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Competitive Sport Involvement and Substance Use among Adolescents: A Nationwide Study

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Abstract

Background—The empirical research examining the impact of sports participation on alcohol and other drug use has produced mixed results. Part of this problem may be the result of how different types of sports participation create different experiences that shape certain types of behaviors that either facilitate or deter substance use.

Objectives—We examined the association between different types of competitive sports participation and substance use among a nationally representative sample of adolescents.

Methods—Two recent cross-sections from the Monitoring the Future were merged to capture a large subsection of adolescents who participate in either high-contact sports (football, wrestling, hockey and lacrosse), semi-contact sports (baseball, basketball, field hockey and soccer), and non-contact sports (cross-country, gymnastics, swimming, tennis, track, and volleyball).

Results—Multivariate analyses revealed that adolescents who participated in high-contact sports had higher odds of using substances during the past 30 days and initiating substance use at early ages. Further, adolescents who participated in non-contact sports had lower odds to indicate smoking cigarettes and marijuana during the past 30 days.

Conclusions—Parents, educators, and policy makers need to consider that some sporting contexts may be a catalyst to engage in risky behaviors like substance use.

The major objective for this investigation is to examine the relationship between sports participation and substance use among adolescents and young adults. The impetus for this question stems from the unsettled debate regarding the role of sport in the development of adolescents and young adults. One side of this debate views sport as connecting participants to pro-social adults and peers. Accordingly, this perspective views sport as fostering a positive social environment that structures daily activities and socializes participants to be physically and mentally competent members of society (Crosnoe, 2002; Larson, 1994; McNeal, 1995). The other side of the debate views sport through a critical lens and questions the salutary outcomes that have been attributed to sports participation. This critical side of the debate views sport as an institution that socializes participants to a set of normative behaviors that either facilitates counter-conformity (e.g. deviance – binge drinking is

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acceptable for football players) or over-conformity (e.g. positive deviance – using performance enhancing drugs to be the best) that can lead to negative social and health related outcomes (Connell, 1978; Connell, 1995; Hughes & Coakley, 1991; Messner & Sabo, 1990; Messner, 1990). Although this research project cannot resolve this ongoing debate, it will be able to illuminate the complex relationship between sport participation and substance use by categorizing sport by a fundamental structure embedded within different sporting contexts – Namely, the level of contact that participants are expected to endure within different types of sports.

The empirical research examining the impact of sports participation on alcohol and other drug use has produced mixed results (Feldman & Matjasko, 2005). While most studies find sports participation is negatively associated with cigarette use and illicit drug use, there is consistent support that athletes are more likely to drink alcohol and engage in problem drinking (Lisha & Sussman, 2010). These findings give insight to understanding the relationship between sports participation and substance use, but most quantitative studies assessing the relationship between sports participation and substance use overlook the vast array of different sporting contexts that can produce divergent experiences and outcomes. Only recently have quantitative studies began to analyze social and health related outcomes among participants and the type of sport they play (Denham, 2011; Ford, 2007; Kreager, 2007; Sokol-Katz et al., 2006) For instance, Denham (2011) found that adolescents who participated in baseball, football, and weightlifting had higher levels of alcohol consumption when compared to their peers. Denham suggests that the higher propensity to consume alcohol among these participants is that their respective sport involves more anaerobic effort (short bursts of strength), which may cultivate a belief that their athletic performance will not be stifled by alcohol consumption.

Despite these recent advancements in examining how sports participation is associated with substance use, very few quantitative studies that examine the impact of competitive sports participation on adolescents' health have focused on different types of sport based on the level of physical contact (Kreager, 2007). Categorizing sport by the amount of physical contact endured by participants may help untangle some of the inconsistences found within the literature regarding sports participation and substance use among adolescents. In particular, sports that involve continual violent contact (e.g. football) socialize youth to view pain, violence, and risk as normative features within the sporting context that may influence risky behavior off the playing field (Bloom & Smith, 1996; Frinter & Rubinson, 1993; Huang et al., 1999; Jackson et al., 2002; Nixon, 1997; Segrave & Hastad, 1984). Contact sport participants come to view their body as an instrument that can be easily gambled with, even if it means permanent damage (i.e. the body is a means to an end). Conversely, sports that involve minimal (e.g. cross country) to no contact (e.g. tennis) are valorized for their sustainability for participants across the lifecourse. These types of sports emphasize an ascetic lifestyle that cultivates a normative orientation that values moderation and self-control in order to sustain long term health (i.e. the body is an end in itself) (Bourdieu, 1978).

