

# Secondary School Socioeconomic Status and Athletic Training Practice Characteristics

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**Context:** Socioeconomic status (SES) is a significant predictor of morbidity and mortality across health outcomes. Limited information exists on how school SES affects athletic training practice when a certified athletic trainer (AT) is present at secondary schools.

**Objective:** To describe contact frequencies and service rates provided by ATs for injuries among secondary school student-athletes and how these differ by school SES.

**Design:** Cross-sectional study.

**Setting:** The number of athletic training facility (ATF) visit days and AT services were collected from 77 secondary schools. Schools were separated into 3 school SES groups: affluent (n = 31), average (n = 29), and disadvantaged (n = 17).

**Patients or Other Participants:** Secondary school student-athletes who participated in ≥1 of 12 boys' or 11 girls' sports, visited the ATF during the 2014–2015 through 2018–2019 academic years, and received athletic or nonathletic injury care.

**Main Outcome Measure(s):** Contact frequencies were expressed as ATF visit days per injury, AT services per injury, and AT services per ATF visit day. Rates for service type used

were expressed as the total count over reported athlete-exposures.

**Results:** The ATs documented 1191 services. Affluent and average SES school communities provided more contact frequencies for injury-related care than did disadvantaged school communities, particularly in AT services per injury (7.10 ± 13.08 versus average: 9.30 ± 11.60 and affluent: 9.40 ± 12.20; P = .020). Affluent school communities supplied greater rates of services in 5 of the 11 service groups reported. No differences were observed among school SES groups in therapeutic exercise.

**Conclusions:** Our findings reflect that AT practice characteristics may have differed by school SES, but these differences did not appear to result in less medical care. Given the complexity and widespread effects of SES, future investigators should use a complex method to determine SES and aim to identify how SES may affect secondary school student-athletes in ways other than AT practice characteristics.

**Key Words:** social determinants of health, NATION-SP, rehabilitation

## Key Points

- Among schools that employed an athletic trainer, those in disadvantaged socioeconomic status (SES) communities reported lower rates of contact frequencies for injury-related care.
- Equal rates of therapeutic exercise, neuromuscular control, and manual therapy were noted by school SES group. The greatest differences were in cost-prohibitive services (ie, strapping and modalities).
- Schools in affluent SES communities supplied the highest rates of services; schools in disadvantaged SES communities described lower rates of athletic trainer evaluation or reevaluation, strapping, total modalities, wound care, and crutch or gait training.

The social determinants of health (SDOH) have been widely used in population health to encapsulate the complex factors within society that allow health disparities to occur among certain groups.<sup>1</sup> The SDOH are often defined by factors such as the neighborhood and built environment, the health of the individual and collective community, the social and community context, education, and economic stability and are often measured via socioeconomic status (SES). As SES lowers and the SDOH tend to be less accessible, the health of the individual and collective community also lowers.<sup>2</sup> In the United States, SES has become an important predictor for morbidity and

mortality in a variety of health conditions, including acute illness, asthma, and cardiovascular disease.<sup>2,3</sup> Among populations seeking orthopaedic care, lower SES has been associated with less access to orthopaedic physician appointments on the basis of insurance status.<sup>4</sup> In addition, lower rates, longer wait times, and poorer outcomes for elective procedures such as anterior cruciate ligament reconstruction in a cohort study of 52 000 Swedish patients were observed.<sup>5</sup> Lower SES has also been associated with risk-taking behaviors, greater exposure to stress, and poor nutritional habits.<sup>3,6</sup> Socioeconomic status affects all ages and groups, but adolescent athletes have been underrepre-

sented in the study of SES and orthopaedic care. At the community level, SES can also be referred to as a *concentrated disadvantage*, given that the measurement is an attempt to quantify the concentration of disadvantage in an area.

