SUMMARY REPORT

NATIONAL HIGH SCHOOL SPORTS-RELATED INJURY SURVEILLANCE STUDY

2015-2016 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 7.8 million in 2014-15. While the health benefits of a physically active lifestyle including participating in sports are undeniable, high school athletes are at risk of sports-related injury because a certain endemic level of injury can be expected among participants of any physical activity. The challenge to injury epidemiologists is to reduce injury rates among high school athletes to the lowest possible level without discouraging adolescents from engaging in this important form of physical activity. This goal can best be accomplished by investigating the etiology of preventable injuries; by developing, implementing, and evaluating protective interventions using such science-based evidence; and by responsibly reporting epidemiologic findings while promoting a physically active lifestyle among adolescents.

1.2 Background and Significance

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

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

Since the 2005-06 school year, Dr. R. Dawn Comstock has conducted the National High School Sports-Related Injury Surveillance System to monitor injuries among US high school athletes participating in boys' football, boys' and girls' soccer, girls' volleyball, boys' and girls' basketball, boys' wrestling, boys' baseball, and girls' softball. This surveillance has been conducted using the time- and cost-efficient RIO™ (Reporting Information Online) surveillance system. Through the generous contributions of the Centers for Disease Control and Prevention (CDC) and the National Federation of State High School Associations (NFHS), the National High School Sports-Related Injury Surveillance System was able to be continued during the 2015-16 school year. Previous study years were funded by the Centers for Disease Control and Prevention (CDC), National Federation of State High School Associations (NFHS), the National Operating Committee on Standards for Athletic Equipment (NOCSAE), the Research Institute at Nationwide Children's Hospital, DonJoy Orthotics, EyeBlack, and The Ohio State University.

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 2015-16 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, dental injury, or exertional heat event 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 ≤ 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 46 weekly exposure reports: one for each week from July 20, 2015 through June 19, 2016. 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 9.4 and SPSS, version 23.0. 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:

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

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:

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

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, 2015-16 School Year*

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Overall total	4,133	1,779,940	2.32	1,393,566
Competition	2,344	494,492	4.74	801,156
Practice	1,789	1,285,448	1.39	592,410
Boys' football total	1,925	471,492	4.08	568,789
Competition	1,084	85,479	12.68	316,308
Practice	841	386,013	2.18	252,481
Boys' soccer total	307	164,487	1.87	174,811
Competition	204	51,660	3.95	111,720
Practice	103	112,827	0.91	63,091
Girls' soccer total	390	150,719	2.59	209,027
Competition	277	46,729	5.93	142,722
Practice	113	103,990	1.09	66,305
Girls' volleyball total	192	162,005	1.19	58,127
Competition	80	52,726	1.52	25,300
Practice	112	109,279	1.02	32,827
Boys' basketball total	322	217,643	1.48	81,240
Competition	184	64,857	2.84	45,596
Practice	138	152,786	0.90	35,644
Girls' basketball total	346	161,651	2.14	99,598
Competition	207	49,598	4.17	56,786
Practice	139	112,053	1.24	42,812
Boys' wrestling total	341	152,716	2.23	91,642
Competition	133	38,791	3.43	38,430
Practice	208	113,925	1.83	53,212
Boys' baseball total	143	170,897	0.84	44,760
Competition	81	59,949	1.35	25,581
Practice	62	110,948	0.56	19,179
Girls' softball total	167	128,330	1.30	65,572
Competition	94	44,703	2.10	38,713
Practice	73	83,627	0.87	26,859

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

Table 2.2 Proportion of Injuries Resulting in Time Loss, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	≥1 days time loss	<1 day time loss	Time loss data missing	Total
Overall	95.6%	0.3%	4.1%	**100%**
Boys' football	96.5%	0.6%	2.9%	**100%**
Boys' soccer	97.1%	0.0%	2.9%	**100%**
Girls' soccer	95.8%	0.0%	4.2%	**100%**
Girls' volleyball	91.7%	0.0%	8.3%	**100%**
Boys' basketball	95.0%	0.5 %	4.5%	**100%**
Girls' basketball	92.8%	0.4%	6.8 %	**100%**
Boys' wrestling	93.3%	0.2%	6.5%	**100%**
Boys' baseball	97.7%	0.0%	2.3%	**100%**
Girls' softball	93.5%	0.0%	6.5%	**100%**

*By study definition, non-time loss injuries were fractures, concussions, dental injuries, and exertional heat events. Because they accounted for <1% of all injuries overall, 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, 2015-16 School Year*

	Male n= 924,686	**Female n= 424,969**
Year in School		
Freshman	22.5%	27.5%
Sophomore	25.5%	27.9%
Junior	22.3%	24.0%
Senior	29.7%	20.6%
Total†	**100.0%**	**100.0%**
Age (years)		
Minimum	12	13
Maximum	19	19
Mean (St. Dev.)	15.9 (1.3)	15.7 (1.3)
BMI		
Minimum	15.2	15.8
Maximum	53.2	42.9
Mean (St. Dev.)	24.7 (4.5)	22.1 (3.2)

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

Figure 2.1 Injury Diagnosis by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

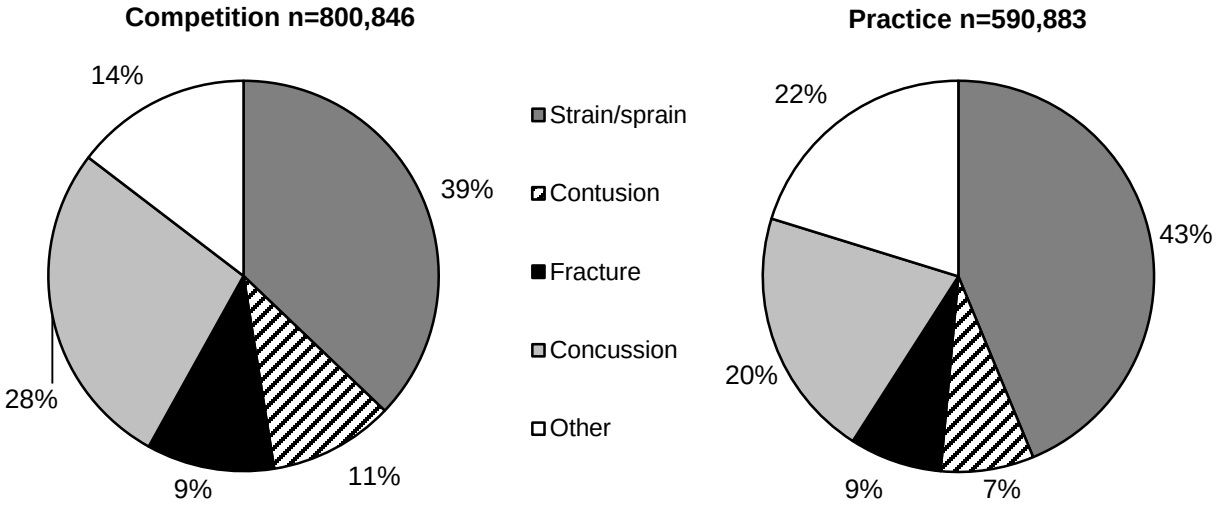


Table 2.4 Body Site of Injury by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Head/face	241,231	30.1%	139,435	23.5%	380,666	27.3%
Ankle	129,164	16.1%	102,071	17.2%	231,235	16.6%
Knee	129,022	16.1%	78,560	13.3%	207,582	14.9%
Hip/thigh/upper leg	49,719	6.2%	61,909	10.5%	111,628	8.0%
Hand/wrist	59,757	7.5%	49,448	8.3%	109,205	7.8%
Shoulder	53,401	6.7%	41,232	7.0%	94,633	6.8%
Lower leg	33,100	4.1%	26,819	4.5%	59,919	4.3%
Trunk	23,411	2.9%	31,791	5.4%	55,202	4.0%
Foot	28,282	3.5%	21,321	3.6%	49,603	3.6%
Arm/elbow	28,590	3.6%	18,404	3.1%	46,994	3.4%
Neck	8,529	1.1%	9,182	1.5%	17,711	1.3%
Other	16,949	2.1%	12,238	2.1%	29,187	2.1%
Total	**801,155**	**100.0%**	**592,410**	**100.0%**	**1,393,565**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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, 2015-16 School Year*

	Male		Female		Total	
	n	% of Ankle Injuries	n	% of Ankle Injuries	n	% of Ankle Injuries
Ankle Ligament Injuries						
Anterior talofibular ligament	103,841	77.2%	71,371	80.0%	175,212	78.3%
Calcaneofibular ligament	34,977	26.0%	30,489	34.2%	65,466	29.3%
Anterior tibiofibular ligament	31,967	23.8%	14,177	15.9%	46,144	20.6%
Posterior talofibular ligament	22,597	16.8%	13,789	15.5%	36,386	16.3%
Deltoid ligament	12,460	9.3%	5,406	6.1%	17,866	8.0%
Posterior tibiofibular ligament	10,877	8.1%	3,532	4.0%	14,076	6.3%
Total Ankle Injuries	**134,577**		**89,192**		**223,769**	

*Multiple ligament responses allowed per injury report. Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 2.6 Most Commonly Injured Knee Structures, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Male		Female		Total	
	n	% of Knee Injuries	n	% of Knee Injuries	n	% of Knee Injuries
Knee Ligament Injuries						
Medial collateral ligament	46,409	35.8%	26,879	36.2%	73,288	36.0%
Patella and/or patellar tendon	27,784	21.5%	18,352	24.7%	46,136	22.6%
Torn cartilage (meniscus)	25,638	19.8%	15,495	20.9%	41,133	20.2%
Anterior cruciate ligament	22,957	17.7%	17,651	23.8%	40,608	19.9%
Lateral collateral ligament	7,247	5.6%	2,497	3.4%	9,744	4.8%
Posterior cruciate ligament	981	0.8%	2,788	3.8%	3,769	1.8%
Total Knee Injuries	**129,476**		**74,277**		**203,753**	

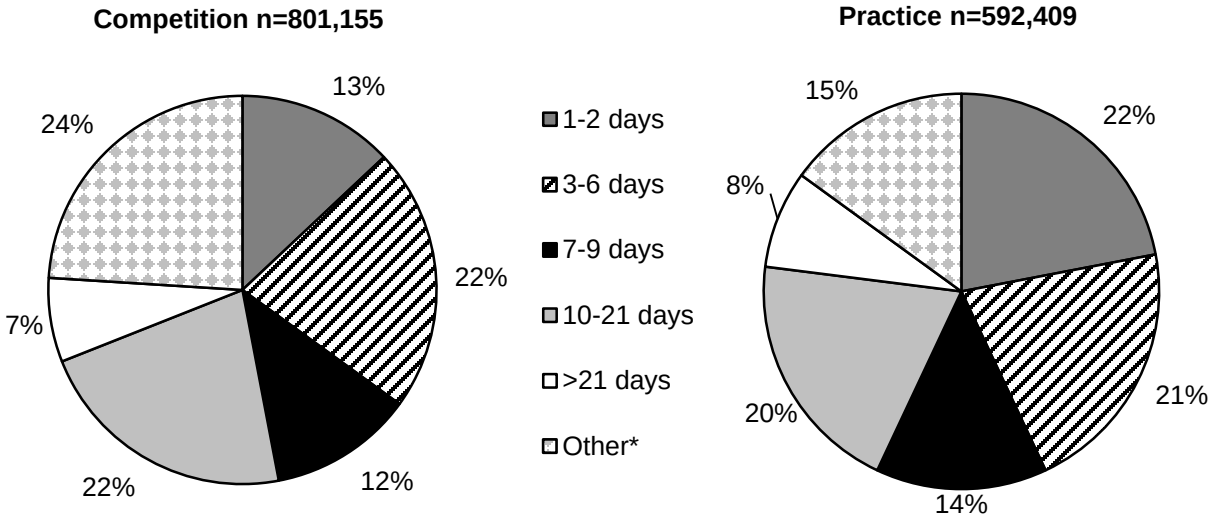
*Multiple ligament responses allowed per injury report. Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 2.7 Ten Most Common Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=800,848		Practice n=590,882		Overall n= 1,391,730	
	N	%	n	%	n	%
Diagnosis						
Head/face concussion	223,841	28.0%	118,656	20.1%	342,497	24.6%
Ankle strain/sprain	124,591	15.6%	93,788	15.9%	218,379	15.7%
Knee strain/sprain	74,107	9.3%	38,849	6.6%	112,956	8.1%
Hip/thigh/upper leg strain/sprain	31,308	3.9%	47,888	8.1%	79,196	5.7%
Knee other	40,296	5.0%	31,968	5.4%	72,264	5.2%
Hand/wrist fracture	26,833	3.4%	22,710	3.8%	49,543	3.6%
Shoulder other	24,582	3.1%	21,068	3.6%	45,650	3.3%
Shoulder strain/sprain	23,925	3.0%	16,961	2.9%	40,886	2.9%
Hand/wrist strain/sprain	17,426	2.2%	17,258	2.9%	34,684	2.5%
Hip/thigh/upper leg contusion	15,992	2.0%	9,081	1.5%	25,073	1.8%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 2.2 Time Loss by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	59,904	7.6%	24,512	4.2%	84,416	6.1%
Did not require surgery	732,044	92.4%	564,272	95.8%	1,296,316	93.9%
Total*	**791,948**	**100.0%**	**588,784**	**100.0%**	**1,380,732**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 2.3 New and Recurring Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

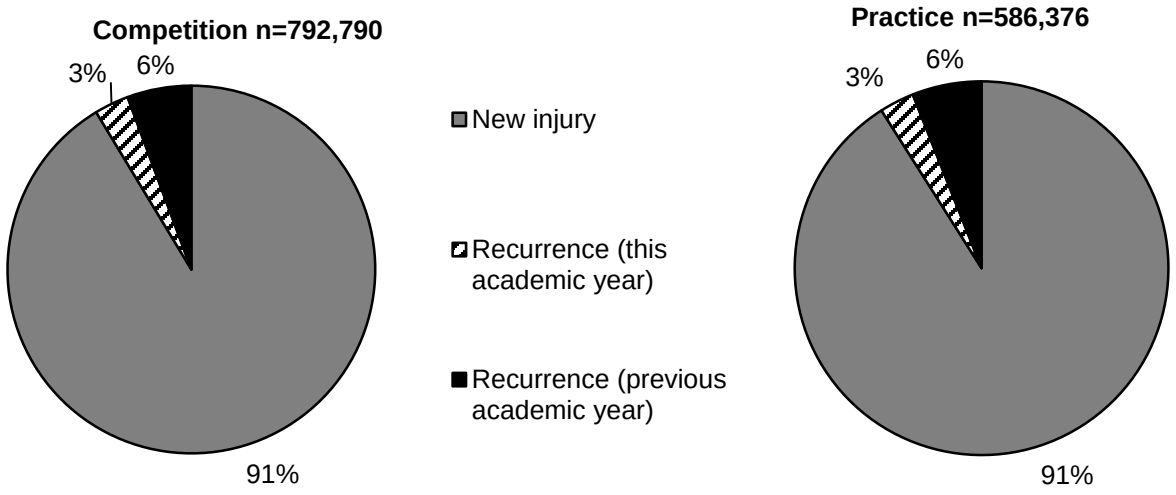


Table 2.9 Time during Season of Injury, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	276,744	19.9%
Regular season	1,055,272	75.9%
Post season	58,162	4.2%
Total	**1,390,178**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 2.10 Practice-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First ½ hour	62,286	11.0%
Second ½ hour	112,916	20.0%
1-2 hours into practice	349,090	61.9%
>2 hours into practice	39,984	7.1%
Total	**564,275**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 2.11 Methods for Injury Evaluation and Assessment, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	n	%
Injuries Evaluated by:*		
Certified athletic trainer	1,307,388	93.8%
Orthopedic physician	274,460	19.7%
General physician	273,580	19.6%
Physician's assistant	11,201	0.8%
Chiropractor	8,998	0.6%
Nurse practitioner	7,985	0.6%
Neurologist/neuropsychologist	7,711	0.6%
Dentist/oral surgeon	620	0.0%
Other	26,041	1.9%
Total	**1,393,566**	
Injuries Assessed by:*		
Evaluation	1,361,058	97.7%
X-ray	439,800	31.6%
MRI	146,511	10.5%
CT-scan	32,580	2.3%
Blood work/lab test	10,430	0.7%
Other	9,285	0.7%
Total	**1,393,566**	

*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, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**1,925**	**471,492**	**4.08**	**568,789**
Competition	1,084	85,479	12.68	316,308
Practice	841	386,013	2.18	252,481

Table 3.2 Demographic Characteristics of Injured Football Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=557,488**
Freshman	23.0%
Sophomore	23.3%
Junior	22.4%
Senior	31.3%
Total†	**100%**
Age (years)	
Minimum	12
Maximum	19
Mean (St. Dev.)	15.9 (1.3)
BMI	
Minimum	15.2
Maximum	53.2
Mean (St. Dev.)	26.0 (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, 2015-16 School Year

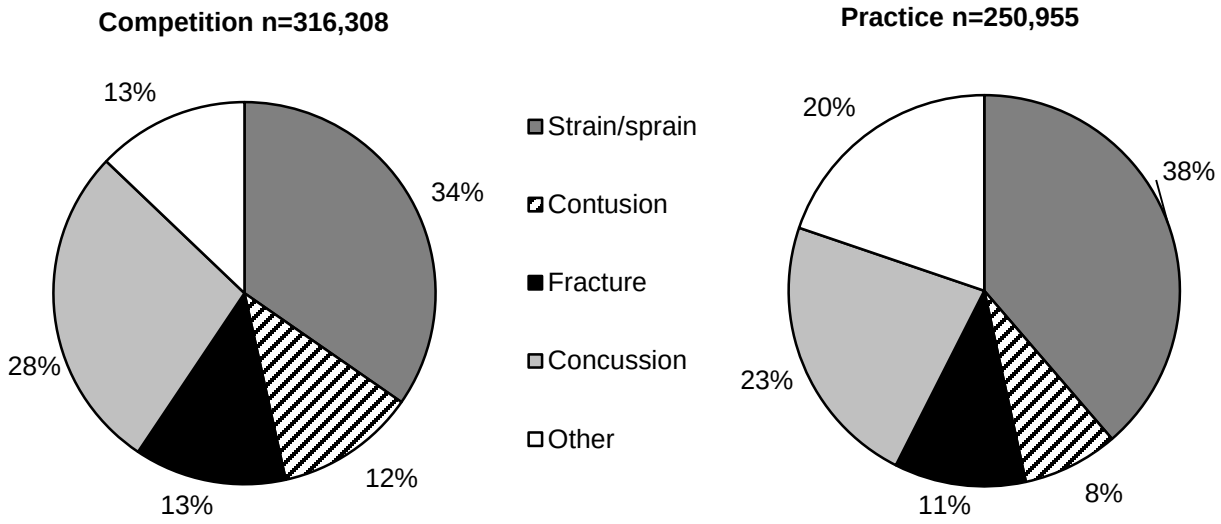


Table 3.3 Body Site of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	89,596	28.3%	60,392	23.9%	149,988	26.4%
Knee	45,530	14.4%	31,950	12.7%	77,480	13.6%
Ankle	36,036	11.4%	29,335	11.6%	65,371	11.5%
Shoulder	33,513	10.6%	23,377	9.3%	56,890	10.0%
Hand/wrist	28,640	9.1%	27,128	10.7%	55,768	9.8%
Hip/thigh/upper leg	19,119	6.0%	24,711	9.8%	43,830	7.7%
Lower leg	15,440	4.9%	13,308	5.3%	28,748	5.1%
Trunk	14,161	4.5%	14,011	5.5%	28,172	5.0%
Arm/elbow	12,824	4.1%	8,970	3.6%	21,794	3.8%
Other	9,101	2.9%	7,328	2.9%	16,429	2.9%
Foot	7,342	2.3%	8,534	3.4%	15,876	2.8%
Neck	5,007	1.6%	3,437	1.4%	8,444	1.5%
Total	**316,309**	**100.0%**	**252,481**	**100.0%**	**568,790**	**100.0%**