In this study, it is expected that adolescents who participate in contact sports are at the highest risk of engaging in different forms of substance use due to the normative practices

that expose youth to favorably embrace risk as a fundamental component within these sporting environments. Further, it is also assumed that youth who are involved with non-contact sports will be the least likely to engage in substance use due to the emphasis placed on fostering a strategic orientation to maintain a level of fitness for both competition and future longevity. In order to test these hypotheses, two nationally representative cross-sections (2010 and 2011) of secondary school students from the Monitoring the Future study (MTF) are merged in order to adequately test the hypothesized relationships among adolescents who participate in competitive sports that involve different levels of physical contact.

METHODS

The data analyzed here were collected as a part of the Monitoring the Future study of American secondary school students, which is an annual cross-sectional survey conducted by the University of Michigan's Institute for Social Research (Johnston et al., 2012). The MTF study surveys eighth-, 10^{th}-, and 12^{th}-grade students on a range of different topics like substance use, academic performance, and competitive sports participation. For the purposes of this study, MTF data collected from eighth- and 10^{th}-grade students during 2010 and 2011 are merged in order to capture a large sample of adolescents to adequately gauge how competitive sports participation is associated with substance use among American youth.[1] Merging the data for all the years results in a total unweighted sample size of 21,049 male (49.1%) and female (50.9%) adolescents (2010: 8^{th} n = 5,249, 10^{th} n = 5,199; 2011: 8^{th} n = 5,471, 10^{th} n = 5,130).

Measures

Dependent Variables—Four dependent variables were used to measure 30-day prevalence of use among several substances and include the following: (1) Number of times the respondent has been drunk during the past 30 days (response categories included (0) 0 occasions, (1) 1-2 occasions, (2) 3-5 occasions, (3) 6-9 occasions, (4) 10-19 occasions, (5) 20—39 occasions, (6) 40 or more occasions), (2) the frequency of cigarette smoking during the past 30 days (response categories included (0) does not smoke, (1) less than one cigarette per day, (2) 1-5 cigarettes per day, (3) one-half pack per day, (4) one pack per day, (5) one and one-half packs per day, (6) two packs or more per day), (3) the number of times respondents indicated smoking marijuana during the past 30 days (response options are the same as number of times drunk during the past 30 days: 0 occasions to 40 or more occasions), and (4) the number of times respondents indicated using 'other types' of illicit drugs during the past 30 days. The variable for 'other types' of illicit drug use combined past 30 day use for cocaine, crack, inhalants and steroids. These measures were combined given the relatively small percentage of respondents in the MTF survey (4.4% of 8^{th} and 10^{th} graders indicated using any illicit drug other than marijuana in 2011) who indicated using these drugs during the past 30 days (Johnston et al., 2012). Accordingly, all of the dependent

[1]The MTF provides different surveys for 8th and 10th graders (four separate forms) when compared to 12th graders (six separate forms). Form 1 (for 8th and 10th graders) was chosen for this study given that it had questions that related to competitive sports participation and questions regarding age of initiation of substance use. Form 5 (for 12th graders) has questions related to competitive sports participation, but does not provide any questions related to age of initiation of substance use (a critical variable needed for this study).

measures for substance use were recoded as binary variables with the following categories: (0) Did not use in the past 30 days, (1) Did use in the past 30 days.

Another four dependent variables were also used to measure when respondents first started using each of the aforementioned substances. These variables included what grade respondents were in when they first got drunk, first smoked cigarettes, first smoked marijuana, and first tried 'other types' of illicit drugs.[2] Accordingly, these variables were each recoded as binary variables to measure *early onset of substance use* in the following manner (four variables in total): (0) Did not initiate use in elementary school or middle school (grades 4-8), (1) Did initiate use in elementary school or middle school (grades 4-8).

Independent Variables—Several variables are used to measure participation in different types of competitive sports based on level of contact. The MTF survey asks adolescents which competitive sports they have participated in during the past twelve months, either in their school or community. Respondents can indicate if they have participated in baseball, basketball, cross-country, field hockey, football, gymnastics, ice hockey, lacrosse, swimming, soccer, tennis, track, volleyball, wrestling, or 'other' types of sport. Moreover, an additional question allowed non-participants to indicate that they did not participate in any competitive sport during the past year. These questions were grouped into three unique categories that capture the amount of contact that participants experience within certain types of sports. The first category, high-contact sports, includes sports that involve continual violent contact that officially sanction hitting, knocking, or wrestling (or tackling) opponents to the ground. Respondents that indicated participating in football, ice hockey, lacrosse or wrestling during the past year were included within this category. The second category, semi-contact sports, includes sports that involve sporadic violent contact that may be officially sanctioned within the rules of the sport. For instance, there is violent contact in basketball, but when players are knocked or forced to the ground, a penalty usually follows the violent exchange. If adolescents indicated participating in baseball, basketball, field hockey, or soccer, they were included within this category. The final category, non-contact sports, includes sports where no contact can occur between participants due to either official rules or the structure of the playing field. An example of this is tennis, where the court (the playing field) is structured in such a way were physical contact between participants is impossible. Respondents that indicated participating in cross-country, gymnastics, swimming, tennis, track, or volleyball were included within this category. In addition to these three variables, a global measure of competitive sport participation was constructed that combined all adolescents that participated in either high-contact, semi-contact, and non-contact sports. Finally, it must be noted that the variables constructed to capture the level of contact within these three groupings of competitive sports are not mutually exclusive. Adolescents could indicate participating in multiple sports. For example, an adolescent could participate in football (high-contact sport), basketball (semi-contact sport), and track (non-contact sport) throughout the year. This type of overlap among the categories can occur given that adolescents participate in different sports depending on the time of year.

