,793	73.1%
Post season	54,086	4.0%
Total	1,357,055	100%

Table 2.10 Competition-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	21,149	2.8%
Yes, according to the coach/athlete but was not ruled illegal/foul play	28,622	3.8%
No	667,056	89.1%
Unknown	31,844	4.3%
Total	748,671	100%

Table 2.11 Practice-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	67,161	11.4%
Second 1/2 hour	118,885	20.1%
1-2 hours into practice	328,017	55.5%
>2 hours into practice	77,415	13.1%
Total	591,477	100%

Table 2.12 Methods for Injury Evaluation and Assessment, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
% of Injuries Evaluated by:*		
Certified athletic trainer	1,272,511	93.6%
General physician	516,510	38.0%
Orthopedic physician	372,989	27.4%
Physicians assistant	15,355	1.1%
Chiropractor	13,215	1.0%
Nurse practitioner	3,993	0.3%
Dentist/oral surgeon	3,067	0.2%
Other	64,049	4.7%
Total	1,359,897	100%
% of Injuries Assessed by:*		
Evaluation	1,298,554	95.5%
X-ray	546,662	40.2%
MRI	166,928	12.3%
CT-scan	59,466	4.4%
Surgery	14,099	1.0%
Blood work/lab test	13,131	1.0%
Other	11,139	0.8%
Total	1,359,897	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, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	1,808	474,929	3.81	581,414
Competition	985	76,085	12.95	322,801
Practice	823	398,844	2.06	258,614

Table 3.2 Demographic Characteristics of Injured Football Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n= 578,667
Freshman	19.8%
Sophomore	24.3%
Junior	24.9%
Senior	31.0%
Total†	100%
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	16.0 (1.2)
BMI	
Minimum	8.1
Maximum	47.2
Mean (St. Dev.)	25.9 (4.8)

*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 3.1 Diagnosis of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

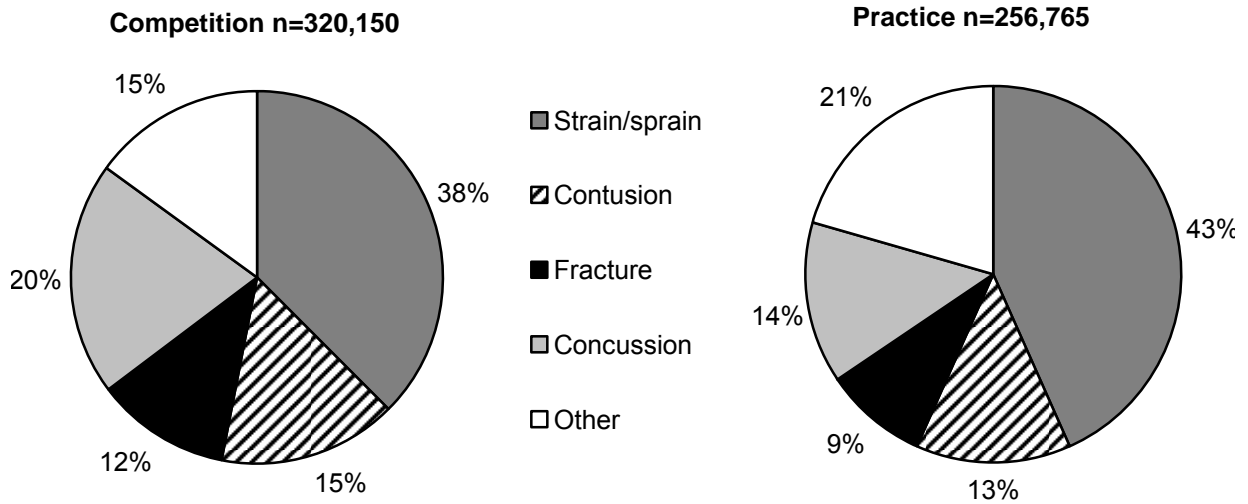


Table 3.3 Body Site of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Head/face	65,268	20.3%	37,681	14.6%	102,948	17.8%
Knee	60,363	18.8%	35,245	13.6%	95,607	16.5%
Shoulder	39,063	12.2%	34,702	13.4%	73,766	12.7%
Hand/wrist	35,495	11.0%	34,257	13.3%	69,752	12.0%
Ankle	40,760	12.7%	25,930	10.0%	66,690	11.5%
Hip/thigh/upper leg	19,808	6.2%	24,742	9.6%	44,550	7.7%
Trunk	17,213	5.4%	17,536	6.8%	34,749	6.0%
Lower leg	13,100	4.1%	11,755	4.5%	24,855	4.3%
Arm/elbow	14,451	4.5%	7,719	3.0%	22,170	3.8%
Foot	6,661	2.1%	13,024	5.0%	19,685	3.4%
Neck	7,651	2.4%	6,354	2.5%	14,005	2.4%
Other	1,483	0.5%	9,526	3.7%	11,009	1.9%
Total	321,316	100%	258,470	100%	579,786	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, 2009-10 School Year

Diagnosis	Competition n= 318,916		Practice n=256,618		Total n=575,538	
	n	%	n	%	n	%
Head/face concussion	63,855	20.0%	35,629	13.9%	99,483	17.3%
Ankle strain/sprain	37,209	11.7%	24,269	9.5%	61,478	10.7%
Knee strain/sprain	38,712	12.1%	15,683	6.1%	54,395	9.5%
Shoulder other	15,880	5.0%	13,697	5.3%	29,577	5.1%
Hip/thigh/upper leg strain/sprain	7,495	2.4%	20,472	8.0%	27,968	4.9%
Hand/wrist fracture	16,581	5.2%	10,850	4.2%	27,430	4.8%
Shoulder strain/sprain	14,237	4.5%	13,121	5.1%	27,358	4.8%
Knee other	13,552	4.2%	11,767	4.6%	25,319	4.4%
Hand/wrist strain/sprain	9,424	3.0%	7,039	2.7%	16,463	2.9%
Hip/thigh/upper leg contusion	11,154	3.5%	3,731	1.5%	14,885	2.6%

Figure 3.2 Time Loss of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

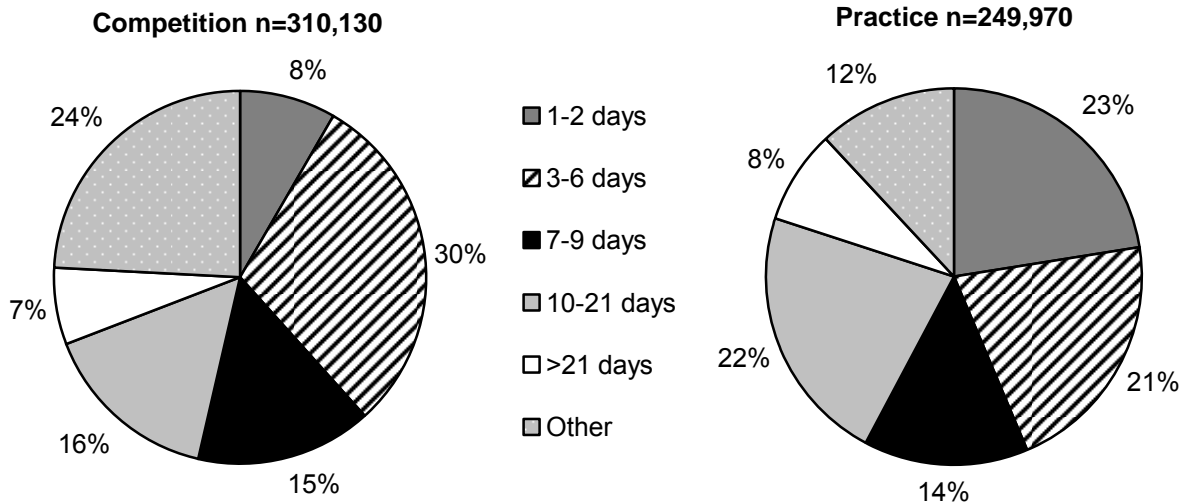


Table 3.5 Football Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	30,691	9.7%	17,800	7.0%	48,491	8.5%
Did not require surgery	286,929	90.3%	236,529	93.0%	523,458	91.5%
Total	317,620	100%	254,329	100%	571,949	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, 2009-10 School Year

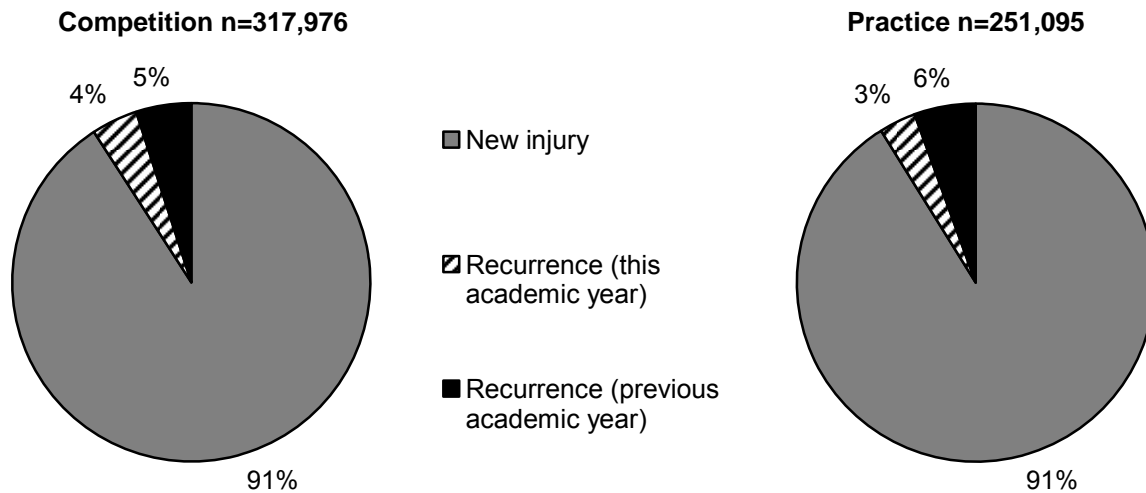


Table 3.6 Time during Season of Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	161,043	27.7%
Regular season	395,646	68.1%
Post season	24,040	4.1%
Total	580,729	100%

Table 3.7 Competition-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	4,734	1.5%
First quarter	40,528	13.0%
Second quarter	93,660	30.1%
Third quarter	94,015	30.2%
Fourth quarter	77,642	25.0%
Overtime	502	0.2%
Total	311,081	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	2,653	0.8%
Yes, according to the coach/athlete but was not ruled illegal/foul play	8,681	2.7%
No	301,642	94.1%
Unknown	7,691	2.4%
Total	320,667	100%
Field Location		
Between the 20 yard lines	225,491	74.0%
Red zone (20 yard line to goal line)	72,856	23.9%
End zone	3,971	1.3%
Off the field	2,395	0.8%
Total	304,713	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, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	18,876	7.4%
Second 1/2 hour	44,231	17.4%
1-2 hours into practice	152,082	59.8%
>2 hours into practice	39,257	15.4%
Total	254,447	100%

Figure 3.4 Player Position of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

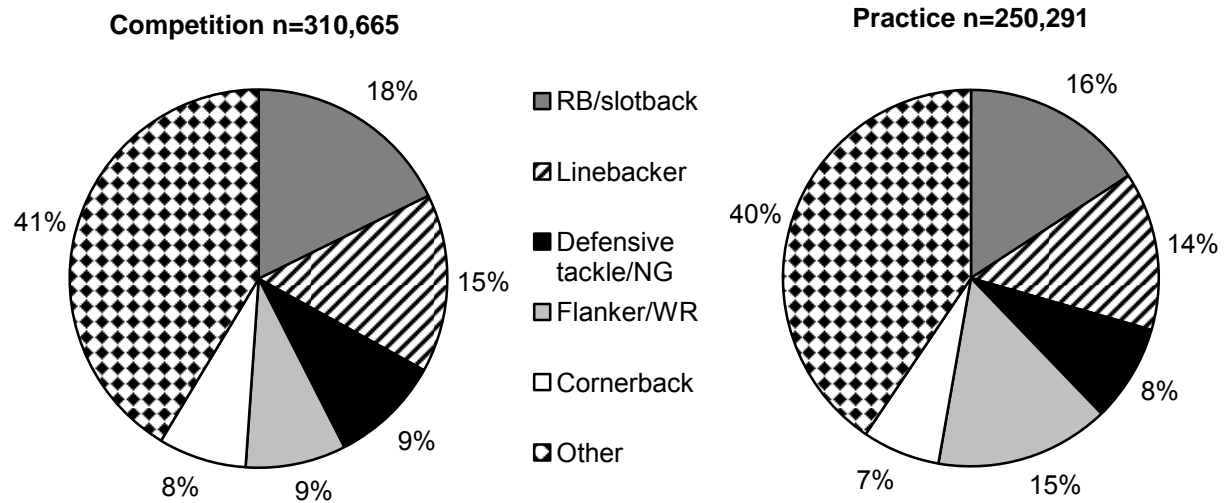
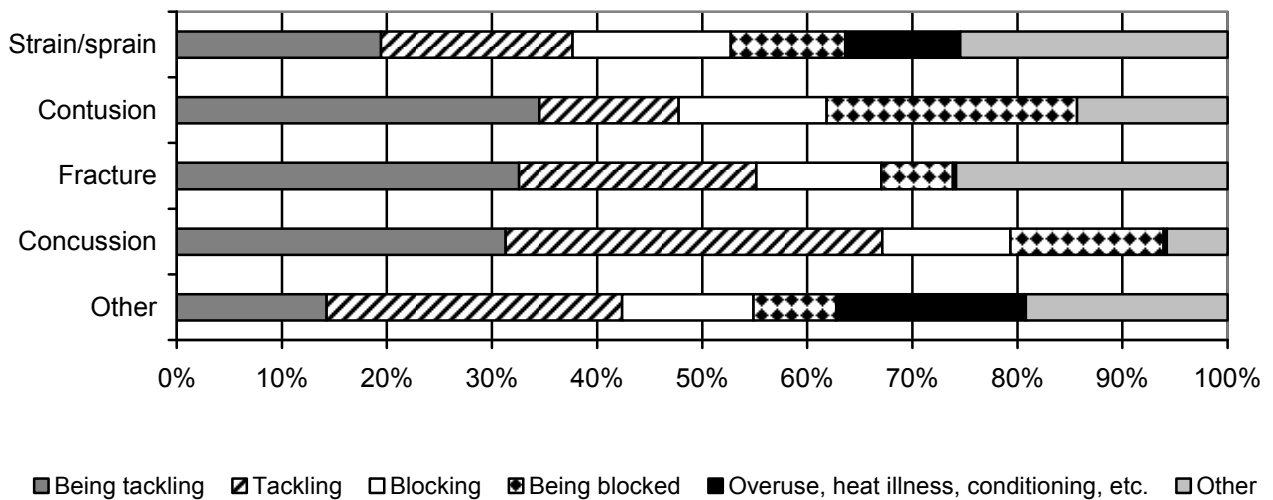


Table 3.9 Activities Leading to Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Being tackled	92,707	29.3%	44,613	17.5%	137,320	24.1%
Tackling	82,058	25.9%	48,722	19.2%	130,779	22.9%
Blocking	42,096	13.3%	35,374	13.9%	77,471	13.6%
Being blocked	47,108	14.9%	23,522	9.2%	70,630	12.4%
N/A (e.g., overuse, heat illness, , etc.)	7,416	2.3%	36,033	14.2%	43,449	7.6%
Stepped on/fell on/kicked	17,116	5.4%	11,989	4.7%	29,104	5.1%
Rotation around a planted foot	11,445	3.6%	14,292	5.6%	25,737	4.5%
Uneven playing surface	2,972	0.9%	9,917	3.9%	12,888	2.3%
Contact with ball	4,355	1.4%	5,217	2.1%	9,572	1.7%
Contact with blocking sled/dummy	-	0.0%	5,468	2.1%	5,468	1.0%
Other	9,109	2.9%	19,243	7.6%	28,352	5.0%
Total	316,381	100%	254,390	100%	570,771	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, 2009-10 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, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	291	166,141	1.75	153,485
Competition	170	50,081	3.39	83,985
Practice	121	116,060	1.04	69,500

Table 4.2 Demographic Characteristics of Injured Boys' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n= 150,328
Freshman	21.7%
Sophomore	18.1%
Junior	27.7%
Senior	32.5%
Total†	100%
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	16.1 (1.2)
BMI	
Minimum	16.5
Maximum	36.6
Mean (St. Dev.)	22.4 (2.9)

*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, 2009-10 School Year

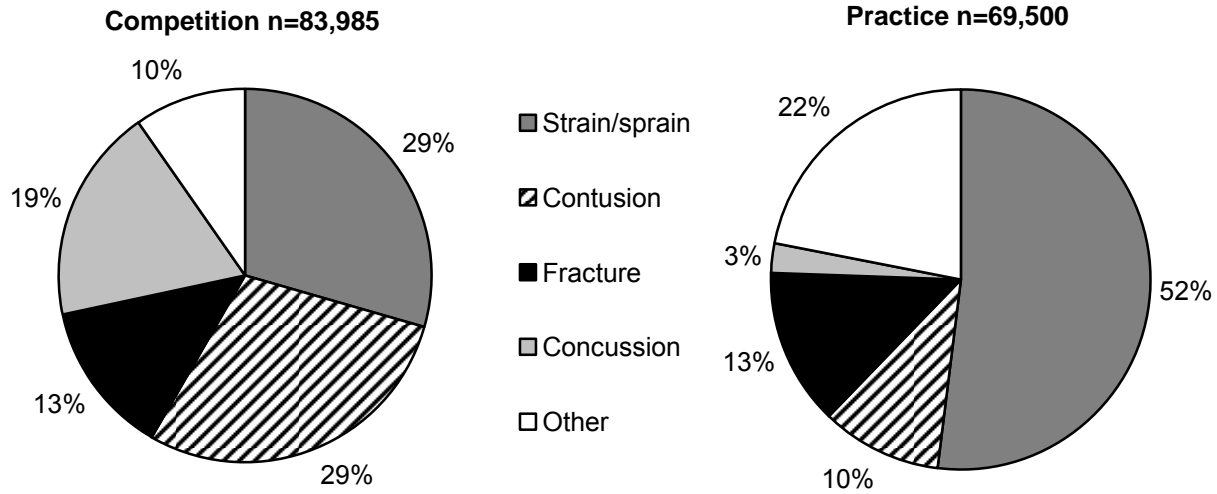


Table 4.3 Body Site of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Hip/thigh/upper leg	12,747	15.2%	17,600	25.3%	30,347	19.8%
Head/face	23,133	27.5%	3,106	4.5%	26,239	17.1%
Ankle	11,801	14.1%	10,597	15.2%	22,397	14.6%
Knee	9,368	11.2%	8,955	12.9%	18,323	11.9%
Hand/wrist	3,866	4.6%	10,129	14.6%	13,996	9.1%
Foot	4,016	4.8%	8,061	11.6%	12,077	7.9%
Lower leg	7,094	8.4%	4,273	6.1%	11,367	7.4%
Trunk	6,150	7.3%	3,912	5.6%	10,061	6.6%
Arm/elbow	2,882	3.4%	2,497	3.6%	5,378	3.5%
Shoulder	2,534	3.0%	150	0.2%	2,685	1.7%
Neck	395	0.5%	69	0.1%	464	0.3%
Other	-	0.0%	150	0.2%	150	0.1%
Total	83,985	100%	69,500	100%	153,485	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, 2009-10 School Year

