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Trends in Medical Use, Diversion, and Nonmedical Use of Prescription Medications among College Students from 2003 to 2013: Connecting the Dots

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Abstract

Objectives—To examine trends in the lifetime and past-year prevalence of medical use, diversion, and nonmedical use of four prescription medication classes (i.e., sedative/anxiety, opioid, sleeping, and stimulant) among college students between 2003 and 2013; and to identify demographic and background characteristics associated with trends in past-year nonmedical use of prescription medications.

Methods—A self-administered, cross-sectional Web survey was conducted in 2003, 2005, 2007, 2009, 2011, and 2013 at a large public four-year university in the Midwest United States.

Results—Approximately one in every five individuals reported nonmedical use of at least one prescription medication class in their lifetime. The past-year prevalence of medical use, diversion

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Contributors

SEM conceived the original idea for the study and drafted the introduction and discussion sections. SEM and CJT jointly conducted the literature review. BTW conducted all of the data analyses and interpretation. SEM and BTW jointly drafted the methods and results sections. All authors contributed to and have approved the final manuscript.

Conflict of interest

There are no conflicts of interest by any author.

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and nonmedical use of prescription stimulants increased significantly between 2003 and 2013 while the past-year prevalence of medical use, diversion and nonmedical use of prescription opioids decreased significantly over this same time period. The odds of past-year nonmedical use of each prescription medication class were generally greater among males, Whites, members of social fraternities and sororities, and those with a lifetime history of medical use of prescription medications or a past-year history of being approached to divert their prescription medications.

Conclusions—The present study represents the first investigation to demonstrate that trends in medical use of controlled medications parallel changes in diversion and nonmedical use of the same medication class among college students. The findings reinforce the importance of continued monitoring of prescription medication use at colleges to help guide prevention and intervention efforts.

Keywords

Trend; Prescription Medication; College students; Anxiolytic; Opioid; Sleeping; Stimulant; Nonmedical use; Substance abuse; Diversion; Epidemiology

1. Introduction

Although several studies have reported recent increases in the prescribing of controlled medications (e.g., sedative/anxiety, opioid, sleeping, stimulant) among children, adolescents and young adults in the United States (Thomas et al., 2006; Fortuna et al., 2010; Zuvekas & Vitiello, 2012), there is a lacuna of knowledge regarding recent trends in medical use of controlled medications among college students in the United States, and related behaviors such as diversion and nonmedical use. To date, there is limited data regarding trends in the medical use and diversion of controlled medications among college students in the United States, leaving an important knowledge gap. And once medical users divert (e.g., sell, trade, or give away) their own medications to peers, these medical users create nonmedical users (e.g. a person who uses controlled medications without their own prescription). In this way, medical use, diversion and nonmedical use of prescription medications are inter-related behaviors, especially among adolescents and young adults who rely primarily on their peers as sources of diversion for nonmedical use (Arria et al., 2008; Arria & DuPont, 2010; Johnston et al., 2013; McCabe et al., 2007a, 2011).

Analyzing data from the Monitoring the Future (MTF) study, Johnston and colleagues (2013) examined the trends in nonmedical use of prescription medications among college students and found evidence for significant changes over the past decade. However, the MTF study does not report trends in diversion and medical use among college students and study measures for nonmedical use changed over time and combined “street” drugs in some prescription categories. For example, the MTF study introduced new medications (e.g. Adderall® in 2007) and included “street” drugs (e.g. crystal methamphetamine) in the same question with prescription amphetamines (e.g. Ritalin®). As a result, trends in nonmedical use of prescription medications among college students over the past decade that are estimated using the MTF data are difficult. The National Epidemiologic Survey on Alcohol and Related Conditions and the National Survey on Drug Use and Health both suffer from similar measurement limitations (Boyd & McCabe, 2008; Hubbard et al., 1992).

