Published in final edited form as:

J Am Coll Health. 2006 ; 54(5): 269–278.

Medical Use, Illicit Use, and Diversion of Abusable Prescription Drugs

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Abstract

The authors investigated the medical use, illicit use, and diversion of 4 distinct classes of abusable prescription medication (sleeping medication, sedative or anxiety medication, stimulant medication, and pain medication) in a random sample of undergraduate students. In spring 2003, 9,161 undergraduate students attending a large, public, midwestern research university in the United States self-administered a Web-based survey. The prevalence rate for illicit use within the past year was highest for pain medication, followed by stimulant medication, sedative or anxiety medication, and sleeping medication. Women generally reported higher past-year medical use rates. However, undergraduate men reported higher illicit use rates. The illicit use-medical use ratio for stimulant medication was the highest among the 4 classes of prescription drugs. Medical users of stimulants for attention deficit hyperactivity disorder were the most likely to be approached to divert their medication. Multivariate results indicated that illicit users of prescription drugs were more likely to use other drugs than were students who did not use prescription drugs illicitly. The authors provide evidence that prescription drug abuse is a problem among college students.

Keywords

college students; diversion; illicit use; medical use; prescription drug abuse

Prescription medications are critical for the treatment of conditions such as attention deficit hyperactivity disorder (ADHD), sleep disorders, and anxiety disorders and the treatment and management of pain in adolescents and young adults.^{1–4} In the past decade, there has been a well-documented increase in the availability of prescription medications such as stimulants, sedatives, anxiolytics, sleeping medications, and opioid analgesics.^{5–9} In the United States, the rise in prevalence of these medical prescriptions could be due to several factors, including an improved ability to recognize many disorders and to manage symptoms, increased duration of treatment, increased marketing efforts, and recognition that many disorders are

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The University of Michigan supported this study, and research grant R03 DA 018239, awarded to Sean Esteban McCabe by the National Institute on Drug Abuse, National Institutes of Health, supported the development of this manuscript.

undertreated.^{10–12} However, a possible consequence of increased production and prescription rates of abusable medications is an increase in illicit use of these drugs due to greater availability. Public health officials have expressed concern regarding recent reports of illicit use of prescription medications among adolescents, young adults, and college students and regarding the high abuse potential of prescription medications.^{3,13–23} Therefore, health care professionals recognize the need to balance the medical necessity of these drugs with the risk of misuse of prescription medications.^{3,5,24}

Researchers have previously found gender differences in the prescribing patterns for various classes of psychotropic medication. For example, men are more likely to use stimulant medication than women.^{6,9,25} In addition, Simoni-Wastila²⁶ examined potential gender differences in the medically prescribed use of abusable prescription drugs and found that women aged 18 years and older were approximately 48% more likely than men to use abusable prescription drugs. Women were, more specifically, considerably more likely to be prescribed opioid analgesics and anxiolytics. However, Simoni-Wastila²⁶ found no gender differences in the medically prescribed use of stimulants or sedative-hypnotic medication.

There is also strong evidence for racial differences in the prescribing rates for abusable prescription medication among youths and adolescents in the United States. For example, several studies have shown that African American youths were less likely to be prescribed stimulant medications than were white youths.^{9,25,27}

According to the 2004 National Survey on Drug Use and Health (NSDUH),¹⁹ young adults (collegiate and noncollegiate) aged 18 to 25 years reported the highest prevalence of illicit use of prescription drugs. Approximately 14.8% of Americans aged 18 to 25 years used prescription drugs for nonmedical purposes in the past year: 11.9% used opioid analgesics, 3.7% used stimulant medication, 5.2% used tranquilizer medication, and 0.5% used sedative medication.¹⁹ According to the 2004 Monitoring the Future Study (MTF),¹⁵ the current illicit use rate of several classes of prescription medications by college students is at the highest level it has been in the past 15 years. Furthermore, based on MTF data, college students reported higher annual prevalence rates of illicit use of Ritalin (methylphenidate) than their same-age peers not attending college (collegiate, 4.7%, vs noncollegiate, 1.6%).¹⁵ There is growing evidence that the illicit use of prescription drugs represents a problem, not only among young adults, but also, more specifically, among undergraduate college students within the young adult age group.^{15,18,23,28–30}