Diagnosis	Competition n=83,982		Practice n=69,496		Total n=153,480	
	n	%	n	%	n	%
Hip/thigh/upper leg strain/sprain	7,893	9.4%	16,094	23.2%	23,987	15.6%
Head/face concussion	15,713	18.7%	1,791	2.6%	17,504	11.4%
Ankle strain/sprain	8,434	10.0%	7,641	11.0%	16,075	10.5%
Knee strain/sprain	3,455	4.1%	4,472	6.4%	7,927	5.2%
Hand/wrist fracture	2,441	2.9%	4,196	6.0%	6,638	4.3%
Knee Other	2,372	2.8%	4,002	5.8%	6,374	4.2%
Hip/thigh/upper leg contusion	4,070	4.8%	1,506	2.2%	5,576	3.6%
Trunk contusion	5,365	6.4%	-	0.0%	5,365	3.5%
Lower leg contusion	3,285	3.9%	1,380	2.0%	4,665	3.0%
Foot other	150	0.2%	4,381	6.3%	4,531	3.0%

Figure 4.2 Time Loss of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

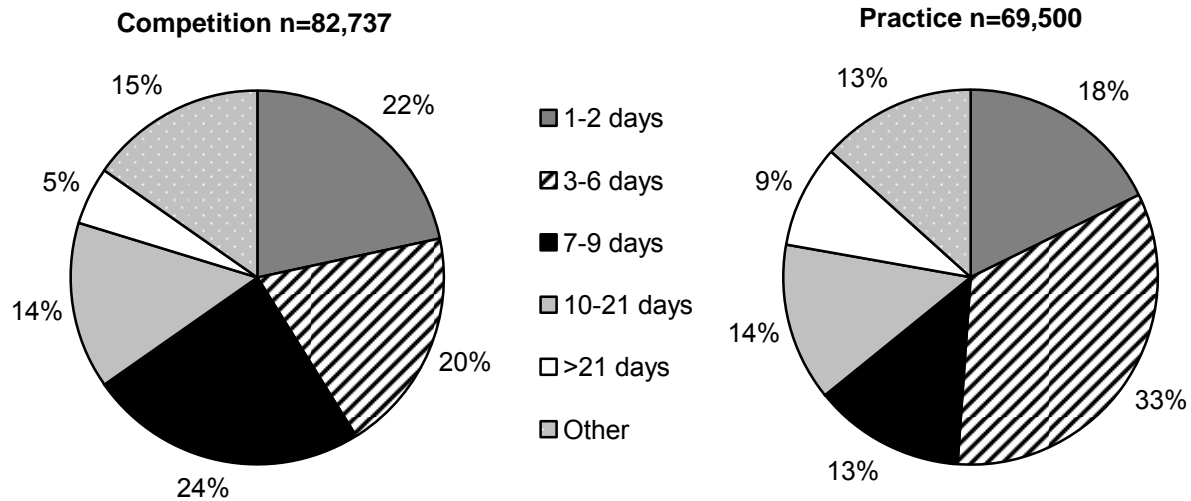


Table 4.5 Boys' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	8,073	9.7%	3,389	5.0%	11,463	7.6%
Did not require surgery	75,240	90.3%	64,975	95.0%	140,215	92.4%
Total	83,314	100%	68,364	100%	151,678	100%

Figure 4.3 History of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

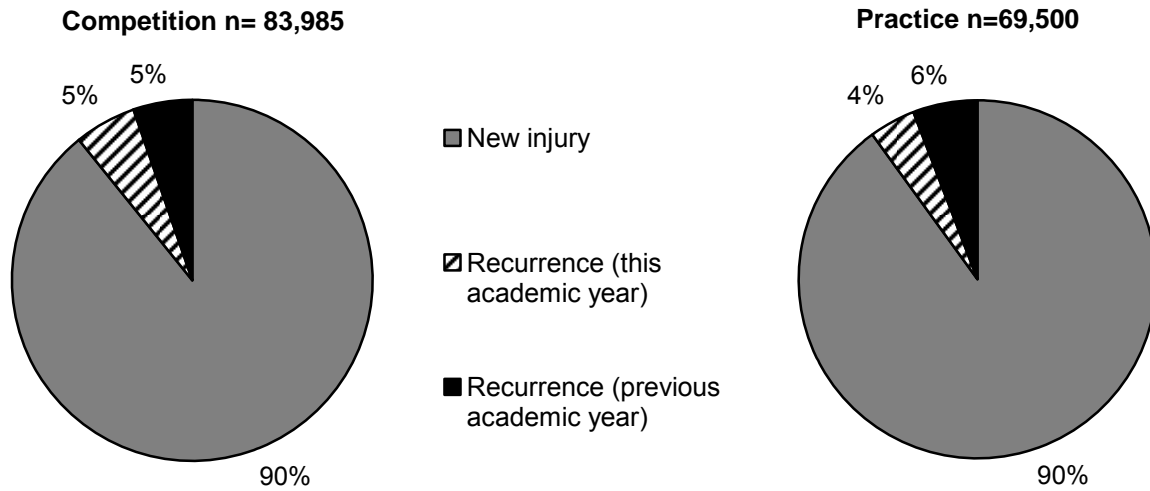


Table 4.6 Time during Season of Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	33,370	21.9%
Regular season	115,655	75.8%
Post season	3,475	2.3%
Total	152,500	100%

Table 4.7 Competition-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	3,006	3.6%
First half	38,308	45.9%
Second half	41,413	49.6%
Overtime	724	0.9%
Total	83,452	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	5,409	6.4
Yes, according to the coach/athlete but was not ruled illegal/foul play	4,464	5.3
No	65,217	77.7
Unknown	8,894	10.6
Total	83,985	100%
Field Location		
Top of goal box extended to center line (offense)	25,191	31.5%
Top of goal box extended to center line (defense)	14,017	17.5%
Goal box (defense)	12,795	16.0%
Side of goal box (offense)	12,698	15.9%
Goal box (offense)	8,019	10.0%
Side of goal box (defense)	5,413	6.8%
Off the field	1,758	2.2%
Total	79,891	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, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	7,296	10.9%
Second 1/2 hour	20,409	30.5%
1-2 hours into practice	28,749	42.9%
>2 hours into practice	10,567	15.8%
Total	67,021	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, 2009-10 School Year

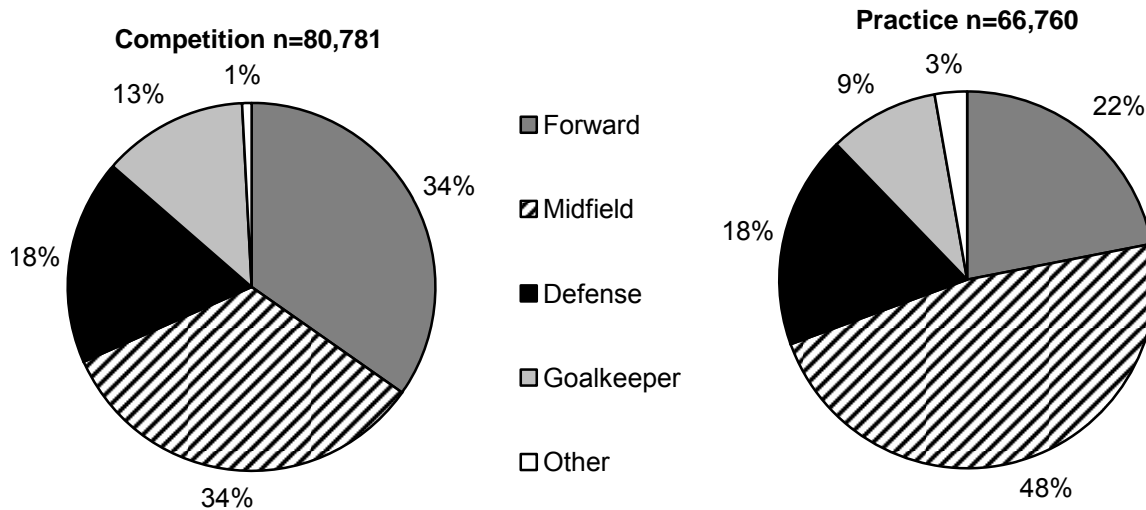
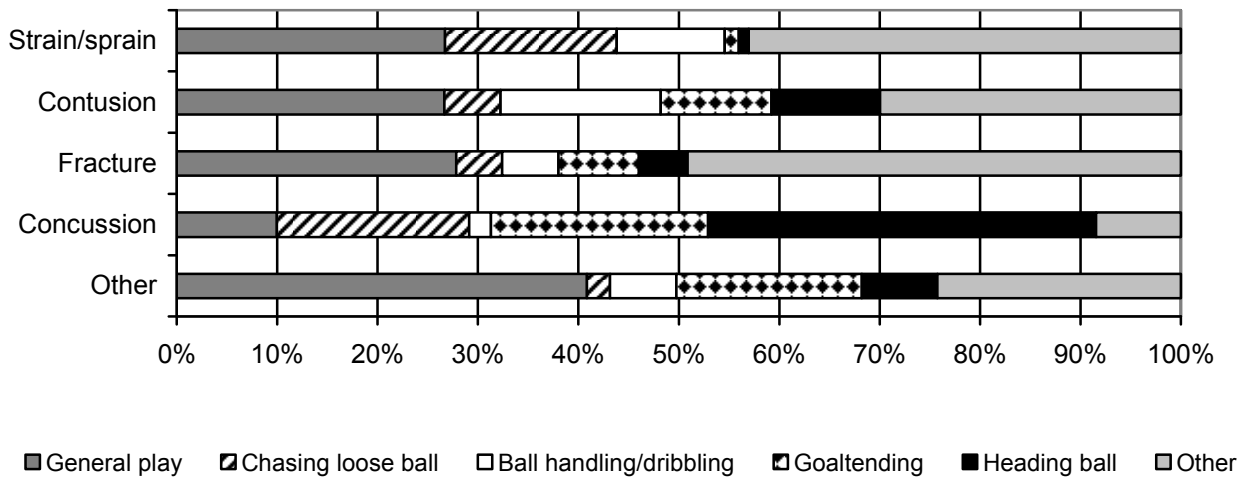


Table 4.9 Activities Leading to Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
General play	18,518	23.4%	21,610	31.9%	40,128	27.3%
Chasing loose ball	9,930	12.5%	6,093	9.0%	16,023	10.9%
Ball handling/dribbling	9,775	12.4%	4,321	6.4%	14,096	9.6%
Goaltending	8,312	10.5%	4,948	7.3%	13,259	9.0%
Heading ball	9,969	12.6%	2,432	3.6%	12,400	8.4%
Passing (foot)	4,304	5.4%	6,851	10.1%	11,155	7.6%
Conditioning	-	0.0%	9,878	14.6%	9,878	6.7%
Defending	7,473	9.4%	1,205	1.8%	8,677	5.9%
Shooting (foot)	1,781	2.3%	3,541	5.2%	5,323	3.6%
Receiving pass	3,911	4.9%	1,396	2.1%	5,308	3.6%
Attempting a slide tackle	260	0.3%	2,776	4.1%	3,037	2.1%
Other	4,907	6.2%	2,694	4.0%	7,601	5.2%
Total	79,140	100%	67,746	100%	146,886	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, 2009-10 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, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	298	148,798	2.00	181,159
Competition	210	44,964	4.67	129,754
Practice	88	103,834	0.85	51,405

Table 5.2 Demographic Characteristics of Injured Girls' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=179,811
Freshman	22.8%
Sophomore	31.4%
Junior	22.7%
Senior	23.0%
Total[†]	100%
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	15.8 (1.2)
BMI	
Minimum	16.0
Maximum	40.4
Mean (St. Dev.)	21.9 (2.9)

*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, 2009-10 School Year

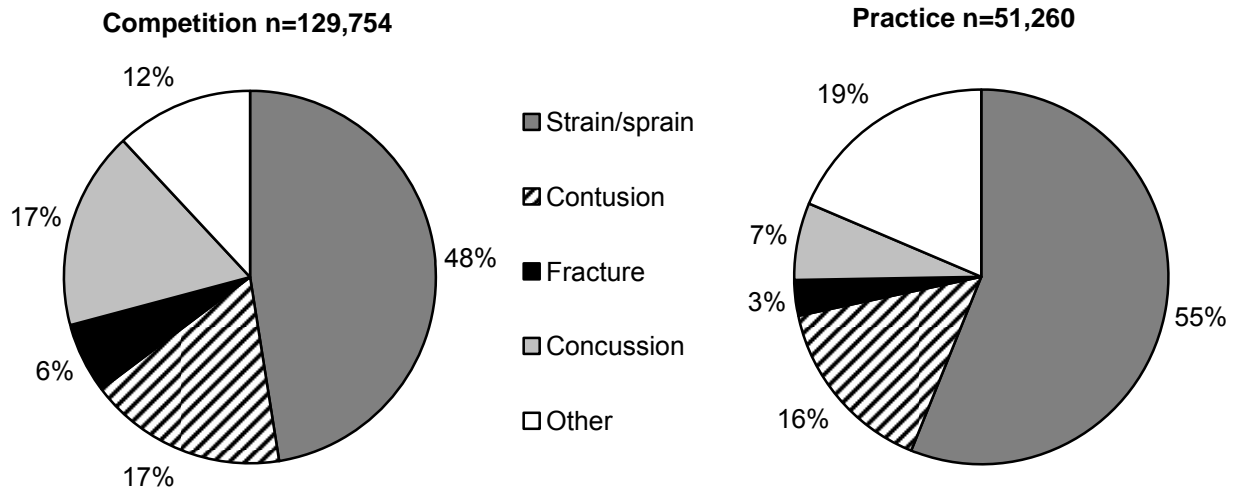


Table 5.3 Body Site of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Knee	31,171	24.0%	10,743	20.9%	41,914	23.1%
Ankle	27,310	21.0%	12,659	24.6%	39,969	22.1%
Head/face	26,676	20.6%	7,239	14.1%	33,915	18.7%
Hip/thigh/upper leg	11,589	8.9%	8,028	15.6%	19,617	10.8%
Lower leg	8,111	6.3%	3,704	7.2%	11,815	6.5%
Trunk	7,934	6.1%	3,410	6.6%	11,344	6.3%
Hand/wrist	6,728	5.2%	1,214	2.4%	7,942	4.4%
Foot	4,782	3.7%	2,153	4.2%	6,936	3.8%
Shoulder	2,426	1.9%	1,566	3.0%	3,992	2.2%
Arm/elbow	2,115	1.6%	285	0.6%	2,400	1.3%
Neck	912	0.7%	403	0.8%	1,315	0.7%
Total	129,754	100%	51,405	100%	181,159	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, 2009-10 School Year

Diagnosis	Competition n=129,752		Practice n=51,259		Total n= 181,011	
	n	%	n	%	n	%
Ankle strain/sprain	25,523	19.7%	12,659	24.7%	38,182	21.1%
Head/face concussion	22,552	17.4%	3,401	6.6%	25,954	14.3%
Knee strain/sprain	17,887	13.8%	4,005	7.8%	21,892	12.1%
Knee other	8,543	6.6%	5,642	11.0%	14,184	7.8%
Hip/thigh/upper leg strain/sprain	5,964	4.6%	7,113	13.9%	13,077	7.2%
Head/face contusion	2,702	2.1%	3,290	6.4%	5,992	3.3%
Lower leg contusion	5,227	4.0%	405	0.8%	5,633	3.1%
Trunk strain/sprain	3,457	2.7%	1,908	3.7%	5,364	3.0%
Knee contusion	4,338	3.3%	1,097	2.1%	5,434	3.0%
Hip/thigh/upper leg contusion	4,123	3.2%	-	0.0%	4,123	2.3%

Figure 5.2 Time Loss of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

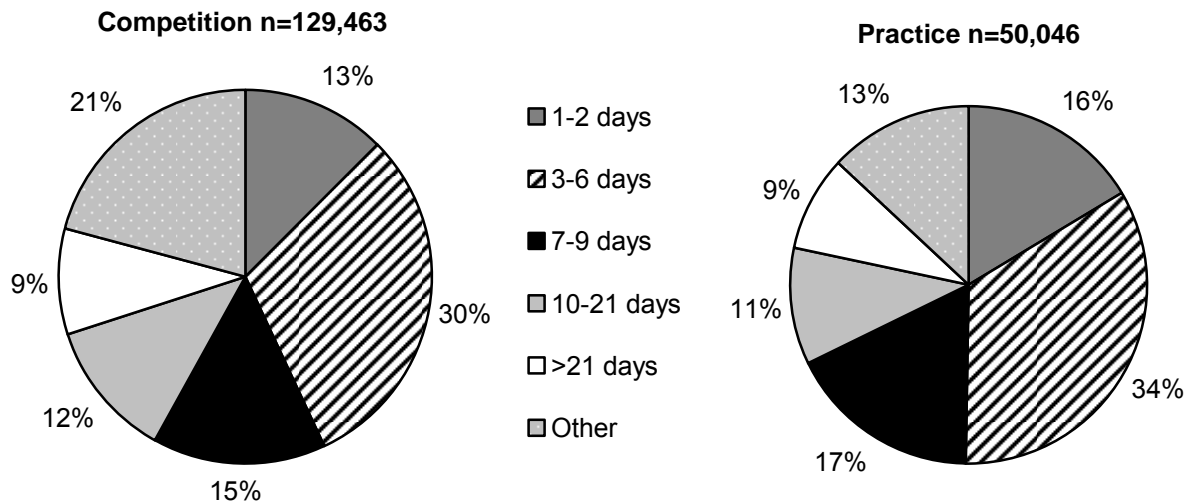


Table 5.5 Girls' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	11,770	9.2%	3,253	6.4%	15,023	8.4%
Did not require surgery	116,228	90.8%	47,749	93.6%	163,977	91.6%
Total	127,998	100%	51,002	100%	179,000	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, 2009-10 School Year

