Published in final edited form as:
J Adolesc Health. 2013 June ; 52(6): 707–715. doi:10.1016/j.jadohealth.2012.11.020.

Middle and High School Drug Testing and Student Illicit Drug Use: A National Study 1998–2011

Yvonne M. Terry-McElrath, MSA,
Survey Research Associate, Institute for Social Research, Room 2341, University of Michigan, PO Box 1248, Ann Arbor, MI 48106-1248, Phone: 734-647-9142, Fax: 734-936-0043

Patrick M. O'Malley, PhD, and
Research Professor, Institute for Social Research, University of Michigan, Ann Arbor, Michigan

Lloyd D. Johnston, PhD
Distinguished Senior Research Scientist, Research Professor, Institute for Social Research, University of Michigan, Ann Arbor, Michigan

Yvonne M. Terry-McElrath: yterry@umich.edu

Abstract

Purpose—This study uses 14 years of data from nationally representative samples of US middle and high school students in the Monitoring the Future study to examine associations between school student drug testing (SDT), substance use, and participation in extracurricular activities.

Methods—Analyses use questionnaire data collected from 1998–2011 from 89,575 students in 883 middle schools and 157,400 students in 1,463 high schools to examine: (1) the current prevalence of SDT; (2) SDT trends over time; (3) associations between substance use and SDT type, volume, or duration among the general student population or students participating in activities subject to testing; (4) associations between students' beliefs/attitudes about marijuana use and SDT; and (5) associations between extracurricular participation rates and SDT.

Results—Moderately lower marijuana use was associated with any random testing of the general high school student population and for SDT of middle and high school sub-populations specifically subject to testing (athletes or participants in non-athletic extracurricular activities). However, SDT generally was associated with increased use of illicit drugs other than marijuana.

Conclusions—Because the study design is observational and the data are cross-sectional, no strong causal conclusions can be drawn. However, there is evidence of lower marijuana use in the presence of SDT, and evidence of higher use of illicit drugs other than marijuana. Until further research can clarify the apparent opposing associations, schools should approach SDT with caution.

Keywords

child and adolescent health; drugs; marijuana; health policy; organization and administration of school health programs; policy

Correspondence to: Yvonne M. Terry-McElrath, yterry@umich.edu.

The authors are unaware of any potential conflicts of interest, potential, perceived, or real, with this work.

INTRODUCTION

Student drug testing (SDT) is one procedure schools use to prevent or reduce youth substance use. SDT may be for-cause or random on some basis. Random testing can be mandatory for certain groups (e.g., athletes; others taking competitive extracurricular activities), mandatory for all students, or voluntary. The primary theoretical underpinning of SDT is deterrence theory: substance use is weighed against the costs/rewards of drug test outcomes.(1) More broadly, SDT is hypothesized to reduce and/or prevent drug use through: (a) counseling/education/treatment intervention opportunities; (b) opportunities for cessation or non-initiation to avoid test consequences; and (c) support for students to say no to peer pressure to use.(2,3) SDT proponents emphasize testing should be part of comprehensive programming efforts, and that the purpose is not to punish students for drug use, but to prevent use or enable intervention for students who test positive.(2,3) Concerns regarding SDT include: testing efficacy; financial costs; testing accuracy; student avoidance of extracurricular activities to avoid testing; student use of drugs less likely to be detected; violation of privacy; Fourth Amendment protection against unreasonable searches; and potential undermining of student trust and harming the student-school relationship.(4,5)

Research on SDT efficacy in deterring drug use has not been definitive. One 2009 review found little support for SDT in deterring use.(1) A recent national survey found SDT effects were conditioned on school climate and student gender.(6) An experimental evaluation found significantly lower use of the specific substances tested for among students in treatment schools compared to students in control schools, but no significant differences in overall substance use.(7) Random athlete SDT was not associated with past 30-day student athlete substance use in a separate randomized controlled study, but some evidence was found for reduced past-year use.(8) Studies that observed substance use reductions did not observe significant differences in intentions to use(7) and found some evidence of increased drug use risk factors.(8) The literature has not shown significant SDT effects among students in schools with testing programs who were not themselves subject to testing.(7,9) One nationally representative cross-sectional sample of middle and high school students from 1998–2001/2002(10,11) found no significant differences in student substance use based on testing, but did find suggestive evidence for a decline in marijuana use but a possible increase in use of illicit drugs other than marijuana. A later study using 2005 data(12) estimated that 14% of public school districts with high schools used random SDT, with almost all of those districts reporting testing athletes, 65% testing other extracurricular participants, and 28% testing all students (student drug use was not examined).

The current study uses 14 years of nationally representative data from US middle and high school students in public and private schools to examine five general research areas: first, current SDT prevalence and trends followed by associations between SDT and (a) and student illicit substance use among the general student population, (b) illicit substance use among student groups subject to testing; (c) marijuana use beliefs and attitudes; and (d) extracurricular participation rates.

METHODS

Participants

Student data were obtained from the Monitoring the Future (MTF) study (supported by the National Institute on Drug Abuse), consisting of nationally representative samples of 8^{th}, 10^{th}, and 12^{th} grade students.(13) School data were obtained from administrators in MTF schools through the Youth, Education, and Society (YES) study (supported by the Robert Wood Johnson Foundation). Both studies were conducted by the Institute for Social

Research at the University of Michigan (approval obtained from the University of Michigan Behavioral Sciences Institutional Review Board) and appropriate consent procedures were used.

Procedure

Self-completed, optically-scanned student questionnaires were administered in classrooms by University of Michigan personnel during a normal class period (detailed information on MTF methodology is provided elsewhere).(13,14) From 1998–2011, the overall school response rate (with replacement) averaged 98%; student response rates averaged 89%, 87%, and 82% for 8th, 10th, and 12th grades, respectively. Absenteeism was the primary reason for missing data; less than 1% of students refused participation.

Mailed questionnaires with a monetary incentive were sent to each sampled school's principal in the spring of the same year in which student data were gathered. School administrator response rates averaged 83%. At the start of the study, pilot testing of various school policy measures was conducted with a convenience sample of secondary school principals. Although detailed reliability and validity studies of measures used were not conducted, participants reported no difficulty completing the measures.