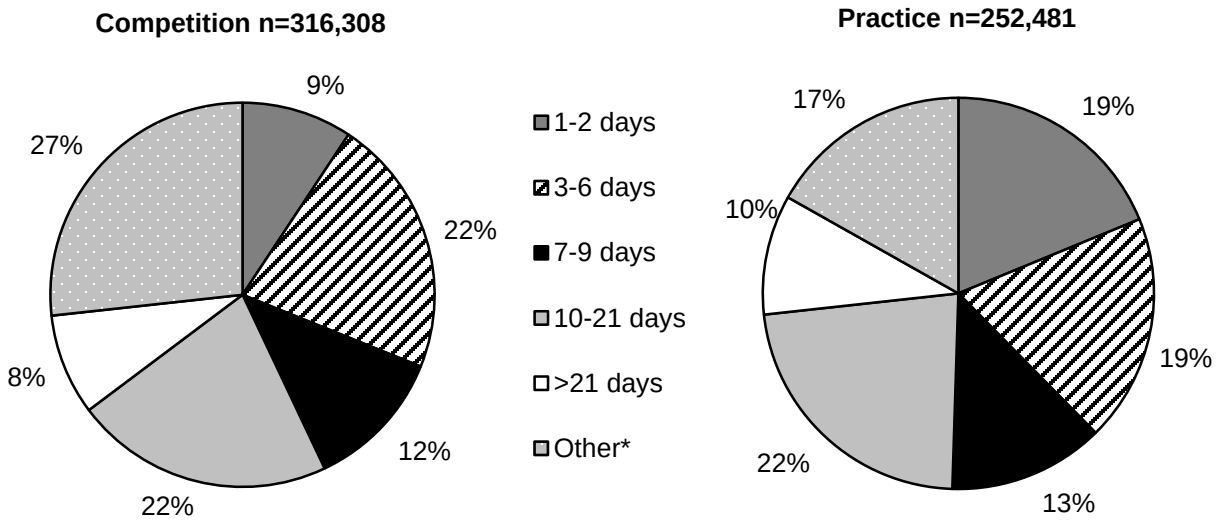
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 3.4 Ten Most Common Football Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=316,304		Practice n=250,953		Total n=567,257	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	87,124	27.5%	57,719	23.0%	144,843	25.5%
Ankle strain/sprain	34,049	10.8%	27,253	10.9%	61,302	10.8%
Knee strain/sprain	29,904	9.5%	18,906	7.5%	48,810	8.6%
Hand/wrist fracture	14,992	4.7%	13,386	5.3%	28,378	5.0%
Shoulder other	16,271	5.1%	11,645	4.6%	27,916	4.9%
Hip/thigh/upper leg strain/sprain	9,050	2.9%	17,245	6.9%	26,295	4.6%
Shoulder strain/sprain	13,295	4.2%	9,743	3.9%	23,038	4.1%
Knee other	9,579	3.0%	10,375	4.1%	19,954	3.5%
Hip/thigh/upper leg contusion	8,928	2.8%	5,496	2.2%	14,424	2.5%
Hand/wrist strain/sprain	7,608	2.4%	6,599	2.6%	14,207	2.5%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 3.2 Time Loss of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	27,411	8.8%	12,489	5.0%	39,900	7.1%
Did not require surgery	284,590	91.2%	238,394	95.0%	522,984	92.9%
Total	**312,001**	**100.0%**	**250,883**	**100.0%**	**562,884**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 3.3 History of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

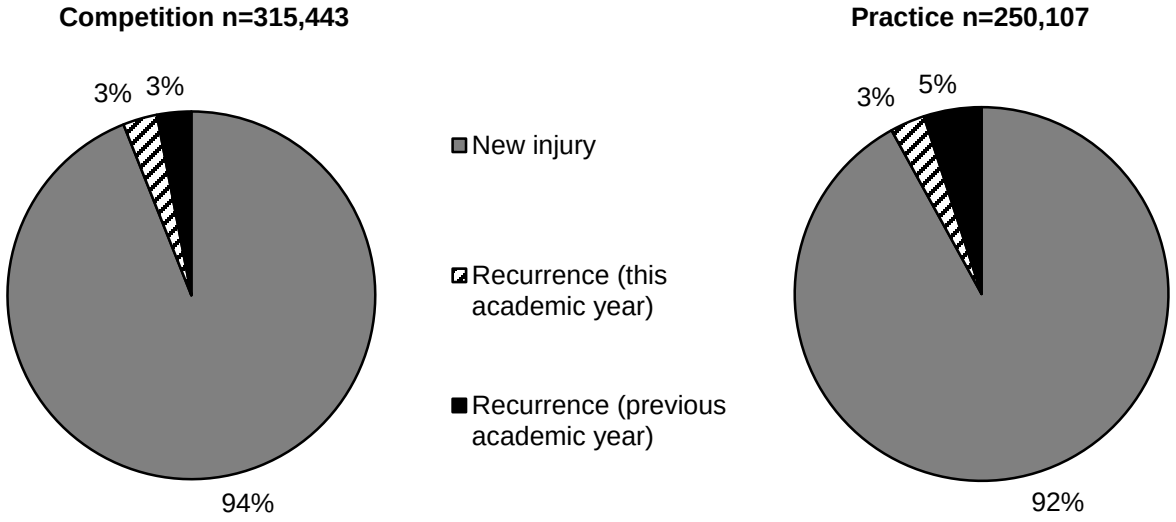


Table 3.6 Time during Season of Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	128,512	22.7%
Regular season	412,456	72.8%
Post season	25,745	4.5%
Total	**566,714**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 3.7 Competition-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	1,166	0.4%
First quarter	37,357	13.5%
Second quarter	79,964	28.9%
Third quarter	98,045	35.4%
Fourth quarter	60,292	21.8%
Overtime	228	0.1%
Total	**277,053**	**100.0%**
Field Location		
Between the 20 yard lines	218,106	81.2%
Red zone (20 yard line to goal line)	43,874	16.3%
End zone	5,127	1.9%
Off the field	1,339	0.5%
Total	**268,446**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 3.8 Practice-Related Variables for Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	27,729	11.5%
Second 1/2 hour	39,437	16.3%
1-2 hours into practice	152,176	62.9%
>2 hours into practice	22,778	9.4%
Total	**242,119**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 3.4 Player Position of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

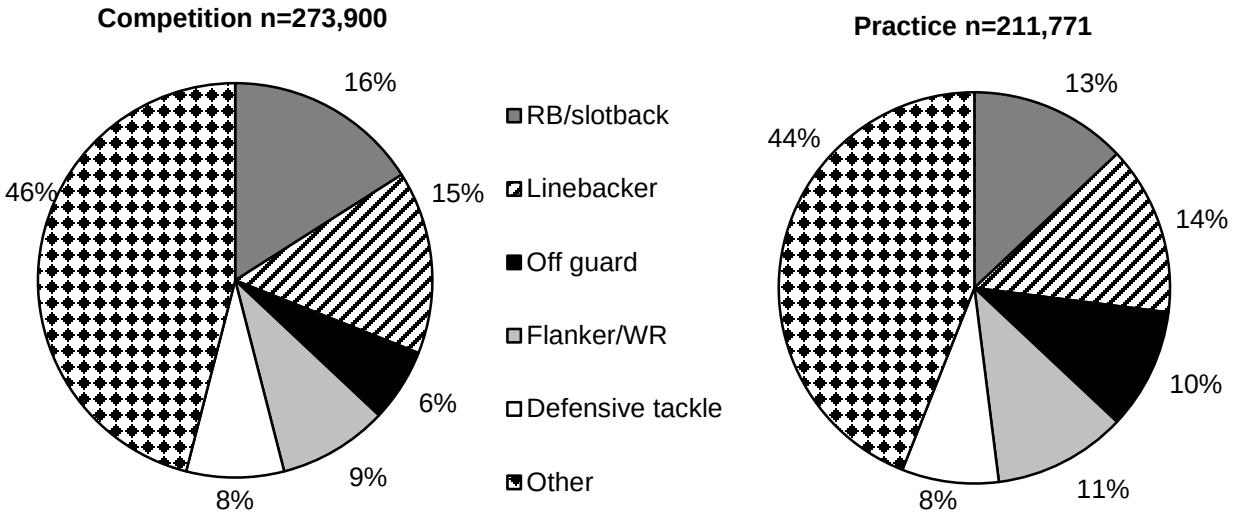


Table 3.9 Activities Leading to Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
being tackled	95,327	33.1%	45,496	20.3%	140,823	27.5%
tackling	72,503	25.2%	41,082	18.3%	113,585	22.2%
blocking	42,949	14.9%	36,896	16.5%	79,845	15.6%
being blocked	21,883	7.6%	21,187	9.4%	43,070	8.4%
n/a (e.g., overuse, heat illness, conditioning, etc.)	5,775	2.0%	28,487	12.7%	34,262	6.7%
other	18,331	6.4%	14,973	6.7%	33,304	6.5%
stepped on/fell on/kicked	18,298	6.4%	12,862	5.7%	31,160	6.1%
rotation around a planted foot/inversion	11,963	4.2%	12,250	5.5%	24,213	4.7%
contact with blocking sled/dummy	0	0.0%	5,242	2.3%	5,242	1.0%
contact with ball	730	0.3%	2,689	1.2%	3,419	0.7%
uneven playing surface	230	0.1%	3,046	1.4%	3,276	0.6%
Total	**287,989**	**100.0%**	**224,210**	**100.0%**	**512,199**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 3.10 Activity Resulting in Football Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Being tackled	45,576	24.4%	17,981	32.5%	18,775	30.3%	45,288	35.0%	13,203	17.1%
Tackling	29,507	15.8%	13,837	25.0%	12,874	20.8%	40,074	31.0%	17,291	22.4%
Blocking	28,319	15.2%	6,775	12.2%	11,940	19.3%	20,288	15.7%	12,020	15.6%
Being blocked	13,954	7.5%	6,089	11.0%	5,811	9.4%	12,125	9.4%	5,092	6.6%
No contact (overuse/illness)	15,467	8.3%	284	0.5%	0	0.0%	502	0.4%	18,010	23.4%
Other	54,029	28.9%	10,437	18.8%	12,598	20.3%	11,096	8.6%	11,430	14.8%
Total	**186,852**	**100%**	**55,403**	**100%**	**61,998**	**100%**	**129,373**	**100%**	**77,046**	**100%**

IV. Boys' Soccer Injury Epidemiology

Table 4.1 Boys' Soccer Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**307**	**164,487**	**1.87**	**174,811**
Competition	204	51,660	3.95	111,720
Practice	103	112,827	0.91	63,091

Table 4.2 Demographic Characteristics of Injured Boys' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n= 170,652**
Freshman	19.6%
Sophomore	25.6%
Junior	25.7%
Senior	29.1%
Total†	**100%**
Age (years)	
Minimum	12
Maximum	18
Mean (St. Dev.)	15.9 (1.3)
BMI	
Minimum	15.5
Maximum	38.0
Mean (St. Dev.)	22.3 (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 4.1 Diagnosis of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

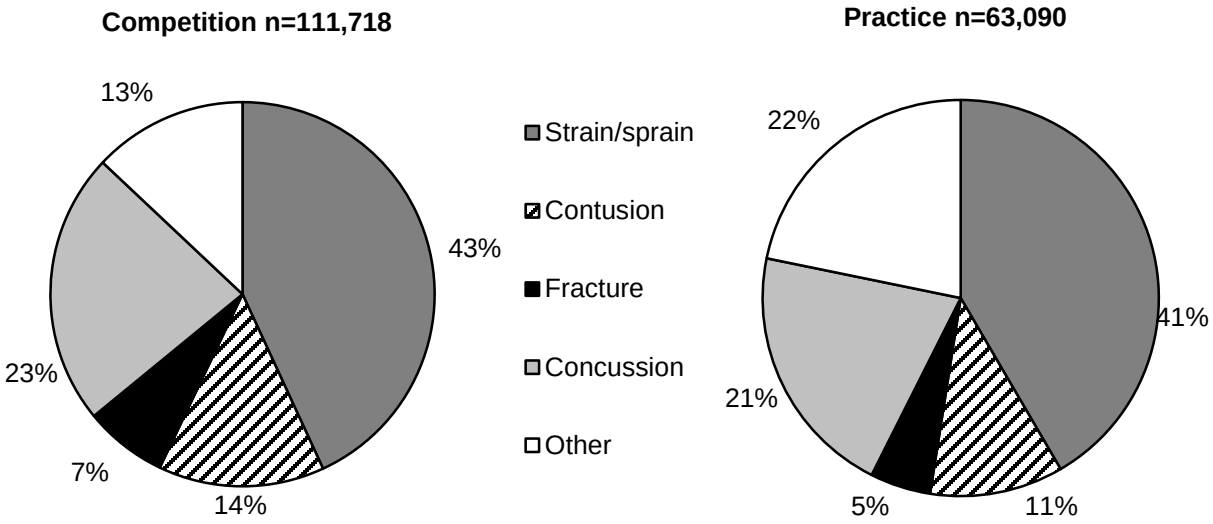


Table 4.3 Body Site of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	29,755	26.6%	19,423	30.8%	49,178	28.1%
Ankle	22,690	20.3%	8,799	13.9%	31,489	18.0%
Knee	17,372	15.5%	8,638	13.7%	26,010	14.9%
Hip/thigh/upper leg	11,471	10.3%	13,512	21.4%	24,983	14.3%
Foot	6,977	6.2%	4,816	7.6%	11,793	6.7%
Lower leg	8,774	7.9%	845	1.3%	9,619	5.5%
Hand/wrist	5,565	5.0%	2,009	3.2%	7,574	4.3%
Trunk	1,778	1.6%	3,864	6.1%	5,642	3.2%
Shoulder	3,218	2.9%	-	0.0%	3,218	1.8%
Other	1,972	1.8%	-	0.0%	1,972	1.1%
Arm/elbow	1,814	1.6%	-	0.0%	1,814	1.0%
Neck	336	0.3%	1,184	1.9%	1,520	0.9%
Total	**111,722**	**100.0%**	**63,090**	**100.0%**	**174,812**	**100.0%**

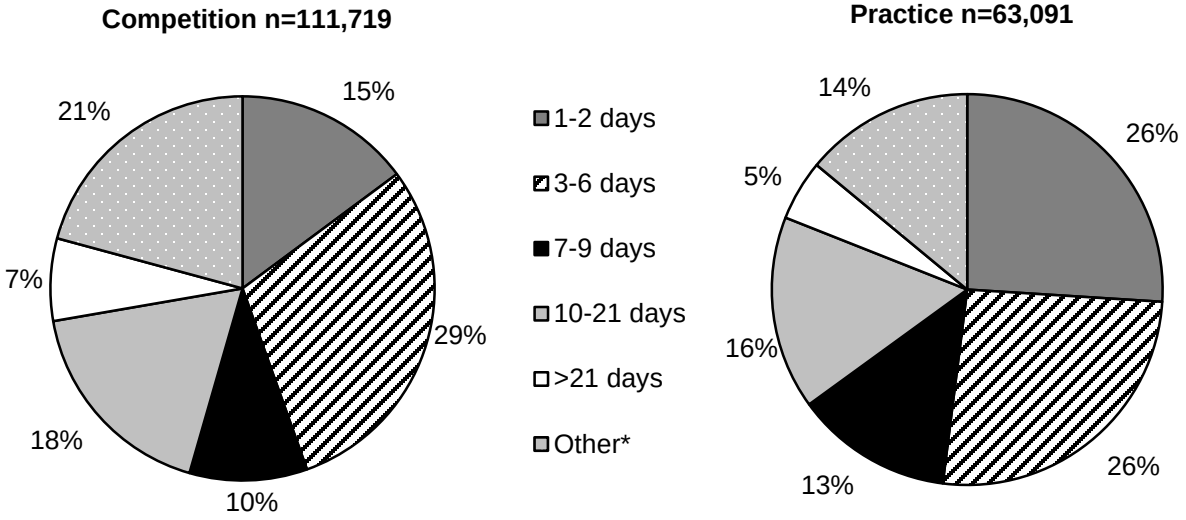
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 4.4 Ten Most Common Boys' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=111,721		Practice n=63,091		Total n=174,812	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	25,287	22.6%	13,322	21.1%	38,609	22.1%
Ankle strain/sprain	22,495	20.1%	8,604	13.6%	31,099	17.8%
Hip/thigh/upper leg strain/sprain	3,025	2.7%	9,926	15.7%	17,564	10.0%
Knee other	6,024	5.4%	4,770	7.6%	10,794	6.2%
Head/face other	3,941	3.5%	3,655	5.8%	7,596	4.3%
Hip/thigh/upper leg contusion	3,025	2.7%	2,957	4.7%	5,982	3.4%
Lower leg contusion	5,306	4.7%	0	0.0%	5,306	3.0%
Foot fracture	1,890	1.7%	2,613	4.1%	4,503	2.6%
Trunk other	738	0.7%	3,077	4.9%	3,815	2.2%
Foot contusion	3,587	3.2%	195	0.3%	3,782	2.2%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 4.2 Time Loss of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	5,302	4.7%	195	0.3%	5,497	3.2%
Did not require surgery	106,418	95.3%	61,517	99.7%	167,935	96.8%
Total	**111,720**	**100%**	**61,712**	**100%**	**173,432**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 4.3 History of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

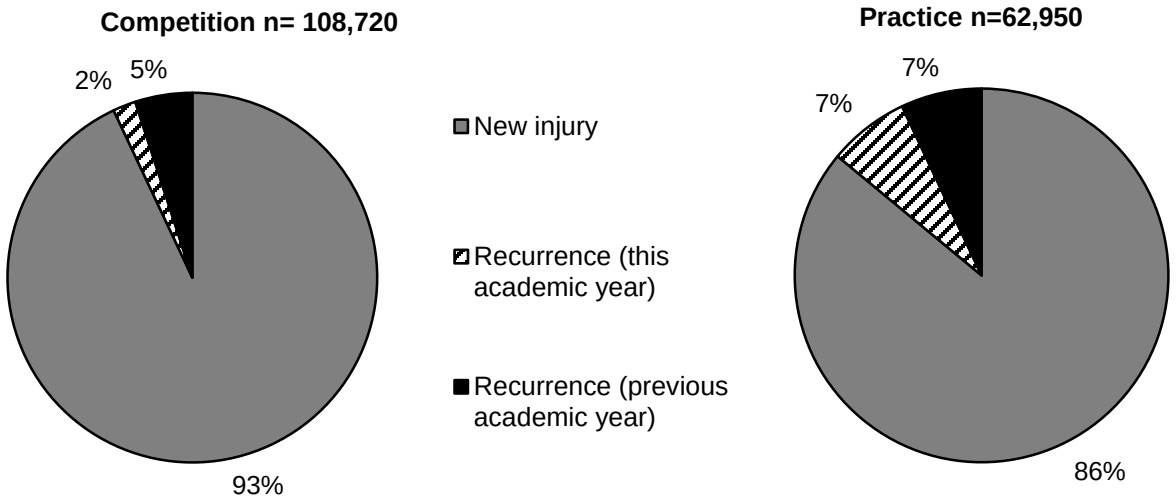


Table 4.6 Time during Season of Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	35,097	20.1%
Regular season	132,750	75.9%
Post season	6,963	4.0%
Total	**174,810**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 4.7 Competition-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	3,639	3.8%
First half	36,816	38.3%
Second half	55,595	57.8%
Overtime	71	0.1%
Total	**96,120**	**100%**
Field Location		
Top of goal box extended to center line (offense)	27,049	28.2%
Top of goal box extended to center line (defense)	22,146	23.1%
Side of goal box (offense)	12,887	13.4%
Goal box (defense)	11,820	12.3%
Goal box (offense)	10,692	11.1%
Side of goal box (defense)	8,735	9.1%
Off the field	2,720	2.8%
Total	**96,049**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 4.8 Practice-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	7,115	12.8%
Second 1/2 hour	13,530	24.3%
1-2 hours into practice	34,191	61.3%
>2 hours into practice	970	1.7%
Total	**55,786**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 4.4 Player Position of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