Secondary school student-athletes in the United States comprise a group of 7.9 million individuals who are at higher risk for injury, and yet, few researchers have studied the effect of SES on injuries in this population.<sup>7</sup> Whereas SES can be measured at the individual or athlete level, school SES has not been assessed using multivariable area-based measurements. The study of the relationship between school SES and athletic training practice is relatively novel, with only 6 published articles identified via a literature search of MEDLINE, SPORTDiscus, and CINAHL.<sup>8–13</sup> These authors relied on the percentage of students who qualified for free or reduced-price lunch,<sup>9,10,12,13</sup> state median household income,<sup>11</sup> county median household income,<sup>10</sup> or economic-tier placement as assessed by the state.<sup>8</sup> Qualification for free or reduced-price lunch is determined by household income, meaning that the only information the athletic training community currently has in regard to how school SES may affect athletic training practice is based solely on area-based income or economic stability, which only represents 1 of the 5 SDOH.<sup>14</sup> This is a limitation of the previous research because other community characteristics, as described through the SDOH, are associated with differences in health.<sup>1,15,16</sup>

In addition to capturing the complexities of a community, the complexities of athletic trainer (AT) practice characteristics must also be captured. The aforementioned investigators primarily focused on the AT presence in secondary schools. Although crucial, aspects such as the frequency and type of care provided may also offer insights into how SES affects AT practice in secondary schools. In other areas of medicine, lower SES groups were exposed to longer wait times and may have received treatment that did not follow best practices, even when access was established.<sup>5,17</sup> Assessment of services by SES offers important insights, such as the number of physical therapy appointments after pediatric anterior cruciate ligament reconstruction or following of best-practice guidelines for emergency department treatment of low back pain.<sup>17,18</sup> The National Athletic Treatment, Injury and Outcomes Network Surveillance Program (NATION-SP) aims to provide a comprehensive examination of AT services for time-loss and non-time-loss injuries in the secondary school setting.<sup>19</sup> Therapeutic intervention, documented in NATION-SP as AT services, is one of the central domains of athletic training practice.<sup>20</sup> Previously, the NATION-SP documented an average of  $11.01 \pm 22.82$  AT-provided services per injury and  $4.17 \pm 6.52$  athletic training facility (ATF) visit days per injury in 147 secondary schools during the 2011–2012 through 2013–2014 academic years.<sup>19</sup> However, these data are becoming outdated and did not explore practice characteristics by school SES.

The SES can be measured at both the individual and community or school level. Whereas in earlier studies, school SES was measured only through income-based measurements, a more comprehensive measurement incorporating the 5 SDOH using methods stemming from the Sampson et al<sup>16</sup> measure of collective efficacy is required. We evaluated 12 variables, including employment status,

single-parent households, race, and educational attainment, from the 2012–2016 American Community Survey to explain area-based SES and categorize school communities in the 2014–2015 through 2018–2019 NATION-SP data into affluent, average, and disadvantaged SES groups. To our knowledge, this method has not yet been used in athletic training research, nor has the effect of school SES, assessed through community variables, on athletic training services been explored. Therefore, the purpose of our study was to analyze how school SES affected AT practice in secondary schools by examining 14 AT practice characteristics, 11 of which were common AT services and 3 of which were categories of contact frequencies.

## METHODS

### Athletic Trainer Service Data

During the 2014–2015 through 2018–2019 academic years, NATION-SP collected injury and AT service data from 77 schools (58 public, 19 private). Data were collected for 23 high school sports during preseason, regular season, and postseason practices and competitions.<sup>21</sup> The 12 boys' sports were baseball, basketball, cross-country, football, lacrosse, soccer, swimming and diving, tennis, indoor and outdoor track and field, volleyball, water polo, and wrestling, and the 11 girls' sports were basketball, cross-country, cheer, field hockey, lacrosse, soccer, softball, swimming and diving, tennis, indoor and outdoor track and field, and volleyball.<sup>21</sup>

