

SUMMARY REPORT

NATIONAL HIGH SCHOOL SPORTS-RELATED INJURY SURVEILLANCE STUDY

2010-2011 School Year

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Note

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

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I. Introduction & Methodology

1.1 Project Overview

To combat the epidemic of obesity among youth in the United States (US), adolescents must be encouraged to get up off the couch and participate in physically active sports, recreation, and leisure activities. Participation in high school sports, one of the most popular physical activities among adolescents, has grown rapidly from an estimated 4.0 million participants in 1971-72 to an estimated 7.4 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 RIOTM (Reporting Information One) surveillance system. The first three study years were funded by the Centers for Disease Control, the Research Institute at Nationwide Children's Hospital, DonJoy Orthotics, EyeBlack, and The Ohio State University. Through the generous contributions of the Centers for Disease Control, the National Federation of State High School Associations (NFHS), and the National Operating Committee on Standards for Athletic Equipment (NOCSAE), the National High School Sports-Related Injury Surveillance System was able to be continued during the 2010-11 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 2010-11 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 (AT) 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 ATs 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 AT 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 AT was asked to complete 45 weekly exposure reports: one for each week from August 2, 2010 through June 12, 2011. 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 AT 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 ATs 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 19.0. 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:

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

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, 2010-11 School Year*

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Overall total	3,475	1,764,785	1.97	1,195,815
Competition	1,984	483,332	4.10	711,642
Practice	1,491	1,281,453	1.16	484,173
Boys' football total	1,659	474,429	3.50	483,016
Competition	970	78,868	12.30	296,199
Practice	689	395,561	1.74	186,817
Boys' soccer total	262	168,389	1.56	138,974
Competition	156	50,680	3.08	81,238
Practice	106	117,709	0.90	57,736
Girls' soccer total	277	143,220	1.93	180,254
Competition	186	45,082	4.13	124,674
Practice	91	98,138	0.93	55,580
Girls' volleyball total	154	159,719	0.96	50,711
Competition	66	55,800	1.18	21,416
Practice	88	103,919	0.85	29,295
Boys' basketball total	280	207,091	1.35	79,762
Competition	149	62,435	2.39	41,252
Practice	131	144,656	0.91	38,510
Girls' basketball total	292	168,574	1.73	83,033
Competition	184	51,184	3.59	53,931
Practice	108	117,389	0.92	29,102
Boys' wrestling total	296	147,073	2.01	80,569
Competition	128	38,519	3.32	36,536
Practice	168	108,554	1.55	44,033
Boys' baseball total	133	164,130	0.81	46,796
Competition	83	55,577	1.49	29,789
Practice	50	108,553	0.46	17,008
Girls' softball total	122	129,861	0.94	52,700
Competition	62	42,887	1.45	26,607
Practice	60	86,974	0.69	26,093

*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, 2010-11 School Year*

	≥1 days time loss	<1 day time loss	Total
Overall	98.8%	1.2%	100%
Boys' football	98.9%	1.1%	100%
Boys' soccer	96.7%	3.3%	100%
Girls' soccer	100.0%	0.0%	100%
Girls' volleyball	98.6%	1.4%	100%
Boys' basketball	97.1%	2.9%	100%
Girls' basketball	100.0%	0.0%	100%
Boys' wrestling	99.6%	0.4%	100%
Boys' baseball	98.7%	1.3%	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, 2010-11 School Year*

	Male n= 817,222	Female n=365,120
Year in School		
Freshman	18.5%	25.0%
Sophomore	25.9%	28.3%
Junior	26.0%	26.5%
Senior	29.6%	20.2%
Total†	100%	100%
Age (years)		
Minimum	12	13
Maximum	19	18
Mean (St. Dev.)	16.1 (1.2)	15.7 (1.3)
BMI		
Minimum	9.1	13.8
Maximum	51.4	45.0
Mean (St. Dev.)	25.0 (4.7)	22.2 (3.3)

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

†Throughout this chapter, totals and n's represent the total 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, 2010-11 School Year

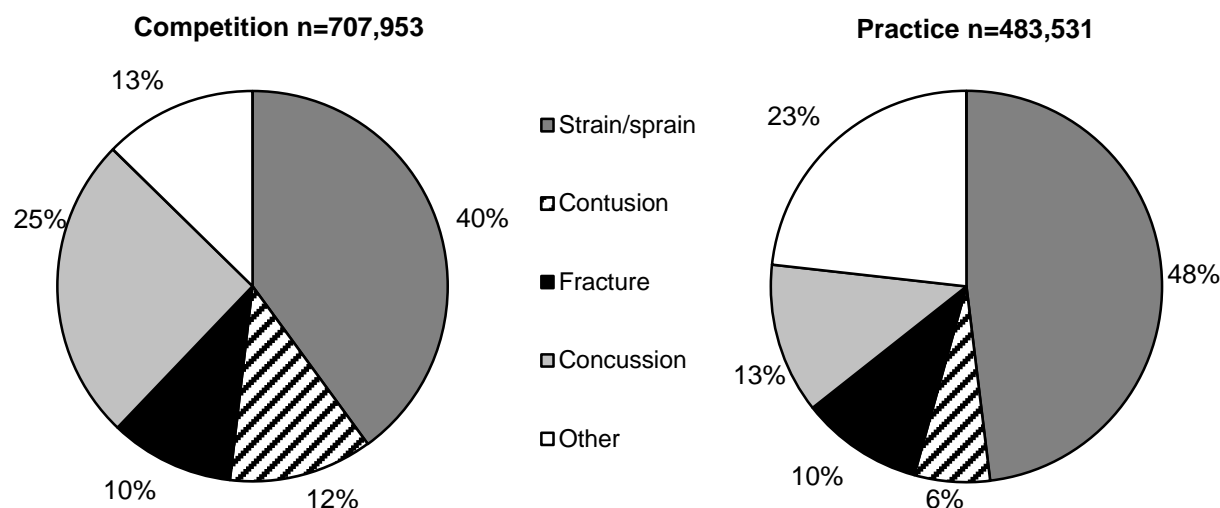


Table 2.4 Body Site of Injury by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	199,422	28.0%	78,516	16.2%	277,938	23.3%
Ankle	132,539	18.6%	78,969	16.3%	211,508	17.7%
Knee	105,555	14.8%	63,898	13.2%	169,454	14.2%
Hand/wrist	58,736	8.3%	47,448	9.8%	106,184	8.9%
Hip/thigh/upper leg	45,326	6.4%	53,345	11.0%	98,671	8.3%
Shoulder	53,736	7.6%	29,726	6.2%	83,462	7.0%
Lower leg	25,675	3.6%	33,910	7.0%	59,586	5.0%
Trunk	27,560	3.9%	28,527	5.9%	56,088	4.7%
Foot	21,333	3.0%	26,289	5.4%	47,622	4.0%
Arm/elbow	18,789	2.6%	17,706	3.7%	36,495	3.1%
Neck	9,081	1.3%	13,009	2.7%	22,089	1.8%
Other	13,335	1.9%	11,887	2.5%	25,222	2.1%
Total*	711,087	100%	483,232	100%	1,194,319	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, 2010-11 School Year*

	Male		Female		Total	
	n	%	n	%	n	%
Ankle Ligament						
Anterior talofibular ligament	79,559	71.7%	80,767	81.3%	161,463	76.3%
Calcaneofibular ligament	26,118	23.5%	27,311	27.5%	54,566	25.8%
Anterior tibiofibular ligament	33,309	30.0%	15,577	15.7%	50,023	23.7%
Posterior talofibular ligament	9,732	8.8%	13,743	13.8%	23,475	11.1%
Deltoid ligament	9,186	8.3%	5,619	5.7%	14,805	7.0%
Posterior tibiofibular ligament	3,269	2.9%	4,248	4.3%	8,654	4.1%
Total	110,986	100%	99,386	100%	211,508	100%

*Multiple responses allowed per injury report.

Table 2.6 Most Commonly Injured Knee Structures, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

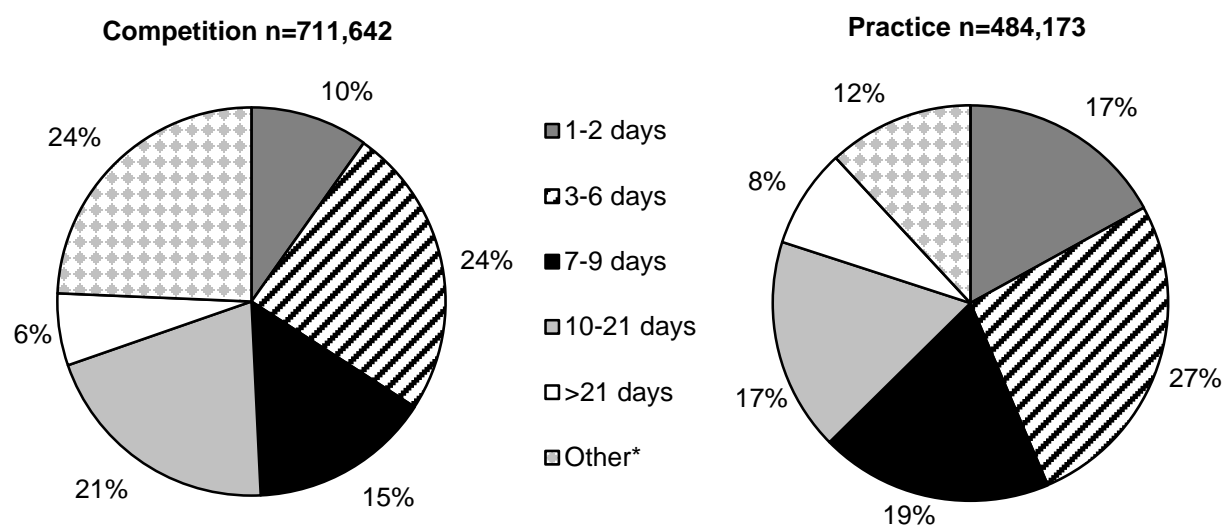
	Male		Female		Total	
	n	%	n	%	n	%
Knee Ligament						
Medial collateral ligament	32,718	28.9%	13,140	23.4%	45,858	27.1%
Anterior cruciate ligament	24,680	21.8%	15,035	26.7%	39,714	23.4%
Patella and/or patellar tendon	30,550	27.0%	11,397	20.3%	41,947	24.8%
Torn cartilage (meniscus)	21,080	18.6%	10,866	19.3%	31,946	18.9%
Lateral collateral ligament	10,349	9.1%	2,852	5.1%	13,201	7.8%
Posterior cruciate ligament	2,245	2.0%	1,592	2.8%	3,838	2.3%
Total	113,206	100%	56,247	100%	169,454	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, 2010-11 School Year

Diagnosis	Competition n=707,399		Practice n=482,586		Overall n=1,189,985	
	n	%	n	%	n	%
Head/Face Concussion	177,904	25.10%	60,026	12.40%	237,931	20.00%
Ankle Strain/Sprain	122,585	17.30%	71,947	14.90%	194,532	16.30%
Knee strain/sprain	62,121	8.80%	29,924	6.20%	92,046	7.70%
Hip/thigh/upper leg strain/sprain	27,922	3.90%	48,809	10.10%	76,731	6.40%
Knee other	28,372	4.00%	28,717	6.00%	57,089	4.80%
Hand/wrist fracture	27,438	3.90%	20,272	4.20%	47,710	4.00%
Shoulder other	27,685	3.90%	16,616	3.40%	44,301	3.70%
Hand/wrist strain/sprain	19,041	2.70%	13,736	2.80%	32,777	2.80%
Trunk strain/sprain	9,983	1.40%	18,482	3.80%	28,465	2.40%
Shoulder strain/sprain	15,807	2.20%	10,205	2.10%	26,012	2.20%

Figure 2.2 Time Loss by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	64,317	9.2%	32,151	6.8%	96,467	8.2%
Did not require surgery	632,794	90.8%	440,162	93.2%	1,072,956	91.8%
Total	697,111	100%	472,313	100%	1,169,423	100%

Figure 2.3 New and Recurring Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

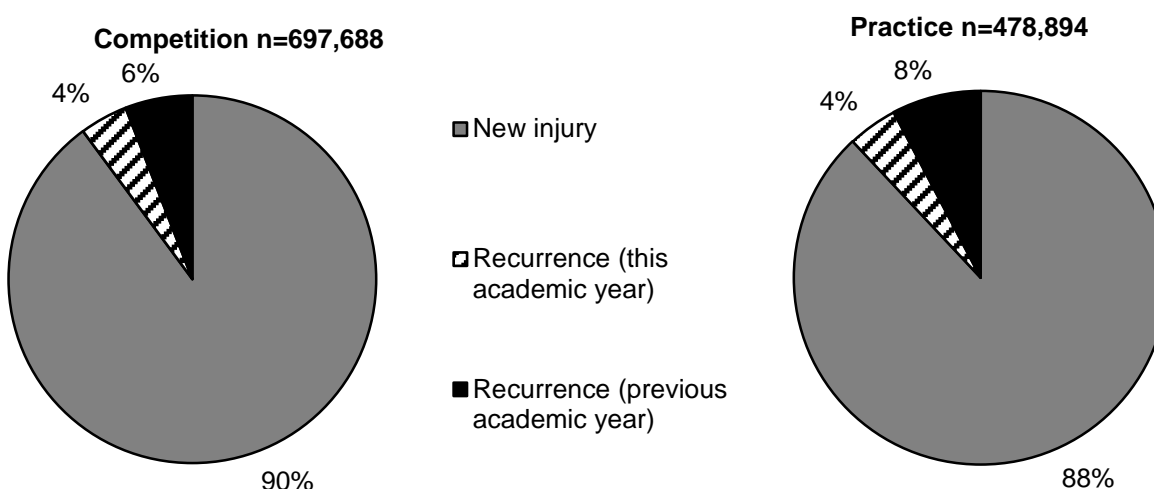


Table 2.9 Time during Season of Injury, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	240,839	20.2%
Regular season	895,981	75.2%
Post season	55,078	4.6%
Total	1,191,898	100%

Table 2.10 Practice-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	54,238	11.5%
Second 1/2 hour	86,649	18.4%
1-2 hours into practice	274,345	58.2%
>2 hours into practice	55,758	11.8%
Total	470,990	100%

Table 2.11 Methods for Injury Evaluation and Assessment, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
% of Injuries Evaluated by:*		
Certified athletic trainer	1,112,900	93.1%
General physician	445,830	37.3%
Orthopedic physician	368,894	30.8%
Physicians assistant	16,722	1.4%
Chiropractor	14,385	1.2%
Neurologist/neuropsychologist	14,594	1.2%
Nurse practitioner	5,916	0.5%
Dentist/oral surgeon	2,624	0.2%
Other	38,772	3.2%
Total	1,195,815	100%
% of Injuries Assessed by:*		
Evaluation	1,156,993	96.8%
X-ray	432,970	36.2%
MRI	133,864	11.2%
CT-scan	60,371	5.0%
Surgery	8,598	0.7%
Blood work/lab test	8,906	0.7%
Other	12,564	1.1%
Total	1,195,815	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, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	1,659	474,429	3.50	483,016
Competition	970	78,868	12.30	296,199
Practice	689	395,561	1.74	186,817

Table 3.2 Demographic Characteristics of Injured Football Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=477,622
Freshman	20.8%
Sophomore	23.5%
Junior	25.8%
Senior	29.9%
Total[†]	100%
Age (years)	
Minimum	12
Maximum	19
Mean (St. Dev.)	16.0 (1.2)
BMI	
Minimum	15.1
Maximum	49.8
Mean (St. Dev.)	25.8 (4.7)

*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 3.1 Diagnosis of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

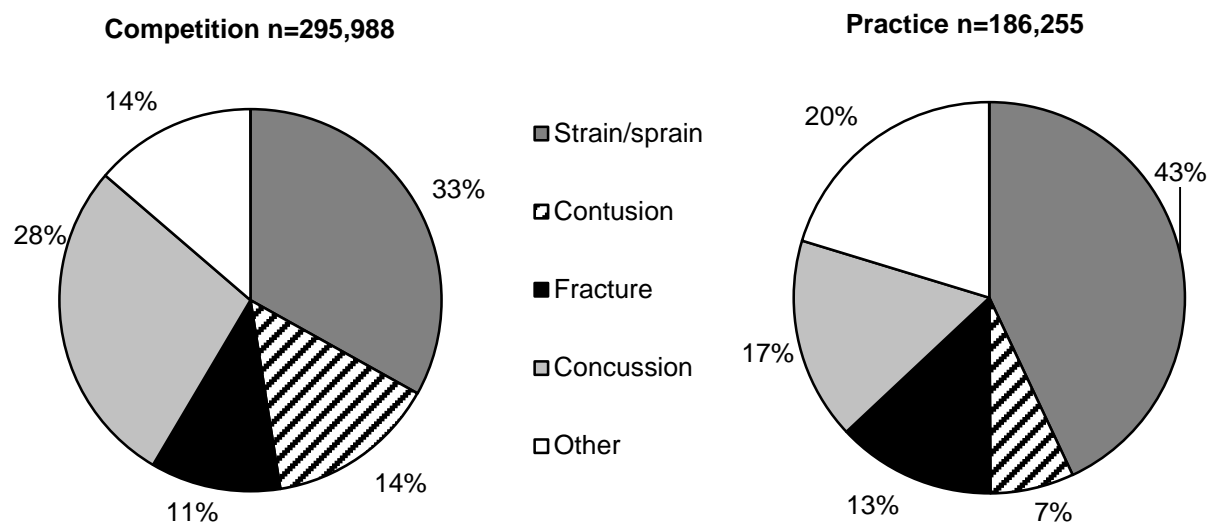


Table 3.3 Body Site of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

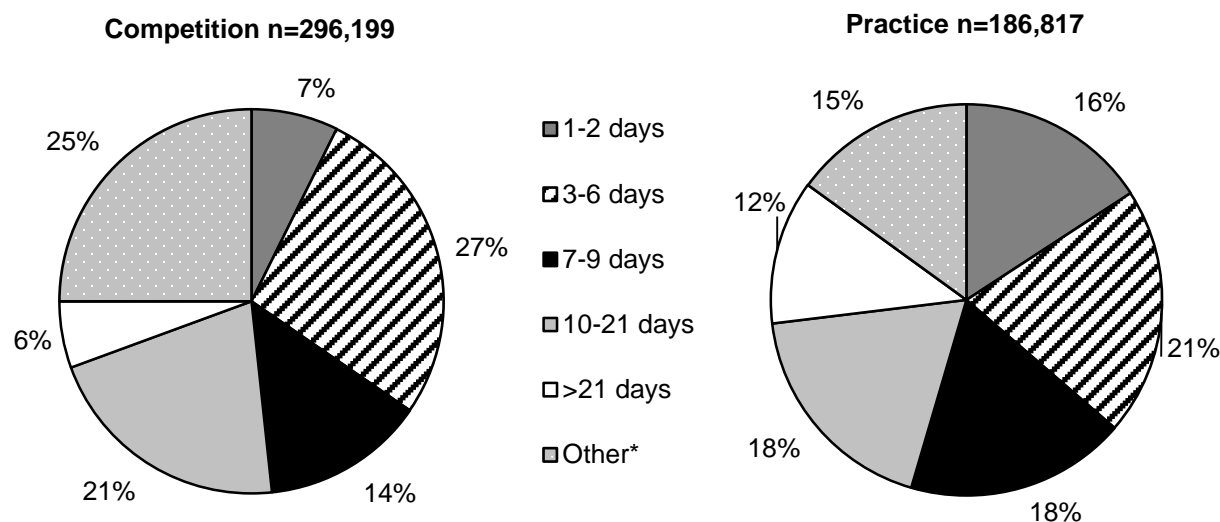
	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	83,346	28.1%	32,501	17.5%	115,848	24.0%
Knee	44,322	15.0%	22,383	12.0%	66,705	13.8%
Ankle	33,750	11.4%	19,728	10.6%	53,478	11.1%
Hand/wrist	30,901	10.4%	22,527	12.1%	53,427	11.1%
Shoulder	31,889	10.8%	18,200	9.8%	50,089	10.4%
Hip/thigh/upper leg	17,404	5.9%	21,197	11.4%	38,602	8.0%
Lower leg	11,370	3.8%	11,429	6.1%	22,799	4.7%
Trunk	12,803	4.3%	8,446	4.5%	21,249	4.4%
Arm/elbow	8,955	3.0%	6,365	3.4%	15,320	3.2%
Foot	7,455	2.5%	7,115	3.8%	14,570	3.0%
Neck	5,864	2.0%	8,382	4.5%	14,246	3.0%
Other	8,140	2.7%	7,602	4.2%	15,743	3.3%
Total	296,199	100%	185,875	100%	482,074	100%

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

Table 3.4 Ten Most Common Football Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Diagnosis	Competition n=295,988		Practice n=185,317		Total n=481,302	
	n	%	n	%	n	%
Head/face concussion	82,370	27.8%	31,046	16.8%	113,416	23.6%
Ankle strain/sprain	30,365	10.3%	18,808	10.1%	49,173	10.2%
Knee strain/sprain	26,237	8.9%	12,463	6.7%	38,700	8.0%
Hip/thigh/upper leg strain/sprain	9,232	3.1%	17,717	9.6%	26,949	5.6%
Shoulder other	16,927	5.7%	9,633	5.2%	26,559	5.5%
Hand/wrist fracture	14,835	5.0%	11,536	6.2%	26,371	5.5%
Knee other	10,868	3.7%	8,296	4.5%	19,164	4.0%
Hand/wrist strain/sprain	9,240	3.1%	6,353	3.4%	15,593	3.2%
Shoulder strain/sprain	8,347	2.8%	5,663	3.1%	14,010	2.9%
Hip/thigh/upper leg contusion	7,447	2.5%	1,702	0.9%	9,149	1.9%