National epidemiological studies have also shown important gender differences in the illicit use of prescription medication among young adults and college students in the United States. According to the NSDUH,¹⁹ among young adults (collegiate and noncollegiate) aged 18 to 25 years, men were more likely than women to report nonmedical use of any prescription drug (16.1% vs 13.4%). According to the MTF, college men reported higher rates of past-year illicit use of some prescription drugs than did college women. In particular, college men reported higher past-year rates of opioid analgesic use (10.6% college men vs 6.8% college women) and Ritalin (methylphenidate) (6.8% college men vs 3.5% college women).¹⁵

There is some evidence that, in addition to gender differences, there are also racial differences in illicit use of prescription drugs among secondary and college students.^{16,23,28,31} For example, there were notable racial differences in illicit use of prescription drugs among college students in the United States; the past-year illicit use of prescription opioids was significantly higher among white college students (8.2%) than among Hispanic (4.4%), African American (3.4%), and Asian (2.5%) students.¹⁶ In addition, the illicit use of prescription stimulants was higher among white college students (4.9%) than among African American (1.6%) and Asian (1.3%) students.²³

There are no comprehensive studies of the diversion (eg, selling, trading, sharing) of prescription drugs among college students. Research on diversion of prescription drugs among elementary and secondary school students is available and enhances an understanding of the scope of the problem.^{31–35} However, the experiences of these younger students may have limited applicability to analyzing the diversion of prescription drugs among college students. To date, many studies regarding abusable prescription drugs focus either on medical use^{6,9,26,36} or illicit use.^{15,16,37} Some researchers have compared nonmedical use and abuse of prescription opioids with the medical availability and use at the national level.^{3,5} Few, if any, investigators have examined the medical use and illicit use of prescription drugs within the same study population. Indeed, data on both of these aspects of prescription drug use offer a more complete picture of the relationship between the medical availability of prescription drugs and the illicit use of prescription drugs, when provided by the same study sample.

In the present study, we examined medically prescribed use and illicit use of 4 distinct classes of abusable prescription drugs within an undergraduate college student population. The main objectives of this study were to assess within an undergraduate student population (1) the prevalence of medical use of 4 classes of abusable prescription drugs, (2) the prevalence of illicit use of 4 classes of abusable prescription drugs, (3) the prevalence of prescribed users being approached to divert their prescription medication, and (4) the relationships between the illicit use of prescription medications and other drug use.

METHODS

The Institutional Review Board approved the protocol for this study, and all respondents gave informed consent. We conducted the study during a 1-month period in March and April 2003, drawing on a total undergraduate population of 21,294 full-time students (10,860 women and 10,434 men). We drew a random sample of 19,378 full-time undergraduate students from the registrar's office. We used several strategies to ensure a high degree of security. For example, we informed all participants that we contracted a research firm, unaffiliated with the university, to set up the Web survey as well as store and maintain data. University officials, faculty, and staff were unable to access any contact information connected with the data of any respondent. In addition, we maintained the Web survey on a hosted secure Web site running under the secure sockets layer protocol to ensure that respondents' data were safely transmitted between the respondents' browsers and the server. We sent all respondents information via e-mail clarifying that participation was voluntary, explaining the relevance of the study, and confirming that responses were to be kept confidential. We sent an e-mail to the entire sample describing the study and inviting respondents to self-administer the Student Life Survey (SLS) by clicking on a link to access the Web survey and using a unique password. We sent non-respondents up to 3 reminder e-mails. By participating in the confidential survey, students became eligible for a sweepstakes that included 13 cash prizes, ranging from \$100 to \$1,000. The final response rate was 47.3%, which is consistent with national college-based alcohol and other drug studies.^{38,39}