The methods of NATION-SP have been documented previously.<sup>21</sup> In brief, NATION-SP relies on a convenience sample of secondary schools via a rolling recruitment model. A common data element strategy is used to collect AT documentation from 3 electronic medical record systems. This strategy allowed AT documentation to be “pushed” to the Datalys Center for Sports Injury Research and Prevention, Inc (Indianapolis, IN).<sup>21</sup> Secure data-transmission protocols were embedded that pushed deidentified records to secure Datalys Center servers on an ongoing and routine basis. The ATs (full time or part time) at participating schools submitted detailed injury information through their electronic medical record systems, including diagnosis and time loss. They also submitted information about school-sanctioned athletic events in which athletes were at risk for injury, including the event type (competition, practice), surface, and number of participating athletes. In addition, the number of ATF visit days and number of AT services provided for each injury were reported.<sup>19</sup> *Athletic trainer services* were defined as the application of any type of manual therapy, modality, exercise and evaluation, testing, or skill session that the player received from interacting with the AT.<sup>19</sup> The AT services that addressed an injury were documented in relation to that specific injury. Services related to nonathletic injuries were also included in the analysis. If the time spent by the AT was <2 minutes, the AT service was not reported.<sup>19</sup> Because NATION-SP collects information on 40 service types, services were consolidated into 11 groups based on earlier groupings (Table 1).<sup>19</sup> This process was compliant with the Health Insurance Portability and Accountability Act.<sup>21</sup> The NATION-SP was reviewed and approved by the Western Institutional Review Board.

**Table 1. Service Group Name and Services Included in Groups**

Service Group Name	Service(s) Included
Athletic trainer evaluation or reevaluation	Consultation, functional performance
Physical performance test or measurement	Treadmill evaluation
Therapeutic activities or exercise	Independent range of motion, isotonic strength, tubing strength, passive range of motion, bicycle range of motion, bicycle conditioning, isometric strength, manual resistance exercise, treadmill conditioning, proprioceptive neuromuscular facilitation range of motion
Stair climber	
Isokinetic strength	
Neuromuscular reeducation	Proprioception with device, basic proprioception
Manual therapy techniques or massage	Massage, mobilization
Total modalities	Includes all modalities
Hot and cold modalities	Ice bag, hot pack, ice massage, Cryo/Cuff, <sup>a</sup> slush bath, hot whirlpool, cold whirlpool
Electrical stimulation	Electrical stimulation, electrical modality
Ultrasound	
Vasopneumatic devices	
Paraffin bath	
Contrast bath	
Iontophoresis	
Phonophoresis	
Strapping	Taping, wrap, padding, splint
Gait training or crutch fitting	
Wound care	

<sup>a</sup> DJO Global.

### Concentrated Disadvantage

We constructed an index of concentrated disadvantage using a principal component analysis (PCA). The PCA was conducted using the psych package in R and varimax rotation (R: A language and environment for statistical computing [R Foundation for Statistical Computing, <https://www.r-project.org>]). The PCA involved 12 variables from the 2012–2016 American Community Survey that were obtained through the National Historical Geographic Information System database (<https://www.nhgis.org>). These data were aggregated by Zip Code Tabulation Areas, which approximate area representations of US Postal Service 5-digit ZIP code service areas and are widely used in neighborhood research.<sup>22</sup> Variables collected from the American Community Survey were the African American proportion of the population, proportion of female-headed households, proportion of households receiving food stamps, proportion of individuals receiving food stamps, proportion of individuals using public health insurance, employment status of individuals 16 years or older, households that received public assistance income in the past 12 months, types of health insurance coverage by age, proportion of households below the federal poverty line, proportion of households with children under the age of 18, median household income (mean centered), and educational attainment. The constructed index explained 58% of the total variance among the 12 variables, which is comparable with findings in other SES research.<sup>16,22</sup> We then matched this measure to the ZIP code of each participating secondary school to approximate the SES of the community in which the school was located and used to describe the school SES.