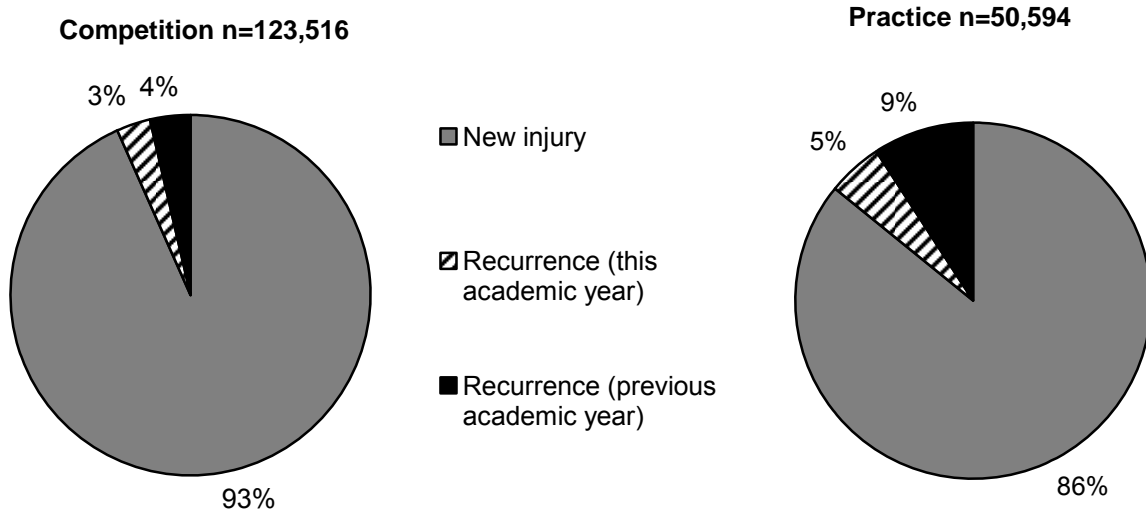


Table 5.6 Time during Season of Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	19,976	11.0%
Regular season	154,128	85.1%
Post season	7,054	3.9%
Total	181,159	100%

Table 5.7 Competition-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	688	0.5%
First half	38,649	30.8%
Second half	83,051	66.2%
Overtime	3,029	2.4%
Total	125,418	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	6,889	5.4%
Yes, according to the coach/athlete but was not ruled illegal/foul play	10,820	8.4%
No	99,992	77.7%
Unknown	10,996	8.5%
Total	128,697	100%
Field Location		
Top of goal box extended to center line (offense)	43,103	35.8%
Top of goal box extended to center line (defense)	25,125	20.9%
Goal box (defense)	18,430	15.3%
Side of goal box (defense)	12,684	10.5%
Goal box (offense)	11,716	9.7%
Side of goal box (offense)	8,095	6.7%
Off the field	1,097	0.9%
Total	120,250	100%

Table 5.8 Practice-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	5,785	11.6%
Second 1/2 hour	9,970	20.0%
1-2 hours into practice	31,108	62.5%
>2 hours into practice	2,936	5.9%
Total	49,799	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, 2009-10 School Year

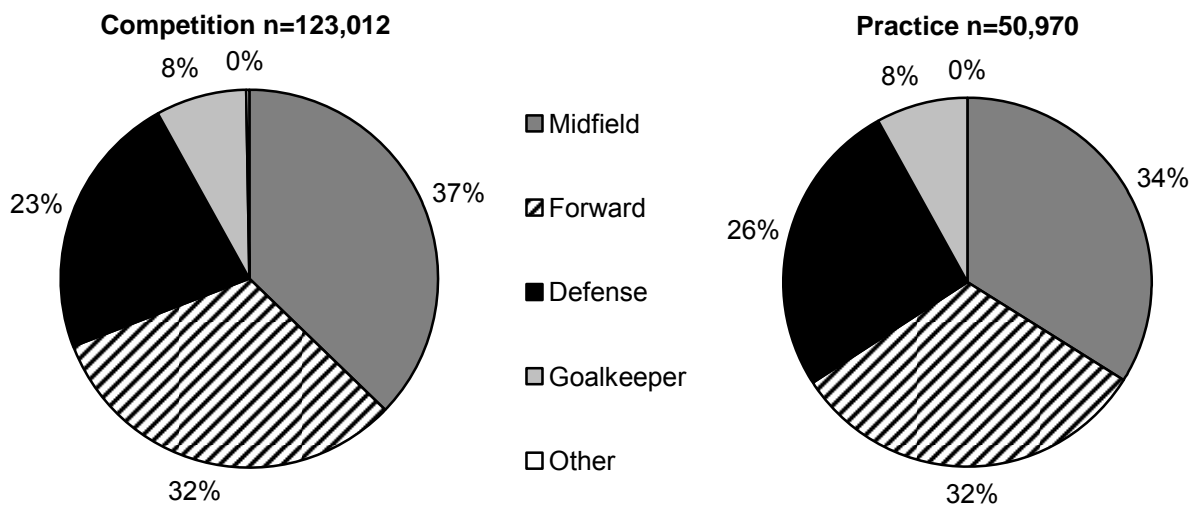
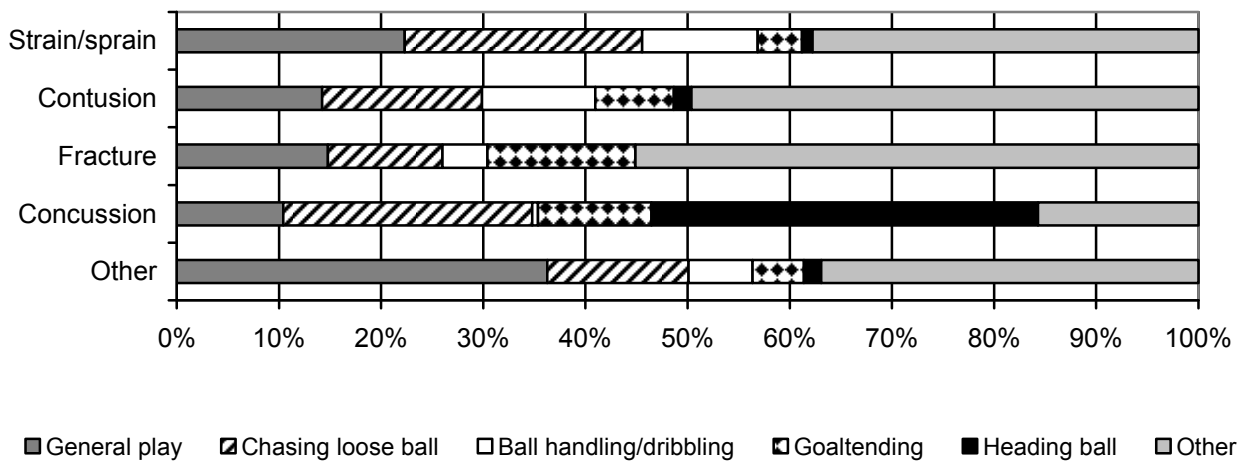


Table 5.9 Activities Leading to Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
General play	21,973	17.5%	14,467	28.8%	36,440	20.7%
Chasing loose ball	25,880	20.6%	9,850	19.6%	35,729	20.3%
Defending	18,283	14.5%	3,914	7.8%	22,196	12.6%
Ball handling/dribbling	10,349	8.2%	4,818	9.6%	15,167	8.6%
Passing (foot)	10,222	8.1%	2,621	5.2%	12,842	7.3%
Heading ball	10,144	8.1%	1,500	3.0%	11,643	6.6%
Shooting (foot)	10,305	8.2%	1,101	2.2%	11,406	6.5%
Goaltending	7,300	5.8%	4,150	8.3%	11,450	6.5%
Receiving pass	6,171	4.9%	951	1.9%	7,121	4.0%
Conditioning	-	0.0%	4,770	9.5%	4,770	2.7%
Other	5,114	4.0%	2,022	4.0%	7,136	4.0%
Total	125,738	100%	50,163	100%	175,901	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, 2009-10 School Year



VI. Volleyball Injury Epidemiology

Table 6.1 Volleyball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	158	159,273	0.99	67,760
Competition	53	52,781	1.00	21,728
Practice	105	106,492	0.99	46,032

Table 6.2 Demographic Characteristics of Injured Volleyball Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=67,760
Freshman	21.8%
Sophomore	27.6%
Junior	29.5%
Senior	21.2%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.8 (1.2)
BMI	
Minimum	15.6
Maximum	32.4
Mean (St. Dev.)	22.3 (3.2)

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

[†]Throughout this chapter, totals and n's represent the total 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, 2009-10 School Year

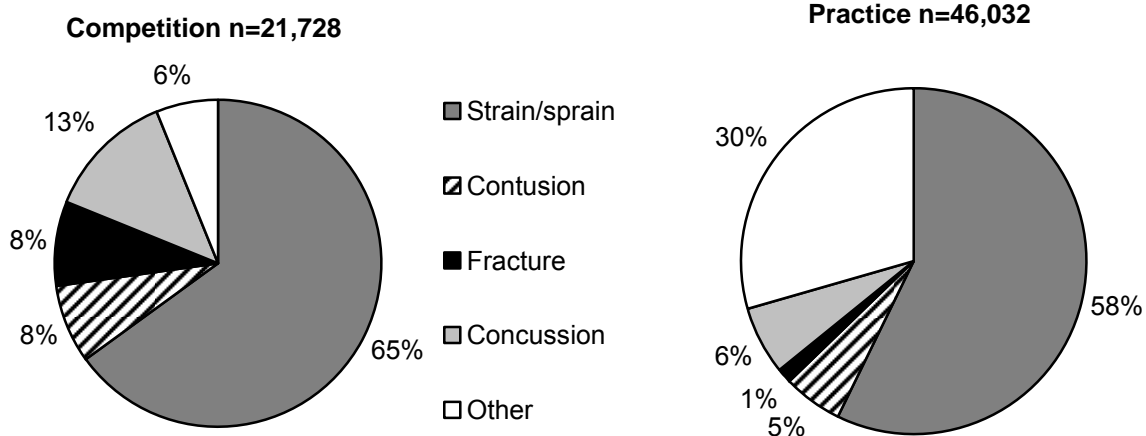


Table 6.3 Body Site of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	8,833	40.7%	17,530	38.1%	26,362	38.9%
Knee	5,256	24.2%	6,115	13.3%	11,371	16.8%
Head/face	3,847	17.7%	5,053	11.0%	8,900	13.1%
Hip/thigh/upper leg	946	4.4%	3,824	8.3%	4,770	7.0%
Trunk	-	0.0%	4,377	9.5%	4,377	6.5%
Hand/wrist	2,000	9.2%	2,218	4.8%	4,218	6.2%
Lower leg	138	0.6%	2,949	6.4%	3,087	4.6%
Foot	530	2.4%	2,075	4.5%	2,605	3.8%
Shoulder	178	0.8%	1,614	3.5%	1,792	2.6%
Arm/elbow	-	0.0%	138	0.3%	138	0.2%
Other	-	0.0%	138	0.3%	138	0.2%
Total	21,728	100%	46,032	100%	67,760	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, 2009-10 School Year

Diagnosis	Competition n=21,728		Practice n=46,031		Total n=67,760	
	n	%	n	%	n	%
Ankle strain/sprain	8,655	39.8%	16,439	35.7%	25,094	37.0%
Head/face concussion	2,756	12.7%	2,871	6.2%	5,628	8.3%
Knee other	1,041	4.8%	3,945	8.6%	4,986	7.4%
Hip/thigh/upper leg strain/sprain	946	4.4%	3,686	8.0%	4,632	6.8%
Knee strain/sprain	2,884	13.3%	1,640	3.6%	4,525	6.7%
Hand/wrist strain/sprain	1,665	7.7%	1,407	3.1%	3,073	4.5%
Trunk strain/sprain	-	0.0%	2,756	6.0%	2,756	4.1%
Lower leg other	138	0.6%	2,593	5.6%	2,731	4.0%
Shoulder other	178	0.8%	1,538	3.3%	1,716	2.5%
Foot other	-	0.0%	1,620	3.5%	1,620	2.4%

Figure 6.2 Time Loss of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

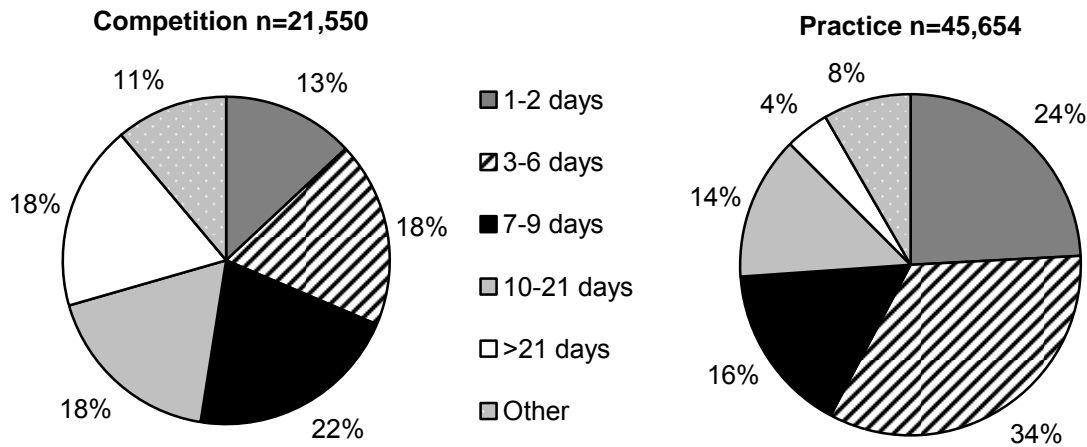


Table 6.5 Volleyball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,801	13.6%	1,469	3.2%	4,270	6.4%
Did not require surgery	17,836	86.4%	44,486	96.8%	62,323	93.6%
Total	20,637	100%	45,955	100%	66,593	100%

Figure 6.3 History of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

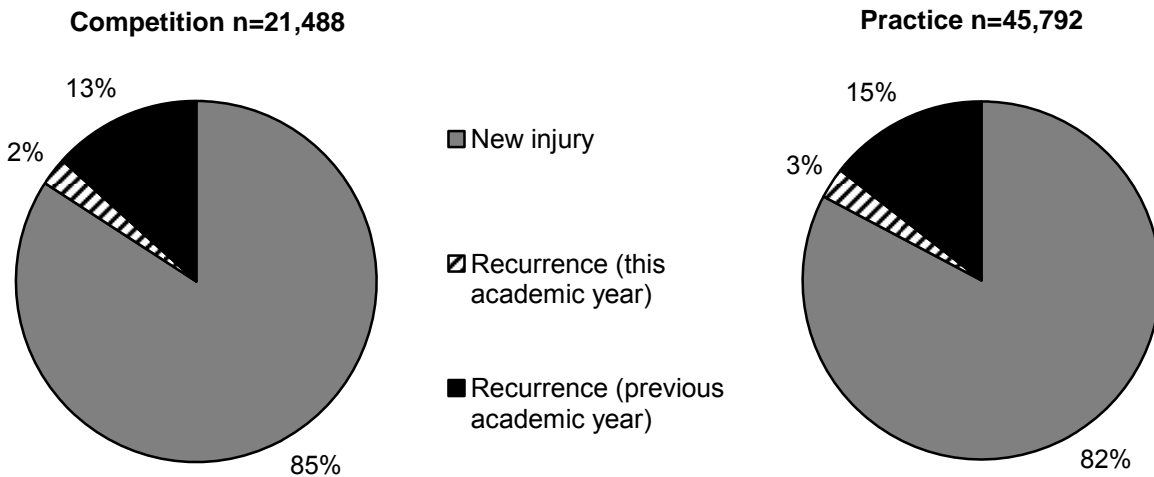


Table 6.6 Time during Season of Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	2,594	12.1%
Regular season	16,440	76.8%
Post season	2,360	11.0%
Total	21,394	100%

Table 6.7 Competition-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,375	7.1%
First game	4,387	22.7%
Second game	8,369	43.4%
Third game	2,802	14.5%
Fourth game	2,360	12.2%
Total	19,292	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	353	1.6%
Yes, according to the coach/athlete but was not ruled illegal/foul play	530	2.4%
No	20,845	95.9%
Total	21,728	100%
Court Location		
Right front	5,210	27.8%
Center front	4,721	25.2%
Left back	3,961	21.1%
Left front	3,787	20.2%
Outside the playable area	667	3.6%
Outside court (opponents side)	240	1.3%
Outside court (your side)	178	0.9%
Total	18,763	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, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	7,662	17.3%
Second 1/2 hour	7,512	16.9%
1-2 hours into practice	26,581	60.0%
>2 hours into practice	2,582	5.8%
Total	44,336	100%

Figure 6.4 Player Position of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

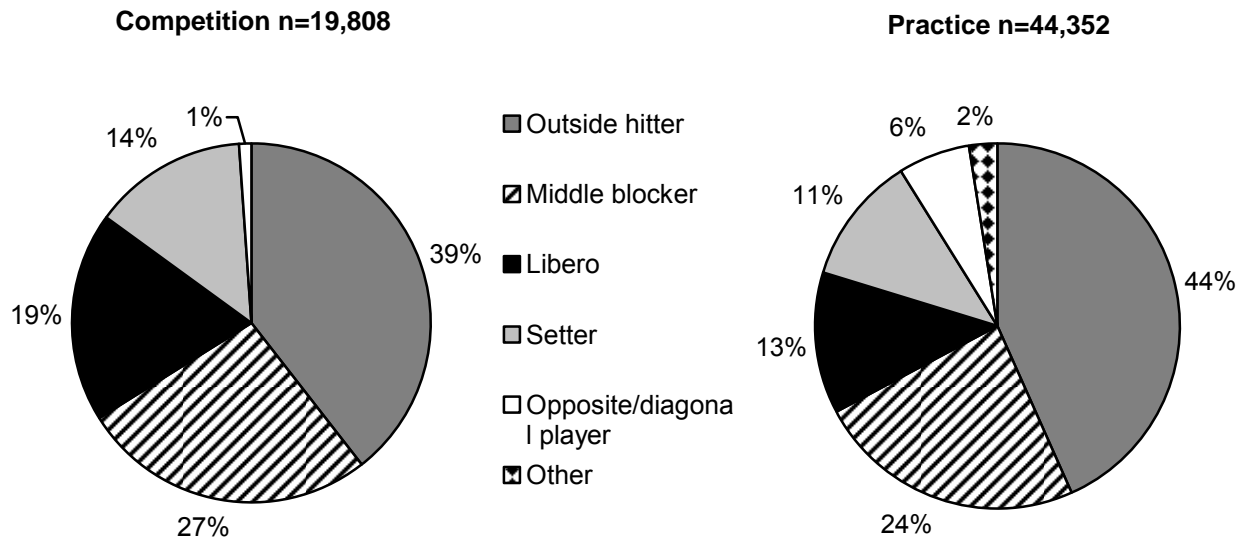
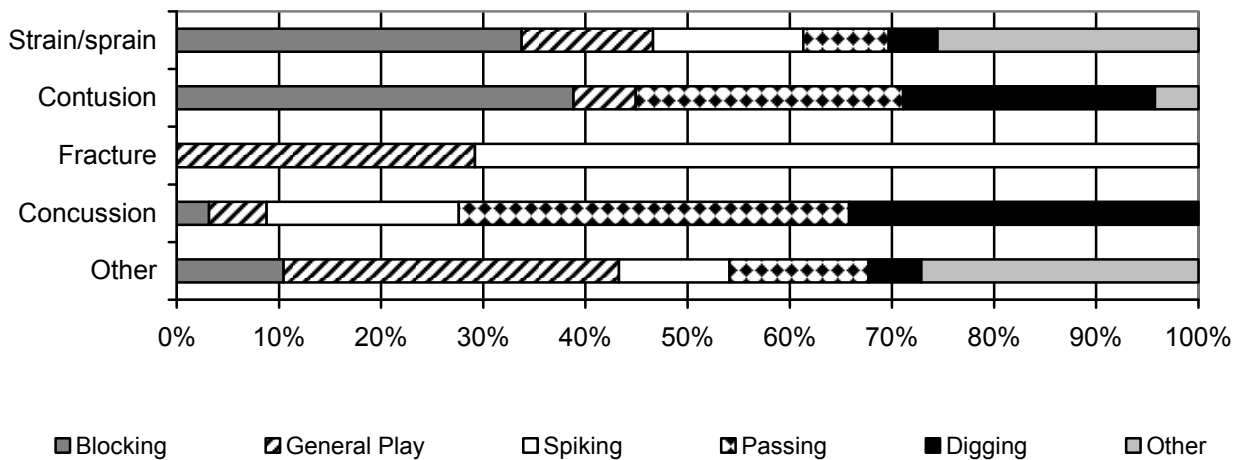