The merged MTF and YES dataset for 1998–2011 had approximately 103,000 8th grade students in 887 schools, 90,000 10th grade students in 731 schools, and 83,000 12th grade students in 745 schools.

Instruments

Student Outcomes—Past 30-day marijuana use frequency was assessed on a 7-point scale (1=0 occasions, 2=1–2, 3=3–5, 4=6–9, 5=10–19, 6=20–39, and 7=40+ occasions). Students were also asked about past 30-day frequency of LSD use, other psychedelics, cocaine, heroin, amphetamines, and tranquilizers. For 12th graders, two additional substances were included: sedatives/barbiturates and narcotics other than heroin. A mean was taken from these items to create a scale of frequency of use of illicit drugs other than marijuana (OTM).

Four outcomes investigated marijuana-related attitudes and beliefs. Two dichotomous items measured perceived risk of physical or other harms from using marijuana as great (vs. none/slight/moderate) for (a) occasional use, and (b) regular use. Two additional dichotomous items measured any personal disapproval of people who use marijuana (a) occasionally and (b) regularly.

Two dichotomous items measured moderate or great participation (vs. not at all/slight) in (a) athletics and (b) one or more non-athletic extracurricular activities (school newspaper/yearbook; music/other performing arts; academic clubs (e.g., science, math, language); student council/government; other school clubs/activities).

SDT Policy Measures—For all years, school officials were asked, "In the [current] school year, did your school test any students for illicit drug use?" If yes, respondents noted if SDT was used "based on suspicion or cause" and/or "routine or random". Three dichotomous indicators were created: (a) any SDT, (b) any for-cause SDT, and (c) any random SDT. Schools with random SDT where *all* students were eligible for testing were identified. Volume of for-cause SDT was first asked in 1999: "In the [current] school year, about how many students were tested for drugs based on suspicion or cause?" Volume of any random SDT was first asked in 2003: "In the [current] school year, about how many students were given a random drug test?" Respondents recorded a number for both items.

Only schools with at least one such test were included in models examining testing volume associations with student substance-related outcomes.

Starting in 1999, school officials were asked which student groups were tested. Responses included: "students participating on an athletic team (not including tests for performance-enhancing drugs)", and "students participating in another extracurricular activity"; dichotomous variables for *any testing* among these two groups were created. Starting in 2004, school officials were asked two questions specific to *random* SDT: (1) "When was random drug testing of students first implemented in your school?" (this school year); last school year; 2–3 years ago; more than 3 years ago); and (2) "Specifically, what groups of students are subject to random drug testing in your school?" with responses for "athletes" and "participants in extracurricular activities other than athletics"; dichotomous variables for *random testing* among these two groups were created.

Control Variables—Student characteristics known to relate to drug use were used as controls:(15) gender; race/ethnicity (African American, Hispanic, White, or other); two-parent family; parental education (based on the average of father's and mother's education). School-level controls included school level (middle school (8^{th} grade) or high school (10^{th} or 12^{th} grades)); grade; sector (public or private); number of students in the grade surveyed; percentage of students eligible for free and reduced-price lunch; majority student race/ethnicity; population density; region.

Data Analysis

Descriptive analyses were conducted in SAS using survey commands to account for clustering by school in estimates of standard errors. Two-level hierarchical multivariate models were run using HLM. Drug use frequency outcomes were modeled using restricted maximum likelihood and robust standard errors. Dichotomous outcomes were modeled using a Bernoulli distribution log-link function; population average model results with robust standard errors are reported. All analyses were weighted to adjust for differential probability of selection. Results are presented separately for middle and high schools.

RESULTS

Analytic Sample

After limiting cases to those with no missing data on control variables, 89,575 students in 883 middle schools, and 157,400 students in 1,463 high schools remained for analysis.

Current SDT Prevalence and Trends

For 1998 to 2011 combined, 14% of middle and 28% of high school students attended schools with any SDT; rates for for-cause testing were 10% and 22%, and for any random testing were 6% and 10% (see Table 1). If any for-cause testing had occurred, the volume of students tested in the current year averaged 6 per school for middle and 17 per school for high school students. If any random testing had occurred, the average number of students tested was 80 per school for middle and 178 per school for high school students. Within schools with any random SDT, testing had been in place for more than 3 years for more than half of students (66% middle school; 58% high school), for 2–3 years for approximately one-quarter of students (25% middle school; 29% high school), and implemented in the last or current school year for 9% of middle and 14% of high school students. Few students (2%) attended schools with random drug testing among all students.

SDT showed a mix of linear and non-linear trends over time; data were grouped as follows to allow for consistent modeling across SDT type: 1998–2001, 2002–2004, 2005–2007, and

2008–2011. The percentage of students attending schools with any for-cause SDT did not change significantly over time. For middle school students, any random SDT increased from 2% in 1998–2001 to 9% in 2005–2007 ($p<.01$), remaining at 9% through 2008–2011. The percentage of high school students with any random SDT increased from 6% in 1998–2001 to 11% in 2005–2007 ($p<.05$) to 14% in 2008–2011 ($p<.001$).

For 1998 to 2011 combined, 6% of middle and 11% of high school students attended schools with any athlete SDT; 3% and 7% attended schools with any non-athlete extracurricular SDT. Strong overlap existed between athlete and non-athlete extracurricular SDT. Over half of students in schools with any athlete testing also had any non-athlete extracurricular SDT (52% of middle and 58% of high school students); almost all students in schools with any non-athlete extracurricular SDT also had any athlete SDT (90% of middle and 92% of high school students). Any student athletic testing rose from 3% in 1998–2001 to 8% in 2008–2011 ($p<.05$) for middle school students and from 8% to 15% ($p<.05$) for high school students. Any non-athlete extracurricular SDT rose from 1% in 1998–2001 to 6% in 2008–2011 ($p<.05$) for middle school students and from 4% to 10% ($p<.01$) for high school students. The average percentage of students attending schools with *random* athlete SDT was 8% and 11% for middle and high school students, respectively, and 5% and 7% for *random* non-athlete extracurricular SDT from 2004–2011.

