

# Disparities in Sports Medicine Health Care Access in Illinois High Schools: Access to Team Physicians, Athletic Trainers, and Automated External Defibrillators

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## Abstract

High school athletes have higher rates of injuries and sudden death than their college counterparts. Medical care for these athletes should include access to team physicians, athletic trainers, and automated external defibrillators. Disparities in medical care access provided by high schools for their athletes may be due to school characteristics or socioeconomic or racial factors. This study investigated relationships between these factors and access to team physicians, athletic trainers, and automated external defibrillators. Medical care access is negatively related to the percentage of low-income students and positively related to the number of sports offered. Relationships between race and access to a team physician became nonsignificant when the percentage of low-income students was considered. Physicians who treat high school athletes should consider the medical care access provided by their schools when they educate these patients about preventing and treating sports injuries.

## Introduction

High school athletes are particularly vulnerable to catastrophic injuries and sudden death (1,2). Sudden cardiac arrest is the most common event, followed by heat-related illness, brain trauma, and spinal fracture (2). Access to a team physician and athletic trainer (AT) reduces the risk of injury for high school athletes (3). ATs are licensed professionals who are trained to promote safe physical activity, supervise return to sport after injury, and recognize and treat life-threatening conditions, such as heat

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stroke and sudden cardiac arrest (4,5). Quick access to an automated external defibrillator (AED) is the single most important factor in surviving sudden cardiac arrest (6).

Many high schools do not have access to a team physician or full-time AT, or enough AEDs (7–9). Although Illinois state law requires all school athletic facilities to have at least one AED, a single AED is usually inadequate. Previous studies have identified socioeconomic disparities in access to an AT (10–12), as well as racial and socioeconomic disparities in access to AEDs (13).

This study investigates athletes' access to medical care in Illinois public high schools, including whether access is related to school racial or socioeconomic composition or other characteristics. The variables were

access to a team physician (MD or DO), access to a full-time AT, and the number of AEDs in a school's athletic facilities.

## Methods

This study was approved by the Rush University Medical Center Institutional Review Board. A link to an electronic survey hosted by SurveyMonkey was included in emails to all Illinois high school athletic directors asking them to complete the survey ( $n = 813$ ). The survey asked about access to a full-time AT and team physician, the number of AEDs, and related variables. Data collection took place from December 2020 through April 2021. Only co-ed public high schools that were not magnet, charter, college preparatory, military, vocational, or religious schools were included in the study. Of the 601 schools of this type that were asked to participate in the study, 101 completed the survey, for a response rate of 16.8%.

Public information about the schools' racial composition and other characteristics was collected from two online sources: the Illinois Report Card ([www.illinoisreportcard.com](http://www.illinoisreportcard.com)), which contains information submitted by school principals, and Niche ([www.niche.com](http://www.niche.com)), which includes data from the Department of Education and the U.S. Census.

The data were analyzed by using the  $\chi^2$  test of association to compare groups with respect to percentages, and the Mann-Whitney test to compare groups with respect to noncategorical variables. Logistic regression also was done to investigate relationships between each outcome and the school's racial composition, the percentage of low-income students, spending per student, and the number of sports offered by taking multiple variables into account. No one-sided statistical tests were done. A 0.05 significance level was used.

## Results

Survey responders had a higher median number of sports offered, compared with nonresponders (21 vs 17,  $P = 0.0056$ ). No other statistically significant differences were found between responders and nonresponders.

Only 36.6% of the schools had a team physician. None of the schools that offered less than 15 sports had a team physician, compared with 49.3% of the schools that offered at least 15 sports ( $P < 0.0001$ ). Schools in which at least 40% of students were low income also were much less likely than other schools to have a team physician (13.6% vs 54.4%,  $P < 0.0001$ ) (Table). Schools with a team physician had a higher median spending per student (\$13,734 vs \$12,000,  $P = 0.043$ ), a higher median number of sports offered (25 vs 17,  $P < 0.0001$ ), and a lower median percentage of low-income students (27.7 vs 44.4,  $P < 0.0001$ ) compared with other schools. However, when all three of these variables were considered, the number of sports offered, and the percentage of low-income students remained statistically significant but spending per student became nonsignificant.

