SUMMARY REPORT

NATIONAL HIGH SCHOOL SPORTS-RELATED INJURY SURVEILLANCE STUDY

2018-2019 School Year

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Acknowledgements

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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 over 7.9 million in 2018-19. 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 National Federation of State High School Associations (NFHS), the National High School Sports-Related Injury Surveillance System was able to be continued during the 2018-19 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 2017-18 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. Due to lower participation this year, strata were first filled with schools reporting for all 9 sports followed by schools reporting for 5 or more sports. Strata were then filled with schools reporting for any one of the 9 original sports in an attempt to have 100 schools reporting for each of the 9 original sports to ensure equal distribution of schools between the 8 strata. Participating ATs were offered a $200-$300 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 49 weekly exposure reports: one for each week from July 23, 2018 through June 2, 2019. 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 24.0. Although fractures, concussions, and dental injuries resulting in <1 day time loss were collected, unless otherwise noted, analyses in this report excluded these injuries. With the exception of injury rates, data were weighted for all analyses to produce national estimates. For each sport in each stratum, weights account for the total number of US schools offering the sport and the average number of participating study schools reporting each week for that sport. For example,

following is the algorithm used to calculate football weights for the small (enrollment ≤ 1,000) west stratum:

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

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, 2018-19 School Year*

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Overall total	3,969	1,732,499	2.29	1,307,414
Competition	2,257	489,701	4.61	748,085
Practice	1,712	1,242,798	1.38	559,329
Boys' football total	1,612	419,137	3.85	455,449
Competition	927	76,646	12.10	259,317
Practice	685	342,491	2.00	196,132
Boys' soccer total	351	191,873	1.83	184,656
Competition	229	59,301	3.86	120,217
Practice	122	132,572	0.92	64,439
Girls' soccer total	448	165,009	2.72	227,951
Competition	297	52,129	5.70	140,542
Practice	151	112,880	1.34	87,409
Girls' volleyball total	217	161,504	1.34	59,370
Competition	83	52,504	1.58	23,045
Practice	134	109,000	1.23	36,325
Boys' basketball total	342	212,605	1.61	87,521
Competition	196	63,448	3.09	48,318
Practice	146	149,157	0.98	39,203
Girls' basketball total	300	153,930	1.95	82,383
Competition	170	46,803	3.63	48,080
Practice	130	107,127	1.21	34,303
Boys' wrestling total	357	141,948	2.52	91,176
Competition	163	36,508	4.46	44,433
Practice	194	105,440	1.84	46,743
Boys' baseball total	175	169,591	1.03	52,889
Competition	101	60,878	1.66	30,158
Practice	74	108,713	0.68	22,731
Girls' softball total	167	116,902	1.43	66,019
Competition	91	41,484	2.19	33,975
Practice	76	75,418	1.01	32,044

*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, 2018-19 School Year*

	≥1 days time loss	<1 day time loss	Time loss data missing	Total
Overall	93.6%	1.8%	4.7%	**100%**
Boys' football	92.6%	2.8%	4.7%	**100%**
Boys' soccer	93.1%	1.6%	5.3%	**100%**
Girls' soccer	94.3%	1.9%	3.8%	**100%**
Girls' volleyball	96.4%	0.9%	2.7%	**100%**
Boys' basketball	94.0%	0.3%	5.8%	**100%**
Girls' basketball	91.5%	1.2%	7.3%	**100%**
Boys' wrestling	93.9%	0.5%	5.5%	**100%**
Boys' baseball	97.2%	1.1%	1.7%	**100%**
Girls' softball	97.1%	0.6%	2.3%	**100%**

*By study definition, non-time loss injuries were fractures, concussions, dental injuries, and exertional heat events that resulted in <1 day time loss. Because they accounted for <2.0% 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, 2018-19 School Year*

	Male n= 804,828	**Female n= 400,346**
Year in School		
Freshman	21.0%	28.4%
Sophomore	24.5%	24.3%
Junior	26.3%	24.4%
Senior	28.2%	22.9%
Total†	**100.0%**	**100.0%**
Age (years)		
Minimum	12	12
Maximum	19	19
Mean (St. Dev.)	15.9 (1.3)	15.7 (1.3)
BMI		
Minimum	14.8	15.5
Maximum	56.7	42.9
Mean (St. Dev.)	24.9 (5.2)	22.5 (3.5)

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

Figure 2.1 Injury Diagnosis by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

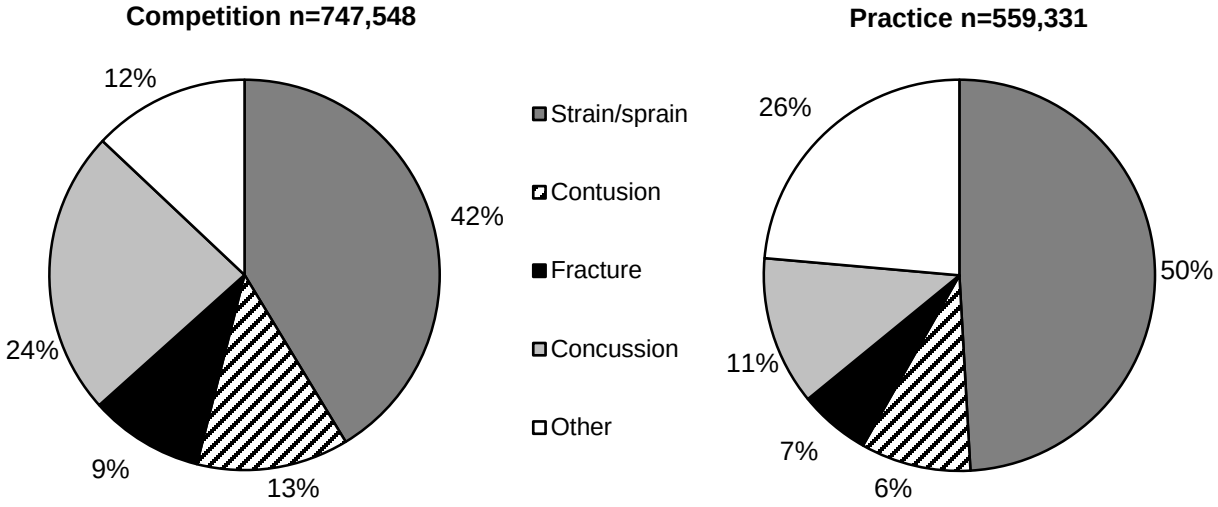


Table 2.4 Body Site of Injury by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	199,993	26.8%	79,018	14.1%	279,011	21.4%
Ankle	146,466	19.6%	92,320	16.5%	238,786	18.3%
Knee	103,469	13.8%	77,404	13.8%	180,873	13.8%
Hip/thigh/upper leg	55,565	7.4%	73,627	13.2%	129,192	9.9%
Hand/wrist	58,669	7.8%	41,770	8.0%	103,439	7.9%
Shoulder	52,685	7.0%	47,859	8.6%	100,544	7.7%
Trunk	27,548	3.7%	47,336	8.5%	74,884	5.7%
Lower leg	24,586	3.3%	30,593	5.5%	55,179	4.2%
Foot	22,882	3.1%	27.772	5.0%	50.654	3.9%
Arm/elbow	25,423	3.4%	20,766	3.7%	46,189	3.5%
Neck	12,303	1.6%	6,792	1.2%	19,095	1.5%
Other	17,833	2.4%	11,074	2.0%	28,907	2.2%
Total	**747,422**	**100.0%**	**559,331**	**100.0%**	**1,306,753**	**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, 2018-19 School Year*

	Male		Female		Total	
	n	% of Ankle Injuries	n	% of Ankle Injuries	n	% of Ankle Injuries
Ankle Ligament Injuries						
Anterior talofibular ligament	91,872	70.1%	68,734	71.6%	160,606	70.7%
Calcaneofibular ligament	41,496	31.7%	33,849	35.3%	75,345	33.2%
Anterior tibiofibular ligament	25,092	19.1%	14,931	15.6%	40,023	17.6%
Posterior talofibular ligament	17,181	13.1%	15,479	16.1%	32,660	14.4%
Deltoid ligament	11,012	8.4%	6,124	6.4%	17,136	7.5%
Posterior tibiofibular ligament	6,440	4.9%	5,890	6.1%	12,330	5.4%
Total Ankle Injuries	**131,052**		**96,000**		**227,052**	

*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, 2018-19 School Year*

	Male		Female		Total	
	n	% of Knee Injuries	n	% of Knee Injuries	n	% of Knee Injuries
Knee Ligament Injuries						
Medial collateral ligament	34,408	30.7%	13,164	21.8%	47,572	27.6%
Torn cartilage (meniscus)	24,143	21.5%	12,938	21.4%	37,081	21.5%
Anterior cruciate ligament	22,915	20.5%	14,085	23.3%	37,000	21.5%
Patella and/or patellar tendon	18,945	16.9%	17,957	29.7%	36,902	21.4%
Lateral collateral ligament	6,896	6.2%	2,631	4.4%	9,527	5.5%
Posterior cruciate ligament	2,907	2.6%	2,538	4.2%	5,445	3.2%
Total Knee Injuries	**112,035**		**60,453**		**172,488**	

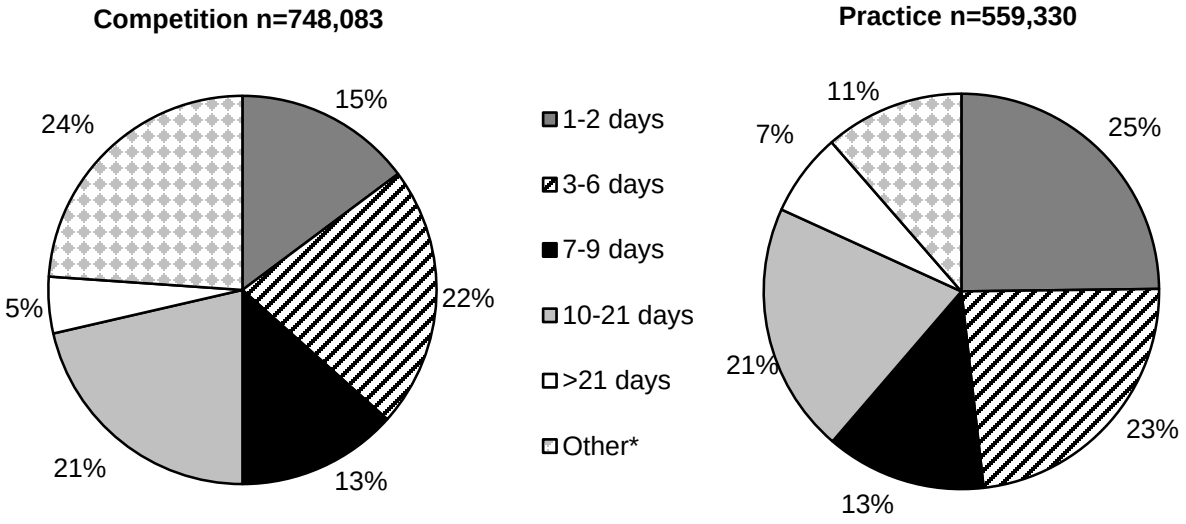
*Multiple ligament responses allowed per injury report. Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 2.7 Ten Most Common Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=746,890		Practice n=559,331		Overall n= 1,306,221	
	N	%	n	%	n	%
Diagnosis						
Head/face concussion	176,913	23.7%	68,983	12.3%	254,896	19.5%
Ankle strain/sprain	129,897	17.4%	81,472	14.6%	211,369	16.2%
Knee strain/sprain	62,185	8.3%	32,169	5.8%	94,354	7.2%
Hip/thigh/upper leg strain/sprain	34,554	4.6%	59,173	10.6%	93,727	7.2%
Knee other	27,183	3.6%	36,270	6.5%	63,453	4.9%
Shoulder strain/sprain	25,286	3.4%	21,972	3.9%	47,258	3.6%
Hand/wrist fracture	30,552	4.1%	14,695	2.6%	45,247	3.5%
Shoulder other	22,682	3.0%	21,681	3.9%	44,363	3.4%
Trunk strain/sprain	10,174	1.4%	31,668	5.7%	41,842	3.2%
Hand/wrist strain/sprain	14,128	1.9%	20,247	3.6%	34,375	2.6%

* 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, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	56,223	7.7%	25,900	4.7%	82,123	6.4%
Did not require surgery	677,543	92.3%	529,347	95.3%	1,206,890	93.6%
Total*	**733,766**	**100.0%**	**555,247**	**100.0%**	**1,289,013**	**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, 2018-19 School Year

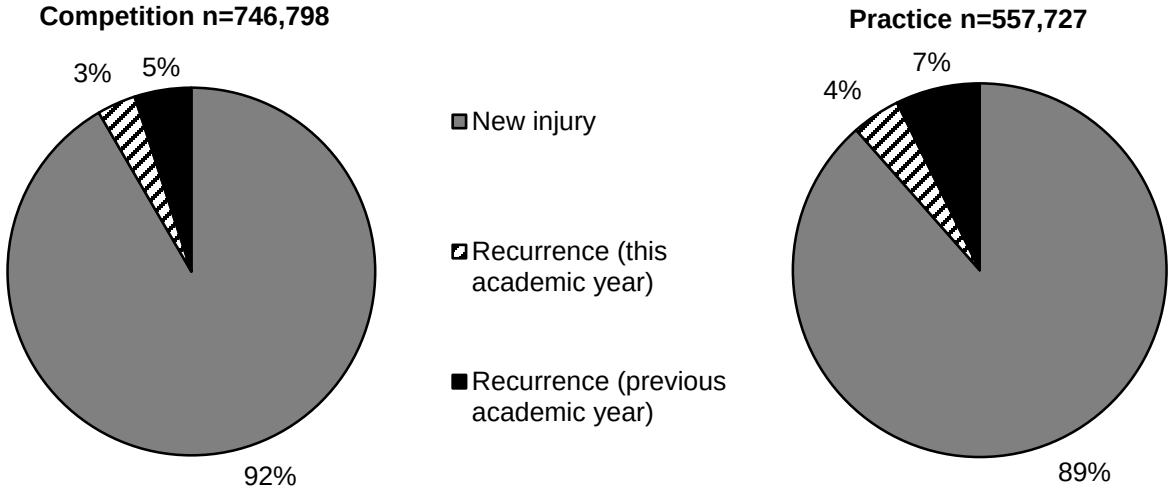


Table 2.9 Time during Season of Injury, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	265,672	20.4%
Regular season	970,650	74.4%
Post season	60,945	4.7%
Unknown/Other	6,734	0.5%
Total	**1,304,001**	**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. Unknown was selected in 0.3% of injuries.

Table 2.10 Practice-Related Variables, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First ½ hour	49,068	9.0%
Second ½ hour	76,161	14.0%
1-2 hours into practice	246,513	45.4%
>2 hours into practice	18,526	3.4%
Unknown	153,199	28.2%
Total	**543,467**	**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, 2018-19 School Year

	n	%
Injuries Evaluated by:*		
Certified athletic trainer	1,204,030	92.1%
General physician	265,647	20.3%
Orthopedic physician	250,711	19.2%
Physician's assistant	13,202	1.0%
Chiropractor	10,252	0.8%
Neurologist/neuropsychologist	9,001	0.7%
Nurse practitioner	5,559	0.4%
Dentist/oral surgeon	1,831	0.1%
Other	24,676	1.9%
Total	**1,307,413**	
Injuries Assessed by:*		
Evaluation	1,283,248	98.2%
X-ray	453,839	34.7%
MRI	135,877	10.4%
CT-scan	25,526	2.0%
Blood work/lab test	12,926	1.0%
Other	7,125	0.5%
Total	**1,307,413**	

*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, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**1,612**	**419,137**	**3.85**	**455,449**
Competition	927	76,646	12.10	**259,317**
Practice	685	342,491	2.00	**196,132**

Table 3.2 Demographic Characteristics of Injured Football Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=439,182**
Freshman	22.1%
Sophomore	24.0%
Junior	24.5%
Senior	29.3%
Total†	**100.0%**
Age (years)	**n=336,440**
Minimum	12
Maximum	19
Mean (St. Dev.)	15.8 (1.3)
BMI	**n=256,272**
Minimum	16.0
Maximum	55.7
Mean (St. Dev.)	26.0 (5.8)

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

Figure 3.1 Diagnosis of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

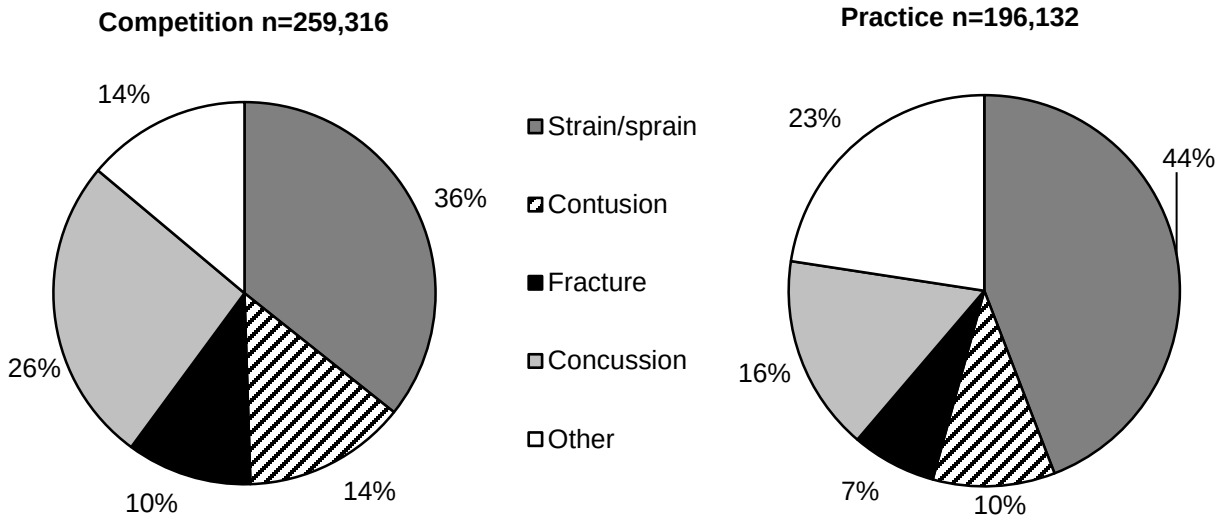


Table 3.3 Body Site of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	**%**	**n**	**%**	**n**	**%**
Body Site						
Head/face	69,646	26.9%	34,148	17.4%	103,794	22.8%
Knee	36,889	14.2%	26,597	13.6%	63,486	14.0%
Ankle	39,517	15.3%	23,855	12.2%	63,372	13.9%
Shoulder	28,796	11.1%	19,812	10.1%	48,608	10.7%
Hand/wrist	22,331	8.6%	18,687	9.5%	41,018	9.0%
Hip/thigh/upper leg	15,172	5.9%	23,858	12.2%	39,030	8.6%
Trunk	9,259	3.6%	15,897	8.1%	25,156	5.5%
Lower leg	6,991	2.7%	8,604	4.4%	15,595	3.4%
Arm/elbow	7,270	2.8%	7,253	3.7%	14,523	3.2%
Foot	7,145	2.8%	6,197	3.2%	13,342	2.9%
Neck	4,534	1.8%	3,397	1.7%	7,931	1.7%
Other	11,349	4.4%	7,827	4.0%	19,176	4.2%
Total	**258,899**	**100.0%**	**196,132**	**100.0%**	**455,031**	**100.0%**

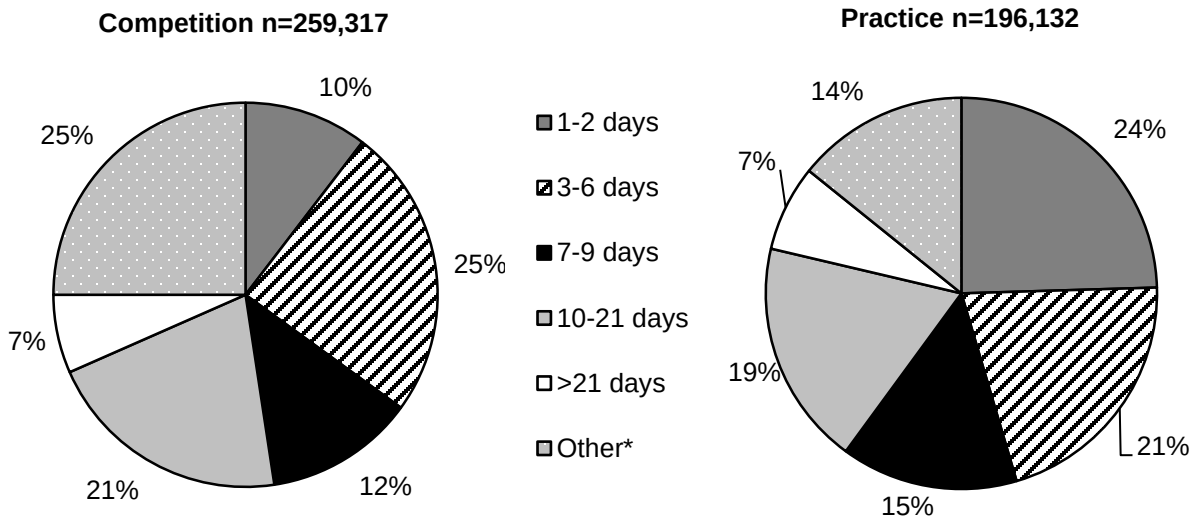
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 3.4 Ten Most Common Football Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=258,895		Practice n=196,130		Total n=455,025	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	67,334	26.0%	31,702	16.2%	99,036	21.7%
Ankle strain/sprain	33,488	12.9%	21,130	10.8%	54,618	12.0%
Knee strain/sprain	25,491	9.8%	10,475	5.3%	35,966	7.9%
Hip/thigh/upper leg strain/sprain	5,727	2.2%	19,818	10.1%	25,545	5.6%
Shoulder other	12,775	4.9%	10,793	5.5%	23,568	5.2%
Shoulder strain/sprain	13,107	5.1%	5,467	2.8%	18,574	4.1%
Knee other	6,811	2.6%	10,850	5.5%	17,661	3.9%
Hand/wrist fracture	11,217	4.3%	5,686	2.9%	16,903	3.7%
Trunk strain/sprain	2,022	0.8%	11,223	5.7%	13,245	2.9%
Hand/wrist strain/sprain	3,514	1.4%	9,166	4.7%	12,680	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 3.2 Time Loss of Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	20,608	8.1%	14,090	7.2%	34,698	7.7%
Did not require surgery	233,564	91.9%	180,764	92.8%	414,328	92.3%
Total	**254,172**	**100.0%**	**194,854**	**100.0%**	**449,026**	**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, 2018-19 School Year