Researchers at the University of Michigan Substance Abuse Research Center developed the SLS and pilot tested it in 1993 and 1999. The survey includes items from several national studies of alcohol and other drug use.^{15,38,39} The survey contains approximately 100 questions and takes 20 minutes for respondents to complete. Reliability and validity of measures of the SLS are described in more detail elsewhere.^{40–42} Demographic measures in the survey include such items as gender, race and ethnicity, and living arrangements. The survey includes standard measures of substance use, such as cigarette use in the past month, binge drinking in the past 2 weeks, and marijuana, cocaine, ecstasy, and other illicit drug use in the past year.^{15,38–39}

Medical Use of Prescription Medication

We measured medical use of prescription medication using the following item:

Based on a doctor's prescription, on how many occasions in the past 12 months have you used the following types of drugs? (a) Sleeping medication (eg, Ambien, Halcion, Restoril), (b) Sedative or anxiety medication (eg, Ativan, Xanax, Valium, Klonopin), (c) Stimulant medication for ADHD (eg, Ritalin, Dexedrine, Adderall, Concerta), (d) Pain medication (eg, Vicodin, OxyContin, Tylenol 3 with Codeine)

The response scale for each question was 1 (no occasions), 2 (1–2 occasions), 3 (3–5 occasions), 4 (6–9 occasions), 5 (10–19 occasions), 6 (20–39 occasions), and 7 (40 or more occasions).

We created a medical use of prescription medication index by summing the medically prescribed use of the 4 classes of prescription medications.

Diversion of Prescription Medication

We assessed diversion of prescription medication using the following item: “On how many occasions in the past 12 months have you been approached to sell, trade, or give away your prescription medication?” There were separate questions for each of the following prescription drugs: (1) sleeping medication (eg, Ambien, Halcion, Restoril), (2) sedative or anxiety medication (eg, Ativan, Xanax, Valium, Klonopin), (3) stimulant medication for ADHD (eg, Ritalin, Dexedrine, Adderall, Concerta), and (4) pain medication (eg, Vicodin, OxyContin, Tylenol 3 with Codeine). The response scale was the same as the scale for medical use of prescription medication. We created a diversion index by summing the diversion of the 4 classes of prescription medication.

Illicit Use of Prescription Medication

We assessed illicit use of prescription medication by asking the following question: “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 the past 12 months have you used the following types of drugs, not prescribed to you?” There were separate questions for each of the following prescription drugs: (1) sleeping medication (eg, Ambien, Halcion, Restoril); (2) sedative or anxiety medication (eg, Ativan, Xanax, Valium, Klonopin); (3) stimulant medication (eg, Ritalin, Dexedrine, Adderall, Concerta); (4) pain medication (eg, Vicodin, OxyContin, Tylenol 3 with Codeine). The response scale was the same as the scale for medical use of prescription medication. We created an illicit use of prescription medication index by summing the illicit use of the 4 classes of prescription medication.

The final sample consisted of 9,161 undergraduate students, and the demographic characteristics closely resembled the characteristics of the overall student population. For example, the racial and ethnic distribution of the sample was 68% white, 13% Asian, 6% African American, 4% Hispanic, and 9% from other racial or ethnic categories. The racial and ethnic distribution of the overall student population was 64% white, 14% Asian, 8% African American, 5% Hispanic, and 9% other racial or ethnic categories. The sample contained a higher proportion of women (56%) than the overall student population (51%). In addition, approximately 46% of the sample lived in a house or apartment within the university town, 44% lived in a university residence hall, 5% lived in a fraternity or sorority house, and 5% had some other living arrangement. Roughly 3 out of 4 students lived within 1 mile of the main campus, and 98% of the sample were not married.

Data analyses included 9,161 undergraduate student respondents, and we carried out all statistical analyses using SPSS 11.0 for Windows (SPSS, Inc, Chicago, IL, 2001). To determine the prevalence of medical use and illicit use of prescription medication, we divided the number

of students reporting each of these behaviors by the total number of students in the final sample. We used chi-square tests to compare the prevalence of medical use and illicit use, according to student characteristics. We used chi-square tests and multivariate logistic regression models to compare alcohol or other drug (AOD) use across 4 distinct groups of prescription medication use in the past year: (1) undergraduate students who did not use prescription medication (nonusers); (2) undergraduate students who used prescription medication as prescribed by their doctor (medical use only); (3) undergraduate students who used both prescription medication as prescribed by their doctor and prescription medication that was not prescribed to them (both medical and illicit use); and (4) undergraduate students who used prescription medication that was not prescribed to them (illicit use only).

