

# Athletic Training Services in Public Secondary Schools: A Benchmark Study

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**Context:** Authors of the most recent study of athletic training (AT) services have suggested that only 42% of secondary schools have access to athletic trainers. However, this study was limited by a small sample size and was conducted more than 10 years ago.

**Objective:** To determine current AT services in public secondary schools.

**Design:** Cross-sectional study.

**Setting:** Public secondary schools in the United States.

**Patients or Other Participants:** A total of 8509 (57%) of 14951 secondary schools from all 50 states and Washington, DC, responded to the survey.

**Main Outcome Measure(s):** Data on AT services were collected for individual states, National Athletic Trainers' Association districts, and the nation.

**Results:** Of the 8509 schools that responded, 70% ( $n = 5930$ ) had AT services, including full-time ( $n = 3145$ , 37%), part-

time ( $n = 2619$ , 31%), and per diem ( $n = 199$ , 2%) AT services, and 27% ( $n = 2299$ ) had AT services from a hospital or physical therapy clinic. A total of 4075 of 8509 schools (48%) provided coverage at all sports practices. Eighty-six percent (2394/2787595) of athletes had access to AT services.

**Conclusions:** Since the last national survey, access to AT services increased such that 70% of respondent public secondary schools provided athletic trainers at sports games or practices. Approximately one-third of all public secondary schools had full-time athletic trainers. This number must increase further to provide appropriate medical coverage at athletic practices and games for secondary school athletes.

**Key Words:** high school, medical services, coverage, athletic trainers

## Key Points

- Seventy percent of public secondary schools in the United States had access to athletic training (AT) services at games or practices, but only 37% had full-time AT services.
- Nearly half of the schools reported providing full AT services for practice each afternoon.
- Access to AT services must increase to ensure secondary school athletes are receiving appropriate medical coverage at sports practices and games.

Athletic training (AT) is a relatively young profession that is expanding at all levels of athletic competition. In 1994, only 35% of high schools had AT services.<sup>1</sup> In the most recent study of schools using AT services, the National Athletic Trainers' Association (NATA) reported that only 42% of high schools employed athletic trainers.<sup>2</sup> This low percentage is alarming, considering that multiple national organizations (eg, NATA, Korey Stringer Institute, American College of Sports Medicine, American Academy of Pediatrics, American Medical Association, American Medical Society for Sports Medicine) promote and encourage the hiring of at least 1 athletic trainer at all high schools.<sup>3–5</sup>

Secondary schools without AT services rely on sports coaches and administrators, such as athletic directors, to determine proper medical treatment when injuries and emergencies arise during a practice or competition. Unfortunately, most coaches do not have the proper medical education to treat injuries or recognize the common causes of life-threatening medical conditions, which puts the lives of athletes in jeopardy.<sup>6</sup> Moreover, if

coaches do recognize a medical emergency is present, they are not trained to treat life-threatening conditions, and it should not be their responsibility to do so.

The incidence of sudden cardiac death in secondary school athletes ranges from 1:50 000 to 1:80 000.<sup>7</sup> Boden et al<sup>8</sup> demonstrated that approximately 10 secondary school American football athletes died each year from 1990 to 2010 in games and practices. Of these deaths, 85% were related to head injuries, heart conditions, or exertional heat stroke. Similarly, from 1980 to 2009, 58 American football athletes died due to exertional heat stroke.<sup>9</sup> Athletic trainers implement prevention strategies, such as coaching education, preparticipation examinations, emergency action plans, and heat-acclimatization policies, and are trained in lifesaving skills to treat these conditions. Therefore, athletic trainers are appropriate medical staff to have on site during sports games and practices and can provide care within seconds or a couple minutes of the onset of symptoms.<sup>3</sup>

Catastrophic injuries and deaths in secondary school athletes could presumably be prevented by having a medical professional on site who is educated in the

prevention, recognition, and treatment of potentially deadly conditions, such as cardiac conditions, exertional sickling, exertional heat stroke, and head injuries, but this has not been studied. The presence of athletic trainers in secondary schools in the United States is unknown, as these data are difficult to gather on a national scale due to the large number of secondary schools. Therefore, the purpose of our study was to determine AT coverage in US public secondary schools.

## METHODS

### Participants

We contacted all 14 951 public secondary schools in the United States, and 8509 responded to our survey, resulting in a 57% response rate. We included US public schools with interscholastic athletics programs that offered at least 1 grade of grades 9 through 12. This information and the telephone numbers and e-mail addresses used to contact schools were collected from state high school athletic associations and the US Department of Education. Alternative, charter, magnet, preparatory, technical, and vocational schools were not included. The University of Connecticut-Storrs Institutional Review Board deemed that this study did not qualify as human subject research and therefore did not require approval due to the public nature of the data collected.

### Procedures

We contacted the athletic director of each school by telephone and e-mail (when available) until he or she responded or up to 4 times, with at least 1 day separating contact attempts. If the school did not employ an athletic director, we contacted the principal. Participants were read a description of the study and a structured series of questions regarding medical coverage during athletic games and practices that specifically related to the employment of an athletic trainer. The extent of AT services (eg, full time, part time, per diem) was determined by the athletic director's knowledge of hours worked and official hiring status at the school. The AT services via a clinic included athletic trainers who worked at the school and contracted through an independent hospital, sports medicine, or physical therapy clinic and were determined to be either full time or part time by the athletic director. Data collection took place from September 2011 through December 2013.