Figure 3.2 Time Loss of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 3.5 Football Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	31,333	10.8%	17,278	9.4%	48,611	10.3%
Did not require surgery	258,247	89.2%	166,382	90.6%	424,629	89.7%
Total	289,580	100%	183,660	100%	473,240	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, 2010-11 School Year

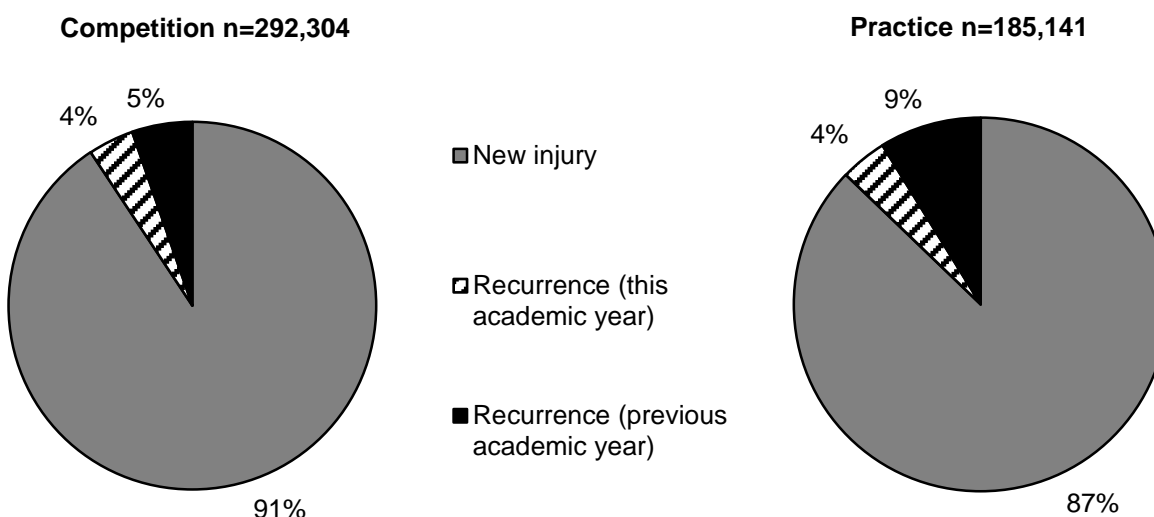


Table 3.6 Time during Season of Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	109,968	22.8%
Regular season	349,591	72.6%
Post season	21,967	4.6%
Total	481,526	100%

Table 3.7 Competition-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	4,593	1.6%
First quarter	35,289	12.4%
Second quarter	85,853	30.3%
Third quarter	87,002	30.7%
Fourth quarter	70,516	24.8%
Overtime	547	0.2%
Total	283,800	100%
Field Location		
Between the 20 yard lines	216,053	77.6%
Red zone (20 yard line to goal line)	55,892	20.1%
End zone	3,387	1.2%
Off the field	2,967	1.1%
Total	278,299	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, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	14,823	8.0%
Second 1/2 hour	33,981	18.4%
1-2 hours into practice	112,578	61.1%
>2 hours into practice	23,008	12.5%
Total	184,390	100%

Figure 3.4 Player Position of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

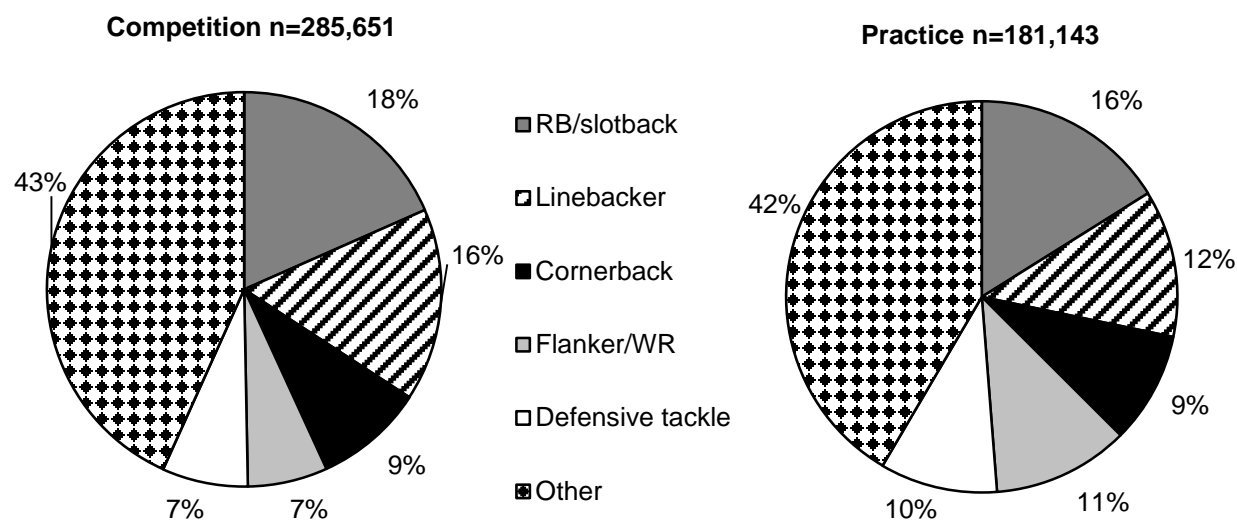
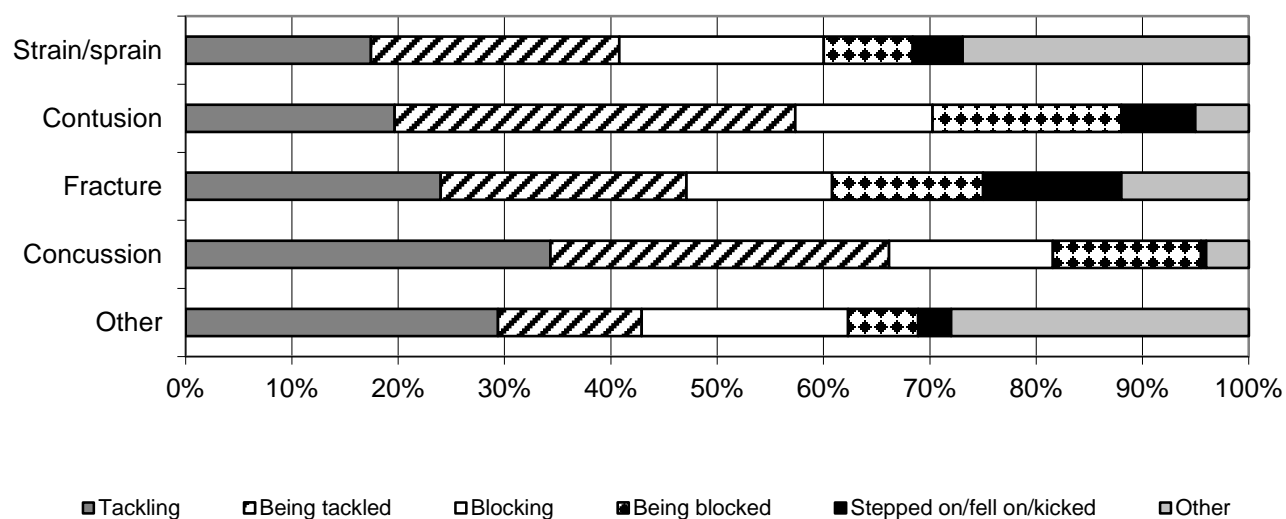


Table 3.9 Activities Leading to Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Being tackled	89,000	31.1%	29,968	16.3%	118,968	25.3%
Tackling	75,411	26.4%	39,711	21.6%	115,122	24.5%
Blocking	46,370	16.2%	33,437	18.2%	79,807	17.0%
Being blocked	37,345	13.0%	14,837	8.1%	52,182	11.1%
N/A (e.g., overuse, heat illness, etc.)	5,819	2.0%	22,110	12.0%	27,929	5.9%
Stepped on/fell on/kicked	11,137	3.9%	10,735	5.8%	21,872	4.7%
Rotation around a planted foot	7,873	2.8%	9,846	5.4%	17,719	3.8%
Contact with ball	343	0.1%	3,323	1.8%	3,666	0.8%
Uneven playing surface	711	0.2%	1,752	1.0%	2,462	0.5%
Contact with blocking sled/dummy	-	0.0%	2,328	1.3%	2,328	0.5%
Contact with out of bounds	-	0.0%	365	0.1%	365	0.1%
Other	12,167	4.3%	15,601	8.5%	27,768	5.9%
Total	286,176	100%	184,013	100%	470,189	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, 2010-11 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, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	262	168,389	1.56	138,974
Competition	156	50,680	3.08	81,238
Practice	106	117,709	0.90	57,736

Table 4.2 Demographic Characteristics of Injured Boys' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n= 138,591
Freshman	13.9%
Sophomore	28.9%
Junior	24.6%
Senior	32.7%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	16.1 (1.2)
BMI	
Minimum	15.2
Maximum	38.1
Mean (St. Dev.)	22.4 (2.3)

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

[†]Throughout this chapter, totals and n's represent the total 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, 2010-11 School Year

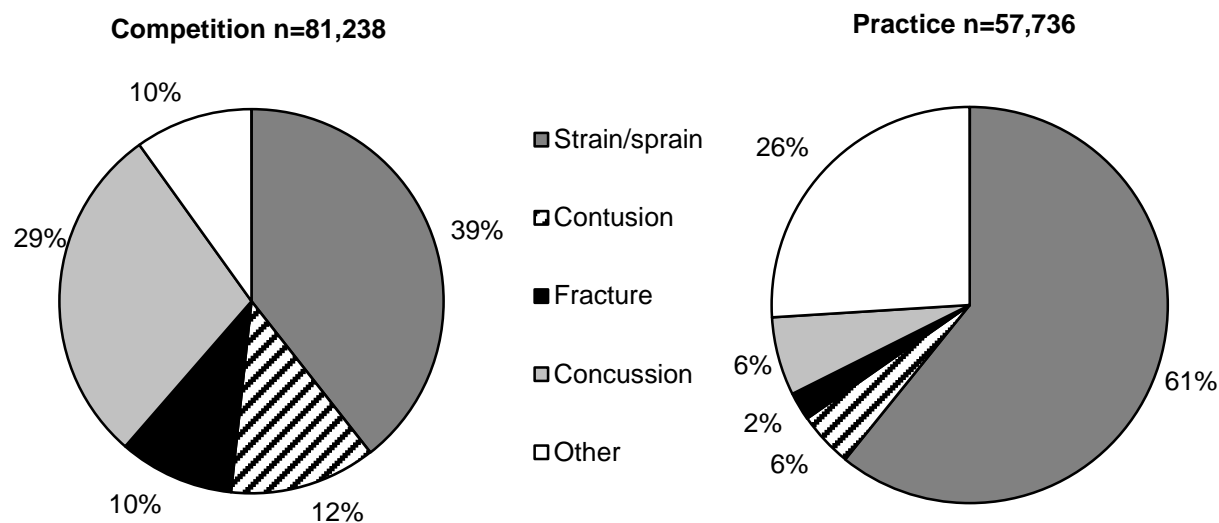


Table 4.3 Body Site of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

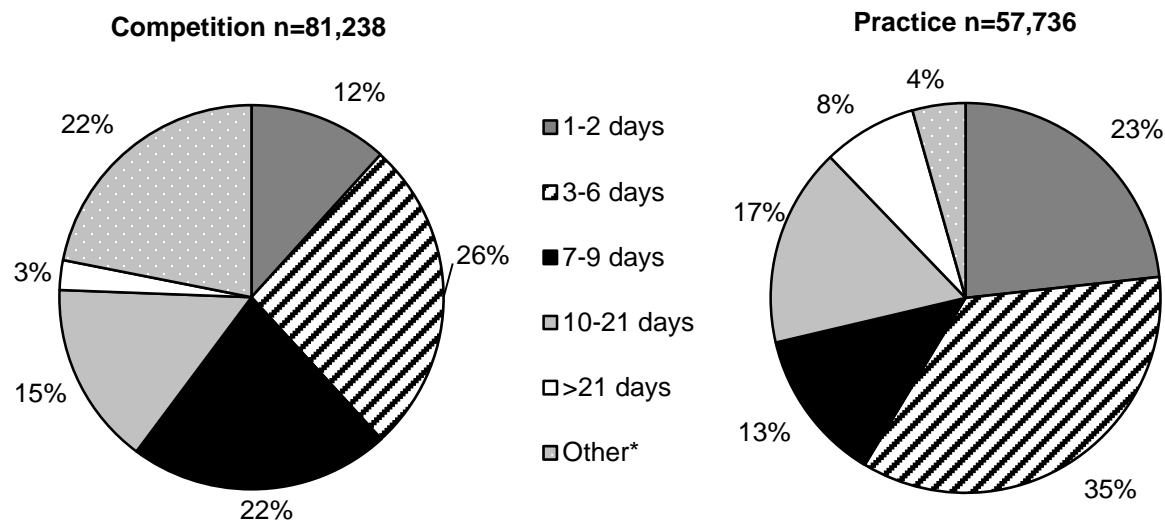
	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	30,635	37.7%	5,207	9.0%	35,842	25.8%
Ankle	17,654	21.7%	6,747	11.7%	24,401	17.6%
Knee	10,659	13.1%	13,521	23.4%	24,180	17.4%
Hip/thigh/upper leg	5,075	6.2%	11,187	19.4%	16,262	11.7%
Foot	4,171	5.1%	4,794	8.3%	8,965	6.5%
Lower leg	1,409	1.7%	7,452	12.9%	8,861	6.4%
Hand/wrist	3,810	4.7%	3,686	6.4%	7,496	5.4%
Trunk	4,188	5.2%	2,439	4.2%	6,627	4.8%
Shoulder	790	1.0%	1,587	2.7%	2,377	1.7%
Neck	-	0.0%	984	1.7%	984	0.7%
Arm/elbow	323	0.4%	66	0.1%	389	0.2%
Other	2,525	3.1%	66	0.1%	2,591	1.8%
Total	81,238	100%	57,736	100%	138,974	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, 2010-11 School Year

Diagnosis	Competition n=81,238		Practice n=57,734		Total n=138,973	
	n	%	n	%	n	%
Head/face concussion	23,333	28.7%	3,721	6.4%	27,055	19.5%
Ankle strain/sprain	16,996	20.9%	6,423	11.1%	23,420	16.9%
Hip/thigh/upper leg strain/sprain	3,392	4.2%	11,055	19.1%	14,447	10.4%
Knee strain/sprain	7,324	9.0%	6,690	11.6%	14,014	10.1%
Knee Other	3,335	4.1%	6,507	11.3%	9,842	7.1%
Foot strain/sprain	1,269	1.6%	2,876	5.0%	4,145	3.0%
Trunk strain/sprain	1,053	1.3%	2,439	4.2%	3,492	2.5%
Hand/wrist other	-	0.0%	3,183	5.5%	3,183	2.3%
Trunk contusion	2,273	2.8%	-	0.0%	2,273	1.6%
Lower leg contusion	1,211	1.5%	389	0.7%	1,600	1.2%

Figure 4.2 Time Loss of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 4.5 Boys' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	6,649	8.4%	1,795	3.2%	8,443	6.3%
Did not require surgery	72,663	91.6%	53,602	96.8%	126,266	93.7%
Total	79,312	100%	55,397	100%	134,709	100%

Figure 4.3 History of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

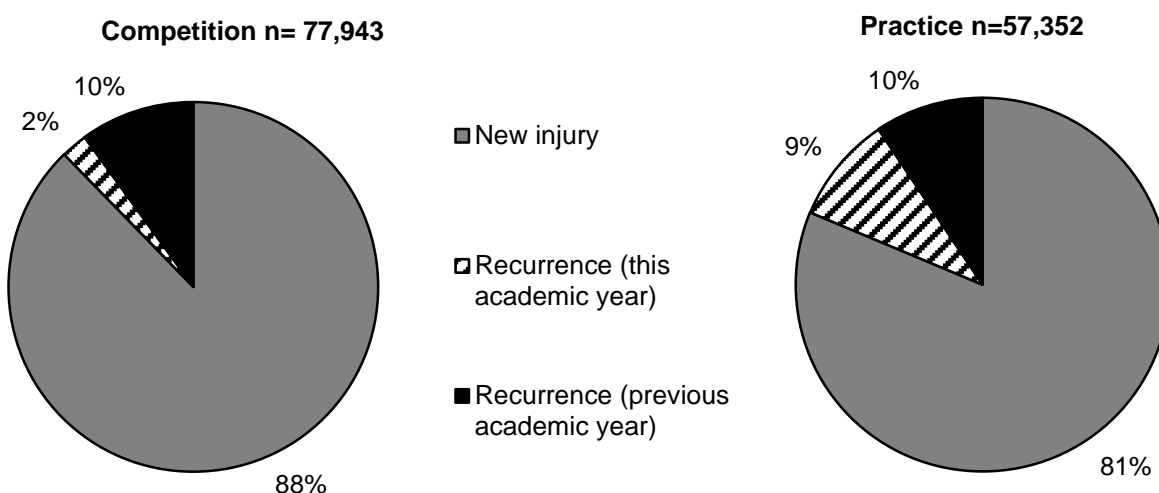


Table 4.6 Time during Season of Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	34,444	24.8%
Regular season	95,747	68.9%
Post season	8,784	6.3%
Total	138,974	100%

Table 4.7 Competition-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	3,086	3.9%
First half	23,738	29.7%
Second half	53,050	66.4%
Overtime	-	0.0%
Total	79,873	100%
Field Location		
Top of goal box extended to center line (offense)	29,081	36.9%
Top of goal box extended to center line (defense)	19,264	24.5%
Goal box (defense)	12,998	16.5%
Side of goal box (offense)	5,309	6.7%
Goal box (offense)	6,146	7.8%
Side of goal box (defense)	4,801	6.1%
Off the field	1,137	1.4%
Total	78,737	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, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	7,781	13.6%
Second 1/2 hour	11,954	20.9%
1-2 hours into practice	27,760	48.5%
>2 hours into practice	9,737	17.0%
Total	57,233	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, 2010-11 School Year

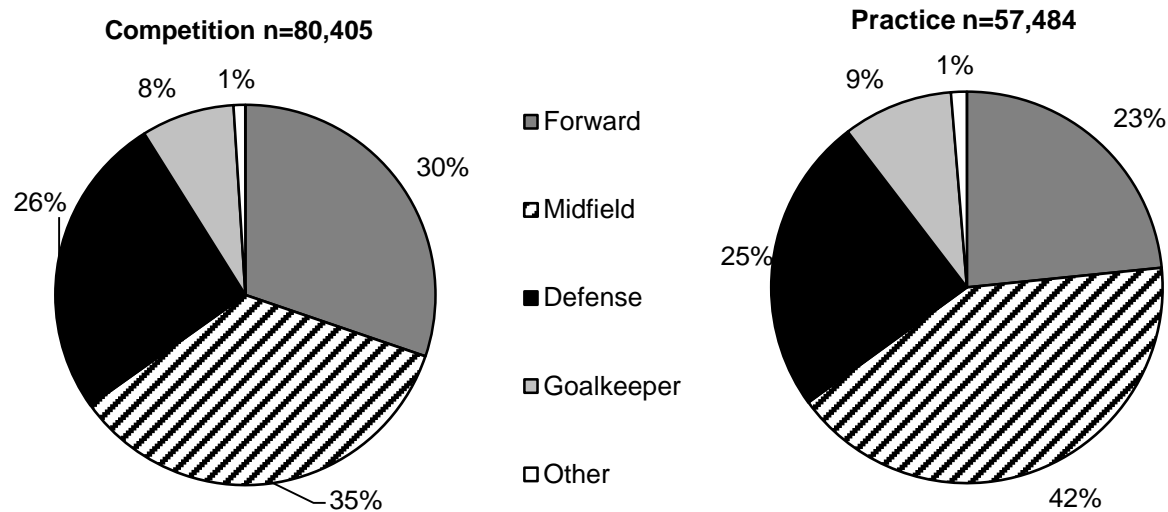
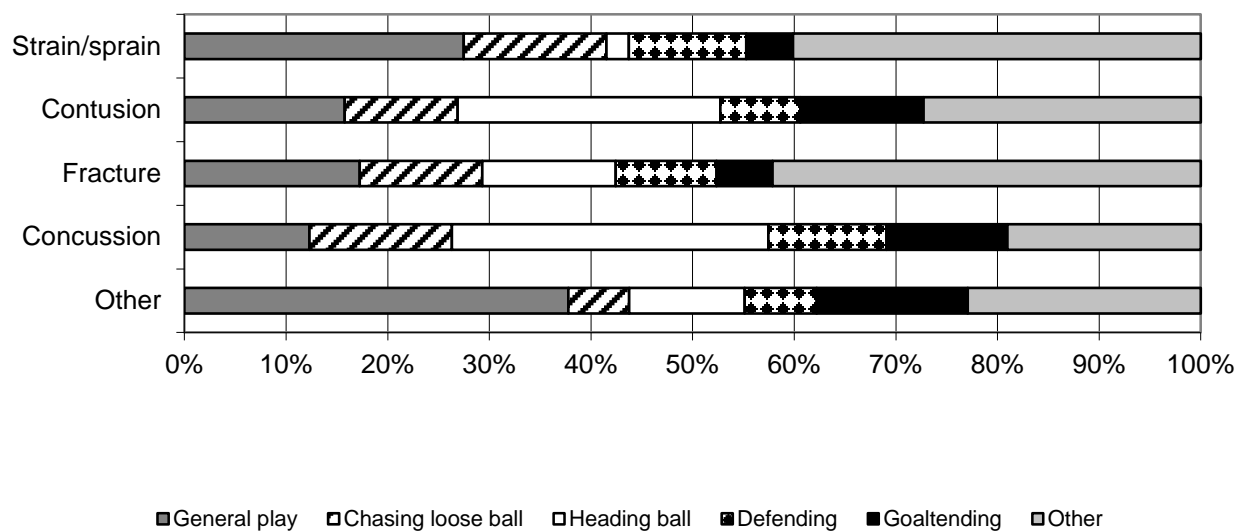