[2]The lowest grade when adolescents used either cocaine, crack, inhalants, or steroids was used to create the variable for early onset of 'Other illicit' drug use.

Control Variables—Several control variables are included in the analyses to isolate the independent effects of participation in different types of sports on adolescent substance use. The first set of controls account for the geographic location of where the respondent resides and the year respondents participated in the survey. The indicators for geographic location are based on Census regions that include the north central region (i.e. Midwest states), southern region (i.e. South Atlantic, East South Central, and West South Central states), western region (i.e. Mountain and Pacific states), and the northeastern region (New England and Middle Atlantic states) of the United States. The northeastern region serves as the reference category. Community type indicates whether respondents live in either a 'city/town' or 'country/farm', with 'country/farm' representing the reference category. To account for any bias across the survey years, indicator variables are used to flag whether respondents participated in 2010 or 2011 (the survey year for 2010 represents the reference category).

The second set of controls accounts for the race, SES, family structure, grade-level, and gender of the responding adolescents. Race is a dichotomous measure that categorizes respondents as either white or non-white, with the non-white classification representing the reference category. The highest level of education obtained by the respondents' mother was used as a proxy measure of SES. Four indicators are created that represent mother's highest level of education as either less than a high school degree, a high school degree only, some college, or a college degree or higher. Respondents indicating that their mothers have less than a high school degree serve as the reference category. Family structure measures whether the respondent lives with either one or two parents (i.e. mother or father). Adolescents who indicated living with only one parent is the reference category. Grade level of respondent consists of whether they are classified as an eighth-, 10^{th}-, or 12^{th}-grader. Eighth-graders represent the reference category. Gender is a dichotomous measure, and male respondents were used as the reference group.

Finally, an additional control variable was used to buffer against selection effects. To protect against high-achieving student bias (i.e. good students self-select into sports), a continuous measure was used to assess the average grade adolescents indicated having during the current school year (0 = D, 1 = C−, 2 = C, 3 = C+, 4 = B−, 5 = B, 6 = B+, 7 = A−, 8 = A).

Data Analysis

In order to analyze the impact of sports participation on substance use, four sets of binary logistic regression models were estimated using cases without missing data on all the variables used in the analyses (refer to tables 1 & 2). The first set of logistic regression models (models 1-8) estimated the overall effect of competitive sports participation (i.e. the global measure of competitive sports participation) on the 30-day prevalence of being drunk, early onset of being drunk, the 30-day prevalence of smoking cigarettes, early onset of smoking cigarettes, the 30-day prevalence of marijuana use, early onset of marijuana use, the 30-day prevalence of 'other illicit' drug use, and early onset of 'other illicit' drug use. In these models, the analyses focused on whether competitive sports participation (in general) was associated with substance use among respondents during the past 30 days, and whether sports participation was associated with early onset of substance use. The second set of

logistic regression models (models 9 – 16) analyzed differences in high-contact sports, semi-contact sports, and non-contact sports on the 30-day prevalence and early onset of the four different types substance use (i.e. Being drunk, smoking cigarettes, smoking marijuana, and using 'other illicit' drugs). The third set of logistic regression models (models 17-20) estimated the impact of competitive sports participation (in general) on the four measures of 30-day prevalence of substance use, while distinctively controlling for early onset of substance use. Finally, the fourth set of logistic regression models (models 21-24) examined differences among high-contact sports, semi-contact sports, and non-contact sports on the 30-day prevalence among the four different types of substance use, while controlling for early onset of substance use.

Finally, it should be noted that the multistage sampling design used for MTF resulted in clustering of the data, which may cause some overstatement of the statistical significance of results when conducting analyses that do not account for the complex sampling. Design effects reflecting the cluster sampling were not available from MTF study staff for the subpopulations and the estimates examined in this paper. We therefore acknowledge that our standard errors (which reflect variability due to the sample weights) might be understated, and only consider highly significant coefficients to be reliable ($p < 0.01$).