RESULTS

Based on the medical use of prescription medication index, the lifetime prevalence of medical use of any of the 4 categories of prescription drugs was 57%, and the annual prevalence was 28%. As illustrated in Table 1, undergraduate students reported the highest annual rates of medically prescribed use of pain medication (24%), followed by sedative or anxiety medication (3%), sleeping medication (3%), and stimulant medication (2%). There were notable gender differences; undergraduate women were significantly more likely than men to report medically prescribed use of any abusable medication (31% vs 24%, $p < .001$), pain medication (27% vs 21%, $p < .001$), sleep medication (4% vs 2%, $p < .001$), and sedative or anxiety medication (4% vs 3%, $p < .001$). Undergraduate men were more likely than undergraduate women to use medically prescribed stimulant medication for ADHD (3% vs 2%, $p < .05$). There were also significant racial differences: Asian students reported lower medical use of each class of prescription medication.

Illicit Use of Prescription Drugs

Based on the illicit use of prescription medication index, the lifetime illicit use of any of the 4 categories of prescription drugs among undergraduate students was 21%, and the annual prevalence was 14%. As illustrated in Table 1, the annual prevalence of illicit use was highest for pain medication (9%), followed by stimulant medication (5%), sedative or anxiety medication (3%), and sleeping medication (2%). The annual prevalence of illicit use of prescription medication was higher than the prevalence of illicit use of cocaine, ecstasy, inhalants, LSD, other psychedelics, crystal methamphetamine, heroin, GHB, or Ketamine. Undergraduate men were significantly more likely than undergraduate women to report illicit use of stimulant medication, pain medication, and sedative or anxiolytic medication. In general, Asian and African American undergraduate students reported lower rates of illicit use of prescription drugs than did white and Hispanic students.

Relationship Between Illicit Use and Medical Use of Abusable Prescription Drugs

As illustrated in Table 1, the illicit use–medical use ratio was the highest for stimulant medication, followed by sedative or anxiolytic medication, sleeping medication, and pain medication. The illicit use–medical use ratio for stimulant medication exceeded 1.0 for all racial and gender categories, which indicates that the proportion of illicit users was higher than medical users. The illicit use–medical use ratio also exceeded 1.0 for some demographic categories of sedative or anxiety medication, including undergraduate men, Asian students, and Hispanic students. The illicit use–medical use ratio did not exceed 1.0 for pain medication or sleeping medication.

As illustrated in Table 2, the overall breakdown of prescription medication use in the past year is as follows: 65% ($n = 5,522$) of undergraduate students did not use an abusable prescription

drug (nonusers), 21% ($n = 1,791$) used prescription medication as prescribed by their doctors (medical use only), 7% ($n = 592$) used both prescription medication as prescribed by their doctors and an abusable prescription medication that was not prescribed to them (medical and illicit use), and 7% ($n = 556$) used an abusable prescription medication that was not prescribed to them (illicit use only).

Diversion of Prescribed Medication

Among students who were prescribed medication in the past year, 27% were approached to divert their medication, based on the diversion index (results not shown). Undergraduate students who were prescribed stimulant medication were the most likely to be approached to divert their medication (54%), followed by those who were prescribed pain medication (26%), sedatives or anxiolytics (19%), and sleeping medication (14%). Although undergraduate men were significantly more likely than women to be approached to divert their prescription pain medication, there were no such gender differences for sedatives or anxiolytics, for sleeping medication, or for stimulant medication.