Table 4.9 Activities Leading to Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	14,508	18.0%	19,014	33.6%	33,522	24.4%
Heading ball	14,564	18.0%	2,405	4.2%	16,969	12.4%
Chasing loose ball	10,388	12.9%	6,306	11.1%	16,694	12.2%
Defending	10,322	12.8%	3,924	6.9%	14,246	10.4%
Goaltending	6,433	8.0%	5,232	9.2%	11,665	8.5%
Receiving pass	3,112	3.9%	4,942	8.7%	8,055	5.9%
Ball handling/dribbling	5,197	6.4%	2,451	4.3%	7,647	5.6%
Passing (foot)	4,438	5.5%	2,997	5.3%	7,435	5.4%
Shooting (foot)	3,417	4.2%	2,821	5.0%	6,238	4.5%
Conditioning	-	0.0%	4,697	8.3%	4,697	3.4%
Receiving a slide tackle	3,587	4.4%	-	0.0%	3,587	2.6%
Attempting a slide tackle	2,096	2.6%	-	0.0%	2,096	1.5%
Blocking shot	1,203	1.5%	-	0.0%	1,203	0.9%
Other	1,521	1.9%	1,809	3.3%	3,330	2.4%
Total	80,783	100%	56,599	100%	137,382	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, 2010-11 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, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	277	143,220	1.93	180,254
Competition	186	45,082	4.13	124,674
Practice	91	98,138	0.93	55,580

Table 5.2 Demographic Characteristics of Injured Girls' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=179,319
Freshman	21.4%
Sophomore	27.9%
Junior	29.0%
Senior	21.7%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.7 (1.4)
BMI	
Minimum	13.8
Maximum	33.5
Mean (St. Dev.)	21.5 (2.3)

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

†Throughout this chapter, totals and n's represent the total 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, 2010-11 School Year

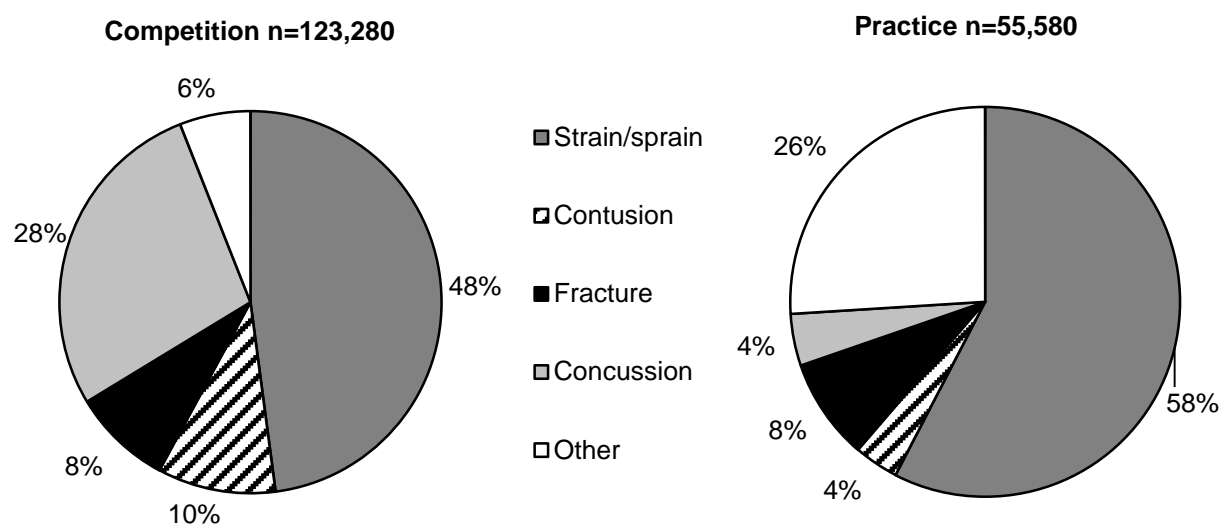


Table 5.3 Body Site of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

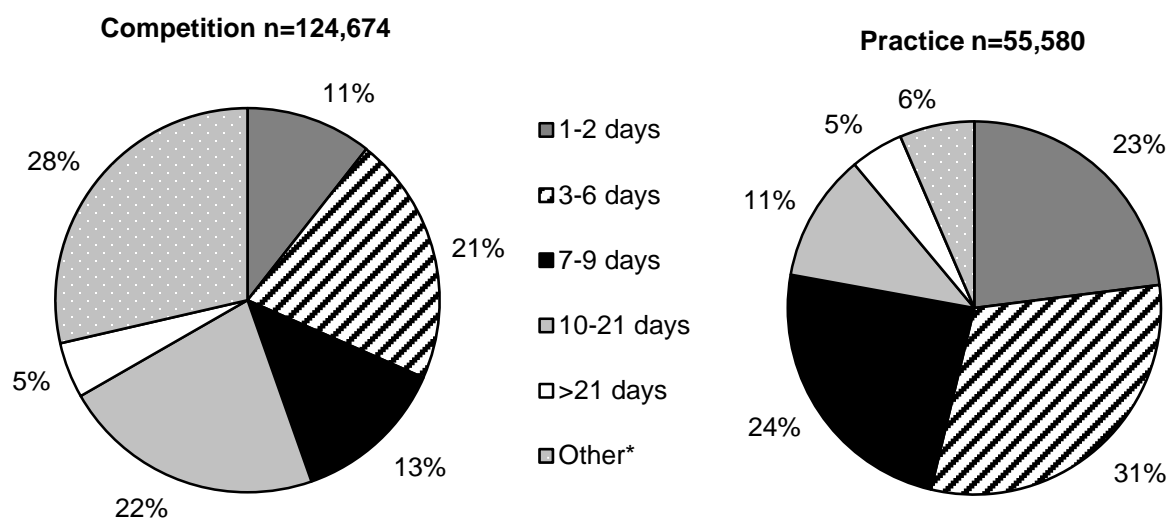
	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	36,650	29.4%	14,765	26.6%	51,415	28.5%
Head/face	37,672	30.2%	2,417	4.3%	40,089	22.2%
Knee	20,007	16.0%	6,450	11.6%	26,456	14.7%
Hip/thigh/upper leg	13,113	10.5%	13,147	23.7%	26,260	14.6%
Lower leg	7,641	6.1%	9,652	17.4%	17,292	9.6%
Foot	5,320	4.3%	5,297	9.5%	10,617	5.9%
Trunk	1,289	1.1%	800	1.4%	2,090	1.2%
Arm/elbow	547	0.4%	1,340	2.4%	1,887	1.0%
Shoulder	1,752	1.4%	-	0.0%	1,752	1.0%
Hand/wrist	682	0.5%	800	1.4%	1,483	0.8%
Other	-	0.0%	913	1.6%	913	0.5%
Total	124,674	100%	55,580	100%	180,254	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, 2010-11 School Year

Diagnosis	Competition n=123,281		Practice n=55,581		Total n=178,861	
	n	%	n	%	n	%
Ankle strain/sprain	32,946	26.7%	11,993	21.6%	44,939	24.9%
Head/face concussion	34,142	27.7%	2,417	4.3%	36,559	20.4%
Hip/thigh/upper leg strain/sprain	9,203	7.5%	12,895	23.2%	22,098	12.3%
Knee strain/sprain	13,015	10.6%	2,367	4.3%	15,382	8.5%
Knee other	3,604	2.9%	4,083	7.3%	7,687	4.3%
Lower leg other	271	0.2%	7,092	12.8%	7,363	4.1%
Lower leg strain/sprain	2,364	1.9%	2,307	4.2%	4,671	2.6%
Foot fracture	3,334	2.7%	519	0.9%	3,852	2.2%
Lower leg contusion	3,218	2.6%	252	0.5%	3,470	1.9%
Foot strain/sprain	395	0.3%	2,336	4.2%	2,730	1.5%

Figure 5.2 Time Loss of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 5.5 Girls' Soccer Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	10,626	8.6%	2,676	5.0%	13,302	7.5%
Did not require surgery	112,990	91.4%	51,293	95.0%	164,283	92.5%
Total	123,616	100%	53,969	100%	177,585	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, 2010-11 School Year

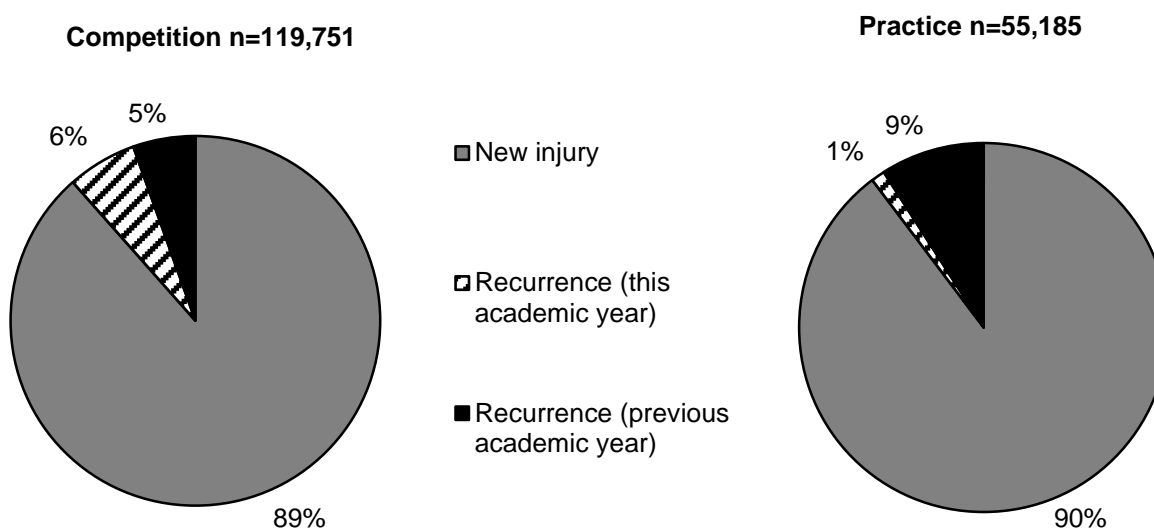


Table 5.6 Time during Season of Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	26,793	14.9%
Regular season	146,513	81.5%
Post season	6,554	3.6%
Total	179,860	100%

Table 5.7 Competition-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	3,793	3.1%
First half	43,369	35.3%
Second half	74,266	60.5%
Overtime	1,394	1.1%
Total	122,822	100%
Field Location		
Top of goal box extended to center line (offense)	35,329	29.7%
Top of goal box extended to center line (defense)	30,418	25.6%
Goal box (defense)	13,373	11.3%
Side of goal box (defense)	15,435	13.0%
Goal box (offense)	11,793	9.9%
Side of goal box (offense)	10,276	8.7%
Off the field	2,146	1.8%
Total	118,770	100%

Table 5.8 Practice-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	9,605	17.6%
Second 1/2 hour	7,447	13.7%
1-2 hours into practice	28,970	53.1%
>2 hours into practice	8,524	15.6%
Total	54,545	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, 2010-11 School Year

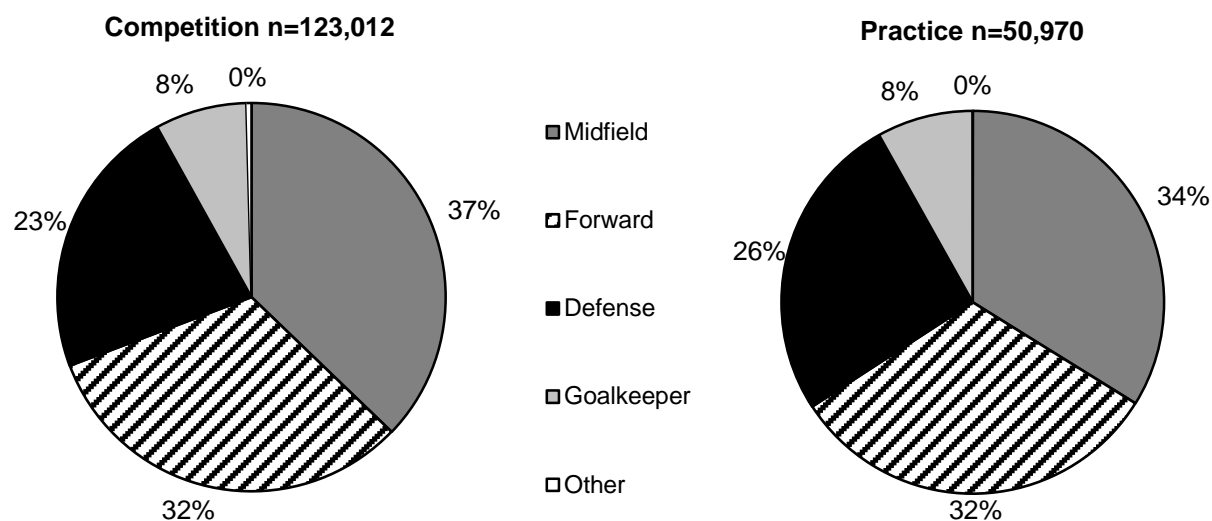
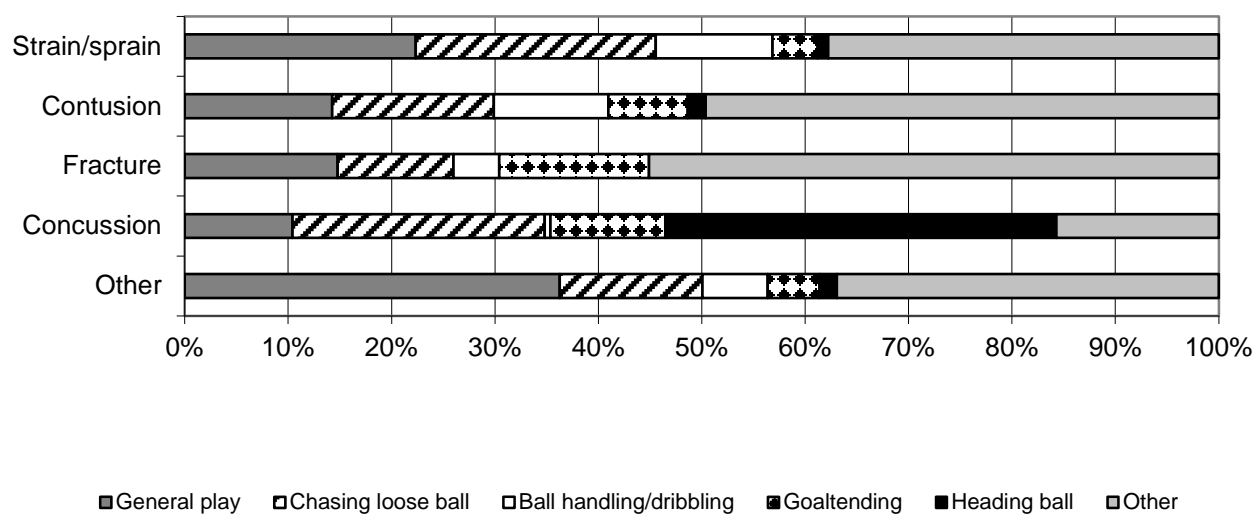


Table 5.9 Activities Leading to Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Defending	32,003	26.2%	5,537	10.0%	37,540	21.2%
Ball handling/dribbling	21,589	17.7%	6,587	11.9%	28,177	15.9%
General play	11,068	9.1%	13,859	25.1%	24,927	14.1%
Chasing loose ball	13,376	11.0%	3,911	7.1%	17,287	9.8%
Shooting (foot)	10,743	8.8%	4,933	8.9%	15,677	8.8%
Conditioning	1,340	1.1%	12,710	23.0%	14,049	7.9%
Passing (foot)	8,058	6.6%	1,460	2.6%	9,518	5.4%
Goaltending	6,445	5.3%	654	1.2%	7,099	4.0%
Receiving pass	5,114	4.2%	1,743	3.1%	6,848	3.9%
Heading ball	6,417	5.3%	395	0.7%	6,812	3.8%
Other	5,852	4.8%	3,403	6.2%	9,255	5.2%
Total	122,005	100%	55,192	100%	177,197	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, 2010-11 School Year



VI. Volleyball Injury Epidemiology

Table 6.1 Volleyball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	154	159,719	0.96	50,711
Competition	66	55,800	1.18	21,416
Practice	88	103,919	0.85	29,295

Table 6.2 Demographic Characteristics of Injured Volleyball Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=50,711
Freshman	26.4%
Sophomore	27.8%
Junior	24.1%
Senior	21.6%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.7 (1.2)
BMI	
Minimum	16.7
Maximum	30.4
Mean (St. Dev.)	21.3 (2.6)

*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 6.1 Diagnosis of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

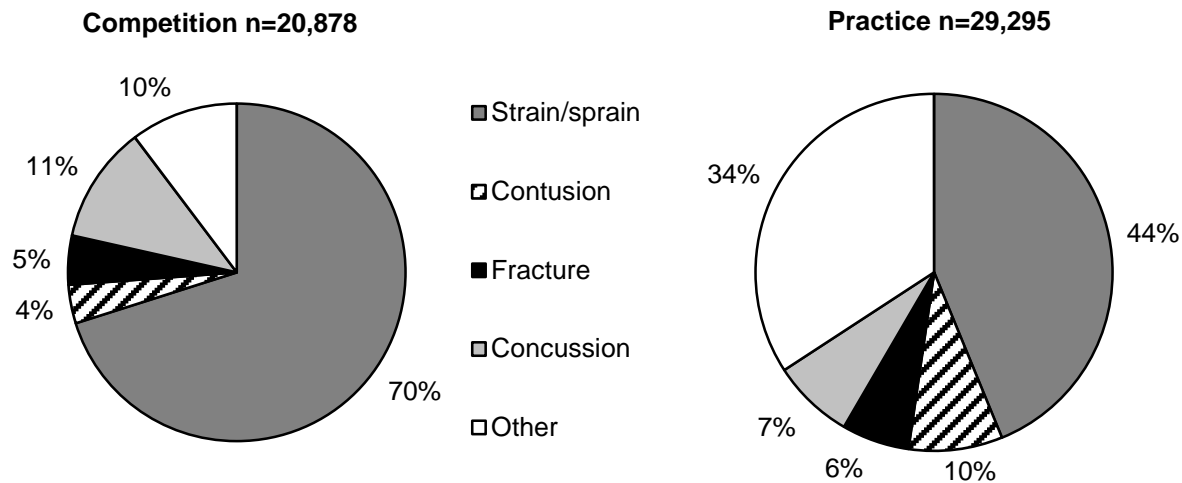


Table 6.3 Body Site of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

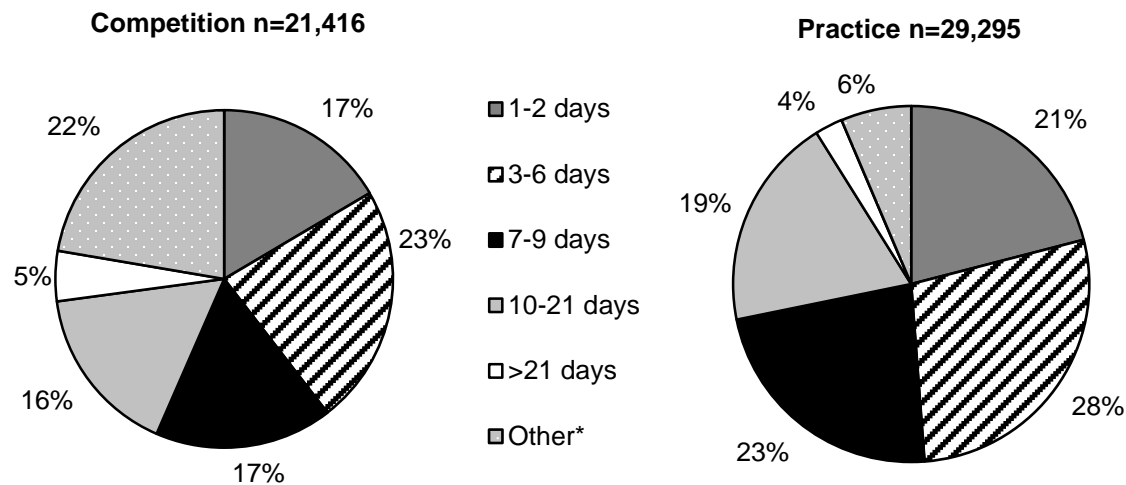
	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	7,875	36.8%	9,913	33.8%	17,788	35.1%
Knee	3,781	17.7%	4,429	15.1%	8,210	16.2%
Head/face	2,925	13.7%	2,783	9.5%	5,708	11.3%
Hand/wrist	2,287	10.7%	2,152	7.3%	4,439	8.8%
Trunk	1,782	8.3%	2,299	7.8%	4,081	8.0%
Foot	554	2.6%	2,462	8.4%	3,016	5.9%
Lower leg	733	3.4%	1,457	5.0%	2,189	4.3%
Shoulder	-	0.0%	1,644	5.6%	1,644	3.2%
Arm/elbow	265	1.2%	82	0.3%	347	0.7%
Hip/thigh/upper leg	-	0.0%	229	0.8%	229	0.5%
Neck	680	3.2%	118	0.4%	798	1.6%
Other	533	2.5%	1,727	5.9%	2,261	4.5%
Total	21,416	100%	29,295	100%	50,711	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, 2010-11 School Year

