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Health-risk behaviors among high school athletes and preventive services provided during sports physicals

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Abstract

Introduction—Pre-participation exams (PPEs), or sports physicals, present opportunities for health care providers to identify and discuss common adolescent health-risk behaviors. We sought to examine the prevalence of health-risk behaviors among high school athletes, and the proportion of providers who address these behaviors during PPEs.

Method—We used data from two statewide surveys: a survey of adolescents ($n=46,492$) and a survey of nurse practitioners and physicians ($n=561$) for this descriptive study.

Results—The most prevalent risk behaviors reported by student athletes were: low levels of physical activity (70%), bullying perpetration (41%), and alcohol use (41%). Most providers (75%) addressed many common risk behaviors during PPEs but fewer addressed bullying, violence, and prescription drug use. Topics discussed differed by provider type and patient population.

Discussion—Many providers addressed critical threats to adolescent health during PPEs but findings suggest potential disconnects between topics addressed during PPEs and behaviors of athletes.

Keywords

adolescent; sports; risk behavior; preventive services; health education

Introduction

Nearly 60% of high school students in the United States played school sports in 2011 (Eaton et al., 2012). Athletes in all 50 states are required to undergo a pre-participation exam (PPE), also known as a sports physical, before they can participate in high school sports (Kurz, Herrera, & Gotlin, 2008; Sanders, Blackburn, & Boucher, 2013). The PPE is typically delivered in one of two ways: individually in a private, office-based setting with the

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adolescent's primary care provider; or in a group-based setting, such as a high school gymnasium, with a team of providers who are not part of the adolescent's primary care team (Sanders et al., 2013). The primary purpose of the PPE is to ensure the health and safety of athletes by ruling out medical contraindications to participation, such as risk factors for sudden cardiac death (Kurz et al., 2008; Sanders et al., 2013).

Many criticize the PPE for being an ineffective and inefficient screening process due to the very low incidence of sudden cardiac death and lack of standardized screening protocols (Best, 2004; Carek & Mainous, 2004; Reich, 2000; Sanders et al., 2013; Wingfield, Matheson, & Meeuwisse, 2004). The risk of sudden cardiac death among children and adolescents is 1 in 200,000 (Beckerman, Wang, & Hlatky, 2004; Carek & Mainous, 1997), and risk factors for sudden cardiac death are prevalent in only 500 out of 200,000 (< 1%) of high school athletes (Carek & Mainous, 1999; Corrado et al., 2011).

Screening and intervening to prevent a single, devastating, and untimely death is certainly worthwhile for the few who are at risk. Yet, other objectives can be incorporated into the PPE to better serve the needs of all adolescents and improve the cost-benefit ratio of the PPE (Carek & Futrell, 1999; Kurz et al., 2008). Specifically, PPEs present a golden opportunity to screen and counsel patients about health-risk behaviors that are common during adolescence (Best, 2004; Carek & Futrell, 1999; Harris & Anderson, 2010), particularly because the PPE may be the only contact an adolescent has with a health care provider during the year (Sanders et al., 2013). Several national organizations, including the American Academy of Pediatrics (AAP) and National Association of Pediatric Nurse Practitioners (NAPNAP) point to the important role that health care providers can play through offering guidance to adolescent patients about risk behaviors (Hagan, Shaw, & Duncan, 2008; American Medical Association, 1997; National Association of Pediatric Nurse Practitioners, 2009; Harris & Anderson, 2010; Bernhardt & Rober, 2010). Indeed, research suggests that such preventive counseling has the potential to positively impact adolescent behavior, such as increases in the use of seat belts and helmets and decreases in tobacco use (Ozer et al., 2011). Given the millions of adolescents who play sports, the PPE is an important part of many pediatric practices and can serve as an additional—if not the only—opportunity providers may have to address health-risk behaviors with adolescent athletes. This is especially true of younger adolescents and males, who participate in high school sports most frequently.

Behaviors such as substance use, violence, and high-risk sex pose a substantially greater risk to health and well-being during adolescence than sudden cardiac death. Nationwide in 2011, 33% of U.S. high school students had been in a physical fight and 20% had been bullied; 34% were sexually active, 40% did not use a condom at last intercourse, and 15% reported having four or more sexual partners in their lifetime (Eaton et al, 2012). In the month preceding the 2011 Youth Risk Behavior Survey, nearly 40% of students reporting drinking alcohol and 23% used marijuana (Eaton et al, 2012).

