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Characteristics associated with the diversion of controlled medications among adolescents

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Abstract

Background—The objective of this study was to estimate the lifetime prevalence of diversion (i.e., trading, selling, giving away or loaning) of four classes of controlled medications (pain, stimulant, anti-anxiety, and sleeping) among adolescents, and to identify demographic and behavioral characteristics of adolescents who divert their own controlled medications.

Methods—A web-based survey was self-administered by 2744 secondary school students from two southeastern Michigan school districts in 2009–2010. The sample consisted of 51% females, 65% Whites, 29% African-Americans, 4% Asians, 1% Hispanics and 1% from other racial categories.

Results—Thirty-three percent of the students had ever been prescribed at least one controlled pain, stimulant, anti-anxiety, or sleeping medication. Approximately 13.8% ($n = 117$) of lifetime prescribed users of controlled medications ($n = 848$) had ever traded, sold, given away or loaned their medications. Multiple logistic regression analyses indicated that being approached to divert medications, nonmedical use of prescription medications, externalizing behaviors, and being non-White were significantly associated with the diversion of controlled medications. Multiple logistic regression analysis indicated that the odds of substance use and abuse for lifetime prescribed users who diverted their controlled medications were significantly greater than prescribed users who never diverted.

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Contributors

Drs. McCabe, Boyd, Ross-Durow, and Young designed the study and wrote the protocol. Dr. McCabe managed the literature searches and summaries of previous related work. Mr. West undertook the statistical analysis, and Dr. McCabe wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

No conflict declared.

Conclusions—The findings indicate that approximately one in seven prescribed users had diverted their controlled medications in their lifetimes. Being approached to divert medications and substance use are more prevalent among adolescents who diverted their controlled medications. Careful assessments, diligent prescribing and monitoring of controlled medications, and continual patient education could be useful in reducing medication diversion.

Keywords

Prescription; Controlled; Medication; Diversion; Drug abuse; Adolescence; Survey

1. Introduction

There have been significant increases in the prescribing of controlled medications (e.g., pain, stimulant, anti-anxiety, and sleeping) among adolescents in the United States over the past two decades (Fortuna et al., 2010; Olfson et al., 2003; Safer et al., 1996; Thomas et al., 2006; Zacny et al., 2003; Zito et al., 2003). For example, controlled medications were prescribed at an increasing proportion of visits by adolescents between 1994 (6.4%) and 2007 (11.2%) (Fortuna et al., 2010). Although controlled medications are considered medically efficacious for treating a wide range of disorders, one consequence of their greater availability may be an increase in the diversion of these medications. For the purposes of this investigation, *diversion* is defined as the exchange (i.e., selling, trading, loaning, giving away) of controlled medications that leads to their use by individuals other than those for whom they were prescribed.

The nonmedical use of controlled medications is most prevalent among adolescents and young adults in the United States, and has significantly increased over the past two decades (Blanco et al., 2007; Johnston et al., 2010; McCabe et al., 2007, 2008; SAMHSA, 2010). Despite the well-documented increase in prescribed and nonmedical use, there are very few studies that have examined the diversion of controlled medications among adolescents, and the majority of such studies have neglected to examine characteristics associated with diversion behaviors.

Previous studies have found that only a minority of prescribed users divert their own controlled medications (Boyd et al., 2007; Daniel et al., 2003; Poulin, 2001). For example, a study of 7th, 9th, 10th, and 12th graders in Canada found that 15% of those who were prescribed stimulants gave them away, 7% reported selling them, 4% experienced theft, and 3% were forced to give someone their medications against their will, suggesting prescribed users could be targets of bullying by their peers (Poulin, 2001). Young men were significantly more likely to sell their stimulant medication than young women. Boyd et al. (2007) also found evidence for sex differences in diversion behaviors among secondary school students (7th through 12th grade). Specifically, a higher percentage of girls gave away their prescription medications as compared to boys (28% vs. 17%, $p = 0.01$). Daniel et al. (2003) also found that approximately 20% of girls and 13% of boys reported borrowing and/or sharing prescribed medications in their lifetimes ($p < 0.01$).