RESULTS

The effect of competitive sports participation on substance use: 30-day prevalence and early onset of substance use

Table 3 presents the results from the logistic regression analysis that examined the overall effect of competitive sports participation on 30-day prevalence and early onset of substance use. Model 1 shows that respondents who participated in competitive sports (global measure) have a higher odds of getting drunk over the past 30 days when compared to non-participants (AOR = 1.477, P<.001). Moreover, Model 2 shows that respondents who participated in competitive sports also have a higher odds of indicating early onset of getting drunk (i.e. first got drunk in elementary or middle school (4^{th} – 8^{th} grade)) when compared to their non-participating peers (AOR = 1.237, P<.001). Participation in competitive sports was not found to be associated with 30-day prevalence or early onset of cigarette use (Model 3: AOR = .961; Model 4: AOR = 1.067), marijuana use (Model 5: AOR = 1.110; Model 6: AOR = 1.108), and 'Other illicit drug' use (Model 7: AOR = 1.110; Model 8: AOR = 1.108).

Table 4 displays the results from the logistic regression analyses that examined differences in 30-day prevalence and early onset of substance use among respondents who participated in high-contact sports, semi-contact sports and non-contact sports. Accordingly, respondents who participated in high-contact sports had a higher odds of 30-day prevalence of getting drunk (Model 9: AOR = 1.860, p<.001), smoking cigarettes (Model 11: AOR = 1.486, p<.001), and smoking marijuana (Model 13: AOR = 1.484, p<.001) when compared to their peers who did not participate in these types of sports. Similarly, the odds were higher for respondents who participated in high-contact sports to initiate substance use at younger ages (early onset) in regards to getting drunk (Model 10: AOR = 1.741, p<.001), smoking cigarettes (Model 12: AOR = 1.410, p<.001), smoking marijuana (Model 14: AOR = 1.674,

p<.001), and using ‘Other illicit drugs’ (Model 16: AOR = 1.420, p<.001). Interestingly, only two other highly significant results emerged among respondents who participated in different types of competitive sports. Namely, respondents who participated in non-contact sports had a lower odds of 30-day prevalence of smoking cigarettes (Model 11: AOR = .759, p<.001) and smoking marijuana (Model 13: AOR = .789, p<.001).

Sports participation and substance use: controlling for early onset of substance use

Table 5 shows the results of the logistic regression analyses that examined the relationship between competitive sports participation and 30-day prevalence of substance use, while explicitly controlling for early onset of substance use. In regards to the global measure of competitive sports participation (i.e. respondents participated in either high-contact, semi-contact, or non-contact sports), competitive sports participation is positively associated with getting drunk during the past 30 days (i.e. 30-day prevalence of getting drunk). In fact, the odds of getting drunk during the past 30 days are nearly 50% higher for sports participants than non-participants (Model 17: AOR = 1.446, p<.001). Table 5 also shows that the odds of 30-day prevalence of getting drunk (Model 21: AOR = 1.632, p<.001) and smoking cigarettes (Model 22: AOR = 1.298, p<.01) are higher for respondents who participated in high-contact sports, while the odds of 30-day prevalence of smoking cigarettes (Model 22: AOR = .764, p<.01) or marijuana (Model 23: AOR = .795, p<.01) are lower for respondents who participated in non-contact sports.

DISCUSSION

This is the first quantitative study using a large national sample to examine the relationship between different levels of contact in sports participation and substance use among secondary school students. Several key findings emerged from the analyses presented above. First, the overall effect of sports participation (i.e. global measure) on substance use among adolescents reveals little, if any, protective effect. In fact, the findings offer support that adolescent boys and girls who participate in competitive sports appeared to be at a greater risk for engaging in drinking behaviors that lead to intoxication. This finding is consistent with other studies that have found participation in interscholastic sports to be related to higher levels of alcohol use among adolescents (Borden et al., 2001; Crosnoe, 2002; Eccles & Barber, 1999; Lisha & Sussman, 2010; Zill et al., 1995).

Second, when the analyses broke out competitive sports participation by different levels of contact, a much different picture emerged. It appears that competitive sport participation produced a bifurcated effect in relation to substance use. Participants in high-contact sports had an elevated risk of initiating substance use at younger ages (i.e. getting drunk, smoking cigarettes, smoking marijuana, and using ‘Other illicit’ drugs) and using substances during the past 30 days (i.e. getting drunk, smoking cigarettes and marijuana). Yet, participants in non-contact sports had a decreased likelihood of smoking cigarettes and smoking marijuana during the past 30 days. Competitive sports participation for can either inhibit or amplify substance use, it just depends upon which type of sport adolescents are involved with.