Evidence suggests sports team participation protects against some health-risk behaviors during adolescence, but not others (Taliaferro, Rienzo, & Donovan, 2010). For example, high school athletes are 25% to 36% less likely than non-athletes to smoke cigarettes

(Castrucci et al., 2004; Melnick et al., 2001), but more likely than non-athletes to report alcohol use and binge drinking (Denham, 2011; Terry-McElrath et al., 2011; Taliaferro et al., 2010). Sex differences exist for sexual risk-taking behaviors; female athletes are consistently less likely than female non-athletes to be sexually active, have unprotected sex, and have multiple partners (Taliaferro et al., 2010; Lehman & Koener, 2004; Miller, Sabo, Farrell, Barnes, & Melnick, 1998). Conversely, male athletes are more likely than male non-athletes to be sexually active (Pate, Trost, Levin, & Dowda, 2000; Taliaferro et al., 2010).

Despite the enormous potential to address adolescent health-risk behaviors during the PPE, little is known about how often health care providers address health-risk behaviors during PPEs and whether they are addressing the most prevalent issues facing the athletes for whom they provide care. The purpose of this descriptive study was to assess the prevalence of health-risk behaviors among school athletes in Minnesota and the proportion of Minnesota health care providers who discuss these behaviors during PPEs. We examine overall prevalence estimates, and then assess differences in high school athletes' behaviors by age and sex and providers' discussion by type of provider and the proportion of their patient populations that are adolescents between ages 11-17.

Methods

Sample/Procedures

We used data from two statewide surveys: the 2010 Minnesota Student Survey (MSS), and an online survey of Minnesota health care providers conducted in April 2013.

Minnesota Student Survey—The MSS is administered during the spring semester every three years to students in grades 6, 9 and 12 by the Minnesota Departments of Health, Education, and Human Services. We did not use data from 6th grade students for the present study. The 2010 MSS consisted of 127 questions assessing a range of health-related behaviors, attitudes, and experiences (Minnesota Center for Health Statistics, n.d.). Whereas most epidemiological adolescent health surveys use stratified random sampling (e.g., Youth Risk Behavior Survey), the MSS uses a census approach to recruit participants. All public school districts in Minnesota ($n=335$) were invited to participate. The participation rate for school districts was 88%; 75% of 9th graders and 59% of 12th graders participated. We restricted analyses of MSS data to students who participated on a school sports team in the past year ($n=46,492$); half (49%) were female, 60% were in 9th grade, 40% were in 12th grade, 20% were youth of color, and 20% received free or reduced price reduced lunch (Table 1). Participation was voluntary and anonymous, with opt-out consent procedures used by most schools.

Minnesota healthcare provider survey—We collected data during spring 2013 from health care providers in Minnesota ($n=561$) who provide care to adolescents ages 11-17 years. Potential participants ($n=3,923$) were identified through lists of providers published by the Minnesota Boards of Nursing and Medical Practice. A total of 615 providers consented to take the online survey and met the eligibility criteria for participation (i.e., provided preventive care to adolescent patients ages 11-17 years), resulting in an adjusted response rate (AAPOR response rate 4; American Association for Public Opinion Research,

2009) of 28% and a cooperation rate of 85%. Of the 615 total respondents, the analytic sample for the present analysis includes 561 providers who answered questions sports physicals. Providers were largely female (71%) and comprised of family physicians (47%), nurse practitioners (32%), and pediatricians (20%). Most providers worked in either private practice (32%) or a practice network (31%) and served patient populations with more than 10% adolescent patients (62%; Table 1). In chi-square analyses, all assessed provider demographic characteristics differed by provider type ($p<.05$). Nurse practitioners were younger, more likely to be female, and more likely to work in an “other” type of clinical practice than pediatricians and family physicians; family physicians and nurse practitioners saw fewer adolescent patients than pediatricians.

Measures

Minnesota Student Survey—We examined 16 questions from the MSS in the areas of bullying, violence, healthy eating, mental health, physical activity, sexual behaviors, and substance use. With the exception of *emotional distress*, which was a continuous variable, all variables were dichotomized as *any* versus *none* for analyses. We dichotomized all categorical variables as *any* versus *none*, or *yes* versus *no*, to denote any engagement in the risk behavior. See Table 2 for a detailed explanation of the survey items we used and for specific cut points for each variable. Such an approach is common among large epidemiological data sets (Eaton et al, 2012) and is further appropriate here because even minimal levels of engagement in many of the assessed behaviors may be considered “risky” and should therefore, be addressed.