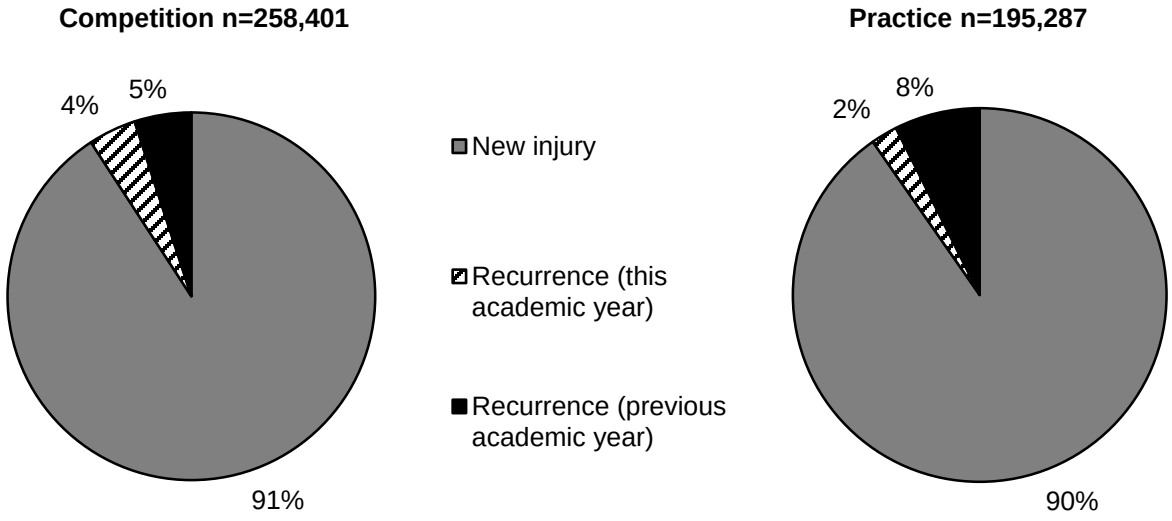


Table 3.6 Time during Season of Football Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	102,800	22.6%
Regular season	332,349	73.0%
Post season	14,368	3.2%
Unknown/Other	5,692	1.3%
Total	**455,209**	**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, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	3,750	1.6%
First quarter	25,204	10.7%
Second quarter	70,272	29.9%
Third quarter	70,299	29.9%
Fourth quarter	65,098	27.7%
Overtime	365	0.2%
Total	**234,988**	**100.0%**
Field Location		
Between the 20 yard lines	131,601	54.2%
Red zone (20 yard line to goal line)	37,614	15.5%
End zone	3,360	1.4%
Off the field	2,634	1.1%
Unknown	67,471	27.8%
Total	**242,680**	**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, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	14,470	7.6%
Second 1/2 hour	28,424	14.9%
1-2 hours into practice	96,845	50.8%
>2 hours into practice	8,688	4.6%
Unknown	42,337	22.2%
Total	**190,764**	**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, 2018-19 School Year

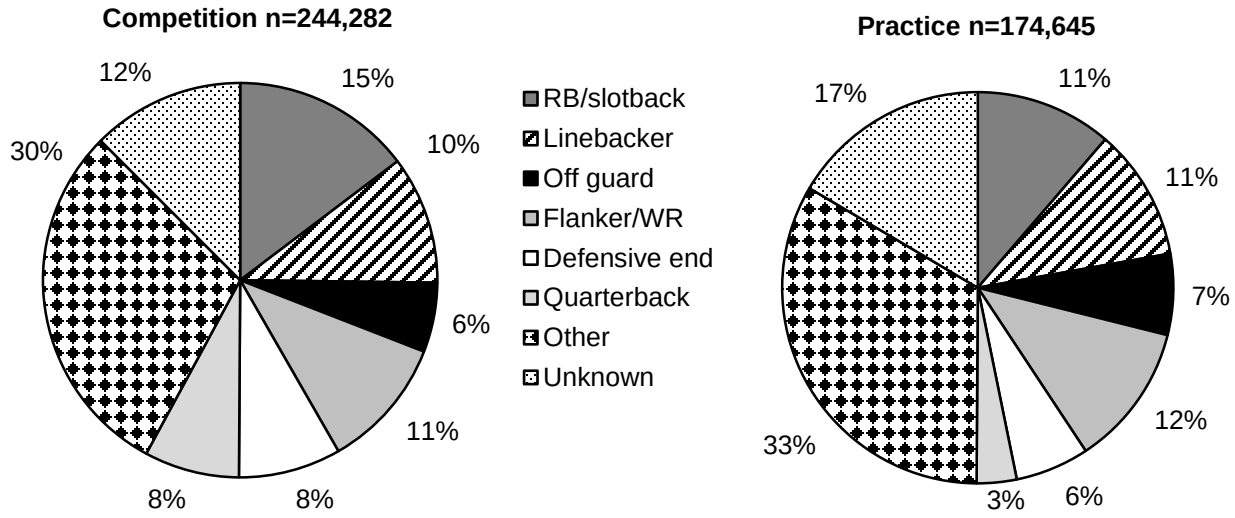


Table 3.9 Activities Leading to Football Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Being tackled	74,126	30.3%	29,462	16.7%	103,588	24.6%
Tackling	55,462	22.7%	30,970	17.5%	86,432	20.5%
Blocking	34,311	14.0%	24,579	13.9%	58,890	14.0%
Being blocked	20,296	8.3%	16,839	9.5%	37,135	8.8%
N/a (e.g., overuse, heat illness, conditioning, etc.)	4,467	1.8%	20,797	11.8%	25,246	6.0%
Rotation around a planted foot/inversion	8,424	3.4%	11,059	6.3%	19,483	4.6%
Stepped on/fell on/kicked	9,431	3.9%	6,076	3.4%	15,507	3.7%
Other	3,928	1.6%	11,373	6.4%	15,301	3.6%
Contact with ball	2,875	1.2%	3,128	1.8%	6,003	1.4%
Uneven playing surface	2,251	0.9%	2,650	1.5%	4,901	1.2%
Contact with blocking sled/dummy	0	0.0%	1,341	0.8%	1,341	0.3%
Unknown	29,201	11.9%	18,500	10.5%	47,701	11.3%
Total	**244,763**	**100.0%**	**176,774**	**100.0%**	**421,537**	**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, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Being tackled	33,870	20.4%	21,342	41.2%	10,725	27.2%	28,744	31.4%	8,907	12.2%
Tackling	29,161	17.6%	8,757	16.9%	9,296	23.6%	20,670	22.6%	18,548	25.5%
Blocking	28,584	17.2%	4,121	8.0%	3,080	7.8%	14,219	15.5%	8,887	12.2%
Being blocked	13,019	7.8%	3,504	6.8%	3,328	8.4%	12,854	14.1%	4,429	6.1%
No contact (overuse/illness)	8,264	5.0%	0	0.0%	432	1.1%	0	0.0%	16,567	22.7%
Other	35,153	21.2%	7,168	13.8%	7,985	20.2%	2,454	2.7%	9,767	13.4%
Unknown	17,873	10.8%	6,929	13.4%	4,623	11.7%	12,528	13.7%	5,748	7.9%
Total	**165,924**	**100.0%**	**51,821**	**100.0%**	**39,469**	**100.0%**	**91,469**	**100.0%**	**72,853**	**100.0%**

IV. Boys' Soccer Injury Epidemiology

Table 4.1 Boys' Soccer Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**351**	**191,873**	**1.83**	**184,656**
Competition	229	59,301	3.86	**120,217**
Practice	122	132,572	0.92	**64,439**

Table 4.2 Demographic Characteristics of Injured Boys' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=166,858**
Freshman	18.2%
Sophomore	24.4%
Junior	31.1%
Senior	26.3%
Total†	**100.0%**
Age (years)	**n=128,150**
Minimum	13
Maximum	19
Mean (St. Dev.)	15.9 (1.3)
BMI	**n=83,562**
Minimum	15.8
Maximum	33.2
Mean (St. Dev.)	22.5 (3.0)

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

Figure 4.1 Diagnosis of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

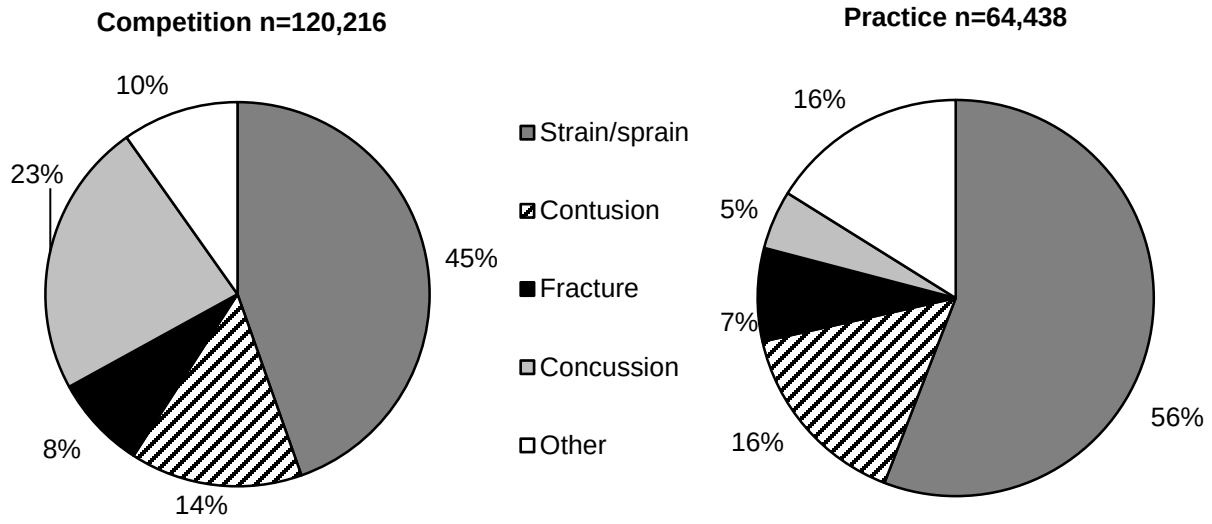


Table 4.3 Body Site of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	32,269	26.8%	3,557	5.5%	35,826	19.4%
Hip/thigh/upper leg	17,539	14.6%	14,616	22.7%	32,155	17.4%
Ankle	22,223	18.5%	7,482	11.6%	29,705	16.1%
Knee	14,127	11.8%	9,085	14.1%	23,212	12.6%
Trunk	5,611	4.7%	11,255	17.5%	16,866	9.1%
Foot	6,021	5.0%	7,341	11.4%	13,362	7.2%
Hand/wrist	6,363	5.3%	4,898	7.6%	11,261	6.1%
Lower leg	4,048	3.4%	4,199	6.5%	8,247	4.5%
Shoulder	5,219	4.3%	361	0.6%	5,580	3.0%
Arm/elbow	2,747	2.3%	70	0.1%	2,817	1.5%
Other	1,275	1.1%	1,575	2.4%	2,850	1.5%
Total	**120,216**	**100.0%**	**64,439**	**100.0%**	**184,655**	**100.0%**

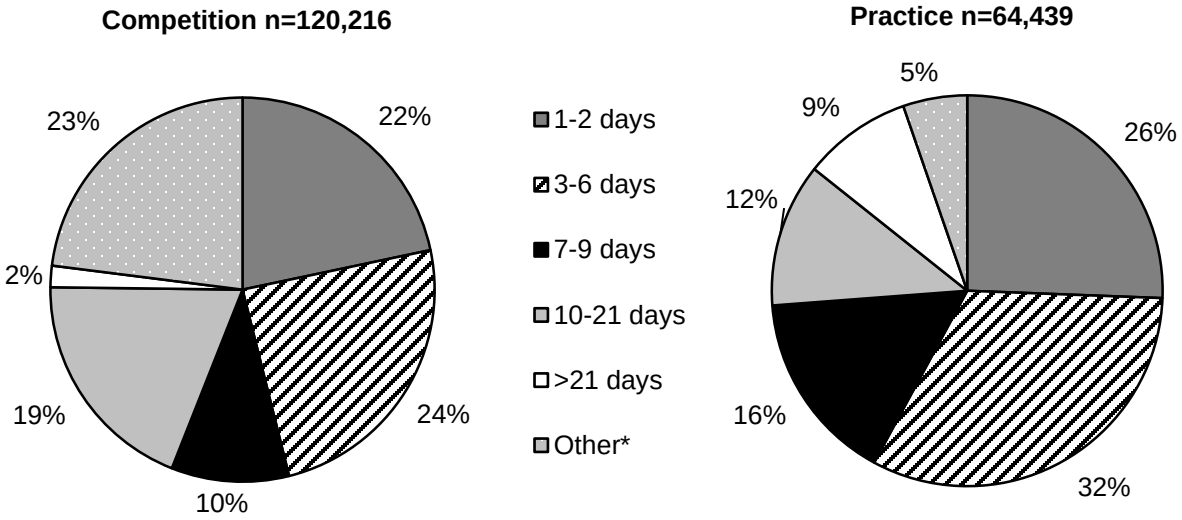
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 4.4 Ten Most Common Boys' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=120,219		Practice n=64,438		Total n=184,657	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	27,936	23.2%	3,125	4.8%	31,061	16.8%
Ankle strain/sprain	20,385	17.0%	5,738	8.9%	26,123	14.1%
Hip/thigh/upper leg strain/sprain	11,926	9.9%	12,319	19.1%	24,245	13.1%
Knee sprain/strain	8,320	6.9%	3,982	6.2%	12,302	6.7%
Trunk strain/sprain	2,405	2.0%	9,107	14.1%	11,512	6.2%
Knee other	2,894	2.4%	4,380	6.8%	7,274	3.9%
Hand/wrist fracture	4,047	3.4%	2,384	4.0%	6,431	3.5%
Foot contusion	2,386	2.0%	3,490	5.4%	5,876	3.2%
Hip/Thigh/Upper leg contusion	3,760	3.1%	1,083	1.7%	4,843	2.6%
Foot strain/sprain	3,327	2.8%	531	0.8%	3,858	2.1%

* 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, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	7,595	6.5%	1,131	1.8%	8,726	4.8%
Did not require surgery	109,555	93.5%	62,947	98.2%	172,502	95.2%
Total	**117,150**	**100.0%**	**64,078**	**100.0%**	**181,228**	**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 4.3 History of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

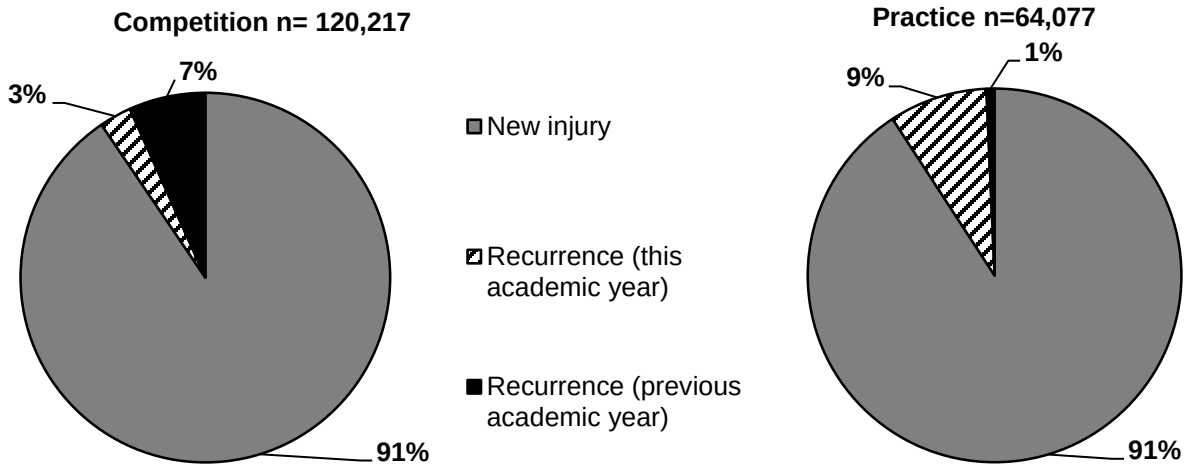


Table 4.6 Time during Season of Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	29,765	16.2%
Regular season	141,116	76.9%
Post season	12,562	6.8%
Total	**183,443**	**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 4.7 Competition-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	3,168	2.9%
First half	37,056	34.2%
Second half	53,752	49.6%
Overtime	206	0.2%
Unknown	14,086	13.0%
Total	**108,268**	**100.0%**
Field Location		
Top of goal box extended to center line (offense)	21,541	20.1%
Goal box (defense)	16,621	15.5%
Top of goal box extended to center line (defense)	10,433	9.7%
Goal box (offense)	10,188	9.5%
Side of goal box (offense)	8,776	8.2%
Side of goal box (defense)	7,274	6.8%
Off the field	1,820	1.7%
Unknown	30,401	28.4%
Total	**107,054**	**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 4.8 Practice-Related Variables for Boys' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	7,855	12.4%
Second 1/2 hour	7,524	11.9%
1-2 hours into practice	20,510	32.4%
>2 hours into practice	309	0.5%
Unknown	27,098	42.8%
Total	**63,296**	**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 4.4 Player Position of Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

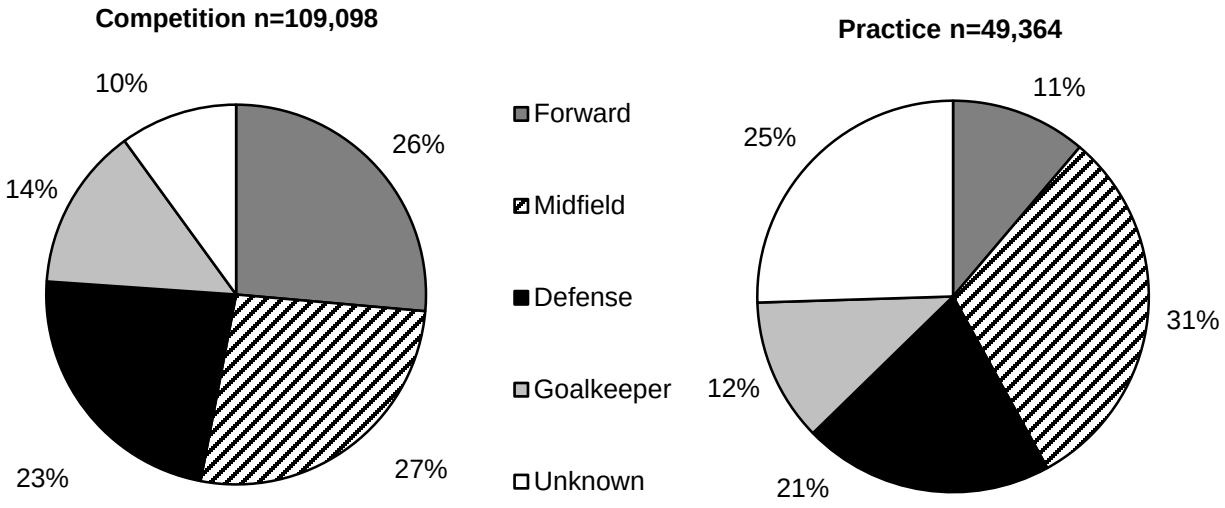


Table 4.9 Activities Leading to Boys' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	14,984	13.9%	18,045	37.2%	33,029	21.1%
Defending	17,617	16.3%	3,382	7.0%	20,999	13.4%
Ball handling/dribbling	16,453	15.2%	2,708	5.6%	19,161	12.2%
Goaltending	10,141	9.4%	3,590	7.4%	13,731	8.8%
Chasing loose ball	11,407	10.5%	70	0.1%	11,477	7.3%
Shooting (foot)	8,690	8.0%	2,481	5.1%	11,171	7.1%
Heading ball	6,880	6.4%	769	1.6%	7,649	4.9%
Blocking shot	4,924	4.6%	361	0.7%	5,285	3.4%
Passing (foot)	4,320	4.0%	431	0.9%	4,751	3.0%
Receiving pass	2,620	2.4%	1,720	3.5%	4,340	2.8%
Conditioning	1,214	1.1%	2,929	6.0%	4,143	2.6%
Attempting a slide tackle	531	0.5%	962	2.0%	1,493	1.0%
Receiving a slide tackle	531	0.5%	0	0.0%	531	0.3%
Other	0	0.0%	933	1.9%	933	0.6%
Unknown	7,813	7.2%	10,118	20.9%	17,931	11.4%
Total	**108,125**	**100.0%**	**48,499**	**100.0%**	**156,624**	**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, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
General play	21,822	28.7%	3,661	15.5%	1,908	13.8%	1,217	4.5%	4,421	27.9%
Defending	8,452	11.1%	2,706	11.5%	1,542	11.1%	6,445	23.6%	1,853	11.7%
Chasing loose ball	5,327	7.0%	909	3.8%	1,168	8.4%	2,222	8.1%	1,851	11.7%
Goaltending	3,025	4.0%	2,594	11.0%	1,820	13.2%	4,677	17.1%	1,614	10.2%
Ball handling/dribbling	11,499	15.1%	4,342	18.4%	1,745	12.6%	1,575	5.8%	0	0.0%
Shooting (foot)	9,538	12.5%	1,633	6.9%	0	0.0%	0	0.0%	0	0.0%
Heading ball	0	0.0%	206	0.9%	0	0.0%	7,444	27.3%	0	0.0%
Conditioning	1,995	2.6%	0	0.0%	1,214	8.8%	0	0.0%	933	5.9%
passing (foot)	3,381	4.4%	309	1.3%	1,062	7.7%	0	0.0%	0	0.0%
Receiving pass	707	0.9%	2,810	11.9%	346	2.5%	239	0.9%	239	1.5%
Blocking shot	1,575	2.1%	0	0.0%	0	0.0%	1,394	5.1%	2,316	14.6%
Attempting a slide tackle	531	0.7%	892	3.8%	0	0.0%	0	0.0%	70	0.4%
Receiving a slide tackle	531	0.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other	70	0.1%	0	0.0%	863	6.2%	0	0.0%	0	0.0%
Unknown	7,605	10.0%	3,559	15.1%	2,167	15.7%	2,068	7.6%	2,533	16.0%
Total	**76,058**	**100.0%**	**23,621**	**100.0%**	**13,835**	**100.0%**	**27,281**	**100.0%**	**15,830**	**100.0%**

V. Girls' Soccer Injury Epidemiology

Table 5.1 Girls' Soccer Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**448**	**165,009**	**2.72**	**227,951**
Competition	297	52,129	5.70	**140,542**
Practice	151	112,880	1.34	**87,409**

Table 5.2 Demographic Characteristics of Injured Girls' Soccer Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=214,442**
Freshman	26.7%
Sophomore	24.4%
Junior	25.8%
Senior	23.2%
Total†	**100.0%**
Age (years)	**n=161,689**
Minimum	13
Maximum	18
Mean (St. Dev.)	15.7 (1.2)
BMI	**n=106,617**
Minimum	15.5
Maximum	38.4
Mean (St. Dev.)	22.2 (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 5.1 Diagnosis of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

