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Athletic Trainer-Reported Prevalence of Mental Health, Substance Use, and Barriers to Health in Secondary Schools

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**Context:** Where a person lives can have a significant impact on health. Limited access to health care, food insecurity, lack of affordable housing, and violence increases a person's likelihood for poor health. Athletic trainers can have an impact on identifying and improving the determinants of health that affect student-athletes.

**Objective:** To understand 1) What are the current perceptions athletic trainers have about the health behaviors (specifically mental health and substance use) of high school student-athletes? 2) What are the barriers that athletic trainers experience when providing health services to high school student-athletes? 3) How does the developed environment effect the health behaviors and barriers that athletic trainers observe?

**Design:** Survey

**Setting:** Online

**Participants:** Certified National Athletic Training Association Members employed in the secondary school setting

**Main Outcome Measure(s):** Demographics of athletic trainers, athletic trainers’ perceptions on the health of student-athletes across developed environments, prevalence of mental health issues, tobacco and substance use, barriers to health care services, and housing and food insecurities among student-athletes. Descriptive statistics for the outcome measures are reported.

**Results:** 7,600 electronic surveys were distributed to athletic trainers, with 910 respondents. Respondents were 61% female; average age was 36 years old; and an average of 12.5 years of experience. 82% of athletic trainers identified their school setting as public, 43.7% of respondents identified their school as suburban, 30.1% rural, and 26.2% urban. Athletic trainers
perceived a high average prevalence of mental health issues (32%), e-cigarette use (31.7%), and marijuana use (26.9%) in student athletes. There were significant perceived barriers to health including access to transportation, poverty, housing and food insecurities.

Conclusions: This study highlights health disparities and barriers athletic trainers observe when addressing health care needs of student-athletes. Understanding determinants of health to identify causes of health disparities may better prepare athletic trainers to manage the health needs of underserved student-athletes.
Introduction

Population health programs aim to improve how determinants of health are impacting large homogeneous groups of individuals throughout a system. Population health relies on the coordination of a variety of interventions including health promotion, prevention, and screening to reduce or eliminate health disparities by promoting quality and equitable care [1]. There are several broad categories of determinants of health that include policymaking, biology and genetics, social factors, health services, and individual behaviors. For athletic trainers, a focus on the social factors that determine health is important. This category is often referred to as social determinants of health and include factors such as socioeconomic status, education, neighborhood and physical environment, employment, and social support/networks. The outcomes of these factors are often related to the conditions of which people are born, grown, live, work and age [2]. Teaching athletic trainers how to identify and address social determinants of health may help reduce health disparities that may be related to inequitable access of resources and structures that promote health.

Athletic Trainers are allied health care professionals with expertise in injury and illness prevention, wellness promotion and education, emergent care, examination and clinical diagnosis, therapeutic intervention, and rehabilitation of injuries and medical conditions [3]. In our nation’s secondary schools, athletic trainers are well positioned to provide effective and efficient care pathways to student-athletes. Under the direction of or in collaboration with physicians, athletic trainers provide care, serve as a liaison to the medical community [4] and are capable of working with student-athletes to find appropriate solutions for addressing a wide variety of health-related issues [5]. The National Federation of State High School Associations (NFHS) reported that about 8 million adolescents participate in U.S. high school athletics.
annually [6]. A recent study of athletic training placement found that approximately 66% of secondary schools employ an athletic trainer in either a full or part-time capacity to provide health care to student-athletes [7]. Understandably, athletic trainers will dedicate much of their time and resources to providing direct medical care to student-athletes (i.e. game and practice coverage and treatment and rehabilitation of injuries), however, increasing the time spent in other areas that impact health outcomes should be considered (i.e. social circumstances, individual behaviors, and physical environments). Athletic trainers are often the first point of contact for health information from student-athletes which may provide them with a unique perspective and insight to understanding the individual and community level exposures that influence health behaviors and outcomes. This perspective, along with providing training in population health, can be used to inform prevention strategies, care pathways, clinical decision making, and reduce health disparities in the population they serve.

The United States Department of Health and Human Services, defined health disparities as, “a type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion” [8]. Health disparities exist across diverse communities and developed environments (suburban, urban, rural), which can result in significantly different barriers to health for patients. Distinguishing between developed environments allow researchers to identify differences in health behaviors and outcomes across populations. Research has found that the type of developed environment has significant effects on individual health behaviors and
outcomes [9-11]. Factors such as distance and time to health care services, access to transportation, and socioeconomic status greatly impact an individual’s health outcomes. Often, poverty, educational opportunities, and economic distress are related to negative outcomes [12].

The purpose of this study was to identify the health behaviors and barriers to health that secondary school athletic trainers are observing among the population they serve, and how they respond to these population health issues. This study aimed to answer three primary questions:

1. What are the current perceptions athletic trainers have about health behaviors (specifically mental health and substance use) of high school student-athletes?
2. What are the barriers that athletic trainers experience when providing health services to high school student-athletes?
3. How does the developed environment effect the health behaviors and barriers that athletic trainers observe?

It was predicted that the role of the developed environment influenced athletic trainers’ clinical practice and the type of health care services they could provide to reduce poor health outcomes among student-athletes.