Past studies examining characteristics associated with the diversion of controlled medications have focused on young adults (Garnier et al., 2010; Wilens et al., 2006). Garnier et al. (2010) found that 35.8% of 483 college students prescribed a medication had diverted it at least once in their lifetime, and diverters had used more illicit drugs and had more childhood conduct problems than nondiversers. Wilens et al. (2006) examined diversion behaviors within the past 4 years in a clinical sample of 55 adults (mean age 21 years) with ADHD and found that 11% ($n = 6$) sold their medications. Approximately 83% ($n = 5$) of the ADHD adults diverting their medications met the criteria for a substance use

disorder, suggesting that substance-related problems may serve as a behavioral correlate for diversion. The authors acknowledged that the study was based on a small homogenous clinical sample of largely white middle class young adults who were seeking treatment for ADHD, which limited the generalizability of the findings, and they encouraged additional studies.

Despite the preliminary work, it remains unknown how early diversion of controlled medications starts among adolescents, which characteristics (e.g., demographic, behavioral) are associated with the diversion of controlled medications among adolescents, and whether diversion is part of a pattern of multiple problem behaviors (Biglan et al., 2004; Jessor et al., 1991). Based on the existing literature, it is hypothesized that sex, substance use, and conduct problems will be associated with diversion of controlled medications among adolescents. The primary objectives of this exploratory study were to estimate the lifetime prevalence of diversion of four classes of controlled medications (pain, stimulant, anti-anxiety, and sleeping) among adolescents in two southeastern Michigan school districts, and to identify the demographic and behavioral characteristics of those who divert their own controlled medications. A secondary objective of the study was to examine the prevalence of substance use and abuse as a function of diversion of controlled medications.

2. Methods

2.1. Study design

This study was conducted during a five-month period from December 2009 to April 2010, drawing on the entire population of middle and high school students attending two public school districts in the Detroit metropolitan area (7–12th grades). The study received approval from the University of Michigan Institutional Review Board, and a Certificate of Confidentiality was obtained from the National Institutes of Health. All students were asked to participate, active parental consent and adolescent assent were obtained, and the study followed all human subjects' protocol as determined by the U.S. Department of Health and Human Services.

The web-based survey was maintained on a hosted secure Internet site running under the secure sockets layer protocol to insure safe transmission of data. The final response rate for this web-based survey was 62%; this rate falls within the range of response rates from schools participating in a 2009 national school-based study of secondary school students using comparable data collection procedures (CDC, 2010).

2.2. Sample

In total, 2744 middle and high school students completed web-based surveys, but the subsample for this study consists of the 2625 students who completed all of the questions that form the basis of this study. The sample consisted of 51.0% females and 49.0% males, and the mean age of students was 14.8 years ($SD = 1.9$). The racial/ethnic distribution was 65.1% White, 29.4% African American, 3.7% Asian, 1.3% Hispanic, and 0.5% from other racial/ethnic categories. Comparisons between respondents and nonrespondents indicated no statistically significant differences in terms of sex or age. Nonresponse was associated with race/ethnicity ($\chi^2 = 6.1$, $df = 2$, $p < 0.05$), with Whites having a higher nonresponse rate (39.5%) compared to African Americans (35.5%) and other racial/ethnic categories (38.9%).

2.3. Measures

The Secondary Student Life Survey (SSLS) assesses demographic characteristics, bullying behaviors, and includes items from several national studies of alcohol and other drug use

(Johnston et al., 2010; SAMHSA, 2010). Standard measures of substance use were included, such as cigarette use, binge drinking, nonmedical use of prescription medications, and marijuana and other drug use.

Prescribed use of controlled medications was measured using the following question: “The following questions are about the use of prescribed medicines. We are not interested in your use of over-the-counter medicines that can be bought in drug or grocery stores without a prescription, such as aspirin, Sominex[®], Benadryl[®], Tylenol PM[®], cough medicine, etc. On how many occasions in your lifetime has a doctor, dentist, or nurse prescribed the following types of medicine for you?” A separate question was asked for each of the following four classes of controlled medications: (a) prescribed sleeping medication (e.g., Ambien[®], Lunesta[®], Restoril[®], temazepam, triazolam); (b) prescribed anti-anxiety medication (e.g., Ativan[®], Xanax[®], Valium[®], Klonopin[®], diazepam, lorazepam); (c) prescribed stimulant medication (e.g., Ritalin[®], Dexedrine[®], Adderall[®], Concerta[®], methylphenidate); and (d) prescribed pain medication (e.g., opioids such as Vicodin[®], OxyContin[®], Tylenol 3[®] with codeine, Percocet[®], Darvocet[®], morphine, hydrocodone, oxycodone). The response scale for each question ranged from (1) 0 occasions to (7) 40 or more occasions. For purpose of the analyses, a binary variable (yes/no) was created for: (a) lifetime prescribed use of each class of controlled medication, and (b) lifetime prescribed use of at least one of the four classes of controlled medications.