SDT and Substance Use among the General Student Population

Table 2 presents results from models relating SDT to student substance use controlling for student- and school-level measures. Due to low middle school prevalence of SDT in general and the very low prevalence of random testing among all students, middle school models did not examine SDT volume, timing of random SDT implementation, or prevalence of random SDT among *all* students.

Past 30-day marijuana and OTM use were not significantly associated with SDT type among the general middle school student population. Within the general high school student population, any for-cause SDT was associated with significantly *higher* marijuana use frequency and prevalence and OTM prevalence. However, within schools with any for-cause SDT, as the volume of testing increased, marijuana use frequency decreased. Any random SDT was associated with significantly *lower* marijuana use frequency and prevalence. However, any random SDT was associated with significantly *higher* OTM use frequency and prevalence, and random SDT among *all* students was associated with significantly higher OTM use prevalence. The volume of random testing was not associated with either marijuana or OTM use among high school students attending schools with such testing. Among high school students attending schools with *any* random SDT, implementation of random SDT programs in the current or prior year was associated with higher OTM use frequency than when random SDT was implemented four or more years earlier. Figure 1 presents predicted probabilities of marijuana and OTM use prevalence among the general high school student population by SDT type.

SDT and Substance Use among Student Groups Subject to Testing

Middle school student athlete marijuana use frequency was significantly lower in schools with either any athlete SDT or random athlete SDT (Table 2). Among middle school students participating in non-athletic extracurricular activities, random testing aimed at that group was associated with significantly higher odds of OTM use prevalence.

Marijuana use frequency and prevalence were significantly lower among high school student athletes in schools with either any athlete SDT or random athlete SDT, compared to students in schools with no SDT (Table 2). Among high school students participating in non-athletic

extracurricular activities, marijuana use prevalence was significantly and *negatively* associated with any SDT and any random SDT aimed at this group. OTM use frequency was significantly and *positively* associated with any SDT testing targeting such students. Figure 2 presents predicted probabilities of past 30-day marijuana and OTM use prevalence among high school student athletes and other extracurricular participants by any SDT for these specific populations.

SDT and Marijuana-Related Attitudes and Beliefs

Models investigating relationships between SDT and perceived risk and disapproval of occasional and regular marijuana use controlled for all student- and school-level measures (see Table 3). No significant relationships were observed for the general middle school student population. Among middle school student athletes, random athlete SDT was associated with significantly higher disapproval of using marijuana occasionally.

Perceived risk and disapproval of occasional and regular marijuana use among the general high school student population were significantly and negatively related to any for-cause SDT. However, among high school students attending schools with either any for-cause or any random SDT, both perceived risk and disapproval of using marijuana regularly increased with for-cause and random SDT volume. Further, implementation of random SDT programs in the current or prior year was associated with significantly lower perceived risk and disapproval of occasional marijuana use than when random SDT was implemented four or more years earlier. Among high school student athletes, perceived risk of regular marijuana use was significantly higher in schools with any athlete SDT. Among high school students participating in non-athletic extracurricular activities, perceived risk of regular marijuana use and disapproval of occasional marijuana use were significantly higher for students in schools with any random non-athlete extracurricular SDT.

SDT and Extracurricular Participation

Multivariate models investigating relationships between SDT type and student athletic or other extracurricular participation showed no significant relationships for either middle or high school students (data not shown).

Summary

Table 4 summarizes all associations between SDT and student illicit substance use and related measures.

DISCUSSION

SDT impacts a sizeable proportion of US students, with a growing number of schools implementing random SDT programs. The current analyses found that any for-cause testing was associated with higher marijuana and OTM use and lower perceived risk/disapproval of marijuana use. Yet, among students attending schools with any for-cause testing, higher for-cause testing volume was associated with *lower* marijuana use and *higher* disapproval. For-cause testing is based on appearance or behavior indicative of substance use. School-level substance use has been shown to relate to the likelihood a student will personally engage in substance use;(16–18) students attending schools with for-cause SDT may be at higher risk of substance use due to *a priori* higher school use. The inverse testing volume-marijuana use relationship, however, indicates that once potential *a priori* higher use rates are accounted for by limiting the sample to only those schools with for-cause testing, a negative association between SDT volume and marijuana use—but not OTM use—was observed. Throughout the models, the desired association of lower drug use with SDT seemed to occur primarily with marijuana use under the conditions of any random testing in the general

student population or in specific sub-populations subject to testing. The intent of SDT as a deterrent to OTM use appears not to be supported. Indeed, these results suggest that SDT may be associated with increased OTM use.

Little prior research examined differences in SDT-drug use associations across illicit substances. Of the significant literature contributions previously noted,(1,6–11) only one study examined associations separately for marijuana and other illicit drugs.(10,11). That study (which also utilized MTF data, but only for 1998–2002), found no significant results but did observe suggestive evidence of a decline in marijuana use coupled with a possible increase in OTM use. Those early findings were replicated in the current study and found to be significant with inclusion of 14 years of data. Literature on SDT efficacy generally indicates little association with illicit drug use among the general population(1,6–7,9) with some evidence for targeted student populations(7–9) for marijuana alone or in combination with other illicit drugs. In the current study, the higher predicted probabilities of OTM use associated with having various types of SDT were modest—ranging from 1 to 2 percentage points across high school SDT types and population groups, compared with a modest 3 to 4 percentage point reduction in high school marijuana use. If marijuana and OTM were combined into one measure of illicit drug use, models would likely show little significance given the opposing nature of the associations.

Possible mechanisms underlying the observed differences in SDT associations with marijuana and OTM include: students may know that marijuana metabolites remain in the body for a longer time than metabolites of most other drugs, making other drugs less likely to be detected even if included in testing; and/or students may move toward the use of illicit drugs not included in testing. Information on drug test detection times is readily available on the Internet;(19–21) as early as 1990, research indicated that drug-tested college athletes were significantly more knowledgeable than non-tested college athletes about SDT detection-avoidance techniques including timing drug use so as to have substances clear their bodies prior to testing.(22) While middle and high school students are not likely to be as sophisticated as college students, it is likely they are aware of detection-avoidance techniques and likely to make use of informal communication networks to convey testing date estimates.(22) One experimental evaluation found that SDT significantly associated with high school student use of substances specifically tested for with no associations for overall substance use.(7)

National estimates of past 30-day marijuana prevalence in 2011 (7%, 18%, and 23% for 8^{th}, 10^{th}, and 12^{th} grade students, respectively) are clearly higher than those for OTM (estimated to be 3%, 5%, 9% for respective grade levels).(13) Reductions in marijuana use among US students are a highly desirable goal and may be associated with SDT; however, corresponding possible increases in OTM use raise serious concerns. Considerable financial costs are also associated with conducting SDT, a particularly salient problem in times of economic stress.