Minnesota healthcare provider survey—The survey assessed healthcare providers’ attitudes with an agree-disagree statement: “Adolescent visits for sports physicals could be a good opportunity to provide health education and anticipatory guidance.” (1=“strongly disagree” to 4=“strongly agree”). The survey then assessed whether they provided education on common adolescent health-risk behaviors with the question: “Which of the following types of information and guidance do you provide to patients and/or their parents during adolescent visits for sports physicals? Please check all that apply.” Providers could select up to 15 categories. As shown in Table 2, we assessed 10 categories, which had corresponding questions on the MSS that allowed for comparison between athletes’ behaviors and providers’ actions. All variables were dichotomized as *yes* (provider addresses health-risk behavior) versus *no* for analyses.

Data Analysis

We used descriptive statistics to calculate the overall prevalence of health-risk behaviors among sports participants and the proportion of health care providers who discussed these health-risk behaviors during PPEs. We then used chi-square analyses to examine differences in (1) adolescents’ engagement in each behavior by sex (male or female) and grade (grade 9 or 12), and (2) providers’ discussion health behavior topics by provider type (pediatrician, family physician, or nurse practitioner) and patient population (populations of 10% adolescent patients or >10%). To adjust for multiple comparisons which increase the possibility of type-I error, we applied a Bonferroni correction (Bland, 1995) to arrive at a cutoff for statistical significance of $p<0.002$ (critical alpha of 0.05 divided by 32 pairwise

comparisons) for the MSS data set and $p < 0.003$ (alpha of 0.05 divided by 20 comparisons) for the provider data. Analyses were conducted using SAS version 9.2 (SAS Institute, Cary NC) and Stata version 10.1 (Statacorp, College Station, TX).

Results

Minnesota Student Survey

Among athletes, the most commonly reported health-risk behaviors included not getting at least 30 minutes per day of physical activity (70%), bullying perpetration (41%), alcohol use (41%), not using a condom at last intercourse (32%), and bullying victimization (32%; Table 3).

Male versus female athletes—Male and female athletes reported different levels of involvement in each type of behavior (all $p < .0001$; Table 4). Whereas males were more likely than females to report bullying perpetration (45% vs. 37%), females were more likely than males to report bullying victimization (34% vs. 30%). Male athletes were more likely than female athletes to report fighting, lifetime history of sexual intercourse, and all substance use behaviors except alcohol. Males were also more likely than females to report eating five or more servings of fruits or vegetables in the day preceding the survey (22% vs. 18%) and engaging in at least 30 minutes of physical activity on all 7 days during the past week. In contrast, female athletes were more likely than males to report non-suicidal self-injury (20% vs. 8%), suicidal ideation (23% vs. 16%), and higher mean scores for emotional distress ($p < .0001$).

9th versus 12th grade athletes—Students also had different levels of involvement in risk behaviors by grade level (all $p < .0001$ unless otherwise noted). Athletes in 9th grader reported more bullying involvement while 12th graders reported more sexual risk behaviors and substance use. Specifically, athletes in 9th grade were more likely than those in 12th grade to report bullying perpetration (46% vs. 34%) and victimization (37% vs. 25%), fighting (19% vs. 13%), and non-suicidal self-injury (14% vs. 13%; $p < .001$). Ninth grade athletes were also more likely than 12th grade athletes to report getting at least 30 minutes of physical activity on all 7 days preceding the survey (33% vs. 26%). Conversely, 12th grade athletes were more likely than 9th grade athletes to report ever having sexual intercourse (49% vs. 18%), not using a condom at last intercourse (34% vs. 28%), and using alcohol (57% vs. 30%), marijuana (28% vs. 12%), cigarettes (16% vs. 7%), and tobacco (13% vs. 5%).

Minnesota healthcare provider survey

The majority of health care providers (89%) strongly agreed that PPEs were a good opportunity to provide health education and anticipatory guidance to adolescents. Five of the seven categories of behavior examined were addressed by most providers (75%) during PPEs, including healthy eating, mental health, physical activity, sexual behaviors, and all substance use behaviors except for prescription drug use. Fewer providers reported discussing bullying (41%), violence (17%), and prescription drug use (52%). See Table 3.

Type of provider—As shown in Table 5, only providers' discussion of bullying during PPEs varied by provider type. Specifically, significantly more pediatricians and nurse practitioners than family physicians reported providing information about bullying (51% vs. 45% vs. 33%, $p<.001$) during PPEs.

Patient population—Providers also had different levels of discussion about health risk-behaviors by the composition of their patient populations (Table 5). Compared to providers whose patient populations were comprised of 10% or less adolescents, significantly more providers who saw over 10% adolescents discussed: bullying (46% vs. 31%), mental health (84% vs. 71%), physical activity (97% vs. 90%), sexual behavior (86% vs. 66%), prescription drug use (58% vs. 43%), and illicit drug use (86% vs. 70%) (all $p<.001$).