Table 6.9 Activities Leading to Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Blocking	3,595	17.8%	12,922	28.2%	16,517	25.0%
General play	1,989	9.9%	9,163	20.0%	11,151	16.9%
Spiking	5,914	29.4%	4,114	9.0%	10,027	15.2%
Passing	4,024	20.0%	4,504	9.8%	8,528	12.9%
Digging	2,206	11.0%	3,392	7.4%	5,598	8.5%
Conditioning	-	0.0%	5,211	11.4%	5,211	7.9%
Setting	1,749	8.7%	3,104	6.8%	4,853	7.4%
Serving	-	0.0%	2,360	5.1%	2,360	3.6%
Other	667	3.3%	1,085	2.4%	1,752	2.7%
Total	20,143	100%	45,854	100%	65,997	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, 2009-10 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, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	292	201,706	1.45	85,063
Competition	161	59,157	2.72	46,787
Practice	131	142,549	0.92	38,276

Table 7.2 Demographic Characteristics of Injured Boys' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=84,214
Freshman	20.5%
Sophomore	29.5%
Junior	24%
Senior	26%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	16.3 (1.2)
BMI	
Minimum	16.3
Maximum	37.4
Mean (St. Dev.)	23.0 (3.0)

*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 7.1 Diagnosis of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

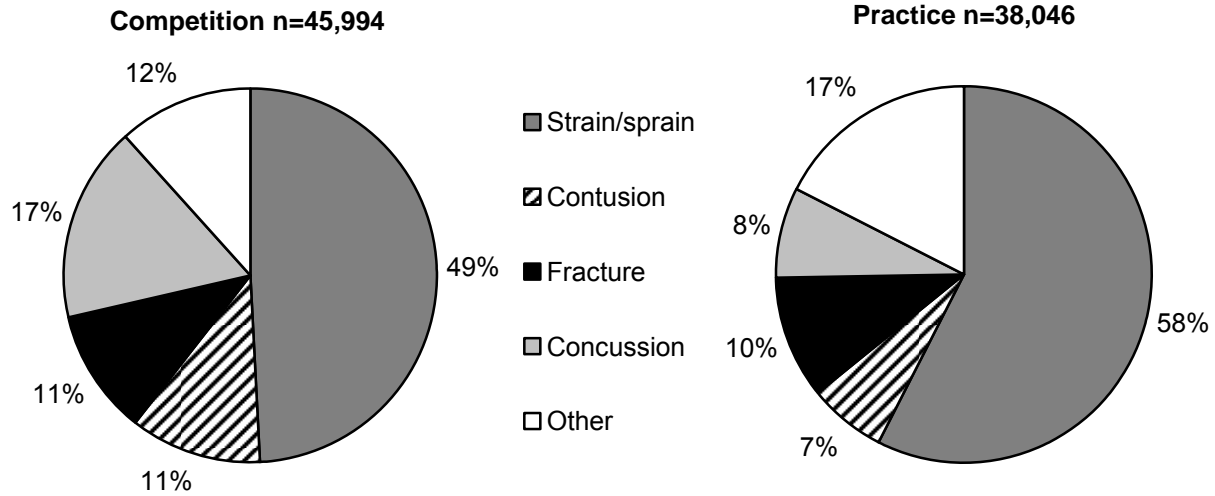


Table 7.3 Body Site of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	16,651	36.0%	11,747	30.7%	28,398	33.6%
Head/face	9,750	21.1%	6,077	15.9%	15,827	18.7%
Knee	7,828	16.9%	4,553	11.9%	12,380	14.7%
Hand/wrist	4,318	9.3%	3,394	8.9%	7,712	9.1%
Hip/thigh/upper leg	3,402	7.4%	2,590	6.8%	5,992	7.1%
Foot	1,339	2.9%	4,047	10.6%	5,386	6.4%
Trunk	1,127	2.4%	1,804	4.7%	2,932	3.5%
Shoulder	798	1.7%	1,606	4.2%	2,404	2.8%
Lower leg	237	0.5%	1,595	4.2%	1,832	2.2%
Arm/elbow	607	1.3%	723	1.9%	1,330	1.6%
Neck	-	0.0%	70	0.2%	70	0.1%
Other	142	0.3%	70	0.2%	212	0.3%
Total	46,198	100%	38,276	100%	84,474	100%

Table 7.4 Ten Most Common Boys' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Diagnosis	Competition n=45,477		Practice n=38,045		Total n=83,522	
	n	%	n	%	n	%
Ankle strain/sprain	14,511	31.9%	10,968	28.8%	25,479	30.5%
Head/face concussion	7,843	17.2%	3,028	8.0%	10,871	13.0%
Knee strain/sprain	2,553	5.6%	2,201	5.8%	4,755	5.7%
Knee other	2,390	5.3%	2,069	5.4%	4,459	5.3%
Hand/wrist strain/sprain	1,570	3.5%	2,336	6.1%	3,906	4.7%
Hip/thigh/upper leg contusion	1,899	4.2%	1,064	2.8%	2,964	3.5%
Hip/thigh/upper leg strain/sprain	1,266	2.8%	1,526	4.0%	2,792	3.3%
Foot strain/sprain	826	1.8%	1,652	4.3%	2,478	3.0%
Knee contusion	1,932	4.2%	282	0.7%	2,214	2.7%
Head/face fracture	379	0.8%	1,786	4.7%	2,164	2.6%

Figure 7.2 Time Loss of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

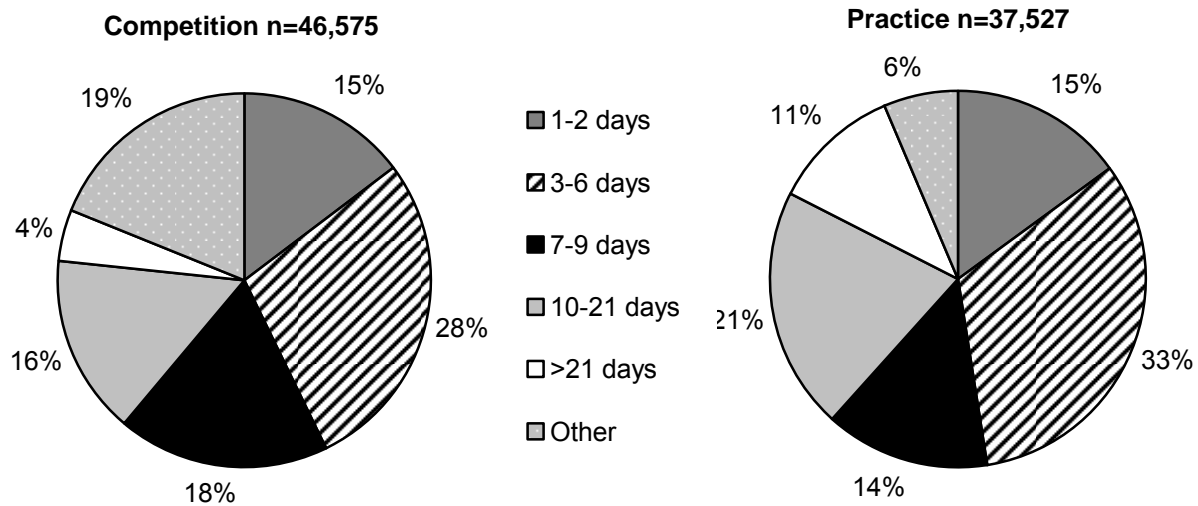


Table 7.5 Boys' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	4,446	9.7%	3,116	8.2%	7,562	9.0%
Did not require surgery	41,492	90.3%	34,693	91.8%	76,185	91.0%
Total	45,938	100%	37,810	100%	83,747	100%

Figure 7.3 History of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

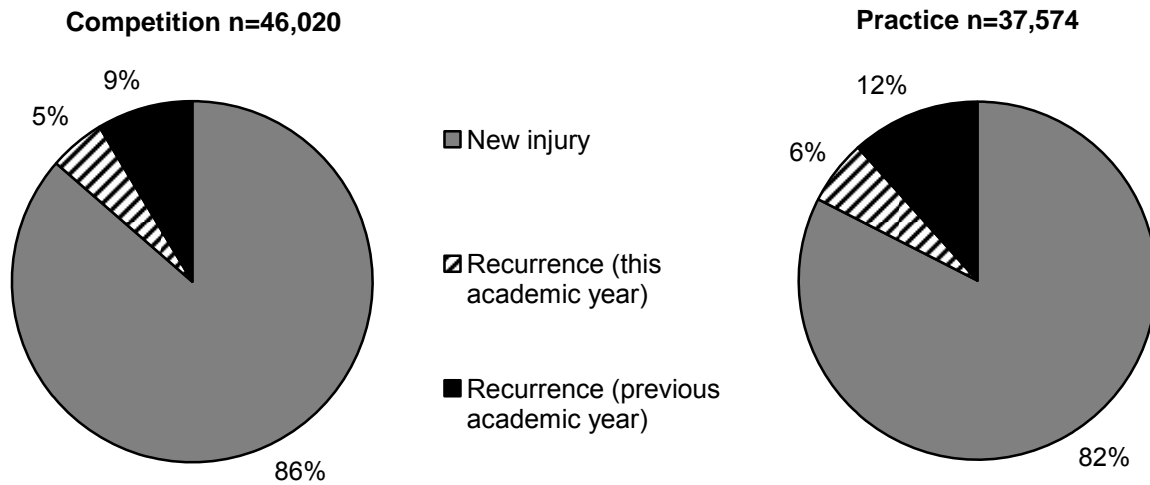


Table 7.6 Time during Season of Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	4,380	9.4%
Regular season	39,368	84.1%
Post season	3,040	6.5%
Total	46,787	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, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,631	3.5%
First quarter	4,103	8.8%
Second quarter	14,295	30.8%
Third quarter	17,288	37.2%
Fourth quarter	9,140	19.7%
Overtime	-	0.0%
Total	46,458	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	1,831	4.0%
Yes, according to the coach/athlete but was not ruled illegal/foul play	703	1.5%
No	42,311	92.1%
Unknown	1,100	2.4%
Total	45,946	100%
Court Location		
Inside lane (defense)	12,068	26.4%
Inside lane (offense)	11,782	25.8%
Between 3 pt arc and lane (offense)	6,998	15.3%
Between 3 pt arc and lane (defense)	4,661	10.2%
Outside 3 point arc (defense)	3,957	8.7%
Outside 3 point arc (offense)	2,157	4.7%
Out of bounds	1,527	3.3%
Backcourt	1,421	3.1%
Off the court	1,165	2.5%
Total	45,736	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, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	3,190	8.5%
Second 1/2 hour	7,233	19.4%
1-2 hours into practice	22,031	59.0%
>2 hours into practice	4,862	13.0%
Total	37,317	100%

Figure 7.4 Player Position of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

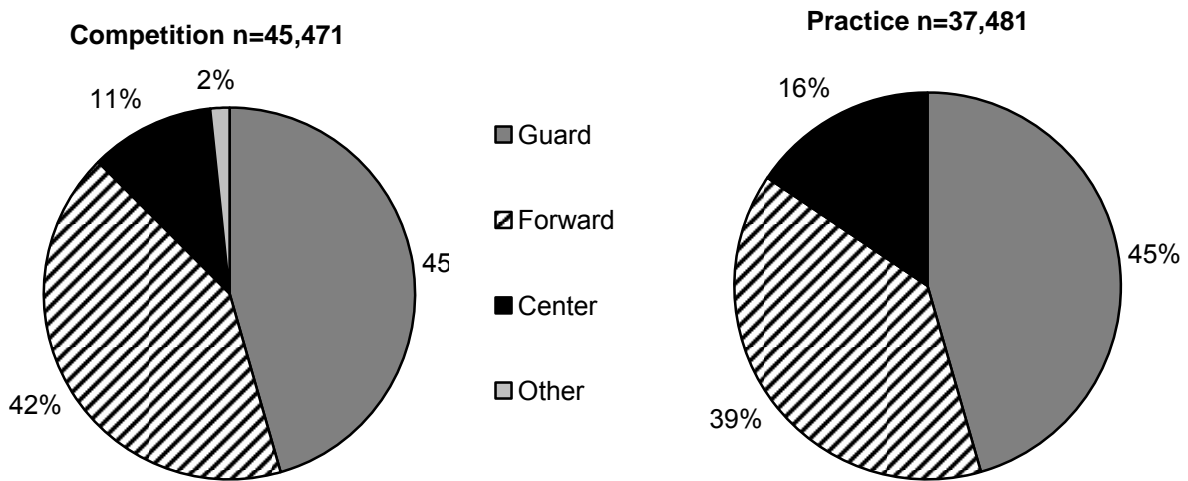
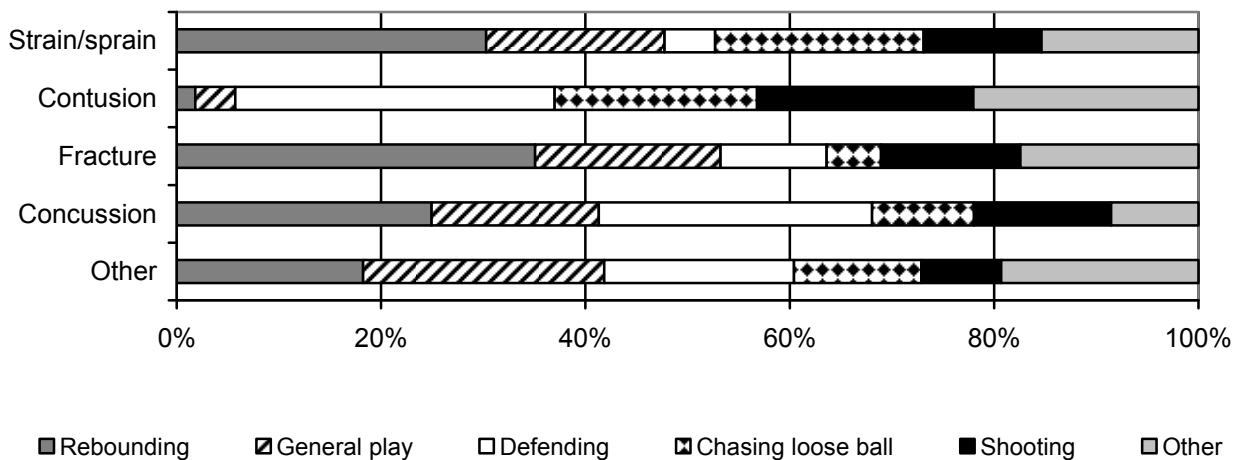


Table 7.9 Activities Leading to Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Rebounding	10,678	23.4%	10,479	27.9%	21,157	25.4%
General play	6,075	13.3%	8,593	22.9%	14,668	17.6%
Shooting	8,969	19.6%	4,461	11.9%	13,430	16.1%
Defending	7,185	15.7%	3,396	9.0%	10,581	12.7%
Chasing loose ball	5,321	11.7%	4,951	13.2%	10,272	12.3%
Receiving pass	2,942	6.4%	1,809	4.8%	4,751	5.7%
Ball handling/dribbling	2,105	4.6%	1,974	5.3%	4,079	4.9%
Screening	709	1.6%	259	0.7%	968	1.2%
Conditioning	-	0.0%	849	2.3%	849	1.0%
Passing	-	0.0%	142	0.4%	142	0.2%
Other	1,680	3.7%	637	1.7%	2,317	2.8%
Total	45,664	100%	37,551	100%	83,214	100%

Figure 7.5 Activity Resulting in Boys' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2009-10 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, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	266	168,408	1.58	78,709
Competition	147	51,819	2.84	44,026
Practice	119	116,589	1.02	34,684

Table 8.2 Demographic Characteristics of Injured Girls' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=77,110
Freshman	36.0%
Sophomore	24.8%
Junior	21.8%
Senior	17.5%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.5 (1.3)
BMI	
Minimum	15.8
Maximum	54.7
Mean (St. Dev.)	22.7 (3.9)

*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, 2009-10 School Year

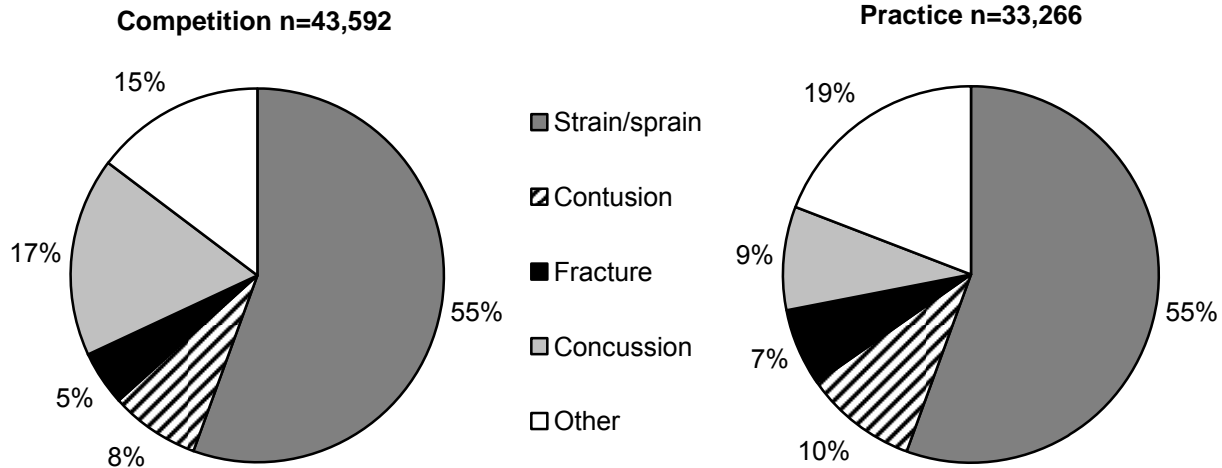


Table 8.3 Body Site of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Ankle	18,158	41.4%	14,179	40.9%	32,337	41.2%
Head/face	9,457	21.6%	5,129	14.8%	14,587	18.6%
Knee	7,511	17.1%	5,150	14.8%	12,661	16.1%
Hand/wrist	1,407	3.2%	3,279	9.5%	4,686	6.0%
Foot	1,545	3.5%	2,241	6.5%	3,786	4.8%
Trunk	2,434	5.5%	348	1.0%	2,781	3.5%
Hip/thigh/upper leg	1,095	2.5%	1,223	3.5%	2,318	2.9%
Shoulder	1,396	3.2%	708	2.0%	2,104	2.7%
Lower leg	147	0.3%	1,199	3.5%	1,347	1.7%
Arm/elbow	728	1.7%	76	0.2%	804	1.0%
Other	-	0.0%	1,152	3.3%	1,152	1.5%
Total	43,878	100%	34,684	100%	78,562	100%