The past-year prevalence of nonmedical use of prescription medications increased significantly between 1993 and 2001 among U.S. college students and varied considerably between individual U.S. colleges (McCabe et al., 2005a, 2007b, 2011). For example, College Alcohol Survey (CAS) data collected from 10,904 college students who were randomly selected from a nationally representative sample of 119 U.S. colleges in 2001 revealed that the past-year prevalence rates of nonmedical use of prescription medications (i.e., sedative/anxiety, opioid, sleeping, and stimulant) ranged from zero percent at the lowest use schools to 31% at the highest use school (McCabe et al., 2011). Unfortunately, the CAS did not contain measures of diversion and medical use of prescription medications and has not collected data recently.

Although previous college-based cross-sectional regional and national studies indicate that the nonmedical use of prescription medications is generally more prevalent among males, Whites, members of social fraternities and sororities, and those with a lifetime history of medical use of prescription medications (Johnston et al., 2013; McCabe, 2008a, 2008b; McCabe et al., 2005a, 2005b, 2007a), it remains unknown whether these characteristics remain significantly associated with nonmedical use of prescription medications over time. The main objectives of the present study were to 1) examine the trends in lifetime and past-year prevalence of medical use, diversion, and nonmedical use of prescription medications between 2003 and 2013 among college students; and 2) identify demographic and background characteristics associated with trends in nonmedical use of prescription medications between 2003 and 2013.

2. Materials and methods

2.1. Data collection

After receiving Institutional Review Board approval [H03-00002776-R2], the College Student Life Survey (CSLS) was conducted during a one-month period, drawing on the total undergraduate population of full-time students attending a large public research university located in the Midwest United States in the winter semesters of the 2003 (N=21,294), 2005 (N=20,138), 2007 (N=25,555), 2009 (24,574), 2011 (N = 25,874) and 2013 (N=26,156) school years. A simple random sample of full-time students was drawn from the total undergraduate population for each of the six studies. The University's Registrar Office provided the study team with the total student population during each Winter term and a computer program was used to randomly draw a sample from the total population.

The entire sample was sent a pre-notification letter describing the study and inviting students to self-administer a Web survey by using a URL address and unique password. Informed consent was obtained online from each participant. Non-respondents were sent up to three reminder e-mails. The CSLS instrument was maintained on an Internet site running under the secure socket layer protocol to ensure privacy and security. By participating in the survey, students became eligible for a sweepstakes that included cash and other prizes. The average response rate for the six study years was 50% based on guideline #2 (RR2) of the American Association for Public Opinion Research (AAPOR, 2011) which is similar to other studies of college students such as the CORE study (Presley & Pimentel, 2006), the CAS (Wechsler et al, 2002), and the National College Health Assessment (Zullig & Divin,

2012). The potential for nonresponse bias was assessed by administering a short form of the questionnaire via a brief telephone survey to a randomly selected sample of 159 students who did not respond to the original web survey and analyses of these data produced minimal evidence for nonresponse bias. In particular, there were no significant differences in prevalence rates of past-year alcohol use, binge drinking, 30-day cigarette smoking and other problem health behaviors between respondents who completed the original web survey and respondents to the follow-up phone survey (McCabe, 2008a; McCabe & Teter, 2007).

2.2. Sample

As illustrated in Table 1, the overall respondent sample across all six study years consisted of 21,771 undergraduate college students (56% female and 44% male). The mean age of respondents in the overall sample was 20 years of age (age range = 17 to 56). The racial/ethnic distribution for the overall sample was 68% White, 13% Asian, 6% African-American, 4% Hispanic, and 10% from other racial/ethnic categories. The demographic characteristics of the overall respondent sample closely resembled the characteristics of the undergraduate student population. For example, the mean age of the population was 20 years of age, and the population was 50% female, 65% White, 13% Asian, 7% African-American, 5% Hispanic and 10% from other racial/ethnic categories. Comparisons across study years indicated no statistically significant differences in terms of age, gender or fraternity/sorority membership distributions. However, study year was associated with race/ethnicity ($p < 0.001$), with African-Americans and individuals reporting other ethnicity having slightly higher than expected representation (7.9% and 13.5%) in 2009, and Asians having higher than expected representation in 2011 (15.1%).