Discussion

It is widely known that health-risk behaviors account for most disease and illness during adolescence (Institute of Medicine & National Research Council, 2011). The PPE was never intended to be a substitute for primary care (Sanders et al., 2013); yet for many adolescents, it may be the only time during the year when they come into contact with a health care provider. The PPE therefore provides a golden opportunity for addressing health-risk behaviors with adolescents. Findings from the current study suggest that, overall, many providers take advantage of this opportunity by providing information and guidance to their patients during PPEs about several of the critical threats to adolescent health. However, consistent with other research on adolescent preventive services (Rand, Auinger, Klein, & Weitzman, 2004; Ma, Wang, & Stafford, 2005), our findings suggest that many health topics are not being discussed with *all* athletes during PPEs and point to potential disconnects between topics addressed during sports physicals and the behaviors of adolescent sports participants.

Our findings from high school athletes in Minnesota support previous research highlighting the prevalence of health-risk behaviors among high school athletes (Denham, 2011; Pate, et al., 2010; Terry-McElrath et al., 2011). All categories of health-risk behaviors were prevalent to some degree among high school athletes. Indeed, current findings support the argument that all health-risk behaviors are more prevalent among high school athletes than risk factors for sudden cardiac death. Even the least common behaviors among athletes, including illicit substance use (4%) and prescription drug use (5%), were far more prevalent than risk factors for sudden cardiac disease, which occur in less than 1% of athletes (Carek & Mainous, 1997).

We acknowledge that the consequences of sudden cardiac death are severe, irreversible, and tragic, making it worthwhile to screen athletes in hopes of saving lives. However we also acknowledge the serious and long-term consequences for youth involved in health-risk behaviors, making it worthwhile to also address such behaviors during PPEs. Although the majority of providers in the current study provided information and guidance about most health-risk behaviors, ideally 100% of providers should address health-risk behaviors during PPEs—just as 100% of providers screen for risk factors for sudden cardiac death. For example, in the current study, one-third of sexually active athletes reported not using a

condom at last intercourse, and three-quarters of providers addressed sexual behaviors during PPEs. Assuming the number of athletes who did not use a condom at last intercourse was distributed evenly across providers, this hypothetically suggests that 1 in 5 student athletes in the current study did not receive this needed counseling and guidance.

Given that brief preventive counseling can decrease adolescent risk behaviors (Ozer et al., 2011), addressing these behaviors during PPEs has great potential to impact a greater number of adolescents at-risk for other serious co-morbidities during adolescence in addition to sudden cardiac death. Primary care providers therefore play a crucial role in identifying and intervening with young people at-risk for poor outcomes related to health-risk behaviors. Future study is needed to determine the quality and effectiveness of education provided during the PPE, and how such guidance can be paired with other clinic-based interventions (e.g., referral and follow-up) that can positively impact health behaviors among adolescent athletes.

Compared to other topic areas, providers were least likely to provide information and guidance about violence, bullying, and prescription drug use. The gap in addressing bullying during PPEs is of particular interest, given that bullying perpetration and victimization were among the highest reported health-risk behaviors among high school athletes. Generally, bullying is associated with many poor outcomes: those who are bullied are more likely to experience depression, anxiety, and other health complaints (Van der Wall, De Witt, & Hirasig, 2003; Espelage & Swearer, 2003; Eisenberg & Aalsma, 2005); those who bully others also experience poor mental health outcomes and are more likely to engage in externalizing behaviors such as fighting and substance use (Eisenberg & Aalsma, 2005). Although beyond the scope of our study, evidence suggests athletes may face particular types of bullying unique to the sports environment, such as hazing, that should be considered by providers during the PPE and by researchers conducting future studies. In one study, nearly 1 in 5 youth athletes reported being subjected to hazing (Gershel, Katz-Sidlow, Small, & Zandieh, 2003). Further study is needed to understand the context of bullying among high school athletes, how it relates to other health-risk behaviors among athletes, and how more providers can effectively address bullying during the PPE.

Interestingly, only about 1 in 3 athletes reported getting at least 30 minutes of physical activity on all 7 days preceding the survey. National recommendations are for adolescents to get 60 minutes of physical activity each day (President's Council on Fitness, Sports & Nutrition, n.d.). While our data do not allow us to examine this higher threshold, it is likely that even fewer athletes meet these national physical activity recommendations. Although sports team participation is associated with higher levels of physical activity (Nelson, Stovitz, Thomas, LaVoi, Bauer, & Neumark-Sztainer, 2011), providers should be aware that high school athletes still may not be meeting national recommendations. In fact, one study suggests that middle school athletes are only active for less than half of practice time (Leek, et al., 2011). Considering that levels of physical activity drop throughout adolescence, it is likely that high school athletes are no more active during practice than middle school athletes.