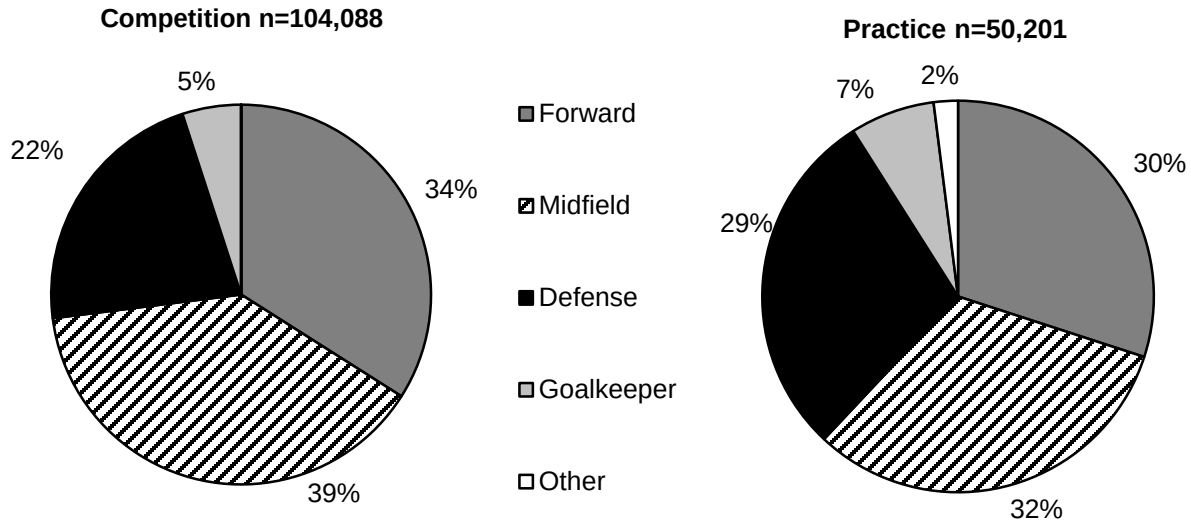


Table 4.9 Activities Leading to Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	27,764	25.7%	23,111	41.7%	50,875	31.2%
Heading ball	10,363	9.6%	11,492	20.7%	21,855	13.4%
Defending	13,936	12.9%	2,766	5.0%	16,702	10.2%
Ball handling/dribbling	13,090	12.1%	2,859	5.2%	15,949	9.8%
Chasing loose ball	10,823	10.0%	1,693	3.1%	12,516	7.7%
Passing (foot)	6,440	6.0%	4,356	7.9%	10,796	6.6%
Receiving pass	9,389	8.7%	650	1.2%	10,039	6.1%
Shooting (foot)	5,912	5.5%	3,657	6.6%	9,569	5.9%
Goaltending	5,568	5.2%	982	1.8%	6,550	4.0%
Receiving a slide tackle	3,036	2.8%	0	0.0%	3,036	1.9%
Blocking shot	195	0.2%	1,570	2.8%	1,765	1.1%
Attempting a slide tackle	1,114	1.0%	473	0.9%	1,587	1.0%
Other	195	0.2%	1,309	2.4%	1,504	0.9%
Conditioning	0	0.0%	509	0.9%	509	0.3%
Total	**107,825**	**100.0%**	**55,427**	**100.0%**	**163,252**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 4.10 Activity Resulting in Boys' Soccer Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
General Play	24,913	35.9%	5,281	25.0%	1,765	16.5%	7,147	19.7%	11,769	45.6%
Chasing loose ball	6,299	9.1%	879	4.2%	1,309	12.2%	1,979	5.5%	2,050	7.9%
Defending	6,846	9.9%	4,820	22.8%	1,040	9.7%	3,416	9.4%	580	2.2%
Shooting	4,524	6.5%	2,117	10.0%	1,114	10.4%	0	0.0%	1,814	7.0%
Heading ball	1,089	1.6%	1,647	7.8%	71	0.7%	15,235	42.1%	3,814	14.8%
Other	25,698	37.0%	6,371	30.2%	5,399	50.5%	8,425	23.3%	5,803	22.5%
Total	**69,369**	**100%**	**21,115**	**100%**	**10,698**	**100%**	**36,202**	**100%**	**25,830**	**100%**

V. Girls' Soccer Injury Epidemiology

Table 5.1 Girls' Soccer Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**390**	**150,719**	**2.59**	**209,027**
Competition	277	46,729	5.93	142,722
Practice	113	103,990	1.09	66,305

Table 5.2 Demographic Characteristics of Injured Girls' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=202,103**
Freshman	28.1%
Sophomore	27.6%
Junior	23.0%
Senior	21.3%
Total†	**100%**
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	15.7 (1.3)
BMI	
Minimum	16.3
Maximum	34.4
Mean (St. Dev.)	21.6 (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 5.1 Diagnosis of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

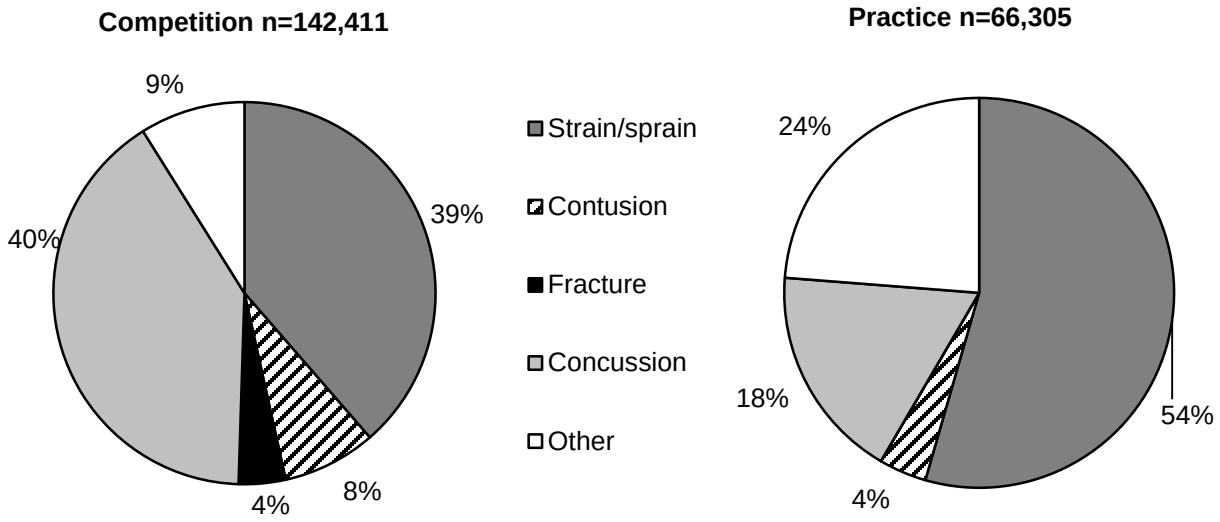


Table 5.3 Body Site of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	59,545	41.7%	11,599	17.5%	71,144	34.0%
Ankle	25,776	18.1%	17,584	26.5%	43,360	20.7%
Knee	28,657	20.1%	12,744	19.2%	41,401	19.8%
Hip/thigh/upper leg	8,856	6.2%	8,645	13.0%	17,501	8.4%
Lower leg	5,409	3.8%	5,487	8.3%	10,896	5.2%
Foot	7,606	5.3%	2,942	4.4%	10,548	5.0%
Hand/wrist	1,900	1.3%	2,038	3.1%	3,938	1.9%
Shoulder	1,278	0.9%	2,125	3.2%	3,403	1.6%
Other	2,101	1.5%	841	1.3%	2,942	1.4%
Trunk	536	0.4%	1,887	2.8%	2,423	1.2%
Arm/elbow	1,059	0.7%	347	0.5%	1,406	0.7%
Neck	-	0.0%	66	0.1%	66	0.0%
Total	**142,723**	**100.0%**	**66,305**	**100.0%**	**209,028**	**100.0%**

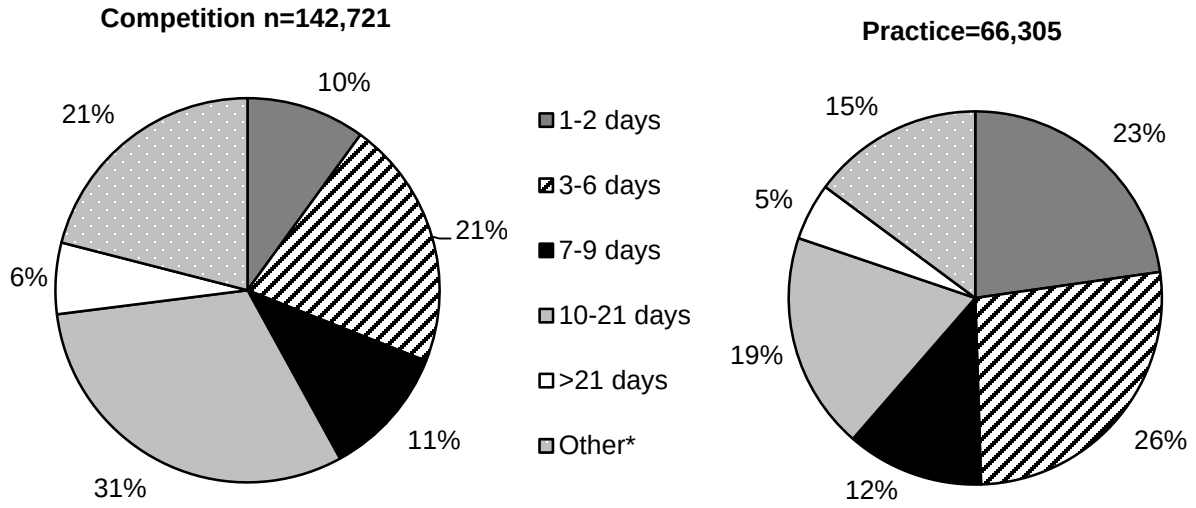
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 5.4 Ten Most Common Girls' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=142,409		Practice n=66,300		Total n=208,709	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	57,693	40.5%	11,599	17.5%	69,292	33.2%
Ankle strain/sprain	25,359	17.8%	14,652	22.1%	40,011	19.2%
Knee strain/sprain	19,992	14.0%	5,883	8.9%	25,875	12.4%
Knee other	7,455	5.2%	6,377	9.6%	13,832	6.6%
Hip/thigh/upper leg strain/sprain	5,267	3.7%	7,989	12.0%	13,256	6.4%
Lower leg other	1,231	0.9%	5,421	8.2%	6,652	3.2%
Foot contusion	3,655	2.6%	0	0.0%	3,655	1.8%
Hip/thigh/upper leg contusion	3,120	2.2%	0	0.0%	3,120	1.5%
Foot strain/sprain	189	0.1%	2,528	3.8%	2,717	1.3%
Foot fracture	2,613	1.8%	66	0.1%	2,679	1.3%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 5.2 Time Loss of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	9,371	6.7%	2,548	3.8%	11,919	5.8%
Did not require surgery	129,981	93.3%	63,757	96.2%	193,738	94.2%
Total	**139,352**	**100%**	**66,305**	**100%**	**205,657**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 5.3 History of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

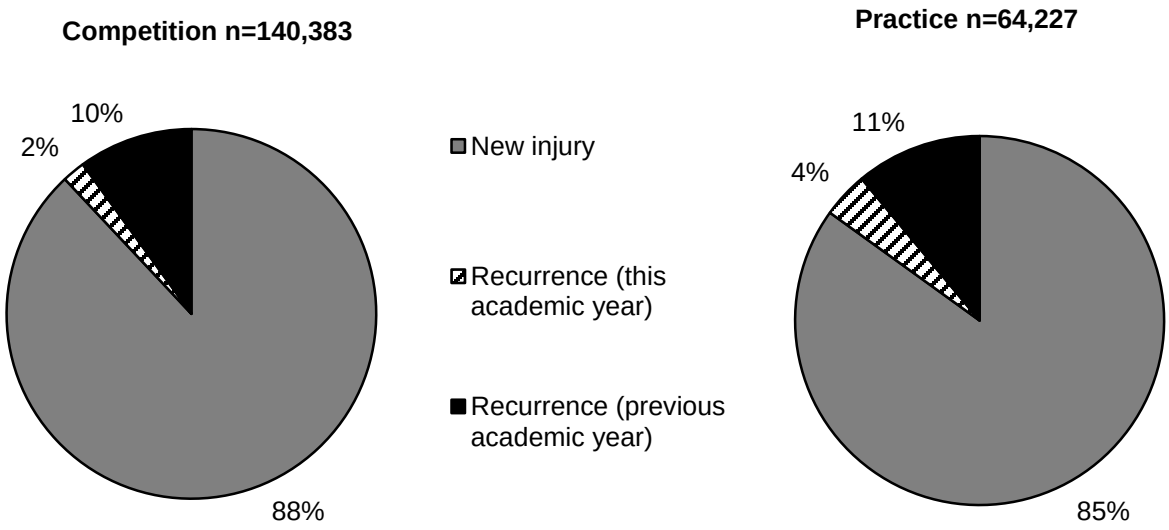


Table 5.6 Time during Season of Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	31,873	15.2%
Regular season	172,426	82.5%
Post season	4,728	2.3%
Total	**209,027**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 5.7 Competition-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	928	0.7%
First half	45,543	34.9%
Second half	82,908	63.5%
Overtime	1,231	0.9%
Total	**130,610**	**100%**
Field Location		
top of goal box extended to center line (offense)	45,437	35.0%
goal box (defense)	20,162	15.5%
top of goal box extended to center line (defense)	18,319	14.1%
goal box (offense)	15,175	11.7%
side of goal box (defense)	13,417	10.3%
side of goal box (offense)	13,094	10.1%
off the field	4,159	3.2%
Total	**129,763**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 5.8 Practice-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	4,569	7.4%
Second 1/2 hour	15,795	25.5%
1-2 hours into practice	39,688	64.1%
>2 hours into practice	1,903	3.1%
Total	**61,955**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 5.4 Player Position of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

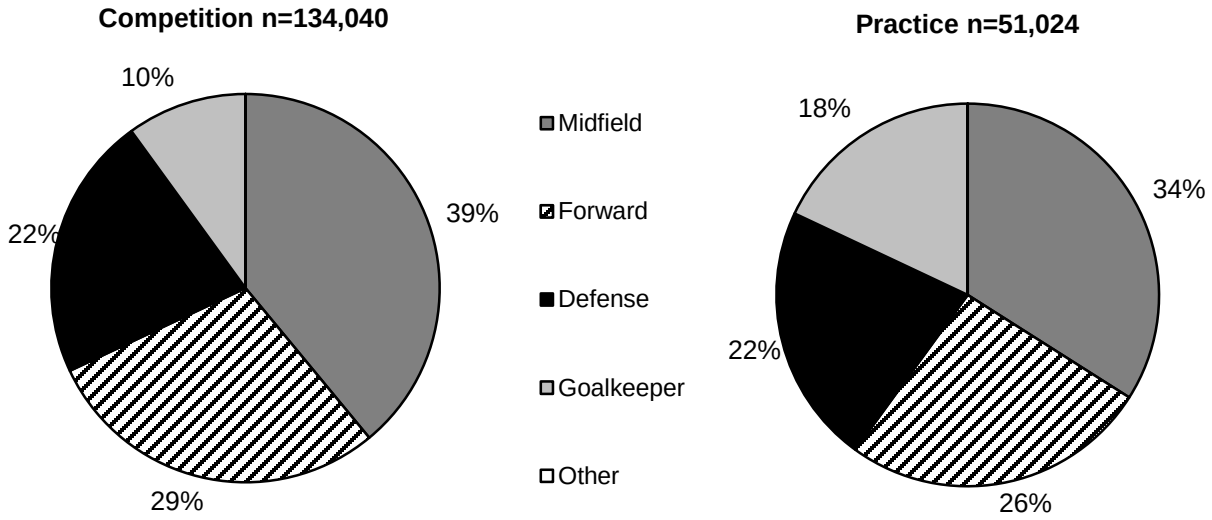


Table 5.9 Activities Leading to Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	31,527	23.3%	18,436	35.7%	49,963	26.7%
Goaltending	10,473	7.7%	8,200	15.9%	18,673	10.0%
Heading ball	15,396	11.4%	2,702	5.2%	18,098	9.7%
Chasing loose ball	12,514	9.3%	4,440	8.6%	16,954	9.1%
Passing (foot)	12,922	9.6%	3,291	6.4%	16,213	8.7%
Ball handling/dribbling	13,342	9.9%	2,287	4.4%	15,629	8.4%
Defending	12,691	9.4%	2,853	5.5%	15,544	8.3%
Receiving pass	8,967	6.6%	1,607	3.1%	10,574	5.7%
Shooting (foot)	6,604	4.9%	1,644	3.2%	8,248	4.4%
Blocking shot	5,630	4.2%	1,512	2.9%	7,142	3.8%
Conditioning	0	0.0%	4,547	8.8%	4,547	2.4%
Other	2,528	1.9%	0	0.0%	2,528	1.4%
Attempting a slide tackle	2,304	1.7%	189	0.4%	2,493	1.3%
Receiving a slide tackle	255	0.2%	0	0.0%	255	0.1%
Total	**135,153**	**100.0%**	**51,708**	**100.0%**	**186,861**	**100.0%**

***** Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 5.10 Activity Resulting in Girls' Soccer Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
General Play	20,143	26.3%	3,625	27.3%	483	8.9%	15,951	24.8%	9,761	36.3%
Defending	6,381	8.3%	606	4.6%	1,006	18.5%	6,607	10.3%	944	3.5%
Heading ball	66	0.1%	561	4.2%	0	0.0%	17,471	27.1%	0	0.0%
Ball handling	8,619	11.3%	3,772	28.4%	590	10.9%	1,688	2.6%	960	3.6%
Chasing loose ball	8,559	11.2%	189	1.4%	1,928	35.5%	2,989	4.6%	3,290	12.2%
Other	32,775	42.8%	4,544	34.2%	1,424	26.2%	19,655	30.5%	11,964	44.4%
Total	**76,543**	**100%**	**13,297**	**100%**	**5,431**	**100%**	**64,361**	**100%**	**26,919**	**100%**

VI. Volleyball Injury Epidemiology

Table 6.1 Volleyball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**192**	**162,005**	**1.19**	**58,127**
Competition	80	52,726	1.52	25,300
Practice	112	109,279	1.02	32,827

Table 6.2 Demographic Characteristics of Injured Volleyball Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=55,005**
Freshman	33.1%
Sophomore	24.5%
Junior	27.7%
Senior	14.7%
Total†	**100%**
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.4 (1.1)
BMI	
Minimum	15.8
Maximum	36.1
Mean (St. Dev.)	22.1 (3.2)

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

Figure 6.1 Diagnosis of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

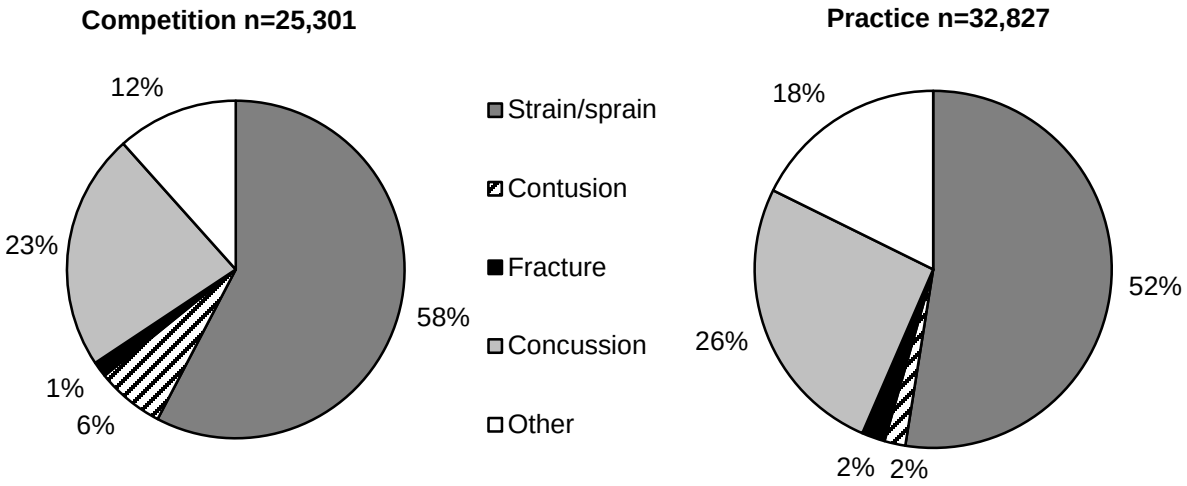


Table 6.3 Body Site of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	5,744	22.7%	9,564	29.1%	15,308	26.3%
Ankle	6,275	24.8%	7,770	23.7%	14,045	24.2%
Hand/wrist	5,923	23.4%	2,082	6.3%	8,005	13.8%
Knee	2,592	10.2%	2,666	8.1%	5,258	9.0%
Trunk	844	3.3%	2,651	8.1%	3,495	6.0%
Hip/thigh/upper leg	636	2.5%	2,663	8.1%	3,299	5.7%
Shoulder	1,266	5.0%	2,024	6.2%	3,290	5.7%
Neck	1,356	5.4%	1,220	3.7%	2,576	4.4%
Foot	354	1.4%	851	2.6%	1,205	2.1%
Lower leg	213	0.8%	884	2.7%	1,097	1.9%
Arm/elbow	98	0.4%	275	0.8%	373	0.6%
Other	0	0.0%	177	0.5%	177	0.3%
Total	**25,301**	**100.0%**	**32,827**	**100.0%**	**58,128**	**100.0%**