Diagnosis	Competition n=20,878		Practice n=29,294		Total n=50,170	
	n	%	n	%	n	%
Ankle strain/sprain	7,757	37.2%	8,694	29.7%	16,451	32.8%
Head/face concussion	2,335	11.2%	2,163	7.4%	4,498	9.0%
Knee other	1,494	7.2%	2,968	10.1%	4,462	8.9%
Hand/wrist strain/sprain	1,875	9.0%	1,041	3.6%	2,916	5.8%
Trunk strain/sprain	1,782	8.5%	894	3.1%	2,676	5.3%
Knee strain/sprain	1,748	8.4%	147	0.5%	1,896	3.8%
Shoulder other	-	0.0%	1,497	5.1%	1,497	3.0%
Foot other	-	0.0%	1,066	3.6%	1,066	2.1%
Head/face contusion	473	2.3%	473	1.6%	946	1.9%
Lower leg strain/sprain	82	0.4%	828	2.8%	909	1.8%

Figure 6.2 Time Loss of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 6.5 Volleyball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,074	11.1%	629	2.1%	2,703	5.4%
Did not require surgery	18,539	89.9%	28,666	97.9%	47,205	94.6%
Total	20,613	100%	29,295	100%	49,908	100%

Figure 6.3 History of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

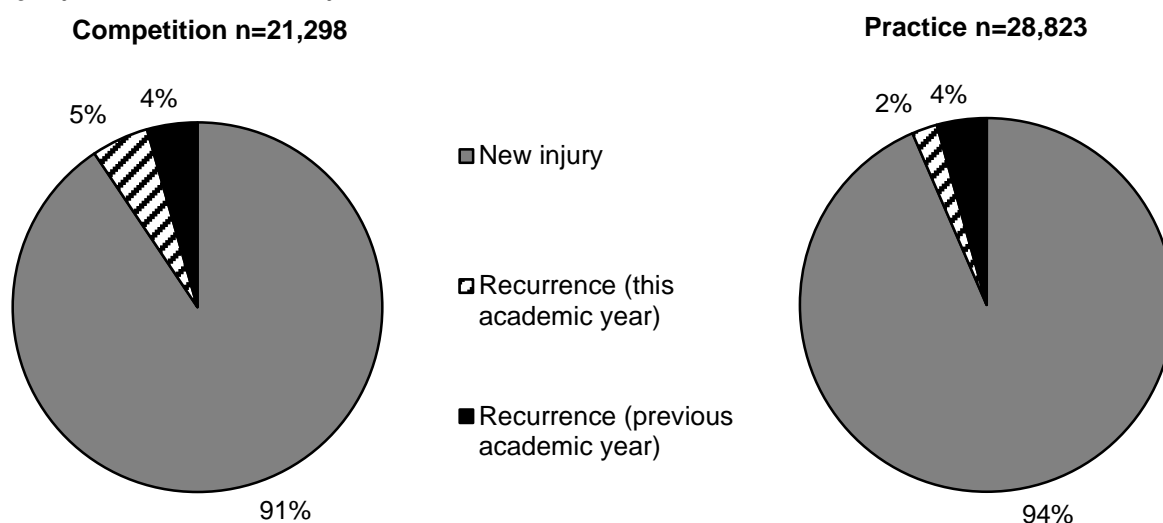


Table 6.6 Time during Season of Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	12,087	23.9%
Regular season	35,709	70.6%
Post season	2,797	5.5%
Total	50,593	100%

Table 6.7 Competition-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	3,337	16.4%
First game	2,418	11.9%
Second game	6,819	33.5%
Third game	5,772	28.4%
Fourth game	1,999	9.8%
Total	20,344	100%
Court Location		
Right back (server)	1,076	5.7%
Right forward	1,856	9.8%
Middle forward	6,409	34.0%
Left back	2,485	13.2%
Left forward	1,423	7.5%
Outside the playable area	1,986	10.5%
At the net	1,852	9.8%
Outside court (your side)	1,762	9.4%
Total	18,849	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, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	5,380	18.9%
Second 1/2 hour	3,494	12.3%
1-2 hours into practice	17,907	63.0%
>2 hours into practice	1,649	5.8%
Total	28,430	100%

Figure 6.4 Player Position of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

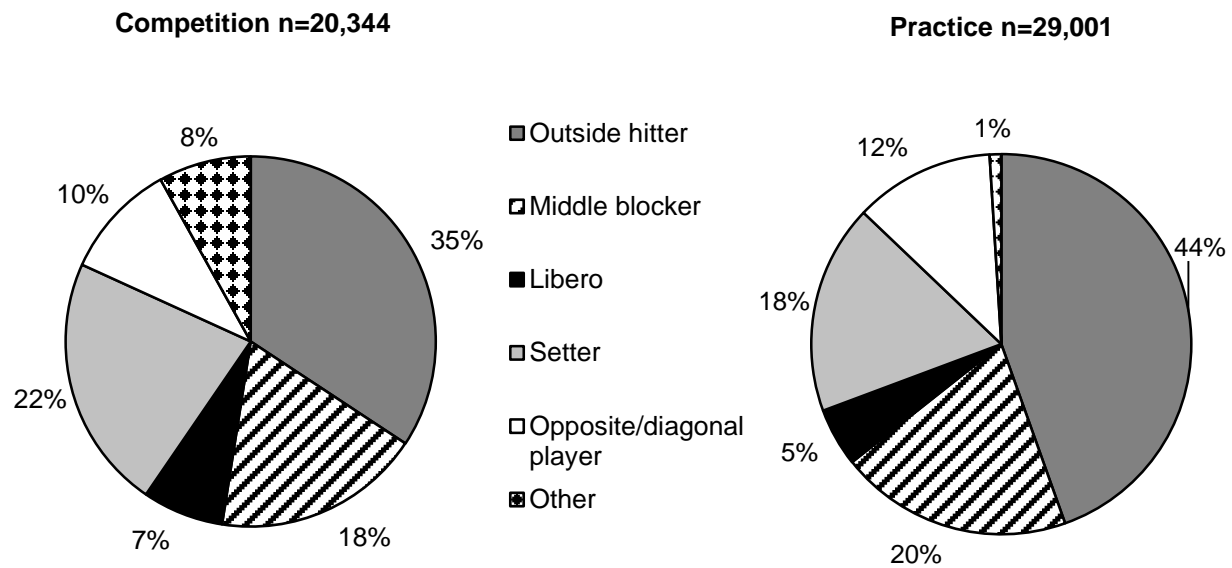
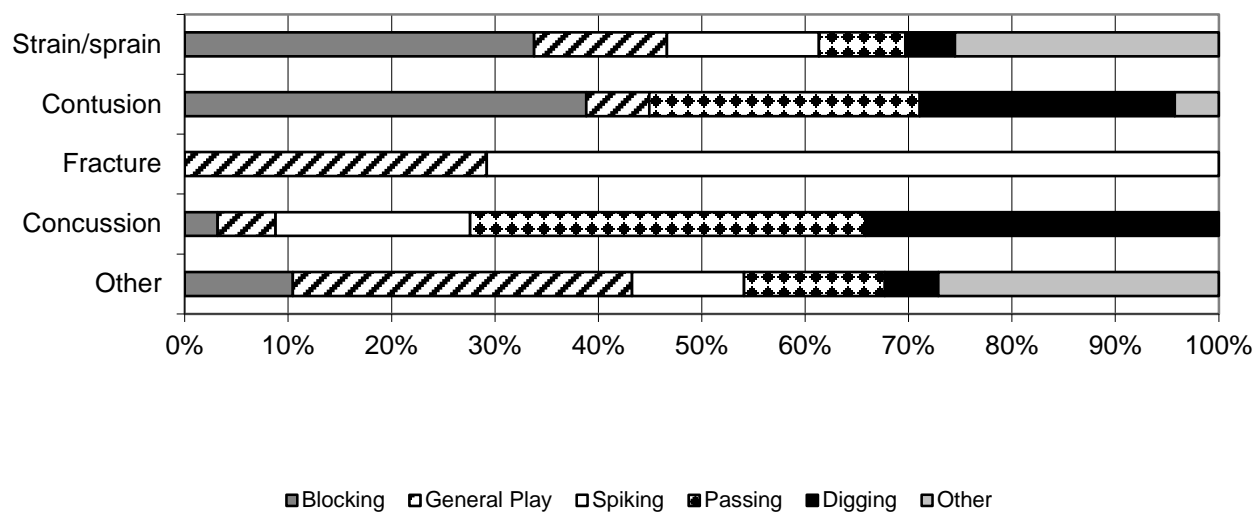


Table 6.9 Activities Leading to Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	3,414	16.4%	8,277	29.0%	11,691	23.7%
Blocking	4,465	21.5%	5,913	20.7%	10,378	21.0%
Digging	5,130	24.7%	4,194	14.7%	9,325	18.9%
Spiking	1,956	9.4%	3,056	10.7%	5,013	10.2%
Conditioning	-	0.0%	3,756	13.2%	3,756	7.6%
Passing	1,082	5.2%	1,563	5.5%	2,644	5.4%
Serving	2,077	10.0%	521	1.8%	2,598	5.3%
Setting	974	4.7%	200	0.7%	1,173	2.4%
Other	1,667	8%	1,068	3.7%	2,735	5.5%
Total	20,765	100%	28,548	100%	49,313	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, 2010-11 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, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	280	207,091	1.35	79,762
Competition	149	62,435	2.39	41,252
Practice	131	144,656	0.91	38,510

Table 7.2 Demographic Characteristics of Injured Boys' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=78,528
Freshman	16.6%
Sophomore	31.3%
Junior	25.3%
Senior	26.8%
Total[†]	100%
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	16.2 (1.2)
BMI	
Minimum	9.1
Maximum	51.4
Mean (St. Dev.)	22.8 (3.1)

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

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

Figure 7.1 Diagnosis of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

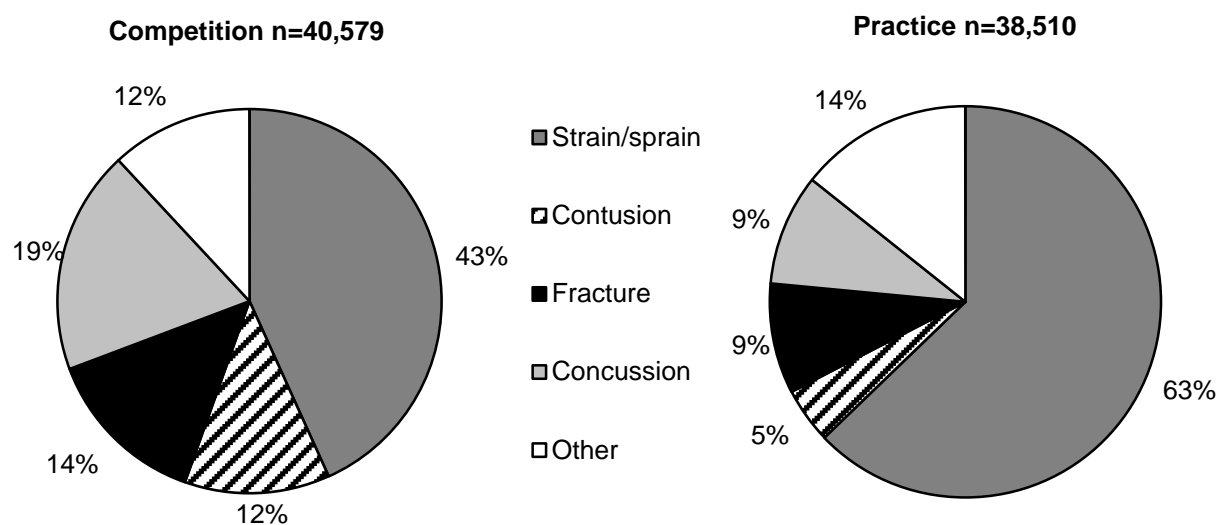


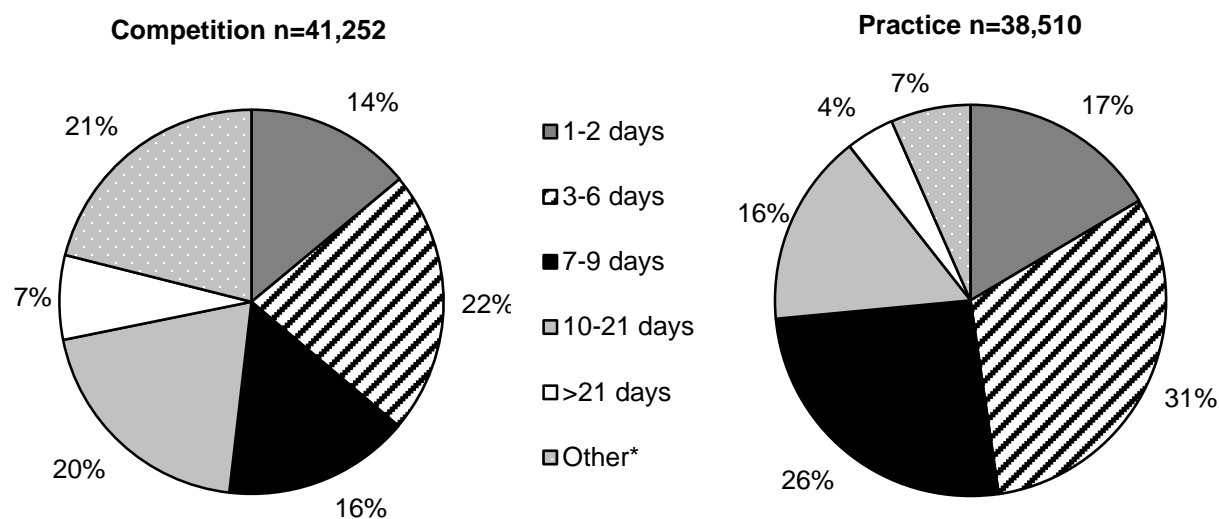
Table 7.3 Body Site of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	11,143	27.0%	13,772	35.8%	24,915	31.2%
Head/face	11,884	28.8%	7,125	18.5%	19,009	23.8%
Knee	5,310	12.9%	2,730	7.1%	8,040	10.1%
Hand/wrist	3,430	8.3%	3,805	9.9%	7,235	9.1%
Foot	1,854	4.5%	3,752	9.7%	5,605	7.0%
Trunk	1,745	4.2%	3,022	7.8%	4,767	6.0%
Hip/thigh/upper leg	2,422	5.9%	2,275	5.9%	4,697	5.9%
Lower leg	1,450	3.5%	1,151	3.0%	2,601	3.3%
Shoulder	1,379	3.3%	234	0.6%	1,613	2.0%
Arm/elbow	489	1.2%	645	1.7%	1,134	1.4%
Other	145	0.4%	-	0.0%	145	0.2%
Total	41,252	100%	38,510	100%	79,762	100%

Table 7.4 Ten Most Common Boys' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Diagnosis	Competition n=40,576		Practice n=38,512		Total n=79,090	
	n	%	n	%	n	%
Ankle strain/sprain	10,026	24.7%	13,655	35.5%	23,681	29.9%
Head/face concussion	7,638	18.8%	3,549	9.2%	11,187	14.0%
Hand/wrist strain/sprain	1,342	3.3%	2,262	5.9%	3,604	4.6%
Knee strain/sprain	2,115	5.2%	1,336	3.5%	3,451	4.3%
Hip/thigh/upper leg strain/sprain	672	1.7%	2,208	5.7%	2,880	3.6%
Foot strain/sprain	735	1.8%	1,846	4.8%	2,581	3.3%
Knee contusion	1,434	3.5%	1,160	3.0%	2,593	3.3%
Head/face fracture	1,777	4.4%	379	1.0%	2,157	2.7%
Knee other	1,762	4.3%	234	0.6%	1,996	2.5%
Hip/thigh/upper leg contusion	1,750	4.3%	-	0.0%	1,750	2.2%

Figure 7.2 Time Loss of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 7.5 Boys' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,324	8.3%	1,617	4.3%	4,492	6.4%
Did not require surgery	36,635	91.7%	36,154	95.7%	72,788	93.6%
Total	39,959	100%	37,771	100%	77,730	100%

Figure 7.3 History of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

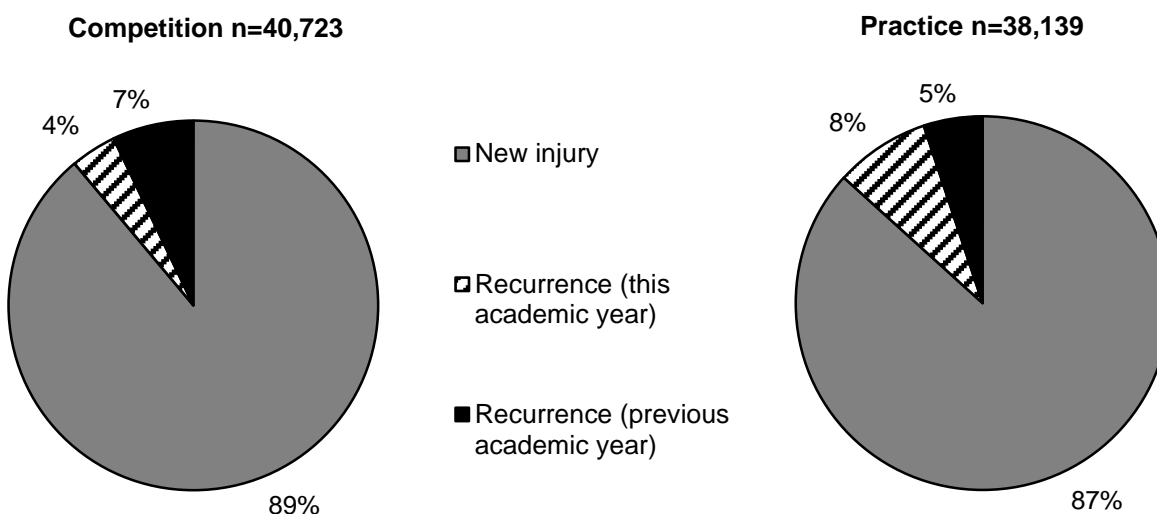


Table 7.6 Time during Season of Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	13,070	16.4%
Regular season	64,139	80.4%
Post season	2,553	3.2%
Total	79,762	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, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,317	3.4%
First quarter	2,133	5.5%
Second quarter	12,296	31.7%
Third quarter	13,083	33.7%
Fourth quarter	10,001	25.8%
Total	38,830	100%
Court Location		
Inside lane (offense)	10,869	29.2%
Inside lane (defense)	8,554	23.0%
Between 3 pt arc and lane (defense)	5,479	14.7%
Backcourt	4,506	12.1%
Outside 3 point arc - offense	2,647	7.1%
Between 3 pt arc and lane (offense)	2,174	5.8%
Out of bounds	1,872	5.0%
Outside 3 point arc - defense	1,113	3.0%
Total	37,214	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, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	3,206	8.6%
Second 1/2 hour	8,702	23.4%
1-2 hours into practice	24,224	65.1%
>2 hours into practice	1,081	2.9%
Total	37,214	100%

Figure 7.4 Player Position of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