2.3. Measures

For all six study years between 2003 and 2013, the web-based CSLS assessed demographic characteristics (e.g., age, gender, race/ethnicity) and included items adapted from several national studies of alcohol and other drug use (Johnston et al., 2013; SAMHSA, 2009). Many of these substance use items are known to be valid and reliable for population-based research using multiple modes of data collection, including pencil-and-paper, mail, and web-based surveys (Johnston & O'Malley, 1985; McCabe, 2004; O'Malley et al., 1983). Standard measures of substance use were included, such as nonmedical use of prescription medications, medical use of prescription medications, being approached to divert prescription medications, marijuana use, other drug use, and problems related to drug use in the past year.

Nonmedical use of prescription medications was assessed with the following items: "Sometimes people use prescription drugs that were meant for other people, even when their own doctor has not prescribed it for them. On how many occasions in (your lifetime or the past 12 months) have you used the following types of drugs not prescribed to you?" A separate question was asked for each of the following four classes of prescription drugs: (a) Sleeping medication (e.g., Ambien, Halcion, Restoril, temazepam, triazolam); (b) Sedative/anxiety medication (e.g., Ativan, Xanax, Valium, Klonopin, diazepam, lorazepam); (c) Stimulant medication (e.g., Ritalin, Dexedrine, Adderall, Concerta, methylphenidate); and (d) Pain medication (i.e., opioids such as Vicodin, OxyContin, Tylenol 3 with codeine,

Percocet, Darvocet, morphine, hydrocodone, oxycodone). The response scale for each question ranged from (1) No occasions to (7) 40 or more occasions.

Medical use of prescription medications was assessed with the following items: “Based on a doctor’s prescription, on how many occasions in (your lifetime or the past 12 months) have you used the following types of drugs?” A separate question was asked for each of the four classes of prescription medications. The medication examples and response scales for each question were identical to the nonmedical use of prescription medications.

Diversion of prescription medication was assessed from people reporting medical use of prescription medication with the following items: “On how many occasions in the past 12 months have you been approached to sell, trade or give away your prescription medication?” A separate question was asked for each of the four classes of prescription medications. The medication examples and response scales for each question were identical to the nonmedical use of prescription medications.

2.4. Data analysis

For each class of prescription medication (in addition to *any* prescription medication), we first computed the proportions of CSLS respondents in each of the six survey years indicating lifetime medical or non-medical use of that class, in addition to the proportions of respondents indicating medical use, non-medical use, and being approached to divert medication in the past year (both for all respondents and all past-year medical users). Given the independent cross-sectional samples in each survey year, the associations between survey year and specific lifetime or past-year use / diversion outcomes were tested using Pearson’s chi-square test. We next used a similar approach to examine trends in the *frequency* of lifetime and past-year nonmedical use of each class of prescription medication (in addition to any medication). We then fitted five logistic regression models predicting the probability of past-year nonmedical use of each class of prescription medication and any of the medication classes. Covariates in the logistic regression models included study year, gender, race, fraternity/sorority membership status, lifetime history of nonmedical use of a particular class, and being approached to divert the medication in the past year. Two-way interactions between study year and each other covariate were tested for significance in the five models to determine whether trends in nonmedical use tended to vary as a function of socio-demographic characteristics. Given the large sample sizes and the five models being fitted, we used an alpha level of 0.01 to identify significant relationships, and focused on the presentation of odds ratios to communicate the sizes of our effects. We also present Phi statistics for all of our chi-square tests as measures of effect sizes. All analyses were conducted using the IBM SPSS Statistics software (Version 21).

3. Results

3.1. Trends in prevalence and frequency of nonmedical use of prescription medications

As illustrated by Table 2, we examined the trends in lifetime and past-year *prevalence* of nonmedical use of prescription medications between 2003 and 2013. There was evidence of a non-linear trend in the estimated lifetime prevalence of non-medical use of *any* prescription medications, marked by a general decrease from 2003–2009 and then an

increase from 2009 to 2013. The estimated lifetime and past-year prevalence of nonmedical use of prescription stimulants increased significantly between 2003 and 2013 (lifetime: $\chi^2(5) = 68.4, p < 0.001$; past-year: $\chi^2(5) = 65.8, p < 0.001$). In contrast, the estimated lifetime and past-year prevalence of nonmedical use of prescription opioids experienced a significant decrease over time (lifetime: $\chi^2(5) = 175.1, p < 0.001$; past-year: $\chi^2(5) = 117.2, p < 0.001$). Notably, there were no significant year-to-year changes in the past-year prevalence of nonmedical use of prescription opioids or stimulants (see Figure 1). The results therefore suggest a general increase (for prescription stimulants) and decrease (for prescription opioids) over time, rather than any one large change. The prevalence of both lifetime and past-year nonmedical use of prescription sedative/anxiety and sleeping medication appeared to be stable during this time.