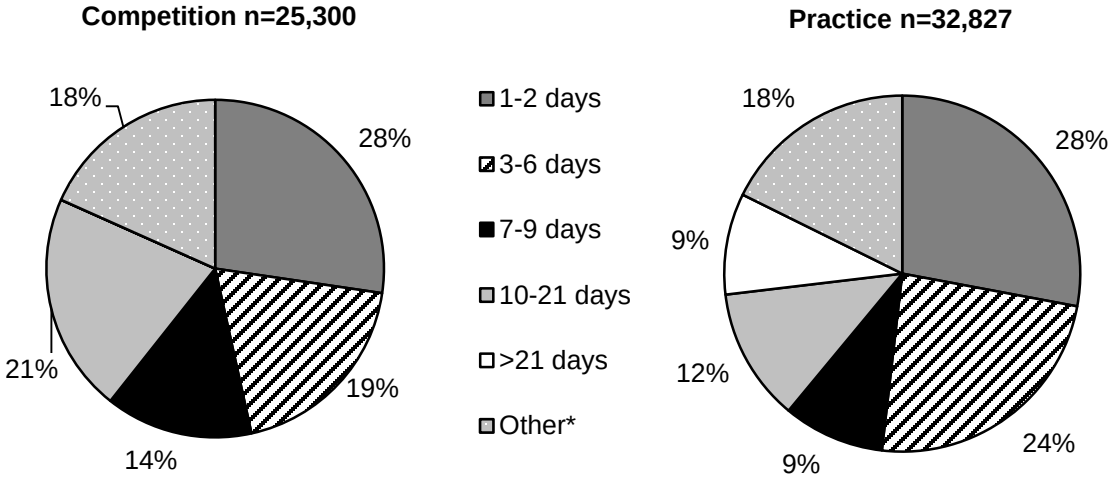
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 6.4 Ten Most Common Volleyball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=25,300		Practice n=32,827		Total n=58,127	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	5,744	22.7%	8,458	25.8%	14,202	24.4%
Ankle strain/sprain	6,275	24.8%	7,396	22.5%	13,671	23.5%
Hand/wrist strain/sprain	3,750	14.8%	1,394	4.2%	5,144	8.8%
Hip/thigh/upper leg strain/sprain	636	2.5%	2,486	7.6%	3,122	5.4%
Knee other	1,681	6.6%	1,124	3.4%	2,805	4.8%
Neck strain/sprain	1,356	5.4%	1,220	3.7%	2,576	4.4%
Knee strain/sprain	911	3.6%	1,542	4.7%	2,453	4.2%
Shoulder strain/sprain	1,266	5.0%	911	2.8%	2,177	3.7%
Trunk strain/sprain	213	0.8%	1,642	5.0%	1,855	3.2%
Trunk other	631	2.5%	1,009	3.1%	1,640	2.8%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 6.2 Time Loss of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	947	3.7%	931	2.8%	1,878	3.2%
Did not require surgery	24,354	96.3%	31,896	97.2%	56,250	96.8%
Total	**25,301**	**100%**	**32,827**	**100%**	**58,128**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 6.3 History of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

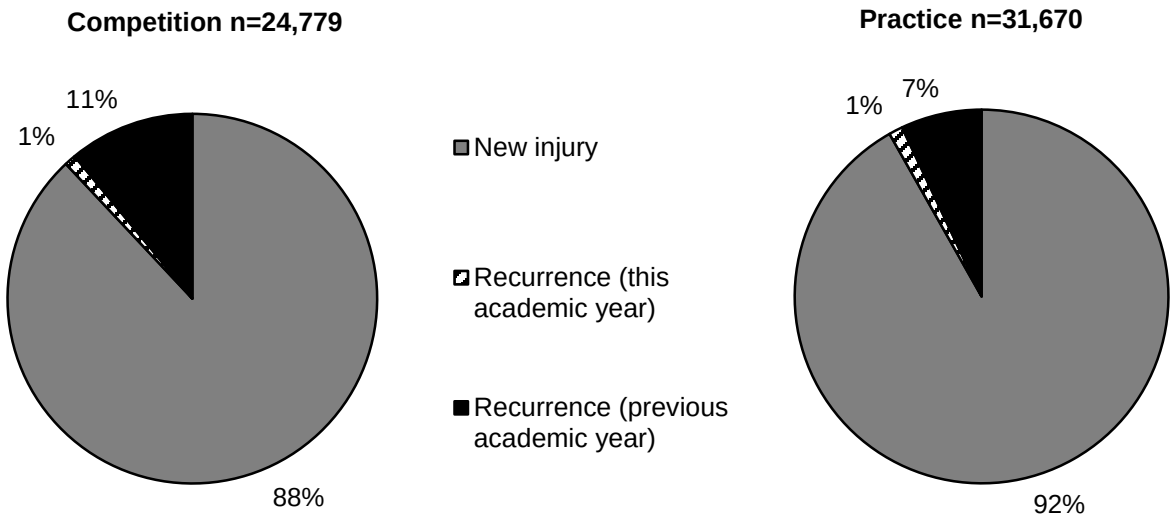


Table 6.6 Time during Season of Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	11,942	20.8%
Regular season	42,458	73.8%
Post season	3,097	5.4%
Total	**57,497**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 6.7 Competition-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	3,834	17.0%
First set	3,059	13.6%
Second set	7,938	35.3%
Third set	6,250	27.8%
Fourth set	573	2.5%
Fifth set	844	3.7%
Total	**22,498**	**100%**
Court Location		
Middle forward	6,633	30.7%
Left forward	3,419	15.8%
Left back	3,323	15.4%
Right forward	3,221	14.9%
Off the court	2,225	10.3%
At the net	996	4.6%
Right back (server)	848	3.9%
Outside court (your side)	458	2.1%
Outside court (opponent's side)	458	2.1%
Total	**21,581**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 6.8 Practice-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	4,330	14.1%
Second 1/2 hour	7,224	23.5%
1-2 hours into practice	17,366	56.5%
>2 hours into practice	1,808	5.9%
Total	**30,727**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 6.4 Player Position of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

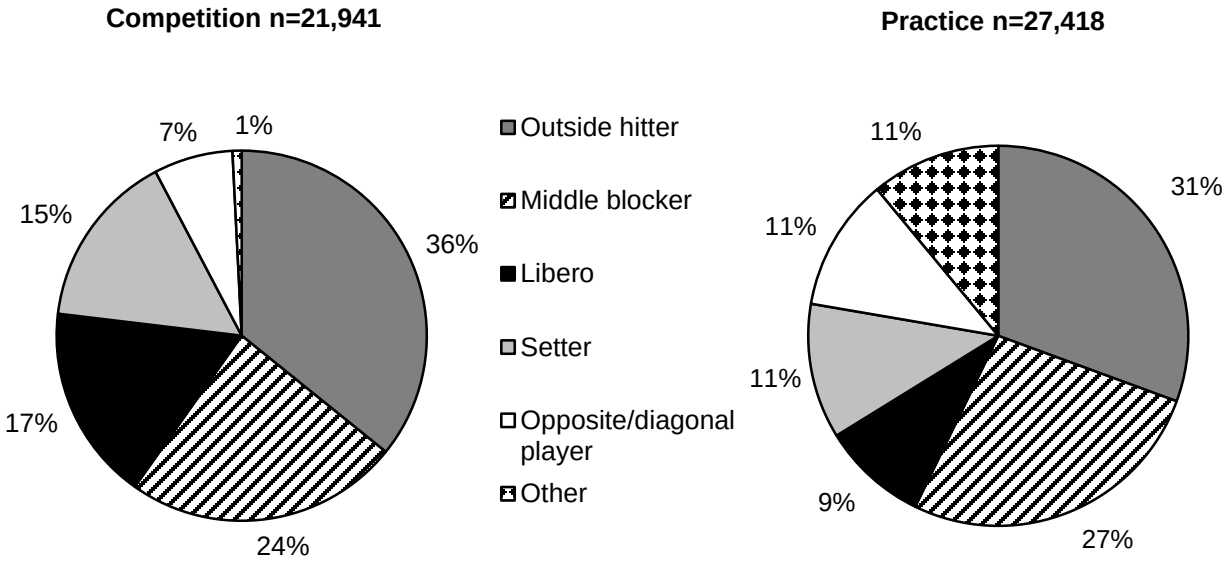


Table 6.9 Activities Leading to Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	2,469	10.4%	8,897	29.9%	11,366	21.3%
Blocking	6,332	26.7%	4,867	16.4%	11,199	20.9%
Digging	4,965	20.9%	5,249	17.6%	10,214	19.1%
Spiking	3,324	14.0%	3,351	11.3%	6,675	12.5%
Passing	2,726	11.5%	2,701	9.1%	5,427	10.1%
Other	1,663	7.0%	1,774	6.0%	3,437	6.4%
Conditioning	0	0.0%	2,001	6.7%	2,001	3.7%
Setting	1,405	5.9%	567	1.9%	1,972	3.7%
Serving	835	3.5%	348	1.2%	1,183	2.2%
Total	**23,719**	**100.0%**	**29,755**	**100.0%**	**53,474**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 6.10 Activity Resulting in Volleyball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Blocking	8,923	30.6%	0	0.0%	213	19.8%	1,007	8.0%	1,056	12.7%
General play	4,627	15.9%	631	27.8%	98	9.1%	2,471	19.5%	3,539	42.6%
Digging	3,806	13.0%	1,537	67.8%	554	51.4%	3,041	24.0%	1,276	15.4%
Spiking	4,195	14.4%	0	0.0%	0	0.0%	1,195	9.4%	1,188	14.3%
Conditioning	1,823	6.3%	0	0.0%	0	0.0%	177	1.4%	0	0.0%
Other	5,793	19.8%	98	4.4%	213	19.7%	4,770	37.7%	1,242	15.0%
Total	**29,167**	**100%**	**2,266**	**100%**	**1,078**	**100%**	**12,661**	**100%**	**8,301**	**100%**

VII. Boys' Basketball Injury Epidemiology

Table 7.1 Boys' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**322**	**217,643**	**1.48**	**81,240**
Competition	184	64,857	2.84	45,596
Practice	138	152,786	0.90	35,644

Table 7.2 Demographic Characteristics of Injured Boys' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=79,371**
Freshman	21.1%
Sophomore	32.9%
Junior	18.5%
Senior	27.6%
Total†	**100%**
Age (years)	
Minimum	14
Maximum	19
Mean (St. Dev.)	16.1 (1.2)
BMI	
Minimum	16.7
Maximum	35.7
Mean (St. Dev.)	22.8 (2.9)

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

Figure 7.1 Diagnosis of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

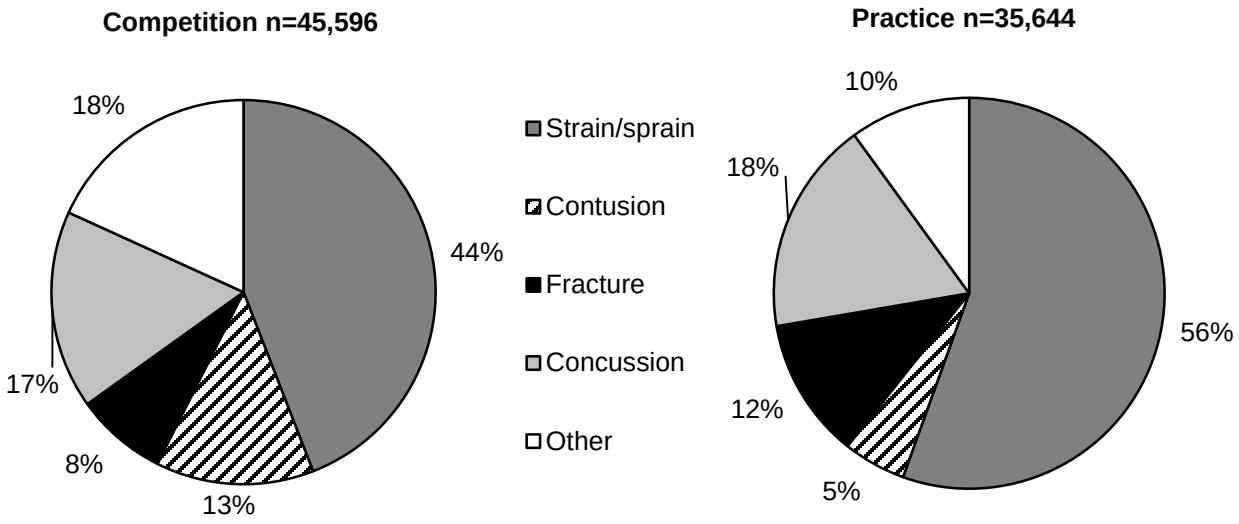


Table 7.3 Body Site of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	13,341	29.3%	14,824	41.6%	28,165	34.7%
Head/face	10,044	22.0%	6,604	18.5%	16,648	20.5%
Knee	7,242	15.9%	3,568	10.0%	10,810	13.3%
Hand/wrist	4,822	10.6%	3,137	8.8%	7,959	9.8%
Hip/thigh/upper leg	2,891	6.3%	2,424	6.8%	5,315	6.5%
Foot	2,873	6.3%	1,389	3.9%	4,262	5.2%
Trunk	1,348	3.0%	1,856	5.2%	3,204	3.9%
Arm/elbow	1,939	4.3%	555	1.6%	2,494	3.1%
Shoulder	892	2.0%	99	0.3%	991	1.2%
Other	204	0.4%	636	1.8%	840	1.0%
Lower leg	0	0.0%	552	1.5%	552	0.7%
Total	**45,596**	**100.0%**	**35,644**	**100.0%**	**81,240**	**100.0%**

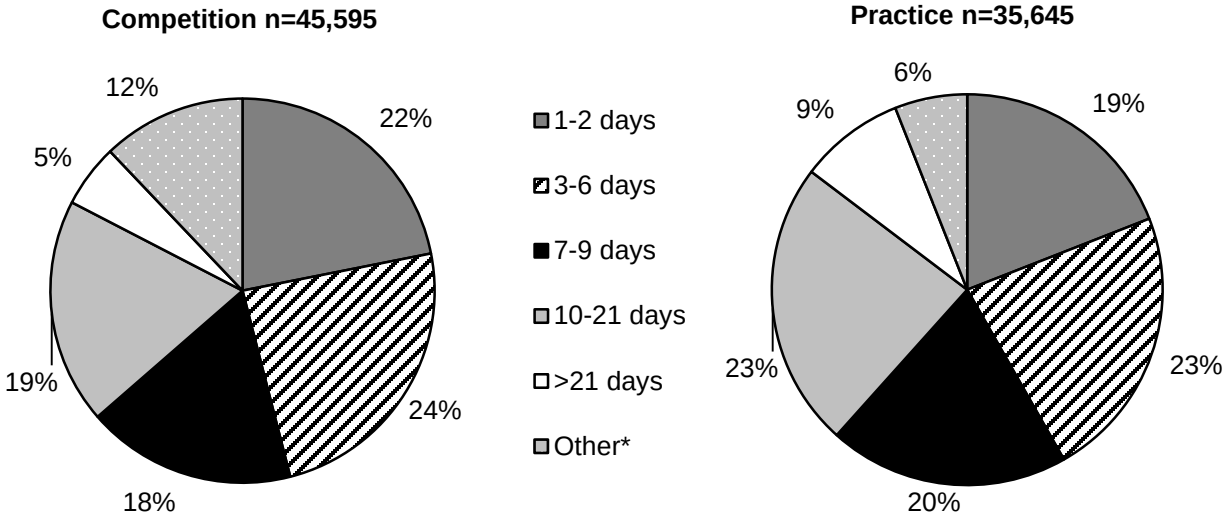
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 7.4 Ten Most Common Boys' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=45,599		Practice n=35,649		Total n=81,248	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	13,341	29.3%	14,057	39.4%	27,398	33.7%
Head/face concussion	7,613	16.7%	6,326	17.7%	13,939	17.2%
Knee other	3,429	7.5%	1,842	5.2%	5,271	6.5%
Hand/wrist fracture	1,935	4.2%	2,293	6.4%	4,228	5.2%
Hip/thigh/upper leg strain/sprain	2,034	4.5%	1,858	5.2%	3,892	4.8%
Knee strain/sprain	1,896	4.2%	1,116	3.1%	3,012	3.7%
Foot strain/sprain	1,474	3.2%	630	1.8%	2,104	2.6%
Knee contusion	1,818	4.0%	204	0.6%	2,022	2.5%
Hand/wrist strain/sprain	977	2.1%	845	2.4%	1,822	2.2%
Head/face other	1,481	3.2%	180	0.5%	1,661	2.0%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 7.2 Time Loss of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,124	6.9%	1,325	3.8%	4,449	5.5%
Did not require surgery	42,292	93.1%	33,772	96.2%	76,064	94.5%
Total	**45,416**	**100%**	**35,097**	**100%**	**80,513**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 7.3 History of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

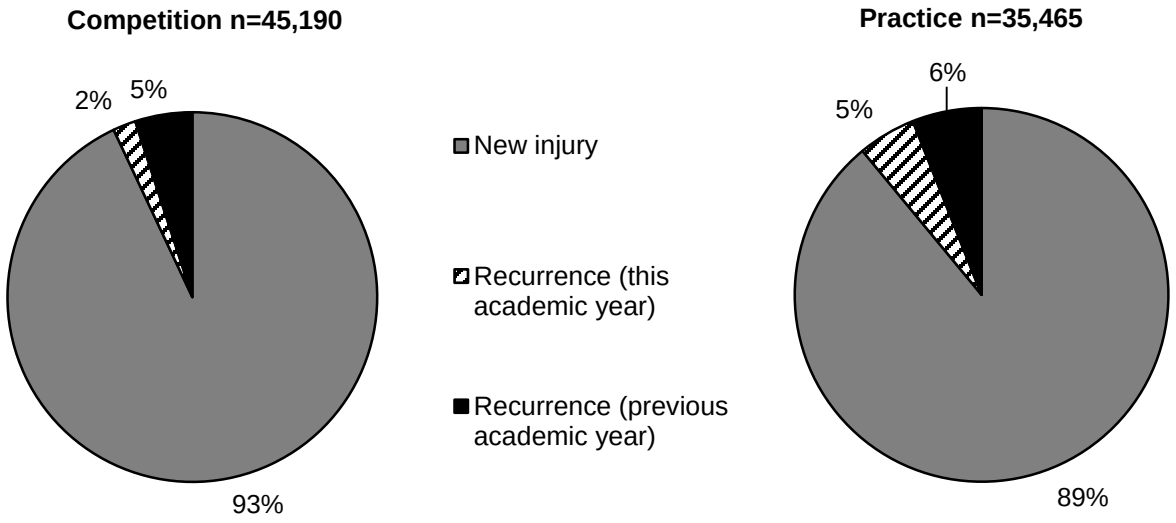


Table 7.6 Time during Season of Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	18,649	23.0%
Regular season	60,113	74.0%
Post season	2,477	3.0%
Total	**81,239**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 7.7 Competition-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	1,073	2.5%
First quarter	6,242	14.6%
Second quarter	10,459	24.5%
Third quarter	12,634	29.6%
Fourth quarter	12,053	28.3%
Overtime	204	0.5%
Total	**42,664**	**100%**
Court Location		
Inside lane (defense)	12,939	30.9%
Inside lane (offense)	7,612	18.2%
Between 3 point arc and lane (offense)	4,719	11.3%
Outside 3 point arc - offense	3,770	9.0%
Outside 3 point arc - defense	3,481	8.3%
Out of bounds/off the court	3,279	7.8%
Backcourt	3,241	7.7%
Between 3 point arc and lane (defense)	2,830	6.8%
Total	**41,870**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 7.8 Practice-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	4,224	12.2%
Second 1/2 hour	9,031	26.0%
1-2 hours into practice	19,939	57.4%
>2 hours into practice	1,545	4.4%
Total	**34,738**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 7.4 Player Position of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

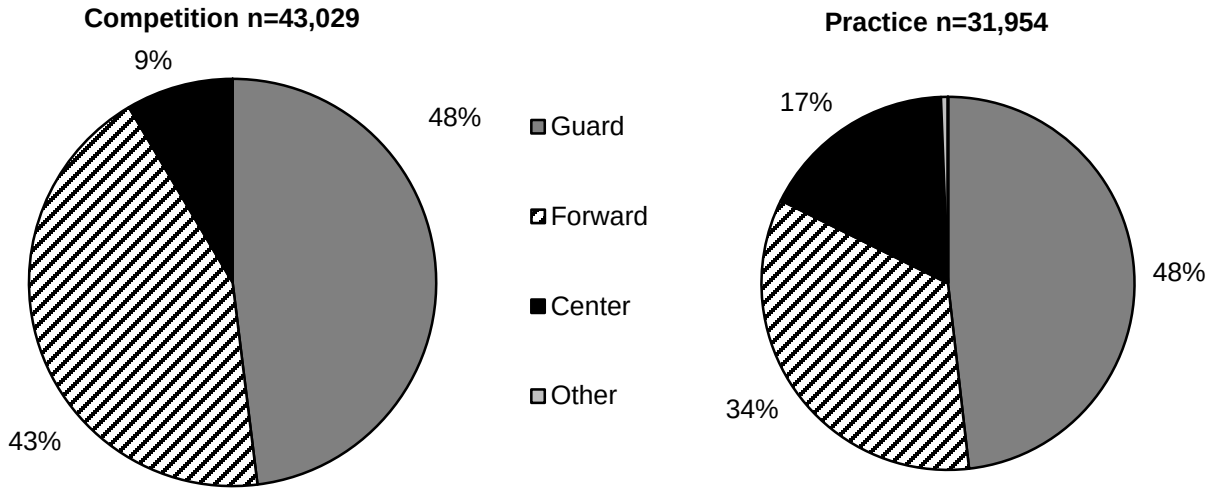


Table 7.9 Activities Leading to Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Activity						
Rebounding	10,613	24.3%	7,232	22.7%	17,845	23.6%
General play	6,182	14.2%	7,723	24.2%	13,905	18.4%
Defending	8,304	19.0%	3,532	11.1%	11,836	15.7%
Chasing loose ball	6,847	15.7%	3,837	12.0%	10,684	14.1%
Shooting	4,058	9.3%	3,831	12.0%	7,889	10.4%
Other	3,160	7.2%	1,072	3.4%	4,232	5.6%
Receiving pass	2,302	5.3%	1,439	4.5%	3,741	5.0%
Ball handling/dribbling	2,130	4.9%	1,427	4.5%	3,557	4.7%
Conditioning	0	0.0%	1,028	3.2%	1,028	1.4%
Passing	0	0.0%	790	2.5%	790	1.0%
Total	**43,596**	**100.0%**	**31,911**	**100.0%**	**75,507**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 7.10 Activity Resulting in Boys' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Rebounding	11,074	29.7%	1,461	19.5%	278	4.0%	2,097	15.6%	2,934	28.6%
General play	7,023	18.8%	1,400	18.7%	1,119	16.1%	1,972	14.6%	2,391	23.3%
Defending	5,857	15.7%	1,818	24.2%	1,195	17.2%	1,984	14.7%	982	9.6%
Shooting	3,834	10.5%	1,224	16.3%	1,026	14.7%	1,049	7.8%	656	6.4%
Chasing loose ball	4,714	12.6%	506	6.7%	793	11.4%	4,421	32.8%	249	2.4%
Other	4,820	12.7%	1,093	14.6%	2,545	36.6%	1,939	14.5%	3,052	29.7%
Total	**37,322**	**100%**	**7,502**	**100%**	**6,956**	**100%**	**13,462**	**100%**	**10,264**	**100%**