Unfortunately, the majority of these findings cast doubt on the belief that participation in any type of competitive sport deters adolescents from engaging in risky behaviors like

substance use. In fact, only four significant negative associations were found out of the 24 models, with the majority of the analyses producing either positive or null associations (i.e. the associations suggest that participation in sports either facilitates are has no impact on substance use). Problematically, it appears that participants in high-contact sports are an influential force driving the relationship between sports participation and substance use. Whether or not this relationship is the product of high-contact sports fostering an attitude that normalizes risk taking behavior due to the normative practices within these sports, it is worth taking a deeper look to investigate how and why these athletes are more at risk for substance use.

The fact that about 69% of girls and 75% of boys between 3rd and 12th grade participate in at least one organized sport in the U.S. underscores why it is necessary to understand how sports involvement influences the health outcomes among youth (Sabo & Veliz, 2008). Moreover, given that football is currently the most popular sport among adolescent boys (1,095,993 boys participate in interscholastic football and 1,604 girls participate in interscholastic football) in the United States, it is vital to recognize that some sports are associated with an elevated risk of engaging in substance use (National Federation of State High School Associations, 2012). Future research needs to address how the context of various sports influence and socialize youth into patterns of behavior that is either beneficial or harmful for their short- and long-term health. Understanding how these sporting contexts mold youth will enable parents, educators, and policy makers to be aware that not all sports deliver the promise of a sustainably healthy life-style.

Substance use prevention strategies should directly target youth who participate in competitive sports at the school- or community-level. For instance, recent research has found that males who participated interscholastic sports during middle school and high school were more likely to misuse prescription pain killers (i.e., use too much of their own pain medication, or used their pain medication to get high) when compared to their peers who did not participate in sports (Veliz et al., 2013). Given that athletes are at an elevated risk for injury and may be prescribed opioids to manage pain, coaches and school staff should be notified by parents or physicians that the athlete has a prescription for a controlled substance (e.g., opioid analgesics). Moreover, since certain types of sports were found to be positively associated with a greater risk of different types of substance use, yearly physical examinations of athletes should include some basic assessment of possible substance use disorders (e.g., the CRAFFT or DAST-10). Greater awareness of certain types of drugs that athletes may possess, or simply knowing that some athletes may be at risk for a substance use disorder, can help coaches, parents, and physicians prevent substance use among this population of adolescents.

In conclusion, the results of this study provide support for the hypothesis that participation in competitive sports is associated with substance use among secondary school students, especially among participants in high-contact sports. The findings regarding physical contact demonstrate the importance of considering different levels of physical contact. Adolescents who participate in high-contact sports had higher odds of engaging in substance use when compared to other adolescents who did not participate in these types of sports. Parents, educators, and policy makers need to be aware that the promise of sport is not a monolithic

force that stretches across all youth participants, and may fall short in providing a necessary forum to establish healthy practices across the lifecourse.

Limitations of the Study

Despite the important strengths of this investigation to include a national sample and categorize competitive sport into different levels of contact, this study relies on cross-sectional data that is ill-suited to account for selection effects. This study cannot determine if adolescents who have a propensity to engage in risky behaviors are drawn to sports that involve a certain level of danger (which would explain why they are more likely to engage in substance use). Even though the problem of selection effects looms in the background of the analyses, this study accounted for a robust set of controls (i.e. early onset of substance use) to help balance the data to isolate the effect of competitive sports participation in either high-contact, semi-contact, or non-contact sports.

It should also be acknowledged that there are two important segments missing from the data collected by the MTF: students who were absent from class at the time of data collection (absentees) and students who dropped out of school were not included in the sample (dropouts). These two distinct groups are important because certain behaviors, such as illicit drug use, tend to be higher in these subgroups. Another limitation is the potential for self-reporting bias. Although The MTF study attempted to diminish the bias associated with self-report surveys by using certain conditions that past research has shown improves the validity and reliability of substance use data collected from self-report surveys (Harrison & Hughes, 1997), no adjustments were made in the MTF to correct for under-reporting. Additionally, the sample used for this study lost a segment of respondents due to missing data on various items used for the analysis. In particular, the sample with no missing data was not directly comparable to the full sample (see tables 1 and 2). The restricted sample (i.e., the sample with no missing data) had a lower prevalence (past 30 days) to engage in substance use and had fewer respondents who initiated substance use between the 4^{th} and 8^{th} grade (early onset) when compared to the full sample that included respondents who had one or more missing items. Accordingly, the sample used for this study was relatively conservative and may not capture the full range of adolescents who may have engaged in various types of substance use.