Strengths and Limitations

Study strengths include large national school and student samples, 14 years of observations, and specification of various types of testing, groups eligible for testing, and duration of random SDT implementation. Thirty-day use was chosen to ensure that outcomes occurred within the time period during which the current school year’s drug testing program was operational. Past 12-month drug use outcomes were also examined; results were similar to those for past 30-day use. There are several limitations. This is an observational study in which schools and school districts select themselves into testing or not testing, which may carry some selection bias. However, analyses controlled for a number of known correlates of drug use at both student and school levels, which should substantially reduce selection bias.

Data were based neither on a pre-post design nor random assignment to treatment conditions; results do not prove causality. All data were based on self-report measures, but there is considerable evidence that MTF measures are likely largely reliable and valid.(13) Data on when students were subject to testing throughout the school year were not available; current analyses do not account for either the existence or level of implementation of educational drug prevention programming that may impact student substance use.

Conclusions

Random SDT among the general high school student population, as well as middle and high school subgroups targeted for testing, was associated with moderately lower marijuana use; however, most forms of testing were associated with moderately higher use of other illicit drugs, particularly in high school. These findings raise the question of whether SDT is worth this apparent tradeoff. Until further research can clarify the apparently opposing associations, schools should approach SDT with caution.

Acknowledgments

The Monitoring the Future study is supported by the National Institute on Drug Abuse (DA01411), and the Youth, Education, and Society (YES) project is part of a larger research initiative funded by the Robert Wood Johnson Foundation, entitled Bridging the Gap: Research Informing Policy and Practice for Healthy Youth Behavior. Neither of the study sponsors had any role in (a) study design; (b) the collection, analysis, and interpretation of data; (c) the writing of the report; or (4) the decision to submit the manuscript for publication. The views expressed in this article are those of the authors and do not necessarily reflect the views of the sponsors.

The first draft of the manuscript was prepared by Y.M. Terry-McElrath. Support for manuscript production was obtained through the aforementioned support through the National Institute on Drug Abuse and the Robert Wood Johnson Foundation. No other honorariums, grants, or forms of payment were used to produce the manuscript.

List of abbreviations used

DAT	drug and alcohol testing
MTF	Monitoring the Future
OTM	illicit drugs other than marijuana
SDT	student drug testing
YES	Youth, Education, and Society

References

1. Roche AM, Bywood P, Pidd K, et al. Drug Testing in Australian Schools: Policy Implications and Considerations of Punitive, Deterrence and/or Prevention Measures. Int J Drug Policy. 2009; 20(6): 521–528. [PubMed: 19447026]
2. Office of National Drug Control Policy. What You Need to Know about Drug Testing in Schools (NCJ 195522). Washington, DC: Executive Office of the President of the United States; 2002.
3. National Institute on Drug Abuse. Frequently Asked Questions about Drug Testing in Schools. Rockville, MD: National Institutes of Health, National Institute on Drug Abuse; Available at: http://www.nida.nih.gov/drugpages/testingfaqs.html [Accessed April 8, 2011.]
4. Evans D. Drug Testing of Students. Journal of Global Drug Policy and Practice. 2010; 3(4) Available at: http://www.globaldrugpolicy.org/Issues/Vol%203%20Issue%204/JournalofGlobalDrugPolicyVol3Issue4.pdf.
5. James-Burdumy, S.; Goesling, B.; Deke, J., et al. The Effectiveness of Mandatory-Random Student Drug Testing (NCEE 2010–4025). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education; 2010.

6. Sznitman SR, Dunlop SM, Nalkur P, et al. Student Drug Testing in the Context of Positive and Negative School Climates: Results from a National Survey. J Youth Adolescence. 2012; 41(2):146–155.
7. James-Burdumy S, Goesling B, Deke J, et al. The Effectiveness of Mandatory-Random Student Drug Testing: A Cluster Randomized Trial. J Adolescent Health. 2012; 50(2):172–178.
8. Goldberg L, Elliot DL, MacKinnon DP, et al. Outcomes of a Prospective Trial of Student-Athlete Drug Testing: The Student Athlete Testing Using Random Notification (SATURN) Study. J Adolescent Health. 2007; 41:421–429.
9. Goldberg L, Elliot DL, MacKinnon DP, et al. Drug Testing Athletes to Prevent Substance Abuse: Background and Pilot Study Results of the SATURN (Student Athlete Testing Using Random Notification) Study. J Adolescent Health. 2003; 32:16–25.
10. Yamaguchi R, Johnston LD, O'Malley PM. Relationship between Student Illicit Drug Use and School Drug-Testing Policies. J Sch Health. 2003; 73(4):159–164. [PubMed: 12728615]
11. Yamaguchi, R.; Johnston, LD.; O'Malley, PM. YES Occasional Paper #2. Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2003. Drug Testing in Schools: Policies, Practices, and Association with Student Drug Use. Available at: http://www.drugpolicy.org/docUploads/Johnston_sdt_study.pdf [Accessed April 16, 2012.]
12. Ringwalt C, Vincus AA, Ennett ST, et al. Random Drug Testing in US Public School Districts. Am J Public Health. 2008; 98:826–828. [PubMed: 18381986]
13. Johnston, LD.; O'Malley, PM.; Bachman, JG., et al. Monitoring the Future National Survey Results on Drug Use, 1975–2011. Volume I: Secondary School Students. Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2012. Available at: http://www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2011.pdf [Accessed July 27, 2012.]
14. Bachman, JG.; Johnston, LD.; O'Malley, PM., et al. Monitoring the Future Occasional Paper No. 76. Ann Arbor, MI: Institute for Social Research; 2011. The Monitoring the Future Project after Thirty-seven Years: Design and Procedures. Available at: http://monitoringthefuture.org/pubs/occpapers/mtf-occ76.pdf [Accessed November 1, 2012.]
15. Brown TN, Schulenberg J, Bachman JG, et al. Are Risk and Protective Factors for Substance Use Consistent across Historical Time? National Data from the High School Classes of 1976 through 1997. Prev Sci. 2001; 2(1):29–43. [PubMed: 11519373]
16. Allison KW, Crawford I, Leone P, et al. Adolescent Substance Use: Preliminary Examinations of School and Neighborhood Context. Am J Commun Psycho. 1999; 27:111–141.
17. Mrug S, Gaines J, Su W, et al. School-level Substance Use: Effects on Early Adolescents' Alcohol, Tobacco, and Marijuana Use. J Stud Alcohol Drugs. 2010; 71(4):488–495. [PubMed: 20557827]
18. Ali MM, Amialchuk A, Dwyer DS. The social contagion effect of marijuana use among adolescents. PLoS ONE. 2011; 6(1):e16183.10.1371/journal.pone.0016183 [PubMed: 21264337]
19. California NORML. [Accessed November 5, 2012.] California NORML Guide to Interpreting Drug Test Results. Available at: http://www.canorml.org/healthfacts/drugtestguide/drugtestdetection.html
20. IPassedMyDrugTest.com. [Accessed November 5, 2012.] Drug Detection Times. Available at: http://www.ipassedmydrugtest.com/drug_detection_times.asp
21. PassingPissTests.com. [Accessed November 5, 2012.] Drug testing detection times for assorted drugs. Available at: http://www.passingpisstests.com/drug-test-information/drug-test-detection-times.html
22. Coombs RH, Ryan FJ. Drug Testing Effectiveness in Identifying and Preventing Drug Use. Am J Drug Alcohol Ab. 1990; 16:173–184.