Methods
A survey was developed to collect data on athletic trainers’ perception of student-athletes’ health behaviors and the barriers to health experienced by these athletic trainers. Preliminary focus groups with secondary school athletic trainers were conducted to understand the current issues athletic trainers face related to providing care to their patients who have experienced health disparities and health barriers. The data collected from these focus groups were used to construct a more comprehensive national survey. This study was approved for Human Subjects Research by an Institutional Review Board under exempt status. The survey was sent to all BOC Certified...
National Athletic Training Association (NATA) members who have reported their job setting to the NATA as employed in a secondary school. The NATA distributed the survey on April, 2019, with regular weekly reminders for six weeks. Athletic trainers received an electronic survey by email with a link to Qualtrics (Qualtrics XM, Provo, UT, 2019). All survey responses were anonymous and followed the NATA guidelines for research and data exporting to protect the identity and information provided by the athletic trainers.

The survey consisted of a mix of multiple choice, sliding scales, and open-ended discussion questions in order to understand the full scope of how athletic trainers are responding to a variety of health behaviors and barriers. Survey items included demographics of the athletic trainer (sex, race, age, employment type, school type) and the type of developed environment that best describes the school setting. Additionally, athletic trainers reported their estimated time allocations based on social determinants of health factors such as medical care, social circumstances, individual behavior, and physical environment.

Athletic trainers reported the percentage of their student-athletes they believed had used health care services (i.e. primary care visit within the past 1 year, used an emergency department for non-emergent health needs), participated in poor health behaviors (tobacco and substance use), and experienced mental health issues (depression, anxiety, suicidality). Using sliding scales, athletic trainers rated how significantly they perceived certain factors being barriers to health (transportation, distance to health care, insurance, housing and food insecurities, community safety and poverty). Finally, athletic trainers were given the opportunity to share examples of situations they had experienced in their clinical practice relating to health disparities and social determinants of health (see appendix for full survey).

Data Analysis
The participating athletic trainers’ demographics are summarized using median (interquartile range) or frequency (percentage). Age and years of experience are summarized using the median as their distributions are positively skewed. Survey responses were summarized as continuous variables using mean (standard deviation) and categorical variables were summarized as frequency (percent). Responses were then analyzed by developed environment (suburban, urban, rural). Continuous responses were compared among the three developed environments using a one-way analysis of variance (ANOVA). If the ANOVA’s overall F-test was significant, then post-hoc pairwise group comparisons were made with the appropriate Bonferroni corrections. Categorical responses were compared among the three developed environments using a Chi-square test of independence. Similarly, if the Chi-square test comparing all three developed environments was significant, then additional post-hoc pairwise comparisons were made using a Chi-square test with Bonferroni corrections. Statistical significance was assessed at the 0.05 level and all tests were two-sided. All analyses were performed in Stata/MP 15.1 (StataCorp LP., Texas, USA).

Results

The survey reached over 7,067 athletic trainers who were members of the NATA and identified secondary schools as their primary employment setting. A response rate of 13% was achieved with 911 total respondents. In all categories where athletic trainers were surveyed on health behaviors, barriers, and social determinants of health that impact student-athletes, the athletic trainers were reporting athletic trainer-perceived proportions.

Demographics of Respondents

The participants for this study represented a diverse background of athletic trainers in categories such as race, gender, and years of experience. Table 1 summarizes respondent demographics
from the survey. Of the 911 athletic trainer respondents, 62% were female, 38% male and were on average, 36 years old. The majority of respondents were also white (85.8%). Most athletic trainers identified the public sector as their school setting (83%) compared to charter and private schools (0.9% and 17%). The respondent athletic trainers were predominantly practicing in suburban environments (44%), but many indicated rural or urban (30% and 26%). Respondents represented a wide range in number of years in which they have practiced athletic training (range: 0.5-45 years), with the median being 9 (IQR: 4-20) years. Additionally, 49 (5.4%) of participants had one year or less of experience.

| Table 1 Demographics of Athletic Trainer Participants |
|-----------------------------------------------------|
| Total (N=911)                                       |
| n (%)                                               |
| Sex                                                 |
| Female                                              |
| Male                                                |
| Missing                                             |
| Race                                                |
| White                                               |
| Black                                               |
| Other (more than 1 race)                            |
| Missing                                             |
| Age (Median, IQR)                                   |
| Minimum-Maximum                                     |
| Missing                                             |
| Years of Experience (Median, IQR)                   |
| Minimum-Maximum                                     |
| Missing                                             |
| Employment                                          |
| Contracted                                          |
| School                                              |
| Other                                               |
| Missing                                             |
| School Type                                         |
| Charter                                             |
| Private                                             |
| Public                                              |
| Missing                                             |
| Developed Environment                               |
| Urban                                               |
| Suburban                                            |
| Rural                                               |
| Missing                                             |

IQR = Interquartile Range
Where ATs are Spending their Time

Athletic trainers were asked about time allocation in their clinical practice. About half (47.7%), reported spending most of their time on direct medical care, which would include tasks such as game and practice coverage care and treatment and rehabilitation of injuries. Athletic trainers reported significantly less time spent in the other areas that impact health outcomes, for example addressing individual health behaviors (i.e smoking cessation, nutrition education). These values are shown in Figure 1 (highlighted in black) and are compared to the percentage that each category has on an individual’s overall health according to research by Choi and Sonin (highlighted in grey) [13].