Diversion of controlled medications was assessed by asking respondents who reported any prescribed use of the four classes of controlled medications the following questions: “On how many occasions (if any) in your lifetime have you ever... (1) ... sold any of your prescription medication to someone?” (2) “... given or loaned your prescription medication to someone?” (3) “... traded your prescription medication for something else (e.g., other medications, other drugs, clothes, etc.)?” (4) “... been approached to sell, trade, or give away your prescription medication?” These questions were asked for each of the four aforementioned medication classes. The response scale for each question and coding was identical to the scale used for the prescribed use questions.

The Youth Self-Report (YSR; Achenbach, 1991; Achenbach and Rescorla, 2001) was used to assess internalizing symptoms (i.e., anxiety, depression, somatic symptoms) and externalizing symptoms (i.e., rule-breaking behaviors and aggressive behaviors). The YSR is designed for ages 11–18 and includes 105 items that assess emotional, behavioral, and social problems. Participants indicate how well each item describes them now or in the past 6 months using a 3-point scale (0 = not true of you, 1 = somewhat or sometimes true of you, 2 = very true or often true of you). Raw scores on the three internalizing syndromes were summed to create the internalizing scale, and raw scores on the two externalizing syndromes were summed to create the externalizing scale. Extensive evidence for the validity and reliability of the YSR is presented in Achenbach and Rescorla (2001). In the current sample, coefficient alphas for the internalizing and externalizing scales were 0.90 and 0.89, respectively.

The Drug Abuse Screening Test, Short Form (DAST-10) is a self-report instrument used to assess whether adolescents screened positive for probable drug abuse or dependence on a wide variety of substances other than alcohol (Skinner, 1982). Respondents who used drugs other than alcohol in the past 12 months were asked whether they had experienced any of 10 drug-related problems in the past 12 months. The DAST-10 can be used in clinical and non-clinical settings and it has good reliability, temporal stability, concurrent validity, and predictive validity (Cocco and Carey, 1998; McCabe et al., 2006; Maisto et al., 2000). Based on previous research, if a respondent positively endorsed three or more DAST items, this

was considered a “positive” screening test result, denoting risk for probable drug abuse or dependence (Skinner, 1982; Cocco and Carey, 1998; French et al., 2001).

The CRAFFT is a six-item self-report brief screening test used to assess whether adolescents had an alcohol or other drug problem (Knight et al., 1999). The CRAFFT was developed specifically for adolescents, has good internal consistency ($\alpha = 0.79$), and is highly correlated ($r = 0.84$) with the Personal Involvement with Chemicals Scale (PICS), the criterion standard for alcohol and other drug screening (Knight et al., 1999). Based on previous research, if a respondent positively endorsed two or more CRAFFT items, this was considered a “positive” screening test result (Knight et al., 1999).

2.4. Data analysis

Data analyses included the 2625 respondents who completed the questions that form the basis of this paper, and all statistical analyses were performed using the SPSS 18.0 software (SPSS Inc., an IBM Company, Chicago, IL, USA). Chi-square tests were used to compare the prevalence of lifetime diversion among prescribed users of controlled medications. Multiple logistic regression models were used to determine the odds of any lifetime diversion (and various types of diversion) of any controlled medications among lifetime prescribed users as a function of demographic and behavioral characteristics, which included sex, race/ethnicity, school, grade level, parental education, quantity of medication classes, frequency of prescribed use, perceived harm of nonmedical use, binge drinking, positive CRAFFT screen, marijuana use, nonmedical use of prescription medications, social and physical bullying victimization, internalizing behaviors, and externalizing behaviors. Chi-square tests and multiple logistic regression models were also used to compare the odds of selected lifetime, past-year and current drug use behaviors across the following three mutually exclusive groups of controlled medication users: (1) no lifetime prescribed use of controlled medication, (2) lifetime prescribed use of controlled medication without diversion, and (3) lifetime prescribed use of controlled medication with diversion (i.e., diversion refers to adolescents who sold, traded, loaned, or gave away their own controlled medications). Estimates of adjusted odds ratios (AOR) and 95% confidence intervals (95% CI) for the AORs were reported to describe adjusted contrasts between groups.