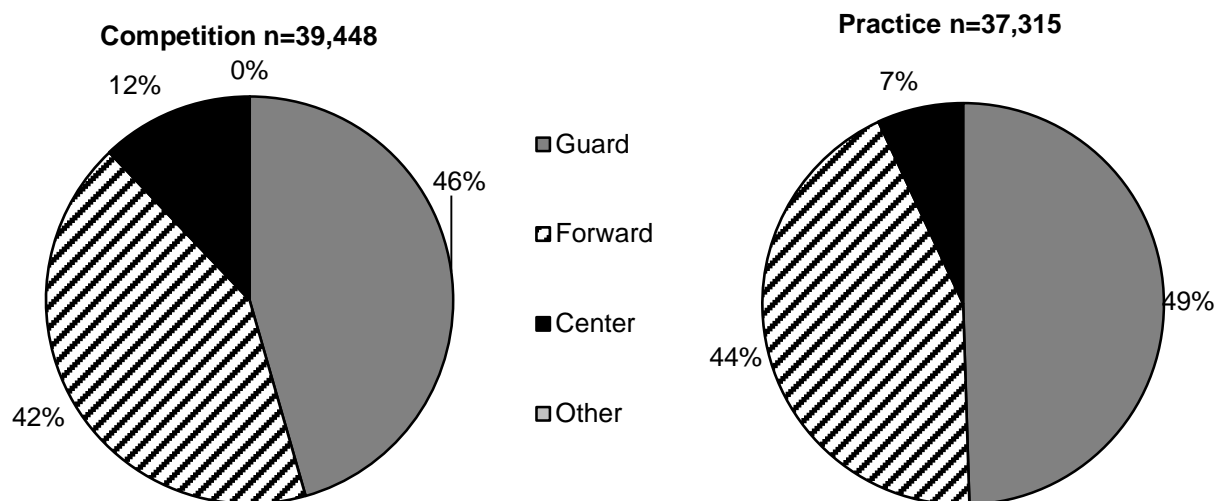
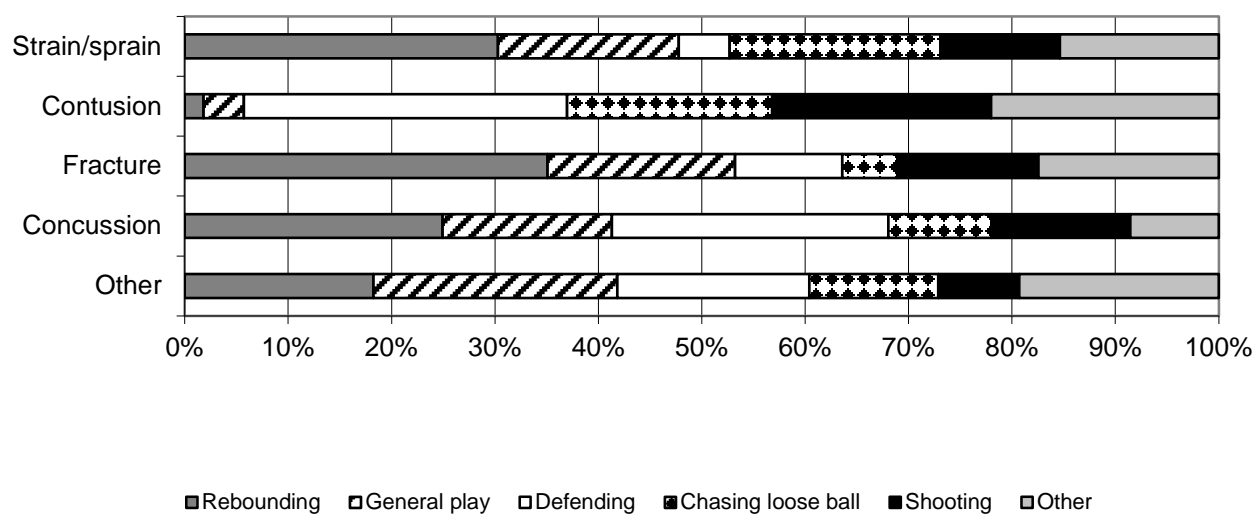


Table 7.9 Activities Leading to Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Rebounding	9,893	24.7%	8,854	23.4%	18,747	24.1%
Defending	6,373	15.9%	7,580	20.0%	13,953	17.9%
Shooting	6,240	15.6%	3,974	10.5%	10,214	13.1%
General play	4,700	11.8%	4,766	12.6%	9,466	12.2%
Chasing loose ball	5,983	15.0%	1,938	5.1%	7,921	10.2%
Ball handling/dribbling	3,430	8.6%	1,981	5.2%	5,411	6.9%
Receiving pass	1,528	3.8%	1,754	4.6%	3,282	4.2%
Conditioning	528	1.3%	2,745	7.2%	3,273	4.2%
Other	1,071	2.7%	2,077	5.5%	3,149	4.0%
Passing	-	0.0%	1,290	3.4%	1,290	1.7%
Screening	234	0.6%	926	2.4%	1,160	1.5%
Total	39,981	100%	37,886	100%	77,867	100%

Figure 7.5 Activity Resulting in Boys' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2010-11 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, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	292	168,574	1.73	83,033
Competition	184	51,185	3.59	53,931
Practice	108	117,389	0.92	29,102

Table 8.2 Demographic Characteristics of Injured Girls' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=81,948
Freshman	28.2%
Sophomore	30.8%
Junior	25.4%
Senior	15.6%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.8 (1.3)
BMI	
Minimum	14.5
Maximum	37.4
Mean (St. Dev.)	22.5 (3.5)

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

†Throughout this chapter, totals and n's represent the total 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, 2010-11 School Year

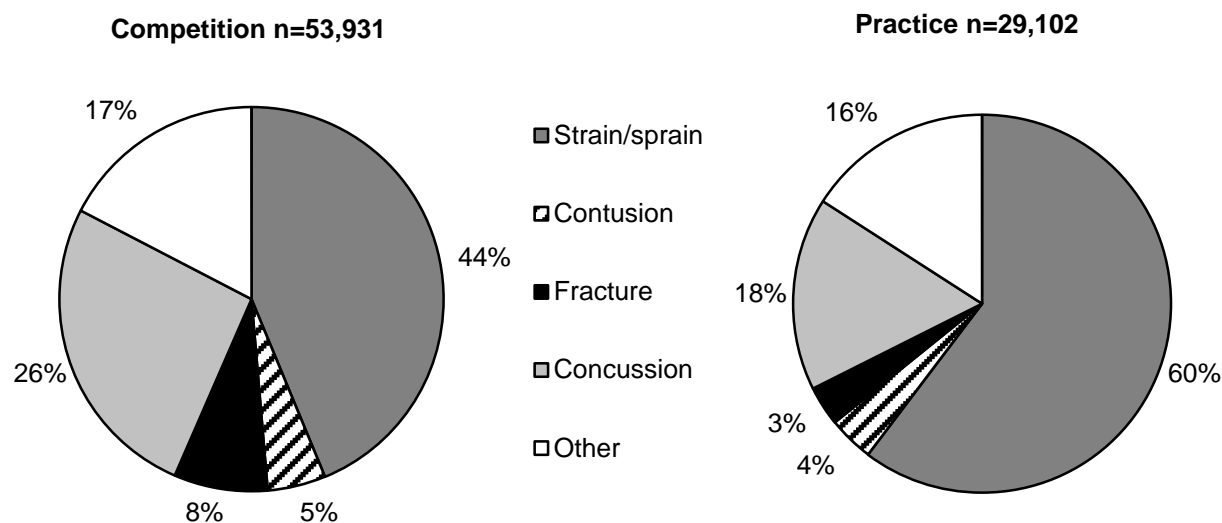


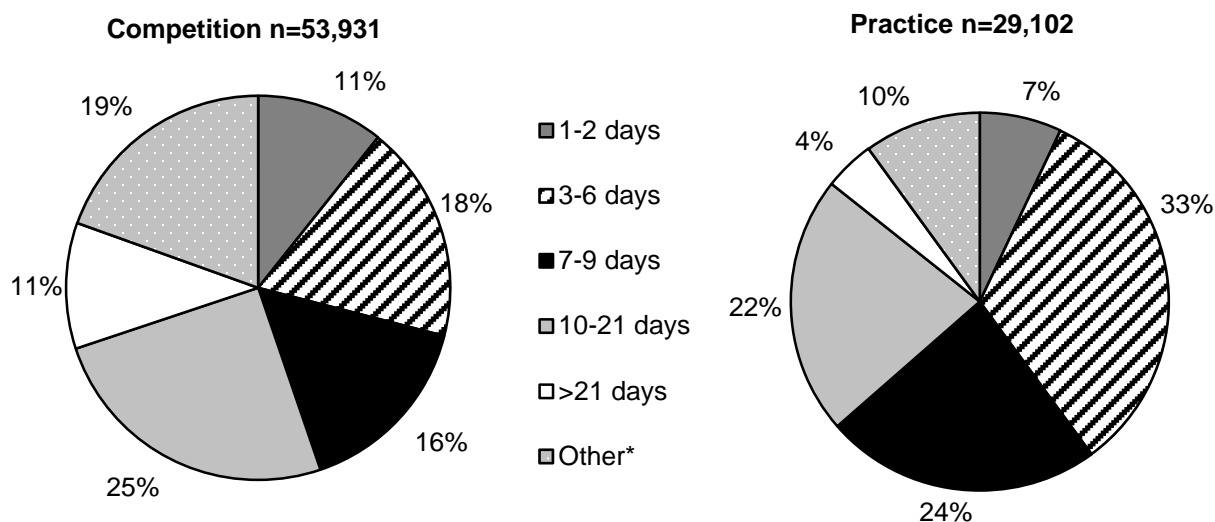
Table 8.3 Body Site of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	12,859	24.1%	7,323	25.2%	20,181	24.5%
Head/face	14,998	28.1%	5,140	17.7%	20,138	24.4%
Knee	11,704	21.9%	5,114	17.6%	16,818	20.4%
Hand/wrist	5,425	10.2%	3,110	10.7%	8,536	10.3%
Trunk	1,148	2.2%	3,760	12.9%	4,908	6.0%
Hip/thigh/upper leg	684	1.3%	2,340	8.0%	3,024	3.7%
Shoulder	2,521	4.7%	-	0.0%	2,521	3.1%
Lower leg	1,369	2.6%	879	3.0%	2,249	2.7%
Foot	1,296	2.4%	945	3.2%	2,241	2.7%
Arm/elbow	1,242	2.3%	149	0.5%	1,390	1.7%
Neck	130	0.2%	342	1.2%	472	0.6%
Total	53,377	100%	29,102	100%	82,479	100%

Table 8.4 Ten Most Common Girls' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Diagnosis	Competition n=53,376		Practice n=29,102		Total n=82,478	
	n	%	n	%	n	%
Ankle strain/sprain	12,785	24.0%	7,323	25.2%	20,108	24.2%
Head/face concussion	13,547	25.4%	4,798	16.5%	18,344	22.2%
Knee strain/sprain	6,238	11.7%	2,131	7.3%	8,369	10.1%
Knee other	4,439	8.3%	2,612	9.0%	7,051	8.5%
Hand/wrist fracture	3,229	6.0%	907	3.1%	4,136	5.0%
Trunk strain/sprain	538	1.0%	2,787	9.6%	3,325	4.0%
Hand/wrist strain/sprain	1,639	3.1%	1,536	5.3%	3,175	3.8%
Hip/thigh/upper leg strain/sprain	342	0.6%	2,266	7.8%	2,608	3.2%
Shoulder other	1,854	3.5%	-	0.0%	1,854	2.2%
Knee contusion	1,027	1.9%	371	1.3%	1,398	1.7%
Foot strain/sprain	758	1.4%	658	2.4%	1,443	1.7%

Figure 8.2 Time Loss of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 8.5 Girls' Basketball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	4,647	9.0%	2,956	10.5%	7,604	9.6%
Did not require surgery	46,801	91.0%	25,119	89.5%	71,919	90.4%
Total	51,448	100%	28,075	100%	79,523	100%

Figure 8.3 History of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

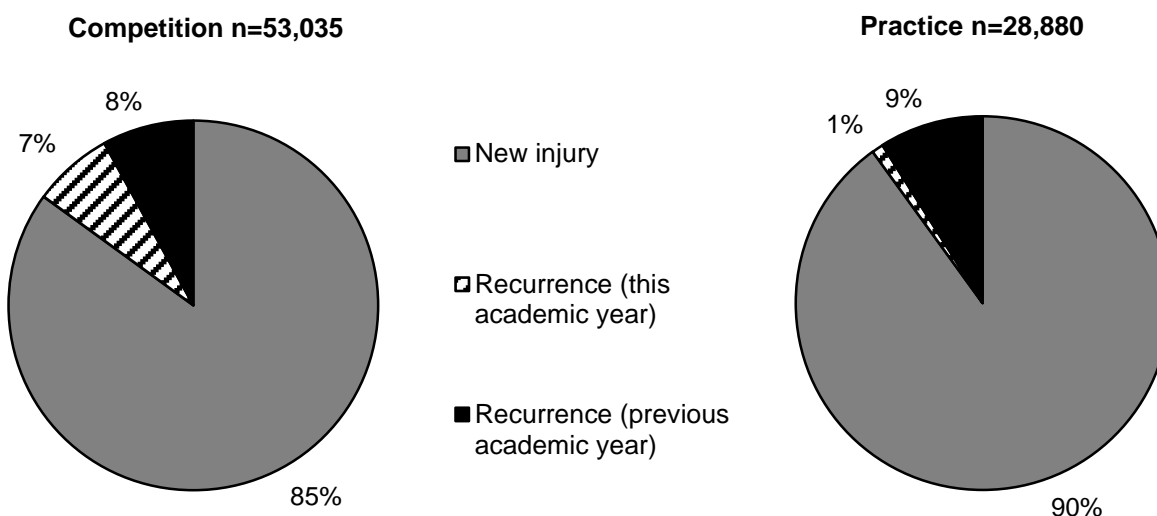


Table 8.6 Time during Season of Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	12,256	14.8%
Regular season	67,011	80.7%
Post season	3,767	4.5%
Total	83,033	100%

Table 8.7 Competition-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	-	0.0%
First quarter	2,888	6.0%
Second quarter	11,177	23.3%
Third quarter	17,503	36.4%
Fourth quarter	16,336	34.0%
Overtime	130	0.3%
Total	48,033	100%
Court Location		
Inside lane (offense)	12,789	26.7%
Inside lane (defense)	9,686	20.2%
Between 3 pt arc and lane (defense)	5,768	12.0%
Outside 3 point arc - offense	5,646	11.8%
Between 3 pt arc and lane (offense)	5,606	11.7%
Outside 3 point arc - defense	4,552	9.5%
Backcourt	2,058	4.3%
Out of bounds	1,112	2.3%
Off the court	741	1.5%
Total	47,958	100%

Table 8.8 Practice-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	3,417	12.1%
Second 1/2 hour	5,088	18.0%
1-2 hours into practice	18,106	64.1%
>2 hours into practice	1,629	5.8%
Total	28,240	100%

Figure 8.4 Player Position of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

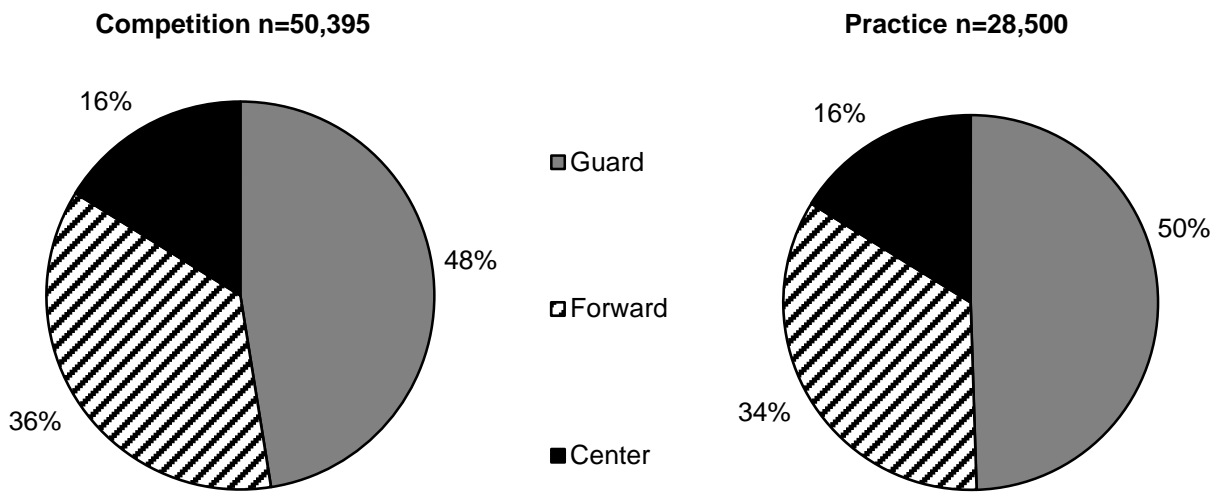
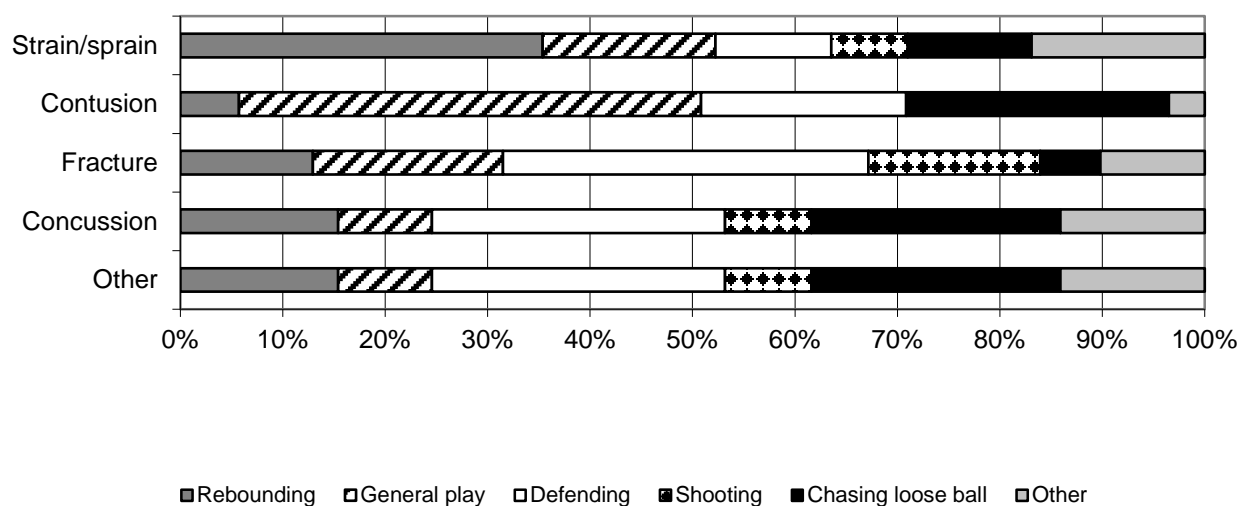


Table 8.9 Activities Leading to Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	11,359	22.3%	8,116	28.0%	19,475	24.3%
Defending	10,745	21.0%	4,204	14.5%	14,949	18.7%
Rebounding	9,436	18.5%	3,513	12.1%	12,950	16.2%
Chasing loose ball	5,519	10.8%	3,483	12.0%	9,002	11.2%
Shooting	7,332	14.4%	1,595	5.5%	8,928	11.1%
Ball handling/dribbling	3,116	6.1%	1,119	3.9%	4,236	5.3%
Conditioning	73	0.1%	3,100	10.7%	3,173	4.0%
Receiving pass	1,082	2.1%	2,065	7.1%	3,147	3.9%
Passing	555	1.1%	1,491	5.1%	2,045	2.6%
Screening	668	1.3%	-	0.0%	668	0.8%
Other	1,165	2.3%	342	1.2%	1,508	1.9%
Total	51,052	100%	29,029	100%	80,081	100%

Figure 8.5 Activity Resulting in Girls' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year



IX. Wrestling Injury Epidemiology

Table 9.1 Wrestling Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	296	147,073	2.01	80,569
Competition	128	38519	3.32	36536
Practice	168	108,554	1.55	44,033

Table 9.2 Demographic Characteristics of Injured Wrestlers, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=79,381
Freshman	12.0%
Sophomore	26.4%
Junior	31.1%
Senior	30.5%
Total[†]	100%
Age (years)	
Minimum	14
Maximum	19
Mean (St. Dev.)	16.3 (1.2)
BMI	
Minimum	15.7
Maximum	43.5
Mean (St. Dev.)	23.5 (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 9.1 Diagnosis of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