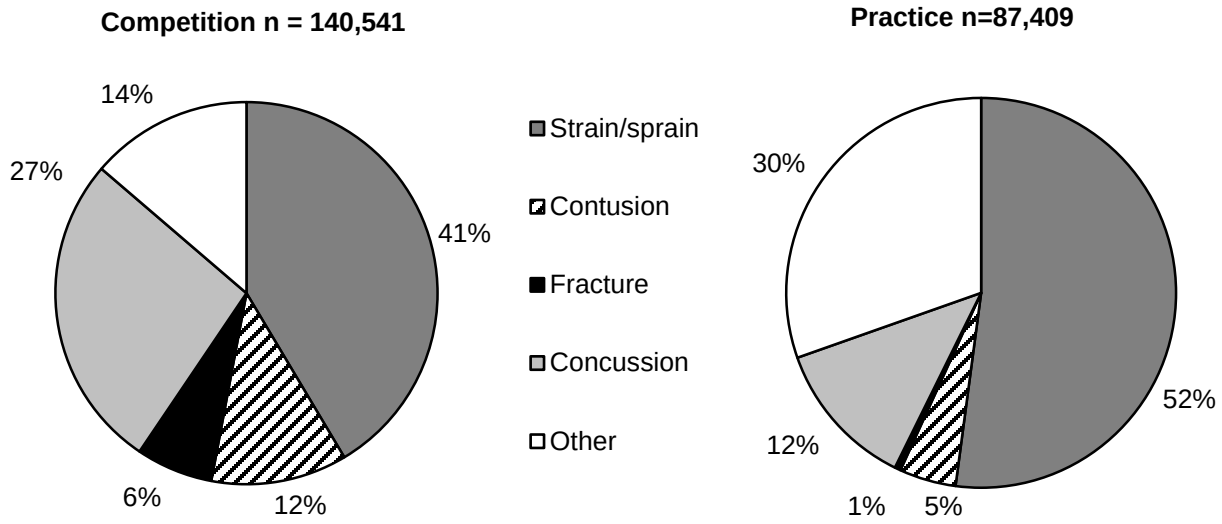


Table 5.3 Body Site of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	38,854	27.6%	16,478	18.9%	55,332	24.3%
Head/face	43,005	30.6%	10,731	12.3%	53,736	23.6%
Knee	24,614	17.5%	12,660	14.5%	37,274	16.4%
Hip/thigh/upper leg	9,447	6.7%	22,918	26.2%	32,365	14.2%
Lower leg	4,900	3.5%	11,152	12.8%	16,052	7.0%
Foot	5,190	3.7%	5,187	5.9%	10,377	4.6%
Hand/wrist	4,017	2.9%	3,091	3.5%	7,108	3.1%
Trunk	2,866	2.0%	1,581	1.8%	4,447	2.0%
Arm/elbow	3,179	2.3%	0	0.0%	3,179	1.4%
Shoulder	229	0.2%	2,345	2.7%	2,574	1.1%
Neck	1,112	0.8%	1,266	1.4%	2,378	1.0%
Other	3,129	2.2%	0	0.0%	3,129	1.4%
Total	**140,542**	**100.0%**	**87,409**	**100.0%**	**227,951**	**100.0%**

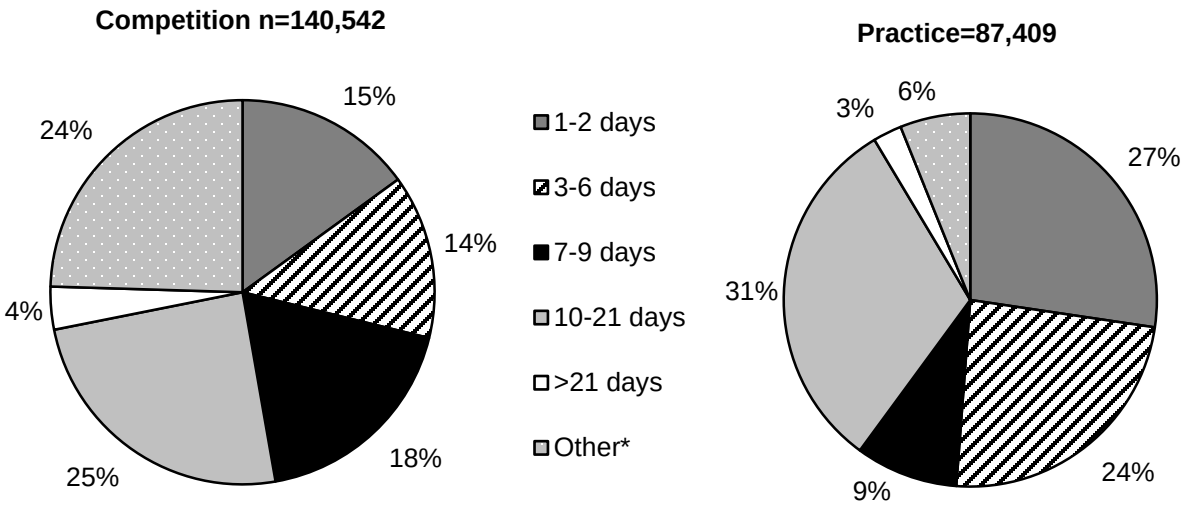
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 5.4 Ten Most Common Girls' Soccer Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=140538		Practice n=87,407		Total n=227,945	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	37,671	26.8%	10,731	12.3%	48,402	21.2%
Ankle strain/sprain	32,906	23.4%	13,437	15.4%	46,343	20.3%
Hip/thigh/upper leg strain/sprain	7,265	5.2%	18,432	21.1%	25,697	11.3%
Knee sprain/strain	14,635	10.4%	4,834	5.5%	19,469	8.5%
Knee other	7,688	5.5%	7,826	9.0%	15,514	6.8%
Lower leg other	1,969	1.4%	7,993	9.1%	9,962	4.4%
Hip/thigh/upper leg other	1,334	0.9%	4,265	4.9%	5,599	2.5%
Ankle contusion	3,348	2.4%	1,690	1.9%	5,038	2.2%
Foot other	1,557	1.1%	2,837	3.2%	4,394	1.9%
Foot contusion	2,979	2.1%	1,043	1.2%	4,022	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 5.2 Time Loss of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	9,863	7.1%	1,911	2.2%	11,774	5.2%
Did not require surgery	129,194	92.9%	85,269	97.8%	214,463	94.8%
Total	**139,057**	**100.0%**	**87,180**	**100.0%**	**226,237**	**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 5.3 History of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

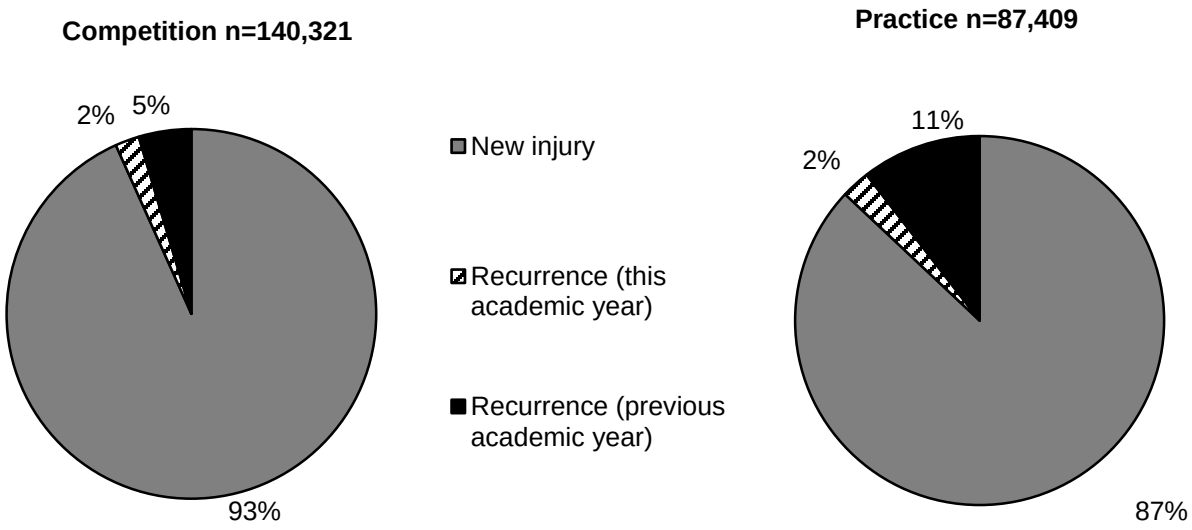


Table 5.6 Time during Season of Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	46,230	20.4%
Regular season	169,277	74.7%
Post season	10,524	4.6%
Other	654	0.3%
Total	**226,685**	**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 5.7 Competition-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	2,779	2.1%
First half	37,929	29.2%
Second half	61,821	47.6%
Overtime	0	0.0%
Unknown	27,426	21.1%
Total	**129,955**	**100.0%**
Field Location		
Top of goal box extended to center line (offense)	21,694	16.8%
Top of goal box extended to center line (defense)	15,065	11.6%
Goal box (defense)	12,914	10.0%
Goal box (offense)	8,110	6.3%
Side of goal box (offense)	7,378	5.7%
Side of goal box (defense)	6,014	4.6%
Off the field	2,264	1.7%
Unknown	55,999	43.3%
Total	**129,439**	**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 5.8 Practice-Related Variables for Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	8,096	9.8%
Second 1/2 hour	6,793	8.2%
1-2 hours into practice	37,597	45.4%
>2 hours into practice	3,321	4.0%
Unknown	26,927	32.5%
Total	**82,734**	**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 5.4 Player Position of Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

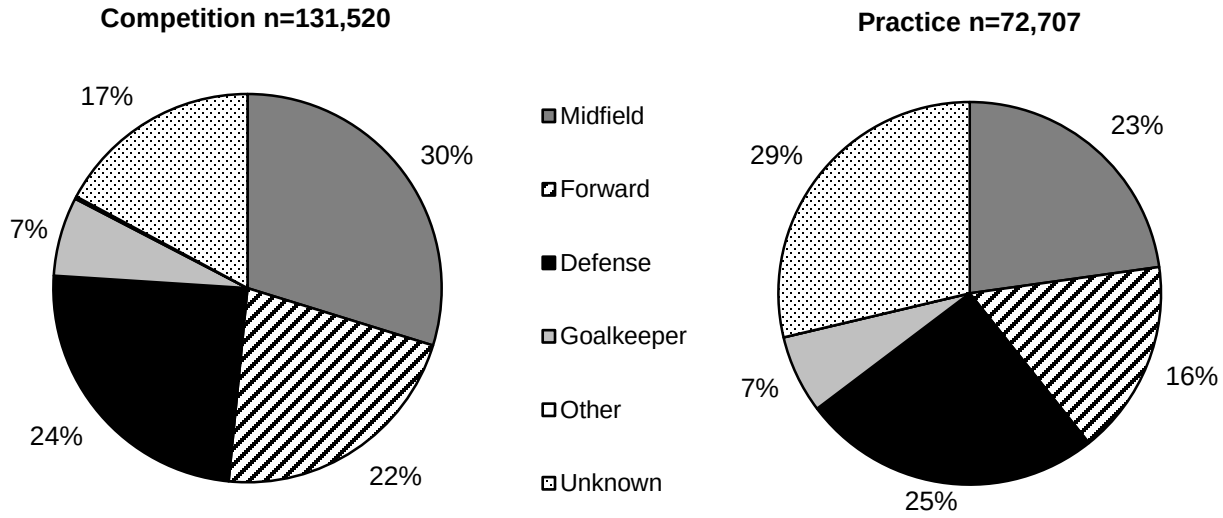


Table 5.9 Activities Leading to Girls' Soccer Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	28,974	22.2%	22,105	29.8%	51,079	25.0%
Defending	26,386	20.2%	6,211	8.4%	32,597	15.9%
Ball handling/dribbling	11,875	9.1%	2,266	3.1%	14,141	6.9%
Shooting (foot)	3,173	2.4%	7,880	10.6%	11,053	5.4%
Receiving pass	9,524	7.3%	1,376	1.9%	10,900	5.3%
Goaltending	5,674	4.3%	4,108	5.5%	9,782	4.8%
Chasing loose ball	6,657	5.1%	3,111	4.2%	9,768	4.8%
Conditioning	0	0.0%	8,503	11.5%	8,503	4.2%
Heading ball	5,004	3.8%	3,582	4.8%	8,586	4.2%
Passing (foot)	4,946	3.8%	450	0.6%	5,396	2.6%
Blocking shot	1,716	1.3%	1,009	1.4%	2,725	1.3%
Receiving a slide tackle	1,272	1.0%	0	0.0%	1,272	0.6%
Attempting a slide tackle	865	0.7%	0	0.0%	865	0.4%
Other	1,679	1.3%	450	0.6%	2,129	1.0%
Unknown	22,715	17.4%	13,007	17.6%	35,722	17.5%
Total	**130,460**	**100.0%**	**74,058**	**100.0%**	**204,518**	**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, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
General play	22,802	24.4%	2,623	12.9%	1,058	16.3%	9,193	20.0%	15,402	40.3%
Defending	12,440	13.3%	3,416	16.9%	3,233	49.8%	9,562	20.8%	3,946	10.3%
Goaltending	2,156	2.3%	1,740	8.6%	70	1.1%	4,678	10.2%	1,139	3.0%
Ball handling/dribbling	7,892	8.4%	4,730	23.3%	0	0.0%	796	1.7%	724	1.9%
Chasing loose ball	6,539	7.0%	654	3.2%	0	0.0%	1,566	3.4%	1,010	2.6%
Shooting (foot)	8,738	9.3%	0	0.0%	0	0.0%	0	0.0%	2,316	6.1%
Blocking shot	1,229	1.3%	0	0.0%	1,266	19.5%	229	0.5%	0	0.0%
Conditioning	6,234	6.7%	0	0.0%	0	0.0%	0	0.0%	2,269	5.9%
Heading ball	0	0.0%	355	1.8%	0	0.0%	8,230	17.9%	0	0.0%
Passing (foot)	3,738	4.0%	70	0.3%	0	0.0%	221	0.5%	1,367	3.6%
Receiving pass	5,917	6.3%	355	1.8%	0	0.0%	3,701	8.0%	926	2.4%
Attempting a slide tackle	865	0.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Receiving a slide tackle	1,272	1.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other	1,450	1.6%	0	0.0%	0	0.0%	450	1.0%	229	0.6%
Unknown	12,276	13.1%	6,329	31.2%	865	13.3%	7,377	16.0%	8,874	23.2%
Total	**93,548**	**100.0%**	**20,272**	**100.0%**	**6,492**	**100.0%**	**46,001**	**100.0%**	**38,202**	**100.0%**

VI. Volleyball Injury Epidemiology

Table 6.1 Volleyball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**217**	**161,504**	**1.34**	**59,370**
Competition	83	52,504	1.58	**23,045**
Practice	134	109,000	1.23	**36,325**

Table 6.2 Demographic Characteristics of Injured Volleyball Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=57,658**
Freshman	29.5%
Sophomore	25.1%
Junior	22.3%
Senior	23.0%
Total†	**100.0%**
Age (years)	**n=40,984**
Minimum	13
Maximum	18
Mean (St. Dev.)	15.3 (1.3)
BMI	**n=25,788**
Minimum	16.1
Maximum	42.9
Mean (St. Dev.)	23.1 (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 6.1 Diagnosis of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

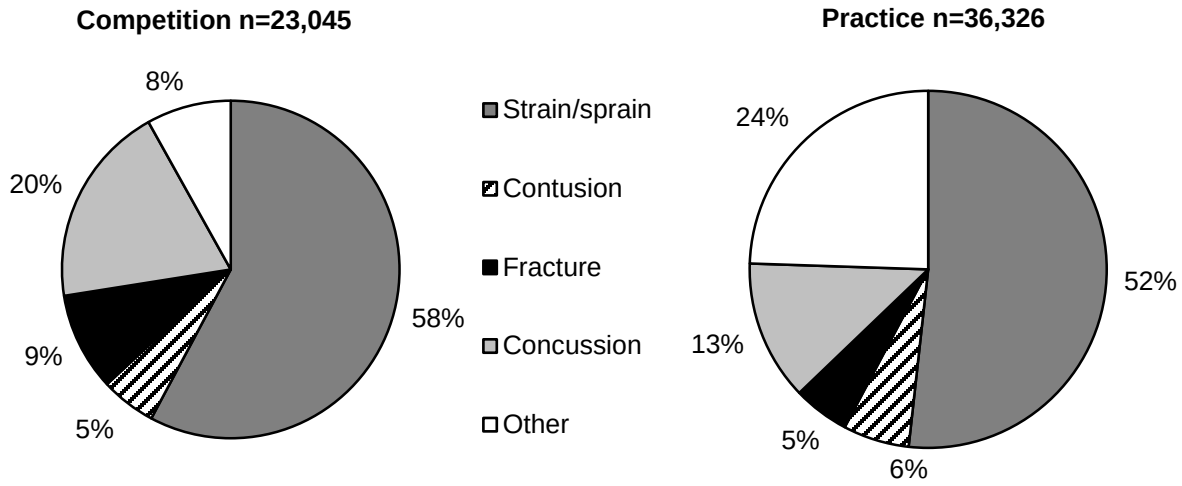


Table 6.3 Body Site of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	4,791	20.8%	10,037	27.6%	14,828	25.0%
Hand/wrist	5,276	22.9%	4,697	12.9%	9,973	16.8%
Head/face	4,463	19.4%	4,735	13.0%	9,198	15.5%
Knee	3,146	13.7%	3,982	11.0%	7,128	12.0%
Shoulder	1,200	5.2%	5,689	15.7%	6,889	11.6%
Trunk	1,301	5.6%	3,096	8.5%	4,397	7.4%
Arm/elbow	1,583	6.9%	1,149	3.2%	2,732	4.6%
Foot	272	1.2%	1,995	5.5%	2,267	3.8%
Hip/thigh/upper leg	0	0.0%	706	1.9%	706	1.2%
Lower leg	545	2.4%	135	0.4%	680	1.1%
Neck	468	2.0%	0	0.0%	468	0.8%
Other	0	0.0%	103	0.3%	103	0.2%
Total	**23,045**	**100.0%**	**36,324**	**100.0%**	**59,369**	**100.0%**

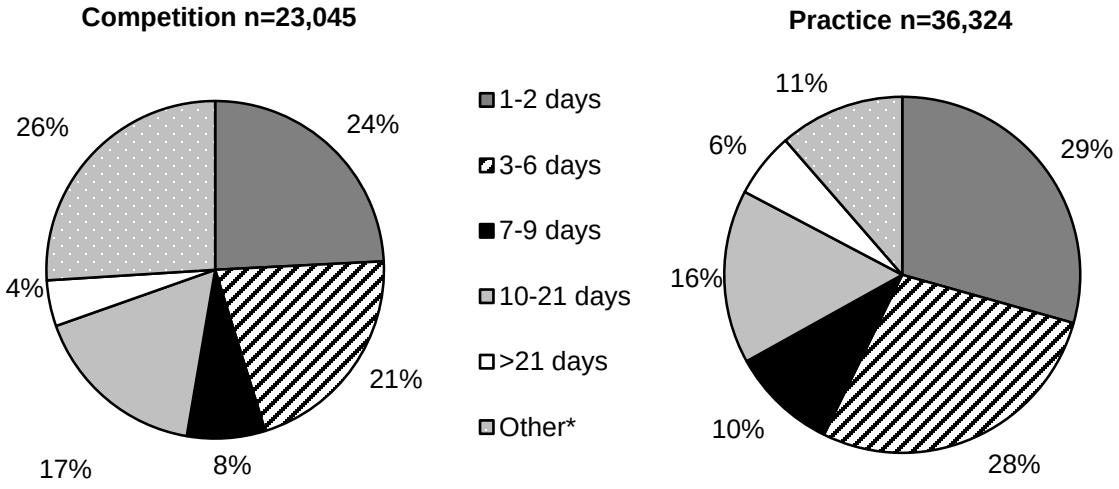
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 6.4 Ten Most Common Volleyball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=23,046		Practice n=36,326		Total n=59,372	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	4,727	20.5%	9,257	25.5%	13,984	23.6%
Head/face concussion	4,463	19.4%	4,600	12.7%	9,063	15.3%
Hand/wrist strain/sprain	3,028	13.1%	2,771	7.6%	5,799	9.8%
Shoulder other	0	0.0%	3,944	10.9%	3,944	6.6%
Knee strain/sprain	2,266	9.8%	1,461	4.0%	3,727	6.3%
Trunk strain/sprain	885	3.8%	2,161	5.9%	3,046	5.1%
Shoulder strain/sprain	1,200	5.2%	1,745	4.8%	2,945	5.0%
Knee other	880	3.8%	1,741	4.8%	2,621	4.4%
Hand/wrist fracture	2,040	8.9%	521	1.4%	2,561	4.3%
Hand/wrist other	208	0.9%	1,092	3.0%	1,300	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 6.2 Time Loss of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	2,482	10.9%	937	2.6%	3,419	5.8%
Did not require surgery	20,292	89.1%	35,387	97.4%	55,679	94.2%
Total	**22,774**	**100.0%**	**36,324**	**100.0%**	**59,098**	**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 6.3 History of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

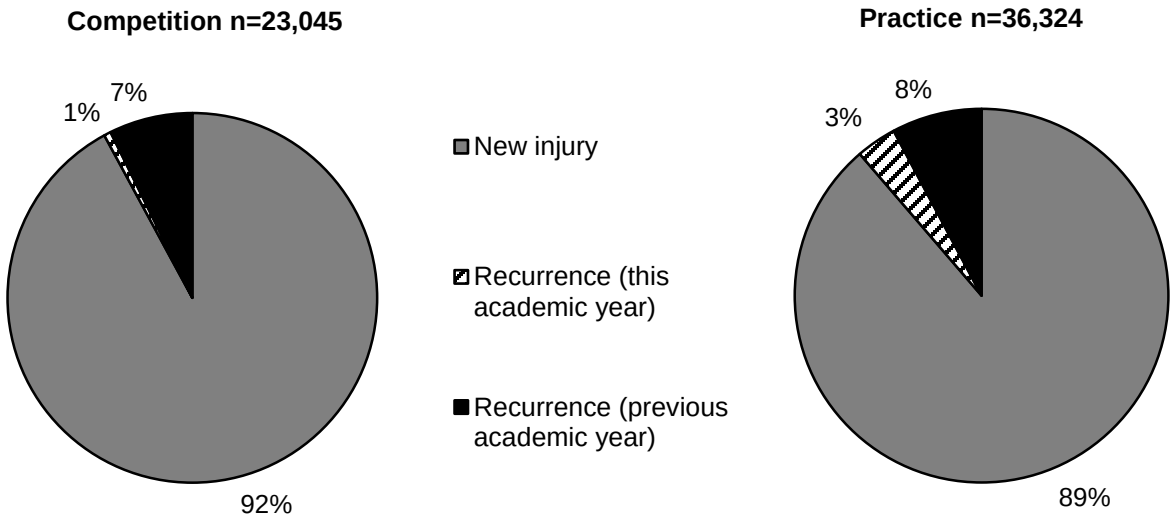


Table 6.6 Time during Season of Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	18,034	30.4%
Regular season	40,002	67.5%
Post season	1,230	2.1%
Total	**59,266**	**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 6.7 Competition-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Time in Competition	n	%
Pre-competition/warm-ups	2,048	9.9%
First set	3,165	15.3%
Second set	3,163	15.3%
Third set	3,977	19.2%
Fourth set	1,208	5.8%
Fifth set	135	0.7%
Unknown	7,010	33.9%
Total	**20,706**	**100.0%**