3. Results

3.1. Prevalence of diversion of controlled medications

Thirty-three percent (33%) of the students reported having a prescription for at least one controlled pain, stimulant, anti-anxiety, or sleeping medication in their lifetimes ($n = 848$). Among these lifetime prescribed users, approximately 13.8% ($n = 117$) had ever sold, traded, loaned, or given away their medications. As illustrated in Table 1, the leading type of diversion for each medication class was giving away or loaning, followed by selling, and then trading. Prescribed users of stimulant medication reported higher prevalence estimates of each type of diversion behavior compared to other prescribed users. When considering lifetime users of only one medication vs. lifetime users of multiple medications, lifetime users of multiple medications were clearly at higher risk of diversion behaviors than lifetime users of single medications. Only 9.1% of lifetime users of a single medication had ever given or loaned their medication, compared to 21.2% of lifetime users of multiple medications.

Approximately 15.6% ($n = 132$) of lifetime prescribed users of pain, stimulant, anti-anxiety, and sleeping medications were *approached* to divert their medication in their lifetimes. Prescribed users of stimulant medications for ADHD were most likely to be approached to

divert their medications, with one in every four prescribed users having been approached to divert.

The prevalence of any lifetime diversion (trading, selling, giving away, or loaning) was significantly higher among prescribed users who had been approached to divert their controlled medications than those who had not been approached (47.0% vs. 7.7%, $p < 0.05$). Furthermore, nearly one-third (30.3%) of lifetime prescribed users of controlled pain, stimulant, anti-anxiety, and sleeping medications who were approached to divert their medications in their lifetime had sold their medications, compared to less than 1% (0.1%) of those who had not been approached ($p < 0.05$). In addition, more than one-third (34.8%) of lifetime prescribed users of controlled pain, stimulant, anti-anxiety, and sleeping medications who were approached to divert their medications had given away or loaned their medications, compared to 7.1% who had not been approached ($p < 0.05$).

3.2. Demographic and behavioral characteristics associated with diversion

Next, we examined the prevalence of any lifetime diversion of controlled medications by demographic characteristics and type of medication prescribed in the respondent's lifetime (see Table 2). Although there were minimal sex and grade level differences, there were significant racial differences in the prevalence of diversion of controlled medications, with White students reporting lower prevalence of diversion than African-American students and those from other racial/ethnic groups.

As illustrated in Table 3, multiple logistic regression analyses indicated that being non-White, engaging in nonmedical use of prescription medications in the past-year, being approached to divert medications, and externalizing behaviors were characteristics that were significantly associated with any lifetime diversion of controlled medications, after adjusting for relevant covariates. The odds of any lifetime diversion among lifetime prescribed users who were approached to divert their medications were almost nine times greater than for prescribed users who were never approached to divert (AOR = 8.98, 95% CI = 4.64, 17.35, $p < 0.001$). Separate multiple logistic regression models were also used to determine the odds of each type of lifetime diversion (selling, giving away/loaning, and trading) of any controlled medications as a function of demographic and behavioral characteristics. We found that the associated characteristics varied across different types of diversion. For example, nonmedical use of prescription medications was significantly associated with selling controlled medications after adjusting for relevant covariates while the characteristics associated with giving away/loaning controlled medications included being non-White, engaging in nonmedical use of prescription medications, being approached to divert medications, and externalizing behaviors.

As illustrated in Table 4, we examined several types of lifetime, past-year and current substance use and abuse as a function of lifetime diversion of controlled medications, and found significant associations with all outcomes. The prevalence of substance use and abuse was significantly higher among prescribed users of controlled medications who had diverted their medications compared to their peers. For example, the prevalence of past-year marijuana use was 40% among lifetime prescribed users who diverted their controlled medications, 12% among lifetime prescribed users who never diverted their controlled medications, and 9% among those who had never been prescribed controlled medications.