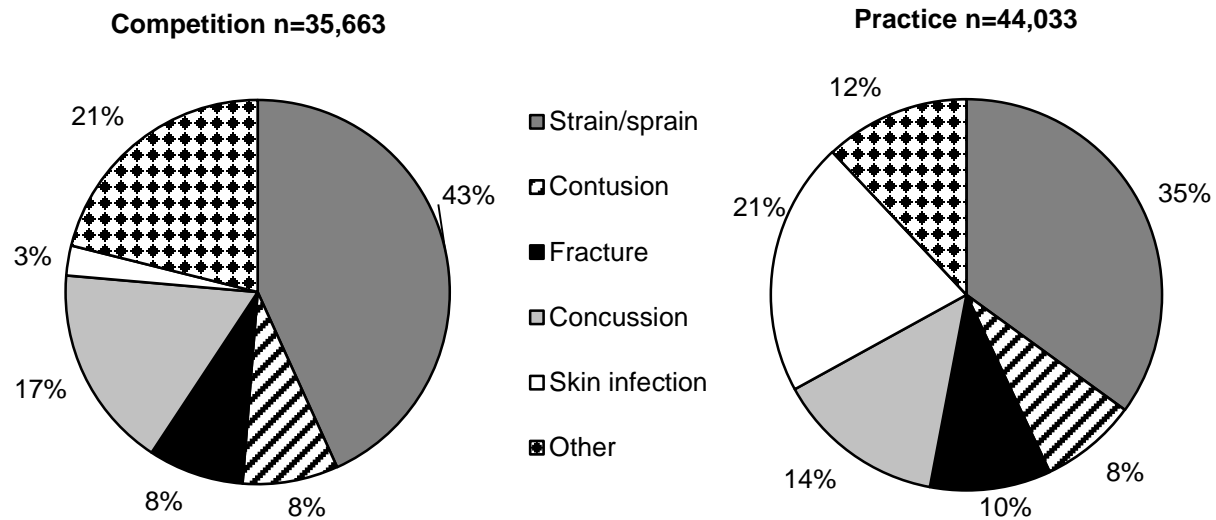


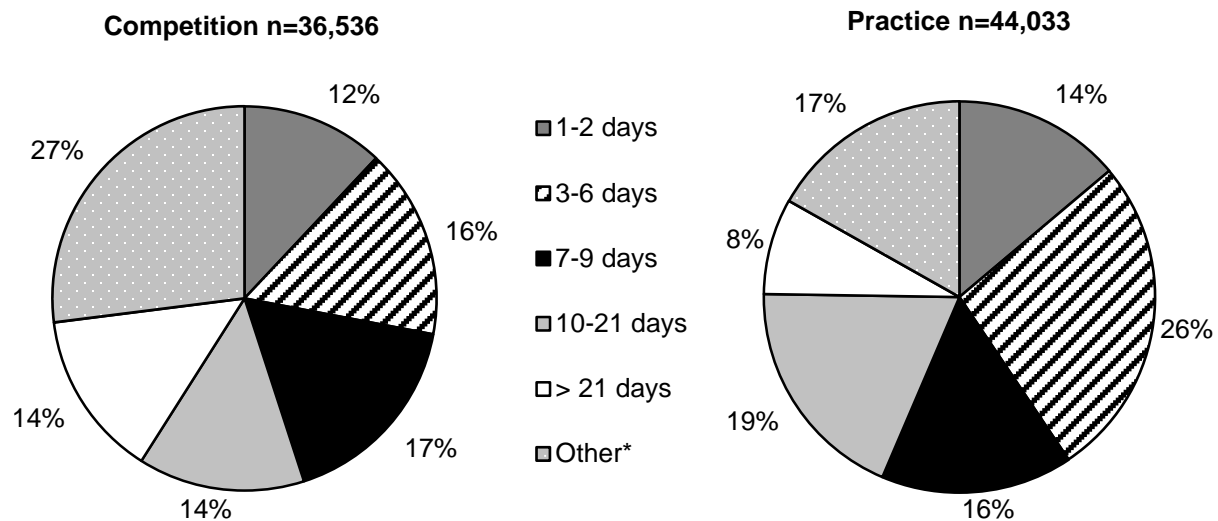
Table 9.3 Body Site of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	7,316	20.0%	11,071	25.1%	18,387	22.8%
Shoulder	7,441	20.4%	5,765	13.1%	13,206	16.4%
Knee	5,343	14.6%	5,399	12.3%	10,743	13.3%
Trunk	3,322	9.1%	5,978	13.6%	9,300	11.5%
Hand/wrist	2,150	5.9%	4,463	10.1%	6,613	8.2%
Ankle	3,130	8.6%	2,298	5.2%	5,428	6.7%
Arm/elbow	2,859	7.8%	2,326	5.3%	5,185	6.4%
Neck	1,945	5.3%	2,912	6.6%	4,857	6.0%
Hip/thigh/upper leg	1,392	3.8%	816	1.9%	2,208	2.7%
Foot	219	0.6%	1,003	2.3%	1,222	1.5%
Lower leg	352	1.0%	616	1.4%	968	1.3%
Other	1,065	2.9%	1,387	3.2%	2,452	3.1%
Total	36,536	100%	44,033	100%	80,569	100%

Table 9.4 Ten Most Common Wrestling Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Diagnosis	Competition n=35,659		Practice n=44,035		Total n=79,694	
	n	%	n	%	n	%
Head/face concussion	6,039	16.9%	6,107	13.9%	12,146	15.2%
Shoulder strain/sprain	4,021	11.3%	2,528	5.7%	6,549	8.2%
Knee strain/sprain	1,812	5.1%	3,335	7.6%	5,147	6.5%
Neck strain/sprain	1,828	5.1%	2,912	6.6%	4,739	5.9%
Ankle strain/sprain	2,665	7.5%	2,007	4.6%	4,672	5.9%
Knee other	2,471	6.9%	1,599	3.6%	4,071	5.1%
Trunk strain/sprain	1,913	5.4%	2,003	4.5%	3,915	4.9%
Arm/elbow other	1,341	3.8%	2,137	7.4%	3,478	4.4%
Head/face skin infection	378	1.1%	2,754	6.3%	3,132	3.9%
Arm/elbow strain/sprain	155	0.4%	189	0.4%	344	0.4%

Figure 9.2 Time Loss of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 9.5 Wrestling Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,092	3.0%	1,210	2.8%	2,302	2.9%
Did not require surgery	35,096	97.0%	41,701	97.2%	76,797	97.1%
Total	36,188	100%	42,911	100%	79,099	100%

Figure 9.3 History of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

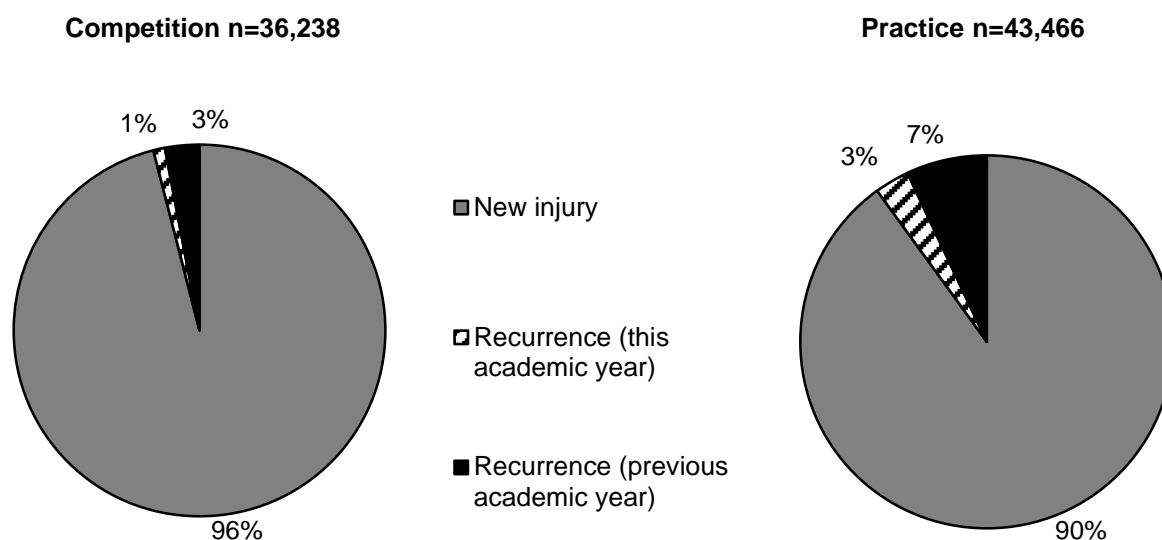


Table 9.6 Time during Season of Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	8,298	10.3%
Regular season	68,329	84.9%
Post season	3,870	4.8%
Total	80,497	100%

Table 9.7 Competition-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	932	2.8%
First period	8,745	26.4%
Second period	14,234	43.0%
Third period	9,178	27.7%
Total	33,090	100%
Mat Location		
Within 28 ft. circle	32,450	94.3%
Out of bounds	1,955	5.7%
Off the mat	-	0.0%
Total	34,405	100%

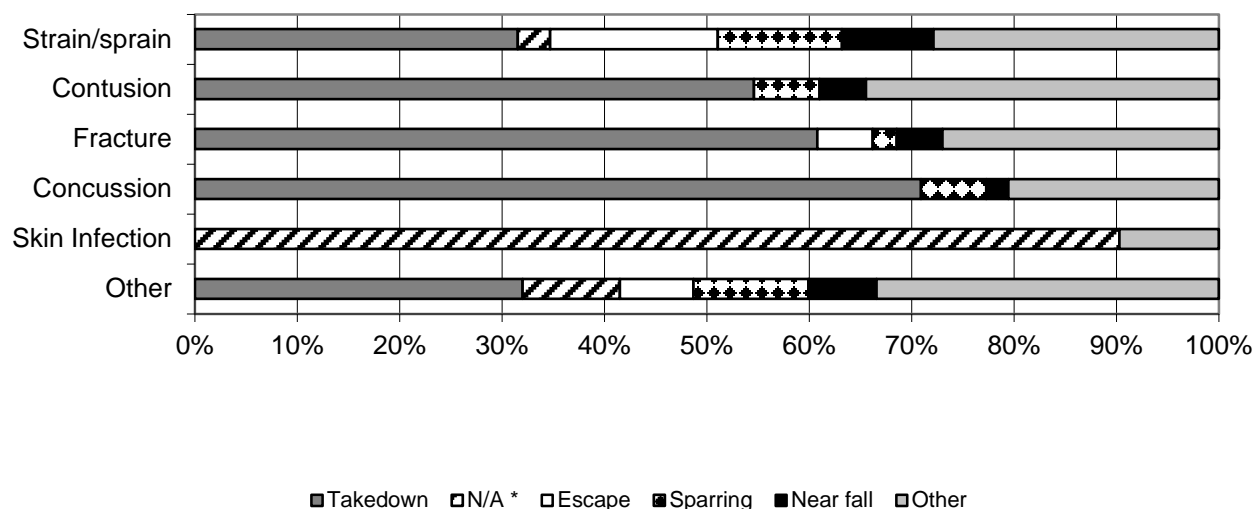
Table 9.8 Practice-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	3,676	9.3%
Second 1/2 hour	6,687	16.9%
1-2 hours into practice	23,412	59.2%
>2 hours into practice	5,805	14.7%
Total	39,581	100%

Table 9.9 Activities Leading to Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Takedown	20,431	56.8%	14,285	33.5%	34,716	44.2%
Sparring	5,712	15.9%	10,455	24.5%	16,167	20.6%
N/A (e.g., skin infection, overuse, etc.)	779	2.2%	7,105	16.7%	7,884	10.0%
Fall	1,293	3.6%	3,116	7.3%	4,409	5.6%
Conditioning	-	0.0%	3,481	8.2%	3,481	4.4%
Near fall	2,289	6.4%	932	2.2%	3,221	4.1%
Escape	964	2.7%	1,227	2.9%	2,191	2.8%
Riding	1,277	3.5%	117	0.3%	1,394	1.8%
Reversal	1,072	3.0%	72	0.2%	1,144	1.5%
Other	2,157	6.0%	1,831	4.3%	3,988	5.1%
Total	35,974	100%	42,621	100%	78,594	100%

Figure 9.4 Activities Resulting in Wrestling Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2010-11 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, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	133	164,130	0.81	46,796
Competition	83	55,577	1.49	29,789
Practice	50	108,553	0.46	17,008

Table 10.2 Demographic Characteristics of Injured Baseball Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=45,736
Freshman	19.4%
Sophomore	30.1%
Junior	30.2%
Senior	20.3%
Total[†]	100%
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	16.1 (1.3)
BMI	
Minimum	17.6
Maximum	40.9
Mean (St. Dev.)	24.2 (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, 2010-11 School Year

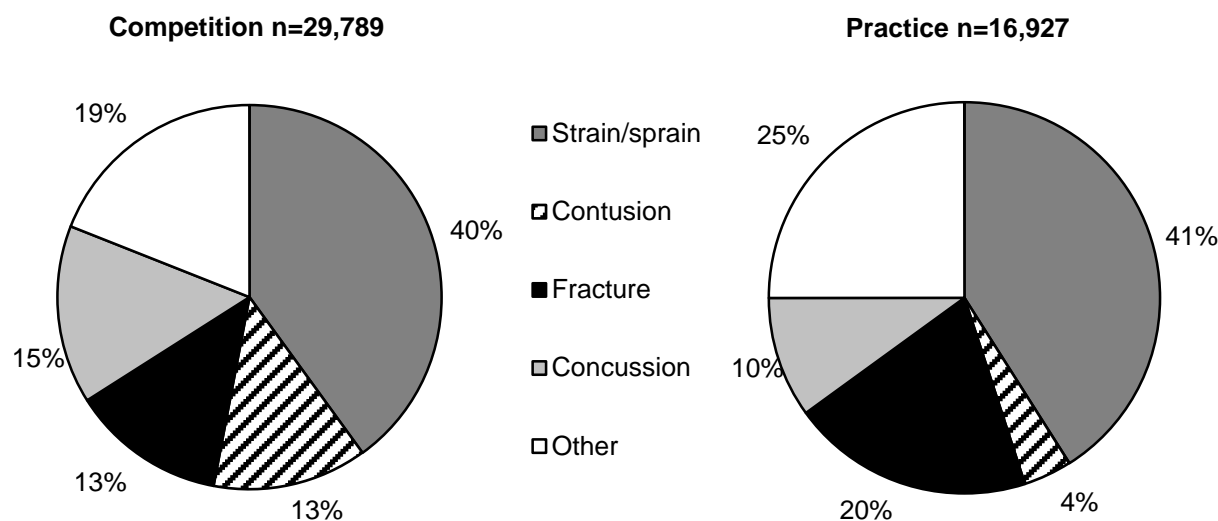


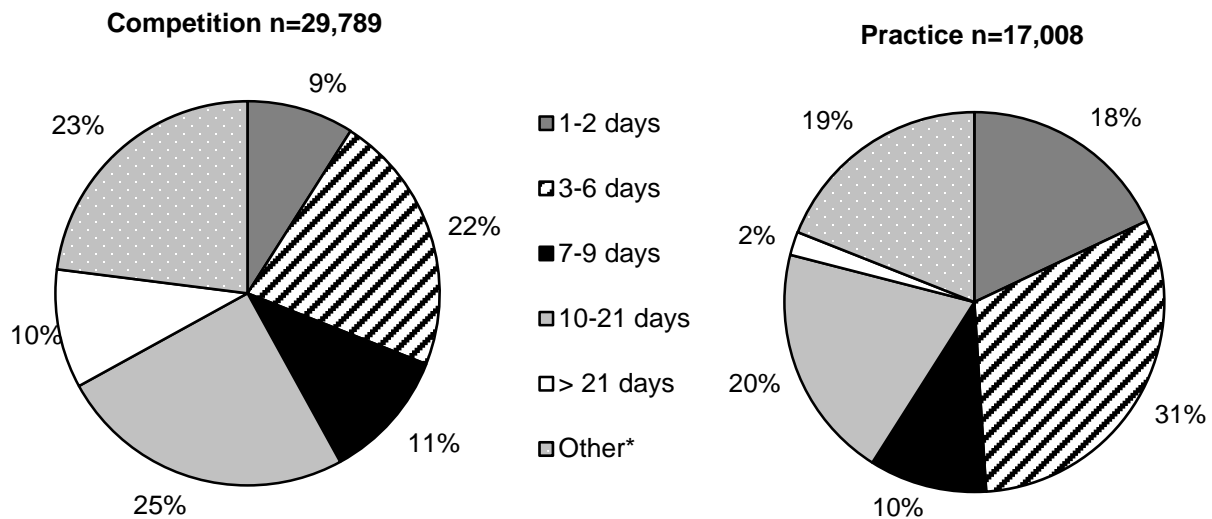
Table 10.3 Body Site of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	5,940	19.9%	5,669	33.3%	11,609	24.8%
Shoulder	6,802	22.8%	1,460	8.6%	8,262	17.7%
Hip/thigh/upper leg	4,669	15.7%	1,266	7.4%	5,935	12.7%
Arm/elbow	2,010	6.7%	3,520	20.7%	5,531	11.8%
Hand/wrist	3,223	10.8%	1,058	6.2%	4,282	9.2%
Ankle	2,479	8.3%	1,421	8.4%	3,900	8.3%
Knee	1,731	5.8%	1,671	9.8%	3,402	7.3%
Trunk	1,283	4.3%	400	2.3%	1,682	3.6%
Lower leg	534	1.8%	80	0.5%	614	1.3%
Neck	-	0.0%	271	1.6%	271	0.6%
Foot	191	0.7%	-	0.0%	191	0.4%
Other	926	3.1%	191	1.1%	1,117	2.4%
Total	29,789	100%	17,008	100%	46,796	100%

Table 10.4 Ten Most Common Baseball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Diagnosis	Competition n=29,791		Practice n=16,929		Total n=46,719	
	n	%	n	%	n	%
Head/face concussion	4,527	15.2%	1,737	10.3%	6,264	13.4%
Hip/thigh/upper leg strain/sprain	3,336	11.2%	1,266	7.5%	4,602	9.8%
Arm/elbow strain/sprain	1,469	4.9%	2,642	15.6%	4,111	8.8%
Ankle strain/sprain	2,208	7.4%	1,421	8.4%	3,629	7.8%
Shoulder strain/sprain	2,092	7.0%	400	2.4%	2,492	5.3%
Knee other	398	1.3%	1,137	6.7%	1,536	3.3%
Hand/wrist fracture	1,285	4.3%	271	1.6%	1,507	3.2%
Knee strain/sprain	933	3.1%	534	3.2%	1,467	3.1%
Head/face contusion	-	0.0%	534	3.2%	534	1.1%
Lower leg contusion	534	1.8%	-	0.0%	534	1.1%

Figure 10.2 Time Loss of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 10.5 Baseball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,403	8.1%	1,870	11.2%	4,272	9.2%
Did not require surgery	27,386	91.9%	14,867	88.8%	42,253	90.8%
Total	29,789	100%	16,737	100%	46,525	100%

Figure 10.3 History of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

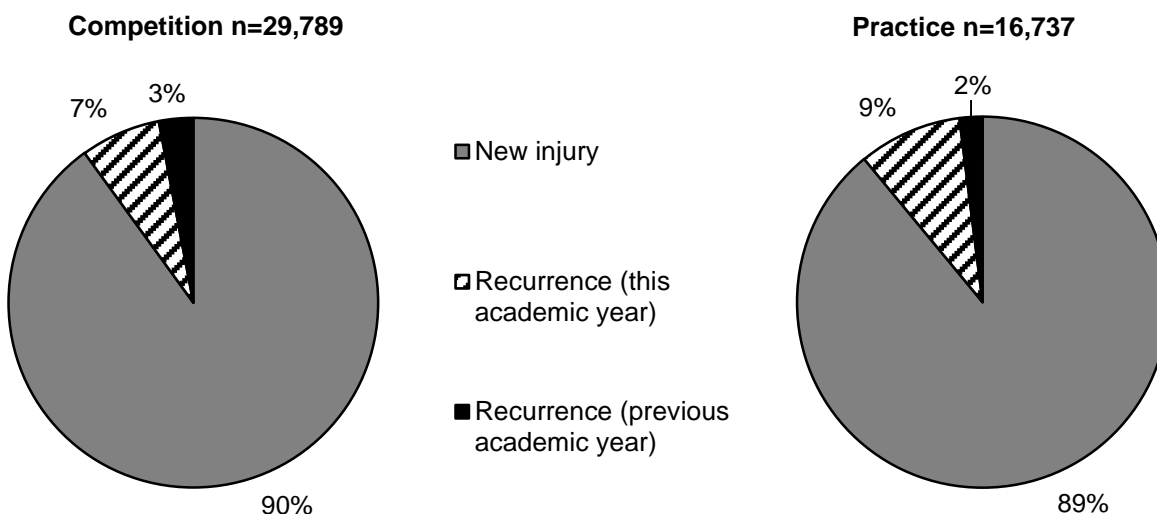


Table 10.6 Time during Season of Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	8,071	17.2%
Regular season	36,460	77.9%
Post season	2,266	4.8%
Total	46,796	100%

Table 10.7 Competition-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,413	4.9%
First inning	2,208	7.7%
Second inning	2,299	8.0%
Third inning	4,574	15.9%
Fourth inning	6,483	22.6%
Fifth inning	5,725	19.9%
Sixth inning	4,540	15.8%
Seventh inning	1,476	5.1%
Total	28,719	100%
Field Location		
Home plate	8,778	30.9%
First base	3,151	11.1%
Second base	3,407	12.0%
Third base	2,962	10.4%
Infield	1,507	5.3%
Pitcher's mound	4,487	15.8%
Outfield	1,882	6.6%
Foul territory	1,199	4.3%
Other	996	3.5%
Total	28,367	100%

Table 10.8 Practice-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	2,044	13.0%
Second 1/2 hour	4,640	29.5%
1-2 hours into practice	5,911	37.6%
>2 hours into practice	3,131	19.9%
Total	15,725	100%

Figure 10.4 Player Position of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