We also examined the trends in lifetime and past-year *frequency* of nonmedical use of prescription medications between 2003 and 2013 (as measured by No occasions, 1–2 occasions, 3–5 occasions, or 6+ occasions), and found results similar to those for the overall prevalence estimates (results not shown). In particular, we found that the frequency of lifetime and past-year nonmedical use of prescription stimulants increased significantly between 2003 and 2013 (lifetime: $\chi^2(15) = 85.6, p < 0.001$; past-year: $\chi^2(15) = 80.7, p < 0.001$) while the frequency of lifetime and past-year nonmedical use of prescription opioids decreased over this same time period (lifetime: $\chi^2(15) = 179.4, p < 0.001$; past-year: $\chi^2(15) = 121.9, p < 0.001$). There were no significance changes in the lifetime and past-year frequency of nonmedical use of sleeping and sedative/anxiety medications. Interestingly, we found a consistent pattern of infrequent use (1–2 occasions) among those who reported nonmedical use of the three CNS depressant medication classes (sedative/anxiety, opioid and sleeping medications) while more frequent use (3 or more occasions) was consistently more normative for those who reported nonmedical use of stimulant medications over time.

3.2. Trends in prevalence estimates of medical use and diversion of prescription medications

As illustrated in Table 2, the estimated lifetime and past-year prevalence of medical use of prescription sedative/anxiety ($p < 0.01$), sleeping ($p < 0.05$ for past-year only), and stimulant medications ($p < 0.001$) increased significantly between 2003 and 2013 while the estimated lifetime and past-year prevalence of medical use of prescription opioids decreased over this same time period ($p < 0.001$). The estimated past-year prevalence of being approached to divert prescription sedative/anxiety and sleeping medications did not change significantly between 2003 and 2013. However, the past-year prevalence of being approached to divert prescription stimulants increased while the past-year prevalence of being approached to divert prescription opioids decreased over this same time period ($p < 0.001$).

3.3. Characteristics associated with past-year nonmedical use of prescription medications

Table 3 presents results from the five logistic regression models, fitted to predict the probability of past-year nonmedical use for each of the four medication classes (in addition to any of the four classes). Notably, we did not find any significant two-way interactions between study year and the other covariates (despite the large sample sizes), suggesting that any trends over time were consistent across different subgroups defined by the various

covariates. Consistent with the bivariate analysis results, we found evidence of significant increases in the odds of past-year nonmedical use of prescription stimulants when adjusting for the other covariates (relative to 2003), and significant *decreases* in the odds of past-year nonmedical use of pain medications (again relative to 2003). We also found that females, Asians, and African-Americans had a general tendency to have lower odds of past-year nonmedical use across the study years and medication classes. For example, the odds of nonmedical use of sedative/anxiety medications in the past year were estimated to be 34% lower for females compared to males across the study years (AOR = 0.66, 95% CI = 0.56, 0.79). In contrast, social fraternity/sorority membership, lifetime history of medical use of a given class, and being approached to divert medication in the past year all had strongly significant associations with the odds of past-year nonmedical use, increasing the odds of this behavior in nearly every case when adjusting for the other covariates. We note that the odds ratios found to be significantly different from 1.0 in Table 3 represent sizeable effects regardless of the sample size, and that these odds ratios are not significant simply because of the large samples being measured in this study.