IMPLICATIONS AND CONTRIBUTION

Random student drug testing among the general high school student population, as well as middle and high school subgroups targeted for testing, was associated with moderately lower marijuana use; however, most forms of testing associated with moderately higher use of other illicit drugs, particularly in high school.

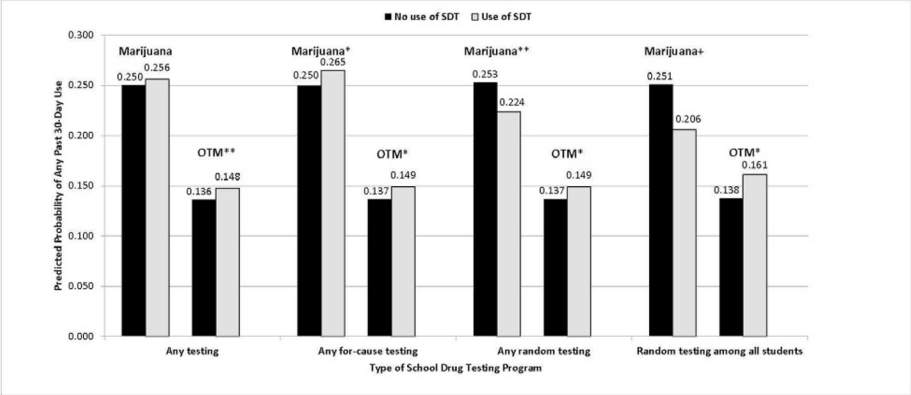

Figure 1. Predicted Probabilities of School Drug Testing and Past 30-Day High School Student Illicit Substance Use, General Student Population

Notes: SDT=student drug testing; OTM=illicit drugs other than marijuana. Predicted probabilities obtained from models simultaneously controlling for both student-level socio-demographics (gender, race/ethnicity, presence of both parents in the home, and average parental education), and school characteristics (grade, region, sector, grade size, majority student race/ethnicity, population density, student socio-economic status), and year. +p<.10; *p<.05; **p<.01 (indicates significant difference in usage rates between students in schools with testing vs. students in schools without testing).

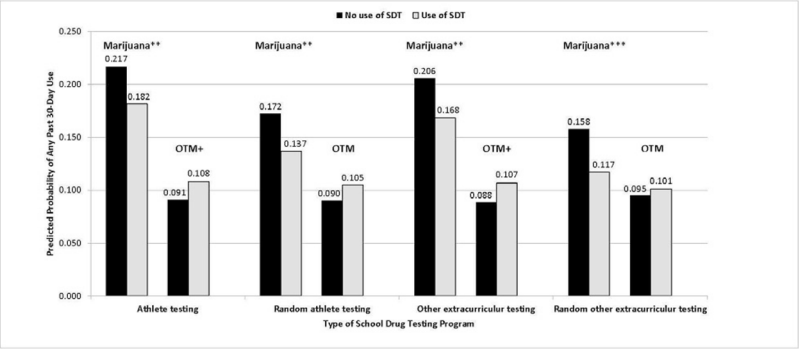

Figure 2. Predicted Probabilities of School Drug Testing and Past 30-Day High School Student Illicit Substance Use, Specific Student Groups

Notes: SDT=student drug testing; OTM= illicit drugs other than marijuana. Respondents include only students who reported moderate to great participation in specified activity. Predicted probabilities obtained from models simultaneously controlling for both student-level socio-demographics (gender, race/ethnicity, presence of both parents in the home, and average parental education), and school characteristics (grade, region, sector, grade size, majority student race/ethnicity, population density, student socio-economic status), and year. +p<.10; *p<.05; **p<.01; ***p<.001 (indicates significant difference in usage rates between students in schools with testing vs. students in schools without testing).