The research questions were as follows:

1. How many total athletes are in your school?
2. How many students (grades 9 through 12) are in your school?
3. Do you have an athletic trainer?
  - a. If yes, how many do you employ?
  - b. If yes, do(es) the athletic trainer(s) work full time, part time, from a clinic full time or part time, or per diem?
  - c. If yes, do(es) the athletic trainer(s) teach a sports medicine, athletic training, or health class?
  - d. If yes, do(es) the athletic trainer(s) work all practices between approximately 2 and 6 PM every day?

### Statistical Analysis

We used descriptive statistics to analyze AT services by individual state, NATA district, and US data and reported

them as means and percentages. Logarithmic and linear trend lines also are reported. All statistical analyses were performed in SPSS statistical software (version 20.0; IBM Corp, Armonk, NY).

## RESULTS

A total of 8509 secondary schools responded, but some schools did not respond to all questions. Of the 8509 schools that responded, 70% ( $n = 5930$ ) reported having AT services, and 86% ( $2\,394\,284/2\,787\,595$ ) of all athletes had access to AT services. The AT services were full time in 37% ( $n = 3145$ ) of schools, part time in 31% ( $n = 2619$ ), and per diem in 2% ( $n = 199$ ); some schools employed multiple athletic trainers. Twenty-seven percent ( $n = 2299$ ) of the 8509 responding schools reported having AT services via a clinic. A total of 47% of schools ( $4075/8509$ ) had full practice coverage every afternoon. Nineteen percent ( $n = 965$ ) of the 5121 schools with AT services also hired the athletic trainer to teach a health or sports medicine class at the school. The AT services by state and NATA district are provided in Table 1.

More large than small secondary schools offered AT services (Figure 1). Schools with athletic trainers averaged 432 athletes, whereas schools without athletic trainers averaged 175 athletes (Table 2). School size and the extent of AT services in all secondary schools are presented in Table 3 and Figure 1. School size and the extent of AT services in schools with AT services are presented in Table 4 and Figure 2.

## DISCUSSION

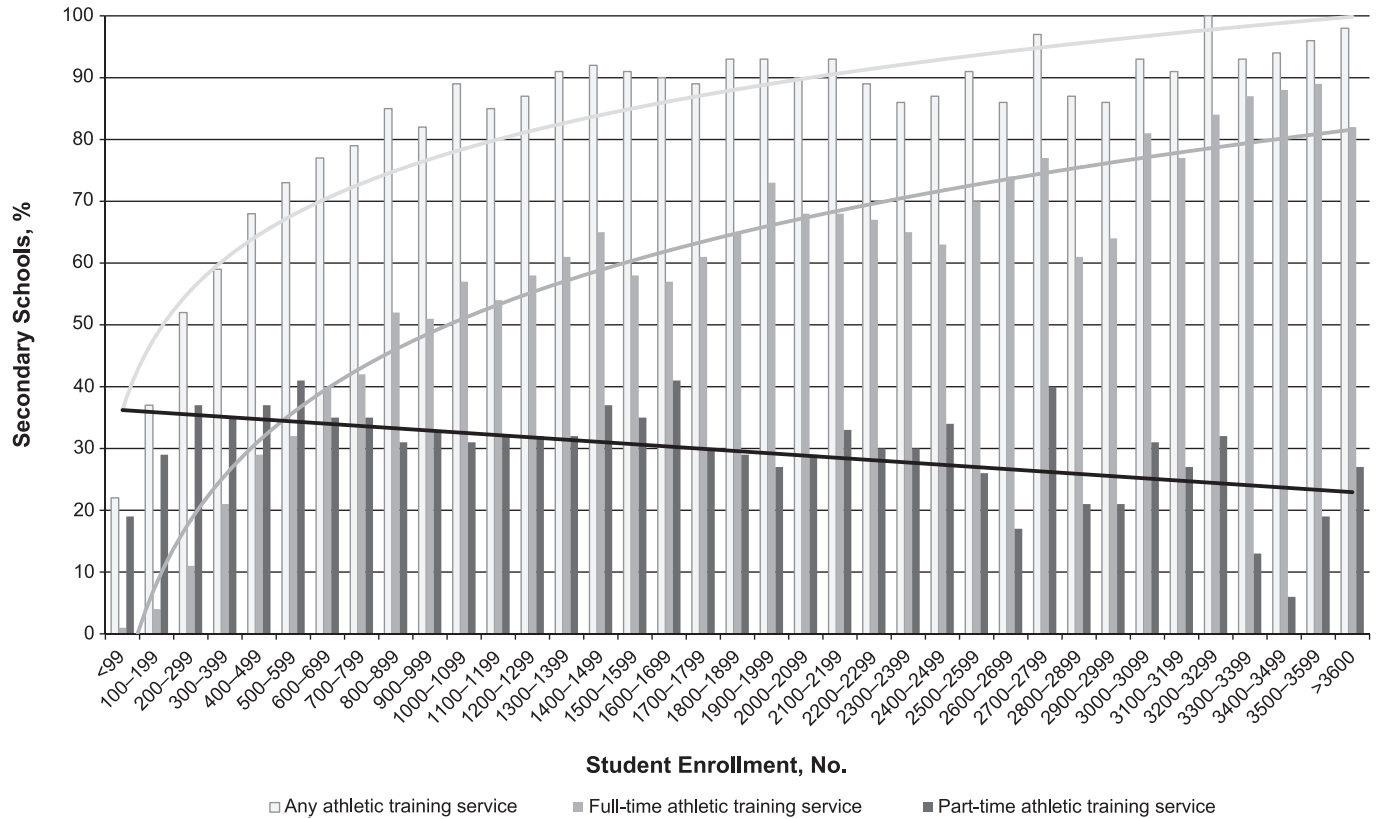
In this benchmark study, we determined the current state of AT services in public secondary schools throughout the United States. A total of 30% of respondent public secondary schools did not have AT services, leaving many athletes without appropriate medical coverage during sports games and practices. The remaining 70% had access to athletic trainers; however, most schools (63%) did not provide full-time AT services, and only 31% had part-time AT coverage. Athletic trainers worked more often at games and competitions than at practices, placing athletes at a substantial risk of injury during a large portion of sport participation. During practices, athletes may perform novel activities or exercise longer than during games, leaving them without appropriate medical coverage on a regular basis.