Illicit Use of Abusable Prescription Medications and Other Drug Use

As illustrated in Table 2, those undergraduate students who reported only illicit use of prescription medication in the past year reported the highest rates of other drug use. In particular, illicit users reported higher rates of substance use than nonusers, including cigarette smoking in the past month (50% among users vs 15% among nonusers); binge drinking in the past 2 weeks (79% among users vs 45% among nonusers); marijuana use in the past year (79% among users vs 29% among nonusers); cocaine use in the past year (20% among users vs 1% among nonusers); ecstasy use in the past year (19% among users vs 1% among nonusers); and use of illicit drugs other than marijuana, cocaine, or ecstasy (34% among users vs 2% among nonusers).

As shown in Table 2, the multivariate logistic regression results reinforced bivariate findings because illicit users of prescription drugs had increased odds of other drug use, after statistically adjusting for gender, race and ethnicity, class year, living arrangement, fraternity or sorority membership, and grade point average. For example, the odds of reporting ecstasy use were over 16 times higher among only illicit users of prescription medications than among nonusers (odds ratio [OR] = 16.2, 95% confidence interval [CI] = 11.7–22.5, $p < .001$). The drug use behaviors of students who reported only medically prescribed use resembled the drug use behaviors of nonusers; this is contrasted with students who reported only illicit use or both prescribed and illicit use. The drug use behaviors of students who reported both prescribed and illicit use in the past year resembled the drug use behaviors of those students who reported only illicit use of prescription medications.

DISCUSSION

In our study, the illicit use of prescription medications was second only to marijuana as the most common form of illicit drug use on this college campus in the past year, a result consistent with findings of national research.^{15–17,19–21} The overall prevalence rates of illicit use of prescription medication in the present study are similar to national findings among young adults and college students.^{15,18–21,23,28} We found that Asian and African American students generally reported lower rates of illicit use of prescription medication than did white students. This finding is in line with past college-based research, which has found higher rates of alcohol and other drug use among white students than among Asian and African American undergraduate students,^{23,28,39} as well as secondary school students.⁴³ In addition, Hispanic students in our sample generally reported higher rates of illicit use of prescription drugs than

did Asian and African American students, which is similar to previous findings of heavy drinking among Hispanic college students.³⁹ Future research is needed to elucidate whether our finding that Hispanic college students have higher rates of illicit use of prescription drugs is consistent with results from other research studies on this population.

We found that the gender differences in medical use of abusable prescription drugs are similar to trends found in previous studies within noncollegiate populations. In particular, undergraduate women in the present study were significantly more likely to report medical use of prescription pain medication, sedative or anxiety medication, and sleeping medication than were men, whereas undergraduate men were more likely to report medical use of stimulant medications for ADHD than were women. These gender differences have been well documented in previous research.^{4,6,9,25–27}

The present study extended previous research efforts by examining the illicit use–medical use ratio of 4 classes of abusable psychoactive medication within the same sample. Although stimulant medication had the lowest annual prevalence of medical use among undergraduate students and did not have the highest prevalence rate of illicit use, the illicit use–medical use ratio for stimulant medication was the highest among all 4 classes of prescription drugs. The fact that the illicit use–medical use ratio was highest for prescription stimulants is consistent with their high abuse potential relative to the other 3 classes of prescription drugs.⁴⁴ Investigators in previous national studies have attempted to compare the nonmedical use and abuse of prescription medication with their rates of prescribed availability and use.^{3,5} However, these studies are limited by a focus solely on opioid analgesics, use of different samples to generate illicit use–medical use ratios, and reliance on Drug Abuse Warning Network (DAWN) data to represent non-medical use and abuse, which may only capture the most severe form of abuse.

The high rates of illicit use and attempted diversion of abusable prescription drugs found in the present study were especially troubling because there are dangers associated with the abuse of these medications. For example, illicit users are likely to be unaware of a drug's documented contraindications, precautions, or interactions with other drugs. In our study, we provide strong evidence that undergraduate students being treated with prescription medications are approached by their peers to divert their medication. Among the 4 classes of prescription drugs, medically prescribed stimulant users were the most likely to be approached to divert their medication. Indeed, more than half of undergraduate students who were currently prescribed stimulants were approached to divert their medication in the past year. Based on the high rates of attempted diversion, future work should examine what proportion of adolescents and young adults approached to divert their medication concede to the request.