Schools with at least 35% Black students, or at least 35% Hispanic students, were much less likely to have a team physician. Only 8.3% of schools in which at least 35% of students were Black had a team physician, compared with 40.4% of other schools ( $P = 0.030$ ). Only 9.1% of schools in which at least 35% of students were Hispanic had a team physician, compared with 40.0% of other schools ( $P = 0.045$ ) (Table). These relationships remained statistically significant when the number of sports offered and spending per student were

considered but became nonsignificant when the percentage of low-income students was considered.

Only 48.5% of the schools had a full-time AT. The ability to have an AT on staff was affected by financial constraints (53.5%), student body size (28.4%), and the sports offered at the school (14.7%). Only 7.7% of the schools that offered less than 15 sports had a full-time AT, compared with 62.7% of the schools that offered at least 15 sports ( $P < 0.0001$ ) (Table). Schools with a full-time AT had a higher median number of sports offered than other schools (23 vs 17,  $P < 0.0001$ ). This relationship remained statistically significant when the percentage of low-income students was considered. No statistically significant relationships were found between whether a school had a full-time AT and whether at least 35% of students were Black, or whether at least 35% of students were Hispanic (Table).

Although all schools had at least one AED in the sports facilities, only 38.0% had more than five AEDs. All coaches, all ATs, all athletic directors, and all administrators were trained to use an AED at 59.4%, 91.3%, 91.1%, and 65.0% of the schools, respectively. Only 15.4% of the schools that offered less than 15 sports had more than five AEDs compared with 45.9% of the schools that offered at least 15 sports ( $P = 0.0057$ ) (Table). The percentage of schools with a cardiac emergency response plan was 75.2%.

Schools with more than five AEDs had a higher median spending per student (\$14,046 vs \$12,000,  $P = 0.0018$ ) and a higher median number of sports offered (24 vs 17.5,  $P < 0.0001$ ). The relationship for spending per student remained statistically significant when the percentage of low-income students was considered but became nonsignificant when the number of sports offered was considered. The relationship for the number of sports offered remained statistically significant when the percentage of low-income students and spending per student were considered. No statistically significant relationships were found between whether a school had more than five AEDs and whether at least 35% of students were Black, or whether at least 35% of students were Hispanic (Table).

## Table.

Relationships between school characteristics and access to team physician, access to full-time AT, and number of AEDs.

Characteristic (n)	% With Team Physician	P	% With Full-Time Athletic Trainer	P	% With More Than 5 AEDs	P
<b>% of low income students</b>						
At least 40% (44)	13.6	<0.0001	40.9	0.18	38.6	0.91
Less than 40% (56–57)	54.4		54.4		37.5	
<b>No. sports offered</b>						
At least 15 (74–75)	49.3	<0.0001	62.7	<0.0001	45.9	0.0057
Less than 15 (26)	0		7.7		15.4	
<b>% of Black students</b>						
At least 35% (12)	8.3	0.030	41.7	0.61	36.4	0.36
Less than 35% (88–89)	40.4		49.4		50.0	
<b>% of Hispanic students</b>						
At least 35% (11)	9.1	0.045	36.4	0.39	36.4	0.91
Less than 35% (88–90)	40.0		50.0		38.2	

## Discussion

Our study found that Illinois public co-ed high schools that offered fewer sports or had more low-income students provided worse access to medical care for their athletes. Although we also found less access to a team physician for schools with higher percentages of Black or Hispanic students, these relationships may be due to the percentage of low-income students.

Physicians with high school athlete patients from a school with no access to a team physician or full-time AT should discuss the potential consequences of this with these patients and their parents. Education about the patient's increased responsibility for heat stroke prevention and appropriate concussion treatment, given the absence of guidance from a team physician or full-time AT, should be strongly emphasized. If the patient's school has an inadequate number of AEDs, the patient and his or her parents should be advised of this. Parents may then have the option of working with the school to find ways to buy more AEDs.

The limitations of this study are the lower response rate, possible bias in survey responses, and generalizability limited to Illinois public high schools of the type in the study. However, our results are consistent with the results of other studies, including a recent study of disparities in access to ATs in Michigan high schools (12).

## Conclusion

A large percentage of the Illinois public high schools studied provide inadequate access to medical care for their athletes, thereby increasing the risk of injury or death. Students in schools that offered more sports or had fewer low-income students had better access to medical care. The impact of school racial composition on access to a team physician may be due to the percentage of low-income students. Physicians who treat high school athletes need to consider the athletes' access to medical care provided by their schools.

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