Figure 1. Athletic trainer time allocation versus contribution to an individual’s overall health

Choi, E. and J. Sonin. Determinants of Health. 2017 [cited 2019 April 26]; Available from: https://www.goinvo.com/vision/determinants-of-health/.
Differences in health across the developed environment were also found. Compared to their suburban counterparts, urban and rural athletic trainers experienced significantly more athletes without health insurance, athletes that used an emergency room for non-emergent care, and athletes who did not have a primary care physician or had not seen one within the past year (Table 2). Additionally, 57% of rural athletic trainers reported that the nearest hospital was greater than five miles away. Suburban athletic trainers believed that on average, a larger percentage of their student-athletes visited a primary care physician (PCP) within the past year (mean = 79% of student-athletes, SD = 21%) compared to urban (mean = 68% of student-athletes, SD = 27%; t(527) = 4.9, P = .001) and rural (mean = 70% of student-athletes, SD = 24%; t(561) = -4.7, P = .001) athletic trainers. In rural and urban community settings, athletic trainers reported higher emergency department utilization by their student-athletes in the past year compared to their suburban counterparts (suburban vs. urban: 52.6% vs 65.2%; \( \chi^2 = 9.4, P = .027 \), suburban vs. rural: 52.6% vs 67.2%; \( \chi^2 = 12.3, P = .006 \)). There were no significant differences in emergency department utilization between urban and rural settings (\( \chi^2 = 0.7, P = 1.000 \)) (Table 2).
Table 2 AT-reported Prevalence of Healthcare Utilization by Student Athletes

|                           | Total (n = 762) | Urban (n = 199) | Suburban (n = 328) | Rural (n = 235) | P-value<sup>1</sup> | Adjusted P-value from Pairwise Comparisons<sup>2</sup> |
|---------------------------|----------------|----------------|-------------------|----------------|---------------------|-----------------------------------------------|
| Mean (SD) percentage of   |                |                |                   |                | < .001*             | U vs S: .001*                                  |
| athletes with health      |                |                |                   |                |                     | U vs R: 1.000                                  |
| insurance                | (n = 764)      | (n = 201)      | (n = 328)         | (n = 235)      |                     | S vs R: < .001*                                |
| Mean (SD) percentage of   |                |                |                   |                | < .001*             | U vs S: < .001*                                |
| athletes who visited a    |                |                |                   |                |                     | U vs R: 1.000                                  |
| primary care physician    |                |                |                   |                |                     | S vs R: < .001*                                |
| in the past year         | (n = 765)      | (n = 201)      | (n = 329)         | (n = 235)      | .003*               | U vs S: .027*                                  |
| Have any of your athletes |                |                |                   |                |                     | U vs R: .693                                    |
| used the ED for           |                |                |                   |                |                     | S vs R: .006*                                  |
| non-emergent care in the  |                |                |                   |                |                     |                                               |
| past year, n (%)         |                |                |                   |                |                     |                                               |
| Yes                      | 462 (60.4)     | 131 (65.2)     | 173 (52.6)        | 158 (67.2)     |                     |                                               |
| No                       | 75 (9.8)       | 21 (10.5)      | 35 (10.6)         | 19 (8.1)       |                     |                                               |
| Unsure                   | 228 (29.8)     | 49 (24.4)      | 121 (37.3)        | 58 (24.7)      |                     |                                               |

SD = Standard Deviation, U = Urban, S = Suburban, R = Rural
* = Significant at the 0.05 level.
1. P-value comparing all three geographical regions.
2. Bonferroni-adjusted P-values from pairwise comparisons.

AT-reported Perceived Prevalence of Behavioral Health Issues

On average, athletic trainers estimated that 32.0% (SD = 23.5%) of student-athletes had expressed feelings of sadness, anxiety, depression, or suicide in the past year (Table 3). There were no significant differences between developed environment (F(2,689) = 0.01, P = .987).

Athletic trainers recognized behavioral health issues and reported working with Student Assistance Program (SAP) leadership, school social workers, nurses, and administrators to identify student-athletes who need counseling and support. Athletic trainers were provided with an open-ended text box to share how they are responding to behavioral health needs as well.

Many athletic trainers reported having open door policies and were communicating regularly with student-athletes about topics such as bullying, relationship violence, eating disorders, and anxiety and depression.

Online First
### Table 3 AT-reported Prevalence of Mental Health Issues and Substance Use by Student Athletes

|                                                                 | Total     | Urban     | Suburban  | Rural     | P-value<sup>1</sup> | Adjusted P-value from Pairwise Comparisons<sup>2</sup> |
|-----------------------------------------------------------------|-----------|-----------|-----------|-----------|----------------------|---------------------------------------------------------|
| Mean (SD) Percentage of Athletes with Feelings of Sadness, Anxiety, Depression, or Suicide in Past Year | (n = 692) | (n = 184) | (n = 292) | (n = 216) | .987 NA              | U vs S: 1.000 S vs R: <.001* U vs R: <.001*              |
| Mean (SD) Percentage of Athletes who Use Tobacco Products      | (n = 683) | (n = 183) | (n = 283) | (n = 217) | <.001*               | U vs S: .440 U vs R: .005* S vs R: .127                |
| Mean (SD) Percentage of Athletes who Use E-Cigarette/Vaping Use| (n = 674) | (n = 176) | (n = 284) | (n = 214) | .006*                | U vs S: .163 U vs R: .023* S vs R: .986                |
| Mean (SD) Percentage of Athletes who Use Marijuana              | (n = 680) | (n = 181) | (n = 288) | (n = 211) | .025*                |                                                         |
| Mean (SD) Percentage of Athletes who Use Illicit Drug           | (n = 441) | (n = 118) | (n = 191) | (n = 132) | .880 NA              |                                                         |
| Mean (SD) Percentage of Athletes who Use Prescription Drugs     | (n = 496) | (n = 127) | (n = 218) | (n = 151) | .374 NA              |                                                         |

SD = Standard Deviation, NA = Pairwise Comparisons are Not Applicable, U = Urban, S = Suburban, R = Rural

* = Significant at the 0.05 level.