Finally, the MTF does not include adequate measures to assess the use of performance enhancing drugs among adolescents who participate in competitive sports. Although, the MTF does include certain questions like steroid use, the questions do not make it possible to assess whether athletes used these drugs to enhance their performance on the playing field. Unfortunately, the current study could not examine how the use of performance enhancing drugs varied across different types of sports participation. No nationally representative data set provides measures that directly capture the use of performance enhancing drugs among adolescents and it remains unclear whether the use of these types of drugs is a growing problem among young athletes. Given the growing number of sports participants in the United States (National Federation of State High School Associations, 2012), future nationally representative studies need to address this limitation in order to track trends

among adolescents who use certain types of drugs to enhance their performance on the playing field.

Glossary

Monitoring the Future (MTF)	The Monitoring the Future (MTF) has been collected annually in the United States since 1975 and is one of the largest and most comprehensive surveys on adolescent substance use.
High-Contact Sports	Includes sports that involve continual violent contact that officially sanction hitting, knocking, or wrestling (or tackling) opponents to the ground. Football, ice hockey, lacrosse and wrestling were identified as high-contact sports for this study.
Semi-Contact Sports	Includes sports that involve sporadic violent contact that may be officially sanctioned within the rules of the sport. Baseball, basketball, field hockey, or soccer, were identified as semi-contact sports for this study.
Non-Contact Sports	Includes sports where no contact can occur between participants due to either official rules or the structure of the playing field. Cross-country, gymnastics, swimming, tennis, track, or volleyball were identified as semi-contact sports for this study.

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Table 1

Sample Characteristics: Control Variables

Control Variables	Full Data Set (n = 21,049) % missing per item	Full Data Set (n = 21,049) %/mean	Working Data Set No missing values (n = 12,962) % missing per item	Working Data Set No missing values (n = 12,962) %/mean	Chi-square/t-test[(b)] value
Male (ref.)	2.70%	49.1%	0%	48.0%	17.89***
Female		50.9%		52.0%	
North East (ref.)	0%	19.9%	0%	20.6%	35.56***
North Central		24.1%		26.2%	
South		35.9%		33.0%	
West		20.1%		20.3%	
Farm/Country (ref.)	2.20%	17.9%	0%	17.9%	0.009
City		82.1%		82.1%	
2010 (ref).	0%	49.7%	0%	49.3%	0.474
2011		50.3%		50.7%	
White (ref.)[(a)]	0%	55%	0%	63%	210.35***
Non-White		45%		37%	
Less than High School (ref.)	10.70%	12%	0%	9%	71.78***
High School Degree Only		22%		21%	
Some College		18%		18%	
College Degree or Higher		48%		52%	
Two-Parent Household (ref.)	4.60%	76%	0%	80%	57.89***
One-Parent Household		24%		20%	
8th Grade (ref.)	0%	51%	0%	48%	30.31***
10th Grade		49%		52%	
Self-Reported Grades	2.90%	5.25	0%	5.6	14.32***

[(a)]The values for non-white include black, Hispanic, and the censored values that are set to missing in the public-use MTF data file to maintain respondent confidentiality.

(b) The chi-square and t-test examine differences between the full data set and working data set (data set with no missing data).

Table 2

Sample Characteristics: Main Independent Variables and Dependent Variables

	Full Data Set (n = 21,049)		Working Data Set No missing values (n = 12,962)		Chi-square/t-test[(b)]
	% missing per item	%/mean	% missing per item	%/mean	value
Independent Variables					
Participates in sport	2.50%	70%	0.00%	71%	4.678*
Participates in sport Does not participate in sport		30%		29%	
Contact Sports	2.50%	27%	0.00%	26%	6.48*
Semi-Contact Sports	2.50%	49%	0.00%	49%	0.036
Non-Contact Sports	2.50%	37%	0.00%	40%	15.88***
Dependent/Independent Variables (Early Onset)					
First got drunk between 4 and 8th grade	10.30%	16%	0.00%	12%	101.12***
First smoked cigarettes between 4th and 8th grade	9.10%	20%	0.00%	15%	125.21***
First smoked Marijuana between 4th and 8th grade	8.80%	15%	0.00%	11%	115.51***
First used 'other illicit drugs' between 4th and 8th grade	13.20%	7%	0.00%	6%	9.1***
Dependent Variables					
Got drunk (past 30 days)	9.30%	10%	0.00%	9%	6.96**
Smoked cigarettes (past 30 days)	9.90%	10%	0.00%	7%	62.35***
Smoked Marijuana (past 30 days)	12.60%	13%	0.00%	10%	53.61***
Used 'other illicit drugs' (past 30 days)	3.20%	3.2%	0.00%	1.60%	75.77***

[(b)]The chi-square and t-test examine differences between the full data set and working data set (data set with no missing data).