Anecdotal case reports, national surveillance data, and epidemiological studies provide evidence that prescription drugs, such as stimulants, opioid analgesics, and benzodiazepines, are often abused in combination with alcohol and other drugs.^{45–49} In the present study, we found that undergraduate students who reported illicit use of prescription medications were significantly more likely to use other drugs, which is consistent with previous studies of secondary school students and college students.^{29,31} Indeed, in the present study, approximately 4 out of every 5 illicit users of prescription drugs also reported heavy episodic drinking in the past 2 weeks. The elevated substance use rates found among those reporting the illicit use of prescription medication provides theoretical support that this type of drug use behavior is part of a pattern of multiproblem behavior among adolescents and college students.^{50,51}

Limitations

There were some limitations to the current study that must be noted. First, we recognize that we covered 4 broad classes of abusable prescription medication without focusing on any individual drug within each class. We acknowledge that individual prescription drugs in each class deserve more focused attention because there are documented differences in the illicit use of individual medications within the same class of prescription drugs¹⁶ and there are varying degrees of abuse liability among medications within the same pharmacological class (eg, Concerta, compared with immediate release methylphenidate). Furthermore, we cannot be sure how individuals interpret each drug class (ie, what they understand as belonging, or not belonging, in each drug class). For example, the present study may have overestimated the prevalence of illicit use of opioid analgesics because the prescription pain medication question was not necessarily limited to opioid analgesics. Future work should examine how respondents conceptualize each of the drug categories beyond the list of examples provided in the survey question.

In addition to the need to further examine individual prescription drugs within each drug class, a second limitation of this study involves the diversity of the sample. Although the current sample is large, it is nevertheless from a single university. Therefore, researchers should exercise caution when generalizing this study to other college and noncollege populations, especially in light of some of the differences in illicit use of prescription drugs found between college students and noncollege students.¹⁶

A third limitation of the study derives from the fact that nonresponse may have introduced bias into the study. However, this concern was lessened by the representative nature of the final obtained sample. In addition, the rates of illicit use of prescription drugs reported in this study are comparable to rates found in other national substance use surveys among young adults and college students.^{15–20} The response rate achieved in this study is consistent with college-based studies nationally.³⁹

A fourth limitation of the current study is that we relied on retrospective recall of college students. Respondents in our study may have had trouble recalling medical and illicit use of specific prescription medications they used or were approached to divert. Therefore, we attempted to minimize this limitation by relying on recall from only the past year rather than from lifetime. The present study was subject to the limitations of self-report surveys. However, such surveys have been widely used and are considered generally valid in examining substance use when certain conditions of confidentiality are met.^{52,53} For instance, we made it clear to students in our study that participation was voluntary, we explained the relevance of the study, and we assured respondents that their responses would remain confidential.

A fifth limitation of the current study involves the collection of data through Web-based surveys. Researchers should use caution when comparing these results to other studies. Previous work suggests that there are minimal differences between Web-based and paper-based surveys when collecting alcohol and other drug use data.^{41,42,54,55} However, more research is needed to examine how survey mode impacts data regarding the medically prescribed use, illicit use, and diversion of prescription drugs. Finally, we may have underestimated the extent of overall illicit use of benzodiazepines. This is because we separated sedative and anxiety medications (eg, Ativan, Xanax, Valium, Klonopin) and sleeping medications (eg, Ambien, Halcion, Restoril).

Implications

Despite the limitations of the present study, there are several important implications for practice, policy, and future research. Based on the high prevalence rates of illicit use and diversion of prescription drugs, college staff (eg, faculty, residence hall advisors, discipline officers) and health professionals who work with college students (eg, counselors, physicians, health educators, pharmacists) should be aware of the signs of prescription drug abuse. For example, counselors and other health professionals should conduct brief screenings to detect possible abuse or dependence. The high rates of diversion and heightened risk for substance use among medically prescribed users indicate that health professionals prescribing medication to college students can play an important role by inquiring about possible substance use problems and by explaining to their patients the dangers of illicit use and diversion of abusable prescription medications. Based on the potential adverse consequences associated with the simultaneous use of prescription drugs and other drugs, future alcohol and other drug preventative efforts should educate individuals regarding the dangerous drug interactions between these substances.