1. P-value comparing all three geographical regions.

2. Bonferroni-adjusted P-values from pairwise comparisons.

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### AT-reported Perceived Prevalence of Substance Use by Student Athletes

Athletic trainers' perception of student athlete's substance use prevalence is reported in Table 3.

On average, rural athletic trainers reported a significantly higher prevalence of tobacco use among student-athletes (26.2% of student-athletes, SD: 20.0%) compared to suburban (16.4%) and urban counterparts (17.2%) of student-athletes, SD: 17.1%; t(498) = 5.9, P =.001)
athletes, SD: 16.3%; t(398) = 4.8, \(P = .001\). Rural athletic trainers reported a significantly higher average prevalence of e-cigarette use among student-athletes (35.3% of student-athletes, SD: 21.7%) compared to their urban counterparts (28.0% of student-athletes, SD: 22.1%; t(388) = 3.2, \(P = .005\)), and although not statistically significant, they reported higher average use compared to suburban athletic trainers (31.2% of student-athletes, SD: 22.9%; t(496) = 2.0, \(P = .127\)). It is also noteworthy that on average, e-cigarette and vaping use was the highest prevalent substance used by secondary school student-athletes (31.7% of student-athletes, SD: 22.5%).

Substance use was also prevalent in the secondary school setting, as athletic trainers estimated that, on average, 26.9% (SD = 19.9%) of student-athletes used marijuana. Urban athletic trainers reported a significantly higher average estimate of student-athletes’ marijuana use (30.1% of student-athletes, SD: 21.5%) than rural athletic trainers (24.7% of student-athletes, SD: 18.0%; t(390) = -2.7, \(P = .023\)). There was no significance between suburban (26.4% of student-athletes, SD: 20.0%) and rural areas (t(497) = -1.0, \(P = .986\)) and urban (30.1% of student-athletes, SD: 21.5%) and suburban areas (t(467) = -1.9, \(P = .163\)). Athletic trainers estimated that illegal use of prescription drugs and illicit drugs such as cocaine, heroin, methamphetamines, and inhalants were used, on average, among 11.0% (SD: 11.9%) and 7.2% (SD: 10.7%) of student-athletes, respectively. There were no significant differences across developed environments (\(F(2,493) = 1.0, P = .374\) and \(F(2,438) = 0.1, P = .880\), respectively).

AT- reported Perception of Student-Athlete Housing and Food Insecurity

On average, athletic trainers estimated that food insecurity and poor nutrition was significantly higher among urban student-athletes compared to rural student-athletes (5.3% of student-athletes (SD: 3.0%) vs 4.2% of student athletes (SD: 2.6%); t(286) = -3.1, \(P = .006\)) and suburban (5.3% of student athletes (SD: 3.0%) vs 4.2% of student athletes (SD: 2.8%); t(333) = -3.1, \(P = .005\))
student-athletes. The perceived average percentage of student-athletes with housing insecurity reported by athletic trainers was also significantly higher in urban areas (4.4% of student athletes, SD: 2.9%) compared to rural (3.4% of student athletes, SD: 2.6%; t(271) = -3.2, \( P = .005 \)) and suburban (3.3% of student athletes, SD: 2.8%; t(313) = -3.6, \( P = .001 \)) counterparts.

Table 4 highlights some of the quotes from the open-ended text boxes for athletic trainers who reported housing and food insecurities in their place of employment.

| Theme                  | Quotes                                                                                                                                                                                                 |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Housing Insecurity     | • 8% of our student population with this situation—we work with local agencies and our district programs to support them  
                          • Several of my athletes have experienced homelessness, eviction, or “being kicked out” of their home  
                          • Athlete placed in a shelter with mom and younger brother to get away from abusive stepfather  
                          • Many students are homeless, living in dwellings with multiple families, sharing small living quarters  
                          • Placed in foster situation from parents with opioid issues; homeless living in a car; couch surfing for a semester after parents kicked out of house for behavior (lesbian/gay)  
                          • A lot of parents of athletes are in jail, so they couch hop                                                                                     |
| Food Insecurity        | • One patient did not have food at home, one was not receiving food due to neglect, many others have food insecurities  
                          • Parents spent most if not all income on nonessentials. Student was noticeably fatigued, I inquired. Student and his brother, a fellow student, hadn’t been eating at home for 3+ days  
                          • There is a list of kids who qualify for the reduced or free lunches at school. When there is a holiday and school isn’t in session, I’ve taken a collection of foods (PB, jelly, fruit cups, granola bars) from the high school staff and I buy bread.  
                          • School provides food backpacks on Fridays for students who need extra food for the weekend                                                         |
Athletic trainers reported what barriers to health they perceived to be most significant to their practice on a sliding scale of 1-10 (1 = not significant, 10 = most significant). The results can be found in Table 5. On average, athletic trainers reported that access to transportation as a perceived barrier to health was significantly higher in urban areas than suburban (5.2 (SD: 3.2) vs 4.1 (SD: 2.7); t(330) = -3.5, \( P = .001 \)). Distance to healthcare services was perceived, on average, as a significantly greater barrier among rural athletic trainers compared to suburban athletic trainers (3.9 (SD: 2.8) vs 2.6 (SD: 2.7); t(337) = 4.3, \( P < .001 \)). Insurance as a barrier to health was the greatest perceived barrier for athletic trainers with an average value of 5.6 (SD: 3.1), and there was no significant difference across developed environments (F(2,508) = 2.3, \( P = .103 \)). Community safety was perceived as a significantly greater barrier to health among urban athletic trainers compared to suburban (4.1 (SD: 3.0) vs 2.9 (SD: 2.9); t(303) = -3.8, \( P < .001 \)) and rural athletic trainers (4.1 (SD: 3.0) vs 2.7 (SD: 2.5); t(254) = -4.3, \( P < .001 \)).