Table 8.4 Ten Most Common Girls' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Diagnosis	Competition n=43,443		Practice n=33,266		Total n=76,709	
	n	%	n	%	n	%
Ankle strain/sprain	17,153	39.5%	13,419	40.3%	30,572	39.9%
Head/face concussion	7,553	17.4%	2,961	8.9%	10,514	13.7%
Knee other	3,283	7.6%	3,150	9.5%	6,433	8.4%
Knee strain/sprain	3,843	8.8%	1,133	3.4%	4,976	6.5%
Head/face contusion	1,324	3.0%	1,714	5.2%	3,037	4.0%
Hand/wrist fracture	1,207	2.8%	835	2.5%	1,988	2.6%
Hip/thigh/upper leg strain/sprain	661	1.5%	1,223	3.7%	1,884	2.5%
Ankle other	857	2.0%	633	1.9%	1,490	1.9%
Foot other	867	2.0%	528	1.6%	1,394	1.8%
Trunk strain/sprain	1,057	2.4%	147	0.4%	1,204	1.6%
Foot strain/sprain	551	1.3%	708	2.1%	1,259	1.6%

Figure 8.2 Time Loss of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

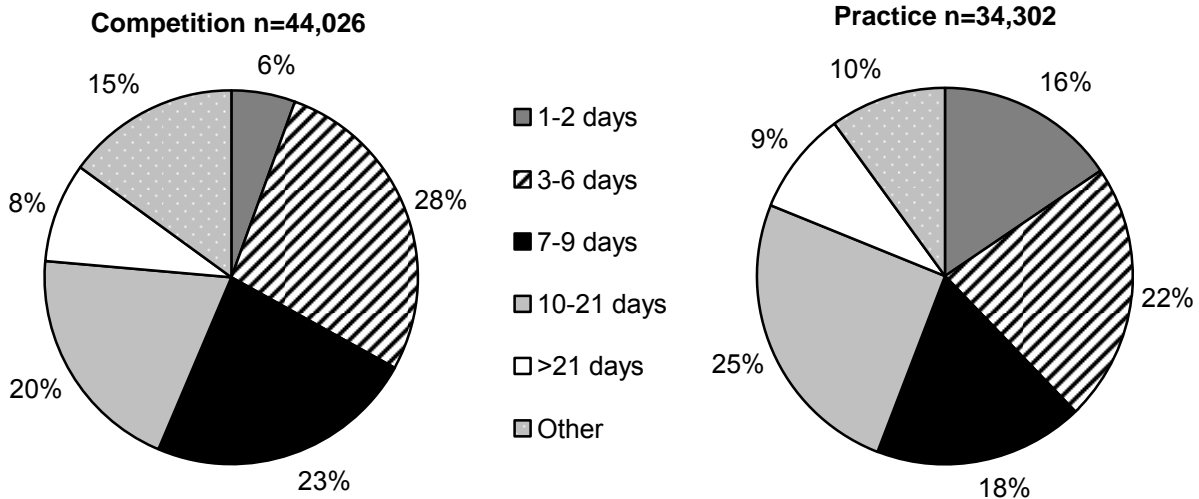


Table 8.5 Girls' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,945	9.1%	1,502	4.6%	5,447	7.2%
Did not require surgery	39,414	90.9%	30,931	95.4%	70,345	92.8%
Total	43,359	100%	32,433	100%	75,792	100%

Figure 8.3 History of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

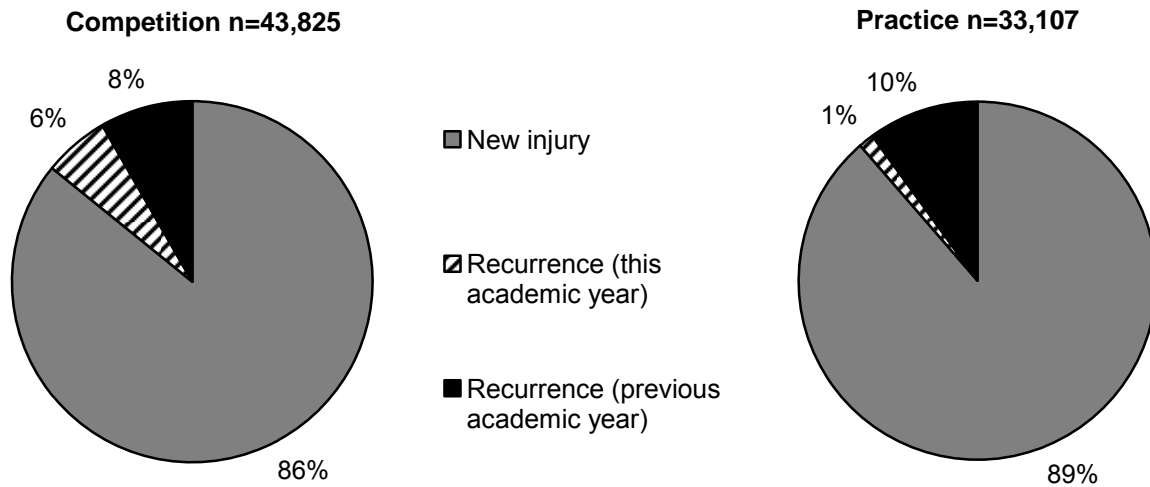


Table 8.6 Time during Season of Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	3,023	6.9%
Regular season	36,995	84%
Post season	4,008	9.1%
Total	44,026	100%

Table 8.7 Competition-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,238	2.9%
First quarter	2,605	6.1%
Second quarter	18,599	43.3%
Third quarter	14,848	34.6%
Fourth quarter	5,615	13.1%
Total	42,904	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	2,558	5.9%
Yes, according to the coach/athlete but was not ruled illegal/foul play	1,257	2.9%
No	38,136	88.3%
Unknown	1,218	2.8%
Total	43,169	100%
Court Location		
Inside lane (defense)	11,124	27.4%
Inside lane (offense)	10,272	25.3%
Between 3 pt arc and lane (defense)	4,775	11.8%
Between 3 pt arc and lane (offense)	4,373	10.8%
Outside 3 point arc (defense)	4,094	10.1%
Outside 3 point arc (offense)	2,628	6.5%
Backcourt	2,295	5.7%
Off the court	814	2.0%
Out of bounds	223	0.6%
Total	40,597	100%

Table 8.8 Practice-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	7,056	21.0%
Second 1/2 hour	10,827	32.2%
1-2 hours into practice	14,205	42.3%
>2 hours into practice	1,501	4.5%
Total	33,589	100%

Figure 8.4 Player Position of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

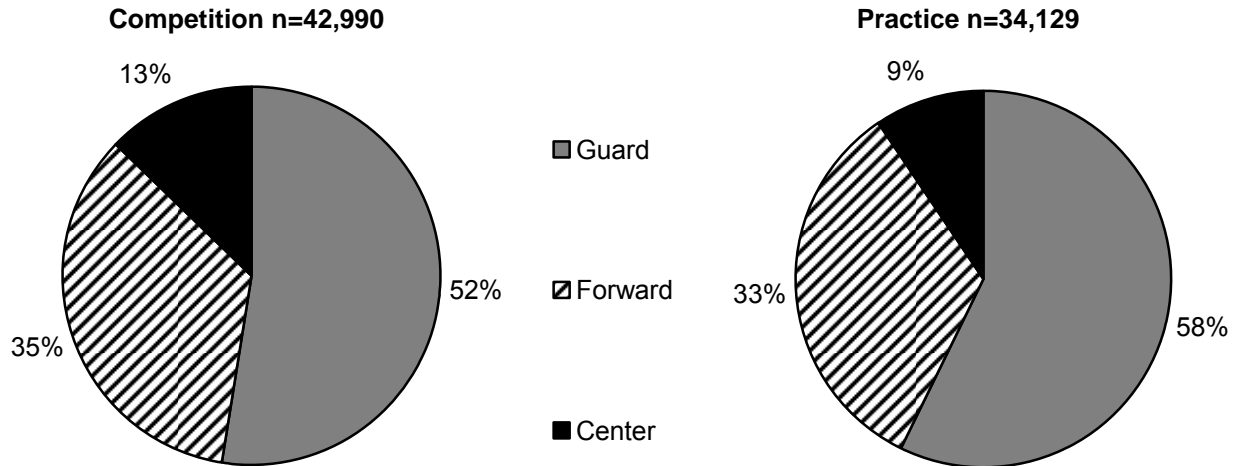
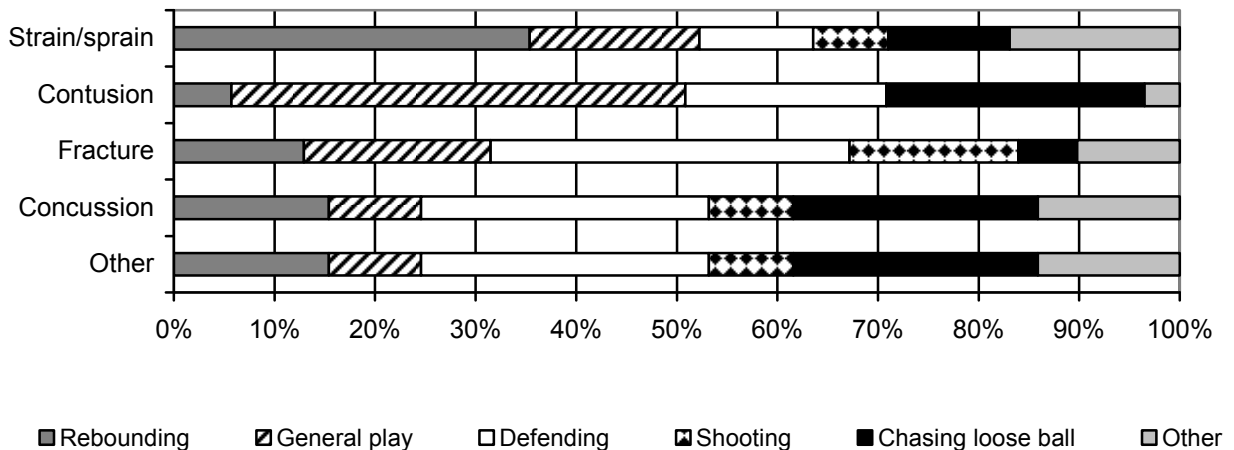


Table 8.9 Activities Leading to Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Rebounding	9,929	23.6%	8,699	25.5%	18,628	24.5%
General play	10,521	25.0%	7,028	20.6%	17,549	23.0%
Defending	6,845	16.3%	5,179	15.2%	12,024	15.8%
Chasing loose ball	8,088	19.2%	2,140	6.3%	10,228	13.4%
Shooting	2,551	6.1%	3,402	10.0%	5,953	7.8%
Receiving pass	1,290	3.1%	3,467	10.2%	4,758	6.2%
Ball handling/dribbling	1,606	3.8%	1,195	3.5%	2,801	3.7%
Conditioning	-	0.0%	2,247	6.6%	2,247	2.9%
Passing	295	0.7%	147	0.4%	442	0.6%
Screening	76	0.2%	-	0.0%	76	0.1%
Other	857	2.0%	624	1.8%	1,480	1.9%
Total	42,058	100%	34,129	100%	76,186	100%

Figure 8.5 Activity Resulting in Girls' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year



IX. Wrestling Injury Epidemiology

Table 9.1 Wrestling Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	313	158,440	1.98	80,390
Competition	133	42,978	3.09	37,742
Practice	180	115,462	1.56	42,647

Table 9.2 Demographic Characteristics of Injured Wrestlers, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=76,809
Freshman	24.1%
Sophomore	24.8%
Junior	29.1%
Senior	22.1%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	16.0 (1.3)
BMI	
Minimum	15.7
Maximum	39.5
Mean (St. Dev.)	23.6 (4.5)

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

[†]Throughout this chapter, totals and n's represent the total 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, 2009-10 School Year

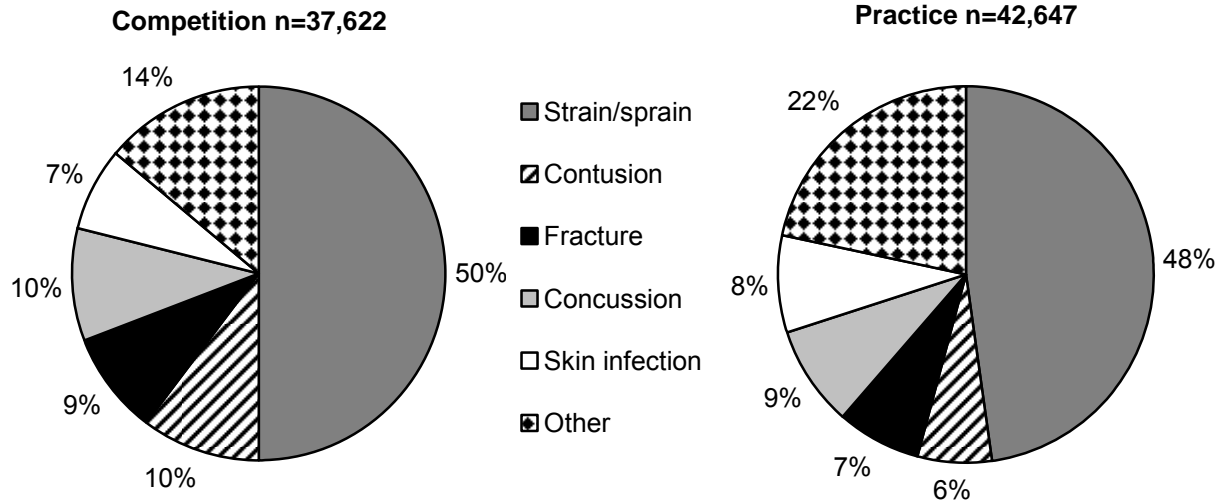


Table 9.3 Body Site of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Shoulder	6,073	16.1%	6,039	14.2%	12,112	15.1%
Head/face	6,807	18.0%	5,265	12.3%	12,073	15.0%
Arm/elbow	6,489	17.2%	4,983	11.7%	11,472	14.3%
Neck	4,654	12.3%	4,861	11.4%	9,515	11.8%
Knee	4,179	11.1%	4,861	11.4%	9,039	11.2%
Trunk	4,748	12.6%	2,821	6.6%	7,568	9.4%
Hand/wrist	1,556	4.1%	4,513	10.6%	6,069	7.5%
Ankle	957	2.5%	2,823	6.6%	3,780	4.7%
Hip/thigh/upper leg	340	0.9%	3,193	7.5%	3,534	4.4%
Lower leg	1,415	3.7%	1,584	3.7%	2,999	3.7%
Foot	405	1.1%	807	1.9%	1,212	1.5%
Other	120	0.3%	898	2.1%	1,018	1.3%
Total	37,742	100%	42,647	100%	80,390	100%

Table 9.4 Ten Most Common Wrestling Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Diagnosis	Competition n=37,624		Practice n=42,650		Total n=80,272	
	n	%	n	%	n	%
Neck strain/sprain	4,506	12.0%	4,232	9.9%	8,738	10.9%
Shoulder strain/sprain	4,736	12.6%	2,988	7.0%	7,724	9.6%
Head/face concussion	3,504	9.3%	3,699	8.7%	7,203	9.0%
Arm/elbow strain/sprain	3,416	9.1%	1,614	3.8%	5,030	6.3%
Knee strain/sprain	1,845	4.9%	2,117	5.0%	3,962	4.9%
Knee other	1,373	3.6%	2,311	5.4%	3,684	4.6%
Ankle strain/sprain	957	2.5%	2,598	6.1%	3,555	4.4%
Head/face skin infection	2,276	6.0%	1,029	2.4%	3,305	4.1%
Arm/elbow other	1,768	4.7%	1,278	3.0%	3,046	3.8%
Trunk strain/sprain	1,768	4.7%	1,297	3.0%	3,065	3.8%

Figure 9.2 Time Loss of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

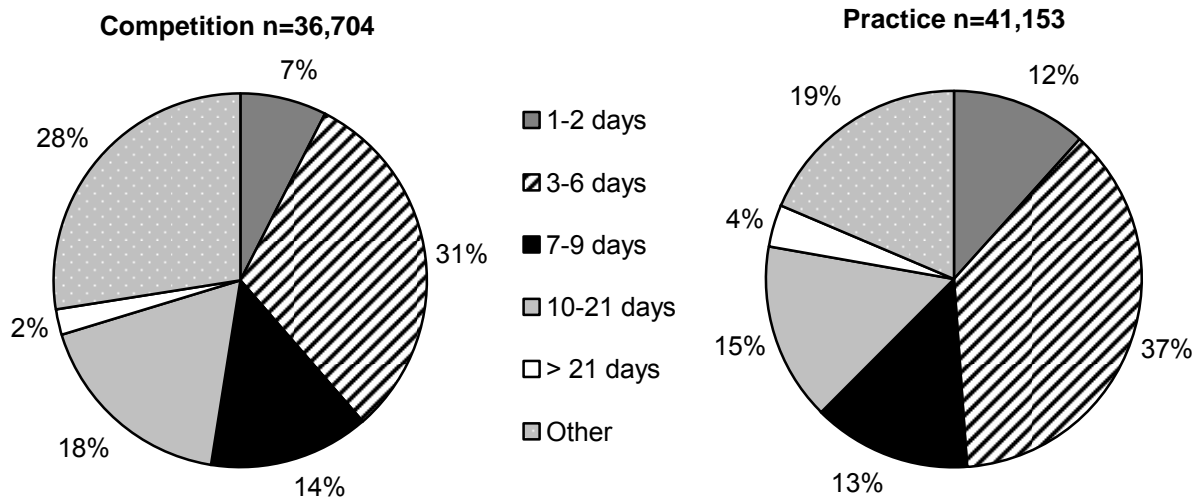


Table 9.5 Wrestling Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,766	10.3%	1,360	3.2%	5,125	6.5%
Did not require surgery	32,780	89.7%	40,721	96.8%	73,500	93.5%
Total	36,545	100%	42,080	100%	78,626	100%