VIII. Girls' Basketball Injury Epidemiology

Table 8.1 Girls' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**346**	**161,651**	**2.14**	**99,598**
Competition	207	49,598	4.17	56,786
Practice	139	112,053	1.24	42,812

Table 8.2 Demographic Characteristics of Injured Girls' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=95,714**
Freshman	27.6%
Sophomore	31.5%
Junior	19.7%
Senior	21.2%
Total†	**100%**
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	15.6 (1.3)
BMI	
Minimum	16.1
Maximum	42.9
Mean (St. Dev.)	22.0 (3.4)

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

Figure 8.1 Diagnosis of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

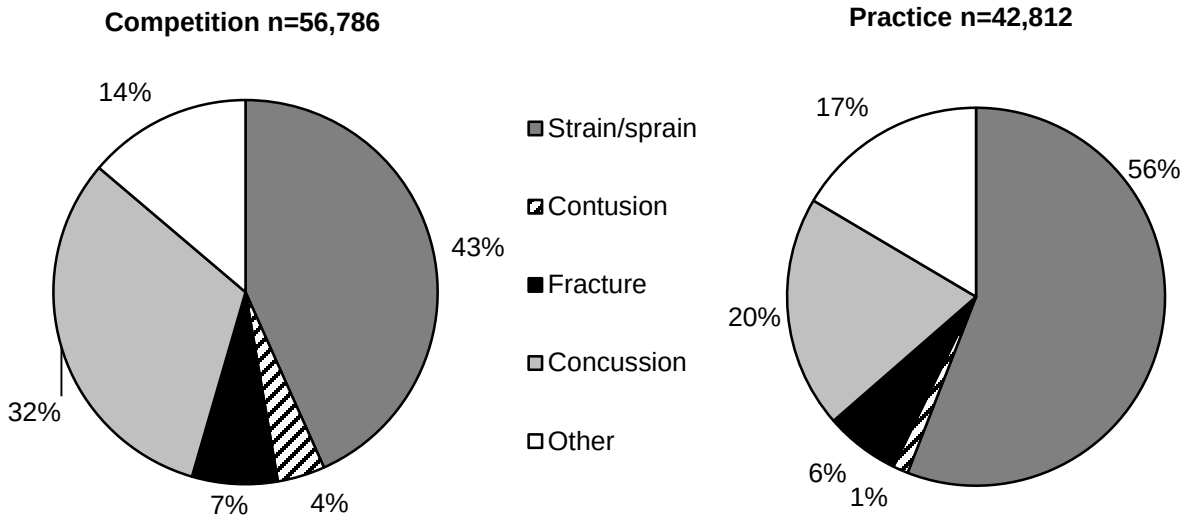


Table 8.3 Body Site of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	19,028	33.5%	9,529	22.3%	28,557	28.7%
Ankle	13,201	23.2%	12,191	28.5%	25,392	25.5%
Knee	13,122	23.1%	7,672	17.9%	20,794	20.9%
Hand/wrist	4,245	7.5%	3,625	8.5%	7,870	7.9%
Hip/thigh/upper leg	1,141	2.0%	3,545	8.3%	4,686	4.7%
Foot	1,805	3.2%	1,405	3.3%	3,210	3.2%
Lower leg	549	1.0%	2,293	5.4%	2,842	2.9%
Other	895	1.6%	1,135	2.7%	2,030	2.0%
Shoulder	1,899	3.3%	101	0.2%	2,000	2.0%
Trunk	800	1.4%	809	1.9%	1,609	1.6%
Neck	-	0.0%	507	1.2%	507	0.5%
Arm/elbow	101	0.2%	-	0.0%	101	0.1%
Total	**56,786**	**100.0%**	**42,812**	**100.0%**	**99,598**	**100.0%**

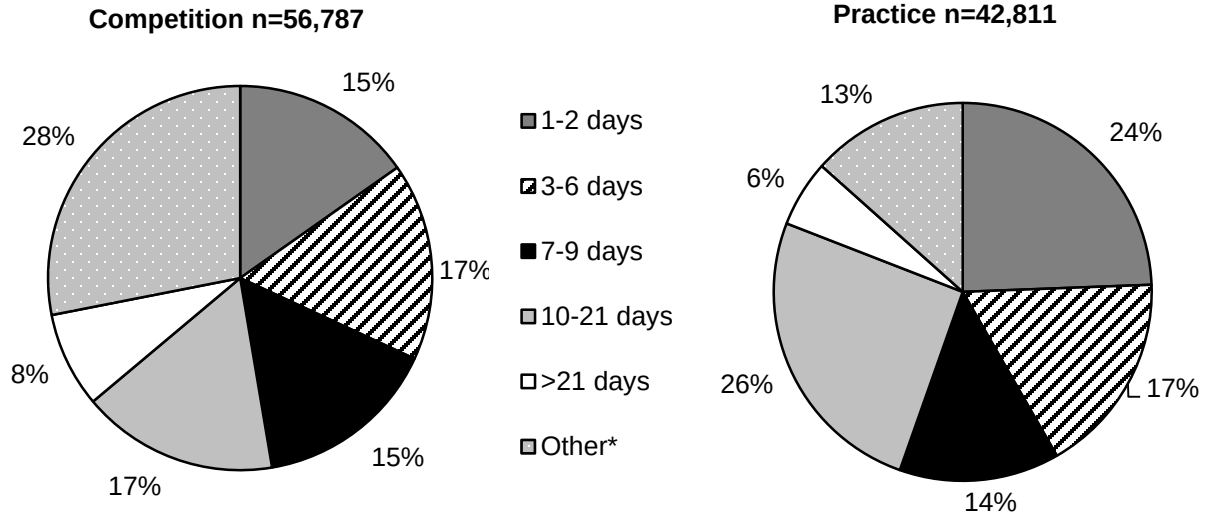
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 8.4 Ten Most Common Girls' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=56,786		Practice n=42,813		Total n=99,599	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	17,984	31.7%	8,516	19.9%	26,500	26.6%
Ankle strain/sprain	12,632	22.2%	11,969	28.0%	24,601	24.7%
Knee strain/sprain	7,177	12.6%	3,312	7.7%	10,489	10.5%
Knee other	4,918	8.7%	3,488	8.1%	8,406	8.4%
Hip/thigh/upper leg strain/sprain	1,079	1.9%	3,545	8.3%	4,624	4.6%
Hand/wrist strain/sprain	2,395	4.2%	1,785	4.2%	4,180	4.2%
Hand/wrist fracture	1,588	2.8%	1,840	4.3%	3,428	3.4%
Knee contusion	1,027	1.8%	448	1.0%	1,475	1.5%
Shoulder other	1,320	2.3%	0	0.0%	1,320	1.3%
Head/face other	823	1.4%	425	1.0%	1,248	1.3%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 8.2 Time Loss of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	6,547	11.6%	2,558	6.0%	9,105	9.2%
Did not require surgery	50,018	88.4%	40,153	94.0%	90,171	90.8%
Total	**56,565**	**100%**	**42,711**	**100%**	**99,276**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 8.3 History of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

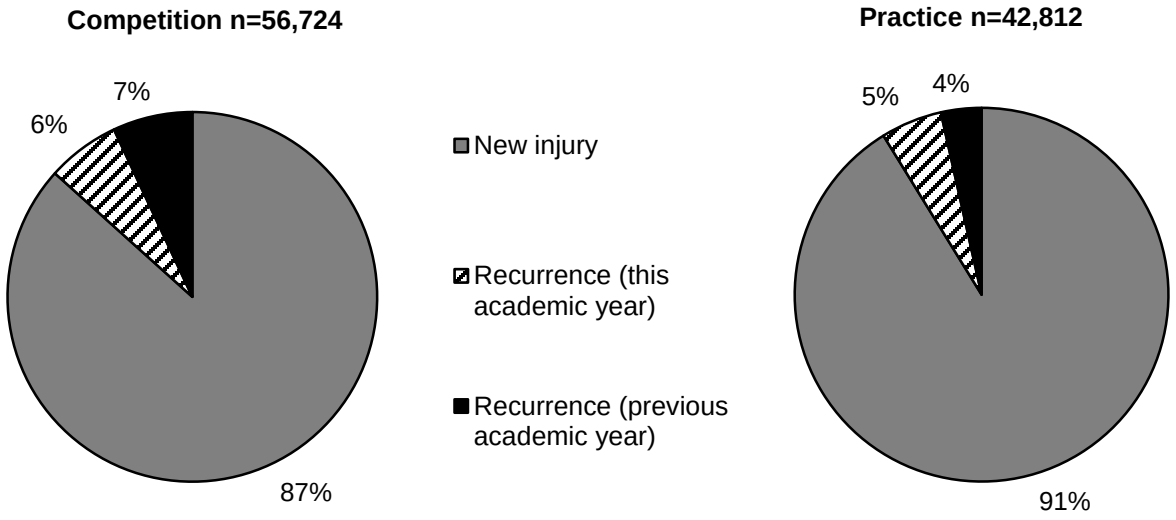


Table 8.6 Time during Season of Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	16,124	16.2%
Regular season	78,111	78.6%
Post season	5,080	5.1%
Total	**99,315**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 8.7 Competition-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	747	1.5%
First quarter	7,421	14.6%
Second quarter	14,313	28.2%
Third quarter	16,141	31.8%
Fourth quarter	12,165	24.0%
Total	**50,786**	**100%**
Court Location		
Inside lane (defense)	13,289	27.0%
Between 3 point arc and lane (defense)	5,752	11.7%
Inside lane (offense)	9,728	19.8%
Between 3 point arc and lane (offense)	6,268	12.7%
Outside 3 point arc - offense	6,091	12.4%
Outside 3 point arc - defense	4,964	10.1%
Backcourt	2,623	5.3%
Out of bounds	529	1.1%
Total	**49,244**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 8.8 Practice-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	2,259	5.3%
Second 1/2 hour	11,210	26.4%
1-2 hours into practice	25,936	61.0%
>2 hours into practice	3,124	7.3%
Total	**42,528**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 8.4 Player Position of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

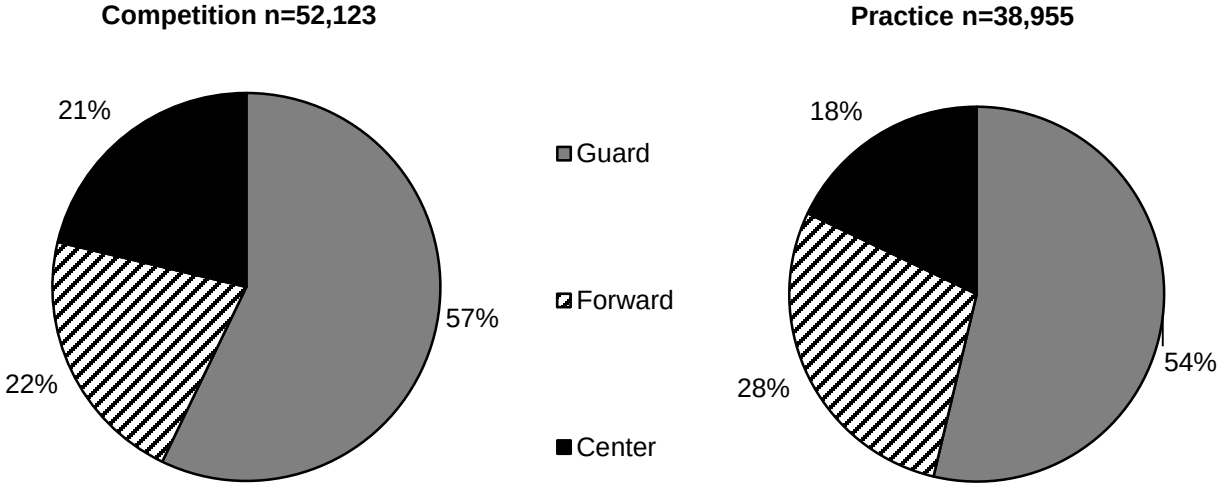


Table 8.9 Activities Leading to Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	11,717	22.4%	17,170	44.2%	28,887	31.7%
Defending	11,040	21.1%	3,568	9.2%	14,608	16.0%
Rebounding	9,319	17.8%	3,610	9.3%	12,929	14.2%
Chasing loose ball	8,100	15.5%	3,831	9.9%	11,931	13.1%
Ball handling/dribbling	4,607	8.8%	2,658	6.8%	7,265	8.0%
Shooting	3,433	6.6%	2,496	6.4%	5,929	6.5%
Receiving pass	2,686	5.1%	1,919	4.9%	4,605	5.0%
Conditioning	0	0.0%	2,104	5.4%	2,104	2.3%
Other	579	1.1%	544	1.4%	1,123	1.2%
Screening	0	0.0%	955	2.5%	955	1.0%
Passing	885	1.7%	0	0.0%	885	1.0%
Total	**52,366**	**100.0%**	**38,855**	**100.0%**	**91,221**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 8.10 Activity Resulting in Girls' Basketball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Defending	6,677	15.1%	425	15.6%	1,027	17.0%	5,515	22.4%	965	7.1%
General play	14,496	32.7%	1,094	40.1%	425	7.0%	7,114	28.8%	5,758	42.6%
Rebounding	5,281	11.9%	832	30.5%	1,504	24.9%	4,549	18.4%	762	5.6%
Chasing loose ball	5,632	12.7%	0	0.0%	850	14.1%	3,139	12.7%	2,310	17.1%
Shooting	4,242	9.6%	0	0.0%	507	8.4%	62	0.3%	1,118	8.3%
Other	7,954	18.0%	375	13.8%	1,718	28.6%	4,294	17.4%	2,593	19.3%
Total	**44,282**	**100%**	**2,726**	**100%**	**6,031**	**100%**	**24,673**	**100%**	**13,506**	**100%**

IX. Wrestling Injury Epidemiology

Table 9.1 Wrestling Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**341**	**152,716**	**2.23**	**91,642**
Competition	133	38,791	3.43	38,430
Practice	208	113,925	1.83	53,212

Table 9.2 Demographic Characteristics of Injured Wrestlers, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=88,793**
Freshman	28.0%
Sophomore	25.0%
Junior	19.5%
Senior	27.4%
Total†	**100%**
Age (years)	
Minimum	13
Maximum	19
Mean (St. Dev.)	15.9 (1.3)
BMI	
Minimum	16.6
Maximum	44.1
Mean (St. Dev.)	23.9 (4.5)

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

Figure 9.1 Diagnosis of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

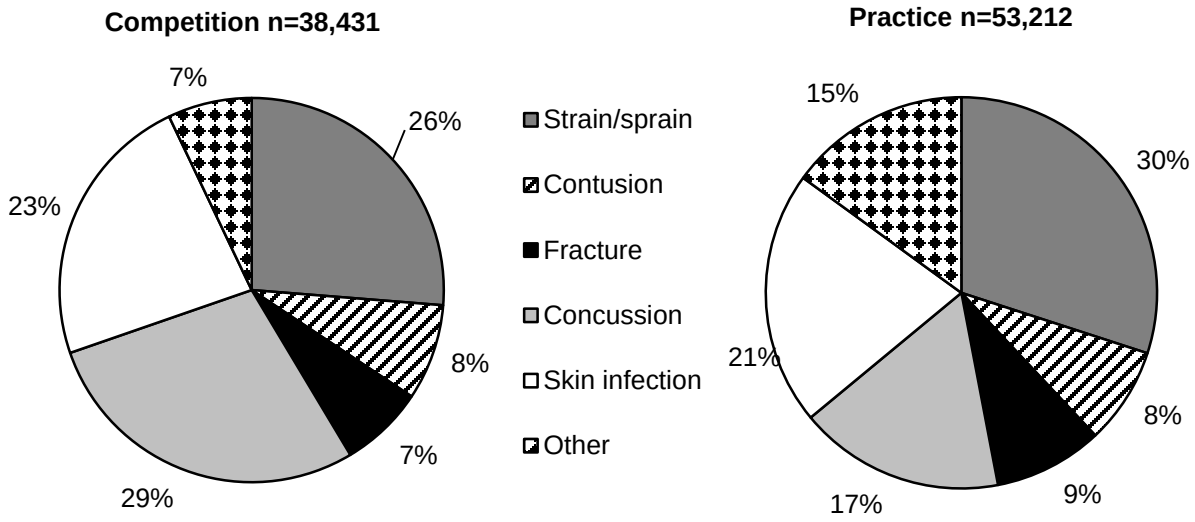


Table 9.3 Body Site of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	12,034	31.3%	14,601	27.4%	26,635	29.1%
Knee	8,810	22.9%	8,068	15.2%	16,878	18.4%
Shoulder	5,057	13.2%	7,832	14.7%	12,889	14.1%
Ankle	1,839	4.8%	4,750	8.9%	6,589	7.2%
Hand/wrist	2,404	6.3%	3,460	6.5%	5,864	6.4%
Arm/elbow	2,491	6.5%	3,324	6.2%	5,815	6.3%
Trunk	1,181	3.1%	4,237	8.0%	5,418	5.9%
Other	2,319	6.0%	1,676	3.1%	3,995	4.4%
Neck	1,830	4.8%	853	1.6%	2,683	2.9%
Hip/thigh/upper leg	0	0.0%	2,044	3.8%	2,044	2.2%
Lower leg	179	0.5%	1,461	2.7%	1,640	1.8%
Foot	285	0.7%	904	1.7%	1,189	1.3%
Total	**38,429**	**100.0%**	**53,210**	**100.0%**	**91,639**	**100.0%**

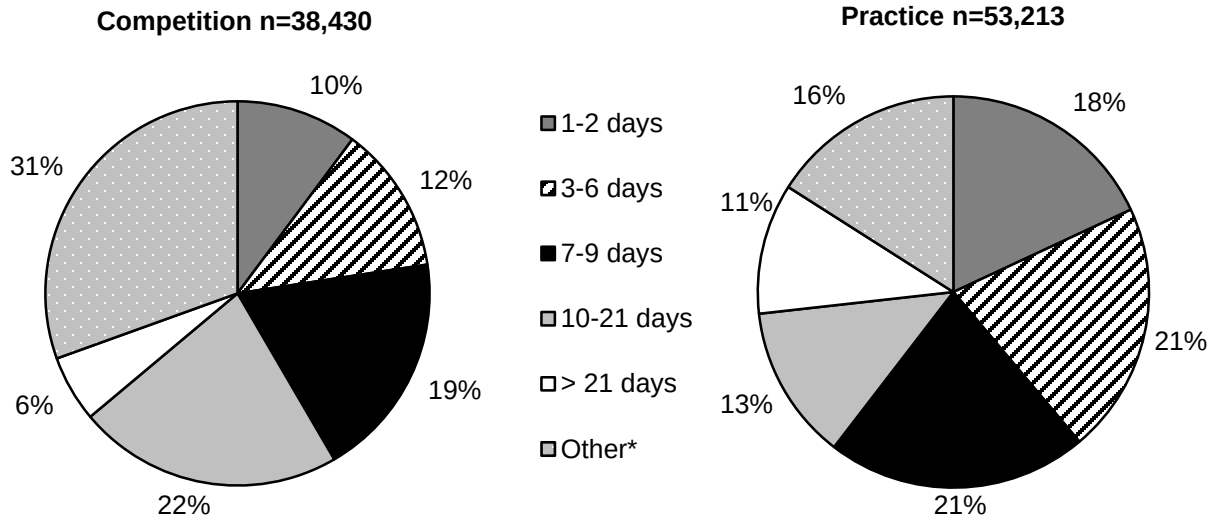
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 9.4 Ten Most Common Wrestling Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=38,427		Practice n=53,210		Total n=91,637	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	10,870	28.3%	9,115	17.1%	19,985	21.8%
Knee skin infection	3,309	8.6%	3,327	6.3%	6,636	7.2%
Knee strain/sprain	3,644	9.5%	2,988	5.6%	6,632	7.2%
Ankle strain/sprain	1,839	4.8%	4,287	8.1%	6,126	6.7%
Shoulder skin infection	2,699	7.0%	2,696	5.1%	5,395	5.9%
Shoulder strain/sprain	1,520	4.0%	3,254	6.1%	4,774	5.2%
Head/face other	390	1.0%	4,159	7.8%	4,549	5.0%
Knee contusion	1,857	4.8%	1,394	2.6%	3,251	3.5%
Hand/wrist fracture	1,293	3.4%	1,530	2.9%	2,823	3.1%
Arm/elbow other	441	2.2%	1,676	3.1%	2,533	2.8%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 9.2 Time Loss of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	4,623	12.2%	2,527	4.7%	7,150	7.8%
Did not require surgery	33,400	87.8%	50,684	95.3%	84,084	92.2%
Total	**38,023**	**100%**	**53,211**	**100%**	**91,234**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuri

Figure 9.3 History of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

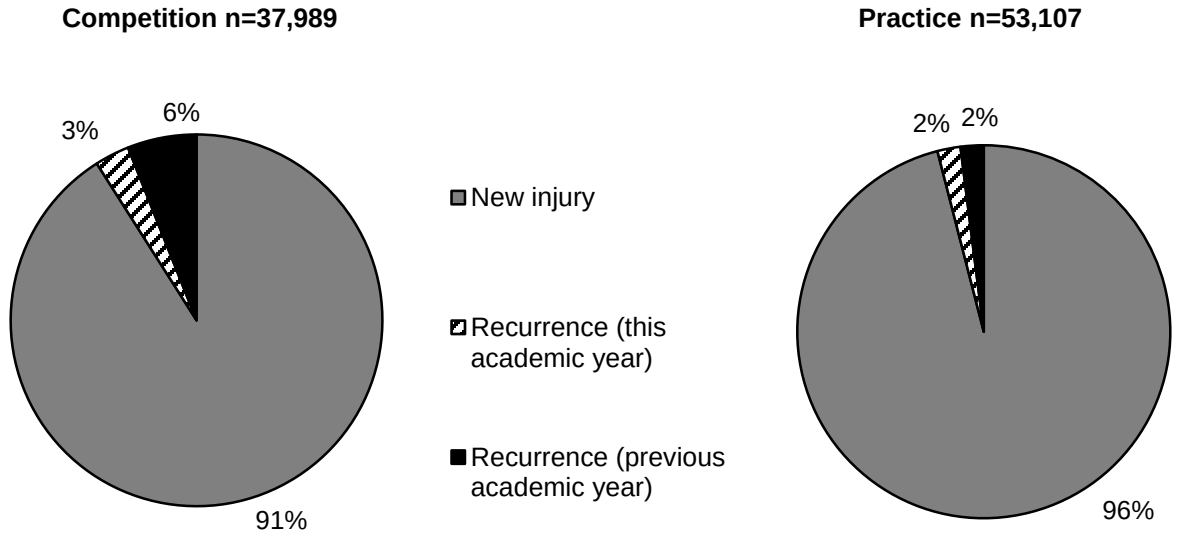


Table 9.6 Time during Season of Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	15,829	17.3%
Regular season	68,828	75.4%
Post season	6,587	7.2%
Total	**91,245**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 9.7 Competition-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	1,084	3.2%
First period	6,741	20.0%
Second period	17,246	51.3%
Third period	8,551	25.4%
Total	**33,622**	**100%**
Mat Location		
Within 28 ft. circle	74,204	93.1%
Off the mat	2,969	3.7%
Out of bounds	2,527	3.2%
Total	**79,701**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 9.8 Practice-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	5,872	11.4%
Second 1/2 hour	8,031	15.6%
1-2 hours into practice	31,332	60.8%
>2 hours into practice	6,296	12.2%
Total	**51,531**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 9.9 Activities Leading to Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Takedown	17,311	48.9%	16,085	35.3%	33,396	41.3%
N/a (e.g., skin infection, overuse, heat illness, etc.)	2,882	8.1%	8,265	18.2%	11,147	13.8%
Sparring	3,802	10.7%	6,799	14.9%	10,601	13.1%
Escape	2,486	7.0%	3,062	6.7%	5,548	6.9%
Fall	2,726	7.7%	2,758	6.1%	5,484	6.8%
Other	1,745	4.9%	3,625	8.0%	5,370	6.6%
Riding	2,245	6.3%	285	0.6%	2,530	3.1%
Conditioning	0	0.0%	2,520	5.5%	2,520	3.1%
Near fall	1,324	3.7%	962	2.1%	2,286	2.8%
Reversal	851	2.4%	1,162	2.6%	2,013	2.5%
Total	**35,372**	**100.0%**	**45,523**	**100.0%**	**80,895**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 9.10 Activities Resulting in Wrestling Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Takedown	10,175	43.7%	4,056	58.8%	2,555	47.8%	10,839	61.4%	5,770	20.8%
Sparring	1,944	8.4%	1,222	17.7%	885	16.6%	3,963	22.4%	2,587	9.3%
N/A*	441	1.9%	0	0.0%	0	0.0%	0	0.0%	10,705	38.6%
Escape	2,694	11.6%	333	4.8%	0	0.0%	81	0.5%	2,439	8.8%
Riding	1,576	6.8%	179	2.6%	0	0.0%	0	0.0%	774	2.8%
Other	6,440	27.7%	1,108	16.1%	1,901	35.6%	2,770	15.7%	682	2.5%
Total	**23,270**	**100.0%**	**6,898**	**100.0%**	**5,341**	**100%**	**17,653**	**100.0%**	**27,729**	**100%**

*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, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**143**	**170,897**	**0.84**	**44,760**
Competition	81	59,949	1.35	25,581
Practice	62	110,948	0.56	19,179

Table 10.2 Demographic Characteristics of Injured Baseball Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=44,529**
Freshman	20.4%
Sophomore	36.3%
Junior	26.0%
Senior	17.2%
Total†	**100%**
Age (years)	
Minimum	14
Maximum	18
Mean (St. Dev.)	16.1 (1.1)
BMI	
Minimum	16.6
Maximum	34.2
Mean (St. Dev.)	23.2 (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 10.1 Diagnosis of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

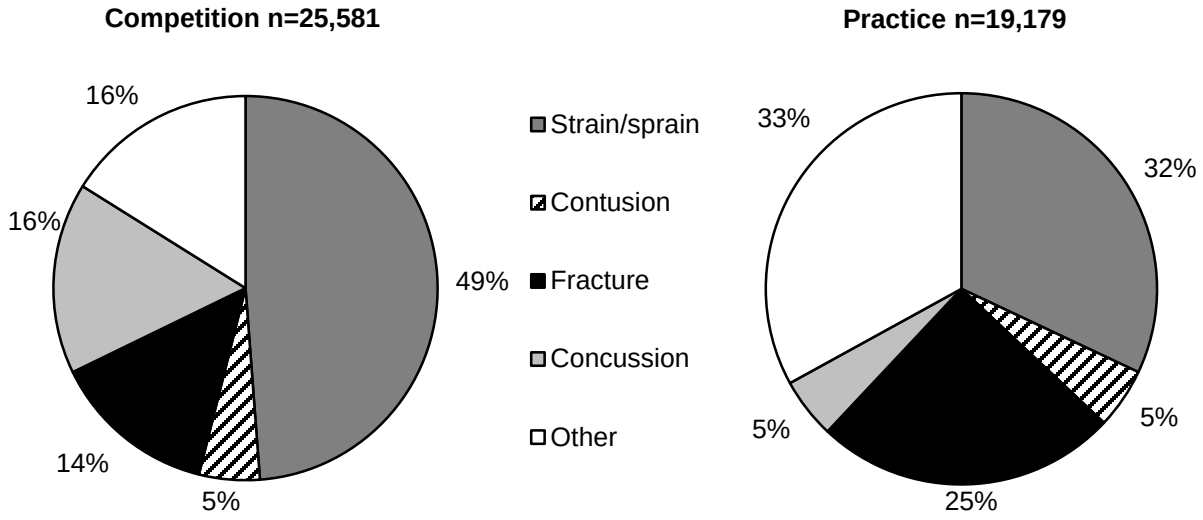


Table 10.3 Body Site of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Arm/elbow	6,001	23.5%	4,241	22.1%	10,242	22.9%
Head/face	5,020	19.6%	3,650	19.0%	8,670	19.4%
Shoulder	4,332	16.9%	2,596	13.5%	6,928	15.5%
Ankle	3,746	14.6%	2,254	11.8%	6,000	13.4%
Hand/wrist	1,875	7.3%	2,842	14.8%	4,717	10.5%
Hip/thigh/upper leg	2,527	9.9%	1,124	5.9%	3,651	8.2%
Knee	1,177	4.6%	574	3.0%	1,751	3.9%
Trunk	364	1.4%	638	3.3%	1,002	2.2%
Lower leg	408	1.6%	299	1.6%	707	1.6%
Foot	65	0.3%	480	2.5%	545	1.2%
Neck	0	0.0%	480	2.5%	480	1.1%
Other	65	0.3%	0	0.0%	65	0.1%
Total	**25,580**	**100.0%**	**19,178**	**100.0%**	**44,758**	**100.0%**

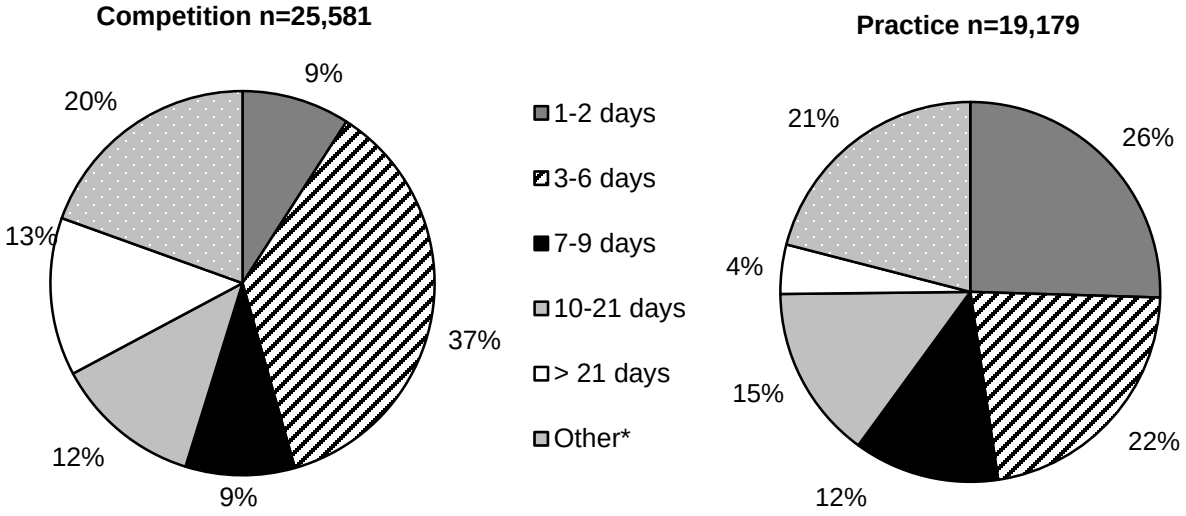
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 10.4 Ten Most Common Baseball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=25,581		Practice n=19,179		Total n=44,760	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	4,117	16.1%	961	5.0%	5,078	11.3%
Arm/elbow strain/sprain	3,174	12.4%	1,394	7.3%	4,568	10.2%
Ankle strain/sprain	2,785	10.9%	1,067	5.6%	3,852	8.6%
Hip/thigh/upper leg strain/sprain	2,527	9.9%	1,124	5.9%	3,651	8.2%
Shoulder other	1,476	5.8%	2,123	11.1%	3,599	8.0%
Arm/elbow fracture	1,119	4.4%	1,806	9.4%	2,925	6.5%
Hand/wrist fracture	1,233	4.8%	1,616	8.4%	2,849	6.4%
Shoulder strain/sprain	2,376	9.3%	473	2.5%	2,849	6.4%
Arm/elbow other	1,409	5.5%	1,040	5.4%	2,449	5.5%
Head/face other	423	1.7%	1,571	8.2%	1,994	4.5%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 10.2 Time Loss of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,401	5.5%	1,487	7.8%	2,888	6.5%
Did not require surgery	24,180	94.5%	17,692	92.2%	41,872	93.5%
Total	**25,581**	**100%**	**19,179**	**100%**	**44,760**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 10.3 History of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

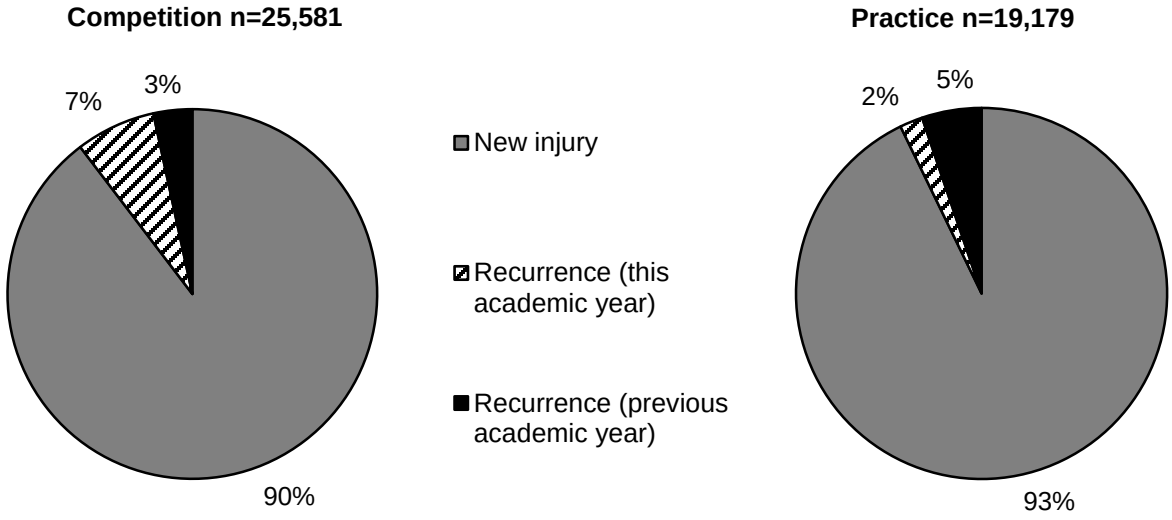


Table 10.6 Time during Season of Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	5,759	12.9%
Regular season	37,680	84.2%
Post season	1,320	3.0%
Total	**44,760**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 10.7 Competition-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	2,719	11.5%
First inning	864	3.6%
Second inning	2,436	10.3%
Third inning	4,418	18.6%
Fourth inning	4,643	19.6%
Fifth inning	3,174	13.4%
Sixth inning	3,760	15.8%
Seventh inning	1,414	6.0%
Extra innings	299	1.3%
Total	**23,726**	**100%**
Field Location		
Pitcher's mound	7,276	30.1%
Home plate	4,925	20.4%
First base	4,390	18.2%
Outfield	3,202	13.2%
Third base	1,477	6.1%
Second base	1,136	4.7%
Foul territory	929	3.8%
Infield	480	2.0%
Other	358	1.5%
Total	**24,175**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 10.8 Practice-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	2,981	16.4%
Second 1/2 hour	3,926	21.6%
1-2 hours into practice	10,798	59.3%
>2 hours into practice	510	2.8%
Total	**18,215**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 10.4 Player Position of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

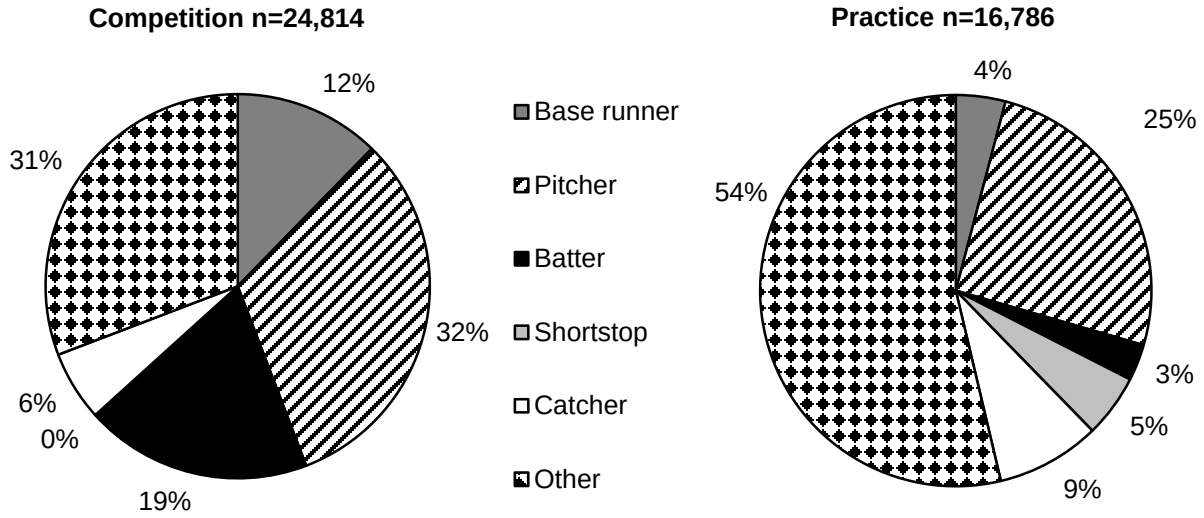


Table 10.9 Activities Leading to Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Pitching	7,914	32.0%	3,128	18.1%	11,042	26.3%
Fielding a batted ball	3,578	14.5%	3,625	21.0%	7,203	17.2%
Running bases	4,601	18.6%	1,061	6.1%	5,662	13.5%
Batting	3,684	14.9%	1,118	6.5%	4,802	11.4%
Throwing (not pitching)	885	3.6%	3,232	18.7%	4,117	9.8%
General play	480	1.9%	3,164	18.3%	3,644	8.7%
Sliding	1,815	7.3%	364	2.1%	2,179	5.2%
Other	358	1.4%	1,211	7.0%	1,569	3.7%
Fielding a thrown ball	1,159	4.7%	299	1.7%	1,458	3.5%
Catching	231	0.9%	0	0.0%	231	0.6%
Conditioning	0	0.0%	65	0.4%	65	0.2%
Total	**24,705**	**100.0%**	**17,267**	**100.0%**	**41,972**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 10.5 Activity Resulting in Baseball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Fielding	2,946	16.3%	364	16.0%	2,282	29.6%	1,680	34.3%	1,389	15.3%
Running	3,483	19.3%	0	0.0%	638	8.3%	1,227	25.0%	314	3.5%
Pitching	7,297	40.5%	231	10.2%	480	6.2%	480	9.8%	2,553	28.2%
Batting	1,227	6.8%	1,198	52.7%	1,987	25.8%	217	4.4%	173	1.9%
Sliding	364	2.0%	0	0.0%	728	9.4%	231	4.7%	855	9.4%
Other	2,706	15.0%	480	21.1%	1,599	20.7%	1,069	21.8%	3,770	41.6%
Total	**18,023**	**100%**	**2,273**	**100%**	**7,714**	**100%**	**4,904**	**100%**	**9,054**	**100%**

XI. Softball Injury Epidemiology

Table 11.1 Softball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**167**	**128,330**	**1.30**	**65,572**
Competition	94	44,703	2.10	38,713
Practice	73	83,627	0.87	26,859

Table 11.2 Demographic Characteristics of Injured Softball Athletes, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

Year in School	**n=64,583**
Freshman	20.5%
Sophomore	28.7%
Junior	31.2%
Senior	19.7%
Total†	**100%**
Age (years)	
Minimum	13
Maximum	18
Mean (St. Dev.)	15.9 (1.2)
BMI	
Minimum	17.0
Maximum	36.3
Mean (St. Dev.)	23.6 (4.0)