4. Discussion

The present study represents the first investigation to demonstrate that the changes in medical use of prescription medications appear to mirror similar changes in the diversion and nonmedical use of prescription medications among college students. More specifically, increases over the past decade in the past-year medical use of prescription stimulants to treat ADHD (1.9% in 2003 to 4.7% in 2013) appear to parallel similar increases in the past-year diversion and nonmedical use of prescription stimulants (5.4% in 2003 to 9.3% in 2013). The findings also indicate a steady decline in the medical, diversion, and nonmedical use of prescription opioids over the past decade. The decline in past-year nonmedical use of prescription opioids found in the present study from 9.3% in 2003 to 4.5% in 2013 is consistent with a similar national decline in this behavior among U.S. college students from 8.8% in 2006 to 5.4% in 2012 (Johnston et al., 2013). Although the decline in diversion and nonmedical use of prescription opioids is encouraging, these behaviors continue to be associated with severe health consequences (CDC, 2012; McCabe et al., 2007a, 2013). In fact, more unintentional drug overdose deaths have involved prescription opioids than heroin and cocaine combined since 2003 in the U.S. (CDC, 2012).

The increase in nonmedical use of prescription stimulants is of concern based on the high abuse potential and consequences associated with this behavior including depressive symptoms, sleep difficulties, irritability, headaches, and increased risk for abuse and dependence (McCabe & Teter, 2007; Rabiner et al., 2009; Teter et al., 2010; Zullig & Divin, 2012). It is well-documented that the past-year nonmedical use of prescription stimulants is more prevalent among U.S. college students aged 18 to 22 as compared to their same-age peers not enrolled in college (Johnston et al., 2013; SAMHSA, 2009). The higher prevalence of prescription stimulants among college students is contrasted with the nonmedical use of sedative/anxiety, opioid, and sleeping medications which is *less* prevalent among U.S. college students compared to their same-age peers not enrolled in college (Johnston et al., 2013). Although the majority of college students who engage in nonmedical use of prescription stimulants are primarily motivated to enhance academic performance, the

efficacy of these medications used nonmedically in real world academic settings remains unproven (Arria & DuPont, 2010; Arria et al., 2008; Rabiner et al., 2009; Teter et al., 2006).

While the increases in medical use of prescription sedative/anxiety and sleeping medications found in the present study are consistent with similar increases found in prescribing rates of sedative-hypnotic medications among adolescents and young adults (Fortuna et al., 2010), the relatively stable lifetime and past-year rates of nonmedical use of prescription sedative/anxiety and sleeping medications in the present study were different from declines in the nonmedical use of these medication classes among U.S. college students over the same time period (Johnston et al., 2013). For example, the past-year rate of nonmedical use of prescription sedative/anxiety medications steadily decreased among U.S. college students from 6.9% in 2003 to 3.4% in 2012 (Johnston et al., 2013). Based on the differences in findings between regional and national studies, it remains critical to monitor medical use, diversion and nonmedical use of prescription medications at the local, regional, and national levels. These findings serve as a reminder that schools should collect their own data and not rely solely on national findings to inform best practices.

Many investigations of nonmedical use of prescription medications among college students and young adults fail to examine the *frequency* of nonmedical use (Johnston et al., 2013). We found an important and consistent pattern with respect to frequency of past-year nonmedical use of the four classes of prescription medications. In particular, college students were consistently more likely to engage in experimental use (1–2 occasions) of the three central nervous system depressant medication classes (i.e., sedative/anxiety, opioid, and sleeping medications) while more frequent use (3 or more occasions) was consistently more normative for nonmedical use of stimulant medications over time. This is relevant considering previous research that has demonstrated an association between depressive symptoms and more frequent nonmedical use of prescription stimulants among college students (Teter et al, 2010). Furthermore, the results reinforce the importance of examining each prescription medication class separately. The more frequent use among nonmedical users of prescription stimulants could partially explain the higher rates of being approached to divert we found among college students who are prescribed stimulants medications for ADHD relative to those prescribed the three CNS depressant medication classes. More than two in every five respondents who were prescribed stimulants medications for ADHD were approached to divert their medication. Physicians should instruct all college patients who require scheduled medications about the abuse potential of these medications and the need to store their medication in a secure location.