Figure 9.3 History of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

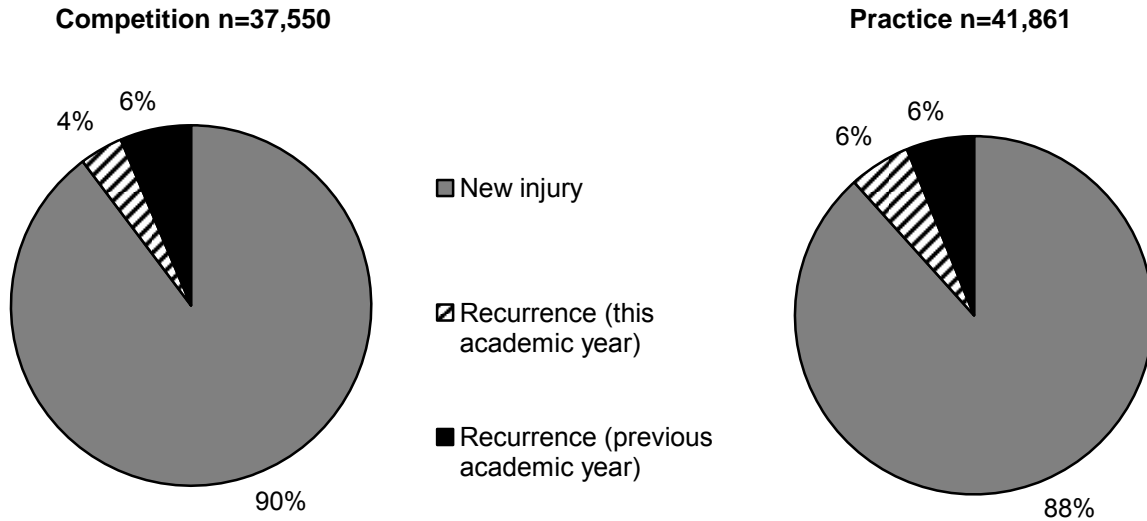


Table 9.6 Time during Season of Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	148	0.4%
Regular season	36,062	96.9%
Post season	1,019	2.7%
Total	37,228	100%

Table 9.7 Competition-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	2,175	6.1%
First period	6,539	18.3%
Second period	15,784	44.1%
Third period	11,136	31.1%
Overtime	120	0.3%
Total	35,754	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	822	2.2%
Yes, according to the coach/athlete but was not ruled illegal/foul play	871	2.3%
No	34,278	91%
Unknown	1,699	4.5%
Total	37,670	100%
Mat Location*		
Within 28 ft. circle	66,380	87.1%
Out of bounds	4,132	5.4%
Off the mat	5,740	7.5%
Total	76,252	100%

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

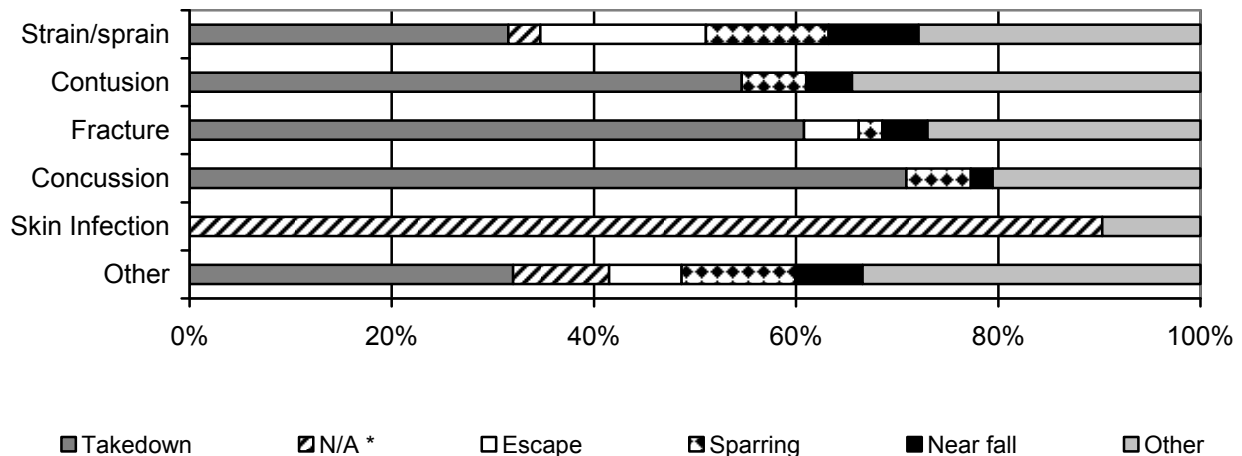
Table 9.8 Practice-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	3,954	9.6%
Second 1/2 hour	7,173	17.5%
1-2 hours into practice	24,083	58.7%
>2 hours into practice	5,824	14.2%
Total	41,035	100%

Table 9.9 Activities Leading to Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Takedown	15,556	42.6%	13,347	32.1%	28,903	37.0%
N/A (e.g., skin infection, overuse, heat illness, etc.)	2,055	5.6%	6,021	14.5%	8,077	10.3%
Escape	3,445	9.4%	4,146	10.0%	7,592	9.7%
Sparring	1,211	3.3%	6,007	14.4%	7,218	9.2%
Near fall	4,039	11.1%	1,019	2.4%	5,058	6.5%
Fall	1,598	4.4%	3,304	7.9%	4,902	6.3%
Conditioning	586	1.6%	4,375	10.5%	4,961	6.3%
Riding	3,145	8.6%	1,241	3.0%	4,386	5.6%
Reversal	2,216	6.1%	345	0.8%	2,561	3.3%
Other	2,655	7.3%	1,832	4.4%	4,487	5.7%
Total	36,506	100%	41,638	100%	78,143	100%

Figure 9.4 Activities Resulting in Wrestling Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year



*N/A category consists of skin infections, overuse injuries, heat illness, etc.

X. Baseball Injury Epidemiology

Table 10.1 Baseball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	134	162,530	0.82	64,053
Competition	74	58,181	1.27	36,502
Practice	60	104,349	0.57	27,551

Table 10.2 Demographic Characteristics of Injured Baseball Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=64,053
Freshman	23.0%
Sophomore	19.7%
Junior	29.4%
Senior	27.9%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	16.1 (1.2)
BMI	
Minimum	16.6
Maximum	37.6
Mean (St. Dev.)	24.3 (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, 2009-10 School Year

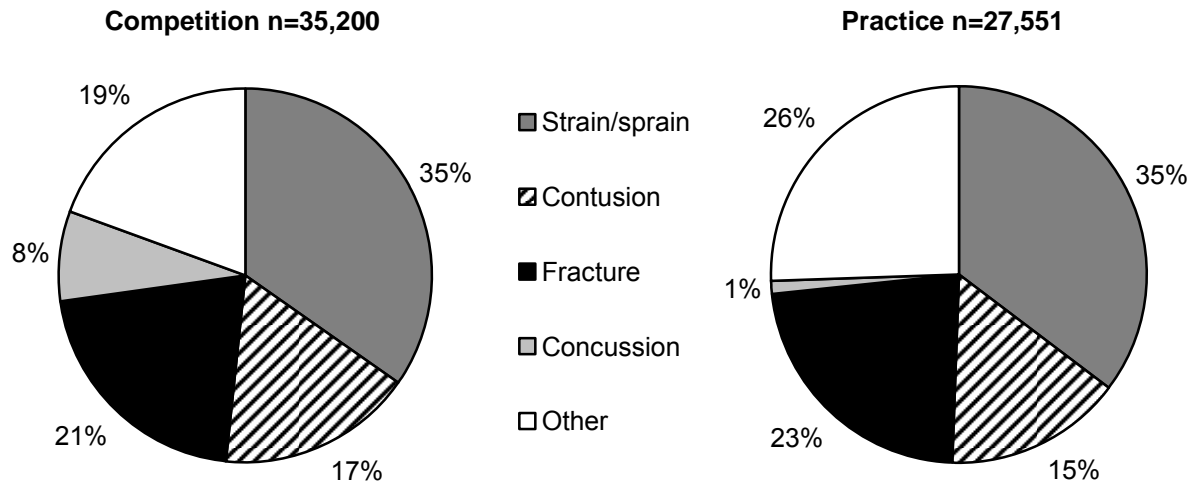


Table 10.3 Body Site of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Hand/wrist	7,048	19.3%	4,595	16.7%	11,643	18.2%
Shoulder	2,090	5.7%	7,858	28.5%	9,948	15.5%
Head/face	7,814	21.4%	1,447	5.3%	9,260	14.5%
Arm/elbow	4,484	12.3%	2,825	10.3%	7,309	11.4%
Hip/thigh/upper leg	4,170	11.4%	2,347	8.5%	6,517	10.2%
Ankle	4,763	13.0%	1,689	6.1%	6,452	10.1%
Knee	4,033	11.0%	1,701	6.2%	5,733	9.0%
Lower leg	1,303	3.6%	2,100	7.6%	3,403	5.3%
Foot	-	0.0%	2,662	9.7%	2,662	4.2%
Trunk	798	2.2%	328	1.2%	1,126	1.8%
Total	36,502	100%	27,551	100%	64,053	100%

Table 10.4 Ten Most Common Baseball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Diagnosis	Competition n=35,197		Practice n=27,551		Total n=62,752	
	n	%	n	%	n	%
Hand/wrist fracture	4,293	12.2%	2,710	9.8%	7,003	11.2%
Hip/thigh/upper leg strain/sprain	3,913	11.1%	1,548	5.6%	5,461	8.7%
Shoulder other	1,912	5.4%	3,024	11.0%	4,936	7.9%
Ankle strain/sprain	3,964	11.3%	714	2.6%	4,678	7.5%
Head/face contusion	3,402	9.7%	327	1.2%	3,729	5.9%
Arm/elbow strain/sprain	1,119	3.2%	2,191	8.0%	3,311	5.3%
Head/face concussion	2,735	7.8%	255	0.9%	2,990	4.8%
Shoulder strain/sprain	-	0.0%	2,885	10.5%	2,885	4.6%
Lower leg contusion	1,125	3.2%	1,773	6.4%	2,898	4.6%
Knee other	1,533	4.4%	1,067	3.9%	2,600	4.1%

Figure 10.2 Time Loss of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

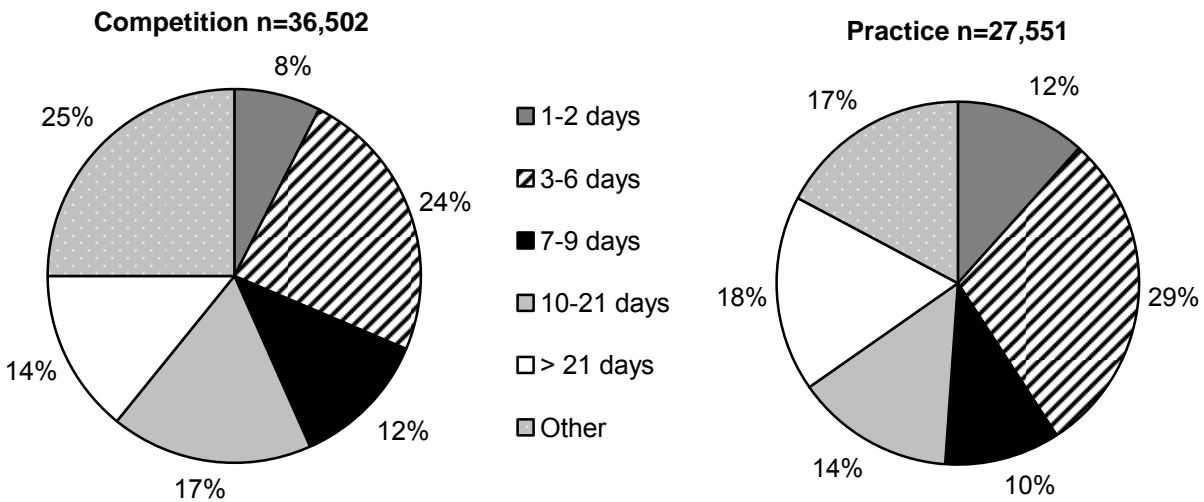


Table 10.5 Baseball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,114	5.8%	3,025	11.0%	5,139	8.0%
Did not require surgery	34,388	94.2%	24,527	89.0%	58,915	92.0%
Total	36,502	100%	27,551	100%	64,053	100%

Figure 10.3 History of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

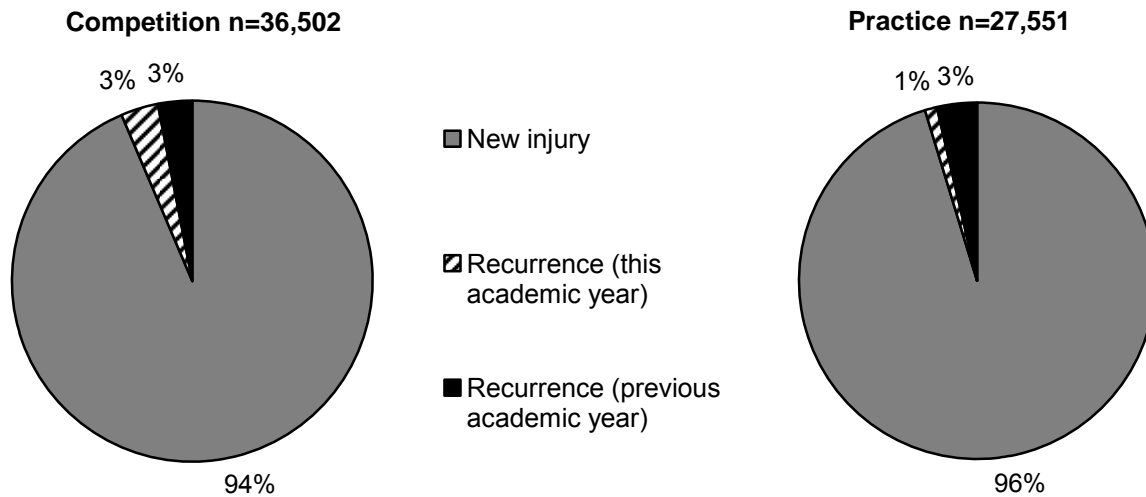


Table 10.6 Time during Season of Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	2,127	5.8%
Regular season	33,457	91.7%
Post season	918	2.5%
Total	36,502	100%

Table 10.7 Competition-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,786	5.0%
First inning	4,379	12.2%
Second inning	3,331	9.3%
Third inning	6,725	18.7%
Fourth inning	10,658	29.7%
Fifth inning	3,351	9.3%
Sixth inning	5,076	14.1%
Seventh inning	257	0.7%
Extra innings	355	1.0%
Total	35,918	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play	634	1.7%
Yes, according to the coach/athlete but was not ruled illegal/foul play	811	2.2%
No	34,879	96.0%
Unknown	-	0.0%
Total	36,325	100%
Field Location		
Home plate	8,527	23.5
First base	7,346	20.3
Second base	6,781	18.7
Pitcher's mound	6,596	18.2
Outfield	3,287	9.1
Infield	2,898	8
Other	811	2.2
Total	36,247	100%

Table 10.8 Practice-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	5,806	21.1%
Second 1/2 hour	3,078	11.2%
1-2 hours into practice	11,367	41.3%
>2 hours into practice	7,301	26.5%
Total	27,551	100%

Figure 10.4 Player Position of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

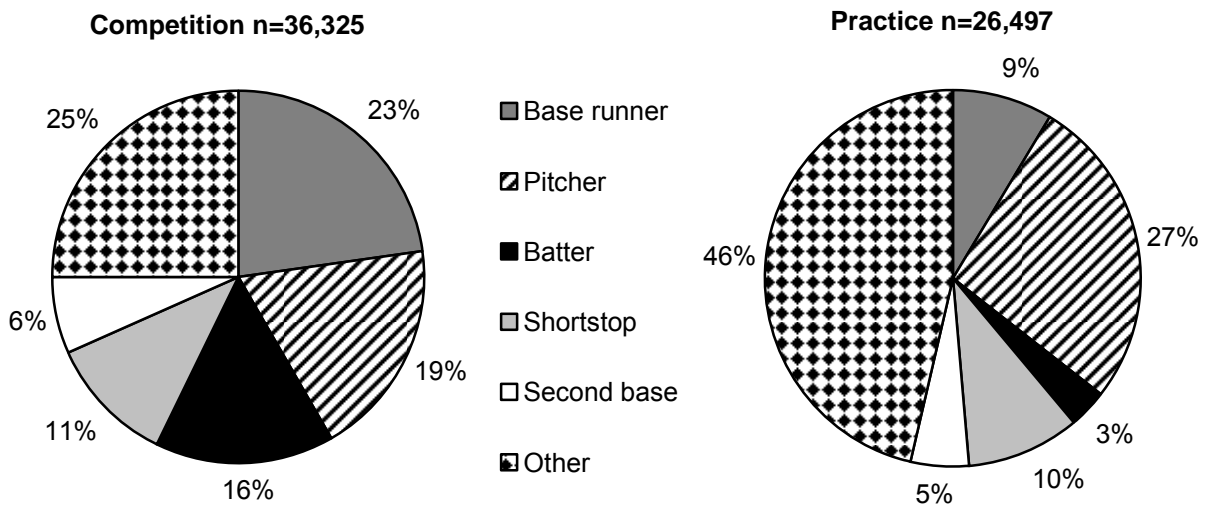
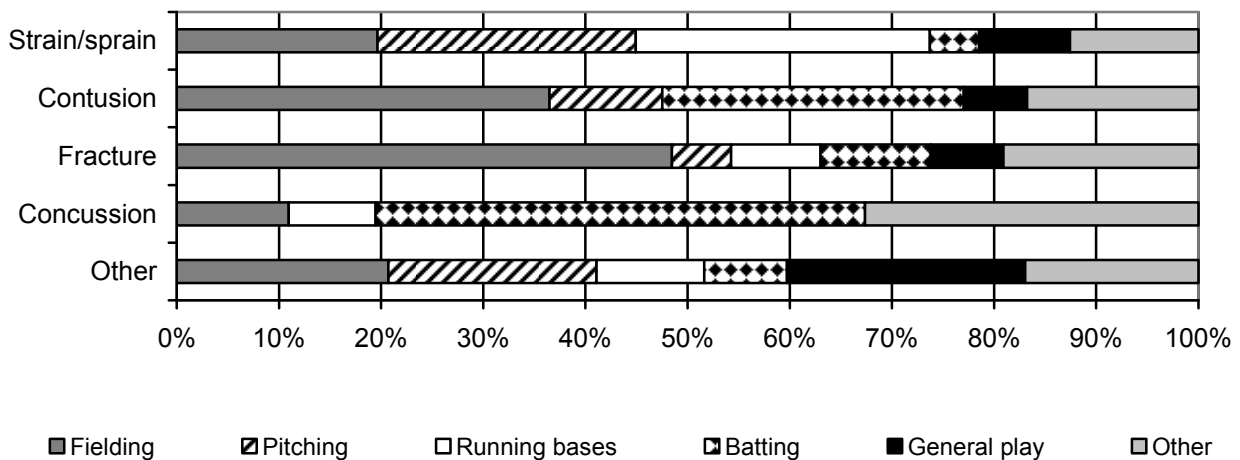