In addition, the present study has some implications for computer-based data collections and prevention efforts. For example, e-mail represents a promising approach for contacting traditionally aged (18–24 years) undergraduate students because approximately 98% of these individuals use e-mail.⁵⁶ Furthermore, screening instruments can be embedded in Web-based surveys so researchers can identify high-risk students and send them tailored referral information while these high-risk students complete Web-based surveys. Nevertheless, despite these promising strengths, nonresponse remains a concern for Web-based surveys, and more work is needed to increase response rates among college student populations.

Given the availability of abusable, yet highly effective, prescription medications, strategies are needed to limit the potential for diversion and illicit use of these drugs among college students. One promising strategy is to continue to develop new delivery systems that provide a gradual onset and sustained delivery of medications and are therefore less prone to abuse. Furthermore, novel medications that may have less abuse liability (eg, nonpsychostimulant alternatives for the treatment of ADHD) may be particularly useful for treating patients with a known history of substance abuse.

Because the current study focused on illicit use and not abuse of or dependence on prescription medication, longitudinal research will be necessary to examine the relationship between the illicit use of abusable prescription medications and subsequent abuse or dependence. Based on the findings of the present study, future researchers would benefit from examining the potential consequences and long-term usage patterns of prescription medication among undergraduate students beyond college and into young adulthood.

Acknowledgements

The authors thank Amanda Hsiao for her editorial comments on an earlier version of this manuscript.

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TABLE 1

Prescription Drugs in the Past Year

	Sleeping medication (<i>n</i> = 8460)			Sedative or anxiety medication (<i>n</i> = 8459)			Stimulant medication for ADHD (<i>n</i> = 8458)			Pain medication (<i>n</i> = 8455)			
	Medical use (%)	Illicit use (%)	Illicit/medical ratio o [†]	Medical use (%)	Illicit use (%)	Illicit/medical ratio o [†]	Medical use (%)	Illicit use (%)	Illicit/medical ratio o [†]	Medical use (%)	Illicit use (%)	Illicit/medical ratio o [†]	
3.3***	2.0	0.61		3.4***	2.9*	0.85		2.2*	5.4**	2.45	24.4***	9.3*	0.38
4.0	2.1	0.53		4.0	2.5	0.63		1.9	4.6	2.42	27.2	8.7	0.32
2.4*	1.9	0.79		2.5***	3.5***	1.40		2.6***	6.5***	2.50	20.7***	10.1***	0.49
1.7	1.5	0.76		1.0	1.3	1.30		0.8	3.4	4.25	16.6	5.2	0.31
3.6	1.5	0.36		1.7	0.8	0.47		0.8	1.4	1.75	26.2	9.9	0.38
3.3	3.3	1.00		2.5	3.6	1.44		3.0	7.5	2.50	25.1	10.9	0.43
3.5	2.0	0.60		4.1	3.4	0.83		2.4	6.2	2.58	25.6	10.0	0.39
3.3	1.5	0.45		2.3	2.9	1.26		2.7	4.1	1.52	24.9	8.2	0.33

^a Illicit hyperactivity disorder.

use.

Author manuscript; available in PMC 2007 May 24.

TABLE 2
Prevalence of Substance Use Across Any Prescription Medication Use and 4 Distinct Groups of Prescription Medication Use