As illustrated in Table 5, multiple logistic regression results indicated that the odds of lifetime, past-year and current substance use and abuse for lifetime prescribed users who diverted their medications were significantly greater than for lifetime prescribed users who never diverted their medications after adjusting for relevant covariates. In contrast, the odds of substance use and abuse did not differ significantly between lifetime prescribed users who

never diverted their medications and nonusers, with the exception of the past-year nonmedical use of prescription medications. The odds of a positive screen for past-year drug abuse (based on the DAST-10) among lifetime prescribed users who diverted their medications were more than nine times greater than for prescribed users who never diverted (AOR = 9.04, 95% CI = 5.37–15.21, $p < 0.001$), while the odds of a positive drug screen did not differ significantly between lifetime prescribed users who never diverted their medications and nonusers.

4. Discussion

The present study found that approximately one in seven prescribed users had ever traded, sold, given away or loaned their controlled medications, which is similar to prevalence estimates reported in previous work with adolescents (Boyd et al., 2007; Daniel et al., 2003; Poulin, 2001). For each of the four medication classes examined, the most common type of lifetime diversion was giving away or loaning controlled medications. Approximately one in every six prescribed users had ever been approached to divert their medications. Adolescents prescribed stimulant medications for ADHD were more likely to be approached to divert their medications than those prescribed pain, anti-anxiety or sleeping medications. In fact, almost one in every four prescribed users of stimulant medications for ADHD was ever approached to divert their medications. Nearly 50% of the prescribed users who were approached to divert actually sold, gave away, or traded their medications, compared to less than 8% of those who were not approached to divert.

A novel contribution of this study was the identification of several characteristics which were significantly associated with the lifetime diversion of controlled medications among young adolescents, including race, nonmedical use of controlled medications, being approached to divert medications, and other externalizing behaviors. The results of this study indicated that White students were less likely than those from other racial groups to divert their medications. These racial differences in diversion were present for all controlled medication classes with the exception of sleeping medications. Multiple logistic regression results revealed that the racial differences in diversion were largely driven by giving away or loaning controlled medications rather than selling or trading controlled medications. Previous work has documented individual- and institutional-level barriers for receiving controlled medications among racial minority patients (Anderson et al., 2009; Burgess et al., 2008; Green et al., 2005). For example, Michigan pharmacies in minority zip codes (at least 70% minority residents) were 52 times less likely to carry sufficient opioid analgesics than pharmacies in white zip codes (at least 70% white residents) regardless of income (Green et al., 2005). Thus, the racial differences in diversion behaviors could be related to the lack of adequate treatment, insufficient availability, and/or under-prescribing among non-White populations.

Diversion was also significantly associated with higher rates of nonmedical use of controlled medications and other externalizing behaviors. The reasons prescribed users who engage in multiple problem behaviors are at higher risk to divert their medications are not entirely clear based on this study and previous work reporting similar results (Garnier et al., 2010; Poulin, 2001; Wilens et al., 2006). One interpretation is that the diversion of controlled medications is part of a pattern of multiple problem behaviors with shared risk factors, and prescribed users who engage in problem behaviors have increased risk for diversion (Biglan et al., 2004; Jessor et al., 1991). For example, substance use increases the likelihood of associating with other adolescents engaging in substance use who may approach their peers to divert controlled medications. Notably, we found that the odds of any lifetime diversion were nine times greater among prescribed users of controlled medications who were approached to divert their medication, compared to those prescribed users who were not

approached to divert, after adjusting for other relevant covariates. Another interpretation is that prescribed users who divert their medications are at risk of being non-compliant with their therapeutic medication regimen, and this could result in an exacerbation of symptoms, which could in turn result in externalizing behaviors such as substance use to self-medicate untreated symptoms. Clearly, more research is needed to examine age of onset of diversion and the reasons prescribed users who engage in multiple problem behaviors are more likely to divert their medications. Regardless of the temporal associations between problem behaviors and diversion, the clinical implications of these findings are that adolescents with documented problems associated with diversion of controlled medications should be screened for diversion and monitored more closely.