Court Location	n	%
Middle forward	1,976	10.0%
Right forward	1,846	9.4%
Left back	1,828	9.3%
At the net	1,620	8.2%
Left forward	1,148	5.8%
Outside the playable area	1,146	5.8%
Outside court (your side)	574	2.9%
Right back (server)	313	1.6%
Outside court (opponents' side)	0	0.0%
Unknown	9,243	46.9%
Total	**19,694**	**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 6.8 Practice-Related Variables for Volleyball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	3,116	8.7%
Second 1/2 hour	8,093	22.7%
1-2 hours into practice	14,174	39.8%
>2 hours into practice	448	1.3%
Unknown	9,821	27.5%
Total	**35,652**	**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 6.4 Player Position of Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

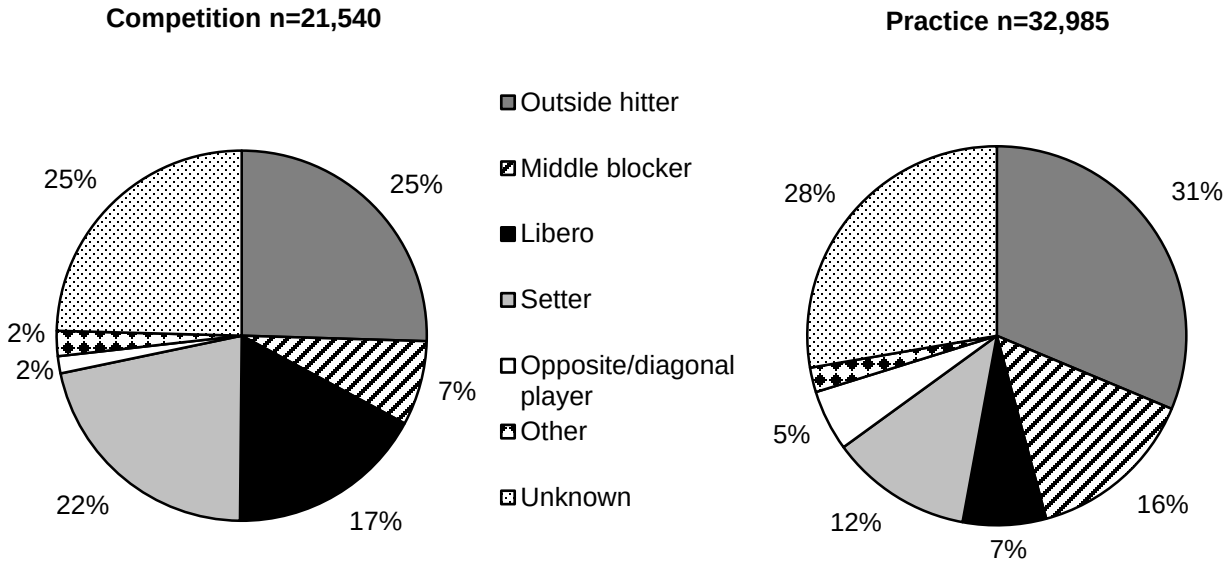


Table 6.9 Activities Leading to Volleyball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	2,709	12.4%	7,169	21.7%	9,878	18.0%
Blocking	3,310	15.1%	6,104	18.5%	9,414	17.1%
Digging	6,925	31.7%	2,209	6.7%	9,134	16.6%
Serving	1,536	7.0%	4,246	12.8%	5,782	10.5%
Passing	1,973	9.0%	2,978	9.0%	4,951	9.0%
Spiking	1,154	5.3%	2,006	6.1%	3,160	5.8%
Conditioning	0	0.0%	2,274	6.9%	2,274	4.1%
Setting	1,056	4.8%	1,145	3.5%	2,201	4.0%
Other	887	4.1%	609	1.8%	1,496	2.7%
Unknown	2,303	10.5%	4,311	13.0%	6,614	12.0%
Total	**21,853**	**100.0%**	**33,051**	**100.0%**	**54,904**	**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, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
General play	5,818	19.7%	783	23.1%	0	0.0%	936	10.9%	2,341	25.0%
Spiking	2,535	8.6%	0	0.0%	0	0.0%	0	0.0%	625	6.7%
Digging	2,779	9.4%	858	25.3%	961	24.3%	3,107	36.1%	1,429	15.2%
Conditioning	917	3.1%	0	0.0%	0	0.0%	135	1.6%	1,221	13.0%
Serving	2,900	9.8%	0	0.0%	0	0.0%	1,352	15.7%	1,530	16.3%
Setting	1,630	5.5%	0	0.0%	468	11.8%	103	1.2%	0	0.0%
Blocking	7,135	24.1%	603	17.8%	64	1.6%	938	10.9%	674	7.2%
Passing	3,093	10.5%	103	3.0%	1,171	29.6%	584	6.8%	0	0.0%
Other	272	0.9%	0	0.0%	470	11.9%	753	8.7%	0	0.0%
Unknown	2,495	8.4%	1,039	30.7%	817	20.7%	706	8.2%	1,556	16.6%
Total	**29,574**	**100.0%**	**3,386**	**100.0%**	**3,951**	**100.0%**	**8,614**	**100.0%**	**9,376**	**100.0%**

VII. Boys' Basketball Injury Epidemiology

Table 7.1 Boys' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**342**	**212,605**	**1.61**	**87,521**
Competition	196	63,448	3.09	**48,318**
Practice	146	149,157	0.98	**39,203**

Table 7.2 Demographic Characteristics of Injured Boys' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=84,134**
Freshman	21.6%
Sophomore	24.7%
Junior	24.5%
Senior	29.3%
Total†	**100.0%**
Age (years)	**n=68,124**
Minimum	14
Maximum	19
Mean (St. Dev.)	16.1 (1.3)
BMI	**n=45,669**
Minimum	15.6
Maximum	37.3
Mean (St. Dev.)	23.4 (3.6)

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

Figure 7.1 Diagnosis of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

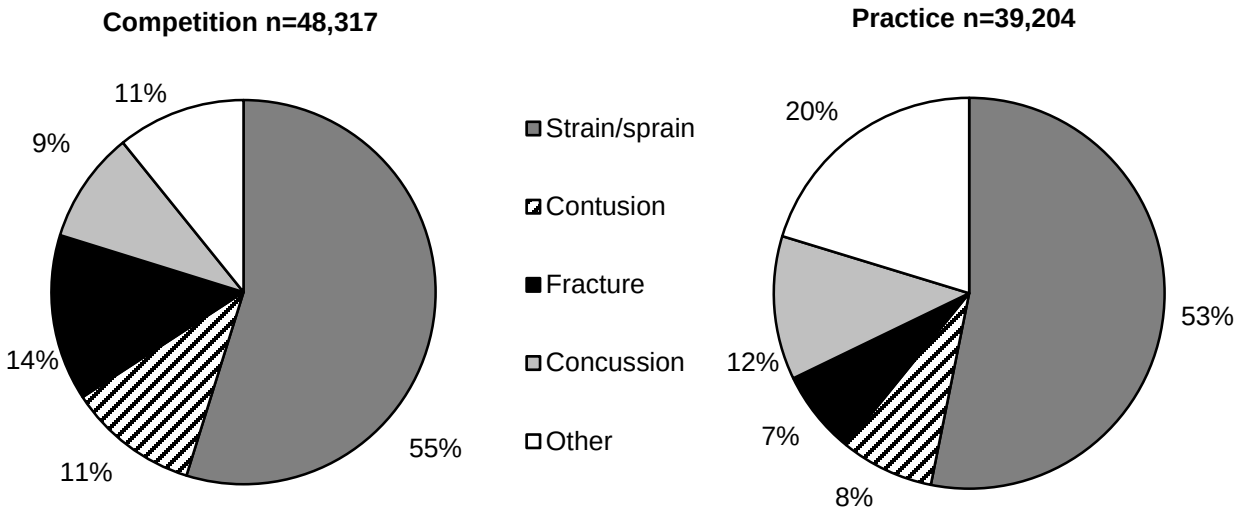


Table 7.3 Body Site of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	20,393	42.2%	16,294	41.6%	36,687	41.9%
Head/face	6,748	14.0%	5,380	13.7%	12,128	13.9%
Hand/wrist	6,686	13.8%	4,082	10.4%	10,768	12.3%
Knee	3,042	6.3%	3,786	9.7%	6,828	7.8%
Trunk	2,110	4.4%	3,031	7.7%	5,141	5.9%
Hip/thigh/upper leg	2,239	4.6%	2,071	5.3%	4,310	4.9%
Lower leg	1,789	3.7%	1,950	5.0%	3,739	4.3%
Foot	2,668	5.5%	733	1.9%	3,401	3.9%
Shoulder	1,443	3.0%	1,368	3.5%	2,811	3.2%
Arm/elbow	951	2.0%	0	0.0%	951	1.1%
Neck	0	0.0%	78	0.2%	78	0.1%
Other	248	0.5%	432	1.1%	680	0.8%
Total	**48,317**	**100.0%**	**39,205**	**100.0%**	**87,522**	**100.0%**

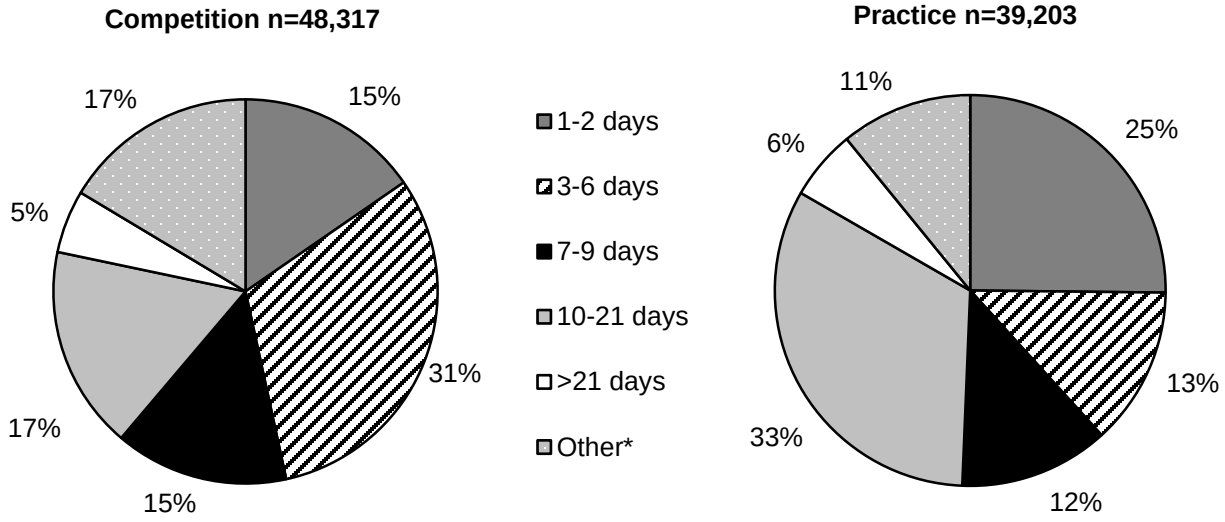
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 7.4 Ten Most Common Boys' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=48,316		Practice n=39,202		Total n=87,518	
	n	%	n	%	n	%
Diagnosis						
Ankle strain/sprain	18,744	38.8%	14,733	37.6%	33,477	38.3%
Head/face concussion	4,535	9.4%	4,652	11.9%	9,187	10.5%
Hand/wrist fracture	3,729	7.7%	1,773	4.5%	5,502	6.3%
Hand/wrist strain/sprain	2,139	4.4%	1,531	3.9%	3,670	4.2%
Knee other	1,059	2.2%	2,315	5.9%	3,374	3.9%
Hip/thigh/upper leg contusion	1,469	3.0%	674	1.7%	2,143	2.4%
Foot strain/sprain	1,925	4.0%	153	0.4%	2,078	2.4%
Trunk strain/sprain	999	2.1%	999	2.5%	1,998	2.3%
Trunk contusion	1,004	2.1%	965	2.5%	1,969	2.2%
Knee sprain/strain	751	1.6%	1,122	2.9%	1,873	2.1%

* 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, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,884	4.0%	2,257	5.8%	4,141	4.8%
Did not require surgery	45,341	96.0%	36,638	94.2%	81,979	95.2%
Total	**47,225**	**100.0%**	**38,895**	**100.0%**	**86,120**	**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 7.3 History of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

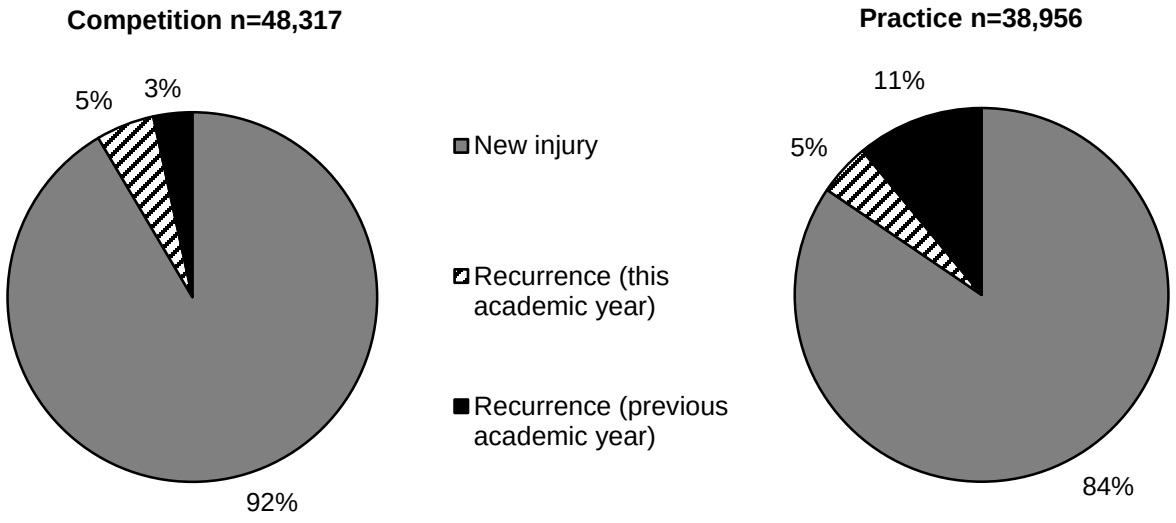


Table 7.6 Time during Season of Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	15,823	18.2%
Regular season	65,886	93.9%
Post season	5,235	6.0%
Total	**87,051**	**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 7.7 Competition-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	911	2.0%
First quarter	4,715	10.6%
Second quarter	9,756	21.9%
Third quarter	12,641	28.4%
Fourth quarter	9,946	22.4%
Unknown	6,504	14.6%
Total	**44,473**	**100.0%**
Court Location		
Inside lane (offense)	11,893	26.6%
Inside lane (defense)	9,169	20.5%
Between 3 pt arc and lane (defense)	4,930	11.0%
Outside 3 point arc - offense	3,516	7.9%
Out of bounds	1,747	3.9%
Between 3 pt arc and lane (offense)	1,547	3.5%
Outside 3 point arc - defense	958	2.1%
Backcourt	474	1.1%
Off the court	0	0.0%
Unknown	10,486	23.4%
Total	**44,721**	**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 7.8 Practice-Related Variables for Boys' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	3,958	10.2%
Second 1/2 hour	5,982	15.3%
1-2 hours into practice	19,649	50.4%
>2 hours into practice	1,625	4.2%
Unknown	7,756	19.9%
Total	**38,970**	**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 7.4 Player Position of Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

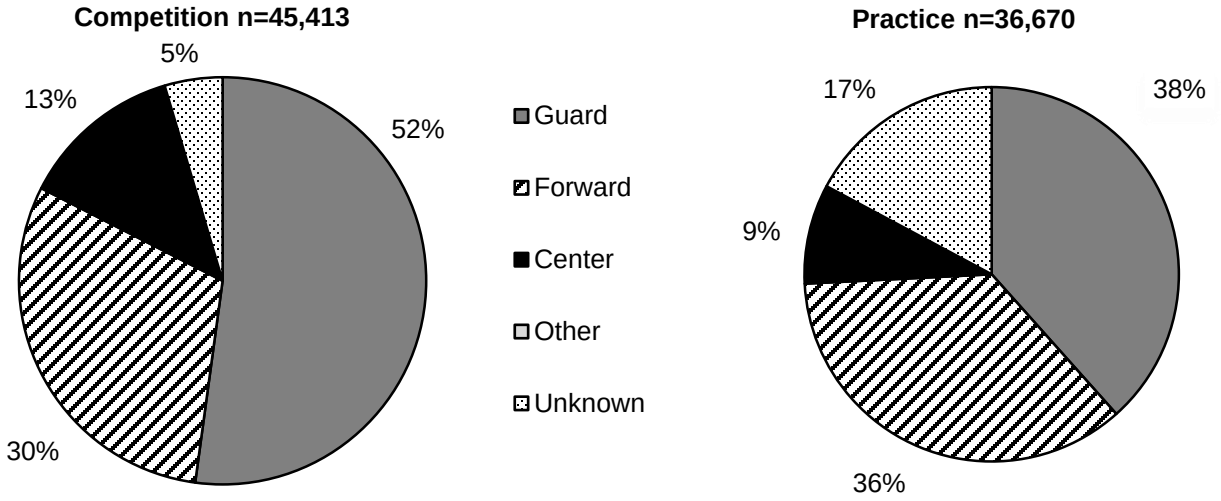


Table 7.9 Activities Leading to Boys' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Rebounding	11,220	24.8%	5,522	15.1%	16,742	20.5%
General play	4,788	10.6%	10,001	27.3%	14,789	18.1%
Shooting	7,770	17.2%	5,541	15.1%	13,311	16.3%
Defending	6,103	13.5%	4,503	12.3%	10,606	13.0%
Chasing loose ball	5,409	12.0%	1,076	2.9%	6,485	7.9%
Ball handling/dribbling	2,344	5.2%	327	0.9%	2,671	3.3%
Conditioning	0	0.0%	1,709	4.7%	1,709	2.1%
Receiving pass	533	1.2%	1,114	3.0%	1,647	2.0%
Passing	1,542	3.4%	107	0.3%	1,649	2.0%
Other	587	1.3%	107	0.3%	694	0.8%
Screening	348	0.8%	0	0.0%	348	0.4%
Unknown	4,543	10.1%	6,663	18.2%	11,206	13.7%
Total	**45,187**	**100.0%**	**36,670**	**100.0%**	**81,857**	**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, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Rebounding	11,386	26.0%	1,819	21.8%	1,003	10.7%	856	10.3%	1,676	13.9%
General play	7,204	16.5%	1,885	22.6%	808	8.6%	1,053	12.6%	3,839	31.7%
Defending	4,517	10.3%	1,354	16.2%	1,338	14.3%	2,170	26.0%	1,227	10.1%
Shooting	7,809	17.9%	1,097	13.2%	3,533	37.7%	249	3.0%	623	5.2%
Chasing loose ball	2,873	6.6%	1,204	14.4%	602	6.4%	1,068	12.8%	739	6.1%
Ball handling/dribbling	1,914	4.4%	78	0.9%	0	0.0%	325	3.9%	355	2.9%
Receiving pass	1,221	2.8%	0	0.0%	348	3.7%	0	0.0%	78	0.6%
Passing	932	2.1%	0	0.0%	470	5.0%	0	0.0%	248	2.1%
Conditioning	965	2.2%	0	0.0%	0	0.0%	0	0.0%	744	6.2%
Screening	0	0.0%	0	0.0%	0	0.0%	0	0.0%	348	2.9%
Other	0	0.0%	185	2.2%	0	0.0%	510	6.1%	0	0.0%
Unknown	4,908	11.2%	720	8.6%	1,259	13.4%	2,103	25.2%	2,216	18.3%
Total	**43,729**	**100.0%**	**8,342**	**100.0%**	**9,361**	**100.0%**	**8,336**	**100.0%**	**12,093**	**100.0%**

VIII. Girls' Basketball Injury Epidemiology

Table 8.1 Girls' Basketball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**300**	**153,930**	**1.95**	**82,383**
Competition	170	46,803	3.63	**48,080**
Practice	130	107,127	1.21	**34,303**

Table 8.2 Demographic Characteristics of Injured Girls' Basketball Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=79,831**
Freshman	29.5%
Sophomore	20.0%
Junior	29.1%
Senior	21.4%
Total†	**100.0%**
Age (years)	**n=67,321**
Minimum	12
Maximum	18
Mean (St. Dev.)	15.7 (1.4)
BMI	**n=47,680**
Minimum	17.0
Maximum	37.4
Mean (St. Dev.)	22.2 (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 8.1 Diagnosis of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