Poverty was reportedly the second greatest perceived barrier to health and had potential influence over the other barriers. Athletic trainers indicated a total average value of 5.1 (SD: 3.1) and was rated significantly higher among urban athletic trainers compared to rural athletic trainers (6.1 (SD: 3.0) vs 5.2 (SD: 3.0); t(290) = -2.6, \( P = .034 \)) and suburban athletic trainers (6.1 (SD: 3.0) vs 4.5 (SD: 3.1); t(331) = -4.6, \( P < .001 \)). There was no significance between suburban and rural athletic trainers (4.5 (SD: 3.1) and 5.2 (3.0); t(365) = 2.1, \( P = .100 \)).
Table 5 AT-reported Perceived Barriers to Health (Scale 1 low significance – 10 high significance)

| Average Significance Rating                        | Total (n = 496) | Urban (n = 128) | Suburban (n = 204) | Rural (n = 164) |
|---------------------------------------------------|-----------------|-----------------|-------------------|-----------------|
| Accessibility of Transportation, Mean (SD)         | 4.5 (2.9)       | 5.2 (3.2)       | 4.1 (2.7)         | 4.4 (2.8)       |
| Distance to Health Care Services, Mean (SD)       | 3.1 (2.8)       | 3.1 (2.9)       | 2.6 (2.7)         | 3.9 (2.8)       |
| Insurance, Mean (SD)                              | 5.6 (3.1)       | 6.1 (2.9)       | 5.4 (3.2)         | 5.6 (3.0)       |
| Poverty, Mean (SD)                                | 5.1 (3.1)       | 6.1 (3.0)       | 4.5 (3.1)         | 4.2 (3.0)       |
| Community Safety, Mean (SD)                       | 3.2 (2.8)       | 4.1 (3.0)       | 2.9 (2.9)         | 2.7 (2.5)       |
| Housing Insecurity, Mean (SD)                     | 3.6 (2.8)       | 4.4 (2.9)       | 3.3 (2.8)         | 3.4 (2.6)       |
| Food Insecurity and Poor Nutrition, Mean (SD)     | 4.5 (2.8)       | 5.3 (3.0)       | 4.2 (2.8)         | 4.2 (2.6)       |

P-values:
- U vs S: .001*
- U vs R: .048*
- S vs R: .849
- U vs S: .345
- U vs R: .001*
- S vs R: .001*

Adjusted P-values from Pairwise Comparisons:
- U vs S: .001*
- U vs R: .001*
- S vs R: .100
- U vs S: .001*
- U vs R: .001*
- S vs R: .001*
- U vs S: .001*
- U vs R: .005*
- S vs R: .005*
- U vs S: .005*
- U vs R: .006*
- S vs R: .001*

SD = Standard Deviation, NA = Pairwise Comparisons are Not Applicable, U = Urban, S = Suburban, R = Rural
*= Significant at the 0.05 level.

1. P-value comparing all three geographical regions.
2. Bonferroni-adjusted P-values from pairwise comparisons.

Discussion

Athletic trainers observed health issues that extend beyond the traditional scope of care that many have been trained to perform. Addressing these health issues creates new challenges for the field of athletic training. While the term social determinants of health may not be new, knowing how to screen for, prevent, and manage the factors that influence them is still quite new to many athletic trainers. Roughly 80% of health outcomes are determined by factors beyond medical care, therefore, as allied health care providers, an awareness of how various health
determinants contribute positively or negatively to the overall health of student-athletes can be used to inform how to best allocate time to addressing them [14]. The presence of athletic trainers in secondary schools may be a protective factor for the population they serve and could lead to a reduction in health disparities that are often related to social determinants of health, such as access to care, substance use, and mental health-related concerns. The results of this study suggest that athletic trainers are currently observing many of these issues related to mental health conditions, substance use, and housing and food insecurities, which are often related to social circumstances, individual health behaviors, and the physical environment.