From an analysis of NATA-membership data, Lyznicki et al<sup>1</sup> reported that during the 1993–1994 school year, only 35% of public schools in the United States used AT services. In 2005, membership data revealed that 42% of schools used AT services, an increase in the presence of athletic trainers in secondary schools (R. Lowe, oral communication, April 2014).<sup>2</sup> These surveys did not differentiate the extent of coverage (eg, full time, part time, clinic, per diem), and the methods and small sample sizes from these surveys limited our knowledge of AT services nationwide by possibly not reflecting true AT coverage. To our knowledge, we are the first to survey all public secondary schools in the United States instead of a subset of the population, and we observed a dramatic increase (an additional 28% nationwide) in secondary school athletic trainers since 2005, a great step forward for health care in secondary school athletes. However, we did

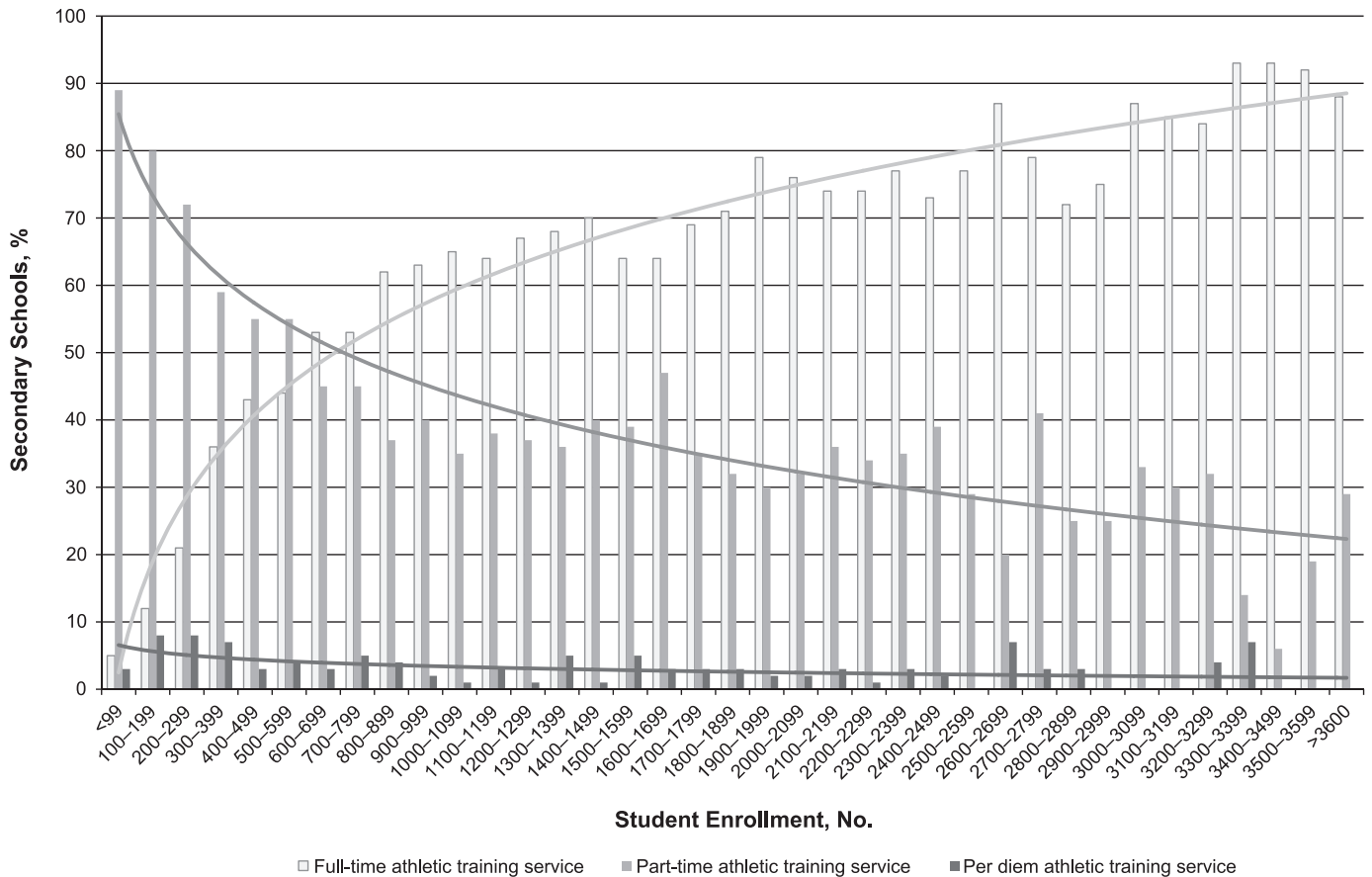
**Table 1. Athletic Training Services in US Secondary Schools, 2011–2013<sup>a</sup>**