To interpret the concentrated disadvantage index, we created 3 wealth categories (affluent, average, and disadvantaged) based on the pattern established by Krieger et al<sup>23</sup> to identify the extreme ends of the index distribution.<sup>24</sup> Specifically, we categorized communities with concentrated disadvantage index scores  $\leq$ 15th percentile as *disad-*

*vantaged*, those from the 16th to the 85th percentiles as having *average wealth*, and those  $>$ 85th percentile as *affluent* communities. These percentiles were selected because they coincided with the federal poverty standards (ie, the federal poverty line) for determining poverty status.<sup>23,24</sup>

### Statistical Analysis

Contact frequencies were expressed as the total number of ATF visit days per injury, total number of AT services per injury, and total number of AT services per ATF visit days for each school. Service rates were calculated by expressing service frequencies per 10 000 athlete-exposures (AEs). An AE was defined as 1 athlete participating in 1 school-sanctioned activity. One-way analysis-of-variance tests were performed to determine whether there were differences in contact frequencies and service rates between measured levels of school SES. We determined statistical significance using an a priori  $\alpha$  of  $<.05$ . Post hoc analyses using Bonferroni pairwise comparisons were conducted for variables found to be significant for the main effect in the analysis-of-variance models. This study was deemed exempt by the School of Public Health at Indiana University Bloomington Institutional Review Board. Data were deidentified to the research team; no interactions occurred between the research team and participants.

### RESULTS

Summaries of school characteristics are provided in Table 2. Throughout the 5-year study period (2014–2015 through 2018–2019), 77 schools (58 public, 19 private) reported service data. A total of 1191 injury-related services were provided for 218 400 AEs. Schools were separated by community SES: 31 (40%) schools were located in affluent communities, 29 (37%) in average SES communities, and 17 (22%) in disadvantaged SES com-

**Table 2. School Characteristics: Injury-Related Services by School Socioeconomic Status**

School Type	School Socioeconomic Status (Injury-Related Services), No. (%)			
	Affluent (474)	Average (372)	Disadvantaged (345)	Overall (1191)
Private	136 (28.7)	115 (30.9)	0 (0.0)	251 (21.1)
Public	338 (71.3)	257 (69.1)	345 (100.0)	940 (78.9)

munities, as assessed through the index score based on the 12 variables representing the 5 SDOH.

### Injury Care: AT Contact Frequencies

Athletes who attended schools located in disadvantaged SES communities had less access to injury-related care than those in schools located in affluent and average SES communities across all 3 variables: ATF visit days per injury ( $4.33 \pm 5.08$  versus average:  $5.66 \pm 6.20$  and affluent:  $6.05 \pm 7.68$ ;  $P < .001$ ), AT services per injury ( $7.10 \pm 13.08$  versus average:  $9.30 \pm 11.60$  and affluent:  $9.40 \pm 12.20$ ;  $P = .020$ ), and AT services per ATF visit days ( $1.48 \pm 1.06$  versus average:  $1.66 \pm 0.97$  and affluent:  $1.58 \pm 0.79$ ;  $P = .031$ ), as shown in Table 3.

### Injury Care: Service Utilization

Services were used similarly among the 3 school SES groups for 6 of the 11 services reported. The 5 services that were used differently by school SES groups were total modalities, AT evaluation or reevaluation, strapping, crutch or gait training, and wound care (Table 4). Those ATs at schools located in disadvantaged SES communities described less use of modalities than those at both average and affluent schools ( $100 \pm 210$  versus average:  $280 \pm 550$  and affluent:  $250 \pm 480$ ;  $P < .001$ ) as well as less wound care ( $5.4 \pm 41$  versus average:  $7.1 \pm 58$  and affluent:  $18 \pm 110$ ;  $P = .01$ ). The ATs at schools located in affluent SES communities recorded more AT evaluations or reevaluations ( $54 \pm 140$  versus average:  $11 \pm 71$  and disadvantaged:  $25 \pm 91$ ;  $P < .001$ ), strapping ( $270 \pm 680$  versus average:  $130 \pm 340$  and disadvantaged:  $61 \pm 240$ ;  $P < .001$ ), and crutch or gait training ( $2.6 \pm 18$  versus average:  $0.39 \pm 6.2$  and disadvantaged:  $1.4 \pm 12$ ;  $P = .02$ ) than schools in average and disadvantaged SES communities.

