

# Cost-Benefit of Hiring Athletic Trainers in Oregon High Schools From 2011–2014

Tao Li, MD, PhD\*; Marc F. Norcross, PhD, ATC\*; Samuel T. Johnson, PhD, ATC, CSCS\*; Michael C. Koester, MD†

\*College of Public Health and Human Sciences, Oregon State University, Corvallis; †Slocum Center for Orthopedics and Sports Medicine, Eugene, OR

**Context:** Hiring athletic trainers (ATs) in high schools may lower medical payments by third-party payers such as Medicaid or commercial insurers by reducing injury risks or may increase medical payments due to more referrals to other health care providers. To date, evidence is lacking on the actual financial effect of high school ATs based on an analysis of medical claims.

**Objective:** To assess the overall cost-benefit of hiring ATs in Oregon high schools based on medical claims data across years.

**Design:** Cost-benefit study.

**Setting:** Oregon public high schools.

**Patients or Other Participants:** Patients aged 14 to 18 years old.

**Main Outcome Measure(s):** We analyzed the 2011–2014 limited dataset from the Oregon Health Authority's All Payer All Claims database. Paired *t* tests were used to compare claims payments at the zip code level between periods of having and not having ATs in Oregon high schools. We also used the percentage of AT effort to adjust for AT investment. The main

outcome measure was the return on investment associated with hiring ATs in high schools.

**Results:** The presence of ATs in Oregon high schools may have had different effects on medical payments for Medicaid and commercial insurance. With every dollar invested in hiring ATs in Oregon public high schools from 2011 to 2014, Medicaid payments increased by 24 cents per month at the zip code level, while commercial insurance payments decreased by 24 cents, although the changes were not statistically significant.

**Conclusions:** Hiring ATs in an outreach model for high schools may not necessarily generate medical savings for Medicaid or commercial insurers. Further research is needed to determine if the lack of cost savings in our study was a factor of the employment model, resulted from increased health care utilization, or reflected the need for ATs to deliver more on-site AT services.

**Key Words:** medical claims, cost-benefit analysis, Medicaid, commercial insurance

## Key Points

- The presence of athletic trainers in Oregon high schools may have had different effects on medical payments by Medicaid and commercial insurance.
- Athletic trainer services in high schools may not generate medical savings in an outreach model.

Athletic trainers (ATs) are allied health care professionals trained to deliver a broad scope of medical services to physically active individuals; these services include emergency care; injury and illness prevention; and clinical evaluation, treatment, and rehabilitation.<sup>1</sup> Hiring ATs in high schools has attracted rising interest across the nation as a successful way of improving adolescents' health by enhancing safety and reducing the injury risk.<sup>2–4</sup> Also, high school ATs may reduce medical costs by evaluating, treating, and rehabilitating athletic injuries outside the traditional health care reimbursement model. However, other than a single case study<sup>5</sup> that suggested modest savings from the hiring of an AT, no previous investigators have directly assessed how hiring ATs in high schools affects medical payments by third-party payers such as Medicaid or commercial insurers; support for this cost-saving notion is primarily anecdotal.<sup>6</sup>

Considering that ATs work in collaboration with or under the direction of a physician, they will refer the patient to a

physician when an injury or medical condition requires additional consultation. Given this additional role as a case manager who coordinates care, it is also possible that hiring ATs in high schools might lead to increased medical payments as a result of this greater health care utilization.

With the increasing interest in sports safety and calls to have ATs available for all high school athletes, it is important to determine the actual effects of hiring ATs in high schools on medical payments. However, we are unaware of any previous researchers who have analyzed medical claims data related to AT services. Therefore, the purpose of our study was to use an ecologic study design to analyze medical claims data across years to assess the cost-benefit of hiring ATs in Oregon public high schools. We implemented a cost-benefit analysis at the zip code level rather than the individual level, and we evaluated the economic effects of hiring ATs on population, which provides valuable information from a public health standpoint. To address the complex public health challeng-

es of sports safety and children's health with limited resources, our population-based cost-benefit study provides evidence to ATs, policy makers, and public health researchers to enhance decision making and identify opportunities for improving children's health at a lower cost.