| National<br>Athletic Trainers'<br>Association District | State                | Response<br>Rate, %<br>(No.) | Schools With Athletic Training Services, % |              |              |             |                       |   |                                |
|--|----------------------|------------------------------|--|--------------|--------------|-------------|-----------------------|---|--------------------------------|
|  |                      |                              | Overall                                    | Full<br>Time | Part<br>Time | Per<br>Diem | Hospital<br>or Clinic | Athletic Trainer<br>Teaching Health Class | Practice Coverage<br>Every Day |
| 1  | Connecticut          | 69 (96)                      | 96   | 33           | 50           | 8           | 11                    | 2   | 73                             |
|  | Maine                | 54 (56)                      | 70   | 25           | 45           | 2           | 16                    | 7   | 48                             |
|  | Massachusetts        | 60 (144)                     | 78   | 44           | 30           | 10          | 15                    | 11  | 73                             |
|  | New Hampshire        | 68 (56)                      | 70   | 34           | 30           | 4           | 34                    | 13  | 61                             |
|  | Rhode Island         | 55 (24)                      | 75   | 17           | 46           | 13          | 17                    | 4   | 29                             |
|  | Vermont              | 48 (27)                      | 44   | 33           | 11           | 0           | 0                     | 11  | 37                             |
|  | Average              | 61 (403)                     | 77   | 35           | 36           | 7           | 16                    | 8   | 63                             |
| 2  | Delaware             | 100 (27)                     | 96   | 44           | 56           | 0           | 44                    | 26  | 93                             |
|  | New Jersey           | 100 (311)                    | 95   | 91           | 10           | 2           | 4                     | 6   | 55                             |
|  | New York             | 49 (341)                     | 67   | 27           | 36           | 3           | 27                    | 7   | 48                             |
|  | Pennsylvania         | 89 (423)                     | 96   | 72           | 30           | 2           | 58                    | 5   | 87                             |
|  | Average              | 73 (1102)                    | 87   | 63           | 27           | 2           | 33                    | 7   | 66                             |
| 3  | District of Columbia | 100 (7)                      | 100  | 86           | 14           | 0           | 0                     | 0   | 14                             |
|  | Maryland             | 61 (105)                     | 61   | 21           | 41           | 1           | 24                    | 4   | 32                             |
|  | North Carolina       | 53 (193)                     | 76   | 50           | 22           | 2           | 19                    | 28  | 64                             |
|  | South Carolina       | 54 (101)                     | 81   | 54           | 29           | 0           | 27                    | 32  | 77                             |
|  | Virginia             | 74 (230)                     | 87   | 70           | 19           | 1           | 23                    | 0   | 36                             |
|  | West Virginia        | 41 (46)                      | 85   | 46           | 37           | 2           | 7                     | 13  | 67                             |
|  | Average              | 59 (682)                     | 79   | 53           | 26           | 1           | 21                    | 14  | 52                             |
| 4  | Illinois             | 55 (320)                     | 79   | 32           | 39           | 2           | 31                    | 8   | 54                             |
|  | Indiana              | 62 (222)                     | 90   | 55           | 36           | 5           | 43                    | 10  | 66                             |
|  | Michigan             | 51 (228)                     | 68   | 31           | 34           | 4           | 43                    | 7   | 55                             |
|  | Minnesota            | 54 (219)                     | 73   | 17           | 53           | 1           | 28                    | 2   | 29                             |
|  | Ohio                 | 60 (422)                     | 92   | 45           | 53           | 2           | 65                    | 12  | 71                             |
|  | Wisconsin            | 66 (285)                     | 88   | 36           | 48           | 2           | 65                    | 4   | 46                             |
|  | Average              | 58 (1696)                    | 83   | 37           | 45           | 2           | 48                    | 8   | 55                             |
| 5  | Iowa                 | 54 (122)                     | 73   | 16           | 49           | 2           | 43                    | 5   | 30                             |
|  | Kansas               | 56 (183)                     | 63   | 19           | 43           | 0           | 27                    | 8   | 30                             |
|  | Missouri             | 51 (252)                     | 51   | 20           | 29           | 2           | 24                    | 6   | 26                             |