Table 10.9 Activities Leading to Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Fielding a batted ball	5,289	14.5%	7,119	25.9%	12,408	19.4%
Pitching	6,341	17.4%	4,265	15.5%	10,606	16.6%
Running bases	7,228	19.8%	1,984	7.2%	9,212	14.4%
Batting	7,152	19.6%	949	3.5%	8,101	12.7%
General play	327	0.9%	6,457	23.5%	6,784	10.6%
Fielding a thrown ball	5,319	14.6%	150	0.5%	5,469	8.5%
Sliding	2,122	5.8%	1,054	3.8%	3,176	5.0%
Throwing (not pitching)	583	1.6%	1,871	6.8%	2,453	3.8%
Conditioning	0	0.0%	1,389	5.1%	1,389	2.2%
Catching	532	1.5%	840	3.1%	1,372	2.1%
Other	1,609	4.4%	1,394	5.1%	3,003	4.7%
Total	36,502	100%	27,472	100%	63,974	100%

Figure 10.5 Activity Resulting in Baseball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year



XI. Softball Injury Epidemiology

Table 11.1 Softball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	138	123,016	1.12	67,862
Competition	69	41,627	1.66	30,767
Practice	69	81,389	0.85	37,096

Table 11.2 Demographic Characteristics of Injured Softball Athletes, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year*

Year in School	n=67,786
Freshman	30.4%
Sophomore	22.2%
Junior	25.3%
Senior	22.1%
Total[†]	100%
Age (years)	
Minimum	14
Maximum	19
Mean (St. Dev.)	16.0 (1.3)
BMI	
Minimum	15.8
Maximum	37.3
Mean (St. Dev.)	23.0 (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 11.1 Diagnosis of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

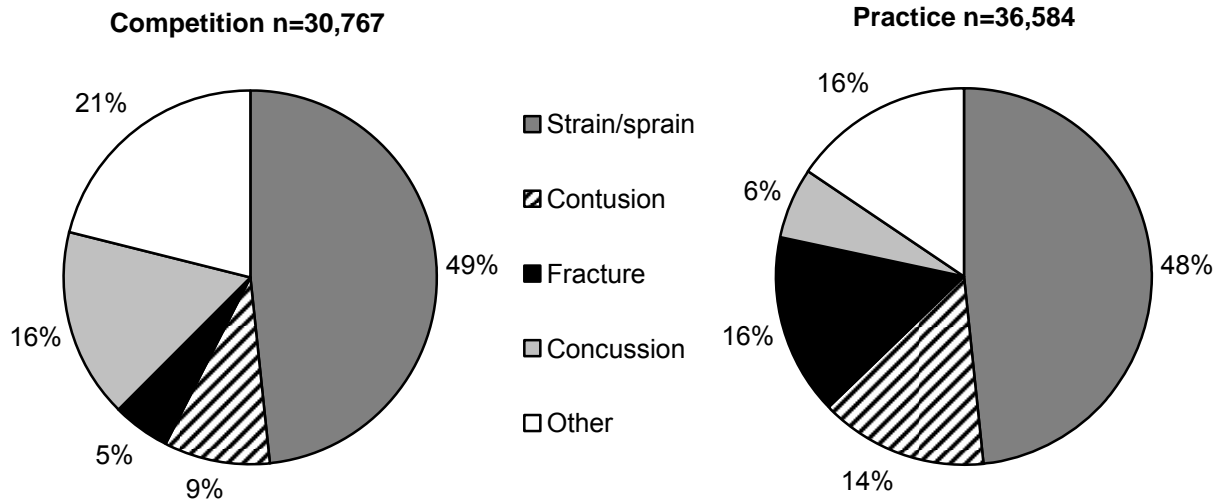


Table 11.3 Body Site of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Competition		Practice		Overall	
	n	%	n	%	n	%
Hand/wrist	5,229	17.0%	8,988	24.2%	14,217	20.9%
Ankle	6,136	19.9%	5,573	15.0%	11,709	17.3%
Head/face	5,594	18.2%	4,609	12.4%	10,203	15.0%
Knee	4,021	13.1%	2,697	7.3%	6,718	9.9%
Hip/thigh/upper leg	3,439	11.2%	3,271	8.8%	6,710	9.9%
Shoulder	2,036	6.6%	3,415	9.2%	5,451	8.0%
Trunk	1,309	4.3%	2,822	7.6%	4,131	6.1%
Arm/elbow	793	2.6%	2,670	7.2%	3,463	5.1%
Lower leg	1,071	3.5%	1,818	4.9%	2,889	4.3%
Foot	1,138	3.7%	748	2.0%	1,887	2.8%
Neck	-	0.0%	485	1.3%	485	0.7%
Total	30,767	100%	37,096	100%	67,862	100%

Table 11.4 Ten Most Common Softball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Diagnosis	Competition n=30,765		Practice n=36,584		Total n=67,350	
	n	%	n	%	n	%
Ankle strain/sprain	4,998	16.2%	5,063	13.8%	10,061	14.9%
Head/face concussion	5,067	16.5%	2,212	6.0%	7,279	10.8%
Hand/wrist fracture	1,251	4.1%	5,100	13.9%	6,350	9.4%
Hip/thigh/upper leg strain/sprain	2,411	7.8%	3,194	8.7%	5,605	8.3%
Knee strain/sprain	2,227	7.2%	1,420	3.9%	3,647	5.4%
Hand/wrist contusion	1,215	3.9%	2,116	5.8%	3,332	4.9%
Shoulder strain/sprain	1,278	4.2%	1,801	4.9%	3,079	4.6%
Hand/wrist strain/sprain	1,794	5.8%	1,260	3.4%	3,054	4.5%
Trunk other	1,028	3.3%	1,309	3.6%	2,337	3.5%
Arm/elbow strain/sprain	281	0.9%	1,904	5.2%	2,185	3.2%

Figure 11.2 Time Loss of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

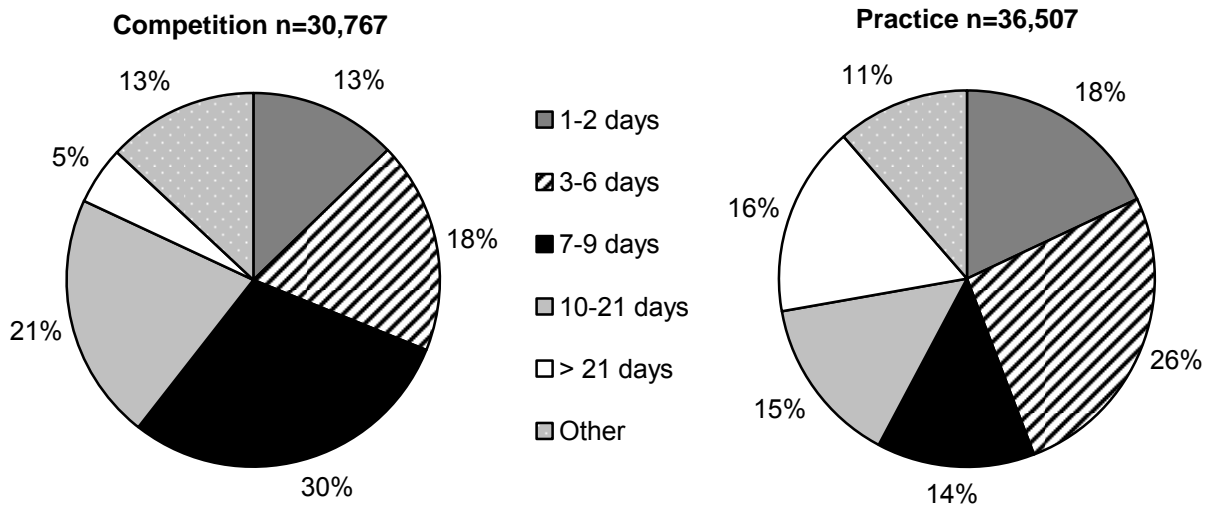


Table 11.5 Softball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,497	4.9%	2,769	7.6%	4,265	6.4%
Did not require surgery	29,270	95.1%	33,551	92.4%	62,822	93.6%
Total	30,767	100%	36,320	100%	67,087	100%

Figure 11.3 History of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

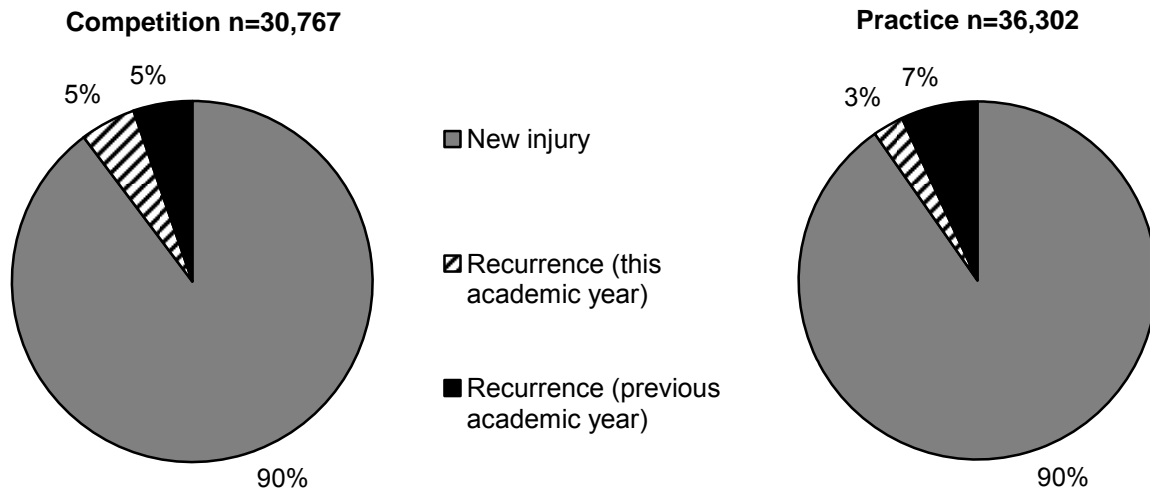


Table 11.6 Time during Season of Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Season		
Preseason	885	2.9%
Regular season	28,639	93.8%
Post season	997	3.3%
Total	30,521	100%

Table 11.7 Competition-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,335	4.7%
First inning	843	3.0%
Second inning	5,500	19.5%
Third inning	4,673	16.6%
Fourth inning	4,004	14.2%
Fifth inning	3,619	12.8%
Sixth inning	4,692	16.7%
Seventh inning	3,003	10.7%
Extra innings	512	1.8%
Total	28,181	100%
Injury Related to Foul Play		
Yes, and the action was ruled illegal/foul play		
Yes, according to the coach/athlete but was not ruled illegal/foul play	485	1.6%
No	29,755	97.6%
Unknown	246	0.8%
Total	30,486	100%
Field Location		
Second base	7,291	24.1%
Home plate	7,149	23.7%
Pitcher's mound	4,220	14.0%
First base	4,111	13.6%
Outfield	3,623	12.0%
Third base	2,006	6.6%
Infield	808	2.7%
Foul territory	485	1.6%
Other	512	1.7%
Total	30,205	100%

Table 11.8 Practice-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	n	%
Time in Practice		
First 1/2 hour	7,535	20.7%
Second 1/2 hour	8,451	23.2%
>2 hours into practice	17,810	49.0%
1-2 hours into practice	2,584	7.1%
Total	36,381	100%

Figure 11.4 Player Position of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

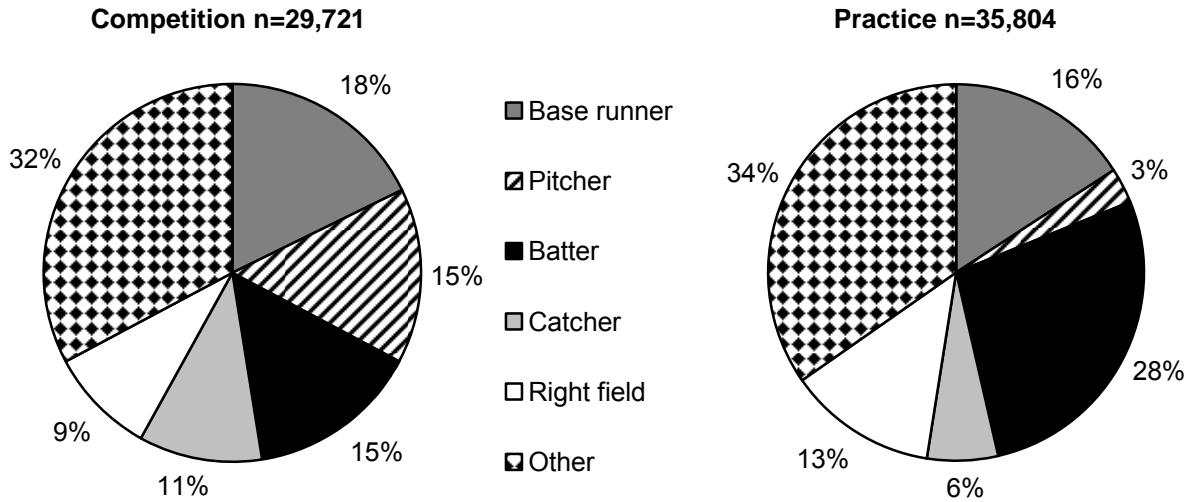
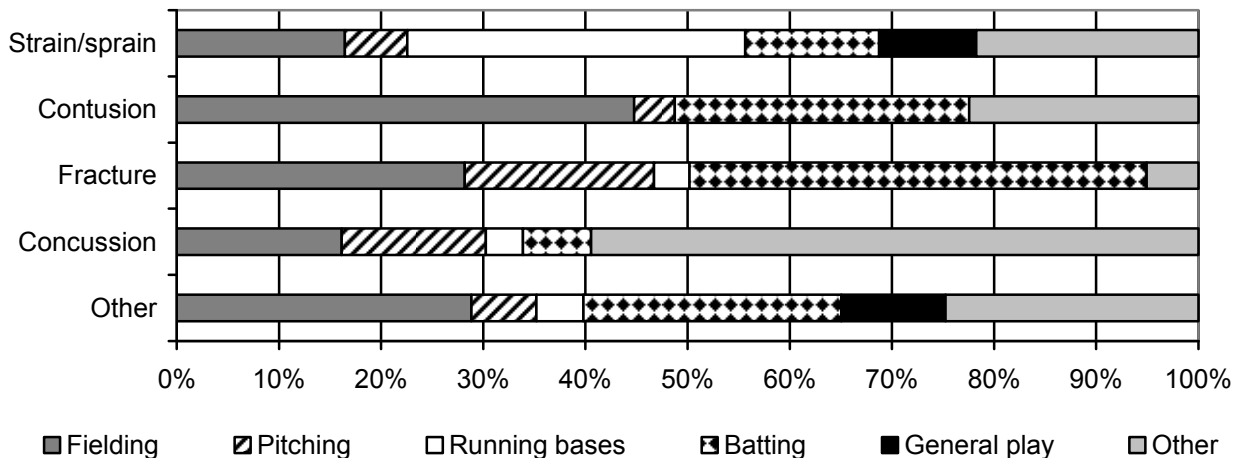


Table 11.9 Activities Leading to Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Batting	4,334	14.1%	8,845	24.7%	13,179	19.8%
Running bases	7,841	25.5%	3,621	10.1%	11,463	17.2%
Fielding a batted ball	5,604	18.2%	5,096	14.2%	10,700	16.1%
Pitching	4,061	13.2%	1,291	3.6%	5,352	8.0%
Fielding a thrown ball	2,293	7.5%	2,998	8.4%	5,291	7.9%
Throwing (not pitching)	1,355	4.4%	3,502	9.8%	4,858	7.3%
Sliding	2,754	9.0%	1,870	5.2%	4,624	6.9%
General play	281	0.9%	3,954	11.0%	4,235	6.4%
Catching	1,513	4.9%	2,177	6.1%	3,690	5.5%
Conditioning	0	0.0%	969	2.7%	969	1.5%
Other	731	2.4%	1,479	4.1%	2,209	3.3%
Total	30,767	100%	35,804	100%	66,571	100%

Figure 11.5 Activity Resulting in Softball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2009-10 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, 2009-10 School Year

	Boys' soccer	Girls' soccer*	RR (95% CI) [†]
Total	1.75	2.00	1.14 (0.97-1.34)
Competition	3.39	4.67	1.38 (1.12-1.68)
Practice	1.04	0.85	1.23 (0.93-1.62)

*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, 2009-10 School Year

Body Site	Boys' soccer	Girls' soccer	IPR (95% CI)
Hip/thigh/upper leg	19.8%	10.8%	1.83 (1.08-3.09)
Head/face	17.1%	18.7%	1.10 (0.70-1.71)
Ankle	14.6%	22.1%	1.51 (0.95-2.40)
Knee	11.9%	23.1%	1.94 (1.22-3.07)
Hand/wrist	9.1%	4.4%	2.08 (0.84-5.15)
Foot	7.9%	3.8%	2.06 (0.93-4.55)
Lower leg	7.4%	6.5%	1.14 (0.56-2.29)
Trunk	6.6%	6.3%	1.08 (0.49-2.40)
Arm/elbow	3.5%	1.3%	2.65 (0.68-10.25)
Shoulder	1.7%	2.2%	1.83 (0.34-9.99)
Neck	0.3%	0.7%	2.40 (0.31-18.79)
Other	0.1%	0.0%	---
Total	100%	100%	---

Table 12.3 Comparison of Diagnoses of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Strain/sprain	40.2%	49.8%	1.26 (0.99-1.60)
Contusion	19.6%	14.5%	1.22 (0.78-1.89)
Fracture	12.0%	6.1%	2.61 (1.37-4.97)
Concussion	11.7%	14.8%	1.26 (0.72-2.19)
Other	16.5%	14.8%	1.11 (0.68-1.80)
Total	100%	100%	---

Table 12.4 Most Common Boys' and Girls' Soccer Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	10.5%	21.1%	2.01 (1.19-3.41)
Head/face concussion	11.4%	14.3%	1.26 (0.72-2.19)
Hip/thigh/upper leg strain/sprain	15.6%	7.2%	2.17 (1.16-4.05)
Knee strain/sprain	5.2%	12.1%	2.34 (1.11-4.93)
Knee other	4.2%	7.8%	1.89 (0.83-4.29)

*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, 2009-10 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Time Loss			
1-2 days	21.3%	15.1%	1.46 (0.89-2.39)
3-6 days	26.5%	26.7%	1.21 (0.86-1.71)
7-9 days	18.1%	15.1%	1.22 (0.77-1.93)
10-21 days	15.0%	15.1%	0.83 (0.49-1.39)
22 days or more	5.2%	8.2%	1.36 (0.67-2.74)
Other	13.9%	19.9%	1.29 (0.81-2.06)
Total	100%	100%	---