## METHODS

We analyzed the 2011–2014 limited dataset from the Oregon Health Authority's All Payer All Claims (APAC) database. We included only the medical claims of patients aged 14 to 18 years to approximately evaluate medical claims among high school students. Based on the APAC data, we were not able to establish a direct link between a patient of high school age and the high school the patient actually attended. Instead, we assigned patients to the enrollment boundaries of public high schools based on their zip codes from the claims. To do so, we first classified all Oregon public high schools as either having or not having ATs during the study period by using data from the Oregon Athletic Trainers' Society. Because a zip code may overlap the enrollment boundaries of multiple high schools with different AT statuses, we used ArcGIS Desktop (version 10.4.1; Esri, Redlands, CA) to build a map that overlaid the enrollment boundaries of public schools and the boundaries of Oregon zip codes. This map was then used to identify and include only zip codes in which all schools within the zip code had the status of both AT coverage and no AT coverage for at least 6 months during the study period. By doing so, we were able to aggregate all claims within these zip codes into the same AT status (either all having ATs or not having ATs) and compare statuses. Grouping claims by month for each zip code also allowed us to adjust for the mid-calendar year change of AT status, such as when a school may have lost or gained AT coverage from one school year to the next.

Inpatient and outpatient claims that were related to ATs' scope of practice were identified using International Classification of Diseases, 9th edition (ICD9) and Current Procedural Terminology (CPT) codes. Two certified athletic trainers (M.F.N., S.T.J.) and 1 sports medicine-trained pediatric physician (M.C.K.) used an iterative process to achieve a priori consensus on diagnoses and procedures that could potentially be prevented or administered, respectively, by ATs. Relevant ICD9 and CPT code lists were then generated and are available in Supplemental Tables 1 through 3 (available online at <http://dx.doi.org/10.4085/1062-6050-390-17.S1>). To generate a more conservative evaluation, only claims with both a primary diagnosis and a primary procedure in the codes list were included in the analysis. For each zip code, we averaged claims payments when having ATs and claims payments when not having ATs by the total number of months with and without ATs, respectively, to adjust for the different lengths of time for high schools' AT presence status.

We conducted our economic analyses from the community perspective. For our base case analysis, we included payments that accrued to Medicaid and commercial insurance plans separately and combined. To estimate the cost-benefit, we calculated the return on investment (ROI) associated with hiring ATs in public high schools, which was the potential savings in claim payments after hiring

ATs divided by total AT salaries. These results can then be interpreted as dollars saved associated with per-dollar investment in hiring ATs. To evaluate the potential savings in claims payments, we conducted paired *t* tests at the zip code level to estimate the difference in per-month payments between the period of having ATs and the period of not having ATs. In so doing, we were able to control for certain factors (eg, socioeconomic, geographic) that were likely to remain relatively stable during a 4-year period within a zip code. We estimated the 95% confidence intervals (CIs) based on 10 000 bootstrap repetitions.

Before conducting our ROI analyses, we adjusted for AT investment by calculating the percentage of each AT's effort attributable to the zip code(s) the AT served. We used a publicly available geographic correspondence engine, known as MABLE/Geocorr 14 (Missouri Census Data Center, Columbia, MO),<sup>7</sup> to generate the proportion of the 2010 census population attributable to the high school(s) within each zip code. Next, the percentage of each AT's effort attributable to the zip code(s) was calculated by dividing the population in the zip code served by each AT by the total population across all zip codes and schools served by the same AT. For our base case, we obtained the cost of AT employment from the Bureau of Labor Statistics<sup>8</sup>: a mean of \$45 640 in Oregon in 2016, or \$3751 per month in 2014 dollars. We calculated per-month AT investment in each zip code as the product of monthly cost and the AT's percentage of effort within that zip code. This value was then multiplied by the total number of months that the zip code had AT services to obtain the adjusted total AT investment in the zip code. Finally, we summed the adjusted total AT investment (as the numerator) and the total number of months of having ATs (as the denominator) of all zip codes in our ROI analysis to calculate the average investment in ATs per month.

In addition to the base case analysis, we conducted 1-way sensitivity analyses for ROIs between the upper and lower limits of the 95% CI for the potential savings in claims payments. We also adjusted for total AT salary (base salary + benefit) at \$3675 per month in public high schools based on the National Athletic Trainers' Association 2014 salary survey.<sup>9</sup>

We used the Consumer Price Index for all items to adjust the monetary values to 2014 dollars,<sup>10</sup> which was the last year in our study period. Stata software (version 14; StataCorp, LLC, College Station, TX) was used for the statistical analysis.<sup>11</sup> This study was approved by the Oregon State University Institutional Review Board.

## RESULTS

We included 26 zip codes in the analysis. Linked to these zip codes, we were able to identify around 1500 claims each year paid by Medicaid and around 2500 claims each year paid by commercial insurance that met our inclusion criteria (Table 1). For both insurance types combined, our analysis included more than 3800 claims and 1000 patients each year from 2011 to 2014.