|  | Nebraska             | 61 (166)                     | 71   | 13           | 59           | 3           | 40                    | 8   | 28                             |
|  | North Dakota         | 48 (75)                      | 44   | 7            | 36           | 1           | 27                    | 7   | 16                             |
|  | Oklahoma             | 98 (445)                     | 26   | 9            | 13           | 3           | 10                    | 2   | 13                             |
|  | South Dakota         | 63 (105)                     | 43   | 12           | 25           | 1           | 12                    | 8   | 23                             |
| 6  | Average              | 64 (1348)                    | 48   | 14           | 31           | 2           | 22                    | 5   | 22                             |
|  | Arkansas             | 55 (103)                     | 34   | 16           | 15           | 3           | 18                    | 5   | 24                             |
|  | Texas                | 48 (618)                     | 78   | 62           | 14           | 6           | 11                    | 34  | 62                             |
|  | Average              | 49 (721)                     | 72   | 56           | 14           | 5           | 12                    | 30  | 57                             |
| 7  | Arizona              | 43 (89)                      | 65   | 43           | 19           | 1           | 6                     | 33  | 64                             |
|  | Colorado             | 46 (131)                     | 56   | 24           | 34           | 0           | 15                    | 11  | 47                             |
|  | New Mexico           | 36 (48)                      | 48   | 40           | 10           | 0           | 0                     | 29  | 46                             |
|  | Utah                 | 44 (53)                      | 58   | 30           | 30           | 0           | 23                    | 34  | 57                             |
|  | Wyoming              | 68 (45)                      | 51   | 24           | 24           | 0           | 18                    | 16  | 33                             |
|  | Average              | 45 (366)                     | 57   | 32           | 26           | 1           | 12                    | 23  | 51                             |
| 8  | California           | 44 (428)                     | 56   | 26           | 25           | 3           | 5                     | 16  | 42                             |
|  | Hawaii               | 59 (24)                      | 100  | 100          | 0            | 0           | 0                     | 0   | 100                            |
|  | Nevada               | 35 (30)                      | 53   | 17           | 27           | 0           | 17                    | 7   | 43                             |
|  | Average              | 44 (482)                     | 58   | 29           | 24           | 2           | 6                     | 14  | 45                             |
| 9  | Alabama              | 32 (113)                     | 78   | 35           | 38           | 4           | 53                    | 5   | 43                             |
|  | Florida              | 52 (225)                     | 82   | 49           | 27           | 1           | 8                     | 23  | 72                             |
|  | Georgia              | 31 (115)                     | 73   | 45           | 27           | 4           | 34                    | 8   | 59                             |
|  | Kentucky             | 52 (129)                     | 68   | 43           | 21           | 1           | 31                    | 8   | 57                             |
|  | Louisiana            | 99 (287)                     | 62   | 20           | 42           | 1           | 46                    | 10  | 23                             |
|  | Mississippi          | 31 (75)                      | 81   | 29           | 45           | 3           | 40                    | 7   | 43                             |
|  | Tennessee            | 38 (112)                     | 75   | 41           | 31           | 2           | 45                    | 9   | 59                             |
|  | Average              | 48 (1056)                    | 73   | 36           | 33           | 2           | 35                    | 11  | 49                             |
| 10   | Alaska               | 56 (84)                      | 4  | 0            | 4            | 0           | 4                     | 1   | 0                              |
|  | Idaho                | 61 (82)                      | 38   | 17           | 26           | 0           | 7                     | 22  | 28                             |
|  | Montana              | 51 (88)                      | 40   | 9            | 31           | 1           | 13                    | 8   | 18                             |
|  | Oregon               | 54 (119)                     | 49   | 14           | 30           | 2           | 24                    | 6   | 34                             |
|  | Washington           | 84 (280)                     | 61   | 21           | 25           | 1           | 12                    | 14  | 35                             |
|  | Average              | 65 (653)                     | 46   | 15           | 24           | 1           | 12                    | 11  | 27                             |
| Average  |                      | 57 (8509)                    | 70   | 37           | 31           | 2           | 27                    | 11  | 48                             |