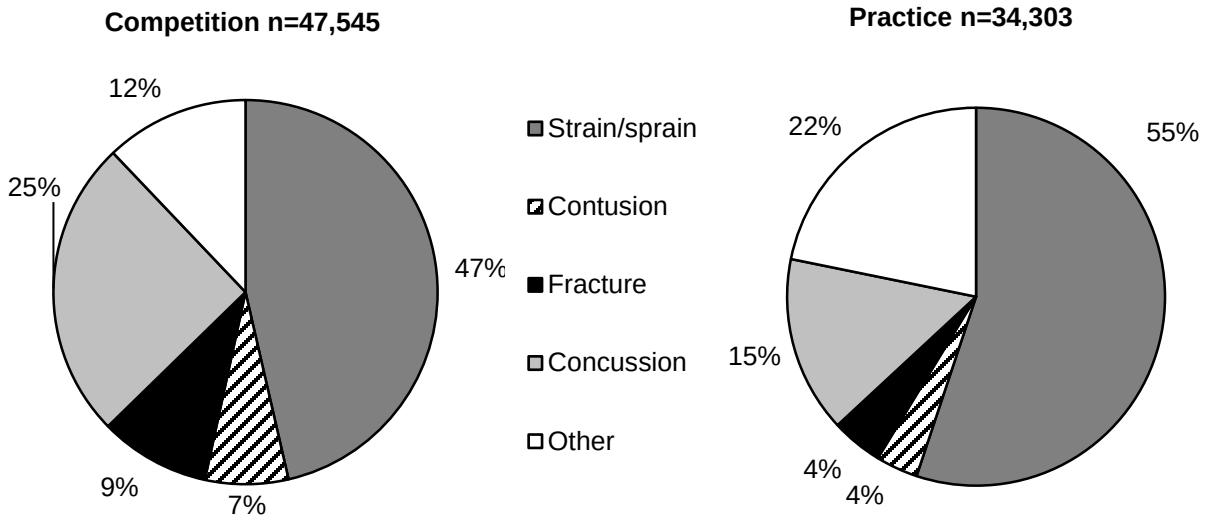


Table 8.3 Body Site of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Ankle	13,598	28.3%	10,121	29.5%	23,719	28.8%
Head/face	15,679	32.6%	5,645	16.5%	21,324	25.9%
Knee	7,402	15.4%	6,026	17.6%	13,428	16.3%
Hip/thigh/upper leg	3,016	6.3%	2,922	8.5%	5,938	7.2%
Trunk	1,763	3.7%	2,773	8.1%	4,536	5.5%
Hand/wrist	2,786	5.8%	1,525	4.4%	4,311	5.2%
Foot	1,039	2.2%	2,159	6.3%	3,198	3.9%
Lower leg	395	0.8%	2,172	6.3%	2,567	3.1%
Shoulder	519	1.1%	480	1.4%	999	1.2%
Arm/elbow	480	1.0%	0	0.0%	480	0.6%
Neck	446	0.9%	0	0.0%	446	0.5%
Other	956	2.0%	480	1.4%	1,436	1.7%
Total	**48,079**	**100.0%**	**34,303**	**100.0%**	**82,382**	**100.0%**

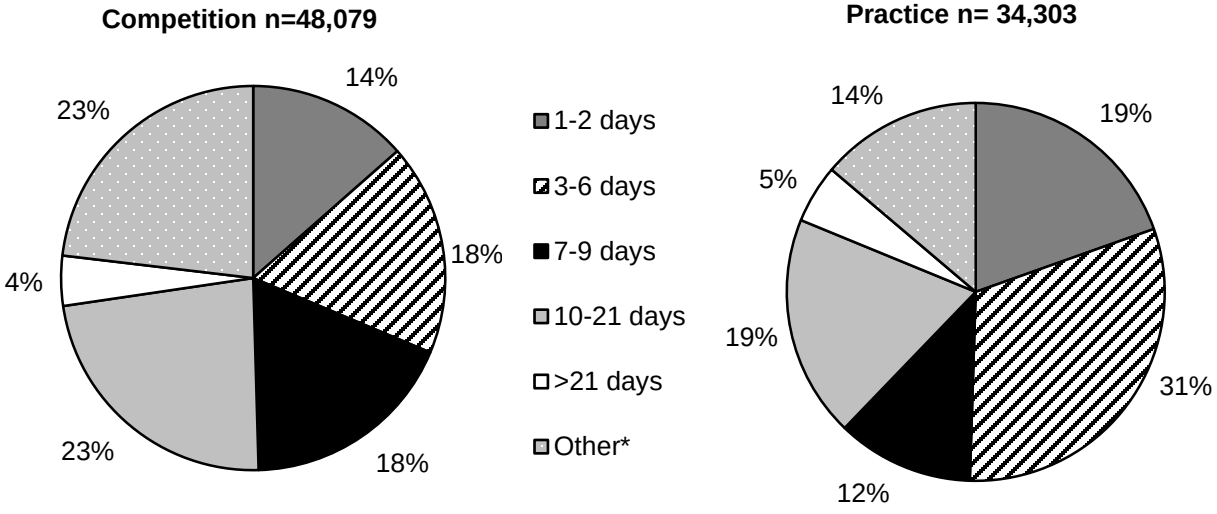
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 8.4 Ten Most Common Girls' Basketball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=47,547		Practice n=34,302		Total n=81,849	
	n	%	n	%	n	%
Diagnosis						
Ankle Strain/sprain	13,330	28.0%	9,479	27.6%	22,809	27.9%
Head/face concussion	11,961	25.2%	5,182	15.1%	17,143	20.9%
Knee strain/sprain	4,826	10.1%	3,309	9.6%	8,135	9.9%
Hip/thigh/upper leg strain/sprain	2,250	4.7%	2,690	7.8%	4,940	6.0%
Knee other	2,130	4.5%	2,717	7.9%	4,847	5.9%
Hand/wrist fracture	1,725	3.6%	341	1.0%	2,066	2.5%
Trunk contusion	1,229	2.6%	619	1.8%	1,848	2.3%
Lower leg other	0	0.0%	1,638	4.8%	1,638	2.0%
Hand/wrist strain/sprain	900	1.9%	656	1.9%	1,556	1.9%
Trunk strain/sprain	0	0.0%	1,520	4.4%	1,520	1.9%

* 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, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,787	8.0%	2,029	6.0%	5,816	7.1%
Did not require surgery	43,759	92.0%	31,816	94.0%	75,575	92.9%
Total	**47,546**	**100.0%**	**33,845**	**100.0%**	**81,391**	**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 8.3 History of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

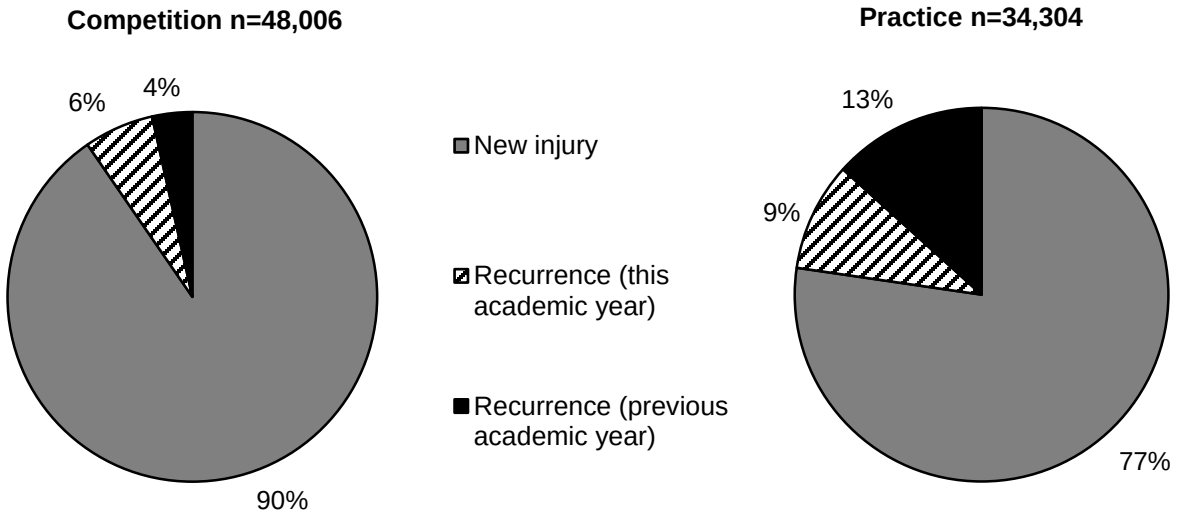


Table 8.6 Time during Season of Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	14,978	18.2%
Regular season	62,904	76.4%
Post season	4,501	5.5%
Total	**82,383**	**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 8.7 Competition-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	1,121	2.5%
First quarter	4,180	9.1%
Second quarter	12,491	27.3%
Third quarter	10,077	22.1%
Fourth quarter	9,567	20.9%
Overtime	583	1.3%
Unknown	7,670	16.8%
Total	**45,689**	**100.0%**
Court Location		
Inside lane (defense)	8,692	19.4%
Inside lane (offense)	7,807	17.4%
Between 3 pt arc and lane (defense)	4,890	10.9%
Outside 3 point arc - defense	2,632	5.9%
Outside 3 point arc - offense	2,435	5.4%
Between 3 pt arc and lane (offense)	1,737	3.9%
Backcourt	700	1.6%
Off the court	583	1.3%
Out of bounds	373	0.8%
Unknown	15,060	33.5%
Total	**44,909**	**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 8.8 Practice-Related Variables for Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	2,470	7.3%
Second 1/2 hour	3,405	10.1%
1-2 hours into practice	15,675	46.6%
>2 hours into practice	1,472	4.4%
Unknown	10,600	31.5%
Total	**33,622**	**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 8.4 Player Position of Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

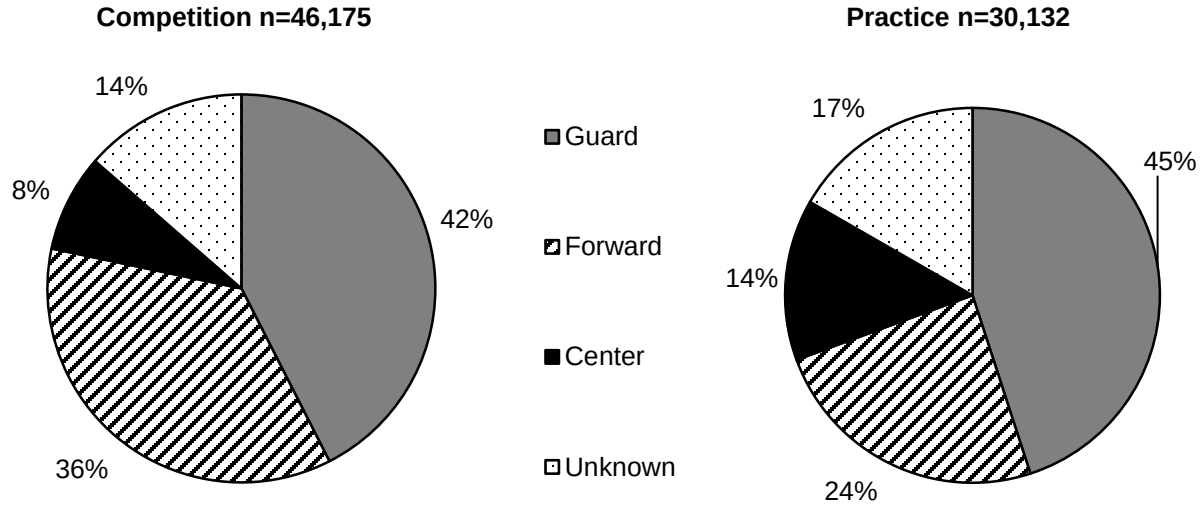


Table 8.9 Activities Leading to Girls' Basketball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
General play	7,821	16.6%	7,390	24.6%	15,211	19.7%
Rebounding	9,025	19.1%	4,708	15.7%	13,733	17.8%
Defending	10,158	21.5%	2,424	8.1%	12,582	16.3%
Chasing loose ball	5,163	10.9%	2,741	9.1%	7,904	10.2%
Ball handling/dribbling	3,816	8.1%	1,484	4.9%	5,300	6.9%
Shooting	3,149	6.7%	1,020	3.4%	4,169	5.4%
Conditioning	107	0.2%	2,384	7.9%	2,491	3.2%
Receiving pass	605	1.3%	1,348	4.5%	1,953	2.5%
Passing	180	0.4%	607	2.0%	787	1.0%
Other	766	1.6%	1,985	6.6%	2,751	3.6%
Unknown	6,440	13.6%	3,547	11.8%	9,987	12.9%
Total	**47,230**	**100.0%**	**29,989**	**100.0%**	**77,219**	**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, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Rebounding	8,175	21.3%	1,404	30.7%	107	1.8%	3,317	20.4%	731	6.3%
Defending	4,596	12.0%	927	20.2%	1,153	19.6%	4,838	29.7%	1067	9.2%
General play	8,742	22.8%	268	5.9%	373	6.4%	2,361	14.5%	2,933	25.2%
Chasing loose ball	2,977	7.8%	161	3.5%	1,258	21.4%	2,339	14.4%	1,169	10.0%
Shooting	2,422	6.3%	73	1.6%	1442	24.6%	0	0.0%	232	2.0%
Ball handling/dribbling	3,412	8.9%	695	15.2%	268	4.6%	393	2.4%	532	4.6%
Receiving pass	587	1.5%	232	5.1%	339	5.8%	268	1.6%	528	4.5%
Conditioning	2,384	6.2%	0	0.0%	0	0.0%	107	0.7%	0	0.0%
Passing	714	1.9%	0	0.0%	73	1.2%	0	0.0%	0	0.0%
Other	746	1.9%	0	0.0%	0	0.0%	107	0.7%	1898	16.3%
Unknown	3,581	9.3%	819	17.9%	856	14.6%	2,536	15.6%	2,195	18.9%
Total	**38,336**	**100.0%**	**4,579**	**100.0%**	**5,869**	**100.0%**	**16,266**	**100.0%**	**11,636**	**100.0%**

IX. Wrestling Injury Epidemiology

Table 9.1 Wrestling Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**357**	**141,948**	**2.52**	**91,176**
Competition	163	36,508	4.46	**44,433**
Practice	194	105,440	1.84	**46,743**

Table 9.2 Demographic Characteristics of Injured Wrestlers, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=88,248**
Freshman	20.2%
Sophomore	24.7%
Junior	28.8%
Senior	26.2%
Total†	**100.0%**
Age (years)	**n=75,132**
Minimum	13
Maximum	18
Mean (St. Dev.)	16.0 (1.3)
BMI	**n=60,869**
Minimum	14.8
Maximum	46.5
Mean (St. Dev.)	24.8 (5.2)

*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 9.1 Diagnosis of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

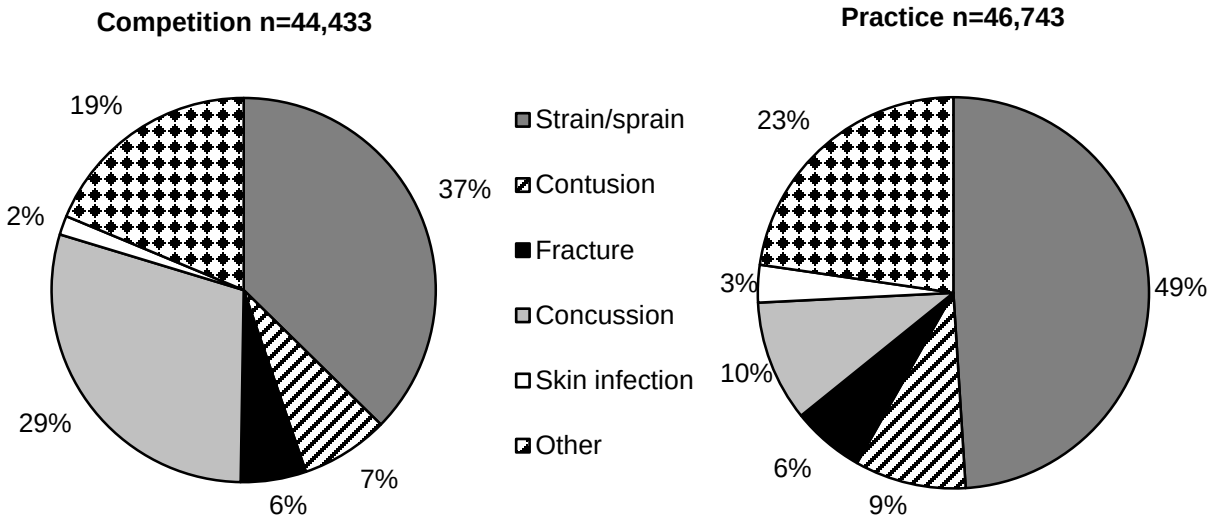


Table 9.3 Body Site of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	14,223	32.0%	5,983	12.8%	20,206	22.2%
Knee	7060	15.9%	12,174	26.0%	19,234	21.1%
Shoulder	7,940	17.9%	9,940	21.3%	17,880	19.6%
Arm/elbow	3,701	8.3%	2,664	5.7%	6,365	7.0%
Trunk	1,484	3.3%	4,879	10.4%	6,363	7.0%
Ankle	3,384	7.6%	2,829	6.1%	6,213	6.8%
Hand/wrist	1,549	3.5%	3,844	8.2%	5,393	5.9%
Foot	477	1.1%	2,945	6.3%	3,422	3.8%
Hip/thigh/upper leg	1,572	3.5%	485	1.0%	2,057	2.3%
Neck	1,669	3.8%	290	0.6%	1,959	2.1%
Lower leg	985	2.2%	406	0.9%	1,391	1.5%
Other	390	0.9%	304	0.7%	694	0.8%
Total	**44,434**	**100.0%**	**46,743**	**100.0%**	**91,177**	**100.0%**

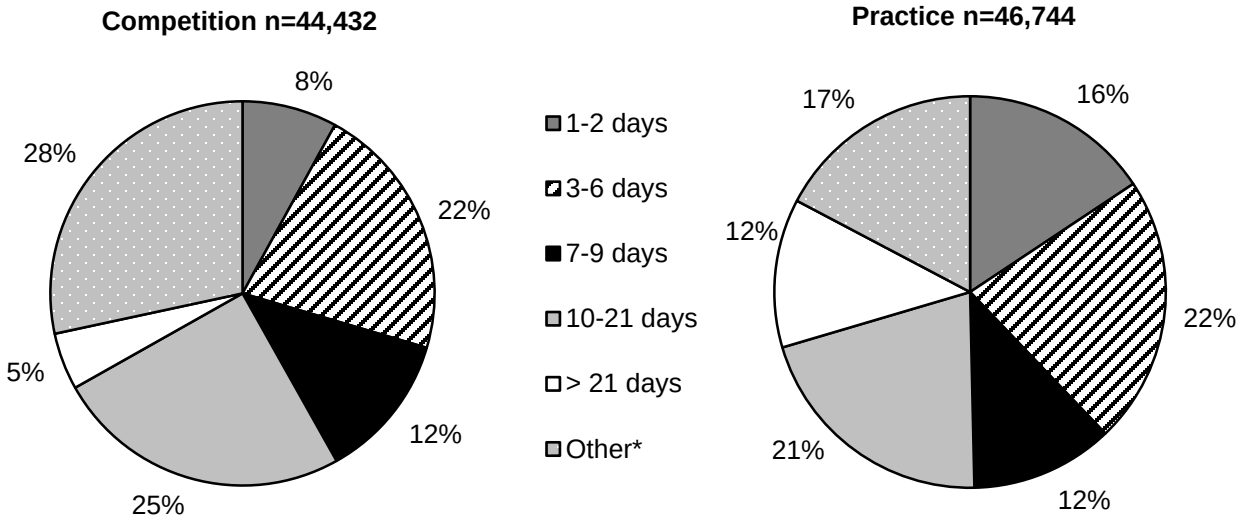
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 9.4 Ten Most Common Wrestling Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=44,433		Practice n=46,744		Total n=91,177	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	13,072	29.4%	4,667	10.0%	17,739	19.5%
Shoulder sprain/strain	4,061	9.1%	7,659	16.4%	11,720	12.9%
Knee sprain/strain	3,142	7.0%	5,715	12.2%	8,857	9.7%
Knee other	2,862	6.4%	4,898	10.5%	7,760	8.5%
Ankle sprain/strain	3,276	7.4%	2,755	5.9%	6,031	6.6%
Shoulder other	3,295	7.4%	1,553	3.3%	4,848	5.3%
Foot sprain/strain	477	1.1%	2,662	5.7%	3,139	3.4%
Trunk contusion	972	2.2%	1,923	4.1%	2,895	3.2%
Knee contusion	1055	2.4%	1,560	3.3%	2,615	2.9%
Hand/wrist sprain/strain	958	2.2%	1,320	2.8%	2,278	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 9.2 Time Loss of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	5,069	11.6%	2,414	5.2%	7,483	8.3%
Did not require surgery	38,591	88.4%	43,699	94.8%	82,290	91.7%
Total	**43,660**	**100.0%**	**46,113**	**100.0%**	**89,773**	**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 injury

Figure 9.3 History of Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

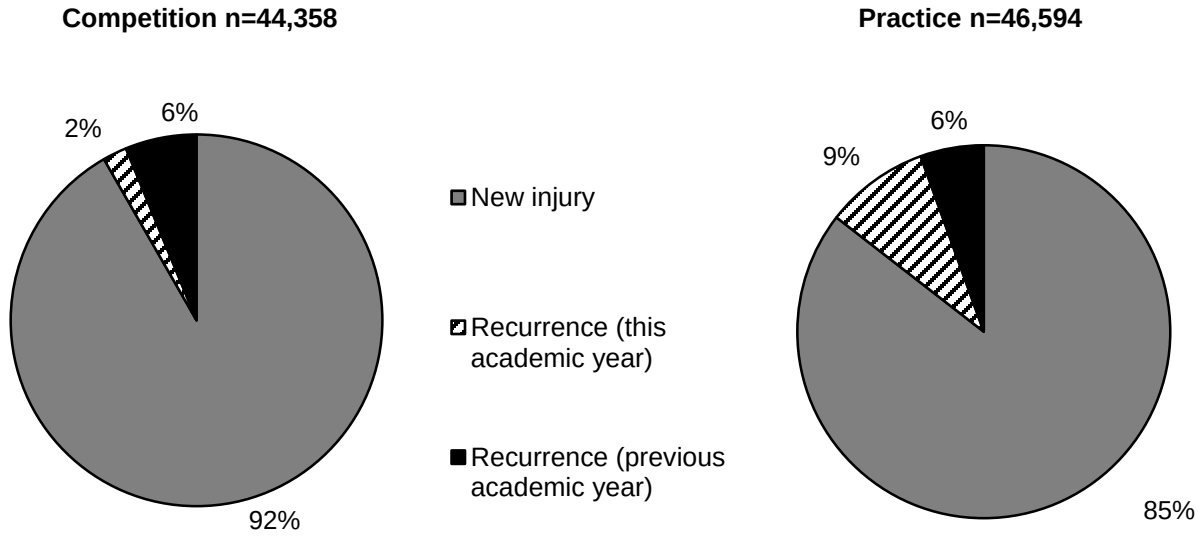


Table 9.6 Time during Season of Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	20,595	22.6%
Regular season	62,612	68.7%
Post season	7,969	8.7%
Total	**91,176**	**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 9.7 Competition-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	283	0.7%
First period	4,106	9.9%
Second period	11,599	28.1%
Third period	7,586	18.4%
Overtime	283	0.7%
Unknown	17,482	42.3%
Total	**41,339**	**100.0%**
Mat Location		
Within 28 ft. circle	51,808	60.3%
Off the mat	697	0.8%
Out of bounds	3,299	3.8%
Unknown	30,180	35.1%
Total	**85,984**	**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 9.8 Practice-Related Variables for Wrestling Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	2,964	6.5%
Second 1/2 hour	6,154	13.4%
1-2 hours into practice	27,421	59.7%
>2 hours into practice	1,144	2.5%
Unknown	8,236	17.9%
Total	**45,920**	**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 9.9 Activities Leading to Wrestling Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Takedown	21,466	52.4%	16,582	37.5%	38,048	44.6%
Sparring	3,681	9.0%	9,282	21.0%	12,963	15.2%
Conditioning	0	0.0%	3,607	8.2%	3,607	4.2%
Escape	1,665	4.1%	1,257	2.8%	2,922	3.4%
n/a (e.g., skin infection, overuse, heat illness, etc.)	654	1.6%	2,110	4.8%	2,764	3.2%
Reversal	1,348	3.3%	1,395	3.2%	2,743	3.2%
Fall	1,283	3.1%	1,434	3.2%	2,717	3.2%
Near fall	1,088	2.7%	544	1.2%	1,632	1.9%
Riding	544	1.3%	150	0.3%	694	0.8%
Unknown	8,544	20.8%	7,080	16.0%	15,624	18.3%
Other	716	1.7%	791	1.8%	1,507	1.8%
Total	**40,989**	**100.0%**	**44,232**	**100.0%**	**85,221**	**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 9.10 Activities Resulting in Wrestling Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Diagnosis											
	Strain/Sprain		Contusion		Fracture		Concussion		Skin Infection		Other	
	n	%	n	%	n	%	n	%	n	%	n	%
Activity												
Takedown	12,277	32.7%	4,804	71.0%	2,543	49.8%	10,264	64.4%	0	0.0%	8,159	44.2%
Near fall	1088	2.9%	544	8.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sparring	6,556	17.4%	390	5.8%	1,422	27.9%	1,683	10.6%	0	0.0%	2,912	15.8%
n/a*	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1,285	94.5%	1,478	8.0%
Conditioning	2,727	7.3%	107	1.6%	75	1.5%	154	1.0%	0	0.0%	544	2.9%
Reversal	1,329	3.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1,413	7.7%
Fall	1,853	4.9%	75	1.1%	0	0.0%	331	2.1%	0	0.0%	458	2.5%
Riding	336	0.9%	0	0.0%	75	1.5%	0	0.0%	0	0.0%	283	1.5%
Escape	2,539	6.8%	154	2.3%	0	0.0%	0	0.0%	0	0.0%	229	1.2%
Unknown	8,451	22.5%	694	10.3%	989	19.4%	3,066	19.2%	75	5.5%	2350	12.7%
Other	433	1.2%	0	0.0%	0	0.0%	433	2.7%	0	0.0%	641	3.5%
Total	**37,589**	**100.0%**	**6,768**	**100.0%**	**5,104**	**100.0%**	**15,931**	**100.0%**	**18,467**	**100.0%**	**1,360**	**100.0%**

