Epidemiology of Sports Injuries Among High School Athletes in the United States

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INTRODUCTION:

Over the last 40 years, participation in high school sports has been on the rise. As of the 2018-2019 academic year, nearly 8 million high school students participated in organized sports, which represents nearly 52% of the 15.3 million high school students in the United States. While participation in sports has shown to benefit adolescents' mental and physical health, it also leads to an increased risk of injury in a vulnerable population. Among children, sports injuries are one of the most common reasons for emergency department visits, totaling an average of nearly 3 million visits per year, with increased proportion requiring surgery. With the lack of recent population data, this epidemiological study sought to provide an update to previous studies characterizing injuries in high school athletes in the United States.

METHODS:

Data from the National Health School Sports-Related Injury Surveillance Study, High School RIO (Reporting Information Online), which collects injury data from 100 nationally representative high schools, was obtained for the 2015-2019 academic years. High schools included in the RIO have athletic trainers affiliated with the National Athletic Trainers' Association who serve as weekly athletic exposure and injury reporters for 5 boys' (football, soccer, basketball, wrestling, and baseball) and 4 girls' (soccer, basketball, volleyball, and softball) sports. Athletic exposure (AE) is defined as one athlete participating in one practice or competition. Injury rates were calculated as the ratio of injuries per 1,000 athletic exposures. Rate ratios with 95% confidence intervals and p-values were calculated. Data regarding injured body site, types of injuries, time loss, and surgical requirement were also obtained.

RESULTS:

From 2015 to 2019, high school athletic trainers reported 15,531 injuries during 6,778,209 athletic exposures, with an overall rate of 2.29 injuries per 1,000 AEs. An estimated 5,228,791 injuries occurred nationally. Injury rates were highest in football (3.96), girls' soccer (2.65), and boys' wrestling (2.36). Injury rate was higher in boys' sports (2.52) compared to girls' sports (1.56). Injury rate was higher in competition compared to practice (RR, 3.39, 95% CI, 3.28-3.49, $p<0.001$). The most commonly injured body sites were the head and face (24.2%), ankle (17.6%), and knee (14.1%). Sprains/strains (36.8%) and concussions (21.6%) were the most common diagnoses. Fractures represented 3.5% of all injuries and were more common in boys' sports (4.2%) than girls' sports (2.0%). Boys' baseball (8.4%) followed by boys' basketball (4.8%) and boys' football (4.5%) had the highest proportion of fractures. 39.2% and 34.0% of injuries resulted in a time loss of less than 1 week and 1-3 weeks, respectively. 7% of injuries led to a time loss of greater than 3 weeks. 20.9% of injuries led to medical disqualification for the season or the athlete's career, inability to return to play before the season ended, or an athlete's decision to not continue with their sport. Overall, 6.3% of injuries required surgery, with wrestling (9.6%), girls' basketball (7.6%), and boys' baseball (7.4%) having the highest proportion.

DISCUSSION AND CONCLUSION:

This study provides updated epidemiologic data regarding sports-related injuries among high school students in the United States. The results of this study indicate that rates and types of injuries vary by sport, gender, and exposure. Our study found an overall injury rate of 2.29 per 1000 AEs, which has decreased from 2.51 in a 2005-2006 study conducted by Rechel et al. Our data also demonstrates a nearly 10% increase in injuries affecting the head and neck compared to Rechel et al.'s study. The increase in injuries to the head coupled with the higher proportion of injuries causing time loss of greater than one week shows that, despite the overall decrease in injuries, those that are occurring have changed in form and severity. This study adds necessary data to existing literature as any injury in adolescent and young adult athletes could affect their overall mental and physical health, future injury risk, and increase healthcare burden. As participation in high school sports remains strong, efforts towards developing effective sport-specific preventative strategies must not cease and should be modified as changing injury patterns emerge.

Table 1. Injury Rates Per 1,000 Athletic Exposures (AEs) by Sport and Type of Exposure, National High School Sports Injury Surveillance Study, United States, 2015-2019

		# Injuries	National Estimated # of Injuries	# AEs	Injury Rate/1,000 AEs	RR*	95% CI	P-value
Boys Football	Overall	6,814	1,932,145	1,722,638	3.960	6.14	5.85-6.44	**< 0.001**
	Competition	3,913	1,109,877	310,197	12.62			
	Practice	2,901	822,268	1,412,441	2.05			
Boys Soccer	Overall	1,245	685,289	699,282	1.78	4.22	3.76-4.74	**< 0.001**
	Competition	816	443,623	217,246	3.76			
	Practice	429	241,666	482,036	0.89			
Girls Soccer	Overall	1,594	870,016	600,581	2.65	4.85	4.36-5.39	**< 0.001**
	Competition	1,097	582,953	187,920	5.84			
	Practice	497	287,063	412,661	1.2			
Girls Volleyball	Overall	818	231,201	626,444	1.31	1.61	1.40-1.85	**< 0.001**
	Competition	365	105,306	209,168	1.75			
	Practice	453	125,955	417,276	1.09			
Boys Basketball	Overall	1,297	351,461	841,400	1.54	2.88	2.58-3.22	**< 0.001**
	Competition	721	188,979	254,768	2.83			
	Practice	576	162,482	586,631	0.98			
Girls Basketball	Overall	1,245	343,235	612,599	2.03	3.28	2.92-3.67	**< 0.001**
	Competition	743	203,360	190,692	3.9			
	Practice	502	139,875	421,907	1.19			
Boys Wrestling	Overall	1,295	353,710	548,837	2.36	2.23	2.00-2.49	**< 0.001**
	Competition	569	166,038	142,723	3.99			
	Practice	726	187,672	406,114	1.79			
Boys Baseball	Overall	583	183,760	652,539	0.89	2.26	1.92-2.66	**< 0.001**
	Competition	327	104,041	235,941	1.39			
	Practice	256	79,719	416,598	0.62			
Girls' Softball	Overall	640	277,914	473,889	1.35	1.91	1.64-2.24	**< 0.001**
	Competition	328	142,694	167,993	1.95			
	Practice	312	135,220	305,896	1.02			
Girls' Sports	Overall	4,297	1,722,426	2,313,513	1.857	2.96	2.78-3.14	**< 0.001**
	Competition	2,533	1,034,313	755,773	3.352			
	Practice	1,764	688,113	1,557,740	1.132			
Boys' Sports	Overall	11,234	3,506,365	4,464,696	2.516	0.65	0.62-6.67	**< 0.001**
	Competition	6,346	2,012,558	1,160,875	5.467			
	Practice	4,888	1,493,807	3,303,820	1.479			
All Sports	Overall	15,531	5,228,791	6,778,209	2.291	3.39	3.28-3.49	**< 0.001**
	Competition	8,879	3,046,871	1,916,648	4.633			
	Practice	6,652	2,181,920	4,861,560	1.368			

*Rate ratio compares competition injury rates to practice injury rates

Bolding equals significance p < 0.05