## DISCUSSION

We aimed to describe the interaction between school SES and AT practice via AT contact frequencies and rates of AT services from 77 schools during the 2014–2015 through 2018–2019 academic years. Of the 14 AT practice characteristics, the starkest differences between school SES groups were for contact frequencies: affluent and

average SES schools were similar, but disadvantaged SES schools reported fewer ATF visit days per injury, fewer AT services per injury, and fewer AT services per ATF visit days. Whereas this finding was somewhat novel given the variables studied, it was not unsurprising because previous investigators<sup>8–11,13</sup> consistently identified that as SES decreased, the AT presence decreased as well. Of particular note, earlier researchers<sup>10</sup> also demonstrated that as school SES lowered, athletes per AT hour increased and AT hours at the school decreased. Our findings continue to strengthen the observed trends that athletes at lower SES schools (despite playing similar sports that carry presumably similar risks) had less access to ATs as measured as AT presence,<sup>8–11,13</sup> AT contact hours,<sup>10</sup> or the variables we used (ATF visit days per injury, AT services per injury, and AT services per ATF visit days). The differences in access among school SES may lead to a variety of consequences that disproportionately affect lower SES communities. These differences may include increased health care costs to the community at large and the athlete's family, secondary to unnecessary emergency department visits<sup>25–27</sup> and subsequent services,<sup>28,29</sup> inappropriate referrals,<sup>25,30</sup> and lost productivity from missed days of work and school.<sup>31</sup> Furthermore, athletes from lower SES communities may be at more risk for injury (in particular, concussion)<sup>13</sup> mismanagement,<sup>32</sup> as well as decreased availability of the AT to provide evaluative,<sup>25</sup> rehabilitative,<sup>18</sup> and preventive services.<sup>26</sup> In turn, this may require the athlete (and guardians) to seek care using services that are often cost prohibitive and may be less accessible to those of lower SES.

Notably, despite the trend of lower school SES being associated with lower contact frequencies, differences among AT service rates were not seen consistently across the 11 services we evaluated. Although secondary school AT services have not been previously categorized by SES, prior authors<sup>19,33</sup> examined AT services in schools through NATION-SP and the Athletic Training Practice-Based Research Network; both groups<sup>19,33</sup> included schools from multiple states, a majority of which were public. The most common AT services used in the secondary school setting were therapeutic exercises, modalities (NATION-SP), hot or cold packs (Athletic Training Practice-Based Research Network), and AT evaluation or reevaluation. Our findings differed slightly in that for all 3 school SES groups, the

**Table 3. Athletic Training Contact Frequencies for Injury-Related Care by School Socioeconomic Status**

Measure	School Socioeconomic Status (Injury-Related Services), Mean $\pm$ SD			
	Affluent (474)	Average (372)	Disadvantaged (345)	P Value <sup>a</sup>
Athletic training facility visit days/injury	$6.05 \pm 7.68^b$	$5.66 \pm 6.20^b$	$4.33 \pm 5.08^c$	<.001
Athletic trainer services/injury	$9.40 \pm 12.20^b$	$9.30 \pm 11.60^b$	$7.10 \pm 13.08^c$	.020
Athletic trainer services/athletic training facility visit days	$1.58 \pm 0.79^b$	$1.66 \pm 0.97^b$	$1.48 \pm 1.06^c$	.031

<sup>a</sup> P values were calculated using 1-way analysis of variance.

<sup>b</sup> Indicates Bonferroni pairwise comparisons.

<sup>c</sup> Indicates Bonferroni pairwise comparisons.