Alphabetic List of Variables and Attributes

#	Variable	Type	Len	Format	Informat	Label
5	AGE_DIFF	Num	8	BEST.		AGE_DIFF
7	AGE_EXAM	Num	8	15.2		AGE_EXAM
28	AGE_EXAM_1	Num	8	15.2		AGE_EXAM_1
3	AGE_SURG	Num	8	BEST.		AGE_SURG
56	CHG_HosSport	Char	3	$3.00	$3.00	CHG HosSport
42	CHG_MCS	Num	8	15.2		CHG MCS
54	Chg_HOSadl	Num	8	15.2		Chg HOSadl
52	Chg_mHHS	Char	3	$3.00	$3.00	Chg mHHS

***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, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**175**	**169,591**	**1.03**	**52,889**
Competition	101	60,878	1.66	**30,158**
Practice	74	108,713	0.68	**22,731**

Table 10.2 Demographic Characteristics of Injured Baseball Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=51,214**
Freshman	20.4%
Sophomore	26.7%
Junior	26.1%
Senior	26.8%
Total†	**100.0%**
Age (years)	**n=37,065**
Minimum	13
Maximum	18
Mean (St. Dev.)	16.2 (1.2)
BMI	**n=24,100**
Minimum	17.6
Maximum	37.5
Mean (St. Dev.)	24.0 (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 10.1 Diagnosis of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

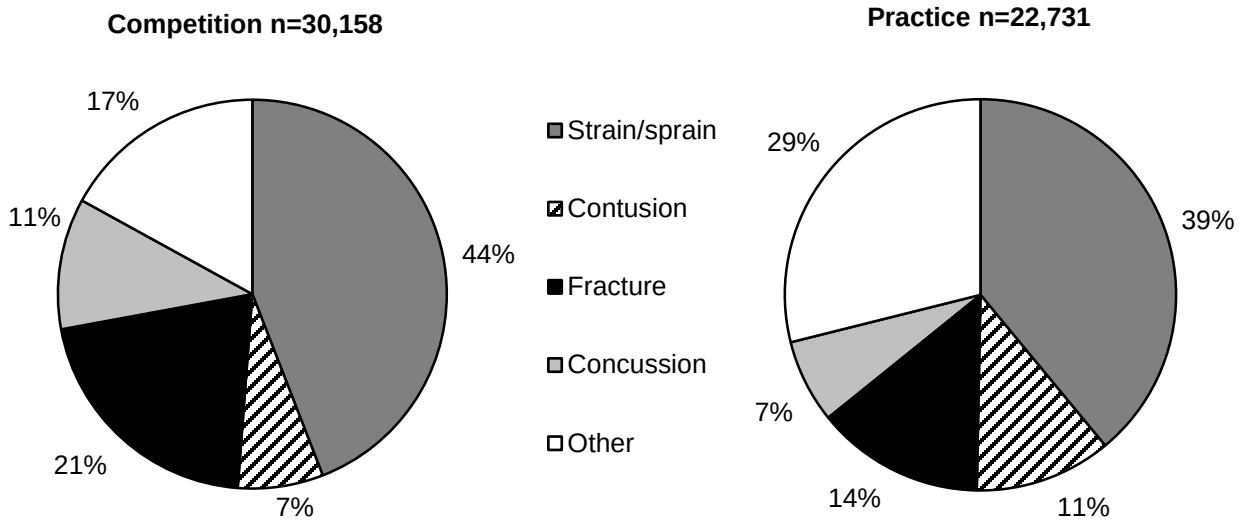


Table 10.3 Body Site of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	5,430	18.2%	4,250	18.7%	9,680	18.4%
Hand/wrist	4,812	16.1%	2,865	12.6%	7,677	14.6%
Hip/thigh/upper leg	4,867	16.3%	2,798	12.3%	7,665	14.6%
Shoulder	3,053	10.2%	4,267	18.8%	7,320	13.9%
Arm/elbow	4,514	15.1%	1,582	7.0%	6,096	11.6%
Knee	2,437	8.1%	1,623	7.1%	4,060	7.7%
Trunk	1,210	4.0%	2,385	10.5%	3,595	6.8%
Ankle	1,656	5.5%	831	3.7%	2,487	4.7%
Lower leg	900	3.0%	981	4.3%	1,881	3.6%
Foot	0	0.0%	911	4.0%	911	1.7%
Other	486	1.6%	119	0.5%	605	1.1%
Total	**29,915**	**100.0%**	**22,731**	**100.0%**	**52,646**	**100.0%**

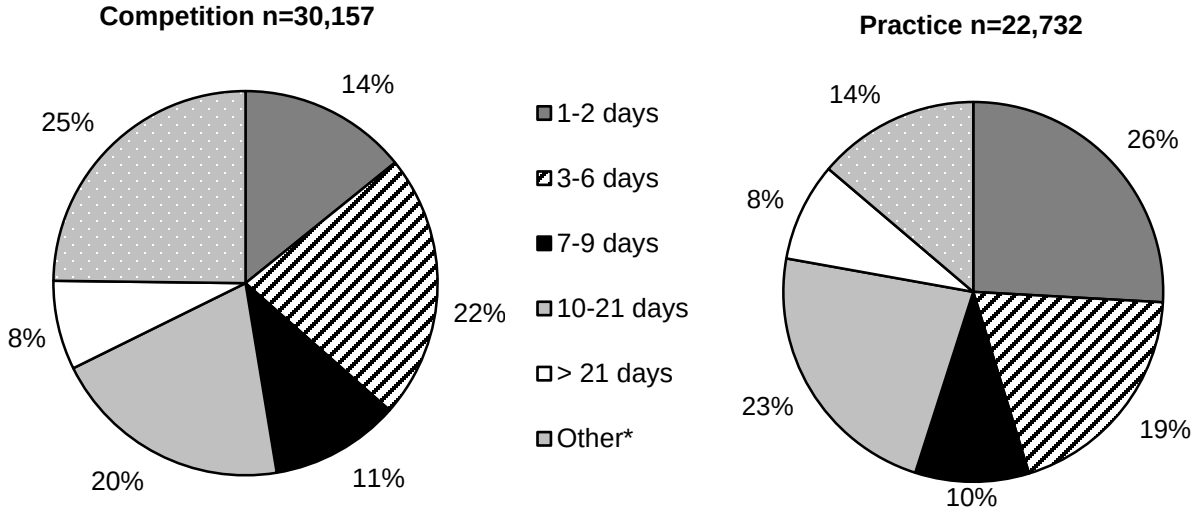
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 10.4 Ten Most Common Baseball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=29,914		Practice n=22,731		Total n=52,645	
	n	%	n	%	n	%
Diagnosis						
Hip/thigh/upper leg strain/sprain	3,767	12.6%	1,418	6.2%	5,185	9.8%
Head/face concussion	3,290	11.0%	1,567	6.9%	4,857	9.2%
Hand/wrist fracture	3,956	13.2%	899	4.0%	4,855	9.2%
Arm/elbow strain/sprain	3,658	12.2%	782	3.4%	4,440	8.4%
Shoulder strain/sprain	981	3.3%	2,782	12.2%	3,763	7.1%
Shoulder other	1,791	6.0%	1,485	6.5%	3,276	6.2%
Trunk strain/sprain	810	2.7%	1,624	7.1%	2,434	4.6%
Ankle strain/sprain	1,656	5.5%	550	2.4%	2,206	4.2%
Knee strain/sprain	987	3.3%	1,061	4.7%	2048	3.9%
Head/face fracture	792	2.6%	1,224	5.4%	2,016	3.8%

* 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 10.2 Time Loss of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	3,209	11.0%	642	2.8%	3,851	7.5%
Did not require surgery	25,849	89.0%	21,921	97.2%	47,770	92.5%
Total	**29,058**	**100.0%**	**22,563**	**100.0%**	**51,621**	**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 10.3 History of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

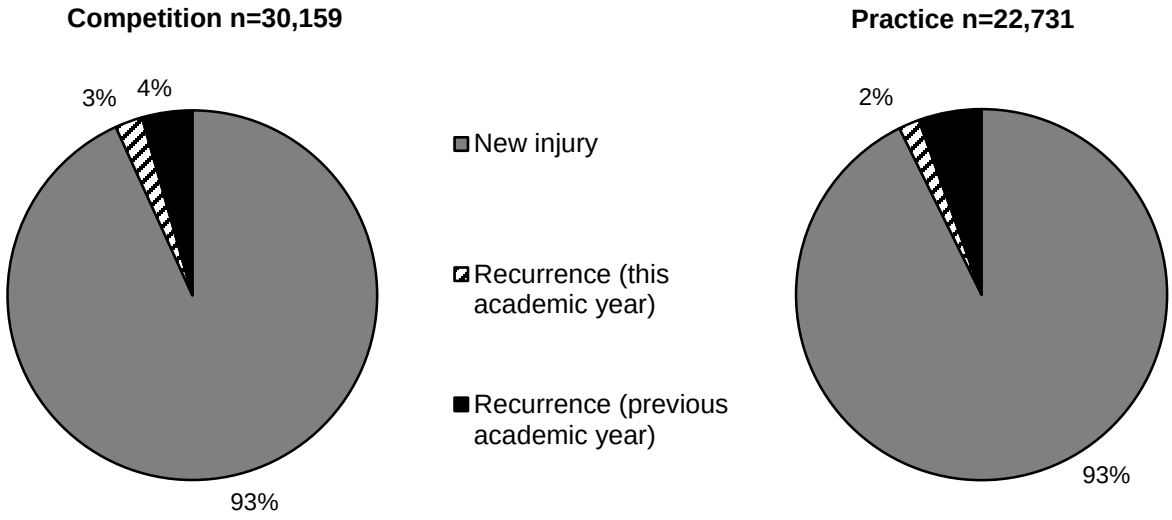


Table 10.6 Time during Season of Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	10,127	19.2%
Regular season	39,945	75.7%
Post season	2,417	4.6%
Other	281	0.5%
Total	**52,771**	**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 10.7 Competition-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	892	3.2%
First inning	2,766	9.8%
Second inning	2,896	10.2%
Third inning	2,277	8.1%
Fourth inning	3,879	13.7%
Fifth inning	4,267	15.1%
Sixth inning	2,984	10.6%
Seventh inning	935	3.3%
Unknown	7,374	26.1%
Total	**28,271**	**100.0%**
Field Location		
Home plate	7,549	25.5%
Pitcher's mound	5,731	19.4%
First base	5,251	17.7%
Second base	4,260	14.4%
Outfield	2,410	8.1%
Third base	891	3.0%
Infield	831	2.8%
Foul territory	0	0.0%
Other	697	2.4%
Unknown	1,993	6.7%
Total	**29,614**	**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 10.8 Practice-Related Variables for Baseball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	1,258	5.8%
Second 1/2 hour	6,005	27.5%
1-2 hours into practice	5,925	27.1%
>2 hours into practice	643	2.9%
Unknown	8,000	36.6%
Total	**21,831**	**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 10.4 Player Position of Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

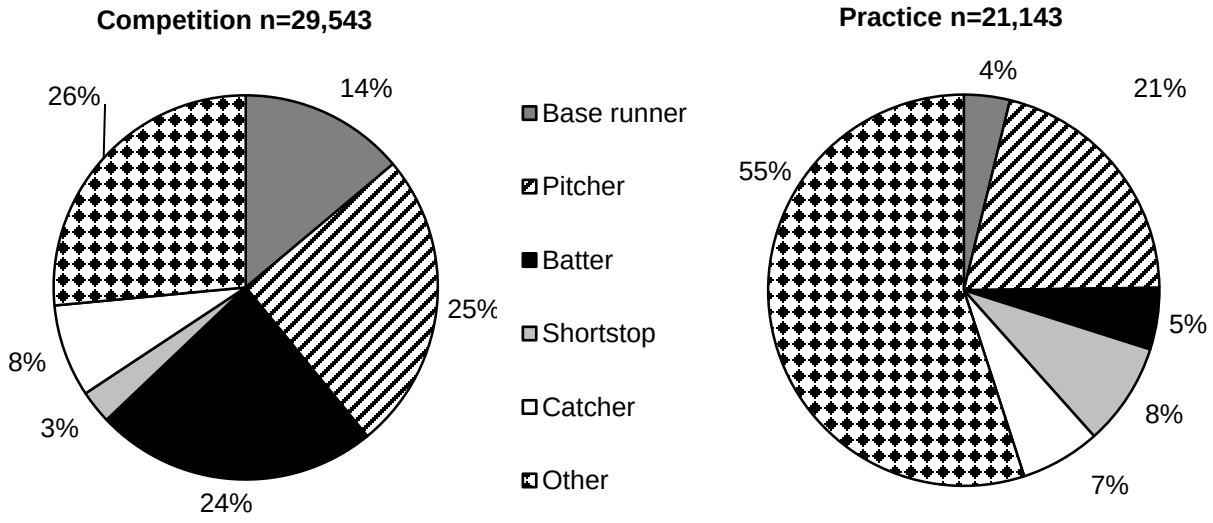


Table 10.9 Activities Leading to Baseball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Pitching	6,180	20.9%	2,667	12.5%	8,847	17.4%
Fielding a batted ball	4,762	16.1%	3,834	18.0%	8,596	16.9%
Running bases	6,227	21.0%	1,242	5.8%	7,469	14.7%
Batting	5,567	18.8%	1,680	7.9%	7,247	14.2%
Throwing (not pitching)	562	1.9%	3,782	17.8%	4,344	8.5%
Catching	1,749	5.9%	2011	9.5%	3,760	7.4%
Sliding	2,223	7.5%	281	1.3%	2,504	4.9%
Fielding a thrown ball	1,111	3.8%	604	2.8%	1,715	3.4%
General play	524	1.8%	810	3.8%	1,334	2.6%
Conditioning	0	0.0%	361	1.7%	361	0.7%
Other	238	0.8%	1,097	5.2%	1,335	2.6%
Unknown	470	1.6%	2,890	13.6%	3,360	6.6%
Total	**29,613**	**100.0%**	**21,259**	**100.0%**	**50,872**	**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 10.10 Activity Resulting in Baseball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Fielding a thrown ball	411	2.0%	1,061	22.4%	0	0.0%	0	0.0%	243	2.1%
Fielding a batted ball	1861	9.1%	1,430	30.25	1,330	14.7%	2,303	47.4%	1,673	14.3%
Throwing not pitching	2,104	10.2%	0	0.0%	281	3.1%	281	5.8%	1,678	14.4%
Running bases	5,684	27.7%	0	0.0%	281	3.1%	0	0.0%	1,505	12.9%
Batting	524	2.6%	869	18.4%	2,981	32.9%	1,280	26.4%	1,593	13.6%
Sliding	1,224	6.0%	0	0.0%	800	8.8%	0	0.0%	480	4.1%
Pitching	7,099	34.6%	819	17.3%	281	3.1%	0	0.0%	648	5.5%
Catching	313	1.5%	550	11.6%	1930	21.3%	69	1.4%	899	7.7%
General play	604	2.9%	0	0.0%	168	1.9%	0	0.0%	562	4.8%
Conditioning	0	0.0%	0	0.0%	361	4.0%	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%	519	5.7%	361	7.4%	455	3.9%
Unknown	722	3.5%	0	0.0%	119	1.3%	562	11.6%	1,956	16.7%
Total	**20,546**	**100.0%**	**4,729**	**100.0%**	**9,051**	**100.0%**	**4,856**	**100.0%**	**11,692**	**100.0%**

XI. Softball Injury Epidemiology

Table 11.1 Softball Injury Rates by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	# Injuries	# Exposures	Injury rate (per 1,000 athlete-exposures)	Nationally Estimated # Injuries
Total	**167**	**116,902**	**1.43**	**66,019**
Competition	91	41,484	2.19	**33,975**
Practice	76	75,418	1.01	**32,044**

Table 11.2 Demographic Characteristics of Injured Softball Athletes, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

Year in School	**n=63,728**
Freshman	33.1%
Sophomore	26.4%
Junior	15.7%
Senior	24.9%
Total†	**100.0%**
Age (years)	**n=48,449**
Minimum	13
Maximum	18
Mean (St. Dev.)	15.8 (1.3)
BMI	**n=30,553**
Minimum	17.8
Maximum	39.1
Mean (St. Dev.)	23.3 (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 11.1 Diagnosis of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

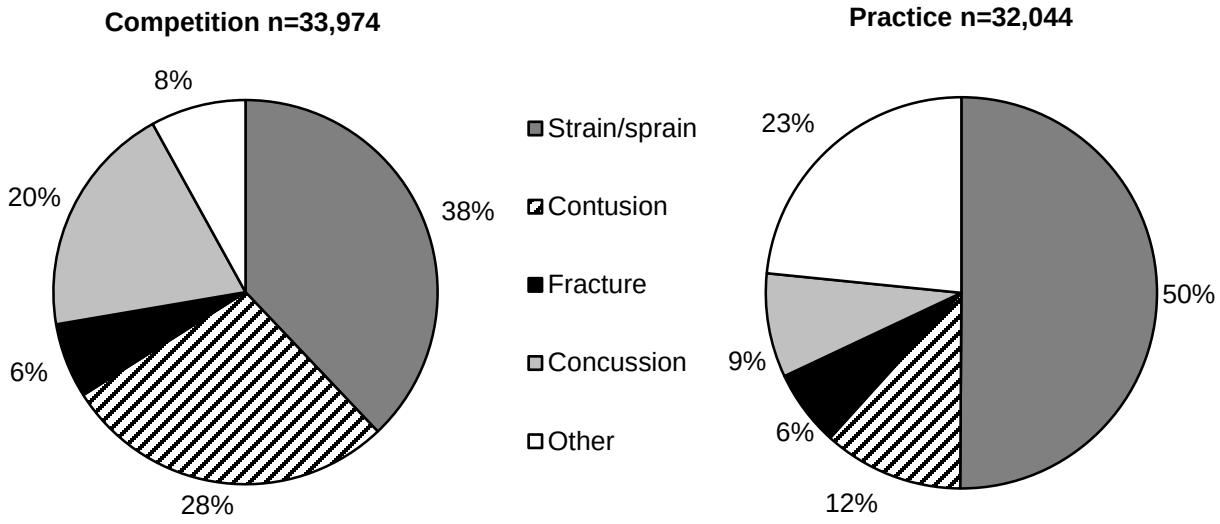


Table 11.3 Body Site of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Body Site						
Head/face	8,531	25.1%	4,590	14.3%	13,121	19.9%
Arm/elbow	998	2.9%	8,048	25.1%	9,046	13.7%
Shoulder	4,285	12.6%	3,595	11.2%	7,880	11.9%
Ankle	2,050	6.0%	4,394	13.7%	6,444	9.8%
Knee	4,753	14.0%	1,471	4.6%	6,224	9.4%
Hand/wrist	4,850	14.3%	1,081	3.4%	5,931	9.0%
Lower leg	4,032	11.9%	993	3.1%	5,025	7.6%
Hip/thigh/upper leg	1,713	5.0%	3,252	10.1%	4,965	7.5%
Trunk	1,944	5.7%	2,440	7.6%	4,384	6.6%
Neck	750	2.2%	1,642	5.1%	2,392	3.6%
Other	0	0.0%	234	0.7%	234	0.4%
Total	**33,976**	**100.0%**	**32,044**	**100.0%**	**66,020**	**100.0%**

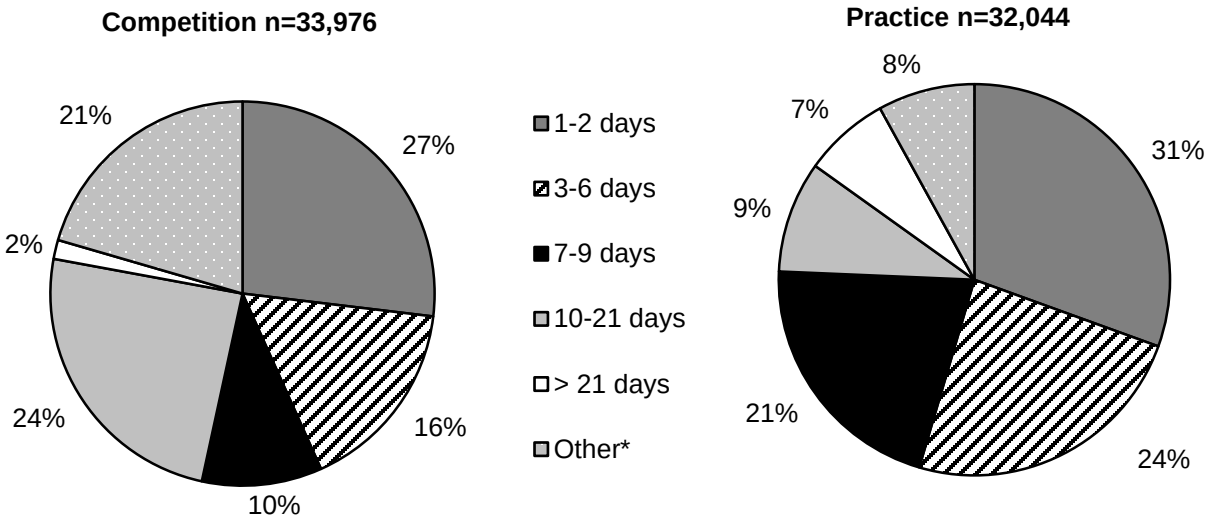
* Totals and n's are not always equal due to slight rounding of the weighted number of injuries and missing responses. Due to a low level of non-response, these totals are always similar but are not always equal to the total number of injuries.