Table 1

Descriptive Statistics

			Middle School			High School		
	Years Available	**Range**	**Student N**	**Mean**	**(SE)**	**Student N**	**Mean**	**(SE)**
Student Exposure to School Drug Testing Environment								
Testing among general student body								
Any testing	'98-'11	0,1	89,575	0.137	(0.013)	157,400	0.280	(0.014)
Any for-cause testing	'98-'11	0,1	89,575	0.096	(0.011)	157,257	0.221	(0.013)
Volume of for-cause testing[a]	'99-'11	1–40[b]; 1–210[c]	8,080	5.802	(0.987)	32,425	16.864	(2.557)
Any random testing	'98-'11	0,1	89,558	0.061	(0.009)	157,158	0.100	(0.009)
Volume of random testing[a]	'03-'11	2–500[b]; 1–847[c]	3,928	79.664	14.808	12,599	178.451	16.984
Any random testing among all students	'98-'11	0,1	89,558	0.017	(0.005)	157,015	0.020	(0.004)
Testing among student athletes								
Any testing	'99-'11	0,1	82,174	0.058	(0.010)	145,044	0.110	(0.010)
Any random testing	'04-'11	0,1	51,146	0.080	(0.014)	93,368	0.105	(0.012)
Testing among students in non-athletic extracurricular activities								
Any testing	'99-'11	0,1	82,174	0.033	(0.008)	144,901	0.069	(0.008)
Any random testing	'04-'11	0,1	51,146	0.052	(0.012)	93,368	0.071	(0.010)
Length of random testing implementation[a]								
Current or last school year	'04-'11	0,1	3,765	0.089	(0.041)	11,104	0.137	(0.035)
2–3 years ago	'04-'11	0,1	3,765	0.253	(0.082)	11,104	0.285	(0.053)
More than 3 years ago	'04-'11	0,1	3,765	0.658	(0.085)	11,104	0.578	(0.056)
Student drug use attitudes, beliefs and behaviors								
Perceive great risk in:								
Using marijuana occasionally	'98-'11	0,1	85,868	0.494	(0.004)	141,984	0.299	(0.003)
Using marijuana regularly	'98-'11	0,1	85,580	0.770	(0.004)	141,771	0.603	(0.003)
Disapprove of:								
Using marijuana occasionally	'98-'11	0,1	85,601	0.853	(0.003)	126,374	0.685	(0.003)
Using marijuana regularly	'98-'11	0,1	85,244	0.897	(0.002)	126,182	0.806	(0.002)
Past 30-day marijuana use								
Any use	'98-'11	0,1	87,815	0.073	(0.002)	154,337	0.185	(0.002)

			Middle School			High School		
	Years Available	**Range**	**Student N**	**Mean**	**(SE)**	**Student N**	**Mean**	**(SE)**
Use frequency[d]	'98-'11	0–40	87,815	0.628	(0.023)	154,337	2.230	(0.039)
Past 30-day use of illicit drugs other than marijuana[e]								
Any use	'98-'11	0,1	88,827	0.041	(0.001)	156,583	0.082	(0.001)
Use frequency	'98-'11	0–40	88,827	0.048	(0.002)	156,583	0.104	(0.003)
Student extracurricular participation								
School athletic teams	'98-'11	0,1	37,847	0.589	(0.006)	61,672	0.521	(0.004)
Non-athletic extracurricular activities[f]	'98-'11	0,1	38,055	0.624	(0.005)	61,889	0.606	(0.004)

Notes: Middle school=8th grade; high school=10th and 12th grades combined. SE=standard error. Ns are unweighted.

[a]Only for students in schools with any of the type of testing specified.

[b]Range for middle school students.

[c]Range for high school students.

[d]Use frequency measured as follows: 0=0 occasions; 1.5=1–2 occasions, 4=3–5 occasions; 7.5=6–9 occasions; 15=10–19 occasions; 30=20–39 occasions; 40=40+ occasions.

[e]For all grades, illicit drugs other than marijuana includes: amphetamines, LSD, other psychedelics, crack, powder cocaine, tranquilizers, and heroin. For 12th graders, this measure also includes sedatives/barbiturates and narcotics other than heroin.

[f]Non-athletic extracurricular activities included any of: academic clubs, performing arts, student publications, and student government.

Table 2

Multivariate Associations between School Drug Testing and Student Past 30-Day Illicit Substance Use

			Use frequency			Any/none use		
	School N	Student N	Coeff.	(SE)	p	OR	(95% CI)	p
Middle School								
General population								
Marijuana use								
Any testing	883	87,815	−0.053	(0.065)		0.97	(0.834,1.132)	
Any for-cause testing	883	87,815	−0.021	(0.082)		0.98	(0.828,1.162)	
Any random testing	882	87,798	0.008	(0.111)		1.00	(0.797,1.266)	
OTM use								
Any testing	883	88,827	0.012	(0.008)		1.03	(0.893,1.195)	
Any for-cause testing	883	88,827	0.009	(0.010)		1.00	(0.838,1.186)	
Any random testing	882	88,810	0.017	(0.015)		1.10	(0.898,1.343)	
Student athletes								
Marijuana use								
Any athlete testing	812	19,861	−0.272	(0.081)	**	0.77	(0.527,1.131)	
Any random athlete testing	512	13,067	−0.243	(0.085)	**	0.71	(0.464,1.078)	
OTM use								
Any athlete testing	812	20,050	−0.004	(0.010)		1.11	(0.781,1.584)	
Any random athlete testing	512	13,183	0.001	(0.012)		1.18	(0.780,1.781)	
Students participating in non-athletic extracurricular activities								
Marijuana use								
Any non-athlete extracurricular testing	814	21,616	0.129	(0.176)		1.10	(0.727,1.662)	
Any random non-athlete extracurricular testing	512	13,840	0.016	(0.125)		0.94	(0.636,1.379)	
OTM use								
Any non-athlete extracurricular testing	814	21,776	0.045	(0.045)		1.50	(0.869,2.579)	
Any random non-athlete extracurricular testing	512	13,931	0.614	(0.566)		1.72	(1.041,2.857)	*
High School								
General population								
Marijuana use								