4.1. Strengths and limitations

The present study has two notable strengths that build upon previous research regarding prescription medication use among college students. First, this study includes probability-based samples of college students from the same institution between 2003 and 2013. Second, six cohorts of college students were assessed using identical prescription medication measures, enabling an assessment of prevalence and frequency estimates over time. Despite these strengths, the present study contained limitations that should be considered when weighing the implications of the findings. First, the results may not

generalize to all college student populations because our study was conducted at a large residential, top-tier public university that serves primarily middle to upper class Caucasian and typical-age college students. Second, the data are subject to the potential bias introduced when collecting substance use behaviors via self-reports surveys. There is general consensus that self-report drug surveys have a high degree of validity and the present study attempted to minimize potential biases associated with self-report surveys by implementing conditions that previous research has shown minimizes biases such as informing potential respondents that participation was voluntary, ensuring potential respondents that data would remain anonymous, using a self-administered computer based survey, and explaining the relevance of the study to potential respondents (Johnston & O'Malley, 1985; Harrison & Hughes, 1997; O'Malley & Johnston, 1983; Turner et al., 1998). Also, self-reports of drug use in epidemiological surveys have been shown to be valid based on biological tests (e.g., hair, saliva, and urine), including among college students (Fendrich et al., 2004; Wills & Cleary, 1997; Zaldivar Basurto et al., 2009). It is worth noting that the prevalence rates of nonmedical use of prescription medications in the present study were comparable to national studies of U.S. college students (Johnston et al., 2013; McCabe et al., 2011). Finally, cross-sectional samples were used to examine trends over time and more longitudinal research is needed to examine the temporal patterns in medical use, diversion and nonmedical use within the same individuals over time (Young et al., 2012).

4.2. Conclusions

The present study found that a lifetime history of medical use or being approached to divert a given medication class significantly increased the odds of engaging in past-year nonmedical use of the same medication class. Most adolescents become fully responsible for their own medication management for the first time in their lives during college and are presented with more opportunities for - and a higher expectation of - substance use. As a result, the medical use, diversion and nonmedical use of prescription medications represent important college health topics and existing research in this area suggests several implications for policy, clinicians, prevention and intervention (Arria & DuPont, 2010). Given the therapeutic efficacy of many scheduled medications when used properly for treating a wide range of health conditions and disorders, institutions of higher education must balance the medical necessity of these medications and the risk for nonmedical use and diversion among college students.

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Highlights

- We examined trends in medical use, diversion and nonmedical prescription drug use.
- Medical use, diversion and nonmedical prescription opioid use decreased over time.
- Medical use, diversion and nonmedical prescription stimulant use rose over time.
- Medical use trends parallel changes in diversion and nonmedical use of same drugs.

Figure 1.
Trends in past-year nonmedical use of prescription medications: 2003–2013

Table 1

Trends in demographic characteristics: 2003–2013

	2003 (%)	2005 (%)	2007 (%)	2009 (%)	2011 (%)	2013 (%)	Chi-square (df), p-value [Phi]
<u>Number of Consenting Respondents</u>	9906	3629	1740	1088	1469	3939	
<u>Gender</u>							
Male	43.7%	46.4%	44.7%	43.7%	44.1%	44.2%	8.7 (5), p = 0.122 [0.020]
Female	56.3%	53.6%	55.3%	56.3%	55.9%	55.8%	
<u>Race</u>							
White	68.1%	67.5%	66.9%	62.5%	68.3%	68.2%	89.7 (20), p < 0.001 [0.064]
Asian	12.4%	12.1%	13.4%	11.5%	15.1%	13.7%	
African-American	6.3%	6.0%	5.4%	7.9%	3.6%	4.1%	
Hispanic	4.2%	4.2%	4.3%	4.6%	3.7%	4.0%	
Other / Not Included / None	8.9%	10.2%	10.1%	13.5%	9.3%	10.0%	
<u>Social fraternity/sorority status</u>							
Member	13.7%	13.5%	12.8%	13.6%	15.1%	15.3%	10.8 (5), p = 0.055 [0.022]
Non-member	86.3%	86.5%	87.2%	86.4%	84.9%	84.7%	

Note: NS = not significant

Table 2
Trends in prevalence of nonmedical use, medical use, and diversion of prescription medications: 2003–2013