Findings from the current study suggest providers should consider patients' sex and grade level when addressing health-risk behaviors among high school athletes. In particular, consistent with national data (Eaton et al, 2012), we found that females and 9th graders in Minnesota reported the highest levels of bullying victimization and non-suicidal self-injury, while males and 12th graders had higher levels of sexual behaviors and substance use. Awareness of such differences among subgroups of athletes might help providers prioritize which health-risk behaviors to address during the PPE if all cannot be addressed in the limited time they have to spend with each patient.

Our findings suggest several differences in the topics that healthcare providers discuss with adolescent patients during PPEs. While pediatricians were more likely to discuss bullying, there were no other differences based on provider type. This difference may be due, at least in part, to the different patient populations that providers see. Although adolescents may receive care in a variety of clinical settings, in our sample, adolescents made up a larger proportion of the patient population for pediatricians than for other types of providers. Our findings suggest that seeing more adolescent patients is associated with discussing several different health-risk topics with adolescent during PPEs. A 2009 Institute of Medicine report found that there continues to be a shortage of health care providers who receive training to promote healthy behaviors within an appropriate developmental framework (National Research Council and Institute of Medicine, 2009). Although we were unable to address the mechanism for this association with the current data, it may be that healthcare providers who see a greater proportion of adolescent patients may be more aware of issues facing this population, or more comfortable and self-efficacious discussing topics, or may have other structural supports in place to support having these conversations. Additional research in this area is warranted.

Important limitations must be considered when interpreting results from the current study. Although our cooperation rate (i.e., the proportion of eligible providers contacted who took the survey; American Association for Public Opinion Research, 2009) was quite high, like many surveys conducted with clinicians (McLeod, Klabunde, Willis, & Stark, 2013), the health care provider survey had a modest response rate. Although the response rate does not affect the survey's internal reliability, it may decrease generalizability of findings and, thus, should not be considered representative of all adolescent-serving providers in Minnesota or nationally. Self-reporting bias is a concern in both samples; whereas adolescents may have underreported their involvement in health-risk behaviors, health care providers may have overreported how often they provide education and guidance on health-risk behaviors during PPEs. Furthermore, we only asked providers whether they provided information and guidance about health-risk behaviors; we did not collect in-depth information on other factors that could affect these discussions such as: the type or quality of information; the context of the PPE (e.g., group-based PPE or as part of primary care); whether providers screened athletes for health-risk behaviors, or whether they provided additional services to athletes deemed to be at-risk for poor outcomes (e.g., referral and follow up to a reproductive health clinic, mental health clinic, substance abuse clinic). These are potential areas for future research. Study data come from a single geographic area which may decrease generalizability of findings to providers and students nationwide. Future studies should be done on a national level using standardized measures, such as the Omaha System,

a research-based electronic health record which contains standardized language for both health-risk behaviors and cardiovascular risk factors that should be addressed during PPEs, to facilitate comparisons across states (Martin, 2005). Additionally, primary care providers could use this type of system to document their assessments and interventions, which would also enable researchers to monitor trends over time and develop best practices for PPEs.

To our knowledge this is one of the first studies to examine PPEs as an opportunity to discuss health-risk behaviors with adolescents. Additional research is needed to assess the most effective and efficient way for providing such information and guidance, as well as any structural issues that may present barriers to addressing health-risk behaviors during the PPE (e.g., legal concerns about missing risk factors for sudden cardiac death, time constraints, reimbursement). National professional organizations representing adolescent healthcare providers (such as NAPNAP) would be well-positioned to provide leadership on these issues. Particularly for adolescents who have no source of primary care, the PPE could also present an opportunity for preventive services beyond asking about health-risk behaviors (e.g., complete health history, family history). For example, providers may also be able to ask all athletes whether they plan to seek any preventive care during the year (other than the PPE) and, if the answer is no, then they can address preventive items in more depth during the PPE (Carek & Futrell, 1999). With addressing health-risk behaviors the new standard for PPEs, providers can then conduct more complete health histories at their own discretion. The implementation of the Affordable Care Act should provide all adolescent athletes with access to a primary care provider; thus, it may also be an opportunity to revisit/evaluate whether *all* PPEs should occur in one-to-one clinic-based settings (as opposed to group-based settings) where providers have the privacy and rapport with patients to address health-risk behaviors.