**Mental Health & Substance Use Concerns**

In this study, athletic trainers reported on the perceived prevalence of mental health disorders that they are experiencing in the population of students they serve. Athletic trainers reported that they believe an average of 32% of student-athletes they interact with have experienced a mental health issue within the past year. Comparing this finding to national data, the results reported by the athletic trainers are significantly overestimated. According to a national study, about 13.3% of students aged 12-17 years reported at least one major depressive episode in the past year in a national survey [15]. Despite the overestimation of the perceived prevalence of mental health issues reported by athletic trainers in this study, athletic trainers in both this survey and the preliminary focus groups stated that student-athletes are discussing their mental health issues with them and often preferred not to speak with school professionals because they felt they could trust the athletic trainer more based on the established relationships. While it is not suggested that athletic trainers should be providing mental health care to patients, it is interesting to note that about 13% of non-specialty mental health care is delivered in the school systems [13]. Recognizing the issues related to mental health, some athletic trainers reported that they
have become members of the school’s mental health assistance programs, established open door policies, and have partnered with mental health professionals to create care pathways for athletes who need advanced mental health care. Managing mental health issues can present other challenges for the athletic trainer as well. In some instances, individuals with mental health disorders may also be more likely to face substance use disorders and vice versa based on research that has shown that adolescents with substance use disorders are also more likely to have co-occurring mental health disorders [16-19]. This can present an additional challenge for athletic trainers to respond to the complexities of these issues and make the appropriate referrals. Athletic trainers in this study reported that they perceive there is a high prevalence of student-athletes who have used tobacco and marijuana in the past year. Nationally about 9.7% of students aged 12-17 reported tobacco use in the past year with the majority (20.3%) living in rural communities. Tobacco usage in rural communities in both this study and in a national study highlighted the high prevalence of usage among this age group [20]. Athletic trainers in this study reported a higher prevalence of tobacco and substance use compared to national survey data. This discrepancy may be a result of inaccurate perceptions of usage or student-athletes being a higher use population. These student-athletes represent a population that may benefit from heightened surveillance and interprofessional health education to prevent substance use disorders in adolescents. To identify and refer individuals with mental health and substance use disorders many secondary schools are adopting an SBIRT model (Surveillance, Brief Intervention, Referral to Treatment) [21].

The SBIRT Method

The SBIRT model is an evidence-based practice that is used to identify, reduce, and prevent problematic use, abuse, and dependence on alcohol and illicit drugs [21]. Research on using brief
interventions with college-aged and adolescents have shown effectiveness in reducing substance use dependence, consumption, and harmful behaviors [22]. While most SBIRT interventions are done at the community level, some secondary schools have incorporated these interventions into school health programs because they are more accessible for adolescents. This increases the opportunity for school health professionals, including athletic trainers, to identify high risk adolescents early, conduct a brief intervention about the type of referral and resources they might need, and get the student appropriate care. However, for SBIRT to be effective, the program must engender student trust, have appropriately trained professionals in risk reduction and motivational interviewing, and be seen as a value to all stakeholders. Schools that use SBIRT interventions should include the athletic trainer when providing trainings on risk surveillance and conducting brief interventions with students. Athletic trainers often have trusted relationships with their student-athletes because of the unique nature of their role in providing care and support, making them more likely to know about the problems and challenges that students experience as a result of both social and individual circumstances.

Housing and Food Insecurity

Housing and food insecurities were issues that many athletic trainers identified as barriers to maintaining proper health. Housing instability is defined as having difficulty paying for rent, spending more than 50% of household income on housing, having frequent moves, living in overcrowded conditions, or doubling up with friends and relatives [23]. Additionally, nearly 39 million persons experience some sort of food insecurity which is defined as having limited or uncertain availability of nutritionally adequate and safe foods or ability to acquire foods in socially acceptable ways [23]. In 2016, the National Center for Homeless Education survey found that homelessness among public school students was on the rise and affected about 3% of
the public school population, or about 1.36 million students [24]. Often, housing and food insecurities are associated with poorer health outcomes, poor or limited access to a usual source of health care, low adherence to medication, and a rise in the use of emergency department utilization. Athletic trainers in this study shared that they interact with many student-athletes who are homeless, living with friends or relatives, are in foster care, or have parents facing deportation. Several stated that they have started athletic training food pantries where student-athletes can purchase healthy snack items at a reduced cost; have done food collections around school breaks to send student-athletes home with healthy meals while school is out of session; are using their own funds to feed student-athletes when they are noticeably hungry and do not have access to food; and are working with school administrators to identify local community services that provide free food to those in need. These athletic trainer-reported housing and food insecurities for student-athletes in this study can create many challenges to preventing injury illness, and worse health outcomes. While the accuracy of the estimates is hard to determine, developing early screening and surveillance to identify these student-athletes can help athletic trainers identify resources and services early on to prevent poor health outcomes for these individuals.

Limitations and Future Research

This study had several limitations that warrant future exploration. Athletic trainers were not asked to report the prevalence of alcohol use among high school athletes. National survey data has shown high utilization of alcohol among children aged 12-17 years, which may correlate with mental health disorders. Athletic trainer’s perception of many of these health behaviors may be based on a small percentage of the student-athlete population or based on the number of encounters they have with student-athletes who have expressed these issues. Future research to
determine the relationship between social engagement among high school student-athletes and the prevalence of substance use may provide additional knowledge about the circumstances and factors that influence health behaviors and the athletic trainer’s role in reducing illness and injury. Because athletic trainers reported that they are responding to mental health, substance use, and housing and food insecurities in their daily interactions with student-athletes, investigating the role of an athletic trainer in school-based health centers and behavioral health education programs is important. Future research and education in the use of population health in athletic training should also be conducted to help inform clinical decision making, prevention programs, and practice patterns for athletic trainers who may be more likely to treat student-athletes from underserved populations.