The current study has some limitations that should be taken into account when considering implications of the findings. Based on the cross-sectional nature of this study, we acknowledge the complexity involved in examining the relationship between diversion and other problem behaviors during early adolescence. Therefore, we have considered various possible interpretations of our findings. Second, the results cannot be generalized to other adolescent populations because our sample was selected from two school districts in southeastern Michigan and did not include individuals who had dropped out of school. Third, the data are subject to the potential bias introduced when collecting sensitive behaviors via self-report surveys. The present study attempted to minimize potential biases by using computer-based self-administration, informing potential respondents that participation was voluntary, and assuring potential respondents that data would remain confidential (Harrison and Hughes, 1997; Johnston and O'Malley, 1985; Turner et al., 1998). Next, differential nonresponse across racial/ethnic groups may have introduced bias in the estimates reported in the present study. Finally, the questionnaire items did not specify the diagnosis, length of time prescribed, or quantity and dose of the controlled medication, and future research on diversion behavior would benefit from examining such information.

Prescribers can provide useful assistance to patients receiving controlled medications by explaining that the diversion of controlled medications can lead to serious legal consequences, as well as potentially life-threatening health consequences. Unlike health professionals, individuals who divert controlled medications do not conduct careful diagnostic assessments, complete medical histories, or perform safety screening and ongoing monitoring of people receiving the medications, which can lead to serious complications in those to whom medications are diverted. For example, an individual with undiagnosed heart problems, such as hypertrophic cardiomyopathy, could be given a stimulant medication by a friend with a prescription, and experience sudden cardiac death. Given the findings in this study that almost a quarter of adolescents prescribed stimulants were approached to divert, and nearly 50% of these teens diverted, prescribers should counsel adolescents about the importance of not diverting these medications, and repeat these conversations for each newly written prescription and refill. Based on the results of this study, prescribers should warn patients that they may be approached to divert their medicines and a plan should be developed with patients if requests to divert occur.

Physicians should instruct all patients who require controlled medications about the abuse potential of these medications, and the need to store their prescriptions in a secure location. Given that many individuals obtain diverted prescription medications for nonmedical use from friends, peers, and family members (Boyd et al., 2007; McCabe and Boyd, 2005), clinicians prescribing these medications should exercise caution, and periodically monitor their patients' behavior over the course of treatment. They should also consider limiting both the quantity of medication prescribed, as well as the number of refills, which in turn requires more frequent clinician-patient interactions and therapeutic monitoring. These steps could result in both a reduction in the overall supply of controlled substances available for

diversion and nonmedical use, and could improve the treatment of target symptoms for which the medications were initially prescribed.

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Table 1

Prevalence of lifetime diversion by class of prescribed controlled medications.^a

Lifetime diversion outcomes	Lifetime pain medication (% n/ Base n)	Lifetime prescribed stimulant medication (% n/Base n)	Lifetime prescribed anti-anxiety medication (% n/Base n)	Lifetime prescribed sleeping medication (% n/Base n)	Any lifetime prescribed controlled medication ^a (% n/Base n)	Lifetime prescribed only one medication class (% n/Base n)	Lifetime prescribed multiple medication classes (% n/Base n)
Approached to divert own medication	14.9% 105/704	24.1% 34/141	11.5% 12/104	13.0% 14/108	15.6% 132/848	13.6% 91/668	24.1% 41/170
Sold own medication	4.5% 32/714	9.6% 14/146	6.5% 7/108	5.3% 6/114	4.8% 41/848	3.7% 25/672	9.4% 16/170
Given or loaned own medication	12.0% 86/714	13.7% 20/146	7.4% 8/108	7.0% 8/114	11.4% 97/848	9.1% 61/672	21.2% 36/170
Traded own medication	2.4% 17/714	7.5% 11/146	6.5% 7/108	6.1% 7/114	2.6% 22/848	1.3% 9/672	7.6% 13/170
Any diversion (i.e., sold, gave away, loaned, traded)	14.0% 100/714	16.4% 24/146	11.1% 12/108	9.6% 11/114	13.8% 117/848	11.5% 77/672	23.5% 40/170

^a Any lifetime prescribed controlled medication refers to the prescribed use of at least one of the following prescription medication classes in the respondent's lifetime: pain, stimulant, anti-anxiety, sleeping medications.

Table 2

Prevalence of any lifetime diversion^a of controlled medication among students ever prescribed controlled medications in a lifetime, by demographic characteristics and class of medication prescribed.