	School N	Student N	Use frequency Coeff.	(SE)	p	Any/none use OR	(95% CI)	p
Any testing	1,463	154,337	0.062	(0.084)		1.03	(0.965,1.104)	
Any for-cause testing	1,462	154,198	0.182	(0.092)	*	1.08	(1.006,1.165)	*
Volume of for-cause testing[a]	279	32,585	−0.006	(0.003)	*	1.00	(0.997,1.001)	
Any random testing	1,461	154,105	−0.253	(0.102)	*	0.85	(0.772,0.940)	**
Volume of random testing[a]	114	12,913	−0.001	(0.001)		1.00	(0.999,1.000)	+
Random testing among all students	1,460	153,966	−0.323	(0.190)	+	0.77	(0.597,1.003)	+
When any random testing was implemented[a]								
This or last year	105	11,325	0.209	(0.259)		1.03	(0.790,1.346)	
2–3 years ago			−0.318	(0.212)		0.95	(0.777,1.162)	
4+ years ago			(ref.)			(ref.)		
OTM use								
Any testing	1,463	156,583	0.015	(0.006)	*	1.10	(1.025,1.184)	**
Any for-cause testing	1,462	156,440	0.013	(0.007)	+	1.11	(1.024,1.196)	*
Volume of for-cause testing	279	33,016	0.000	(0.000)		1.00	(0.997,1.003)	
Any random testing	1,461	156,346	0.027	(0.011)	*	1.11	(1.002,1.220)	*
Volume of random testing	114	13,103	0.000	(0.000)		1.00	(0.999,1.000)	
Random testing among all students	1,460	156,203	0.027	(0.023)		1.20	(1.008,1.440)	*
When any random testing was implemented								
This or last year	105	11,501	0.086	(0.036)	*	1.22	(0.937,1.588)	
2–3 years ago			−0.032	(0.024)		0.87	(0.720,1.053)	
4+ years ago			(ref.)			(ref.)		
Student athletes								
Marijuana use								
Any athlete testing	1,341	29,252	−0.328	(0.137)	*	0.80	(0.689,0.935)	**
Any random athlete testing	831	19,536	−0.420	(0.169)	*	0.76	(0.631,0.924)	**
OTM use								
Any athlete testing	1,341	29,609	0.004	(0.014)		1.21	(0.998,1.474)	+
Any random athlete testing	831	19,777	−0.001	(0.017)		1.19	(0.916,1.534)	
Students participating in non-athletic extracurricular activities								

J Adolesc Health. Author manuscript; available in PMC 2014 June 01.

			Use frequency			Any/none use		
	School N	Student N	Coeff.	(SE)	p	OR	(95% CI)	p
Marijuana use								
Any non-athlete extracurricular testing	1,346	34,170	−0.135	(0.189)		0.78	(0.668,0.909)	**
Any random non-athlete extracurricular testing	832	22,368	−0.308	(0.206)		0.71	(0.591,0.848)	***
OTM use								
Any non-athlete extracurricular testing	1,346	34,527	0.039	(0.020)	*	1.24	(0.987,1.547)	+
Any random non-athlete extracurricular testing	832	22,610	0.010	(0.017)		1.07	(0.810,1.415)	

Notes: Coeff=estimated regression coefficient. SE=standard error. OR=odds ratio. CI=confidence interval. OTM=illicit drugs other than marijuana. Middle school=8th grade. High school=10th and 12th grades combined. Student athletes defined as those who reported moderate to great participation in school athletic teams. Participants in non-athletic extracurricular activities defined as students who reported moderate to great participation in any of a variety of non-athletic extracurricular activities (academic clubs, performing arts, student publications, student government, etc.). All models simultaneously controlled for both student-level socio-demographics (gender, race/ethnicity, presence of both parents in the home, and average parental education), and school characteristics (grade (for high school models), region, sector, grade size, majority student race/ethnicity, population density, student socio-economic status), and year.

[a] Only for students in schools with any of the type of testing specified.

+ p<.10;

* p<.05;

** p<.01;

*** p<.001.

Table 3

Multivariate Associations between School Drug Testing and Student Perceived Risk and Disapproval of Marijuana Use

			Occasional use			Regular use		
	School N	Student N	OR	95% CI	p	OR	95% CI	p
Middle School								
General population								
Perceive great risk in using marijuana at specified level								
Any testing	883	85,580–85,868	1.07	(0.976,1.162)		1.08	(0.976,1.204)	
Any for-cause testing	883	85,580–85,868	1.04	(0.937,1.159)		1.05	(0.931,1.191)	
Any random testing	882	85,564–85,852	1.10	(0.967,1.240)		1.02	(0.890,1.180)	
Disapprove of using marijuana at specified level								
Any testing	883	85,244–85,601	1.10	(0.974,1.237)		1.05	(0.915,1.212)	
Any for-cause testing	883	85,244–85,601	1.07	(0.937,1.218)		1.08	(0.929,1.259)	
Any random testing	882	85,228–85,585	1.09	(0.909,1.302)		1.01	(0.803,1.268)	
Student athletes								
Perceive great risk in using marijuana at specified level								
Any athlete testing	812	19,488–19,547	1.11	(0.935,1.328)		1.03	(0.835,1.280)	
Any random athlete testing	512	12,800–12,844	1.08	(0.883,1.332)		1.02	(0.814,1.273)	
Disapprove of using marijuana at specified level								
Any athlete testing	812	19,270–19,349	1.24	(0.957,1.611)		1.13	(0.811,1.564)	
Any random athlete testing	512	12,668–12,712	1.39	(1.040,1.870)	*	1.35	(0.925,1.983)	
Students participating in non-athletic extracurricular activities								
Perceive great risk in using marijuana at specified level								
Any non-athlete extracurricular testing	814	21,172–21,209	1.17	(0.920,1.482)		0.83	(0.623,1.103)	
Any random non-athlete extracurricular testing	512	13,529–13,561	1.19	(0.934,1.510)		1.00	(0.763,1.299)	
Disapprove of using marijuana at specified level								
Any non-athlete extracurricular testing	814	21,005–21,088	0.99	(0.667,1.474)		0.86	(0.519,1.427)	
Any random non-athlete extracurricular testing	512	13,420–13,468	1.11	(0.808,1.517)		0.97	(0.620,1.517)	
High School								
General population								
Perceive great risk in using marijuana at specified level								