Table 11.4 Ten Most Common Softball Injury Diagnoses by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition n=33,975		Practice n=32,044		Total n=66,019	
	n	%	n	%	n	%
Diagnosis						
Head/face concussion	6,649	19.6%	2,757	8.6%	9,406	14.2%
Shoulder strain/sprain	4,145	12.2%	2,119	6.6%	6,264	9.5%
Ankle strain/sprain	1,386	4.1%	4,394	13.7%	5,780	8.8%
Arm/elbow strain/sprain	70	0.2%	4,521	14.1%	4,591	7.0%
Arm/elbow other	694	2.0%	3,527	11.0%	4,221	6.4%
Hip/thigh/upper leg strain/sprain	1,713	5.0%	2,259	7.0%	3,972	6.0%
Head/face contusion	1,881	5.5%	1,833	5.7%	3,714	5.6%
Trunk strain/sprain	1,501	4.4%	2,121	6.6%	3,622	5.5%
Lower leg contusion	3,180	9.4%	0	0.0%	3,180	4.8%
Knee other	1,408	4.1%	1,262	3.9%	2,670	4.0%

* 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, 2018-19 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, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Need for surgery						
Required surgery	1,725	5.2%	488	1.6%	2,213	3.4%
Did not require surgery	31,398	94.8%	30,908	98.4%	62,306	96.6%
Total	**33,123**	**100.0%**	**31,396**	**100.0%**	**64,519**	**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 11.3 History of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

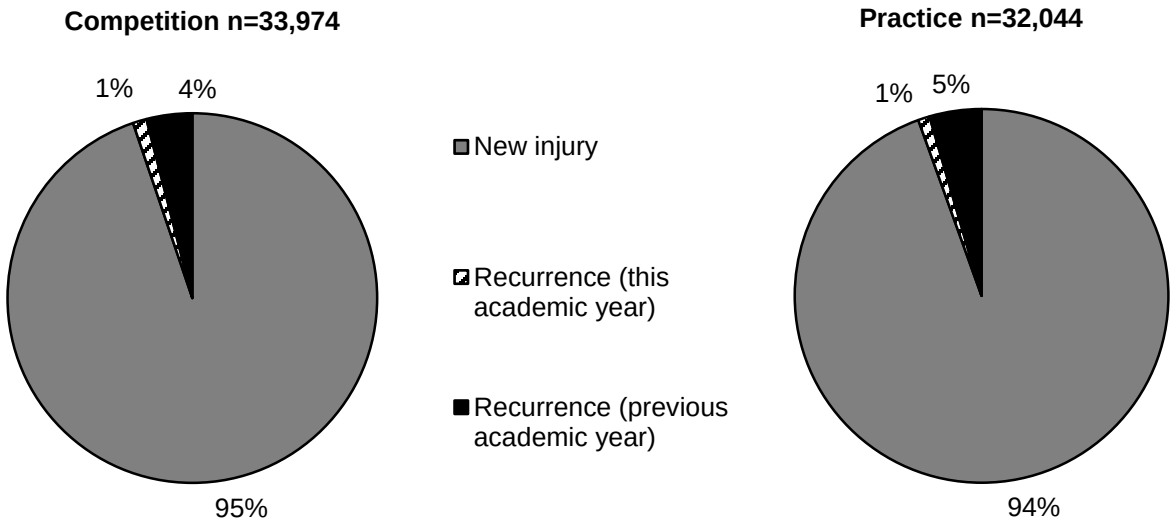


Table 11.6 Time during Season of Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Season		
Preseason	7,321	11.1%
Regular season	56,560	85.7%
Post season	2,139	3.2%
Total	**66,020**	**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 11.7 Competition-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Competition		
Pre-competition/warm-ups	2,983	10.0%
First inning	936	3.1%
Second inning	734	2.5%
Third inning	2,185	7.3%
Fourth inning	2,399	8.1%
Fifth inning	4,746	15.9%
Sixth inning	2,365	7.9%
Seventh inning	1,710	5.7%
Unknown	11,728	39.4%
Total	**29,786**	**100.0%**
Field Location		
Home plate	6,720	21.3%
Outfield	5,462	17.3%
Second base	4,130	13.1%
First base	3,231	10.3%
Pitcher's mound	2,935	9.3%
Foul territory	2,589	8.2%
Infield	1,782	5.7%
Third base	1,608	5.1%
Other	249	0.8%
Unknown	2,783	8.8%
Total	**31,490**	**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 11.8 Practice-Related Variables for Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	n	%
Time in Practice		
First 1/2 hour	4,880	15.9%
Second 1/2 hour	3,782	12.3%
1-2 hours into practice	8,716	28.4%
>2 hours into practice	876	2.9%
Unknown	12,425	40.5%
Total	**30,679**	**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 11.4 Player Position of Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

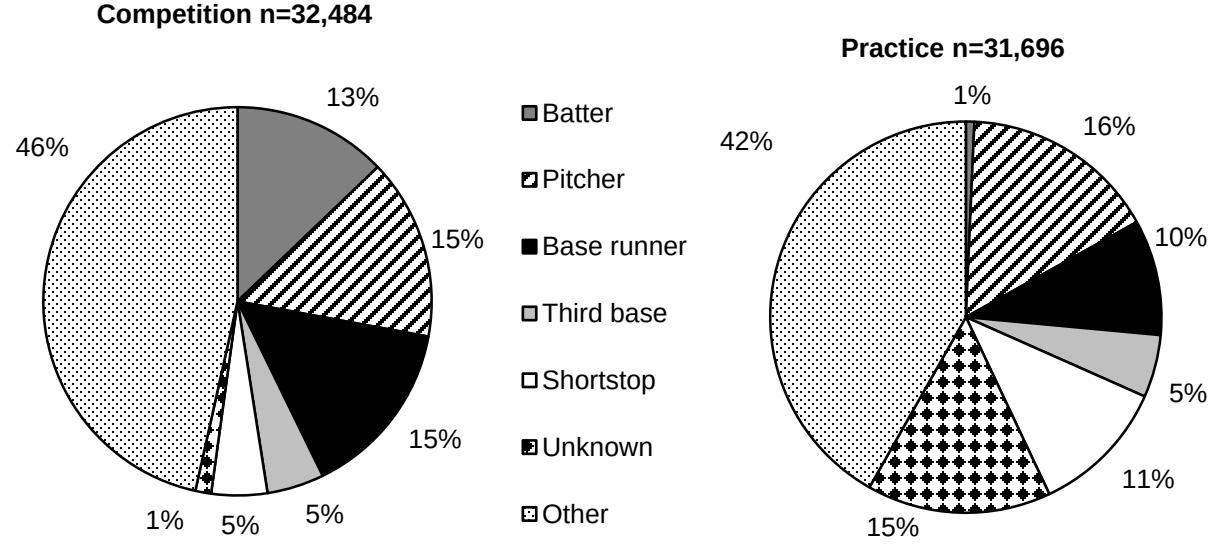


Table 11.9 Activities Leading to Softball Injuries by Type of Exposure, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year*

	Competition		Practice		Overall	
	n	%	n	%	n	%
Activity						
Fielding a batted ball	7,095	21.8%	3,456	10.9%	10,551	16.4%
Running bases	5,470	16.8%	4,812	15.1%	10,282	16.0%
Throwing (not pitching)	513	1.6%	9,303	29.2%	9,816	15.3%
Pitching	2,935	9.0%	2,992	9.4%	5,927	9.2%
Batting	4,957	15.3%	528	1.7%	5,485	8.5%
Sliding	3,354	10.3%	1,481	4.7%	4,835	7.5%
Catching	3,390	10.4%	1,380	4.3%	4,770	7.4%
Fielding a thrown ball	1,144	3.5%	2,937	9.2%	4,081	6.3%
General play	0	0.0%	3,923	12.3%	3,923	6.1%
Unknown	1,845	5.7%	719	2.3%	2,564	4.0%
Other	1,780	5.5%	234	0.7%	2,014	3.1%
Total	**32,483**	**100.0%**	**31,835**	**100.0%**	**64,318**	**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 11.10 Activity Resulting in Softball Injuries by Injury Diagnosis, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Diagnosis									
	Strain/Sprain		Contusion		Fracture		Concussion		Other	
	n	%	n	%	n	%	n	%	n	%
Activity										
Fielding a thrown ball	443	1.6%	2,079	16.0%	0	0.0%	1,326	14.1%	234	2.3%
Fielding a batted ball	3,805	13.7%	3,580	27.5%	1,436	36.0%	1,660	17.6%	70	0.7%
Running bases	6,279	22.7%	1,295	10.0%	1,147	28.8%	498	5.3%	1,063	10.4%
Throwing (not pitching)	5,058	18.3%	0	0.0%	0	0.0%	418	4.4%	4,339	42.5%
Batting	1,476	5.3%	3,275	25.2%	0	0.0%	664	7.1%	70	0.7%
Catching	1,410	5.1%	1,562	12.0%	234	5.9%	900	9.6%	664	6.5%
General play	852	3.1%	249	1.9%	0	0.0%	707	7.5%	2,115	20.7%
Pitching	4,360	15.7%	209	1.6%	249	6.2%	0	0.0%	1,109	10.9%
Sliding	2,708	9.8%	513	3.9%	852	21.4%	279	3.0%	483	4.7%
Conditioning	0	0.0%	0	0.0%	70	1.8%	0	0.0%	0	0.0%
Other	234	0.8%	234	1.8%	0	0.0%	1,476	15.7%	70	0.7%
Unknown	1,086	3.9%	0	0.0%	0	0.0%	1,478	15.7%	0	0.0%
Total	**27,711**	**100.0%**	**12,996**	**100.0%**	**3,988**	**100.0%**	**9,406**	**100.0%**	**10,217**	**100.0%**

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, 2018-19 School Year

	Boys' soccer	Girls' soccer*	RR (95% CI)†
Total	1.83	**2.72**	**1.48 (1.29-1.71)**
Competition	3.86	**5.70**	**1.48 (1.24-1.75)**
Practice	0.92	**1.34**	**1.45 (1.15-1.85)**

*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, 2018-19 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Body Site			
Hip/thigh/upper leg	**17.4%**	14.2%	1.23 (0.81-1.86)
Head/face	19.4%	**23.6%**	1.22 (0.87-1.70)
Ankle	16.1%	**24.3%**	**1.51 (1.05-2.16)**
Knee	12.6%	**16.4%**	1.30 (0.85-1.99)
Hand/wrist	**6.1%**	3.1%	1.96 (0.83-4.59)
Foot	**7.2%**	4.6%	1.59 (0.79-3.21)
Lower leg	4.5%	**7.0%**	1.58 (0.80-3.10)
Trunk	**9.1%**	2.0%	**4.68 (1.86-11.82)**
Arm/elbow	**1.5%**	1.4%	1.09 (0.26-4.63)
Shoulder	**3.0%**	1.1%	2.68 (0.71-10.10)
Neck	**1.5%**	1.0%	1.44 (0.28-7.36)
Other	**1.5%**	1.4%	1.12 (0.28-4.48)
Total	**100.0%**	**100.0%**	

Table 12.3 Comparison of Diagnoses of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Strain/sprain	**48.5%**	45.5%	1.07 (0.89-1.28)
Contusion	**14.9%**	8.9%	**1.67 (1.04-2.68)**
Fracture	**7.8%**	4.2%	1.84 (0.90-3.76)
Concussion	16.8%	**21.2%**	1.26 (0.88-1.82)
Other	12.1%	**20.1%**	1.67 (1.09-2.57)
Total	**100.0%**	**100.0%**	

Table 12.4 Most Common Boys' and Girls' Soccer Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	14.1%	**20.3%**	1.47 (0.97-2.13)
Head/face concussion	16.8%	**21.2%**	1.26 (0.88-1.82)
Hip/thigh/upper leg strain/sprain	**13.1%**	11.3%	1.17 (0.72-1.88)
Knee strain/sprain	6.7%	**8.5%**	1.28 (0.69-2.37)
Knee other	3.9%	**6.8%**	1.73 (0.81-3.66)

*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, 2018-19 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Time Loss			
1-2 days	**23.0%**	19.8%	1.16 (0.83-1.63)
3-6 days	**27.2%**	17.6%	**1.54 (1.11-2.15)**
7-9 days	12.0%	**14.8%**	1.23 (0.79-1.91)
10-21 days	16.7%	**27.2%**	**1.63 (1.15-2.31)**
22 days or more	**4.3%**	3.2%	1.35 (0.62-2.94)
Other	16.8%	**17.4%**	1.04 (0.71-1.52)
Total	**100.0%**	**100.0%**	

Table 12.6 Comparison of Mechanisms of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Mechanism			
Contact with another player	**33.2%**	25.5%	1.31 (0.98-1.73)
Stepped on/fell on/kicked	11.1%	**12.7%**	1.14 (0.70-1.87)
Rotation around a planted foot/inversion	10.4%	**13.8%**	1.32 (0.79-2.20)
Overuse, heat illness, conditioning, etc.	9.0%	**17.1%**	**1.89 (1.15-3.11)**
Contact with ball	11.0%	**11.7%**	1.06 (0.65-1.74)
Uneven playing surface	**2.0%**	1.5%	1.29 (0.31-5.39)
Slide tackle	**7.6%**	4.3%	1.75 (0.83-3.70)
Contact with goal	0.7%	**0.7%**	1.08 (0.08-14.08)
Other	**10.7%**	7.4%	1.44 (0.81-2.56)
Unknown	4.3%	**5.3%**	1.22 (0.57-2.62)
Total	**100.0%**	**100.0%**	

Table 12.7 Comparison of Activities of Boys' and Girls' Soccer Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' soccer	Girls' soccer	IPR (95% CI)
Soccer Activity			
General play	21.1%	**25.0%**	1.18 (0.85-1.64)
Defending	13.4%	**15.9%**	1.19 (0.76-1.87)
Chasing loose ball	**7.3%**	4.8%	1.53 (0.74-3.18)
Ball handling/dribbling	**12.2%**	6.9%	1.77 (0.97-3.23)
Goaltending	**8.8%**	4.8%	1.83 (0.98-3.44)
Shooting (foot)	**7.1%**	5.4%	1.32 (0.62-2.82)
Heading ball	**4.9%**	4.2%	1.16 (0.51-2.65)
Passing (foot)	**3.0%**	2.6%	1.15 (0.42-3.13)
Receiving pass	2.8%	**5.3%**	1.92 (0.76-4.90)
Conditioning	2.6%	**4.2%**	1.57 (0.52-4.72)
Other	**5.4%**	3.4%	1.54 (0.68-3.48)
Unknown	11.4%	**17.5%**	1.53 (0.98-2.37)
Total	**100.0%**	**100.0%**	

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, 2018-19 School Year

	Boys' basketball	Girls' basketball	RR (95% CI)*
Total	1.61	**1.95**	**1.21 (1.04-1.42)**
Competition	3.09	**3.63**	1.18 (0.96-1.44)
Practice	0.98	**1.21**	1.24 (0.98-1.57)

*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 12.9 Comparison of Body Sites of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Body Site			
Ankle	**41.9%**	28.8%	**1.46 (1.32-1.87)**
Knee	7.8%	**16.3%**	**2.09 (1.27-3.44)**
Head/face	13.9%	**25.9%**	**1.87 (1.30-2.68)**
Hip/thigh/upper leg	4.9%	**7.2%**	1.46 (0.73-2.93)
Hand/wrist	**12.3%**	5.2%	**2.35 (1.22-4.52)**
Shoulder	**3.2%**	1.2%	2.65 (0.81-8.67)
Trunk	**5.9%**	5.5%	1.07 (0.50-2.29)
Lower leg	**4.3%**	3.1%	1.37 (0.52-3.60)
Arm/elbow	**1.1%**	0.6%	1.87 (0.26-13.16)
Foot	3.9%	3.9%	1.00 (0.39-2.54)
Neck	0.1%	**0.5%**	6.10 (0.46-83.33)
Other	0.8%	**1.7%**	2.24 (0.54-9.30)
Total	**100.0%**	**100.0%**	

Table 12.10 Comparison of Diagnoses of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Strain/sprain	**54.1%**	50.0%	1.08 (0.91-1.29)
Contusion	**9.5%**	5.6%	1.70 (0.92-3.16)
Fracture	**10.9%**	7.3%	1.50 (0.82-2.73)
Concussion	10.5%	**20.9%**	**2.00 (1.31-3.05)**
Other	15.0%	**16.2%**	1.07 (0.71-1.63)
Total	**100.0%**	**100.0%**	

Table 12.11 Most Common Boys' and Girls' Basketball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	**38.3%**	27.9%	**1.38 (1.06-1.80)**
Head/face concussion	10.5%	**20.9%**	**1.98 (1.30-3.03)**
Knee strain/sprain	2.1%	**9.9%**	**4.61 (1.91-11.13)**
Knee other	3.9%	**5.9%**	1.53 (0.70-3.33)
Hand/wrist fracture	**6.3%**	2.5%	**2.51 (1.00-6.26)**
Hip/thigh/upper leg strain/sprain	2.0%	**6.0%**	**2.97 (1.11-7.96)**

*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, 2018-19 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Time Loss			
1-2 days	**19.8%**	16.1%	1.23 (0.83-1.83)
3-6 days	23.1%	**23.3%**	1.01 (0.72-1.40)
7-9 days	13.6%	**15.5%**	1.14 (0.74-1.76)
10-21 days	**24.1%**	21.4%	1.24 (0.81-1.57)
22 days or more	**5.5%**	4.5%	1.23 (0.56-2.70)
Other	13.9%	**19.2%**	1.38 (0.93-2.06)
Total	**100.0%**	**100.0%**	

Table 12.13 Comparison of Mechanisms of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Mechanism			
Collision with another player	**26.0%**	24.9%	1.04 (0.77-1.42)
Jumping/landing	**24.1%**	17.8%	1.35 (0.95-1.93)
Overuse, heat illness, conditioning, etc.	6.6%	**9.8%**	1.50 (0.80-2.83)
Rotation around a planted foot/inversion	**17.3%**	15.3%	1.13 (0.75-1.71)
Stepped on/fell on/kicked	**9.0%**	5.3%	1.67 (0.82-3.44)
Contact with ball	4.9%	**5.6%**	1.13 (0.51-2.48)
Other	8.6%	**13.2%**	1.53 (0.88-2.70)
Unknown	3.6%	**8.0%**	**2.25 (1.01-5.02)**
Total	**100.0%**	**100.0%**	

Table 12.14 Comparison of Activities of Boys' and Girls' Basketball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Boys' basketball	Girls' basketball	IPR (95% CI)
Basketball Activity			
Rebounding	**20.5%**	17.8%	1.15 (0.79-1.67)
General play	18.1%	**19.7%**	1.09 (0.75-1.60)
Defending	13.0%	**16.3%**	1.26 (0.80-1.98)
Chasing loose ball	7.9%	**10.2%**	1.29 (0.71-2.34)
Shooting	**16.3%**	5.4%	**3.01 (1.53-5.95)**
Conditioning	2.1%	**3.2%**	1.55 (0.47-5.06)
Ball handling/dribbling	3.3%	**6.9%**	**2.10 (1.02-4.33)**
Receiving pass	2.0%	**2.5%**	1.26 (0.41-3.86)
Other	3.1%	**5.1%**	1.53 (0.64-3.68)
Unknown	**13.7%**	12.9%	1.06 (0.66-1.69)
Total	**100.0%**	**100.0%**	

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, 2018-19 School Year

	Baseball	Softball	RR (95% CI)
Total	1.03	**1.43**	**1.38 (1.12-1.71)**
Competition	1.66	**2.19**	1.32 (1.00-1.76)
Practice	0.68	**1.01**	**1.48 (1.08-2.04)**

Table 12.16 Comparison of Body Sites of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Baseball	Softball	IPR (95% CI)
Body Site			
Ankle	4.7%	**9.8%**	2.07 (0.84-5.07)
Knee	7.7%	**9.4%**	1.22 (0.54-2.75)
Head/face	18.4%	**19.9%**	1.08 (0.66-1.76)
Hip/thigh/upper leg	**14.6%**	7.5%	1.94 (0.85-4.44)
Hand/wrist	**14.6%**	9.0%	1.62 (0.82-3.21)
Shoulder	**13.9%**	11.9%	1.17 (0.56-2.42)
Trunk	**6.8%**	6.6%	1.03 (0.41-2.60)
Lower leg	3.6%	**7.6%**	2.13 (0.61-7.49)
Arm/elbow	11.6%	**13.7%**	1.18 (0.59-2.37)
Foot	**1.7%**	0.6%	3.06 (0.44-21.28)
Neck	1.3%	**3.6%**	2.85 (0.40-20.15)
Other	**1.1%**	0.4%	3.24 (0.33-32.07)
Total	**100.0%**	**100.0%**	

Table 12.17 Comparison of Diagnoses of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Strain/sprain	41.9%	**43.8%**	1.05 (0.78-1.41)
Contusion	8.9%	**20.1%**	**2.24 (1.12-4.51)**
Fracture	**17.9%**	6.4%	**2.79 (1.28-6.06)**
Concussion	9.2%	**14.2%**	1.55 (0.80-3.00)
Other	**22.1%**	15.5%	1.43 (0.83-12.47)
Total	**100.0%**	**100.0%**	

Table 12.18 Most Common Baseball and Softball Injury Diagnoses*, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Baseball	Softball	IPR (95% CI)
Diagnosis			
Ankle strain/sprain	4.2%	**8.8%**	2.10 (0.80-5.52)
Hand/wrist fracture	**9.2%**	2.2%	**4.26 (1.63-11.13)**
Head/face concussion	9.2%	**14.2%**	1.52 (0.80-2.00)
Hip/thigh/upper leg strain/sprain	**9.8%**	6.0%	1.63 (0.64-4.16)
Knee strain/sprain	**3.9%**	3.0%	1.29 (0.32-5.21)
Shoulder strain/sprain	7.1%	**9.5%**	1.33 (0.51-3.48)