	Lifetime prescribed pain medication (% n/Base n)	Lifetime prescribed stimulant medication (% n/Base n)	Lifetime prescribed anti-anxiety medication (% n/Base n)	Lifetime prescribed sleeping medication (% n/Base n)	Any Lifetime prescribed controlled medication ^b (% n/Base n)
Total	14.0% 100/714	16.4% 24/146	11.1% 12/108	9.6% 11/114	13.8% 117/848
Sex					
Male	14.0% 40/286	20.7% 18/87	20.0% 8/40*	10.0% 6/60	13.4% 49/365
Female	14.0% 60/428	10.2% 6/59	5.9% 4/68*	9.3% 5/54	14.1% 68/483
Grade level					
Grades 7–8	10.9% 22/202	20.0% 6/30	9.1% 2/22	7.1% 3/42	11.7% 27/231
Grades 9–12	15.2% 78/512	15.5% 18/116	11.6% 10/86	11.1% 8/72	14.6% 90/617
Race/ethnicity					
White	12.0% 61/509*	12.9% 15/116*	6.6% 6/91*	11.4% 9/79	11.3% 69/613*
African-American	19.3% 33/171*	25.0% 6/24*	38.5% 5/13*	6.5% 2/31	20.0% 39/195*
Other ^c	17.6% 6/34*	50.0% 3/6*	25.0% 1/4*	0.0% 0/4	22.5% 9/40*

* $p < 0.05$ based on chi-square results.

^a Any lifetime diversion refers to selling own controlled medication to someone else, giving away or loaning own controlled medication to someone else, or trading own controlled medication for something else (e.g., other medications, other drugs, clothes, etc.).

^b Any lifetime prescribed controlled medication refers to the prescribed use of at least one of the following controlled medication classes in the respondent's lifetime: pain, stimulant, anti-anxiety, sleeping medications.

^c Other race/ethnicity refers to Asian, Hispanic, and other racial/ethnic categories.

Table 3

Adjusted odds of various types of lifetime diversion of any controlled medications as a function of demographic and behavioral characteristics (lifetime prescribed users only).

	Any lifetime diversion ^a AOR ^b (95% CI)	Any lifetime selling AOR ^b (95% CI)	Any lifetime giving/loaning AOR ^b (95% CI)
Race			
White	Reference	Reference	Reference
African-American	5.14 (2.46, 10.76) ***	2.44 (0.32, 18.69)	6.07 (2.77, 13.28) ***
Other	4.01 (1.32, 12.21) *	0.39 (0.03, 6.03)	4.68 (1.47, 14.90) **
Past-year nonmedical use of controlled medication ^c			
No	Reference	Reference	Reference
Yes	2.58 (1.25, 5.36) *	5.71 (1.15, 28.25) *	3.09 (1.47, 6.48) **
Any lifetime approached to divert			
No	Reference	Reference	Reference
Yes	8.98 (4.64, 17.35) ***	N/A	4.57 (2.26, 9.25) ***
Externalizing behaviors	1.04 (0.99, 1.09)	1.06 (0.97, 1.17)	1.05 (1.00, 1.10) *

N/A = not applicable because only 1 lifetime user who had not been approached to divert in his/her lifetime reported having sold, and this person was dropped from the analysis due to missing data.

Note: The estimation procedure for the model for lifetime trading of controlled medications did not converge due to a lack of variance in the dependent variable for race/ethnicity groups and social bullying, so we do not report those results here.

$n = 704$ for all three models.

^a Any lifetime diversion refers to selling own controlled medication to someone else, giving or loaning own controlled medication to someone else, or trading own controlled medication for something else (e.g., other medications, other drugs, clothes, etc.) for at least one of the following controlled medication classes: pain, stimulant, anti-anxiety, sleeping medications.

^b Odds ratios are also adjusted for binge drinking, marijuana use, CRAFFT screen, social bullying, physical bullying, gender, school, grade level, parental education, quantity of medication classes, frequency of prescribed use, perceived harm of nonmedical use, and internalizing behaviors (odds ratios for these variables were not significant and are not shown).

^c Nonmedical use refers to any use of at least one of the following controlled medication classes not prescribed to respondent: pain, stimulant, anti-anxiety, sleeping medications.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$ based on logistic regression results.