<sup>a</sup> All values were rounded. The average response rates for each district represent the total schools in the district that responded divided by all schools in the district that were contacted.



**Figure 1. Extent of athletic training (AT) coverage in all US secondary schools by student enrollment, 2011–2013. Logarithmic lines of best fit indicate trends for “Any AT service” and “Full-time AT service.” A linear line of best fit indicates trend for “Part-time AT service.”**



**Figure 2. Extent of athletic training (AT) coverage in US secondary schools with AT services by student enrollment, 2011–2013. Logarithmic lines of best fit indicate trends for all types of services.**

**Table 2. Athletic Training Services by Number of Athletes in US Secondary Schools, 2011–2013<sup>a</sup>**

| National<br>Athletic Trainers'<br>Association District | State                | Overall Average<br>No. of Students | Average No. of Athletes |  |   |                                   |
|--|----------------------|------------------------------------|-------------------------|--|---|-----------------------------------|
|  |                      |                                    | Overall                 | Schools With<br>Athletic Training Services | Schools Without<br>Athletic Training Services | Per Full-Time<br>Athletic Trainer |
| 1  | Connecticut          | 1108                               | 542                     | 556  | 230   | 688                               |
|  | Maine                | 530                                | 274                     | 348  | 103   | 453                               |
|  | Massachusetts        | 1022                               | 496                     | 540  | 295   | 576                               |
|  | New Hampshire        | 720                                | 304                     | 383  | 123   | 382                               |
|  | Rhode Island         | 942                                | 361                     | 354  | 381   | 416                               |
|  | Vermont              | 453                                | 214                     | 305  | 141   | 346                               |
|  | Average              | 885                                | 421                     | 482  | 196   | 544                               |
| 2  | Delaware             | 1101                               | 416                     | 413  | 500   | 387                               |
|  | New Jersey           | 1215                               | 563                     | 570  | 167   | 574                               |
|  | New York             | 972                                | 400                     | 476  | 244   | 574                               |
|  | Pennsylvania         | 1028                               | 436                     | 445  | 200   | 484                               |
|  | Average              | 1046                               | 447                     | 479  | 239   | 522                               |
| 3  | District of Columbia | 854                                | 216                     | 216  | NA  | 224                               |
|  | Maryland             | 1377                               | 510                     | 542  | 459   | 490                               |
|  | North Carolina       | 1160                               | 350                     | 379  | 256   | 382                               |
|  | South Carolina       | 1085                               | 406                     | 451  | 191   | 469                               |
|  | Virginia             | 1286                               | 471                     | 509  | 214   | 537                               |
|  | West Virginia        | 759                                | 268                     | 287  | 166   | 202                               |
|  | Average              | 1198                               | 417                     | 449  | 293   | 457                               |
| 4  | Illinois             | 1041                               | 450                     | 536  | 119   | 716                               |
|  | Indiana              | 900                                | 318                     | 336  | 149   | 399                               |
|  | Michigan             | 823                                | 354                     | 437  | 174   | 527                               |
|  | Minnesota            | 729                                | 355                     | 428  | 161   | 659                               |
|  | Ohio                 | 813                                | 339                     | 353  | 176   | 432                               |
|  | Wisconsin            | 627                                | 293                     | 320  | 99  | 475                               |
|  | Average              | 823                                | 354                     | 396  | 148   | 504                               |
| 5  | Iowa                 | 531                                | 261                     | 304  | 144   | 533                               |
|  | Kansas               | 499                                | 213                     | 280  | 100   | 483                               |
|  | Missouri             | 605                                | 228                     | 346  | 105   | 526                               |
|  | Nebraska             | 348                                | 156                     | 185  | 85  | 391                               |
|  | North Dakota         | 230                                | 119                     | 198  | 55  | 500                               |
|  | Oklahoma             | 517                                | 203                     | 344  | 113   | 496                               |
|  | South Dakota         | 280                                | 128                     | 212  | 66  | 369                               |
| 6  | Average              | 469                                | 197                     | 278  | 98  | 484                               |
|  | Arkansas             | 653                                | 243                     | 432  | 146   | 491                               |
|  | Texas                | 1195                               | 425                     | 501  | 158   | 572                               |
|  | Average              | 1117                               | 399                     | 496  | 154   | 569                               |
| 7  | Arizona              | 1231                               | 405                     | 544  | 150   | 586                               |
|  | Colorado             | 736                                | 351                     | 554  | 88  | 631                               |
|  | New Mexico           | 803                                | 290                     | 485  | 126   | 444                               |
|  | Utah                 | 1020                               | 364                     | 512  | 156   | 536                               |
|  | Wyoming              | 452                                | 200                     | 279  | 117   | 449                               |
|  | Average              | 867                                | 340                     | 507  | 120   | 556                               |
| 8  | California           | 1686                               | 564                     | 686  | 409   | 767                               |
|  | Hawaii               | 1171                               | 533                     | 533  | NA  | 533                               |
|  | Nevada               | 1100                               | 338                     | 506  | 147   | 575                               |
|  | Average              | 1625                               | 548                     | 662  | 391   | 720                               |
| 9  | Alabama              | 617                                | 237                     | 264  | 145   | 333                               |
|  | Florida              | 1652                               | 496                     | 532  | 333   | 565                               |
|  | Georgia              | 1308                               | 415                     | 457  | 302   | 478                               |
|  | Kentucky             | 847                                | 283                     | 327  | 185   | 344                               |
|  | Louisiana            | 705                                | 247                     | 312  | 123   | 387                               |
|  | Mississippi          | 688                                | 261                     | 289  | 136   | 294                               |
|  | Tennessee            | 909                                | 255                     | 282  | 174   | 300                               |
|  | Average              | 1037                               | 337                     | 380  | 208   | 424                               |
| 10   | Alaska               | 175                                | 80                      | 450  | 66  | NA                                |
|  | Idaho                | 590                                | 232                     | 398  | 131   | 512                               |
|  | Montana              | 241                                | 110                     | 174  | 67  | 395                               |
|  | Oregon               | 742                                | 316                     | 504  | 137   | 607                               |
|  | Washington           | 860                                | 364                     | 517  | 177   | 550                               |
|  | Average              | 618                                | 261                     | 451  | 122   | 541                               |
| Average  |                      | 919                                | 358                     | 432  | 175   | 515                               |

Abbreviation: NA, not applicable.