*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, 2018-19 School Year

	Baseball	Softball	IPR (95% CI)
Time Loss			
1-2 days	19.2%	**28.6%**	1.49 (0.94-2.38)
3-6 days	**21.0%**	20.1%	1.05 (0.63-1.75)
7-9 days	10.4%	**15.4%**	1.48 (0.79-2.79)
10-21 days	**21.4%**	17.1%	1.25 (0.72-2.16)
22 days or more	**7.9%**	4.3%	1.82 (0.63-5.32)
Other	**20.1%**	14.4%	1.39 (0.82-2.36)
Total	**100.0%**	**100.0%**	

Table 12.20 Comparison of Mechanisms of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Mechanism			
Overuse, heat illness, conditioning, etc.	11.3%	**14.5%**	1.28 (0.64-2.58)
Contact with another player	**10.3%**	7.0%	1.46 (0.66-3.27)
Contact with bases	8.2%	**8.6%**	1.04 (0.46-2.35)
Throwing - not pitching	6.7%	**10.0%**	1.51 (0.63-3.60)
Throwing - pitching	**10.8%**	5.9%	1.84 (0.73-4.66)
Contact with thrown ball (non-pitch)	6.0%	**12.0%**	2.06 (0.86-1.02)
Rotation around a planted foot/inversion	3.0%	**6.3%**	2.08 (0.54-8.06)
Hit by batted ball	**8.6%**	8.5%	1.00 (0.46-2.20)
Hit by pitch	**9.2%**	5.1%	1.81 (0.67-4.90)
Other	**17.4%**	17.1%	1.01 (0.89-1.12)
Unknown	**8.6%**	4.9%	1.75 (0.55-5.56)
Total	**100.0%**	**100.0%**	

Table 12.21 Comparison of Activities of Baseball and Softball Injuries, High School Sports-Related Injury Surveillance Study, US, 2018-19 School Year

	Baseball	Softball	IPR (95% CI)
Baseball/Softball Activity			
Fielding a batted ball	**16.9%**	16.4%	1.03 (0.59-1.81)
Fielding a thrown ball	3.4%	**6.3%**	1.88 (0.56-6.32)
Running bases	14.7%	**16.0%**	1.09 (0.59-2.01)
Pitching	**17.4%**	9.2%	1.89 (0.92-3.86)
Batting	**14.2%**	8.5%	1.67 (0.78-3.58)
Sliding	4.9%	**7.5%**	1.53 (0.55-4.22)
Throwing (not pitching)	8.5%	**15.3%**	1.79 (0.85-3.77)
General play	2.6%	**6.1%**	2.33 (0.73-7.41)
Conditioning	**0.7%**	0.0%	--
Catching	7.4%	7.4%	1.00 (0.43-2.37)
Other	2.6%	**3.1%**	1.19 (0.31-4.55)
Unknown	**6.6%**	4.0%	**1.66 (0.48-5.68)**
Total	**100.0%**	**100.0%**	

XIII. Trends over Time

Table 13.1 Injury Rates by Sport, Type of Exposure, and Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years (continued on next page)

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	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	2.09	2.45	2.29	0.56
Competition	4.63	4.88	4.45	4.05	4.19	4.10	4.26	4.31	4.22	4.40	4.74	4.28	4.88	4.61	0.61
Practice	1.69	1.75	1.52	1.26	1.32	1.16	1.40	1.34	1.39	1.28	1.39	1.22	1.47	1.38	0.09
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	3.56	4.33	3.85	0.37
Competition	12.09	13.50	12.80	11.26	12.95	12.30	12.41	12.53	11.38	11.97	12.68	11.55	14.13	12.10	0.94
Practice	**2.54**	**2.68**	**2.47**	**1.92**	**2.06**	**1.74**	**2.16**	**2.08**	**2.15**	**2.06**	**2.18**	**1.89**	**2.14**	**2.00**	**0.05**
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	1.47	1.94	1.83	0.13
Competition	4.22	4.31	3.63	3.43	3.39	3.08	3.47	3.28	3.40	3.43	3.95	3.25	3.92	3.86	0.54
Practice	**1.58**	**1.45**	**0.96**	**0.87**	**1.04**	**0.90**	**0.90**	**0.78**	**0.82**	**0.78**	**0.91**	**0.67**	**1.04**	**0.92**	**0.02**
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**	**2.46**	**2.82**	**2.72**	**0.02**
Competition	**5.21**	**5.43**	**5.15**	**4.59**	**4.67**	**4.13**	**5.68**	**5.54**	**5.72**	**6.11**	**5.93**	**5.91**	**5.83**	**5.70**	**0.02**
Practice	1.10	1.31	1.16	1.00	0.85	0.93	1.09	0.92	1.04	1.09	1.09	0.85	1.48	1.34	0.48
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	1.13	1.54	1.34	0.98
Competition	1.92	1.40	1.43	0.90	1.00	1.18	1.27	1.08	1.15	1.39	1.52	1.67	2.18	1.58	0.27
Practice	1.48	1.36	1.12	0.88	0.99	0.85	0.85	0.78	0.91	0.97	1.02	0.86	1.20	1.23	0.34
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	1.54	1.54	1.61	0.40
Competition	2.98	2.87	2.23	2.32	2.72	2.30	2.60	2.44	2.40	1.98	2.84	2.65	2.74	3.09	0.70
Practice	1.46	1.28	1.04	0.95	0.92	0.91	0.91	1.04	1.02	0.68	0.90	1.04	1.01	0.98	0.06

*Statistically significant tests for trend are bolded

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Table 13.1 Injury Rates by Sport, Type of Exposure, and Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	p-value for trend*
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	1.87	2.15	1.95	0.23
Competition	3.60	3.60	3.30	3.13	2.84	3.59	3.03	3.13	3.66	3.27	4.17	3.63	4.12	3.63	0.12
Practice	1.37	1.44	0.90	0.87	1.02	0.92	0.98	1.24	1.08	0.94	1.24	1.03	1.26	1.21	0.74
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	2.02	2.65	2.52	0.79
Competition	3.93	3.80	3.70	3.35	3.09	3.32	3.56	3.54	3.95	3.76	3.43	3.77	4.30	4.46	0.10
Practice	2.04	2.06	1.76	1.75	1.56	1.55	2.10	1.88	1.95	1.61	1.83	1.40	2.04	1.84	0.54
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	0.74	0.95	1.03	0.25
Competition	1.77	2.01	1.37	1.32	1.27	1.49	1.14	1.30	1.68	1.67	1.35	1.23	1.28	1.66	0.32
Practice	0.87	0.82	0.68	0.48	0.57	0.46	0.65	0.66	0.63	0.55	0.56	0.44	0.77	0.68	0.31
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	1.34	1.34	1.43	0.13
Competition	1.78	1.96	1.86	1.62	1.66	1.45	2.04	1.96	1.09	1.67	2.10	1.55	1.94	2.19	0.63
Practice	0.79	0.65	0.98	0.72	0.85	0.69	1.16	0.73	0.93	0.65	0.87	1.21	1.01	1.01	0.09

*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, 2005/06-2018/19 School Years (continued on next page)

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
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**
Competition	**759,334**	**766,512**	**763,034**	**690,525**	**754,091**	**711,642**	**740,493**	**779,055**
Practice	**683,199**	**706,337**	**656,689**	**557,601**	**605,805**	**484,173**	**651,769**	**582,931**
Boys' football total	516,150	574,367	616,665	527,321	581,414	483,016	559,064	616,209
Competition	280,919	292,316	311,780	288,637	322,801	296,199	287,710	344,097
Practice	235,231	282,051	304,885	238,684	258,614	186,817	271,354	272,112
Boys' soccer total	218,760	171,874	159,351	149,229	153,485	138,974	172,070	149,049
Competition	119,703	93,295	99,785	87,082	83,985	81,238	97,540	89,429
Practice	99,058	78,579	59,566	62,147	69,500	57,736	74,530	59,620
Girls' soccer total	185,770	230,769	215,850	192,108	181,159	180,254	222,679	190,382
Competition	122,803	149,231	146,102	123,312	129,754	124,674	145,469	141,339
Practice	62,967	81,538	69,748	68,796	51,405	55,580	77,210	49,043
Girls' volleyball total	81,813	80,493	72,261	56,609	67,760	50,711	52,662	44,064
Competition	32,677	27,423	26,539	19,764	21,728	21,416	24,439	19,150
Practice	49,136	53,069	45,722	36,845	46,032	29,295	28,223	24,914
Boys' basketball total	100,058	96,670	82,612	79,230	85,063	79,762	75,872	85,819
Competition	44,826	46,109	36,766	40,152	46,787	41,252	41,978	44,095
Practice	55,232	50,561	45,846	39,078	38,276	38,510	33,894	41,724
Girls' basketball total	103,566	102,831	73,283	64,933	78,709	83,033	67,280	83,107
Competition	53,812	53,703	45,236	38,277	44,026	53,931	37,213	45,645
Practice	49,753	49,128	28,047	26,656	34,684	29,102	30,067	37,462
Boys' wrestling total	105,542	101,139	91,625	88,996	80,390	80,569	107,992	85,485
Competition	36,259	38,750	40,698	39,029	37,742	36536	40,235	35,016
Practice	69,283	62,389	50,927	49,967	42,647	44,033	67,757	50,469
Boys' baseball total	67,560	60,296	44,760	39,869	64,053	46,796	43,590	49,747
Competition	33,639	33,494	22,803	25,584	36,502	29,789	20,818	24,807
Practice	33,922	26,802	21,957	14,285	27,551	17,008	22,772	24,940
Girls' softball total	63,313	54,411	63,316	49,831	67,862	52,700	91,053	58,124
Competition	34,696	32,191	33,325	28,688	30,767	26,607	45,091	35,477
Practice	28,618	22,220	29,991	21,143	37,096	26,093	45,962	22,647

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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, 2005/06-2018/19 School Years

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Overall total	**1,427,315**	**1,196,479**	**1,393,566**	**1,160,321**	**1,367,490**	**1,307,414**
Competition	**790,966**	**708,150**	**801,156**	**699,410**	**798,220**	**748,085**
Practice	**636,349**	**488,329**	**592,410**	**460,911**	**569,270**	**559,329**
Boys' football total	624,470	529,483	568,789	444,281	463,626	455,449
Competition	324,354	286,421	316,308	252,462	281,790	259,317
Practice	300,116	243,062	252,481	191,819	181,836	196,132
Boys' soccer total	149,278	133,919	174,811	145,215	180,607	184,656
Competition	90,683	89,091	111,720	98,031	113,655	120,217
Practice	58,595	44,828	63,091	47,184	66,952	64,439
Girls' soccer total	227,172	217,546	209,027	190,436	242,602	227,951
Competition	167,975	158,078	142,722	146,696	152,993	140,542
Practice	59,197	59,468	66,305	43,740	89,609	87,409
Girls' volleyball total	45,144	46,807	58,127	46,601	67,163	59,370
Competition	16,430	19,373	25,300	23,886	33,075	23,045
Practice	28,714	27,434	32,827	22,715	34,088	36,325
Boys' basketball total	84,455	55,980	81,240	88,927	93,773	87,521
Competition	42,504	32,534	45,596	46,251	48,814	48,318
Practice	41,951	23,446	35,644	42,676	44,959	39,203
Girls' basketball total	89,451	64,491	99,598	70,700	90,554	82,383
Competition	50,864	38,803	56,786	44,660	53,834	48,080
Practice	38,587	25,688	42,812	26,040	36,720	34,303
Boys' wrestling total	91,203	60,253	91,642	67,834	103,058	91,176
Competition	39,378	32,728	38,430	34,405	48,770	44,433
Practice	51,825	27,525	53,212	33,429	54,288	46,743
Boys' baseball total	62,493	44,208	44,760	36,395	49,716	52,889
Competition	37,682	27,129	25,581	21,458	26,844	30,158
Practice	24,811	17,079	19,179	14,937	22,872	22,731
Girls' softball total	53,649	43,792	65,572	69,932	76,391	66,019
Competition	21,096	23,993	38,713	31,561	38,445	33,975
Practice	32,553	19,799	26,859	38,371	37,946	32,044

Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years* (continued on next page)

	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
Body Site							
Ankle	22.7%	19.8%	18.5%	16.4%	17.5%	17.7%	16.1%
Knee	14.2%	16.6%	14.6%	14.8%	15.7%	14.2%	13.4%
Head/face	12.3%	12.4%	12.4%	15.3%	17.2%	23.3%	25.1%
Hip/thigh/upper leg	10.8%	10.5%	10.2%	10.3%	9.2%	8.3%	9.8%
Shoulder	7.9%	8.0%	10.1%	9.3%	8.4%	7.0%	6.6%
Hand/wrist	8.0%	7.5%	9.1%	8.5%	10.3%	8.9%	8.5%
Trunk	6.2%	6.7%	6.5%	6.6%	5.8%	4.7%	4.9%
Lower leg	4.6%	5.2%	5.7%	5.8%	4.7%	5.0%	4.5%
Arm/elbow	4.1%	3.9%	4.6%	4.1%	4.0%	3.1%	4.0%
Foot	4.0%	4.0%	4.2%	5.0%	4.1%	4.0%	3.4%
Neck	2.2%	1.9%	1.8%	1.9%	1.9%	1.8%	1.7%
Other	3.2%	3.6%	2.4%	2.1%	1.2%	2.1%	2.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

*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.

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Table 13.3 Body Site of Injury by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years*

	2012-13 n=1,361,584	2013-14 n=1,427,315	2014-15 n=1,196,398	2015-16 n=1,393,565	2016-17 n = 1,160,321	2017-18 n=1,367,491	2018-19 n=1,306,753
Body Site							
Ankle	15.5%	16.9%	15.1%	16.6%	17.8%	17.8%	18.3%
Knee	14.8%	14.4%	13.7%	14.9%	13.4%	14.1%	13.8%
Head/face	25.7%	25.3%	27.4%	27.3%	27.2%	21.4%	21.4%
Hip/thigh/upper leg	9.5%	8.7%	9.0%	8.0%	9.0%	10.4%	9.9%
Shoulder	6.5%	8.5%	7.2%	6.8%	6.4%	6.1%	7.7%
Hand/wrist	7.4%	7.8%	7.4%	7.8%	7.7%	9.1%	7.9%
Trunk	5.2%	4.1%	4.3%	4.0%	4.3%	5.1%	5.7%
Lower leg	3.9%	4.9%	4.0%	4.3%	4.4%	4.7%	4.2%
Arm/elbow	3.5%	3.1%	3.7%	3.4%	3.7%	4.5%	3.5%
Foot	3.2%	2.8%	3.9%	3.6%	2.5%	3.9%	3.9%
Neck	2.3%	1.2%	1.9%	1.3%	1.4%	0.9%	1.5%
Other	2.5%	2.4%	2.5%	2.1%	2.3%	2.0%	2.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

*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, 2005/06-2018/19 School Years

	2005-06, n=1,444,172	2006-07, n=1,466,398	2007-08 n=1,414,139	2008-09 n=1,248,126	2009-10 n=1,359,897	2010-11 n=1,191,484
Diagnosis						
Strain/sprain	52.0%	48.2%	48.3%	45.7%	44.7%	43.2%
Contusion	12.2%	13.7%	12.4%	11.5%	14.0%	9.6%
Fracture	9.8%	8.9%	10.2%	10.9%	9.9%	10.2%
Concussion	9.1%	8.4%	9.2%	11.8%	14.0%	20.0%
Other	16.8%	20.9%	19.9%	20.2%	17.5%	17.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	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**	**2016-17 n=1,157,001**
Diagnosis						
Strain/sprain	42.2%	42.3%	41.7%	39.8%	40.4%	40.2%
Contusion	10.8%	10.6%	9.4%	9.3%	9.2%	9.6%
Fracture	7.7%	7.8%	7.6%	9.4%	8.6%	8.5%
Concussion	22.2%	23.1%	21.9%	24.6%	24.6%	24.8%
Other	17.1%	16.2%	19.4%	16.9%	17.1%	16.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	2017-18 n=1,365,293	**2018-19 n=1,306,879**				
Diagnosis						
Strain/sprain	45.1%	44.6%				
Contusion	10.3%	11.1%				
Fracture	8.0%	7.9%				
Concussion	18.8%	18.8%				
Other	17.8%	17.5%				
Total	**100.0%**	**100.0%**				

Table 13.5 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years (continued on next page)

	2005-06 n=1,435,954	2006-07 n=1,463,273	2007-08 n=1,410,654	2008-09 n=1,248,126	2009-10 n=1,359,897	2010-11 n=1,189,985
Diagnosis						
Ankle strain/sprain	20.6%	17.8%	17.3%	15.0%	16.0%	16.3%
Head/face concussion	9.0%	8.4%	9.2%	11.7%	13.9%	20.0%
Knee strain/sprain	7.6%	8.8%	7.8%	7.9%	8.0%	7.7%
Hip/thigh/upper leg strain/sprain	7.9%	7.7%	7.3%	7.7%	6.5%	6.4%
Knee other	4.3%	4.9%	4.7%	4.5%	5.2%	4.8%
Shoulder other	3.1%	3.7%	4.1%	4.0%	3.3%	3.7%
Hand/wrist fracture	3.2%	3.3%	4.0%	4.0%	4.2%	4.0%
Shoulder strain/sprain	3.4%	2.9%	3.4%	3.7%	3.3%	2.2%
Trunk strain/sprain	2.8%	2.7%	3.2%	2.8%	2.5%	2.4%
Hand/wrist strain/sprain	3.1%	2.5%	3.8%	2.9%	2.8%	2.8%
	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**	**2016-17 n=1,157,003**
Diagnosis						
Ankle strain/sprain	14.7%	14.5%	15.6%	14.2%	15.7%	16.5%
Head/face concussion	22.2%	23.1%	21.9%	24.5%	24.6%	24.8%
Knee strain/sprain	7.6%	8.2%	7.8%	7.3%	8.1%	6.9%
Hip/thigh/upper leg strain/sprain	6.9%	6.7%	6.6%	6.9%	5.7%	6.4%
Knee other	3.9%	4.1%	4.7%	4.5%	5.2%	4.9%
Shoulder other	3.1%	3.4%	4.6%	4.0%	3.3%	3.4%
Hand/wrist fracture	3.7%	3.2%	3.3%	3.5%	3.6%	3.5%
Shoulder strain/sprain	2.9%	2.6%	3.3%	2.6%	2.9%	2.7%
Trunk strain/sprain	1.9%	2.3%	1.7%	1.9%	1.5%	1.9%
Hand/wrist strain/sprain	3.0%	2.5%	2.8%	1.9%	2.5%	2.0%

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Table 13.5 Most Common Injury Diagnoses by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years

	2017-18 n=1,365,292	2018-19 n=1,306,221
Diagnosis		
Ankle strain/sprain	16.4%	16.2%
Head/face concussion	18.7%	19.5%
Knee strain/sprain	6.6%	7.2%
Hip/thigh/upper leg strain/sprain	8.1%	7.2%
Knee other	5.1%	4.9%
Shoulder other	2.9%	3.4%
Hand/wrist fracture	3.5%	3.5%
Shoulder strain/sprain	2.8%	3.6%
Trunk strain/sprain	2.6%	3.2%
Hand/wrist strain/sprain	3.5%	2.6%

Table 13.6 Time Loss of Injuries by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 School Years

	2005-06 n=1,378,145	2006-07 n=1,423,183	2007-08 n=1,355,981	2008-09 n= 1,248,126	2009-10 n= 1,359,897	2010-11 n=1,195,815
Time Loss						
1-2 days	22.5%	26.6%	22.8%	13.7%	14.7%	12.8%
3-6 days	30.0%	28.5%	28.8%	28.5%	27.3%	25.2%
7-9 days	15.3%	14.7%	15.8%	17.7%	16.1%	16.7%
10-21 days	14.9%	14.1%	16.7%	19.7%	16.9%	19.2%
≥22 days or other	17.2%	16.1%	15.9%	20.3%	25.0%	26.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

	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	2016-17 n=1,160,321
Time Loss						
1-2 days	15.9%	12.6%	14.9%	11.0%	16.3%	12.6%
3-6 days	23.3%	23.6%	21.8%	22.0%	21.9%	22.0%
7-9 days	16.1%	16.3%	16.7%	15.6%	12.9%	16.1%
10-21 days	19.6%	21.3%	21.1%	22.1%	21.1%	21.6%
≥22 days or other	25.0%	26.2%	25.5%	29.3%	27.8%	27.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

	2017-18 n=1,367,490	2018-19 n=1,307,413
Time Loss		
1-2 days	21.1%	19.1%
3-6 days	20.9%	22.5%
7-9 days	12.8%	13.3%
10-21 days	`18.8%	`21.0%
≥22 days or other	26.4%	24.2%
Total	**100%**	**100%**

Table 13.7 Injuries Requiring Surgery by Year, High School Sports-Related Injury Surveillance Study, US, 2005/06-2018/19 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
Required surgery	5.3%	6.4%	6.1%	6.7%	8.0%	8.2%
Did not require surgery	94.7%	93.6%	93.9%	93.3%	92.0%	91.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	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**	**2016-17 n=1,147,090**
Required surgery	6.7%	7.3%	7.6%	7.3%	6.1%	7.1%
Did not require surgery	93.3%	92.7%	92.4%	92.7%	93.9%	92.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	2017-18 n=1,354,995	**2018-19 n=1,289,013**				
Required surgery	5.7%	6.4%				
Did not require surgery	94.3%	93.6%				
Total	**100%**	**100%**				

XIV. Reporter Demographics & Compliance

During the 2018-19 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, 95 enrolled ATs reported an average of 41 study weeks. The majority of ATs (94.7%) reported all the weeks during which they were enrolled, with only 2 ATs (2.1%) missing over 10 weeks. Internal validity checks of a 5% randomly selected sample of the 175 schools participating in the convenience sample during the 2018-19 academic year yielded 76.7% sensitivity, 96.4% specificity, a positive predictive value of 74.2%, 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 2020-21 academic year.

Prior to the start of the 2018-19 High School RIO™ study, participating ATs were asked to complete a short demographics survey. Over three-quarters (79.4%) of participating high schools (both in the original study as well as in the expanded convenience study) were public schools, with the remainder being private. All ATs except for 5 provided services to athletes of their high school on 5 or more days each week. Over 60% of ATs participating during the 2018-19 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 convenience 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 101 ATs (47.0%). Average reporting time burdens were 37 minutes for the weekly exposure report and 17 minutes for the injury report form. Using a 5 point Likert scale, RIO™ was overwhelmingly reported to be either very easy (54.5%) or somewhat easy (36.6%) to use (5 and 4 on the Likert scale, respectively), with ATs being either very satisfied (67.3%) or

somewhat satisfied (24.8%) 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 2019-20 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.