Table 12.6 Comparison of Mechanisms of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Mechanism			
Contact with another player	31.5%	35.5%	1.19 (0.88-1.59)
Stepped on/fell on/kicked	13.3%	11.3%	0.95 (0.55-1.64)
Rotation around a planted foot/inversion	8.7%	16.7%	2.00 (1.11-3.62)
Overuse, heat illness, conditioning, etc.	17.8%	10.6%	2.67 (1.60-4.44)
Contact with ball	10.1%	10.9%	1.44 (0.75-2.76)
Uneven playing surface	2.8%	3.4%	1.25 (0.41-3.78)
Slide tackle	5.2%	4.4%	2.08 (0.88-4.91)
Contact with goal	0.7%	1.0%	0.80 (0.12-5.27)
Other	9.9%	6.2%	1.54 (0.76-3.16)
Total	100%	100%	---

Table 12.7 Comparison of Activities of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Activity			
General play	24.1%	20.5%	1.32 (0.91-1.92)
Defending	8.2%	13.9%	2.14 (1.13-4.03)
Chasing loose ball	12.8%	14.9%	1.86 (1.07-3.23)
Ball handling/dribbling	9.9%	9.0%	1.11 (0.56-2.23)
Goaltending	7.8%	8.3%	0.72 (0.37-1.40)
Shooting (foot)	5.3%	6.3%	1.79 (0.78-4.09)
Heading ball	8.9%	7.6%	1.28 (0.61-2.65)
Passing (foot)	6.0%	5.9%	1.04 (0.47-2.30)
Receiving pass	5.0%	5.2%	1.12 (0.47-2.69)
Other	12.0%	8.4%	2.06 (1.08-3.94)
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, 2009-10 School Year

	Boys' basketball	Girls' basketball	RR (95% CI)*
Total	1.45	1.58	1.09 (0.92-1.29)
Competition	2.72	2.84	1.04 (0.83-1.30)
Practice	0.92	1.02	1.11 (0.87-1.42)

Table 12.9 Comparison of Body Sites of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Boys' basketball	Girls' basketball	IPR (95% CI)
Ankle	33.8%	38.5%	1.22 (0.93-1.61)
Knee	11.7%	15.1%	1.10 (0.66-1.83)
Head/face	20.3%	16.2%	1.01 (0.65-1.58)
Hip/thigh/upper leg	6.9%	5.3%	2.41 (1.13-5.11)
Hand/wrist	7.9%	5.7%	1.53 (0.70-3.36)
Shoulder	3.4%	3.8%	0.98 (0.35-2.73)
Trunk	4.8%	4.2%	1.01 (0.37-2.77)
Lower leg	2.1%	2.6%	0.79 (0.20-3.16)
Arm/elbow	1.7%	1.9%	0.65 (0.15-2.89)
Foot	6.2%	5.7%	1.32 (0.60-2.92)
Neck	0.3%	0.0%	---
Other	0.7%	1.1%	5.84 (0.72-47.62)
Total	100%	100%	---

Table 12.10 Comparison of Diagnoses of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Strain/sprain	52.6%	58.0%	1.05 (0.86-1.28)
Contusion	10.0%	8.0%	1.08 (0.54-2.16)
Fracture	9.7%	6.5%	1.90 (0.92-3.95)
Concussion	13.5%	12.6%	0.95 (0.55-1.64)
Other	14.2%	14.9%	1.17 (0.70-1.93)
Total	100%	100%	---

Table 12.11 Most Common Boys' and Girls' Basketball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	30.5%	39.9%	1.29 (0.97-1.73)
Head/face concussion	13.0%	13.7%	1.05 (0.61-1.82)
Knee strain/sprain	5.7%	6.5%	1.12 (0.50-2.53)
Knee other	5.3%	8.4%	1.55 (0.64-3.75)

*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, 2009-10 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Time Loss			
1-2 days	16.3%	11.8%	1.48 (0.88-2.50)
3-6 days	30.6%	27.4%	1.20 (0.85-1.70)
7-9 days	17.7%	19.8%	1.27 (0.81-2.01)
10-21 days	16.3%	19.4%	1.25 (0.81-1.94)
22 days or more	8.0%	7.2%	0.87 (0.42-1.79)
Other	11.1%	14.4%	0.97 (0.57-1.67)
Total	100%	100%	---

Table 12.13 Comparison of Mechanisms of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Mechanism			
Collision with another player	31.0%	27.3%	1.14 (0.80-1.61)
Jumping/landing	29.2%	23.0%	1.33 (0.93-1.89)
Overuse, heat illness, conditioning, etc.	6.3%	8.6%	0.97 (0.48-1.97)
Rotation around a planted foot/inversion	10.9%	18.0%	2.28 (1.32-3.93)
Stepped on/fell on/kicked	6.0%	7.4%	1.31 (0.57-3.04)
Contact with ball	3.2%	3.5%	0.88 (0.29-2.66)
Other	13.4%	12.2%	1.09 (0.61-1.93)
Total	100%	100%	---

Table 12.14 Comparison of Activities of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Activity			
Rebounding	25.9%	25.7%	1.04 (0.73-1.49)
General play	15.6%	18.3%	1.31 (0.83-2.05)
Defending	15.2%	17.9%	1.24 (0.75-2.05)
Chasing loose ball	11.7%	14.8%	1.09 (0.63-1.89)
Shooting	15.2%	6.6%	2.07 (1.05-4.06)
Conditioning	1.4%	3.5%	2.89 (0.64-13.06)
Ball handling/dribbling	4.6%	4.3%	1.33 (0.48-3.67)
Receiving pass	4.3%	5.4%	1.09 (0.45-2.67)
Other	6.1%	3.5%	1.57 (0.52-4.77)
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, 2009-10 School Year

	Baseball	Softball	RR (95% CI)
Total	0.82	1.12	1.36 (1.07-1.73)
Competition	1.27	1.66	1.30 (0.94-1.81)
Practice	0.57	0.85	1.47 (1.04-2.08)

Table 12.16 Comparison of Body Sites of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

Body Site	Baseball	Softball	IPR (95% CI)
Ankle	10.1%	17.3%	1.71 (0.78-3.76)
Knee	9.0%	9.9%	1.11 (0.47-2.60)
Head/face	14.5%	15.0%	1.13 (0.87-1.47)
Hip/thigh/upper leg	10.2%	9.9%	1.03 (0.42-2.50)
Hand/wrist	18.2%	20.9%	1.15 (0.64-2.08)
Shoulder	15.5%	8.0%	1.71 (0.77-3.82)
Trunk	1.8%	6.1%	1.71 (0.43-6.89)
Lower leg	5.3%	4.3%	1.25 (0.36-4.38)
Arm/elbow	11.4%	5.1%	2.24 (0.83-6.03)
Foot	4.2%	2.8%	1.50 (0.29-7.83)
Neck	0.0%	0.7%	---
Other	0.0%	0.0%	---
Total	100%	100%	---

Table 12.17 Comparison of Diagnoses of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Strain/sprain	34.1%	44.5%	1.38 (0.97-1.97)
Contusion	13.6%	13.1%	1.35 (0.65-2.81)
Fracture	18.9%	11.7%	2.04 (1.00-4.19)
Concussion	4.5%	12.4%	2.27 (0.79-6.47)
Other	28.8%	18.2%	1.22 (0.70-2.13)
Total	100%	100%	---

Table 12.18 Most Common Baseball and Softball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	7.5%	14.9%	2.03 (0.82-5.06)
Hand/wrist fracture	11.2%	9.4%	1.18 (0.48-2.91)
Head/face concussion	4.8%	10.8%	2.30 (0.80-6.56)
Hip/thigh/upper leg strain/sprain	8.7%	8.3%	1.03 (0.39-2.74)
Knee strain/sprain	0.0%	5.4%	1.66 (0.45-6.08)

*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, 2009-10 School Year

	Baseball	Softball	IPR (95% CI)
Time Loss			
1-2 days	11.2%	11.8%	1.67 (0.77-3.64)
3-6 days	23.9%	22.1%	1.16 (0.69-1.93)
7-9 days	12.7%	22.1%	1.85 (0.93-3.68)
10-21 days	14.9%	19.1%	1.10 (0.58-2.09)
22 days or more	11.9%	9.6%	1.39 (0.63-3.07)
Other	25.4%	15.4%	1.79 (0.98-3.27)
Total	100%	100%	---

Table 12.20 Comparison of Mechanisms of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Mechanism			
Overuse, heat illness, conditioning, etc.	15.0%	15.9%	1.25 (0.64-2.44)
Contact with another player	17.3%	7.2%	3.65 (1.51-8.84)
Contact with bases	6.8%	10.1%	1.58 (0.59-4.20)
Throwing - not pitching	4.5%	5.8%	1.14 (0.37-3.55)
Throwing - pitching	7.5%	4.3%	2.11 (0.70-6.31)
Contact with thrown ball (non-pitch)	2.3%	0.0%	0.56 (0.15-2.12)
Rotation around a planted foot/inversion	9.0%	10.1%	1.33 (0.57-3.14)
Hit by batted ball	7.5%	13.0%	2.50 (0.98-6.43)
Hit by pitch	9.8%	8.0%	2.11 (0.70-6.31)
Other	20.3%	25.6%	0.75 (0.40-1.39)
Total	100%	100%	---

Table 12.21 Comparison of Activities of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2009-10 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Activity			
Fielding a batted ball	16.5%	18.5%	0.83 (0.46-1.50)
Fielding a thrown ball	6.8%	8.9%	0.93 (0.34-2.53)
Running bases	16.5%	15.6%	0.84 (0.43-1.64)
Pitching	15.0%	9.6%	2.06 (0.94-4.55)
Batting	12.0%	14.1%	1.56 (0.77-3.18)
Sliding	6.0%	8.1%	1.40 (0.46-4.29)
Throwing (not pitching)	5.3%	9.6%	1.90 (0.70-5.21)
General play	9.0%	5.9%	1.67 (0.61-4.57)
Conditioning	3.0%	1.5%	1.49 (0.23-9.51)
Catching	5.3%	4.4%	0.39 (0.12-1.27)
Other	4.6%	3.8%	1.41 (0.34-5.96)
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, 2005-10 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10	p-value for trend*
Overall total	2.51	2.59	2.31	2.01	2.10	0.048
Competition	4.63	4.88	4.45	4.05	4.19	0.096
Practice	1.69	1.75	1.52	1.26	1.32	0.040
Boys' football total	4.36	4.45	4.18	3.50	3.81	0.093
Competition	12.09	13.50	12.80	11.26	12.95	0.879
Practice	2.54	2.68	2.47	1.92	2.06	0.080
Boys' soccer total	2.43	2.27	1.75	1.62	1.75	0.048
Competition	4.22	4.31	3.63	3.43	3.39	0.029
Practice	1.58	1.45	0.96	0.87	1.04	0.080
Girls' soccer total	2.36	2.51	2.35	2.07	2.00	0.065
Competition	5.21	5.43	5.15	4.59	4.67	0.078
Practice	1.10	1.31	1.16	1.00	0.85	0.150
Girls' volleyball total	1.64	1.37	1.22	0.89	0.99	0.019
Competition	1.92	1.40	1.43	0.90	1.00	0.030
Practice	1.48	1.36	1.12	0.88	0.99	0.026
Boys' basketball total	1.89	1.75	1.39	1.35	1.45	0.072
Competition	2.98	2.87	2.23	2.32	2.72	0.382
Practice	1.46	1.28	1.04	0.95	0.92	0.010
Girls' basketball total	2.01	2.09	1.61	1.54	1.58	0.067
Competition	3.60	3.60	3.30	3.13	2.84	0.006
Practice	1.37	1.44	0.90	0.87	1.02	0.143
Boys' wrestling total	2.50	2.51	2.27	2.17	1.98	0.007
Competition	3.93	3.80	3.70	3.35	3.09	0.005
Practice	2.04	2.06	1.76	1.75	1.56	0.016
Boys' baseball total	1.19	1.25	0.93	0.78	0.82	0.042
Competition	1.77	2.01	1.37	1.32	1.27	0.088
Practice	0.87	0.82	0.68	0.48	0.57	0.034
Girls' softball total	1.13	1.11	1.29	1.04	1.12	0.804
Competition	1.78	1.96	1.86	1.62	1.66	0.231
Practice	0.79	0.65	0.98	0.72	0.85	0.700

*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, 2005-10 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10
Overall total	1,442,533	1,472,849	1,419,723	1,248,126	1,359,897
Competition	759,334	766,512	763,034	690,525	754,091
Practice	683,199	706,337	656,689	557,601	605,805
Boys' football total	516,150	574,367	616,665	527,321	581,414
Competition	280,919	292,316	311,780	288,637	322,801
Practice	235,231	282,051	304,885	238,684	258,614
Boys' soccer total	218,760	171,874	159,351	149,229	153,485
Competition	119,703	93,295	99,785	87,082	83,985
Practice	99,058	78,579	59,566	62,147	69,500
Girls' soccer total	185,770	230,769	215,850	192,108	181,159
Competition	122,803	149,231	146,102	123,312	129,754
Practice	62,967	81,538	69,748	68,796	51,405
Girls' volleyball total	81,813	80,493	72,261	56,609	67,760
Competition	32,677	27,423	26,539	19,764	21,728
Practice	49,136	53,069	45,722	36,845	46,032
Boys' basketball total	100,058	96,670	82,612	79,230	85,063
Competition	44,826	46,109	36,766	40,152	46,787
Practice	55,232	50,561	45,846	39,078	38,276
Girls' basketball total	103,566	102,831	73,283	64,933	78,709
Competition	53,812	53,703	45,236	38,277	44,026
Practice	49,753	49,128	28,047	26,656	34,684
Boys' wrestling total	105,542	101,139	91,625	88,996	80,390
Competition	36,259	38,750	40,698	39,029	37,742
Practice	69,283	62,389	50,927	49,967	42,647
Boys' baseball total	67,560	60,296	44,760	39,869	64,053
Competition	33,639	33,494	22,803	25,584	36,502
Practice	33,922	26,802	21,957	14,285	27,551
Girls' softball total	63,313	54,411	63,316	49,831	67,862
Competition	34,696	32,191	33,325	28,688	30,767
Practice	28,618	22,220	29,991	21,143	37,096

Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005-10 School Years*

	2005-06 n=1,442,048	2006-07 n=1,464,926	2007-08 n=1,411,621	2008-09 n=1,248,126	2009-10 n=1,359,897
Body Site					
Ankle	22.7%	19.8%	18.5%	16.4%	17.5%
Knee	14.2%	16.6%	14.6%	14.8%	15.7%
Head/face	12.3%	12.4%	12.4%	15.3%	17.2%
Hip/thigh/upper leg	10.8%	10.5%	10.2%	10.3%	9.2%
Shoulder	7.9%	8.0%	10.1%	9.3%	8.4%
Hand/wrist	8.0%	7.5%	9.1%	8.5%	10.3%
Trunk	6.2%	6.7%	6.5%	6.6%	5.8%
Lower leg	4.6%	5.2%	5.7%	5.8%	4.7%
Arm/elbow	4.1%	3.9%	4.6%	4.1%	4.0%
Foot	4.0%	4.0%	4.2%	5.0%	4.1%
Neck	2.2%	1.9%	1.8%	1.9%	1.9%
Other	3.2%	3.6%	2.4%	2.1%	1.2%
Total	100%	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, 2005-10 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	2009-10 n=1,359,897
Diagnosis					
Strain/sprain	52.0%	48.2%	48.3%	45.7%	44.7%
Contusion	12.2%	13.7%	12.4%	11.5%	14.0%
Fracture	9.8%	8.9%	10.2%	10.9%	9.9%
Concussion	9.1%	8.4%	9.2%	11.8%	14.0%
Other	16.8%	20.9%	19.9%	20.2%	17.5%
Total	100%	100%	100%	100%	100%

Table 13.5 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2005-10 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	2009-10 n= 1,359,897
Diagnosis					
Ankle strain/sprain	20.6%	17.8%	17.3%	15.0%	16.0%
Head/face concussion	9.0%	8.4%	9.2%	11.7%	13.9%
Knee strain/sprain	7.6%	8.8%	7.8%	7.9%	8.0%
Hip/thigh/upper leg strain/sprain	7.9%	7.7%	7.3%	7.7%	6.5%
Knee other	4.3%	4.9%	4.7%	4.5%	5.2%
Shoulder other	3.1%	3.7%	4.1%	4.0%	3.3%
Hand/wrist fracture	3.2%	3.3%	4.0%	4.0%	4.2%
Shoulder strain/sprain	3.4%	2.9%	3.4%	3.7%	3.3%
Trunk strain/sprain	2.8%	2.7%	3.2%	2.8%	2.5%
Hand/wrist strain/sprain	3.1%	2.5%	3.8%	2.9%	2.8%

Table 13.6 Time Loss of Injuries by Year, High School Sports-Related Injury Surveillance Study, US, 2005-10 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	2009-10 n= 1,359,897
Time Loss					
1-2 days	22.5%	26.6%	22.8%	13.7%	14.7%
3-6 days	30.0%	28.5%	28.8%	28.5%	27.3%
7-9 days	15.3%	14.7%	15.8%	17.7%	16.1%
10-21 days	14.9%	14.1%	16.7%	19.7%	16.9%
22 days or more	17.2%	16.1%	15.9%	20.3%	25.0%
Total	100%	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	2009-10 n= 1,359,897
Need for surgery					
Required surgery	5.3%	6.4%	6.1%	6.7%	8.0%
Did not require surgery	94.7%	93.6%	93.9%	93.3%	92.0%
Total	100%	100%	100%	100%	100%

IX. Reporter Demographics & Compliance

During the 2009-10 school year, 117 ATCs were invited to participate in the study at the beginning of the school year. 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, 99 enrolled ATCs reported an average of 43 study weeks. The majority of ATCs (85.9%) reported all the weeks during which they were enrolled, with only 10 ATCs (10.1%) missing over 10 weeks. Internal validity checks yielded 92.3% sensitivity, 99.6% specificity, a positive predictive value of 96.0%, and a negative predictive value of 99.2%.

Prior to the start of the 2009-10 High School RIO™ study, participating ATCs were asked to complete a short demographics survey. Three-quarters (81.4%) of participating high schools were public schools, with the remainder being private. All ATCs provided services to athletes of their high school on 5 or more days each week. Nearly 90% (86.9%) of ATCs participating during the 2009-10 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 (n=184 combined) the opportunity to provide feedback on their experiences with High School RIO™. This survey was completed by 116 ATCs (63.0%). Average reporting time burdens were 20 minutes for the weekly exposure report and 8 minutes for the injury report form. Using a 5 point Likert scale, RIO™ was overwhelmingly reported to be either very easy (55.2%) or somewhat easy (35.3%) to use (5 and 4 on the Likert scale, respectively), with ATCs being either very satisfied (56.0%) or somewhat satisfied (34.5%) with the study (5 and 4 on the Likert scale, respectively). Suggestions provided by ATCs, such as the

addition or clarification of questions or answer choices, will be used to improve the National High School Sports-Related Injury Surveillance Study for the 2010-11 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.