<sup>a</sup> All values were rounded. The average for each district represents the total schools in the district that responded divided by all schools in the district that were contacted.



**Table 3. Extent of Athletic Training Coverage of All US Secondary Schools Based on Student Enrollment, 2011–2013**

| Range of Student Enrollment | No. of Schools   | Schools With Athletic Training Services, % |           |           |          |        |
|-----------------------------|------------------|--|-----------|-----------|----------|--------|
|                             |                  | Any Service                                | Full Time | Part Time | Per Diem | Clinic |
| 1–99                        | 550              | 22   | 1         | 19        | 1        | 12     |
| 100–199                     | 713              | 37   | 4         | 29        | 3        | 20     |
| 200–299                     | 664              | 52   | 11        | 37        | 4        | 30     |
| 300–399                     | 564              | 59   | 21        | 35        | 4        | 27     |
| 400–499                     | 523              | 68   | 29        | 37        | 2        | 37     |
| 500–599                     | 441              | 73   | 32        | 41        | 3        | 37     |
| 600–699                     | 385              | 77   | 40        | 35        | 2        | 33     |
| 700–799                     | 337              | 79   | 42        | 35        | 4        | 30     |
| 800–899                     | 338              | 85   | 52        | 31        | 3        | 35     |
| 900–999                     | 257              | 82   | 51        | 33        | 2        | 33     |
| 1000–1099                   | 230              | 89   | 57        | 31        | 1        | 36     |
| 1100–1199                   | 284              | 85   | 54        | 32        | 3        | 32     |
| 1200–1299                   | 297              | 87   | 58        | 32        | 1        | 32     |
| 1300–1399                   | 218              | 91   | 61        | 32        | 4        | 32     |
| 1400–1499                   | 191              | 92   | 65        | 37        | 1        | 32     |
| 1500–1599                   | 210              | 91   | 58        | 35        | 4        | 37     |
| 1600–1699                   | 176              | 90   | 57        | 41        | 2        | 28     |
| 1700–1799                   | 174              | 89   | 61        | 30        | 3        | 33     |
| 1800–1899                   | 187              | 93   | 65        | 29        | 3        | 24     |
| 1900–1999                   | 110              | 93   | 73        | 27        | 2        | 15     |
| 2000–2099                   | 167              | 90   | 68        | 29        | 2        | 26     |
| 2100–2199                   | 94               | 93   | 68        | 33        | 3        | 27     |
| 2200–2299                   | 105              | 89   | 67        | 30        | 1        | 25     |
| 2300–2399                   | 71               | 86   | 65        | 30        | 3        | 18     |
| 2400–2499                   | 68               | 87   | 63        | 34        | 1        | 22     |
| 2500–2599                   | 53               | 91   | 70        | 26        | 0        | 19     |
| 2600–2699                   | 35               | 86   | 74        | 17        | 6        | 26     |
| 2700–2799                   | 30               | 97   | 77        | 40        | 3        | 30     |
| 2800–2899                   | 38               | 87   | 61        | 21        | 3        | 16     |
| 2900–2999                   | 14               | 86   | 64        | 21        | 0        | 29     |
| 3000–3099                   | 42               | 93   | 81        | 31        | 0        | 14     |
| 3100–3199                   | 22               | 91   | 77        | 27        | 0        | 23     |
| 3200–3299                   | 25               | 100  | 84        | 32        | 4        | 16     |
| 3300–3399                   | 15               | 93   | 87        | 13        | 7        | 7      |
| 3400–3499                   | 16               | 94   | 88        | 6         | 0        | 19     |
| 3500–3599                   | 27               | 96   | 89        | 19        | 0        | 15     |
| >3600                       | 45               | 98   | 82        | 27        | 0        | 29     |
| Average                     | 167 <sup>a</sup> | 70   | 37        | 31        | 2        | 27     |

<sup>a</sup> The average number of schools per state was 293, but an average of 167 schools per state responded to the survey.

not determine if the athletic trainers had appropriate certifications or licensure to meet the individual state athletic training standards.

In intercollegiate athletics, health care units (HCUs) were developed to quantify an athlete-to-athletic trainer ratio that would permit appropriate medical coverage.<sup>10</sup> Whereas similar research has not been performed at the secondary school level, the same concept can be applied, and the following example has been adjusted using secondary school injury-rate data.<sup>11</sup> One full-time certified athletic trainer reasonably can be responsible for approximately 12 adjusted HCUs, which are based on injury rate, treatment time per injury, and athlete-exposures for each sports team.<sup>10</sup> For example, a typical secondary school that has junior varsity and varsity teams for football and boys' and girls' soccer in the fall, boys' and girls' basketball and wrestling in the winter, and baseball and softball in the spring is equivalent to 34.1 HCUs and approximately 500 athletes (similar to the average number of athletes in public