			Occasional use			Regular use		
	School N	Student N	OR	95% CI	p	OR	95% CI	p
Any testing	1,463	141,771–141,984	0.94	(0.886,1.001)	+	0.95	(0.895,1.001)	+
Any for-cause testing	1,462	141,640–141,852	0.92	(0.857,0.984)	*	0.92	(0.867,0.981)	*
Volume of for-cause testing[a]	279	30,069–30,096	1.00	(1.000,1.003)	+	1.00	(1.000,1.004)	*
Any random testing	1,461	141,550–141,762	0.98	(0.904,1.064)		1.05	(0.968,1.145)	
Volume of random testing[a]	114	11,727–11,750	1.00	(0.999,1.000)		1.00	(1.000,1.001)	*
Random testing among all students	1,460	141,419–141,630	1.00	(0.862,1.157)		1.11	(0.901,1.374)	
When any random testing was implemented[a]								
This or last year	105	10,228–10,248	0.71	(0.566,0.887)	**	0.82	(0.655,1.021)	+
2–3 years ago			0.84	(0.715,0.976)	*	0.86	(0.716,1.023)	+
4+ years ago			(ref)			(ref)		
Disapprove of using marijuana at specified level								
Any testing	1,463	126,182–126,374	0.95	(0.893,1.011)		0.95	(0.893,1.008)	+
Any for-cause testing	1,462	126,048–126,242	0.91	(0.850,0.975)	**	0.92	(0.856,0.979)	*
Volume of for-cause testing	279	26,867–26,902	1.00	(1.000,1.003)		1.00	(1.000,1.004)	*
Any random testing	1,461	125,980–126,171	1.08	(0.987,1.173)	+	1.04	(0.950,1.149)	
Volume of random testing	114	10,261–10,271	1.00	(1.000,1.000)		1.00	(1.000,1.001)	**
Random testing among all students	1,460	125,846–126,039	1.11	(0.892,1.386)		0.96	(0.761,1.213)	
When any random testing was implemented								
This or last year	105	8,815–8,828	0.74	(0.608,0.890)	**	0.87	(0.694,1.088)	
2–3 years ago			0.90	(0.752,1.079)		1.06	(0.888,1.267)	
4+ years ago			(ref)			(ref)		
Student athletes								
Perceive great risk in using marijuana at specified level								
Any athlete testing	1,340	29,206–29,228	1.09	(0.966,1.238)		1.17	(1.026,1.326)	*
Any random athlete testing	830	19,512–19,527	1.01	(0.865,1.177)		1.12	(0.947,1.324)	
Disapprove of using marijuana at specified level								
Any athlete testing	1,340	29,042–29,064	1.12	(0.984,1.275)	+	1.06	(0.913,1.238)	
Any random athlete testing	831	19,408–19,421	1.08	(0.914,1.282)		1.04	(0.850,1.278)	
Students participating in non-athletic extracurricular activities								

J Adolesc Health. Author manuscript; available in PMC 2014 June 01.

	School N	Student N	Occasional use OR	95% CI	p	Regular use OR	95% CI	p
Perceive great risk in using marijuana at specified level								
Any non-athlete extracurricular testing	1,345	34,061–34,104	1.01	(0.875,1.160)		1.14	(0.986,1.320)	+
Any random non-athlete extracurricular testing	831	22,297–22,329	1.02	(0.871,1.184)		1.22	(1.031,1.437)	*
Disapprove of using marijuana at specified level								
Any non-athlete extracurricular testing	1,346	33,921–33,959	1.13	(0.980,1.309)	+	1.03	(0.865,1.217)	
Any random non-athlete extracurricular testing	832	22,200–22,229	1.20	(1.002,1.433)	*	1.13	(0.929,1.383)	

Notes: Coeff=estimated regression coefficient. SE=standard error. OR=odds ratio. CI=confidence interval. OTM=illicit drugs other than marijuana. Middle school=8th grade. High school=10th and 12th grades combined. Student athletes defined as those who reported moderate to great participation in school athletic teams. Participants in non-athletic extracurricular activities defined as students who reported moderate to great participation in any of a variety of non-athletic extracurricular activities (academic clubs, performing arts, student publications, student government, etc.). All models simultaneously controlled for both student-level socio-demographics (gender, race/ethnicity, presence of both parents in the home, and average parental education), and school characteristics (grade (for high school models), region, sector, grade size, majority student race/ethnicity, population density, student socio-economic status), and year.

[a] Only for students in schools with any of the type of testing specified.

+ p<.10;

* p<.05;

** p<.01;

*** p<.001.

Table 4

Summary of Significant Multivariate Associations (p<.05) between School Drug Testing and Student Illicit Substance Use and Related Measures

1. Associations between SDT[a] and substance use among the general student population
No associations for middle school students[b]
For high school students:
Marijuana use
Higher with any for-cause testing
Lower among students in schools with any for-cause testing but high volume of such testing
Lower with any random testing
OTM[c] use
Higher with any for-cause testing
Higher with any random testing
Higher with random testing among all students
Lower in schools where random testing in place for 4+ years
2. Associations between SDT and substance use among the population of students subject to testing
Marijuana use
Lower among athletes with athlete testing for both middle and high school students
Lower among high school students subject to non-athlete extracurricular testing
OTM use
Higher among middle and high school students subject to non-athlete extracurricular testing
3. Associations between SDT and marijuana use beliefs and attitudes
Risk of marijuana use
General student population
Lower with any for-cause testing among high school students
Higher among high school students in schools with for-cause testing but high volume of such testing
Higher among high school students in schools with random testing but high volume of such testing
Higher in high schools where random testing in place for 4+ years
Populations subject to testing
Higher among high school students subject to athlete testing
Higher among high school students subject to non-athlete extracurricular testing
Disapproval of marijuana use
General student population
Lower with any for-cause testing among high school students
Higher among high school students in schools with any for-cause testing but high volume of such testing
Higher among high school students in schools with random testing but high volume of such testing
Higher in high schools where random testing in place for 4+ years
Populations subject to testing
Higher among middle school students subject to athlete testing
Higher among high school students subject to non-athlete extracurricular testing
4. Associations between SDT and extracurricular participation rates
No associations for middle or high school students.

Notes: All noted associations significant in multivariate models at p<.05 or less.

[a] SDT=Student drug testing.

[b] Lack of associations for middle school general student population may be related to the overall lower prevalence of SDT among middle schools.

[c] OTM = Illicit drugs other than marijuana.