Conclusion

Population health theory and practice is grounded in the concept that health care professionals understand the causes, conditions, and factors that determine the health of homogenous groups of people. While the primary responsibility of the athletic trainer may be providing direct medical care to their student-athletes; teaching athletic trainers how to screen for and identify the impact that social factors are having on them health should also be considered. When athletic trainers begin to identify the barriers and challenges to better health within the population, they may be more likely to discover that other student-athletes are sharing and experiencing similar characteristics that are putting them at a significant health disadvantage. Developing new training and education opportunities for athletic trainers to identify population health level issues related to social determinants of health is critical in the current healthcare landscape. With a significant emphasis being placed on care coordination, screening and prevention, and social equality in health, athletic trainers in secondary schools are in a position to inform policy and
implement interventions and programs that can positively impact the behaviors and health outcomes of the population they serve at an early stage.
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### Table 1: Demographics of Athletic Trainer Participants

|                        | Total (N=911) |
|------------------------|---------------|
|                        | n (%)         |
| **Sex**                |               |
| Female                 | 564 (62.0)    |
| Male                   | 346 (38.0)    |
| Missing                | 1             |
| **Race**               |               |
| White                  | 779 (85.8)    |
| Black                  | 38 (4.2)      |
| Other (more than 1 race)| 91 (10.0)   |
| Missing                | 3             |
| **Age** (Median, IQR)  |               |
| Minimum-Maximum        | 32 (27-44)    |
| Missing                | 9             |
| **Years of Experience**|               |
| Minimum-Maximum        | 9 (4-20)      |
| Missing                | 3             |
| **Employment**         |               |
| Contracted             | 400 (44.0)    |
| School                 | 482 (53.0)    |
| Other                  | 27 (3.0)      |
| Missing                | 2             |
| **School Type**        |               |
| Charter                | 8 (0.9)       |
| Private                | 151 (16.6)    |
| Public                 | 750 (82.5)    |
| Missing                | 2             |
| **Developed Environment**|           |
| Urban                  | 337 (36.1)    |
| Suburban               | 398 (43.8)    |
| Rural                  | 274 (30.1)    |
| Missing                | 2             |

IQR = Interquartile Range
Table 2 AT-reported Perceived Prevalence of Healthcare Utilization by Student Athletes

| Percentage of athletes who have/do the following: | Total       | Urban       | Suburban    | Rural       | P-value<sup>1</sup> | Adjusted P-value from Pairwise Comparisons<sup>2</sup> |
|--------------------------------------------------|-------------|-------------|-------------|-------------|---------------------|-----------------------------------------------------|
| Health Insurance, Mean (SD)                      | 79.9 (18.5) | 77.7 (20.1) | 83.5 (16.1) | 76.7 (19.5) | < .001*             | U vs S: .001*                                       |
|                                                  | (n = 762)   | (n = 199)   | (n = 328)   | (n = 235)   |                     | U vs R: 1.000                                       |
|                                                  |             |             |             |             |                     | S vs R: < .001*                                     |
| Athletes who visit PCP <1 yr, Mean (SD)          | 73.2 (24.0) | 68.4 (26.6) | 78.6 (21.2) | 69.7 (23.9) | < .001*             | U vs S: < .001*                                     |
|                                                  | (n = 764)   | (n = 201)   | (n = 328)   | (n = 235)   |                     | U vs R: 1.000                                       |
|                                                  |             |             |             |             |                     | S vs R: < .001*                                     |
| Athletes Use ED for Non-Emergent Care < 1yr, n (%)| 462 (60.4)  | 131 (65.2)  | 173 (52.6)  | 158 (67.2)  | .003*               | U vs S: .027*                                       |
|                                                  | (n = 765)   | (n = 201)   | (n = 329)   | (n = 235)   |                     | U vs R:.693                                         |
|                                                  |             |             |             |             |                     | S vs R: .006*                                       |
|                                                  | Yes         | No          | Unsure      |             |                     |                                                     |
|                                                  | 75 (9.8)    | 21 (10.5)   | 35 (10.6)   | 19 (8.1)    |                     |                                                     |
|                                                  | 49 (24.4)   | 121 (36.8)  | 58 (24.7)   |             |                     |                                                     |

SD = Standard Deviation, U = Urban, S = Suburban, R = Rural

* = Significant at the 0.05 level.

1. P-value comparing all three geographical regions.
2. Bonferroni-adjusted P-values from pairwise comparisons.
Table 3 AT-reported Perceived Prevalence of Mental Health Issues and Substance Use by Student Athletes

| Percentage of athletes with the following: | Total | Urban | Suburban | Rural | P-value<sup>1</sup> | Adjusted P-value from Pairwise Comparisons<sup>2</sup> |
|-----------------------------------------|-------|-------|----------|-------|---------------------|---------------------------------------------------|
| Feelings of Sadness, Anxiety, Depression, or Suicide in Past Year, Mean (SD) | 32.0 (23.5) (n = 692) | 32.2 (24.2) (n = 184) | 31.9 (24.0) (n = 292) | 31.9 (22.3) (n = 216) | .987 | NA |
| Tobacco Products Use, Mean (SD) | 19.7 (18.4) (n = 683) | 17.2 (16.6) (n = 183) | 16.4 (17.1) (n = 283) | 26.2 (20.0) (n = 217) | < .001* | U vs S: 1.000 U vs R: <.001* S vs R: <.001* |
| E-Cigarette/Vaping Use, Mean (SD) | 31.7 (22.5) (n = 674) | 28.0 (22.1) (n = 176) | 31.2 (22.9) (n = 284) | 35.3 (21.7) (n = 214) | .006* | U vs S: .440 U vs R: .005* S vs R: .127 |
| Marijuana Use, Mean (SD) | 26.9 (19.9) (n = 680) | 30.1 (21.5) (n = 181) | 26.4 (20.0) (n = 288) | 24.7 (18.0) (n = 219) | .025* | U vs S: .163 U vs R: .023* S vs R: .986 |
| Illicit Rx Drug Use, Mean (SD) | 7.2 (10.7) (n = 441) | 7.6 (11.5) (n = 118) | 6.9 (12.0) (n = 191) | 7.2 (7.5) (n = 132) | .880 | NA |
| Prescription Drug Use, Mean (SD) | 11.0 (11.9) (n = 496) | 11.5 (12.1) (n = 127) | 10.1 (12.0) (n = 218) | 11.7 (11.4) (n = 151) | .374 | NA |

SD = Standard Deviation, NA = Pairwise Comparisons are Not Applicable, U = Urban, S = Suburban, R = Rural

* = Significant at the 0.05 level.