**Table 4. Extent of Athletic Training Coverage of US Secondary Schools With Athletic Training Services Based on Student Enrollment, 2011–2013**

| Range of Student Enrollment | Athletic Training Services, % |           |          |        |
|-----------------------------|-------------------------------|-----------|----------|--------|
|                             | Full Time                     | Part Time | Per Diem | Clinic |
| 1–99                        | 5                             | 89        | 3        | 57     |
| 100–199                     | 12                            | 80        | 8        | 55     |
| 200–299                     | 21                            | 72        | 8        | 57     |
| 300–399                     | 36                            | 59        | 7        | 45     |
| 400–499                     | 43                            | 55        | 3        | 55     |
| 500–599                     | 44                            | 55        | 4        | 50     |
| 600–699                     | 53                            | 45        | 3        | 43     |
| 700–799                     | 53                            | 45        | 5        | 38     |
| 800–899                     | 62                            | 37        | 4        | 41     |
| 900–999                     | 63                            | 40        | 2        | 41     |
| 1000–1099                   | 65                            | 35        | 1        | 41     |
| 1100–1199                   | 64                            | 38        | 3        | 38     |
| 1200–1299                   | 67                            | 37        | 1        | 37     |
| 1300–1399                   | 68                            | 36        | 5        | 37     |
| 1400–1499                   | 70                            | 40        | 1        | 35     |
| 1500–1599                   | 64                            | 39        | 5        | 41     |
| 1600–1699                   | 64                            | 47        | 3        | 32     |
| 1700–1799                   | 69                            | 35        | 3        | 37     |
| 1800–1899                   | 71                            | 32        | 3        | 26     |
| 1900–1999                   | 79                            | 30        | 2        | 17     |
| 2000–2099                   | 76                            | 32        | 2        | 29     |
| 2100–2199                   | 74                            | 36        | 3        | 29     |
| 2200–2299                   | 74                            | 34        | 1        | 28     |
| 2300–2399                   | 77                            | 35        | 3        | 22     |
| 2400–2499                   | 73                            | 39        | 2        | 25     |
| 2500–2599                   | 77                            | 29        | 0        | 21     |
| 2600–2699                   | 87                            | 20        | 7        | 30     |
| 2700–2799                   | 79                            | 41        | 3        | 31     |
| 2800–2899                   | 72                            | 25        | 3        | 19     |
| 2900–2999                   | 75                            | 25        | 0        | 33     |
| 3000–3099                   | 87                            | 33        | 0        | 15     |
| 3100–3199                   | 85                            | 30        | 0        | 25     |
| 3200–3299                   | 84                            | 32        | 4        | 16     |
| 3300–3399                   | 93                            | 14        | 7        | 13     |
| 3400–3499                   | 93                            | 6         | 0        | 20     |
| 3500–3599                   | 92                            | 19        | 0        | 15     |
| >3600                       | 88                            | 29        | 0        | 31     |
| Average                     | 55                            | 46        | 4        | 41     |

secondary schools [ $n = 535$ ]).<sup>11</sup> This is well beyond 12 HCUs per full-time athletic trainer and indicates the need for 3 full-time athletic trainers. Therefore, the employment of multiple full-time athletic trainers should be encouraged in secondary schools to enhance sport safety. Hawaii, for example, has successfully implemented multiple athletic trainers at secondary schools, with 19 of 24 schools having hired 2 full-time athletic trainers. This number increased from 1991, when only 8% of public and private schools in Hawaii had 1 athletic trainer at sports practices.<sup>12</sup>

One major limitation of our study involves the definitions of *AT services*. Full- and part-time AT services were determined by the athletic director based on game and practice coverage and on official employment status at the school. Athletic directors may have mistakenly considered an employee who teaches during the day and covers some practices and games to be a full-time athletic trainer. Not all athletic directors knew exact school enrollment or athlete numbers and, therefore, they approximated these values. Similarly, not all athletic directors understood who qualified as an *athletic trainer*, as some mentioned that

they themselves were the athletic trainers despite no education or training as such. We did not ask if the athletic trainer was certified, licensed, or registered, and this should be explored in a future study. Thus, in states that do not require certification to work as an athletic trainer (eg, California), the number of schools with appropriate, qualified AT services may be overestimated.

Researchers should investigate private and specialty (eg, vocational, technical, charter, alternative) school AT services. These types of secondary schools may offer differing levels of AT services due to differences in school enrollment and financial support. Understanding the barriers and reasons why school districts do not employ athletic trainers or only hire part-time athletic trainers can help identify how to increase AT coverage of sports games and practices.

## CONCLUSIONS

Whereas the percentage of schools with AT services in secondary schools has increased dramatically since 1994, at the time of this study, only 37% of schools had full-time AT services. The presence of AT services in US public secondary schools needs to increase, and school districts should continue to hire athletic trainers as appropriate medical providers for sports games and practices. It is promising that 70% of the public secondary schools in the United States recognize the importance of AT services and have some level of medical coverage. Although many of these schools need to enhance coverage to properly protect all athletes and some schools still need to begin offering AT services, the momentum is clearly focused on improving medical services for secondary school athletes. This is a trend that will have life-saving consequences.

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