In conclusion, health care providers are in a unique position to empower high school athletes to have a healthy adolescence by addressing health-risk behaviors during PPEs; yet our findings point to missed opportunities for them to do so. Perhaps we should take a cue from the world of sports. As the hall of fame hockey player Wayne Gretsky once said, “You miss 100% of the shots you don’t take.” So, too will health care providers miss opportunities for prevention among 100% of the adolescent athletes they do not ask about health-risk behaviors. Additional efforts are needed to improve the provision of education and guidance during health care visits, including PPEs, to ensure that all adolescents received needed preventive care.

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Table 1
Characteristics of high school athletes (*n*=46,492) and healthcare providers (*n*=561)

	<i>n</i> (%)
High school athletes	
Grade level	
9 th grade	28,125 (60.5)
12 th grade	18,367 (39.5)
Sex	
Male	23,833 (51.3)
Female	22,659 (48.7)
Race/Ethnicity	
White	37,086 (80.2)
Black	2,065 (4.5)
Hispanic	1,320 (2.9)
Other	5,766 (12.5)
Free or reduced lunch	
Yes	8,934 (19.5)
No	36,965 (80.5)
Healthcare providers ^a	
Age, mean (SD)	48.0 (10.5)
Sex	
Female	397 (70.9)
Male	163 (29.1)
Provider type	
Family medicine physician	265 (37.2)
Nurse practitioner	182 (32.4)
Pediatrician	114 (20.3)
Practice type	
Private independent practice	181 (32.3)
Practice network/HMO	176 (31.4)
Hospital or medical center	113 (20.1)
Other ^b	91 (16.2)
Patient population	
10% adolescent patients (11-17 yrs)	216 (38.5)
>10% adolescent patients (11-17y rs)	345 (61.5)

Note: Percentages may not sum to 100 due to rounding.

^aNurse practitioners were younger (mean age 45.3 years), more likely to be female (96.7%), and more likely to work in an “other” type of clinical practice (31.9%) than pediatricians and family physicians (31.9%); more pediatricians had patient populations of >10% adolescents (80.7%) than did nurse practitioners and family physicians.

^bIncludes: “public clinic,” “community health center,” “university health center,” and “other.”

Table 2
Questions from health care provider survey and Minnesota Student Survey (MSS)

Category on MN healthcare provider survey ^a	MSS Variable ^b	MSS Question
Bullying		
	Bullying perpetration ^c	During the last 30 days, how often have you, on your own or as part of a group, made fun of or teased another student in a hurtful way or excluded another student from friends or activities?
	Bullying victimization ^c	During the last 30 days, how often has another student or group of students made fun of or teased you in a hurtful way, or excluded you from friends or activities?
Fighting	Fighting ^c	During the last 12 months, how often have you hit or beat up another person?
Healthy eating		
	Fruit/vegetable intake ^d	How many servings of fruits, fruit juices, or vegetables did you eat yesterday?
Mental health/Depression/Suicide		
	Non-suicidal self-injury ^e	Have you ever... hurt yourself on purpose ("cutting," burns, bruises)?
	Suicidal ideation ^e	Have you ever. Thought about killing yourself?
	Emotional distress ^f	<ol style="list-style-type: none"> 1 How much do you agree or disagree with the following statements...I am often unhappy, depressed, or tearful 2 During the last 30 days, have you felt you were under any stress or pressure? 3 During the last 30 days, have you felt sad? 4 During the last 30 days, have you felt so discouraged or hopeless that you wondered if anything was worthwhile? 5 During the last 30 days, have you felt nervous, worried, or upset?
Physical activity		
	Physical activity ^g	On how many of the last 7 days were you physically active for a combined total of at least 30 minutes?
Sexual health		
	Ever had sex ^e	Have you ever had sexual intercourse ("had sex")?
	No condom use at last intercourse ^h	The last time you had sexual intercourse, did you or your partner use a condom?
Substance use: Alcohol		
	Alcohol use ⁱ	During the last 12 months, on how many occasions (if any) have you had alcoholic beverages (beer, wine, wine coolers, or liquor) to drink...
Substance use: Illicit substances		
	Marijuana ⁱ	During the last 12 months, on how many occasions (if any) have you used marijuana (bud, weed, pot) or hashish (hash, hash oil)...
	Illicit drugs ^k	<p>During the last 12 months, on how many occasions (if any) have you used</p> <p>... LSD ("acid", PCP (wet sticks or dipped joints), or other psychedelics (like mescaline, mushrooms, peyote)...</p> <p>... MDMA (E, X, "ecstasy"), GHB (H, Liquid E, Liquid X) or Ketamine ("Special K")...</p> <p>... "crack" (cocaine in chunk or rock form), or cocaine in any other form...</p>