Table 3

Sports participation (global measure) and substance use

	Model 1 Drunk (past 30 days) AOR	Model 2 Early Onset Drunk AOR	Model 3 Cigarettes (past 30 days) AOR	Model 4 Early Onset Cigarettes AOR	Model 5 Marijuana (past 30 days) AOR	Model 6 Early Onset Marijuana AOR	Model 7 Other Illicit Drugs (past 30 days) AOR	Model 8 Early Onset Other Illicit Drugs AOR
constant	.143 ***	.574 ***	.390 ***	1.051	.216 ***	.687 ***	.112 ***	.297 ***
North Central	.722 ***	.919	.852	1.076	.796 *	.974	.878	1.005
South	.879	1.166	1.200	1.390 ***	.996	1.296 **	.724	1.223
West	.881	1.025	.652 ***	.847	1.073	1.141	.845	1.134
Lives in the country/on farm	1.252 **	1.251 ***	1.240 **	1.332 ***	.758 ***	.921	1.120	.995
2011	1.012	.951	.895	.909	1.153 *	.937	1.049	.782 ***
High School Degree Only (Mother)	.934	.757 **	.820	.681 ***	.991	.795 *	.595 *	.604 ***
Some College (Mother)	.815	.717 ***	.731 *	.558 ***	1.091	.733 **	.511 **	.690 **
College Degree or Higher (Mother)	.804 *	.572 ***	.594 ***	.425 ***	.905	.527 ***	.588 *	.634 ***
Single-Parent Family (Mother)	1.606 ***	1.572 ***	1.581 ***	1.564 ***	1.872 ***	1.718 ***	1.122	.924
Female	.992	.925	.900	.853 **	.738 ***	.673 ***	1.393 *	1.528 ***
Non-White	.568 ***	.857 *	.514 ***	.843 **	.721 ***	1.067	.957	.854
10th Grade	3.806 ***	.924	2.439 ***	1.212 ***	3.370 ***	.975	.656 **	.621 ***
Self-Reported Grades	.798 ***	.785 ***	.725 ***	.752 ***	.762 ***	.751 ***	.755 ***	.808 ***
Sports Participant	**1.477 *** **	**1.237 *** **	.961	1.067	1.110	1.108	1.082	.973
Cox & Snell R-Square	R2 = .062	R2 = .046	R2 = .259	R2 = .083	R2 = .075	R2 = .067	R2 = .338	R2 = .019

Notes. AOR = adjusted odds ratio. All analyses are weighted

* p<.05,

** p,.01,

*** p<.001

Table 4

Different types of sports participation and substance use

	Model 9 Drunk (past 30 days) AOR	Model 10 Early Onset Drunk AOR	Model 11 Cigarettes (past 30 days) AOR	Model 12 Early Onset Cigarettes AOR	Model 13 Marijuana (past 30 days) AOR	Model 14 Early Onset Marijuana AOR	Model 15 Other Illicit Drugs (past 30 days) AOR	Model 16 Early Onset Other Illicit Drugs AOR
constant	.129 ***	.510 ***	.320 ***	.950	.185 ***	.598 ***	.084 ***	.244 ***
North Central	.728 ***	.925	.856	1.082	.798 *	.975	.885	1.012
South	.872	1.159	1.198	1.381 ***	.990	1.282 **	.739	1.233
West	.906	1.040	.666 ***	.858	1.101	1.156	.859	1.147
Lives in the country/on farm	1.261 **	1.256 ***	1.239 *	1.333 ***	.757 ***	.918	1.119	.996
2011	1.014	.951	.897	.910	1.155 *	.938	1.048	.780 ***
High School Degree Only (Mother)	.914	.745 **	.812	.677 ***	.980	.785 *	.581 *	.597 ***
Some College (Mother)	.815	.713 ***	.735 *	.561 ***	1.101	.733 **	.499 **	.682 **
College Degree or Higher (Mother)	.813	.570 ***	.599 ***	.429 ***	.917	.526 ***	.568 **	.623 ***
Single-Parent Family (Mother)	1.596 ***	1.563 ***	1.591 ***	1.561 ***	1.876 ***	1.714 ***	1.124	.924
Female	1.235 **	1.138 *	1.097	.989	.881	.830 **	1.652 **	1.776 ***
Non-White	.563 ***	.851 **	.503 ***	.837 **	.710 ***	1.058	.933	.844 *
10th Grade	3.831 ***	.929	2.462 ***	1.212 ***	3.413 ***	.981	.692 *	.635 ***
Self-Reported Grades	.805 ***	.788 ***	.727 ***	.755 ***	.766 ***	.754 ***	.750 ***	.807 ***
Contact Sports	**1.860 *** **	**1.741 *** **	**1.486 *** **	**1.410 *** **	**1.484 *** **	**1.674 *** **	1.470 *	**1.420 *** **
Semi-Contact Sports	1.149 *	.994	1.073	1.015	1.155 *	.978	1.279	1.003
Non-Contact Sports	.907	.970	**.759 *** **	.862 *	**.789 *** **	.866 *	1.112	1.010
Cox & Snell R-Square	R2 = .065	R2 = .049	R2 = .069	R2 = .086	R2 = .078	R2 = .070	R2 = .009	R2 = .020