**Table 4. Injury-Related Care by Service Type and School Socioeconomic Status (per 10 000 Athlete-Exposures)**

Athletic Trainer Service	School Socioeconomic Status (Injury-Related Services), Mean ± SD			P Value <sup>a</sup>
	Affluent (474)	Average (372)	Disadvantaged (345)	
Total modalities	250 ± 480 <sup>b</sup>	280 ± 550 <sup>b</sup>	100 ± 210 <sup>c</sup>	<.001
Athletic trainer evaluation or reevaluation	54 ± 140 <sup>b</sup>	11 ± 71 <sup>b</sup>	25 ± 91 <sup>c</sup>	<.001
Physical performance test	0.17 ± 4.1	0 ± 0	.21 ± 4.5	.6
Stair climber	0 ± 0	0 ± 0	.21 ± 4.5	.3
Therapeutic exercise	180 ± 480	190 ± 510	250 ± 900	.2
Isokinetic strength	6.6 ± 65	16 ± 190	28 ± 140	.1
Neuromuscular reeducation	16 ± 83	24 ± 220	7.4 ± 50	.2
Manual therapies	25 ± 140	41 ± 170	38 ± 170	.2
Strapping	270 ± 680 <sup>b</sup>	130 ± 340 <sup>c</sup>	61 ± 240 <sup>c</sup>	<.001
Crutch or gait training	2.6 ± 18 <sup>b</sup>	0.39 ± 6.2 <sup>c</sup>	1.4 ± 12 <sup>c</sup>	.02
Wound care	18 ± 110 <sup>b</sup>	7.1 ± 58 <sup>b</sup>	5.4 ± 41 <sup>c</sup>	.01

<sup>a</sup> P values were calculated using 1-way analysis of variance.

<sup>b</sup> Indicates Bonferroni pairwise comparisons.

<sup>c</sup> Indicates Bonferroni pairwise comparisons.

most common services were modalities, strapping, and therapeutic exercise. Furthermore, the frequency of these services differed for each school SES group. The most-used service for affluent SES schools was strapping, whereas in average SES schools, it was modalities. In contrast, among disadvantaged SES schools, the most used service was therapeutic exercise. These differences may reflect a multitude of factors, the most notable being that both modalities and strapping services have a cost-prohibitive element due to a high initial or recurring cost. Therefore, services involving these cost-prohibitive elements may be more subject to the size of the sports medicine budget and likely to be used less heavily among lower SES schools. The differences in AT evaluation or reevaluation, crutch or gait training, and wound care by school SES group may be a result of both lower contact frequencies and the cost-prohibitive nature of these services. An AT evaluation or reevaluation and crutch or gait training may be particularly subject to lower AT contact frequencies, whereas wound care (excluding basic wound care), similar to strapping, may be limited by both the high and recurring cost of wound-care supplies.

Previous investigators<sup>12</sup> found that in schools (with or without an AT), the AT presence and sports medicine budget size were associated with the level of medical services as assessed via the 132-item Appropriate Medical Care Assessment Tool. This is not surprising given earlier research regarding AT access by school SES and our results regarding AT contract frequencies; nevertheless, our inclusion of specific AT service rates may offer further insight into the medical care provided across school SES when an AT presence has been established. Whereas disadvantaged SES schools reported lower rates of cost-prohibitive services (modalities and strapping), no differences were detected in the rates of therapeutic exercise, which have been strongly supported in the literature as an effective intervention.<sup>34-38</sup> When considering these findings, it may be salient to consider that although AT practices may differ by school SES group, these differences do not clearly translate to lower levels of medical care. This suggestion may be further supported by a prior determination<sup>12</sup> that when an AT was present at the school, levels of medical care were not affected by school characteristics such as size, proximity to a medical center, public or private status, or SES (assessed using the percentage of

students who qualified for free or reduced-price lunch). Whereas we performed different analyses of services, the similar rates in 6 of the 11 services analyzed across school SES may further elucidate the mechanisms of care by which securing an AT to provide services at a secondary school could serve as a mitigating factor when barriers (eg, proximity to a medical center or SES) to orthopaedic care are present.