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

Figure 11.1 Diagnosis of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

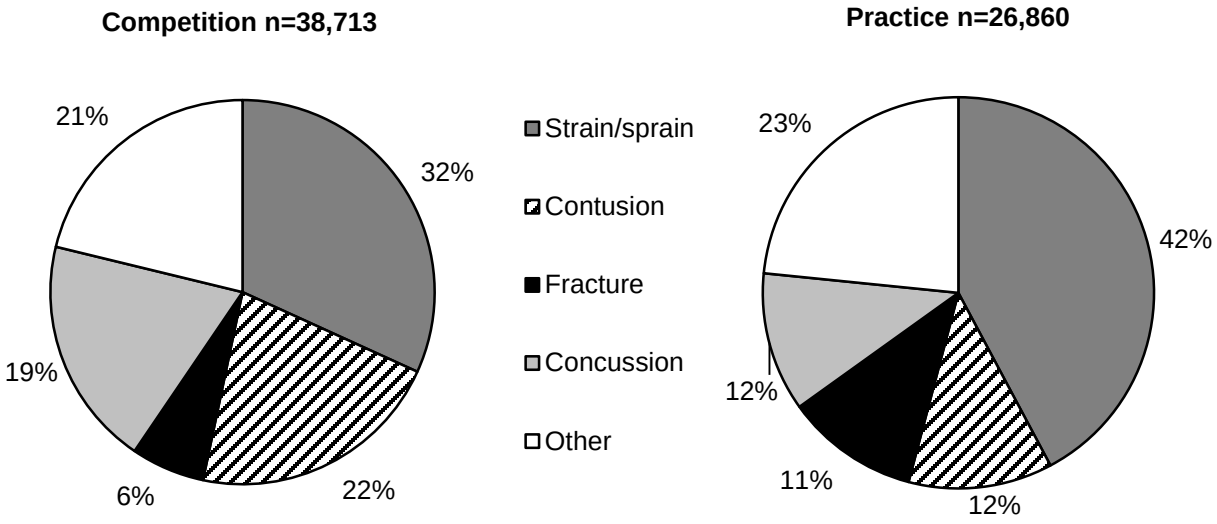


Table 11.3 Body Site of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	10,465	27.0%	4,073	15.2%	14,538	22.2%
Ankle	6,259	16.2%	4,565	17.0%	10,824	16.5%
Hand/wrist	4,384	11.3%	3,126	11.6%	7,510	11.5%
Knee	4,520	11.7%	2,680	10.0%	7,200	11.0%
Hip/thigh/upper leg	3,078	8.0%	3,241	12.1%	6,319	9.6%
Shoulder	1,946	5.0%	3,077	11.5%	5,023	7.7%
Trunk	2,400	6.2%	1,837	6.8%	4,237	6.5%
Lower leg	2,128	5.5%	1,691	6.3%	3,819	5.8%
Arm/elbow	2,263	5.8%	691	2.6%	2,954	4.5%
Neck	0	0.0%	1,434	5.3%	1,434	2.2%
Foot	975	2.5%	0	0.0%	975	1.5%
Other	294	0.8%	445	1.7%	739	1.1%
Total	**38,712**	**100.0%**	**26,860**	**100.0%**	**65,572**	**100.0%**

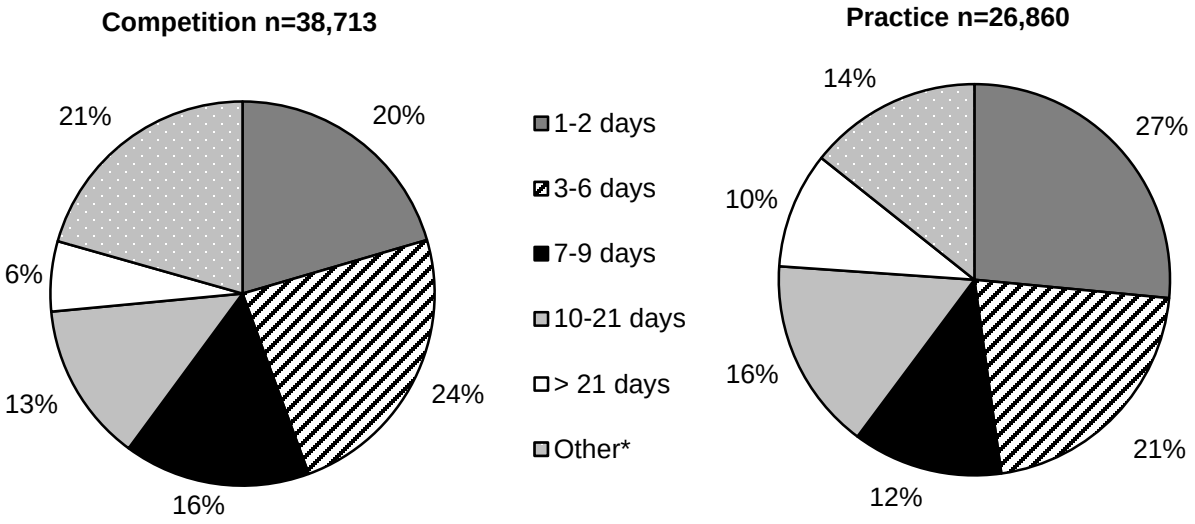
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 11.4 Ten Most Common Softball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition n=38,715		Practice n=26,860		Total n=65,575	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	7,409	19.1%	3,086	11.5%	10,495	16.0%
Ankle strain/sprain	5,815	15.0%	4,503	16.8%	10,318	15.7%
Hip/thigh/upper leg sprain/strain	3,078	8.0%	2,455	9.1%	5,533	8.4%
Knee other	3,312	8.6%	242	0.9%	3,554	5.4%
Hand/wrist fracture	1,956	5.1%	1,262	4.7%	3,218	4.9%
Trunk other	1,434	3.7%	1,714	6.4%	3,148	4.8%
Shoulder other	806	2.1%	1,895	7.1%	2,701	4.1%
Hand/wrist contusion	2,196	5.7%	445	1.7%	2,641	4.0%
Shoulder strain/sprain	1,140	2.9%	1,182	4.4%	2,322	3.5%
Knee contusion	242	0.6%	1,714	6.4%	1,956	3.0%

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 11.2 Time Loss of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 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, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,177	3.1%	453	1.7%	1,630	2.5%
Did not require surgery	36,811	96.9%	26,406	98.3%	63,217	97.5%
Total	**37,988**	**100%**	**26,859**	**100%**	**64,847**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 11.3 History of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

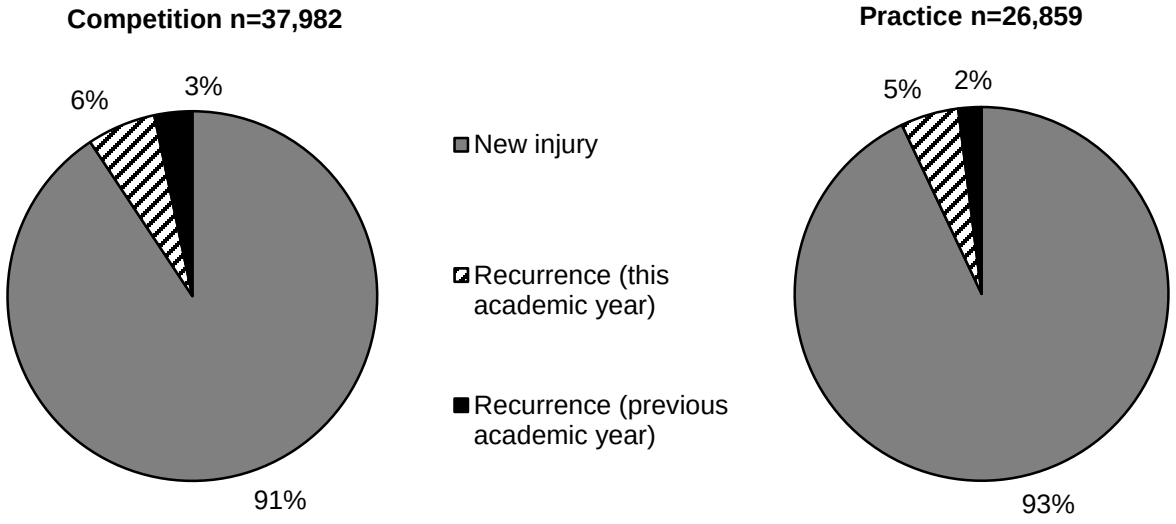


Table 11.6 Time during Season of Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Season		
Preseason	12,957	19.8%
Regular season	50,450	76.9%
Post season	2,165	3.3%
Total	**65,572**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 11.7 Competition-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	2,157	6.0%
First inning	1,870	5.2%
Second inning	5,339	14.8%
Third inning	8,497	23.6%
Fourth inning	6,886	19.1%
Fifth inning	6,279	17.4%
Sixth inning	2,252	6.3%
Seventh inning	2,704	7.5%
Total	**35,984**	**100%**
Field Location		
Home plate	9,233	24.9%
Second base	7,526	20.3%
First base	6,208	16.8%
Third base	4,354	11.8%
Outfield	3,747	10.1%
Pitcher's mound	2,957	8.0%
Foul territory	568	1.5%
Infield	515	1.4%
Other	1,918	5.2%
Total	**37,026**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 11.8 Practice-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	n	%
Time in Practice		
First 1/2 hour	3,208	12.0%
Second 1/2 hour	4,732	17.7%
1-2 hours into practice	17,683	66.3%
>2 hours into practice	1,051	3.9%
Total	**26,675**	**100%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 11.4 Player Position of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

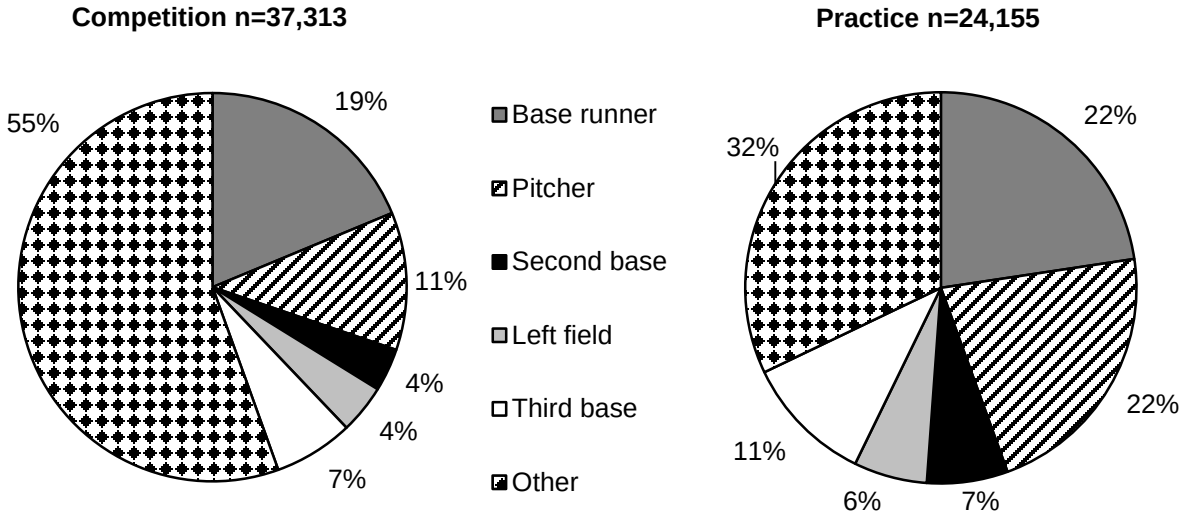


Table 11.9 Activities Leading to Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Running bases	11,771	31.0%	3,264	13.5%	15,035	24.2%
Sliding	4,808	12.7%	2,612	10.8%	7,420	11.9%
Pitching	3,018	7.9%	4,153	17.1%	7,171	11.5%
Fielding a batted ball	4,251	11.2%	2,673	11.0%	6,924	11.1%
Batting	5,204	13.7%	123	0.5%	5,327	8.6%
Throwing (not pitching)	1,667	4.4%	3,564	14.7%	5,231	8.4%
Catching	3,406	9.0%	1,402	5.8%	4,808	7.7%
Fielding a thrown ball	1,231	3.2%	2,618	10.8%	3,849	6.2%
General play	913	2.4%	2,415	10.0%	3,328	5.3%
Other	1,722	4.5%	997	4.1%	2,719	4.4%
Conditioning	0	0.0%	396	1.6%	396	0.6%
Total	**37,991**	**100.0%**	**24,217**	**100.0%**	**62,208**	**100.0%**

* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. 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 11.5 Activity Resulting in Softball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Fielding	3,187	13.8%	2,613	22.7%	2,251	42.0%	1,929	19.3%	794	6.5%
Running	9,840	42.5%	1,449	12.6%	0	0.0%	2,056	20.5%	1,689	13.9%
Catching	413	1.8%	1,207	10.5%	0	0.0%	2,563	25.6%	625	5.1%
Pitching	1,351	5.8%	1,939	16.8%	724	13.5%	0	0.0%	3,156	26.0%
Sliding	3,662	15.8%	0	0.0%	1,510	28.2%	0	0.0%	2,247	18.5%
Other	4,706	20.3%	4,324	37.5%	876	16.3%	3,469	34.6%	3,629	29.9%
Total	**23,159**	**100%**	**11,532**	**100%**	**5,361**	**100%**	**10,017**	**100%**	**12,140**	**100%**

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, 2015-16 School Year

	Boys' soccer	Girls' soccer*	RR (95% CI)†
Total	1.87	**2.59**	**1.39 (1.19, 1.61)**
Competition	3.95	**5.93**	**1.50 (1.25, 1.80)**
Practice	0.91	**1.09**	1.19 (0.91, 1.56)

*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, 2015-16 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Body Site			
Hip/thigh/upper leg	**14.3%**	8.4%	1.71 (0.99, 2.96)
Head/face	28.1%	**34.0%**	1.21 (0.90, 1.63)
Ankle	18.0%	**20.7%**	1.15 (0.77, 1.71)
Knee	14.9%	**19.8%**	1.33 (0.86, 2.06)
Hand/wrist	**4.3%**	1.9%	2.30 (0.79, 6.71)
Foot	**6.7%**	5.0%	1.34 (0.61, 2.93)
Lower leg	**5.5%**	5.2%	1.06 (0.44, 2.51)
Trunk	**3.2%**	1.2%	2.79 (0.74, 10.44)
Arm/elbow	**1.0%**	0.7%	1.54 (0.24, 9.85)
Shoulder	**1.8%**	1.6%	1.13 (0.25, 5.15)
Neck	**0.9%**	0.0%	**27.33 (2.34, 319.26)**
Other	1.1%	**1.4%**	1.25 (0.26, 5.91)
Total	**100%**	**100%**	--

Table 12.3 Comparison of Diagnoses of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Strain/sprain	42.4%	**44.0%**	1.04 (0.83, 1.30)
Contusion	**13.0%**	6.4%	**2.04 (1.11, 3.76)**
Fracture	**6.2%**	2.6%	**2.37 (1.04, 5.40)**
Concussion	22.1%	**33.2%**	**1.50 (1.08, 2.10)**
Other	**16.3%**	13.8%	1.18 (0.74, 1.88)
Total	**100%**	**100%**	--

Table 12.4 Most Common Boys' and Girls' Soccer Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	17.8%	**19.1%**	1.08 (0.72, 1.62)
Head/face concussion	22.1%	**33.2%**	**1.50 (1.08, 2.09)**
Hip/thigh/upper leg strain/sprain	**10.0%**	6.3%	1.58 (0.82, 3.07)
Knee strain/sprain	7.4%	**12.4%**	1.68 (0.90, 3.14)
Knee other	6.2%	**6.6%**	1.07 (0.50, 2.31)

*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, 2015-16 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Time Loss			
1-2 days	**19.0%**	14.0%	1.36 (0.87, 2.14)
3-6 days	**28.1%**	22.9%	1.23 (0.88, 1.72)
7-9 days	11.0%	**11.0%**	1.00 (0.59, 1.70)
10-21 days	17.3%	**27.4%**	**1.58 (1.08, 2.31)**
22 days or more	**6.2%**	5.4%	1.15 (0.54, 2.42)
Other	18.3%	**19.3%**	1.06 (0.70, 1.59)
Total	**100%**	**100%**	---

Table 12.6 Comparison of Mechanisms of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Mechanism			
Contact with another player	**31.3%**	25.0%	1.25 (0.91, 1.71)
Stepped on/fell on/kicked	13.0%	**13.5%**	1.04 (0.62, 1.76)
Rotation around a planted foot/inversion	10.9%	**19.8%**	**1.82 (1.09, 3.06)**
Overuse, heat illness, conditioning, etc.	13.8%	11.0%	1.25 (0.75, 2.11)
Contact with ball	12.1%	**19.8%**	1.64 (0.99, 2.71)
Uneven playing surface	1.5%	**1.9%**	1.31 (0.28, 6.15)
Slide tackle	**4.7%**	1.5%	**3.09 (1.14, 8.38)**
Contact with goal	0.0%	**0.3%**	7.95 (0.77, 82.34)
Other	**12.7%**	7.0%	1.81 (0.94, 3.47)
Total	**100%**	**100%**	---

Table 12.7 Comparison of Activities of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Activity			
General play	**31.2%**	26.7%	1.17 (0.84, 1.62)
Defending	**10.2%**	8.3%	1.23 (0.69, 2.21)
Chasing loose ball	7.7%	**9.1%**	1.18 (0.63, 2.22)
Ball handling/dribbling	**9.8%**	8.4%	1.17 (0.62, 2.22)
Goaltending	4.0%	**10.0%**	**2.49 (1.16, 5.35)**
Shooting (foot)	**5.9%**	4.4%	1.33 (0.55, 3.21)
Heading ball	**13.4%**	9.7%	1.38 (0.80, 2.39)
Passing (foot)	6.6%	**8.7%**	1.31 (0.64, 2.71)
Receiving pass	**6.1%**	5.7%	1.09 (0.50, 2.36)
Conditioning	0.3%	**2.4%**	**7.80 (1.41, 43.29)**
Other	4.8%	**6.6%**	1.38 (0.57, 3.31)
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, 2015-16 School Year

	Boys' basketball	Girls' basketball	RR (95% CI)*
Total	1.48	**2.14**	**1.45 (1.24, 1.68)**
Competition	2.84	**4.17**	**1.47 (1.21, 1.80)**
Practice	0.90	**1.24**	**1.37 (1.09, 1.74)**

Table 12.9 Comparison of Body Sites of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Body Site			
Ankle	**34.7%**	25.5%	**1.36 (1.04, 1.78)**
Knee	13.3%	**20.9%**	**1.57 (1.05, 2.34)**
Head/face	20.5%	**28.7%**	**1.40 (1.02, 1.92)**
Hip/thigh/upper leg	**6.5%**	4.7%	1.39 (0.67, 2.90)
Hand/wrist	**9.8%**	7.9%	1.24 (0.71, 2.16)
Shoulder	1.2%	**2.0%**	1.65 (0.39, 6.88)
Trunk	**3.9%**	1.6%	2.44 (0.86, 6.90)
Lower leg	0.7%	**2.9%**	**4.20 (1.18, 14.97)**
Arm/elbow	**3.1%**	0.1%	**30.23 (3.75, 243.47)**
Foot	**5.2%**	3.2%	1.63 (0.69, 3.87)
Neck	0.0%	**0.5%**	---
Other	1.0%	**2.0%**	1.97 (0.48, 8.16)
Total	**100%**	**100%**	---

Table 12.10 Comparison of Diagnoses of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Strain/sprain	**49.1%**	48.7%	1.01 (0.84, 1.21)
Contusion	**9.7%**	2.8%	**3.42 (1.59, 7.37)**
Fracture	**9.4%**	6.9%	1.37 (0.75, 2.48)
Concussion	17.2%	**26.6%**	**1.55 (1.10, 2.19)**
Other	14.6%	**15.0%**	1.02 (0.67, 1.57)
Total	**100%**	**100%**	---

Table 12.11 Most Common Boys' and Girls' Basketball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	**33.7%**	24.7%	**1.37 (1.04, 1.79)**
Head/face concussion	17.2%	**26.6%**	**1.55 (1.10, 2.19)**
Knee strain/sprain	3.7%	**10.5%**	**2.84 (1.41, 5.72)**
Knee other	6.5%	**8.4%**	1.30 (0.68, 2.49)
Hand/wrist fracture	**5.2%**	3.4%	1.51 (0.65, 3.51)
Hip/thigh/upper leg strain/sprain	**4.8%**	4.6%	1.03 (0.47, 2.28)

*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, 2015-16 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Time Loss			
1-2 days	**20.7%**	19.2%	1.08 (0.76, 1.53)
3-6 days	**23.5%**	16.9%	1.39 (0.98, 1.96)
7-9 days	**18.6%**	14.6%	1.27 (0.86, 1.89)
10-21 days	**21.1%**	20.4%	1.04 (0.74, 1.45)
22 days or more	6.8%	**7.2%**	1.06 (0.55, 2.03)
Other	9.4%	**21.7%**	**2.31 (1.47, 3.65)**
Total	**100%**	**100%**	---

Table 12.13 Comparison of Mechanisms of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Mechanism			
Collision with another player	31.6%	**34.6%**	1.09 (0.85, 1.42)
Jumping/landing	**31.0%**	17.0%	**1.82 (1.29, 2.57)**
Overuse, heat illness, conditioning, etc.	3.7%	**10.5%**	**2.83 (1.42, 5.61)**
Rotation around a planted foot/inversion	11.0%	**11.3%**	1.03 (0.62, 1.69)
Stepped on/fell on/kicked	7.8%	**12.0%**	1.55 (0.86, 2.78)
Contact with ball	2.4%	**6.0%**	**2.52 (1.01, 6.30)**
Other	**12.6%**	8.6%	1.46 (0.85, 2.48)
Total	**100%**	**100%**	---

Table 12.14 Comparison of Activities of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Activity			
Rebounding	**23.6%**	14.2%	**1.67 (1.14, 2.45)**
General play	18.4%	**31.7%**	**1.72 (1.25, 2.38)**
Defending	15.7%	**16.0%**	1.02 (0.67, 1.55)
Chasing loose ball	**14.1%**	13.1%	1.08 (0.67, 1.75)
Shooting	**10.4%**	6.5%	1.61 (0.88, 2.95)
Conditioning	1.4%	**2.3%**	1.69 (0.56, 5.12)
Ball handling/dribbling	4.7%	**8.0%**	1.69 (0.83, 3.45)
Receiving pass	**5.0%**	5.0%	1.02 (0.47, 2.22)
Other	**6.7%**	3.2%	2.05 (0.91, 4.61)
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, 2015-16 School Year