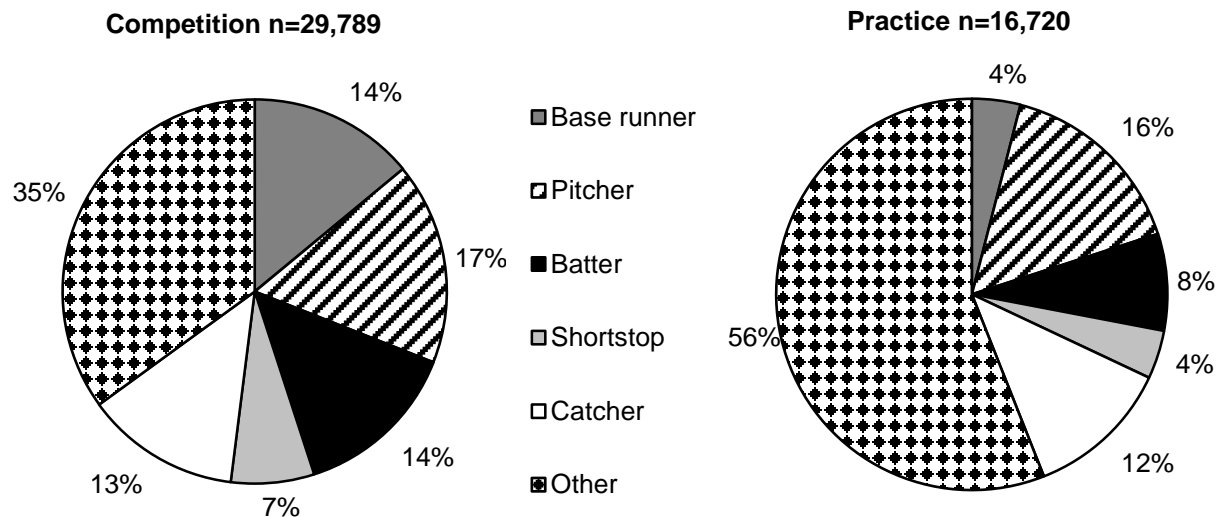
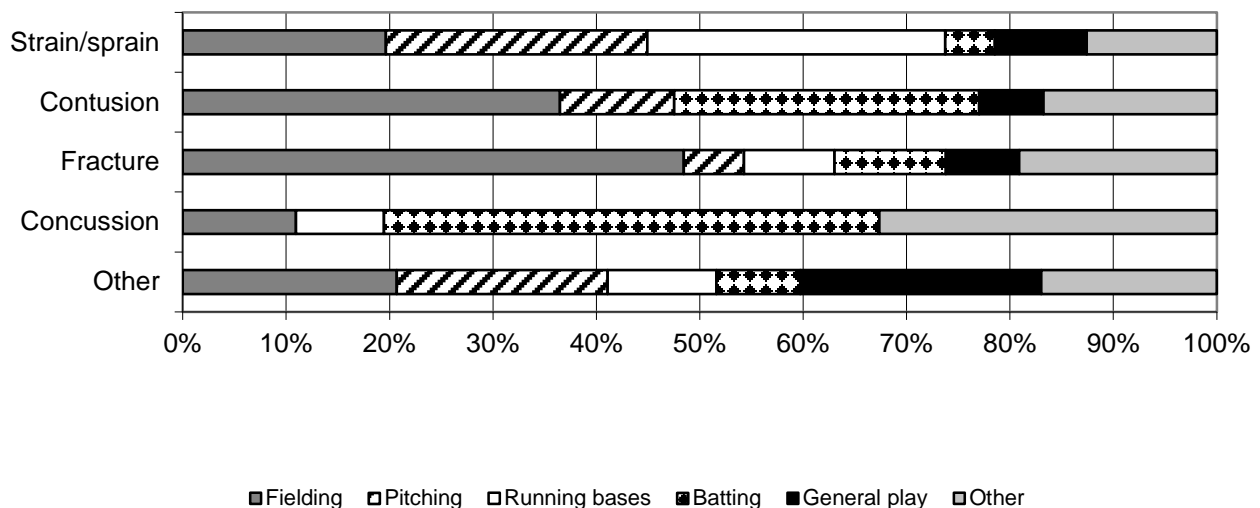


Table 10.9 Activities Leading to Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Fielding a batted ball	3,452	11.6%	4,322	25.5%	7,774	16.6%
Pitching	4,678	15.7%	2,885	17.0%	7,563	16.2%
Running bases	4,159	14.0%	2,047	12.1%	6,207	13.3%
Batting	4,609	15.5%	1,156	6.8%	5,765	12.3%
Sliding	4,826	16.2%	-	0.0%	4,826	10.3%
Catching	3,237	10.9%	1,070	6.3%	4,308	9.2%
Throwing (not pitching)	2,871	9.6%	1,007	5.9%	3,878	8.3%
Fielding a thrown ball	933	3.1%	1,197	7.1%	2,130	4.6%
General play	671	2.3%	802	4.7%	1,473	3.2%
Conditioning	-	0.0%	1,022	6.0%	1,022	2.2%
Other	351	1.2%	1,419	8.4%	1,770	3.8%
Total	29,789	100%	16,927	100%	46,716	100%

Figure 10.5 Activity Resulting in Baseball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year



XI. Softball Injury Epidemiology

Table 11.1 Softball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete- exposures)	Nationally Estimated # Injuries
Total	122	129,861	0.94	52,700
Competition	62	42,887	1.45	26,607
Practice	60	86,974	0.69	26,093

Table 11.2 Demographic Characteristics of Injured Softball Athletes, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year*

Year in School	n=52,191
Freshman	33.5%
Sophomore	26.9%
Junior	20.1%
Senior	19.6%
Total[†]	100%
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	15.7 (1.2)
BMI	
Minimum	16.3
Maximum	45.0
Mean (St. Dev.)	23.7 (5.3)

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

†Throughout this chapter, totals and n's represent the total 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, 2010-11 School Year

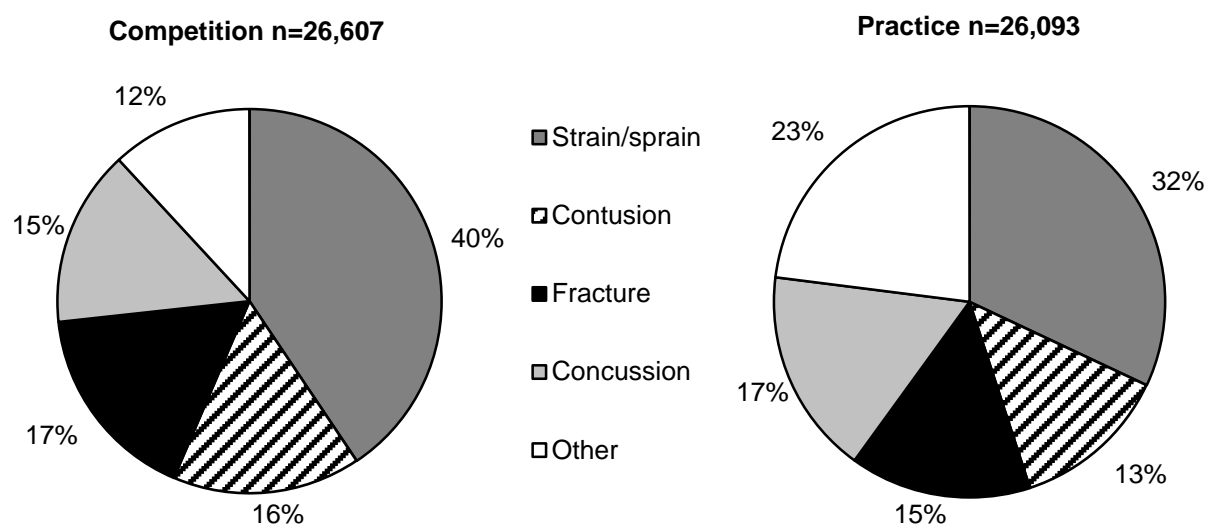


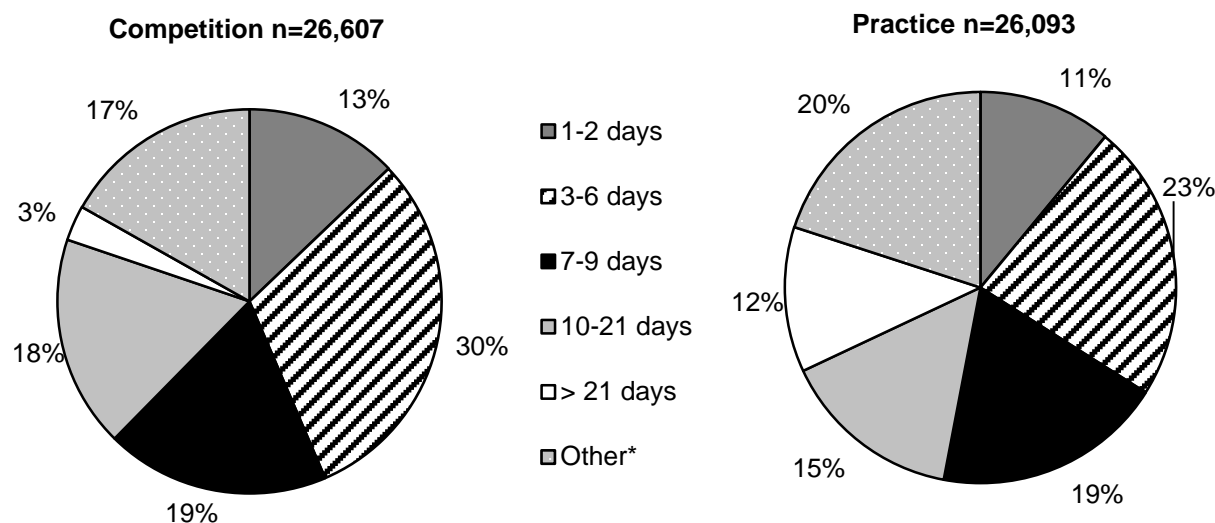
Table 11.3 Body Site of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Hand/wrist	6,828	25.7%	5,846	22.4%	12,675	24.1%
Head/face	4,704	17.7%	6,604	25.3%	11,307	21.5%
Ankle	6,998	26.3%	3,003	11.5%	10,002	19.0%
Arm/elbow	2,099	7.9%	3,213	12.3%	5,312	10.1%
Knee	2,699	10.1%	2,202	8.4%	4,901	9.3%
Lower leg	818	3.1%	1,195	4.6%	2,013	3.8%
Shoulder	1,161	4.4%	837	3.2%	1,998	3.8%
Hip/thigh/upper leg	566	2.1%	888	3.4%	1,455	2.8%
Trunk	-	0.0%	1,383	5.3%	1,383	2.6%
Foot	273	1.0%	921	3.5%	1,195	2.3%
Neck	460	1.7%	-	0.0%	460	0.8%
Total	26,607	100%	26,093	100.0	52,700	100%

Table 11.4 Ten Most Common Softball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Diagnosis	Competition n=26,606		Practice n=26,090		Total n=52,698	
	n	%	n	%	n	%
Head/face concussion	3,972	14.9%	4,489	17.2%	8,462	16.1%
Ankle strain/sprain	6,836	25.7%	1,621	6.2%	8,457	16.0%
Hand/wrist fracture	2,495	9.4%	1,866	7.2%	4,361	8.3%
Knee strain/sprain	2,699	10.1%	921	3.5%	3,620	6.9%
Hand/wrist contusion	2,038	7.7%	921	3.5%	2,959	5.6%
Hand/wrist strain/sprain	756	2.8%	1,842	7.1%	2,598	4.9%
Trunk strain/sprain	-	0.0%	1,383	5.3%	1,383	2.6%
Arm/elbow strain/sprain	214	0.8%	921	3.5%	1,135	2.2%
Hip/thigh/upper leg strain/sprain	352	1.3%	428	1.6%	780	1.5%
Shoulder strain/sprain	81	0.3%	214	0.8%	295	0.6%

Figure 11.2 Time Loss of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 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 11.5 Softball Injuries Requiring Surgery by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,168	8.1%	3,715	8.7%	4,288	8.4%
Did not require surgery	24,439	91.9%	22,378	91.3%	46,817	91.6%
Total	26,607	100%	26,093	100%	51,105	100%

Figure 11.3 History of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

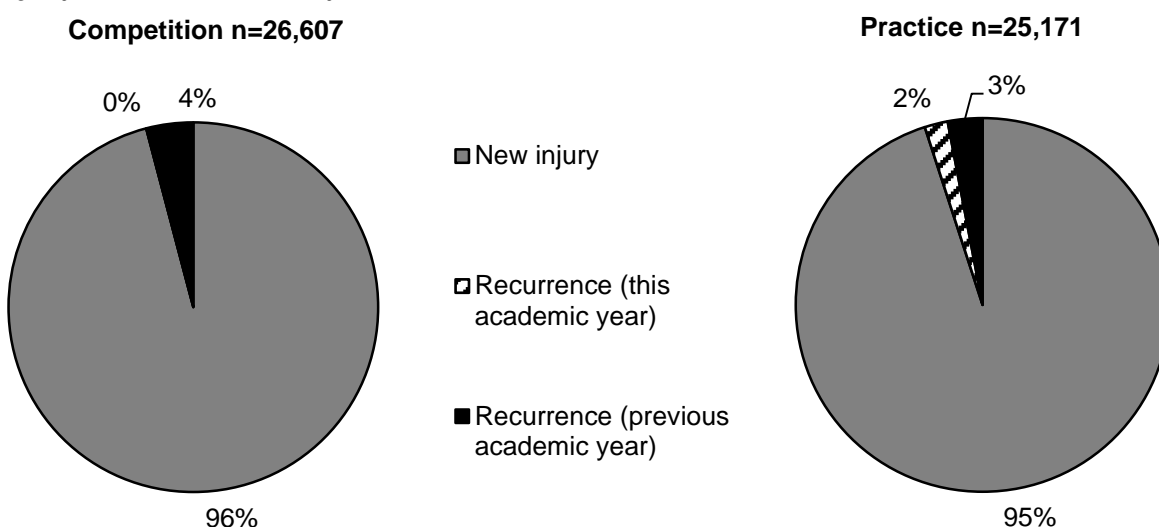


Table 11.6 Time during Season of Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Season		
Preseason	15,853	31.2%
Regular season	32,484	63.9%
Post season	2,521	5.0%
Total	50,857	100%

Table 11.7 Competition-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Competition		
Pre-competition/warm-ups	1,758	6.9%
First inning	652	2.5%
Second inning	1,575	6.2%
Third inning	5,663	22.1%
Fourth inning	7,485	29.3%
Fifth inning	3,793	14.8%
Sixth inning	2,818	11.0%
Seventh inning	815	3.2%
Extra innings	1,019	4.0%
Total	25,579	100%
Field Location		
Home plate	7,599	29.8%
First base	4,865	19.1%
Second base	2,043	8.0%
Third base	4,082	16.0%
Infield	485	1.9%
Pitcher's mound	780	3.1%
Outfield	3,964	15.5%
Foul territory	214	0.8%
Other	1,492	5.8%
Total	25,523	100%

Table 11.8 Practice-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	n	%
Time in Practice		
First 1/2 hour	4,306	16.8%
Second 1/2 hour	4,656	18.2%
1-2 hours into practice	15,475	60.4%
>2 hours into practice	1,195	4.7%
Total	25,632	100%

Figure 11.4 Player Position of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

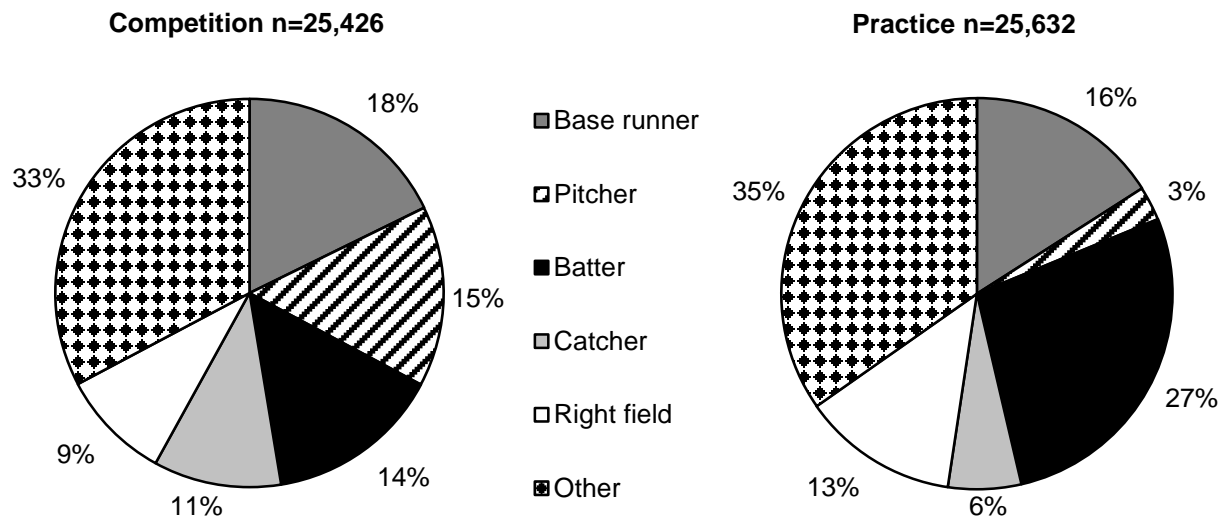
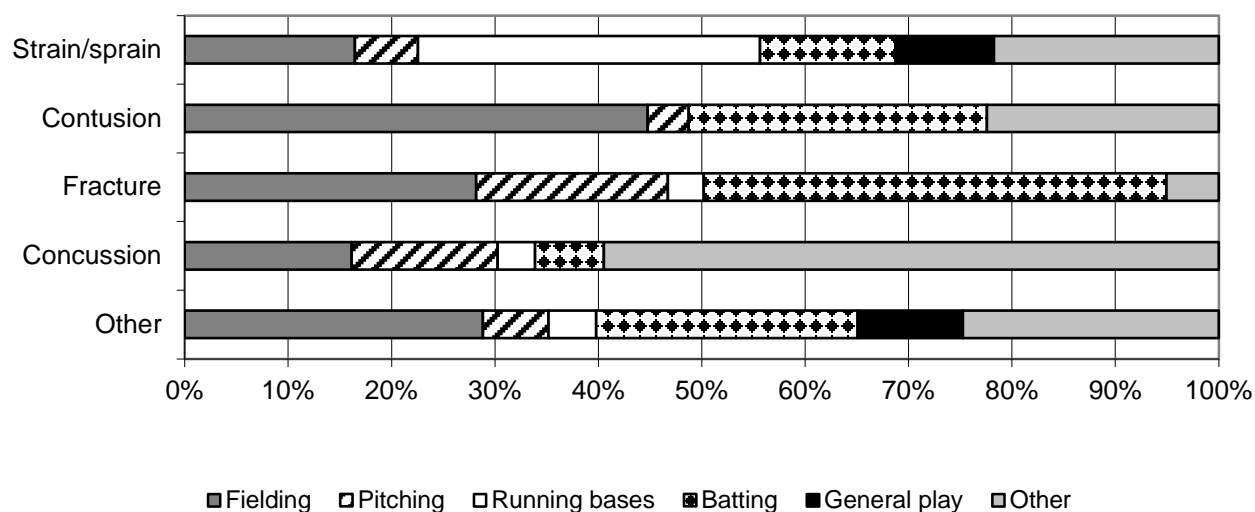


Table 11.9 Activities Leading to Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

Activity	Competition		Practice		Overall	
	n	%	n	%	n	%
Running bases	6,629	24.9%	3,063	11.7%	9,692	18.4%
Fielding a batted ball	4,417	16.6%	3,849	14.8%	8,266	15.7%
Fielding a thrown ball	3,135	11.8%	3,136	12.0%	6,271	11.9%
Catching	2,517	9.5%	2,162	8.3%	4,679	8.9%
Batting	2,904	10.9%	1,544	5.9%	4,448	8.4%
Sliding	3,924	14.7%	214	0.8%	4,138	7.9%
Throwing (not pitching)	652	2.4%	3,007	11.5%	3,659	6.9%
Pitching	1,075	4.0%	2,033	7.8%	3,109	5.9%
Conditioning	-	0.0%	2,603	10.0%	2,603	4.9%
General play	-	0.0%	2,368	9.1%	2,368	4.5%
Other	1,355	5.1%	2,114	8.1%	3,468	6.6%
Total	26,607	100%	26,093	100%	52,700	100%

Figure 11.5 Activity Resulting in Softball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2010-11 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, 2010-11 School Year

	Boys' soccer	Girls' soccer*	RR (95% CI) [†]
Total	1.56	1.93	1.24 (1.05-1.47)
Competition	3.08	4.13	1.34 (1.08-1.66)
Practice	0.90	0.93	1.03 (0.78-1.36)

*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, 2010-11 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Body Site			
Hip/thigh/upper leg	11.7%	14.6%	1.25 (0.69-2.24)
Head/face	25.8%	22.2%	1.16 (0.78-1.73)
Ankle	17.6%	28.5%	1.63 (1.07-2.47)
Knee	17.4%	14.7%	1.19 (0.71-1.99)
Hand/wrist	5.4%	0.8%	6.56 (2.25-19.09)
Foot	6.5%	5.9%	1.10 (0.48-2.49)
Lower leg	6.4%	9.6%	1.51 (0.65-3.49)
Trunk	4.8%	1.2%	4.11 (1.37-12.31)
Arm/elbow	0.3%	1.0%	3.74 (0.41-34.11)
Shoulder	1.7%	1.0%	1.76 (0.26-11.81)
Neck	0.7%	-	---
Other	1.9%	0.5%	3.68 (0.57-23.58)
Total	100%	100%	---