Prescription medication use status	Monthly cigarette smoking		2-week binge drinking		Annual marijuana use		Annual cocaine use		Annual ecstasy use		Annual illicit drug index [†]	
	%	OR [‡]	%	OR [‡]	%	OR [‡]	%	OR [‡]	%	OR [‡]	%	OR [‡]
Any prescription medication												
Nonuser (n = 5522, 65.3%)	15.2	§	45.2	§	29.0	§	1.0	§	1.4	§	2.3	§
Medical use only (n = 1791, 21.2%)	19.1	1.27**	53.3	1.33***	38.1	1.46***	2.0	1.97**	1.6	1.23	3.5	1.66**
Medical and illicit use (n = 592, 7.0%)	46.8	4.36***	74.8	3.07***	72.2	5.61***	18.9	19.89***	14.3	11.82***	24.1	13.56***
Illicit use only (n = 556, 6.6%)	49.8	4.83***	79.4	4.07***	79.3	8.58***	20.4	15.44***	18.7	16.22***	33.8	21.24***
Stimulant medication for ADHD												
Nonuser (n = 7872, 93.2%)	17.6	§	48.9	§	33.7	§	1.9	§	2.0	§	3.9	§
Medical use only (n = 123, 1.5%)	35.0	2.16***	61.2	1.17	61.0	2.79***	13.0	6.09***	4.9	2.35*	14.6	3.74***
Medical and illicit use (n = 55, 0.7%)	67.3	7.21***	81.8	2.59*	94.3	24.87***	39.6	26.66***	30.2	18.77***	42.6	17.05***
Illicit use only (n = 399, 4.7%)	66.4	7.52***	89.2	6.00***	92.4	18.74***	32.5	21.25***	27.0	16.64***	43.1	17.02***
Pain medication												
Nonuser (n = 5990, 71.0%)	17.1	§	46.9	§	31.7	§	1.9	§	1.9	§	3.6	§
Medical use only (n = 1663, 19.7%)	20.5	1.21**	55.6	1.40***	40.3	1.40***	2.7	1.43	2.7	1.42	4.5	1.29
Medical and illicit use (n = 391, 4.6%)	45.1	3.66***	74.4	3.15***	68.7	4.44***	17.7	9.84***	12.6	6.70***	22.3	7.17***
Illicit use only (n = 394, 4.7%)	47.2	3.90***	75.8	3.25***	76.9	6.83***	22.6	13.42***	20.6	12.42***	35.8	13.53***
Sedative or anxiety medication												
Nonuser (n = 7973, 94.4%)	19.0	§	50.2	§	35.2	§	2.4	§	2.4	§	4.7	§
Medical use only (n = 230, 2.7%)	27.9	1.43*	55.0	0.91	50.4	1.66***	8.7	3.27***	6.1	2.44**	11.7	2.82***
Medical and illicit use (n = 56, 0.7%)	60.7	5.49***	69.1	1.55	74.5	4.27***	38.2	20.46***	29.1	15.50***	36.4	10.94***
Illicit use only (n = 190, 2.2%)	63.7	5.74***	85.3	3.87***	94.7	25.38***	41.5	21.92***	34.0	17.19***	53.7	19.49***
Sleeping medication												
Nonuser (n = 8065, 95.4%)	19.8	§	50.7	§	36.3	§	3.3	§	3.1	§	5.5	§
Medical use only (n = 220, 2.6%)	24.2	1.31	55.7	1.25	49.3	1.76***	5.0	1.51	4.5	1.48	8.2	1.70*
Medical and illicit use (n = 55, 0.7%)	47.3	3.53***	63.0	1.55	58.2	2.10**	20.0	7.02***	20.0	8.05***	23.6	5.61***

Prescription medication use status	Monthly cigarette smoking		2-week binge drinking		Annual marijuana use		Annual cocaine use		Annual ecstasy use		Annual illicit drug index [†]	
	%	OR [‡]	%	OR [‡]	%	OR [‡]	%	OR [‡]	%	OR [‡]	%	OR [‡]
Illicit use only (n = 112, 1.3%)	54.5	4.38 ^{****}	77.7	2.91 ^{****}	71.2	3.70 ^{****}	25.9	8.42 ^{****}	21.4	7.61 ^{****}	42.9	12.83 ^{****}

Note. OR = odds ratio; ADHD = attention deficit hyperactivity disorder.

[†]The annual drug index was created by summing past-year use of LSD, other psychedelics, inhalants, crystal methamphetamine, heroin, GHB, or Ketamine.

[‡]Multivariate logistic regression models adjusted for sex, race and ethnicity, class year, living arrangement, fraternity or sorority membership, and grade point average.

[§]Reference group.

* $p < .05$.

** $p < .01$.

*** $p < .001$.