1. P-value comparing all three geographical regions.
2. Bonferroni-adjusted P-values from pairwise comparisons.

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### Table 4 Quotes from athletic trainers about student-athlete housing and food insecurity

| Theme                  | Quotes                                                                                                                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Housing Insecurity     | • 8% of our student population with this situation—we work with local agencies and our district programs to support them                                                                                   |
|                        | • Several of my athletes have experienced homelessness, eviction, or “being kicked out” of their home                                                                                                   |
|                        | • Athlete placed in a shelter with mom and younger brother to get away from abusive stepfather                                                                                                         |
|                        | • Many students are homeless, living in dwellings with multiple families, sharing small living quarters                                                                                                 |
|                        | • Placed in foster situation from parents with opioid issues; homeless living in a car; couch surfing for a semester after parents kicked out of house for behavior (lesbian/gay)                                   |
|                        | • A lot of parents of athletes are in jail, so they couch hop                                                                                                                                           |
| Food Insecurity        | • One patient did not have food at home, one was not receiving food due to neglect, many others have food insecurities                                                                                        |
|                        | • Parents spent most if not all income on nonessentials. Student was noticeably fatigued, I inquired. Student and his brother, a fellow student, hadn’t been eating at home for 3+ days                                           |
|                        | • There is a list of kids who qualify for the reduced or free lunches at school. When there is a holiday and school isn’t in session, I’ve taken a collection of foods (PB, jelly, fruit cups, granola bars) from the high school staff and I buy bread. |
|                        | • School provides food backpacks on Fridays for students who need extra food for the weekend                                                                                                             |
Table 5 *AT-reported Perceived Barriers to Health (Scale 1 low significance - 10 high significance)*

| Average Significance Rating:                      | Total       | Urban       | Suburban    | Rural       | P-value¹ | Adjusted P-value from Pairwise Comparisons² |
|---------------------------------------------------|-------------|-------------|-------------|-------------|----------|--------------------------------------------|
| Accessibility of Transportation, Mean (SD)         | 4.5 (2.9)   | 5.2 (3.2)   | 4.1 (2.7)   | 4.4 (2.8)   | < .001*  | U vs S: .001* U vs R: .048* S vs R: .849 |
| (n = 496)                                          | (n = 128)   | (n = 204)   | (n = 164)   |             |          |                                            |
| Distance to Health Care Services, Mean (SD)       | 3.1 (2.8)   | 3.1 (2.9)   | 2.6 (2.7)   | 3.9 (2.8)   | < .001*  | U vs S: .345 U vs R: .097 S vs R: .001* |
| (n = 448)                                          | (n = 109)   | (n = 189)   | (n = 150)   |             |          |                                            |
| Insurance, Mean (SD)                              | 5.6 (3.1)   | 6.1 (2.9)   | 5.4 (3.2)   | 5.6 (3.0)   | .103*    | NA                                         |
| (n = 511)                                          | (n = 133)   | (n = 211)   | (n = 167)   |             |          |                                            |
| Poverty, Mean (SD)                                | 5.1 (3.1)   | 6.1 (3.0)   | 4.5 (3.1)   | 5.2 (3.0)   | < .001*  | U vs S: < .001* U vs R: .034* S vs R: .100 |
| (n = 496)                                          | (n = 129)   | (n = 204)   | (n = 163)   |             |          |                                            |
| Community Safety, Mean (SD)                       | 3.2 (2.8)   | 4.1 (3.0)   | 2.9 (2.9)   | 2.7 (2.5)   | < .001*  | U vs S: < .001* U vs R: < .001* S vs R: 1.000 |
| (n = 441)                                          | (n = 121)   | (n = 184)   | (n = 135)   |             |          |                                            |
| Housing Insecurity, Mean (SD)                     | 3.6 (2.8)   | 4.4 (2.9)   | 3.3 (2.8)   | 3.4 (2.6)   | < .001*  | U vs S: .001* U vs R: .005* S vs R: 1.000 |
| (n = 465)                                          | (n = 123)   | (n = 192)   | (n = 150)   |             |          |                                            |
| Food Insecurity and Poor Nutrition, Mean (SD)     | 4.5 (2.8)   | 5.3 (3.0)   | 4.2 (2.8)   | 4.2 (2.6)   | .002*    | U vs S: .006* U vs R: .005* S vs R: 1.000 |
| (n = 495)                                          | (n = 128)   | (n = 207)   | (n = 160)   |             |          |                                            |

SD = Standard Deviation, NA = Pairwise Comparisons are Not Applicable, U = Urban, S = Suburban, R = Rural

*= Significant at the 0.05 level.
1.  P-value comparing all three geographical regions.
2.  Bonferroni-adjusted P-values from pairwise comparisons.
Figure 1. Self-Reported Breakdown of Social Determinants of Health

Choi, E. and Sonin, J., 2020. *Determinants Of Health Visualized*. [online] Goinvo.com. Available at: <https://www.goinvo.com/vision/determinants-of-health/> [Accessed 1 June 2019].