Category on MN healthcare provider survey ^a	MSS Variable ^b	MSS Question
Substance use: Prescription drug use		...heroin... ... methamphetamine (meth, glass, crank, crystal meth, ice) by any method...
	Prescription drug use ^j	During the last 12 months, on how many occasions (if any) have you used ...stimulants like Benzedrine or diet pills that were not prescribed for you by a doctor, or that you took only to get high... ... your own or someone else's ADHD or ADD drugs like Ritalin (hyper pills) to get high... ...OxyContin, Percocet, Percodan, Vicodin or other pain relievers that were not prescribed for you by a doctor, or that you took only to get high... ... tranquilizers (Valium, Xanax, nerve pills) or sedatives or barbiturates that were not prescribed for you by a doctor, or that you took only to get high...
Substance use: Tobacco		
	Cigarettes ^c	During the last 30 days, on how many days did you smoke a cigarette?
	Tobacco ^c	During the last 30 days, on how many days did you use chewing tobacco, snuff, or dip?

^a Provider question: Which of the following types of information and guidance do you provide to patients and/or their parents during adolescent visits for sports physicals? Please check all that apply. (answer options on survey are listed under "HCP survey" column)

^b Unless otherwise noted, all MSS variables were dichotomized as "any" vs. "none" for analyses.

^c Engaged in/experienced this behavior in 1 of the past 30 days

^d Ate 5 or more servings of fruit/vegetables on the day preceding the survey

^e Ever in one's lifetime

^f Emotional distress included the following variables measures over the past 30 days: feeling (1) unhappy, depressed, tearful; (2) under stress or pressure; (3) sad; (4) discouraged or hopeless; (5) nervous, worried, upset. Cronbach alpha = 0.84.

^g Engaged in at least 30 minutes of physical activity on all 7 days preceding the survey

^h Did not use a condom at last intercourse

ⁱ Used this substance 1 times in the past year

^j Used 1 of the following prescription drugs to get high 1 times in the past year: stimulants (e.g., diet pills), ADHD drugs (e.g., Ritalin), pain relievers (e.g., OxyContin), tranquilizers (e.g., Xanax)

^k Used 1 of the following illicit drugs 1 times in the past year: glue/inhalants, psychedelics (e.g., LSD), ecstasy, GHB, Special K, crack/cocaine, heroin, methamphetamine

Table 3

Overall prevalence of risk behaviors among high school athletes and information discussed by healthcare providers during PPEs

	Adolescent athlete risk behaviors (<i>n</i> =46,492) %	Information discussed during PPEs (<i>n</i> =561) %
Bullying		
Perpetration ^a	41.3	40.5
Victimization ^a	32.2	
Violence		
Fighting ^a	16.9	17.3
Healthy eating		
Fruit/vegetable intake ^b	20.1	93.8
Mental health		
Non-suicidal self-injury ^c	13.8	
Suicidal ideation ^c	19.2	78.8
Emotional distress (mean, SD) ^d	10.6 (4.0)	
Physical activity		
Physical activity ^e	30.1	93.9
Sexual behavior		
Ever had sex ^c	30.5	78.1
No condom use ^f	32.1	
Substance use		
Alcohol use ^g	40.8	87.0
Prescription drugs ^h	4.7	52.4
Marijuana ^g	18.5	80.0
Illicit drugs ⁱ	3.6	
Cigarettes ^a	10.8	90.0
Tobacco (chew) ^a	8.2	

Note. Table presents proportion of adolescents who report each behavior and the proportion of healthcare providers who report discussing or providing information about each topic during adolescent visits for pre-participation exams (PPEs).

^aEngaged in/experienced this behavior in 1 of the past 30 days

^bAte 5 or more servings of fruit/vegetables on the day preceding the survey

^cEver in one's lifetime

^dEmotional distress included the following variables measures over the past 30 days: feeling (1) unhappy, depressed, tearful; (2) under stress or pressure; (3) sad; (4) discouraged or hopeless; (5) nervous, worried, upset

^eEngaged in at least 30 minutes of physical activity on all 7 days preceding the survey

^fDid not use a condom at last intercourse

^gUsed this substance 1 times in the past year

^hUsed 1 of the following prescription drugs to get high 1 times in the past year: stimulants (e.g., diet pills), ADHD drugs (e.g., Ritalin), pain relievers (e.g., OxyContin), tranquilizers (e.g., Xanax)

ⁱUsed 1 of the following illicit drugs 1 times in the past year: glue/inhalants, psychedelics (e.g., LSD), ecstasy, GHB, Special K, crack/cocaine, heroin, methamphetamine

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Table 4
Prevalence of risk behaviors among high school athletes, by sex and grade level (*n*=46,492)