Paired *t*-test results that compared per-month claims payments at the zip code level between the period of having ATs and the period with no ATs in Oregon public high schools were not statistically significant (Table 2). In

**Table 1. Number of Patients and Claims Included in the Analysis by Insurance Type and Year<sup>a</sup>**

Year	Medicaid		Commercial Insurance		Both	
	Claims	Patients	Claims	Patients	Claims	Patients
2011	1591	441	2403	601	3994	1033
2012	1567	450	2670	605	4237	1045
2013	1725	452	2864	612	4589	1056
2014	1483	495	2348	578	3831	1062

<sup>a</sup> Data source: 2011–2014 limited dataset from the Oregon Health Authority's All Payer All Claims database.

our base case, when high schools had ATs, claims payments per month at the zip code level increased by \$182 (95% CI = -\$11, \$374) for Medicaid and decreased by \$185 (95% CI = -\$813, \$443) for commercial insurance. With both insurance types combined, payments per month at the zip code level rarely changed.

Because claims payments may have increased when high schools had ATs (meaning a potential loss or a negative return), we multiplied the ROI by (-1). The negative ROI can then be interpreted as extra dollars spent on medical claims associated with every dollar invested in hiring ATs. Among the public high schools in the 26 zip codes we analyzed, the average adjusted investment in ATs was approximately \$757 per month. As shown in Table 2, with every dollar spent to hire ATs in Oregon public high schools, Medicaid would pay an extra 24 cents, whereas commercial plans would save 24 cents.

Sensitivity analyses for ROI are presented in the Figure. Our base case findings were robust across alternative models. With every dollar invested in hiring high school ATs, up to \$1.074 in claims payments could be saved for commercial plans (the best scenario), whereas payers could expend an extra \$0.808 with both insurance types combined (the worst scenario). A narrow range of ROI also suggested that our results were less sensitive to changes in total AT salaries in public high schools.

## DISCUSSION

The primary finding in our base case analysis was that hiring ATs in Oregon public high schools may not have resulted in savings in medical payments by Medicaid and commercial insurance plans. We estimated that, with every dollar invested in hiring ATs in Oregon public high schools from 2011 to 2014, Medicaid spent an extra 24 cents, whereas commercial insurance payments were reduced by 24 cents. However, the payment changes for neither payer were statistically significant. We also implemented a secondary analysis focusing on emergency department

claims. Consistent with our primary findings, we did not detect a difference in per-month payer payments for emergency department claims by Medicaid or commercial insurance between the period of having ATs and the period with no ATs. The lack of savings in overall claims payments was surprising given a prevailing notion among the athletic training community that having an AT in high schools would yield cost savings because an AT can perform injury evaluations, treatments, and rehabilitation outside the billable system in place of other clinicians who generate medical claims.

The authors of a previous case study<sup>5</sup> in a Michigan school estimated the total cost of treatment related to an AT's practice administered over the course of an academic year at \$64 026. Subtracting the cost of an AT from this total cost of treatment, the authors suggested a total savings of approximately \$8386, or a return of \$1.15 per dollar of investment in AT employment, which seemed beneficial. However, this calculation translated the full cost of treatment into savings from AT employment. In fact, our results based on actual medical claims across multiple schools and years indicated that hiring an AT may generate minimal savings, no savings, or minimal costs depending on the type of insurance.

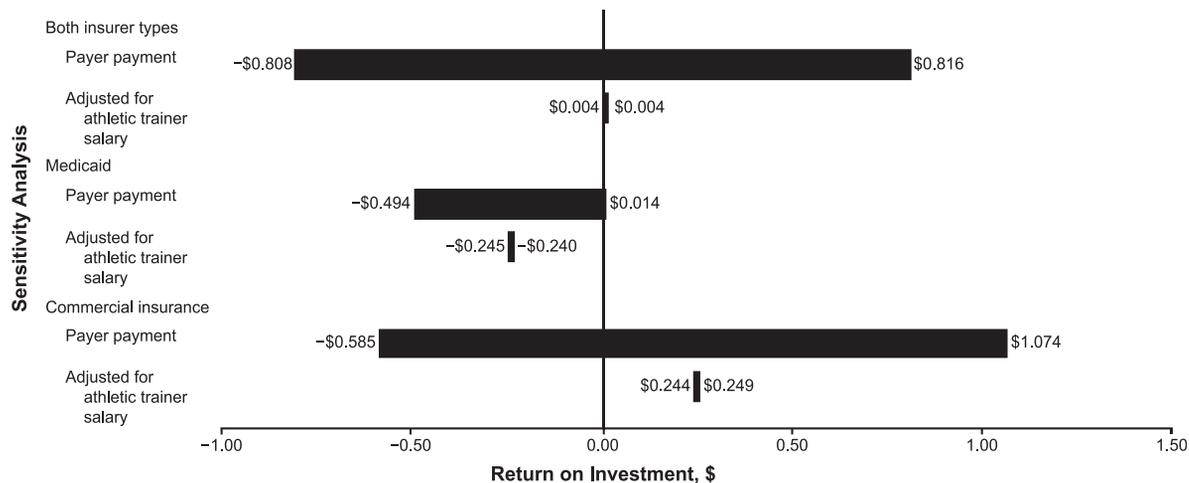
Another potential reason for the lack of savings is the model in which the ATs served the zip code(s). During the study period, schools in our analysis were served by ATs operating under an outreach model. In this model, an AT is generally employed by a private entity, such as a hospital, physicians' clinic, or physical therapy clinic that contracts with a school district to provide athletic training services—often for less money than their cost to employ the AT. However, the expected return for the private entity comes in the form of increased visibility among the community and referrals for billable services. Accordingly, it is likely unrealistic to expect that ATs serving students under an outreach model—as was the case for all zip codes in our analysis—would reduce medical claims payments, as ATs may well be referring patients in need of extended treatment and rehabilitation to the clinic in lieu of performing these services themselves at the school.