	2003 (%)	2005 (%)	2007 (%)	2009 (%)	2011 (%)	2013 (%)	Chi-square (df), p-value [Phi]
<u>Lifetime nonmedical use</u>							
Sleeping medication	3.5%	4.4%	4.7%	4.3%	4.3%	4.8%	13.9 (5), p < 0.05 [0.027]
Sedative/anxiety medication	4.9%	4.4%	4.2%	4.1%	4.0%	5.4%	8.9 (5), NS [0.021]
Stimulant medication	8.1%	8.5%	9.6%	9.6%	10.7%	12.7%	68.4 (5), p < 0.001 [0.059]
Pain medication	16.4%	14.4%	12.2%	9.3%	8.8%	8.8%	175.1 (5), p < 0.001 [0.095]
Any prescription medication	21.3%	20.2%	19.7%	16.4%	17.4%	19.4%	23.5 (5), p < 0.001 [0.035]
<u>Past-year nonmedical use</u>							
Sleeping medication	2.0%	2.4%	2.6%	2.5%	2.1%	2.3%	4.6 (5), NS [0.015]
Sedative/anxiety medication	2.9%	2.6%	2.5%	2.1%	1.8%	3.0%	8.9 (5), NS [0.021]
Stimulant medication	5.4%	6.0%	6.8%	6.9%	7.6%	9.3%	65.8 (5), p < 0.001 [0.058]
Pain medication	9.3%	7.4%	6.6%	5.5%	4.0%	4.5%	117.2 (5), p < 0.001 [0.077]
Any prescription medication	13.6%	12.5%	12.7%	11.4%	11.5%	13.1%	8.3 (5), NS [0.021]
<u>Lifetime medical use</u>							
Sleeping medication	6.4%	7.2%	7.2%	7.1%	7.0%	7.4%	5.7 (5), NS [0.017]
Sedative/anxiety medication	6.7%	6.6%	7.3%	7.3%	8.1%	8.8%	20.6 (5), p < 0.01 [0.032]
Stimulant medication	3.4%	5.1%	4.8%	4.4%	6.0%	7.0%	82.3 (5), p < 0.001 [0.065]
Pain medication	53.5%	51.5%	53.9%	49.1%	48.5%	46.6%	58.7 (5), p < 0.001 [0.055]
Any prescription medication	56.7%	55.6%	57.5%	53.1%	52.9%	52.4%	27.4 (5), p < 0.001 [0.037]
<u>Past-year medical use</u>							
Sleeping medication	2.9%	3.5%	3.9%	4.0%	3.7%	3.2%	11.2 (5), p < 0.05 [0.023]
Sedative/anxiety medication	2.9%	3.0%	3.9%	3.9%	4.5%	4.3%	26.0 (5), p < 0.001 [0.035]
Stimulant medication	1.9%	3.1%	3.2%	3.0%	3.9%	4.7%	88.6 (5), p < 0.001 [0.064]
Pain medication	21.0%	21.4%	20.5%	16.5%	16.4%	15.7%	74.8 (5), p < 0.001 [0.059]
Any prescription medication	24.3%	25.8%	25.2%	22.5%	21.7%	22.3%	19.9 (5), p < 0.01 [0.030]
<u>Past-year approached to divert</u>							
Sleeping medication	0.5%	0.3%	0.3%	0.6%	0.5%	0.6%	4.6 (5), NS [0.015]
Sedative/anxiety medication	0.7%	0.7%	0.8%	0.6%	1.2%	1.0%	8.3 (5), NS [0.019]
Stimulant medication	1.1%	1.8%	1.8%	1.6%	2.2%	2.3%	31.3 (5), p < 0.001 [0.038]

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	2003 (%)	2005 (%)	2007 (%)	2009 (%)	2011 (%)	2013 (%)	Chi-square (df), p-value [Phi]
Pain medication	7.1%	7.6%	6.1%	4.4%	3.7%	2.9%	122.8 (5), p < 0.001 [0.075]
Past-year approached to divert (past-year medical users only)							
Sleeping medication	13.4%	9.4%	8.8%	13.6%	11.1%	18.9%	6.6 (5), NS [0.097]
Sedative/anxiety medication	18.3%	11.0%	17.9%	16.7%	25.8%	22.2%	8.0 (5), NS [0.104]
Stimulant medication	53.0%	53.2%	54.5%	51.5%	48.3%	46.2%	2.6 (5), NS [0.065]
Pain medication	26.3%	26.5%	21.1%	18.3%	19.1%	14.4%	47.8 (5), p < 0.001 [0.106]