Table 12.3 Comparison of Diagnoses of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Strain/sprain	48.3%	50.9%	1.06 (0.84-1.33)
Contusion	9.1%	8.0%	1.13 (0.55-2.32)
Fracture	6.6%	8.4%	1.26 (0.59-2.69)
Concussion	19.5%	20.4%	1.05 (0.67-1.65)
Other	16.6%	12.2%	1.36 (0.76-2.42)
Total	100%	100%	---

Table 12.4 Most Common Boys' and Girls' Soccer Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	16.9%	24.9%	1.48 (0.95-2.30)
Head/face concussion	19.5%	20.4%	1.05 (0.67-1.65)
Hip/thigh/upper leg strain/sprain	10.4%	12.3%	1.18 (0.62-2.26)
Knee strain/sprain	10.1%	8.5%	1.18 (0.59-2.37)
Knee other	7.1%	4.3%	1.66 (0.67-4.14)

*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, 2010-11 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Time Loss			
1-2 days	16.5%	14.4%	1.15 (0.65-2.01)
3-6 days	30.2%	24.1%	1.25 (0.86-1.84)
7-9 days	18.1%	16.4%	1.10 (0.68-1.78)
10-21 days	15.9%	18.7%	1.18 (0.72-1.93)
22 days or more	4.7%	4.6%	1.03 (0.41-2.55)
Other	14.6%	21.8%	1.49 (0.93-2.39)
Total	100%	100%	---

Table 12.6 Comparison of Mechanisms of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Mechanism			
Contact with another player	30.4%	28.7%	1.06 (0.75-1.50)
Stepped on/fell on/kicked	11.3%	8.8%	1.28 (0.66-2.48)
Rotation around a planted foot/inversion	12.2%	18.5%	1.51 (0.88-2.61)
Overuse, heat illness, conditioning, etc.	15.6%	17.2%	1.10 (0.65-1.85)
Contact with ball	8.6%	9.7%	1.13 (0.57-2.26)
Uneven playing surface	2.1%	2.2%	1.09 (0.27-4.42)
Slide tackle	6.4%	4.7%	1.35 (0.56-3.23)
Contact with goal	-	0.8%	---
Other	13.4%	9.3%	1.44 (0.82-2.87)
Total	100%	100%	---

Table 12.7 Comparison of Activities of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Activity			
General play	24.4%	14.1%	1.74 (1.06-2.83)
Defending	10.4%	21.2%	2.04 (1.20-3.49)
Chasing loose ball	12.2%	9.8%	1.25 (0.67-2.30)
Ball handling/dribbling	5.6%	15.9%	2.86 (1.39-5.86)
Goaltending	8.5%	4.0%	2.12 (0.95-4.74)
Shooting (foot)	4.5%	8.8%	1.95 (0.84-4.55)
Heading ball	12.4%	3.8%	3.21 (1.36-7.57)
Passing (foot)	5.4%	5.4%	1.01 (0.41-2.49)
Receiving pass	5.9%	3.9%	1.52 (0.58-3.96)
Conditioning	3.4%	7.9%	2.32 (0.83-6.48)
Other	7.4%	5.2%	1.42 (0.64-2.31)
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, 2010-11 School Year

	Boys' basketball	Girls' basketball	RR (95% CI)*
Total	1.35	1.73	1.28 (1.09-1.51)
Competition	2.39	3.59	1.51 (1.21-1.87)
Practice	0.91	0.92	1.02 (0.79-1.31)

Table 12.9 Comparison of Body Sites of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Body Site			
Ankle	31.2%	24.5%	1.28 (0.93-1.75)
Knee	10.1%	20.4%	2.02 (1.22-3.37)
Head/face	23.8%	24.4%	1.02 (0.73-1.44)
Hip/thigh/upper leg	5.9%	3.7%	1.61 (0.66-3.93)
Hand/wrist	9.1%	10.3%	1.14 (0.64-2.04)
Shoulder	2.0%	3.1%	1.51 (0.46-5.02)
Trunk	6.0%	6.0%	1.00 (0.46-2.18)
Lower leg	3.3%	2.7%	1.20 (0.44-3.24)
Arm/elbow	1.4%	1.7%	1.19 (0.24-5.87)
Foot	7.0%	2.7%	2.59 (0.96-6.98)
Neck	-	0.6%	---
Other	0.2%	-	---
Total	100%	100%	---

Table 12.10 Comparison of Diagnoses of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Strain/sprain	52.7%	49.6%	1.06 (0.88-1.29)
Contusion	8.5%	4.5%	1.88 (0.91-3.89)
Fracture	11.5%	6.3%	1.83 (0.97-3.47)
Concussion	14.1%	22.8%	1.61 (1.06-2.45)
Other	13.1%	16.8%	1.29 (0.80-2.06)
Total	100%	100%	---

Table 12.11 Most Common Boys' and Girls' Basketball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	29.9%	24.2%	1.24 (0.90-1.70)
Head/face concussion	14.0%	22.2%	1.59 (1.04-2.42)
Knee strain/sprain	4.3%	10.1%	2.33 (1.08-5.05)
Knee other	2.5%	8.5%	3.39 (1.18-9.75)

*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, 2010-11 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Time Loss			
1-2 days	15.2%	9.4%	1.62 (0.95-2.76)
3-6 days	26.5%	23.4%	1.13 (0.81-1.59)
7-9 days	20.6%	18.5%	1.11 (0.75-1.65)
10-21 days	18.1%	24.1%	1.33 (0.91-1.94)
22 days or more	5.6%	8.4%	1.52 (0.74-3.12)
Other	14.1%	16.2%	1.15 (0.73-1.82)
Total	100%	100%	---

Table 12.13 Comparison of Mechanisms of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Mechanism			
Collision with another player	33.6%	37.0%	1.10 (0.84-1.44)
Jumping/landing	22.3%	16.1%	1.39 (0.93-2.08)
Overuse, heat illness, conditioning, etc.	9.4%	11.4%	1.21 (0.68-2.14)
Rotation around a planted foot/inversion	10.7%	11.0%	1.02 (0.60-1.76)
Stepped on/fell on/kicked	10.4%	7.3%	1.41 (0.73-2.74)
Contact with ball	3.2%	5.5%	1.71 (0.67-4.34)
Other	10.4%	11.7%	1.13 (0.65-1.96)
Total	100%	100%	---

Table 12.14 Comparison of Activities of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Activity			
Rebounding	24.1%	16.2%	1.49 (1.00-2.22)
General play	12.2%	24.3%	2.00 (1.30-3.08)
Defending	17.9%	18.7%	1.04 (0.69-1.58)
Chasing loose ball	10.2%	11.2%	1.11 (0.63-1.93)
Shooting	13.1%	11.1%	1.18 (0.67-2.05)
Conditioning	4.2%	4.0%	1.06 (0.43-2.63)
Ball handling/dribbling	6.9%	5.3%	1.31 (0.94-1.03)
Receiving pass	4.2%	3.9%	1.07 (0.44-2.63)
Other	7.2%	5.3%	1.36 (0.60-3.12)
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, 2010-11 School Year

	Baseball	Softball	RR (95% CI)
Total	0.81	0.94	1.16 (0.91-1.48)
Competition	1.49	1.45	1.03 (0.74-1.44)
Practice	0.46	0.69	1.50 (1.03-2.18)

Table 12.16 Comparison of Body Sites of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Baseball	Softball	IPR (95% CI)
Body Site			
Ankle	8.3%	19.0%	2.28 (1.04-5.00)
Knee	7.3%	9.3%	1.28 (0.50-3.30)
Head/face	24.8%	21.5%	1.15 (0.68-1.98)
Hip/thigh/upper leg	12.7%	2.8%	4.60 (1.66-12.74)
Hand/wrist	9.2%	24.1%	2.63 (1.27-5.46)
Shoulder	17.7%	3.8%	4.66 (1.78-12.20)
Trunk	3.6%	2.6%	1.37 (0.28-6.67)
Lower leg	1.3%	3.8%	2.91 (0.40-21.43)
Arm/elbow	11.8%	10.1%	1.17 (0.52-2.63)
Foot	0.4%	2.3%	5.56 (0.45-68.00)
Neck	0.6%	0.9%	1.51 (0.10-24.02)
Other	2.4%	-	---
Total	100%	100%	---

Table 12.17 Comparison of Diagnoses of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Strain/sprain	40.4%	36.4%	1.11 (0.77-1.60)
Contusion	9.6%	14.3%	1.48 (0.64-3.43)
Fracture	15.3%	15.9%	1.04 (0.54-2.01)
Concussion	13.4%	16.1%	1.20 (0.58-2.48)
Other	21.2%	17.3%	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, 2010-11 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	7.8%	16.0%	2.07 (0.89-4.79)
Hand/wrist fracture	3.2%	8.3%	2.57 (0.68-9.68)
Head/face concussion	13.4%	16.1%	1.20 (0.58-2.49)
Hip/thigh/upper leg strain/sprain	9.8%	1.5%	6.64 (2.00-22.04)
Knee strain/sprain	3.1%	6.9%	2.19 (0.54-8.82)

*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, 2010-11 School Year

	Baseball	Softball	IPR (95% CI)
Time Loss			
1-2 days	12.4%	12.1%	1.02 (0.47-2.23)
3-6 days	25.2%	26.9%	1.02 (0.86-1.22)
7-9 days	10.6%	18.9%	1.78 (0.88-3.63)
10-21 days	23.1%	16.5%	1.09 (0.94-1.26)
22 days or more	7.2%	7.1%	1.01 (0.36-2.85)
Other	21.5%	18.5%	1.16 (0.67-2.03)
Total	100%	100%	---

Table 12.20 Comparison of Mechanisms of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Mechanism			
Overuse, heat illness, conditioning, etc.	10.9%	7.8%	1.39 (0.62-3.13)
Contact with another player	9.0%	6.1%	1.47 (0.49-4.36)
Contact with bases	9.1%	12.3%	1.35 (0.58-3.14)
Throwing - not pitching	6.1%	4.6%	1.32 (0.40-4.31)
Throwing - pitching	12.8%	3.3%	3.94 (1.31-11.83)
Contact with thrown ball (non-pitch)	5.3%	12.2%	2.28 (0.88-5.94)
Rotation around a planted foot/inversion	3.6%	12.6%	3.46 (1.11-10.79)
Hit by batted ball	17.0%	13.9%	1.23 (0.60-2.51)
Hit by pitch	8.2%	4.9%	1.68 (0.52-5.41)
Other	18.0%	22.4%	1.25 (0.70-2.21)
Total	100%	100%	---

Table 12.21 Comparison of Activities of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2010-11 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Activity			
Fielding a batted ball	16.6%	15.7%	1.06 (0.55-2.06)
Fielding a thrown ball	4.6%	11.9%	2.61 (0.92-7.40)
Running bases	13.3%	18.4%	1.38 (0.71-2.71)
Pitching	16.2%	5.9%	2.75 (1.20-6.26)
Batting	12.3%	8.4%	1.46 (0.57-3.77)
Sliding	10.3%	7.9%	1.32 (0.55-3.13)
Throwing (not pitching)	8.3%	6.9%	1.20 (0.46-3.14)
General play	3.2%	4.5%	1.43 (0.32-6.33)
Conditioning	2.2%	4.9%	2.26 (0.43-11.89)
Catching	9.2%	8.9%	1.04 (0.42-2.57)
Other	3.8%	6.6%	1.74 (0.51-5.98)
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, 2005-11 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	p-value for trend*
Overall total	2.51	2.59	2.31	2.01	2.10	1.97	.012
Competition	4.63	4.88	4.45	4.05	4.19	4.10	.040
Practice	1.69	1.75	1.52	1.26	1.32	1.16	.007
Boys' football total	4.36	4.45	4.18	3.50	3.81	3.50	.023
Competition	12.09	13.50	12.80	11.26	12.95	12.30	.781
Practice	2.54	2.68	2.47	1.92	2.06	1.74	.014
Boys' soccer total	2.43	2.27	1.75	1.62	1.75	1.56	.017
Competition	4.22	4.31	3.63	3.43	3.39	3.08	.004
Practice	1.58	1.45	0.96	0.87	1.04	0.90	.041
Girls' soccer total	2.36	2.51	2.35	2.07	2.00	1.93	.013
Competition	5.21	5.43	5.15	4.59	4.67	4.13	.012
Practice	1.10	1.31	1.16	1.00	0.85	0.93	.075
Girls' volleyball total	1.64	1.37	1.22	0.89	0.99	0.96	.014
Competition	1.92	1.40	1.43	0.90	1.00	1.18	.062
Practice	1.48	1.36	1.12	0.88	0.99	0.85	.007
Boys' basketball total	1.89	1.75	1.39	1.35	1.45	1.34	.034
Competition	2.98	2.87	2.23	2.32	2.72	2.30	.193
Practice	1.46	1.28	1.04	0.95	0.92	0.91	.008
Girls' basketball total	2.01	2.09	1.61	1.54	1.58	1.73	.135
Competition	3.60	3.60	3.30	3.13	2.84	3.59	.400
Practice	1.37	1.44	0.90	0.87	1.02	0.92	.087
Boys' wrestling total	2.50	2.51	2.27	2.17	1.98	2.01	.003
Competition	3.93	3.80	3.70	3.35	3.09	3.32	.013
Practice	2.04	2.06	1.76	1.75	1.56	1.55	.004
Boys' baseball total	1.19	1.25	0.93	0.78	0.82	0.81	.026
Competition	1.77	2.01	1.37	1.32	1.27	1.49	.144
Practice	0.87	0.82	0.68	0.48	0.57	0.46	.008
Girls' softball total	1.13	1.11	1.29	1.04	1.12	0.94	.267
Competition	1.78	1.96	1.86	1.62	1.66	1.45	.048
Practice	0.79	0.65	0.98	0.72	0.85	0.69	.894

*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, 2005-11 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Overall total	1,442,533	1,472,849	1,419,723	1,248,126	1,359,897	1,195,815
Competition	759,334	766,512	763,034	690,525	754,091	711,642
Practice	683,199	706,337	656,689	557,601	605,805	484,173
Boys' football total	516,150	574,367	616,665	527,321	581,414	483,016
Competition	280,919	292,316	311,780	288,637	322,801	296,199
Practice	235,231	282,051	304,885	238,684	258,614	186,817
Boys' soccer total	218,760	171,874	159,351	149,229	153,485	138,974
Competition	119,703	93,295	99,785	87,082	83,985	81,238
Practice	99,058	78,579	59,566	62,147	69,500	57,736
Girls' soccer total	185,770	230,769	215,850	192,108	181,159	180,254
Competition	122,803	149,231	146,102	123,312	129,754	124,674
Practice	62,967	81,538	69,748	68,796	51,405	55,580
Girls' volleyball total	81,813	80,493	72,261	56,609	67,760	50,711
Competition	32,677	27,423	26,539	19,764	21,728	21,416
Practice	49,136	53,069	45,722	36,845	46,032	29,295
Boys' basketball total	100,058	96,670	82,612	79,230	85,063	79,762
Competition	44,826	46,109	36,766	40,152	46,787	41,252
Practice	55,232	50,561	45,846	39,078	38,276	38,510
Girls' basketball total	103,566	102,831	73,283	64,933	78,709	83,033
Competition	53,812	53,703	45,236	38,277	44,026	53,931
Practice	49,753	49,128	28,047	26,656	34,684	29,102
Boys' wrestling total	105,542	101,139	91,625	88,996	80,390	80,569
Competition	36,259	38,750	40,698	39,029	37,742	36,536
Practice	69,283	62,389	50,927	49,967	42,647	44,033
Boys' baseball total	67,560	60,296	44,760	39,869	64,053	46,796
Competition	33,639	33,494	22,803	25,584	36,502	29,789
Practice	33,922	26,802	21,957	14,285	27,551	17,008
Girls' softball total	63,313	54,411	63,316	49,831	67,862	52,700
Competition	34,696	32,191	33,325	28,688	30,767	26,607
Practice	28,618	22,220	29,991	21,143	37,096	26,093

Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005-11 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	2010-11 n=1,194,319
Body Site						
Ankle	22.7%	19.8%	18.5%	16.4%	17.5%	17.7%
Knee	14.2%	16.6%	14.6%	14.8%	15.7%	14.2%
Head/face	12.3%	12.4%	12.4%	15.3%	17.2%	23.3%
Hip/thigh/upper leg	10.8%	10.5%	10.2%	10.3%	9.2%	8.3%
Shoulder	7.9%	8.0%	10.1%	9.3%	8.4%	7.0%
Hand/wrist	8.0%	7.5%	9.1%	8.5%	10.3%	8.9%
Trunk	6.2%	6.7%	6.5%	6.6%	5.8%	4.7%
Lower leg	4.6%	5.2%	5.7%	5.8%	4.7%	5.0%
Arm/elbow	4.1%	3.9%	4.6%	4.1%	4.0%	3.1%
Foot	4.0%	4.0%	4.2%	5.0%	4.1%	4.0%
Neck	2.2%	1.9%	1.8%	1.9%	1.9%	1.8%
Other	3.2%	3.6%	2.4%	2.1%	1.2%	2.1%
Total	100%	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, 2005-11 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	2010-11 n=1,191,484
Diagnosis						
Strain/sprain	52.0%	48.2%	48.3%	45.7%	44.7%	43.2%
Contusion	12.2%	13.7%	12.4%	11.5%	14.0%	9.6%
Fracture	9.8%	8.9%	10.2%	10.9%	9.9%	10.2%
Concussion	9.1%	8.4%	9.2%	11.8%	14.0%	20.0%
Other	16.8%	20.9%	19.9%	20.2%	17.5%	17.0%
Total	100%	100%	100%	100%	100%	100%

Table 13.5 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2005-11 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	2010-11 n=1,189,985
Diagnosis						
Ankle strain/sprain	20.6%	17.8%	17.3%	15.0%	16.0%	16.3%
Head/face concussion	9.0%	8.4%	9.2%	11.7%	13.9%	20.0%
Knee strain/sprain	7.6%	8.8%	7.8%	7.9%	8.0%	7.7%
Hip/thigh/upper leg strain/sprain	7.9%	7.7%	7.3%	7.7%	6.5%	6.4%
Knee other	4.3%	4.9%	4.7%	4.5%	5.2%	4.8%
Shoulder other	3.1%	3.7%	4.1%	4.0%	3.3%	3.7%
Hand/wrist fracture	3.2%	3.3%	4.0%	4.0%	4.2%	4.0%
Shoulder strain/sprain	3.4%	2.9%	3.4%	3.7%	3.3%	2.2%
Trunk strain/sprain	2.8%	2.7%	3.2%	2.8%	2.5%	2.4%
Hand/wrist strain/sprain	3.1%	2.5%	3.8%	2.9%	2.8%	2.8%

Table 13.6 Time Loss of Injuries by Year, High School Sports-Related Injury Surveillance Study, US, 2005-11 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	2010-11 n=1,195,815
Time Loss						
1-2 days	22.5%	26.6%	22.8%	13.7%	14.7%	12.8%
3-6 days	30.0%	28.5%	28.8%	28.5%	27.3%	25.2%
7-9 days	15.3%	14.7%	15.8%	17.7%	16.1%	16.7%
10-21 days	14.9%	14.1%	16.7%	19.7%	16.9%	19.2%
≥22 days	17.2%	16.1%	15.9%	20.3%	25.0%	26.1%
Total	100%	100%	100%	100%	100%	100%

Table 13.7 Injuries Requiring Surgery by Year, High School Sports-Related Injury Surveillance Study, US, 2005-11 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	2010-11 n=1,169,423
Need for surgery						
Required surgery	5.3%	6.4%	6.1%	6.7%	8.0%	8.2%
Did not require surgery	94.7%	93.6%	93.9%	93.3%	92.0%	91.8%
Total	100%	100%	100%	100%	100%	100%

IX. Reporter Demographics & Compliance

During the 2010-11 school year, 105 ATs were invited to participate in the study at the beginning of the school year. ATs were expected to report for every week in which they were enrolled. For example, an AT who joined the study as a replacement school in week 10 was not expected to report for weeks 1-9. Overall, 92 enrolled ATs reported an average of 41 study weeks. The majority of ATs (84.8%) reported all the weeks during which they were enrolled, with only 5 ATs (5.4%) missing over 10 weeks. Internal validity checks yielded 96.3% sensitivity, 100.0% specificity, a positive predictive value of 100.0%, and a negative predictive value of 99.5%.

Prior to the start of the 2010-11 High School RIO™ study, participating ATs were asked to complete a short demographics survey. Three-quarters (81.5%) of participating high schools were public schools, with the remainder being private. All ATs provided services to athletes of their high school on 5 or more days each week. Nearly 90% (87.0%) of ATs participating during the 2010-11 study year had previously participated in the High School RIO™ study.

An online “End of Season” survey gave all participating ATs (both in the original study as well as in the expanded study (n=176 combined) the opportunity to provide feedback on their experiences with High School RIO™. This survey was completed by 116 ATs (65.9%). Average reporting time burdens were 19 minutes for the weekly exposure report and 9 minutes for the injury report form. Using a 5 point Likert scale, RIO™ was overwhelmingly reported to be either very easy (61.2%) or somewhat easy (33.6%) to use (5 and 4 on the Likert scale, respectively), with ATs being either very satisfied (68.1%) or somewhat satisfied (28.4%) with the study (5 and 4 on the Likert scale, respectively). Suggestions provided by ATs, 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 2011-12 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.