This idea is supported by the researchers of a recent study<sup>12</sup> who reported that the number of AT services provided (eg, evaluation, therapeutic exercise) per high school football injury was nearly half as much in schools with outreach ATs compared with schools that directly employed the AT. Reasons for this discrepancy in the services provided are unclear, but 2 explanations are possible. The AT may be referring the patient to his or her employer for care to generate increased revenue or the AT may have limited time, facilities, or equipment to

**Table 2. Results of Paired *t* Test and Return on Investment Analyses at the Zip Code Level**

Payer Payment	Difference in per-Month Claims Payments Between the Periods of Having and Not Having Athletic Trainers, \$ (95% Confidence Interval) <sup>a</sup>		Return on Investment, \$ (Range)	<i>t</i> <sub>25</sub> Value	<i>P</i> Value
Medicaid	182	(-11, 374)	-0.24 (-0.49 to 0.01)	1.8105	.08
Commercial insurance	-185	(-813, 443)	0.24 (-0.59 to 1.07)	-0.5670	.58
Both	-3	(-618, 611)	0 (-0.81 to 0.82)	-0.0099	.99

<sup>a</sup> Monetary values were adjusted to 2014 dollars using the Consumer Price Index for all items. Bootstrap confidence intervals based on 10 000 repetitions are reported in parentheses and were used to estimate the range of return on investment.



**Figure. One-way sensitivity analysis of return on investment (ROI).** In terms of investment, the negative ROI can be interpreted as extra dollars spent on medical payments associated with every dollar invested in hiring athletic trainers. The positive ROI can be interpreted as savings in medical payments associated with every dollar invested in hiring athletic trainers.

perform the care at the school. The latter may be especially true considering that many ATs working in the outreach model are not available at the school full time but only a few days a week. Another group<sup>13</sup> also suggested the importance of increasing the number of full-time ATs to provide appropriate medical coverage for secondary school athletes. Referrals of patients to non-school-based providers may place a burden on students and their families due to missed school and work time. This is particularly important for student-athletes because the increased burden may discourage their participation in sports. Therefore, our findings suggest the need to examine different models of AT practice to provide athletic training services in a more cost-effective model. Future investigators should evaluate whether these results differ when ATs are employed directly by schools rather than by a private entity.

Although the results do not show a significant cost savings to hiring ATs, that does not necessarily mean hiring an AT is without benefit. Increased health care utilization is an important concept in keeping populations healthy. For example, it has been shown that athletes at schools with ATs have a higher rate of concussions, which has been interpreted as a positive finding due to the underreporting of concussions by athletes.<sup>3</sup> To extend this idea, the AT may be identifying patients with injuries and conditions that need referral to physicians and other providers that would otherwise go untreated and lead to more significant sequelae in later years. Additionally, using only claims data may not capture other potential preventive cost savings by the AT. For example, a recent study<sup>2</sup> demonstrated an association between AT availability at schools and improved emergency preparedness.

A primary strength of our study is that we used an ecologic study design to analyze medical claims data across years to examine the broader population-level effect of high school ATs in zip codes. Despite this strength, we recognize several limitations of our study. A major limitation is that, due to the structure of the APAC dataset, we were unable to directly link individual patients to high schools. Therefore, we could not evaluate the effect at the individual level and could only implement our analysis at the population level by mapping the enrollment boundaries

of high schools over zip codes. Because we could only map public schools with defined enrollment boundaries and were unable to identify whether a patient attended a public or private school from the claims data, we assumed that all patients included in our analysis attended public high schools.