Table 4Prevalence of substance use and abuse as a function of diversion of controlled medications.^a

Substance use and abuse outcomes	Lifetime prescribed use without diversion ^b No. (%); Base n	Lifetime prescribed use with diversion ^b No. (%); Base n	No lifetime prescribed use ^b No. (%); Base n
Past-month cigarette smoking	5.7% 41/714*	32.4% 36/111*	4.7% 82/1748*
Past 2-week binge drinking ^c	4.7% 33/708*	23.0% 26/113*	2.7% 47/1715*
Positive CRAFFT screen (lifetime)	13.3% 95/714*	45.0% 50/111*	9.3% 161/1733*
Past-year use of marijuana	11.7% 84/718*	39.5% 45/114*	9.3% 161/1739*
Past-year use of other illicit drugs ^d	2.1% 15/722*	19.1% 22/115*	1.4% 24/1756*
Past-year nonmedical use of controlled medication ^e	10.8% 74/684*	32.6% 31/95*	4.6% 78/1712*
Positive DAST-10 ^f screen (past-year)	7.5% 55/730*	36.8% 43/117*	4.0% 71/1776*

^aDiversion of controlled medication refers to selling own controlled medication to someone else, giving or loaning own controlled medication to someone else, or trading own controlled medication for something else (e.g., other medications, other drugs, clothes, etc.) for at least one of the following controlled medication classes: pain, stimulant, anti-anxiety, sleeping medications.

^bPrescribed use refers to the use of at least one of the following controlled medication classes: pain, stimulant, anti-anxiety, sleeping medications.

^cBinge drinking refers to consuming four or more drinks (five or more for women) in a 2 hour period.

^dOther illicit drugs refers to the use of at least one of the following drugs: cocaine, LSD, other psychedelics, crystal methamphetamine, heroin, inhalants, ecstasy, GHB or Rohypnol.

^eNonmedical use refers to any misuse of at least one of the following controlled medication classes not prescribed to the respondent: sleeping, anti-anxiety, stimulant, or pain medications.

^fDAST-10 refers to the Drug Abuse Screening Test, short form.

* $p < 0.05$ based on chi-square results.

Table 5

Logistic regression modeling results showing adjusted odds of substance use and abuse as a function of diversion of controlled medications.^a

Substance use and abuse outcomes	Lifetime prescribed use without diversion ^b AOR ^c (95% CI)	Lifetime prescribed use with diversion ^b AOR ^c (95% CI)	No lifetime prescribed use ^a AOR ^c (95% CI)
Past-month cigarette smoking	Reference	9.79 (5.58, 17.19)***	1.21 (0.81, 1.80)
Past 2-week binge drinking ^d	Reference	7.33 (3.98, 13.51)***	0.88 (0.55, 1.40)
Positive CRAFFT screen (lifetime)	Reference	5.77 (3.54, 9.39)***	0.90 (0.67, 1.20)
Past-year use of marijuana	Reference	5.34 (3.26, 8.75)***	1.04 (0.77, 1.40)
Past-year use of other illicit drugs ^e	Reference	16.23 (7.67, 34.35)***	0.82 (0.42, 1.60)
Past-year nonmedical use of controlled medication ^f	Reference	4.09 (2.45, 6.82)***	0.47 (0.33, 0.66)***
Positive DAST-10 ^g screen (past-year)	Reference	9.04 (5.37, 15.21)***	0.72 (0.49, 1.05)

The sample sizes for these models ranged from 2445 for past-year binge drinking to 2623 for positive DAST-10 screen.

^a Prescribed use refers to the use of at least one of the following controlled medication classes: pain, stimulant, anti-anxiety, sleeping medications.

^b Diversion of controlled medication refers to selling own controlled medication to someone else, giving or loaning own controlled medication to someone else, or trading own controlled medication for something else (e.g., other medications, other drugs, clothes, etc.) for at least one of the following controlled medication classes: pain, stimulant, anti-anxiety, sleeping medications.

^c Odds ratios are also adjusted for sex, race, school, and grade level (odds ratios for these variables are not shown).

^d Binge drinking refers to consuming four or more drinks (five or more for women) in a 2 hour period.

^e Other illicit drugs refers to the use of at least one of the following drugs: cocaine, LSD, other psychedelics, crystal methamphetamine, heroin, inhalants, ecstasy, GHB or Rohypnol.

^f Nonmedical use refers to any misuse of at least one of the following controlled medication classes not prescribed to respondent: pain, stimulant, anti-anxiety, sleeping medications.

^g DAST-10 refers to the Drug Abuse Screening Test, short form.

*** $p < 0.001$ based on logistic regression results.