Table 3

Models predicting the probability of past-year nonmedical use of each medication class as a function of study year, individual characteristics, and environmental characteristics

<u>Study Year</u>	<u>Sleeping Medication</u>	<u>Sedative/Anxiety Medication</u>	<u>Stimulant Medication</u>	<u>Opioid Medication</u>	<u>Any Medication</u>
2003	AOR (95% CI) Ref	AOR (95% CI) Ref	AOR (95% CI) Ref	AOR (95% CI) Ref	AOR (95% CI) Ref
2005	1.24 (0.94–1.62)	0.87 (0.68–1.12)	1.05 (0.88–1.25)	0.78 (0.67–0.91)*	0.91 (0.80–1.03)
2007	1.33 (0.94–1.89)	0.84 (0.60–1.18)	1.24 (1.00–1.54)	0.71 (0.57–0.88)*	0.96 (0.82–1.13)
2009	1.23 (0.80–1.89)	0.69 (0.44–1.08)	1.32 (1.01–1.71)	0.63 (0.48–0.84)*	0.90 (0.73–1.11)
2011	1.07 (0.70–1.61)	0.53 (0.34–0.82)*	1.35 (1.07–1.70)	0.46 (0.35–0.62)**	0.89 (0.74–1.07)
2013	1.03 (0.85–1.26)	0.92 (0.73–1.17)	1.63 (1.40–1.89)**	0.54 (0.46–0.65)**	1.04 (0.92–1.18)
<u>Gender</u>					
Male	Ref	Ref	Ref	Ref	Ref
Female	1.03 (0.85–1.26)	0.66 (0.56–0.79)**	0.82 (0.73–0.92)*	0.83 (0.74–0.93)*	0.94 (0.86–1.02)
<u>Race</u>					
White	Ref	Ref	Ref	Ref	Ref
Asian	0.60 (0.41–0.89)	0.48 (0.33–0.71)**	0.55 (0.44–0.68)**	0.64 (0.51–0.80)**	0.66 (0.56–0.78)**
African-American	0.53 (0.30–0.96)	0.44 (0.24–0.81)*	0.28 (0.18–0.45)**	1.01 (0.78–1.29)	0.74 (0.60–0.92)*
Hispanic	1.35 (0.89–2.05)	0.95 (0.63–1.45)	1.15 (0.89–1.49)	1.19 (0.92–1.54)	1.11 (0.90–1.36)
Other / Not Included / None	0.94 (0.67–1.33)	1.07 (0.80–1.44)	0.84 (0.68–1.03)	0.92 (0.76–1.13)	0.87 (0.75–1.02)
<u>Social Fraternity/Sorority Status</u>					
Member	1.94 (1.54–2.45)**	2.29 (1.87–2.80)**	2.82 (2.47–3.21)**	1.30 (1.12–1.51)**	1.89 (1.69–2.10)**
Non-member	Ref	Ref	Ref	Ref	Ref
<u>Lifetime Medical Use History</u>					
Yes	7.17 (5.74–8.95)**	6.25 (5.05–7.73)**	3.80 (3.06–4.72)**	2.02 (1.78–2.31)**	1.80 (1.63–1.99)**
No	Ref	Ref	Ref	Ref	Ref
<u>Past-Year Approached to Divert</u>					
Yes	3.61 (2.24–5.82)**	3.42 (2.35–5.01)**	1.31 (0.95–1.81)	4.26 (3.69–4.93)**	4.00 (3.56–4.50)**
No	Ref	Ref	Ref	Ref	Ref
<u>Nagelkerke's Pseudo R-Squared Value</u>	0.107	0.119	0.091	0.103	0.108

Note: There were no significant two-way interactions between study year and the individual and environmental characteristics.

p < 0.001

p < 0.01,

*

AOR = adjusted odds ratios.