Second, when comparing medical payments between periods of having an AT and not having an AT, we assumed that all patients within a zip code had the same access to AT services. Due to the data limitation mentioned previously, we were not able to identify the actual access to AT services among individual patients within a zip code. Third, the current data were insufficient for precisely investigating medical claims by each patient's sport participation status, such as interscholastic sports, club sports, or recreational activities. This limits the strength of our conclusion about ATs' influence on medical cost or causation of claims relevant to the AT presence in Oregon high schools.

## CONCLUSIONS

Using a novel approach to assess the cost-benefit of hiring ATs, we found that the outreach model may not necessarily generate medical savings. The effect may differ depending on the type of insurance. Future researchers should attempt to establish a direct link between students and their schools to address the major limitation and to assess the effect at the individual level. Future investigators should also examine whether the AT practice model—outreach versus full-time employee—influences medical savings.

## DISCLAIMER

The study (principal investigator: T.L.) was funded by the Oregon School Activities Association Foundation in Wilsonville, OR. The opinions expressed in this study are solely those of the authors and do not represent an endorsement by or the views of the Oregon School Activities Association Foundation.

Data from the Oregon Health Authority's APAC database were used to produce this product. Statements contained herein are solely those of the authors, and the authors assume responsibility for the accuracy and completeness of the analyses contained in the product.

## REFERENCES

1. Athletic training. National Athletic Trainers' Association Web site. <https://www.nata.org/about/athletic-training>. Accessed August 6, 2018.
2. Johnson ST, Norcross MF, Bovbjerg VE, Hoffman MA, Chang E, Koester MC. Sports-related emergency preparedness in Oregon high schools. *Sports Health*. 2017;9(2):181–184.
3. Kroshus E, Rivara FP, Whitlock KB, Herring SA, Chrisman SPD. Disparities in athletic trainer staffing in secondary school sport: implications for concussion identification. *Clin J Sport Med*. 2017;27(6):542–547.
4. Olympia RP, Dixon T, Brady J, Avner JR. Emergency planning in school-based athletics: a national survey of athletic trainers. *Pediatr Emerg Care*. 2007;23(10):703–708.
5. Hambleton M, Smith S, Evers C, Schneider W. Cost savings analysis of a high school athletic trainer. *Interschol Athl Admin*. 2012;39(2):8–11.
6. Huggins R, Cooper L, Walker L, Dec K. Strategies, successes, pitfalls when working to hire an athletic trainer: 3rd Annual Collaborative Solutions for Safety in Sport National Meeting. National Athletic Trainers' Association Web site. <https://www.nata.org/sites/default/files/strategiessuccesspitfalls.pdf>. Accessed August 6, 2018.
7. MABLE/Geocorr 14: Geographic correspondence engine. Missouri Census Data Center Web site. <http://mcdc.missouri.edu/websas/geocorr14.html>. Accessed August 6, 2018.
8. May 2016 state occupational employment and wage estimates - Oregon. Bureau of Labor Statistics Web site. <https://www.bls.gov/oes/2016/may/oessrcst.htm>. Accessed August 6, 2018.
9. NATA 2014 salary survey. National Athletic Trainers' Association Web site. <https://members.nata.org/members1/salarysurvey2014/results.cfm>. Accessed August 6, 2018.
10. Consumer price index. Bureau of Labor Statistics Web site. <https://www.bls.gov/cpi/>. Accessed August 6, 2018.
11. *Stata Statistical Software* [computer program]. Release 14. College Station, TX: StataCorp; 2015.
12. Kerr ZY, Lynall RC, Mauntel TC, Dompier TP. High school football injury rates and services by athletic trainer employment status. *J Athl Train*. 2016;51(1):70–73.
13. Pryor RR, Casa DJ, Vandermark LW, et al. Athletic training services in public secondary schools: a benchmark study. *J Athl Train*. 2015;50(2):156–162.

## SUPPLEMENTAL MATERIAL

**Supplemental Tables.** ICD diagnosis codes; ICD procedure codes; and current procedural terminology codes.

Found at DOI: <http://dx.doi.org/10.4085/1062-6050-390-17.S1>

---

Address correspondence to Tao Li, MD, PhD, College of Public Health and Human Sciences, Oregon State University, 458 Waldo Hall, Corvallis, OR 97331. Address e-mail to [tao.li2@oregonstate.edu](mailto:tao.li2@oregonstate.edu).