	Baseball	Softball	RR (95% CI)
Total	0.84	**1.30**	**1.56 (1.24, 1.95)**
Competition	1.35	**2.10**	**1.56 (1.16, 2.10)**
Practice	0.56	**0.87**	**1.56 (1.11, 2.20)**

Table 12.16 Comparison of Body Sites of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Baseball	Softball	IPR (95% CI)
Body Site			
Ankle	13.4%	**16.5%**	1.23 (0.64, 2.37)
Knee	3.9%	**11.0%**	2.81 (0.93, 8.44)
Head/face	19.4%	**22.2%**	1.15 (0.67, 1.96)
Hip/thigh/upper leg	8.2%	**9.6%**	1.18 (0.48, 2.92)
Hand/wrist	10.5%	**11.5%**	1.09 (0.50, 2.36)
Shoulder	**15.5%**	7.7%	2.02 (0.96, 4.26)
Trunk	2.2%	**6.5%**	2.89 (0.59, 14.10)
Lower leg	1.6%	**5.8%**	3.68 (0.88, 15.35)
Arm/elbow	**22.9%**	4.5%	**5.08 (1.97, 13.12)**
Foot	1.2%	**1.5%**	1.22 (0.12, 12.21)
Neck	1.1%	**2.2%**	2.04 (0.18, 23.32)
Other	0.1%	**1.1%**	7.81 (0.72, 84.41)
Total	**100%**	**100%**	---

Table 12.17 Comparison of Diagnoses of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Strain/sprain	**41.6%**	36.1%	1.15 (0.82, 1.63)
Contusion	5.1%	**17.6%**	**3.46 (1.43, 8.40)**
Fracture	**18.7%**	8.2%	**2.28 (1.03, 5.06)**
Concussion	11.3%	**16.1%**	1.42 (0.71, 2.84)
Other	**23.3%**	22.1%	1.06 (0.64, 1.75)
Total	**100%**	**100%**	---

Table 12.18 Most Common Baseball and Softball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	8.6%	**15.7%**	1.83 (0.84, 4.00)
Hand/wrist fracture	**6.4%**	4.9%	1.30 (0.39, 4.32)
Head/face concussion	11.3%	**16.1%**	1.42 (0.71, 2.84)
Hip/thigh/upper leg strain/sprain	8.2%	**8.4%**	1.03 (0.41, 2.63)
Shoulder strain/sprain	**6.4%**	3.5%	1.80 (0.58, 5.61)
Arm/elbow strain/sprain	**10.2%**	1.3%	**7.72 (2.08, 28.67)**
Knee other	1.5%	**5.4%**	3.71 (0.70, 19.78)

*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, 2015-16 School Year

	Baseball	Softball	IPR (95% CI)
Time Loss			
1-2 days	16.1%	**23.0%**	1.42 (0.79, 2.57)
3-6 days	**30.3%**	22.9%	1.33 (0.84, 2.11)
7-9 days	10.5%	**14.4%**	1.36 (0.68, 2.71)
10-21 days	13.4%	**14.4%**	1.07 (0.54, 2.13)
22 days or more	**9.4%**	7.4%	1.27 (0.51, 3.18)
Other	**20.2%**	18.0%	1.12 (0.65, 1.93)
Total	**100%**	**100%**	---

Table 12.20 Comparison of Mechanisms of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Mechanism			
Overuse, heat illness, conditioning, etc.	**12.6%**	10.0%	1.26 (0.58, 2.73)
Contact with another player	**13.8%**	6.7%	2.05 (0.89, 4.73)
Contact with bases	8.3%	**19.3%**	**2.32 (1.08, 5.01)**
Throwing - not pitching	**6.5%**	5.6%	1.16 (0.42, 3.19)
Throwing - pitching	**21.4%**	4.7%	**4.58 (1.78, 11.83)**
Contact with thrown ball (non-pitch)	4.2%	**13.7%**	**3.24 (1.20, 8.76)**
Rotation around a planted foot/inversion	4.0%	**6.6%**	1.67 (0.55, 5.08)
Hit by batted ball	5.9%	**9.2%**	1.56 (0.58, 4.19)
Hit by pitch	6.3%	**10.1%**	1.61 (0.57, 4.55)
Other	**17.0%**	14.0%	1.21 (0.62, 2.37)
Total	**100%**	**100%**	---

Table 12.21 Comparison of Activities of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2015-16 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Activity			
Fielding a batted ball	**17.2%**	11.1%	1.54 (0.77, 3.08)
Fielding a thrown ball	3.5%	**6.2%**	1.78 (0.54, 5.87)
Running bases	13.5%	**24.2%**	1.79 (0.94, 3.41)
Pitching	**26.3%**	11.5%	**2.28 (1.21, 4.32)**
Batting	**11.4%**	8.6%	1.34 (0.56, 3.20)
Sliding	5.2%	**11.9%**	2.30 (0.90, 5.89)
Throwing (not pitching)	**9.8%**	8.4%	1.17 (0.52, 2.63)
General play	**8.7%**	5.4%	1.62 (0.55, 4.80)
Conditioning	0.2%	**0.6%**	4.13 (0.36, 46.89)
Catching	0.6%	**7.7%**	**14.03 (1.78, 110.67)**
Other	3.7%	**4.4%**	1.17 (0.31, 4.44)
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, 2005/06-2015/16 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	p-value for trend*
Overall total	2.51	2.59	2.31	2.01	2.10	1.97	2.17	2.16	2.18	2.13	2.32	0.18
Competition	4.63	4.88	4.45	4.05	4.19	4.10	4.26	4.31	4.22	4.40	4.74	0.63
Practice	1.69	1.75	1.52	1.26	1.32	1.16	1.40	1.34	1.39	1.28	1.39	0.05
Boys' football total	4.36	4.45	4.18	3.50	3.81	3.50	3.78	3.87	3.74	3.73	4.08	0.15
Competition	12.09	13.50	12.80	11.26	12.95	12.30	12.41	12.53	11.38	11.97	12.68	0.46
Practice	2.54	2.68	2.47	1.92	2.06	1.74	2.16	2.08	2.15	2.06	2.18	0.10
Boys' soccer total	**2.43**	**2.27**	**1.75**	**1.62**	**1.75**	**1.56**	**1.64**	**1.52**	**1.62**	**1.60**	**1.87**	**0.04**
Competition	4.22	4.31	3.63	3.43	3.39	3.08	3.47	3.28	3.40	3.43	3.95	0.17
Practice	**1.58**	**1.45**	**0.96**	**0.87**	**1.04**	**0.90**	**0.90**	**0.78**	**0.82**	**0.78**	**0.91**	**0.006**
Girls' soccer total	2.36	2.51	2.35	2.07	2.00	1.93	2.42	2.29	2.47	2.64	2.59	0.27
Competition	5.21	5.43	5.15	4.59	4.67	4.13	5.68	5.54	5.72	6.11	5.93	0.09
Practice	1.10	1.31	1.16	1.00	0.85	0.93	1.09	0.92	1.04	1.09	1.09	0.39
Girls' volleyball total	1.64	1.37	1.22	0.89	0.99	0.96	1.00	0.89	0.99	1.11	1.19	0.10
Competition	1.92	1.40	1.43	0.90	1.00	1.18	1.27	1.08	1.15	1.39	1.52	0.48
Practice	**1.48**	**1.36**	**1.12**	**0.88**	**0.99**	**0.85**	**0.85**	**0.78**	**0.91**	**0.97**	**1.02**	**0.03**
Boys' basketball total	**1.89**	**1.75**	**1.39**	**1.35**	**1.45**	**1.34**	**1.40**	**1.47**	**1.45**	**1.08**	**1.48**	**0.04**
Competition	2.98	2.87	2.23	2.32	2.72	2.30	2.60	2.44	2.40	1.98	2.84	0.29
Practice	**1.46**	**1.28**	**1.04**	**0.95**	**0.92**	**0.91**	**0.91**	**1.04**	**1.02**	**0.68**	**0.90**	**0.009**

Girls' basketball total	2.01	2.09	1.61	1.54	1.58	1.73	1.57	1.83	1.88	1.65	2.14	0.91
Competition	3.6	3.6	3.3	3.13	2.84	3.59	3.03	3.13	3.66	3.27	4.17	0.51
Practice	1.37	1.44	0.9	0.87	1.02	0.92	0.98	1.24	1.08	0.94	1.24	0.53
Boys' wrestling total	2.50	2.51	2.27	2.17	1.98	2.01	2.50	2.33	2.48	2.12	2.23	0.52
Competition	3.93	3.80	3.70	3.35	3.09	3.32	3.56	3.54	3.95	3.76	3.43	0.73
Practice	2.04	2.06	1.76	1.75	1.56	1.55	2.10	1.88	1.95	1.61	1.83	0.51
Boys' baseball total	1.19	1.25	0.93	0.78	0.82	0.81	0.83	0.88	1.01	0.94	0.84	0.13
Competition	1.77	2.01	1.37	1.32	1.27	1.49	1.14	1.30	1.68	1.67	1.35	0.35
Practice	0.87	0.82	0.68	0.48	0.57	0.46	0.65	0.66	0.63	0.55	0.56	0.08
Girls' softball total	1.13	1.11	1.29	1.04	1.12	0.94	1.46	1.15	0.99	1.00	1.30	0.97
Competition	1.78	1.96	1.86	1.62	1.66	1.45	2.04	1.96	1.09	1.67	2.10	0.81
Practice	0.79	0.65	0.98	0.72	0.85	0.69	1.16	0.73	0.93	0.65	0.87	0.75

*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, 2005/06-2015/16 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Overall total	**1,442,533**	**1,472,849**	**1,419,723**	**1,248,126**	**1,359,897**	**1,195,815**	**1,392,262**	**1,361,986**	**1,427,315**	**1,196,479**	**1,393,566**
Competition	**759,334**	**766,512**	**763,034**	**690,525**	**754,091**	**711,642**	**740,493**	**779,055**	**790,966**	**708,150**	**801,156**
Practice	**683,199**	**706,337**	**656,689**	**557,601**	**605,805**	**484,173**	**651,769**	**582,931**	**636,349**	**488,329**	**592,410**
Boys' football total	516,150	574,367	616,665	527,321	581,414	483,016	559,064	616,209	624,470	529,483	568,789
Competition	280,919	292,316	311,780	288,637	322,801	296,199	287,710	344,097	324,354	286,421	316,308
Practice	235,231	282,051	304,885	238,684	258,614	186,817	271,354	272,112	300,116	243,062	252,481
Boys' soccer total	218,760	171,874	159,351	149,229	153,485	138,974	172,070	149,049	149,278	133,919	174,811
Competition	119,703	93,295	99,785	87,082	83,985	81,238	97,540	89,429	90,683	89,091	111,720
Practice	99,058	78,579	59,566	62,147	69,500	57,736	74,530	59,620	58,595	44,828	63,091
Girls' soccer total	185,770	230,769	215,850	192,108	181,159	180,254	222,679	190,382	227,172	217,546	209,027
Competition	122,803	149,231	146,102	123,312	129,754	124,674	145,469	141,339	167,975	158,078	142,722
Practice	62,967	81,538	69,748	68,796	51,405	55,580	77,210	49,043	59,197	59,468	66,305
Girls' volleyball total	81,813	80,493	72,261	56,609	67,760	50,711	52,662	44,064	45,144	46,807	58,127
Competition	32,677	27,423	26,539	19,764	21,728	21,416	24,439	19,150	16,430	19,373	25,300
Practice	49,136	53,069	45,722	36,845	46,032	29,295	28,223	24,914	28,714	27,434	32,827

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Table 13.2 Nationally Estimated Number of Injuries by Sport, Type of Exposure, and Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2015/16 School Years (continued)

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Boys' basketball total	100,058	96,670	82,612	79,230	85,063	79,762	75,872	85,819	84,455	55,980	81,240
Competition	44,826	46,109	36,766	40,152	46,787	41,252	41,978	44,095	42,504	32,534	45,596
Practice	55,232	50,561	45,846	39,078	38,276	38,510	33,894	41,724	41,951	23,446	35,644
Girls' basketball total	103,566	102,831	73,283	64,933	78,709	83,033	67,280	83,107	89,451	64,491	99,598
Competition	53,812	53,703	45,236	38,277	44,026	53,931	37,213	45,645	50,864	38,803	56,786
Practice	49,753	49,128	28,047	26,656	34,684	29,102	30,067	37,462	38,587	25,688	42,812
Boys' wrestling total	105,542	101,139	91,625	88,996	80,390	80,569	107,992	85,485	91,203	60,253	91,642
Competition	36,259	38,750	40,698	39,029	37,742	36536	40,235	35,016	39,378	32,728	38,430
Practice	69,283	62,389	50,927	49,967	42,647	44,033	67,757	50,469	51,825	27,525	53,212
Boys' baseball total	67,560	60,296	44,760	39,869	64,053	46,796	43,590	49,747	62,493	44,208	44,760
Competition	33,639	33,494	22,803	25,584	36,502	29,789	20,818	24,807	37,682	27,129	25,581
Practice	33,922	26,802	21,957	14,285	27,551	17,008	22,772	24,940	24,811	17,079	19,179
Girls' softball total	63,313	54,411	63,316	49,831	67,862	52,700	91,053	58,124	53,649	43,792	65,572
Competition	34,696	32,191	33,325	28,688	30,767	26,607	45,091	35,477	21,096	23,993	38,713
Practice	28,618	22,220	29,991	21,143	37,096	26,093	45,962	22,647	32,553	19,799	26,859

Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2015/16 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	2011-12 n=1,391,577	2012-13 n=1,361,584	2013-14 n=1,427,315	2014-15 n=1,196,398	2015-16 N=1,393,565
Body Site											
Ankle	22.7%	19.8%	18.5%	16.4%	17.5%	17.7%	16.1%	15.5%	16.9%	15.1%	16.6%
Knee	14.2%	16.6%	14.6%	14.8%	15.7%	14.2%	13.4%	14.8%	14.4%	13.7%	14.9%
Head/face	12.3%	12.4%	12.4%	15.3%	17.2%	23.3%	25.1%	25.7%	25.3%	27.4%	27.3%
Hip/thigh/ upper leg	10.8%	10.5%	10.2%	10.3%	9.2%	8.3%	9.8%	9.5%	8.7%	9.0%	8.0%
Shoulder	7.9%	8.0%	10.1%	9.3%	8.4%	7.0%	6.6%	6.5%	8.5%	7.2%	6.8%
Hand/wrist	8.0%	7.5%	9.1%	8.5%	10.3%	8.9%	8.5%	7.4%	7.8%	7.4%	7.8%
Trunk	6.2%	6.7%	6.5%	6.6%	5.8%	4.7%	4.9%	5.2%	4.1%	4.3%	4.0%
Lower leg	4.6%	5.2%	5.7%	5.8%	4.7%	5.0%	4.5%	3.9%	4.9%	4.0%	4.3%
Arm/elbow	4.1%	3.9%	4.6%	4.1%	4.0%	3.1%	4.0%	3.5%	3.1%	3.7%	3.4%
Foot	4.0%	4.0%	4.2%	5.0%	4.1%	4.0%	3.4%	3.2%	2.8%	3.9%	3.6%
Neck	2.2%	1.9%	1.8%	1.9%	1.9%	1.8%	1.7%	2.3%	1.2%	1.9%	1.3%
Other	3.2%	3.6%	2.4%	2.1%	1.2%	2.1%	2.0%	2.5%	2.4%	2.5%	2.1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**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, 2005/06-2015/16 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	2011-12 n=1,392,262	2012-13 n=1,360,701	2013-14 n=1,427,315	2014-15 n=1,194,932	2015-16 n=1,391,729
Diagnosis											
Strain/sprain	52.0%	48.2%	48.3%	45.7%	44.7%	43.2%	42.2%	42.3%	41.7%	39.8%	40.4%
Contusion	12.2%	13.7%	12.4%	11.5%	14.0%	9.6%	10.8%	10.6%	9.4%	9.3%	9.2%
Fracture	9.8%	8.9%	10.2%	10.9%	9.9%	10.2%	7.7%	7.8%	7.6%	9.4%	8.6%
Concussion	9.1%	8.4%	9.2%	11.8%	14.0%	20.0%	22.2%	23.1%	21.9%	24.6%	24.6%
Other	16.8%	20.9%	19.9%	20.2%	17.5%	17.0%	17.1%	16.2%	19.4%	16.9%	17.1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 13.5 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2015/16 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	2011-12 n=1,388,873	2012-13 n=1,360,303	2013-14 n=1,426,018	2014-15 n=1,194,848	2015-16 n=1,391,729
Diagnosis											
Ankle strain/sprain	20.6%	17.8%	17.3%	15.0%	16.0%	16.3%	14.7%	14.5%	15.6%	14.2%	15.7%
Head/face concussion	9.0%	8.4%	9.2%	11.7%	13.9%	20.0%	22.2%	23.1%	21.9%	24.5%	24.6%
Knee strain/sprain	7.6%	8.8%	7.8%	7.9%	8.0%	7.7%	7.6%	8.2%	7.8%	7.3%	8.1%
Hip/thigh/upper leg strain/sprain	7.9%	7.7%	7.3%	7.7%	6.5%	6.4%	6.9%	6.7%	6.6%	6.9%	5.7%
Knee other	4.3%	4.9%	4.7%	4.5%	5.2%	4.8%	3.9%	4.1%	4.7%	4.5%	5.2%
Shoulder other	3.1%	3.7%	4.1%	4.0%	3.3%	3.7%	3.1%	3.4%	4.6%	4.0%	3.3%
Hand/wrist fracture	3.2%	3.3%	4.0%	4.0%	4.2%	4.0%	3.7%	3.2%	3.3%	3.5%	3.6%
Shoulder strain/sprain	3.4%	2.9%	3.4%	3.7%	3.3%	2.2%	2.9%	2.6%	3.3%	2.6%	2.9%
Trunk strain/sprain	2.8%	2.7%	3.2%	2.8%	2.5%	2.4%	1.9%	2.3%	1.7%	1.9%	1.5%
Hand/wrist strain/sprain	3.1%	2.5%	3.8%	2.9%	2.8%	2.8%	3.0%	2.5%	2.8%	1.9%	2.5%

Table 13.6 Time Loss of Injuries by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2015/16 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	2011-12 n=1,392,262	2012-13 n=1,361,986	2013-14 n=1,427,312	2014-15 n=1,196,479	2015-16 n=1,393,565
Time Loss											
1-2 days	22.5%	26.6%	22.8%	13.7%	14.7%	12.8%	15.9%	12.6%	14.9%	11.0%	16.3%
3-6 days	30.0%	28.5%	28.8%	28.5%	27.3%	25.2%	23.3%	23.6%	21.8%	22.0%	21.9%
7-9 days	15.3%	14.7%	15.8%	17.7%	16.1%	16.7%	16.1%	16.3%	16.7%	15.6%	12.9%
10-21 days	14.9%	14.1%	16.7%	19.7%	16.9%	19.2%	19.6%	21.3%	21.1%	22.1%	21.1%
≥22 days or other	17.2%	16.1%	15.9%	20.3%	25.0%	26.1%	25.0%	26.2%	25.5%	29.3%	27.8%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 13.7 Injuries Requiring Surgery by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2015/16 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	2011-12 n=1,392,262	2012-13 n=1,337,403	2013-14 n=1,407,594	2014-15 n=1,186,938	2015-16 n=1,380,731
Required surgery	5.3%	6.4%	6.1%	6.7%	8.0%	8.2%	6.7%	7.3%	7.6%	7.3%	6.1%
Did not require surgery	94.7%	93.6%	93.9%	93.3%	92.0%	91.8%	93.3%	92.7%	92.4%	92.7%	93.9%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

XIV. Reporter Demographics & Compliance

During the 2015-16 school year, 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, 99 enrolled ATs reported an average of 43 study weeks. The majority of ATs (94.9%) reported all the weeks during which they were enrolled, with only 1 ATs (1.0%) missing over 10 weeks. Internal validity checks during the 2014-15 academic year yielded 90.9% sensitivity, 98.4% specificity, a positive predictive value of 95.2%, and a negative predictive value of 96.9%. Internal validity checks are completed every other year, so the next will occur using data from the 2016-17 academic year.

Prior to the start of the 2015-16 High School RIO™ study, participating ATs were asked to complete a short demographics survey. Over three-quarters (86.0%) of participating high schools were public schools, with the remainder being private. All ATs except for 1 provided services to athletes of their high school on 5 or more days each week. Over 95% of ATs participating during the 2015-16 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 including those ATs who did not report any data) the opportunity to provide feedback on their experiences with High School RIO™. This survey was completed by 132 ATs (65.0%). Average reporting time burdens were 23 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 (56.8%) or somewhat easy (37.9%) to use (5 and 4 on the Likert scale, respectively), with ATs being either very satisfied (62.1%) or somewhat satisfied (26.5%) 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 2016-17 school year.

XV. 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.