Notes. AOR = adjusted odds ratio. All analyses are weighted

* p<.05,

** p,.01,

*** p<.001

Table 5

Sports participation (Global measure and different types) and substance use, while explicitly controlling for early onset of substance use

	Model 17 Drunk (past 30 days)	Model 18 Cigarettes (past 30 days)	Model 19 Marijuana (past 30 days)	Model 20 Other Illicit Drugs (past 30 days)	Model 21 Drunk (past 30 days	Model 22 Cigarettes (past 30 days)	Model 23 Marijuana (past 30 days)	Model 24 Other Illicit Drugs (past 30 days)
	AOR	AOR	AOR	AOR	AOR	AOR	AOR	AOR
constant	.029 ***	.043 ***	.037 ***	.007 ***	.028 ***	.036 ***	.033 ***	.006 ***
North Central	.734 **	.773 *	.763 *	.817	.743 **	.772 *	.769 *	.830
South	.822	.975	.853	.579 *	.815 *	.980	.855	.600 *
West	.899	.677 **	1.040	.720	.922	.684 **	1.067	.744
Lives in the country/on farm	1.189 *	1.028	.724 ***	1.172	1.198 *	1.027	.725 ***	1.180
2011	1.023	.949	1.232 **	1.317	1.020	.950	1.233 **	1.303
High School Degree Only (Mother)	1.166	1.116	1.232	.862	1.140	1.107	1.222	.862
Some College (Mother)	.994	1.134	1.512 **	.641	.998	1.150	1.530 **	.636
College Degree or Higher (Mother)	1.109	1.058	1.414 **	.770	1.116	1.053	1.433 **	.765
Single-Parent Family (Mother)	1.402 ***	1.302 **	1.619 ***	1.206	1.396 ***	1.305 **	1.625 ***	1.211
Female	1.057	.967	.858 *	.977	1.264 ***	1.138	.967	1.029
Non-White	.569 ***	.519 ***	.627 ***	1.188	.566 ***	.511 ***	.617 ***	1.157
10th Grade	5.38 ***	2.658 ***	5.000 ***	.914	5.379 ***	2.690 ***	5.028 ***	.950
Self-Reported Grades	.864 ***	.830 ***	.841 ***	.871 ***	.872 ***	.830 ***	.843 ***	.867 ***
Early Onset (Drunk)	15.68 ***	--	--	--	15.37 ***	--	--	--
Early Onset (Cigarettes)	--	24.52 ***	--	--	--	24.10 ***	--	--
Early Onset (Marijuana)	--	--	22.21 ***	--	--	--	21.94 ***	--
Early Onset ('Other Illicit Drugs')	--	--	--	95.91 ***	--	--	--	94.990 ***
Sports Participant	**1.446 *** **	.853	1.067	1.131	--	--	--	--
Contact Sports	--	--	--	--	**1.632 *** **	**1.298 ** **	1.237 *	1.126
Semi-Contact Sports	--	--	--	--	1.163 *	1.041	1.179 *	1.308
Non-Contact Sports	--	--	--	--	.881	**.764 ** **	**.795 ** **	1.100

	Model 17 Drunk (past 30 days)	Model 18 Cigarettes (past 30 days)	Model 19 Marijuana (past 30 days)	Model 20 Other Illicit Drugs (past 30 days)	Model 21 Drunk (past 30 days	Model 22 Cigarettes (past 30 days)	Model 23 Marijuana (past 30 days)	Model 24 Other Illicit Drugs (past 30 days)
	AOR	AOR	AOR	AOR	AOR	AOR	AOR	AOR
Cox & Snell R-Square	R2 = .154	R2 = .173	R2 = .185	R2 = .064	R2 = .155	R2 = .174	R2 = .186	R2 = .064

Notes. AOR = adjusted odds ratio. All analyses are weighted

* p<.05,

** p,.01,

*** p<.001