	Sex		χ^2 or <i>t</i>	Grade level		χ^2 or <i>t</i>
	Male %	Female %		9 th grade %	12 th grade %	
Bullying						
Perpetration ^a	45.4	37.1	328.5*	46.4	33.6	750.5*
Victimization ^a	30.4	34.0	66.2*	37.0	24.8	750.5*
Violence						
Fighting ^a	24.0	9.5	1679.9*	19.4	13.0	316.4*
Healthy eating						
Fruit/vegetable intake ^b	22.0	18.0	114.1*	20.1	20.0	0.2
Mental health						
Non-suicidal self-injury ^c	8.4	19.4	1143.3*	14.4	12.9	21.4*
Suicidal ideation ^c	15.6	22.8	373.6*	19.7	18.5	9.1
Emotional distress (mean, SD) ^d	9.8 (3.8)	11.4 (4.1)	41.2*	10.5 (4.2)	10.7 (3.8)	5.1*
Physical activity						
Physical activity ^e	38.8	20.9	1782.2*	32.8	25.9	255.9*
Sexual behavior						
Ever had sex ^c	33.8	27.2	215.9*	17.8	49.3	4741.4*
No condom use ^f	30.0	34.7	31.0*	28.1	34.2	47.8*
Substance use						
Alcohol use ^f	40.8	40.9	0.0	30.1	56.8	3049.0*
Prescription drugs ^h	5.2	4.2	23.7*	3.8	6.1	128.1*
Marijuana ^f	21.6	15.4	284.7*	12.2	28.1	1739.0*
Illicit drugs ⁱ	4.3	2.8	71.3*	2.7	4.8	121.4*
Cigarettes ^a	12.0	9.7	59.6*	7.3	16.1	854.8*

	Sex		Grade level		χ^2 or <i>t</i>
	Male %	Female %	9 th grade %	12 th grade %	
Tobacco (chew) ^d	14.3	1.9	2274.5*	4.9	13.3
					1016.9*

Note. Table presents results of chi-square analyses for categorical variables and t-test for the continuous variable (emotional distress). Asterisks indicate statistically significant between group differences in engagement in health-risk behaviors using a Bonferroni-adjusted significance level of

* $p < .002$ (.05/32 pairwise comparisons).

^a Engaged in/experienced this behavior in 1 of the past 30 days

^b Ate 5 or more servings of fruit/vegetables on the day preceding the survey

^c Ever in one's lifetime

^d Emotional distress included the following variables measures over the past 30 days: feeling (1) unhappy, depressed, tearful; (2) under stress or pressure; (3) sad; (4) discouraged or hopeless; (5) nervous, worried, upset

^e Engaged in at least 30 minutes of physical activity on all 7 days preceding the survey

^f Did not use a condom at last intercourse

^g Used this substance 1 times in the past year

^h Used 1 of the following prescription drugs to get high 1 times in the past year: stimulants (e.g., diet pills), ADHD drugs (e.g., Ritalin), pain relievers (e.g., OxyContin), tranquilizers (e.g., Xanax)

ⁱ Used 1 of the following illicit drugs 1 times in the past year: glue/inhalants, psychedelics (e.g., LSD), ecstasy, GHB, Special K, crack/cocaine, heroin, methamphetamine

Table 5
Information discussed by healthcare providers during PPEs by provider type and patient population (*n*=561)

	Provider type			Patient population: Percent of patients who are adolescents		
	Pediatrician %	Family Physician %	Nurse practitioner %	10% %	>10% %	χ^2
Bullying	50.9	32.8	45.0	31.0	46.4	13.01*
Violence (fighting)	21.9	14.3	18.7	14.8	18.8	1.51
Healthy eating	97.4	92.8	92.7	90.7	95.7	5.48
Mental health	88.6	75.1	78.0	71.3	83.5	11.80*
Physical activity	98.3	92.5	93.4	89.8	96.5	10.50*
Sexual behavior	87.7	73.2	79.1	65.7	85.8	31.21*
Substance use						
Alcohol use ^g	93.0	84.5	86.8	82.4	89.9	6.51
Prescription drugs ^h	56.1	50.2	53.3	43.5	58.0	11.12*
Illicit drugs	86.0	77.4	80.2	70.4	86.1	20.53*
Tobacco	92.1	89.4	89.6	85.7	92.8	7.46

Note. Table presents results of chi-square analyses. Asterisks indicate statistically significant between group differences in the proportion of providers who discuss each topic during adolescent visits for PPEs using a Bonferroni-adjusted significance level of

* $p < .003$ (.05/20 pairwise comparisons).