Our findings highlight that AT rehabilitative services in secondary schools, particularly therapeutic exercise, may not be limited by the barriers typically associated with access to orthopaedic rehabilitation (eg, cost, transport, missed days and time from work or school). Regardless, a variety of factors require greater delineation and research, including AT contact hours, AT employment status, and mean student population; we also need a more granular understanding of orthopaedic care for student-athletes who attend schools with or without an AT. In addition to rehabilitative care, an athletic training presence has been credited with a central role in decreasing sport injury presentation for acute management at higher-cost clinical settings such as emergency departments.<sup>25,26,30</sup> Lateral ankle sprains alone, which are commonly managed by ATs,<sup>34</sup> incurred emergency room charges ranging from \$702 to \$1408 in 2010.<sup>27</sup> These charges are not only an undue burden on society at large but also on individual athletes' families and potentially even more so on athletes from lower SES communities. The role ATs can play in minimizing nonurgent visits to emergency departments may be further highlighted by the fact that the most common sport-related injuries in 15- to 19-year-old patients diagnosed in emergency departments were sprains, strains, and dislocations and most commonly affected the lower extremity.<sup>39</sup> Our outcomes and previous investigations of orthopaedic emergency department visits, injury management, and preventive interventions may identify potential mitigation strategies for attempting to address inequities, barriers, and appropriate management of sport-related injuries among secondary school student-athletes using school-based approaches. Despite these encouraging initial findings, it is still critical to note that the schools with the highest rate of services and contact frequencies were affluent. Both an AT presence and AT accessibility (once the presence has been established) are likely necessary

when addressing inequities in orthopaedic care by SES through athletic training practice.

This study was not without limitations. The ATs who worked at secondary schools and did not track or did not provide rehabilitative services were not included. In addition, AT contact hours, AT employment status, and school characteristics (eg, student population, individual school funding) may provide greater insight into our work although we did not collect them. The NATION-SP relies on a convenience sample of ATs. Our data, therefore, may not be generalizable to other secondary schools with access to an AT. Moreover, our dataset cannot be used to identify athletes' experiences at schools without an AT or with limited AT access, which may include a greater proportion of schools located in disadvantaged SES communities.<sup>8,9,13</sup> Furthermore, the level of detail in reporting may have differed by AT. Given the relatively small sample of schools, we chose to include all entries. Some schools reported >50 service events, whereas others reported <10. Schools that described lower numbers of services could reflect inconsistent reporting; however, this could not be verified. All schools were included in the analyses, and service events were grouped.

Schools in communities with more significant levels of poverty may have been excluded due to a lack of or very limited AT access. School type was based on neighborhood wealth, indicating that the SES measurement was area based. Thus, we cannot make inferences about individual athletes' experiences. In addition, there is no way to know whether the students resided in the communities where the schools were located. Inferences can only be made about the school environment and not the SES of the individual student. Most of the schools were located in areas with household incomes above the federal poverty line. This led to a separation of schools in areas that were not considered to be located in impoverished areas, providing more detailed findings for schools that were above the federal poverty line. All schools located in areas categorized as disadvantaged and, hence, below the federal poverty line, were placed in 1 group, which may have led to minimizing true differences in care. Despite rapid growth in the study of SES and the SDOH, SES measurement methods have not progressed accordingly, and the lack of a consensus on the most appropriate method of SES measurement remains.<sup>40</sup> Researchers should use a multivariate approach and select variables based on the current subject of study. Although unavoidable, it is important to recognize that our results are only comparable with similar constructions of the school SES index.<sup>40,41</sup>

## CONCLUSIONS

We presented an alternative method that allows researchers to better account for the SDOH. Future investigations into SES and athletic training practice should use a complex method to determine SES and move beyond the percentage of free or reduced-price lunch or other income-based measures. Also, AT contact hours should be considered to identify additional opportunities for ATs to provide services. The SES, which represents the 5 SDOH, undoubtedly affects the 7.9 million secondary school US student-athletes. We demonstrated differences among school SES groups for total modalities, AT evaluations

and reevaluations, strapping, crutch or gait training, and wound-care service rates. Future researchers should identify avenues by which SES may affect secondary school student-athletes to further inform mitigation strategies for orthopaedic inequities in this population and, in particular, the role ATs play in these strategies.

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