Screening for Drug Abuse Among Medical and Nonmedical Users of Prescription Drugs in a Probability Sample of College Students

Sean Esteban McCabe, PhD, MSW

Objectives: To determine the prevalence of medical and nonmedical use of 4 classes of prescription drugs (opioid, stimulant, sleeping, and sedative or anxiety) and to assess probable drug abuse among 4 mutually exclusive groups of medical and nonmedical use of prescription drugs.

Design: In 2005, a Web survey was self-administered by a probability sample of 3639 college students (68% response rate).

Setting: A large, midwestern 4-year university.

Participants: The sample had a mean age of 19.9 years, and respondents were 53.6% female, 67.4% white, 12.1% Asian, 6.0% African American, 4.2% Hispanic, and 10.2% other racial categories.

Main Outcome Measures: Medical and nonmedical use of prescription drugs was measured. Probable drug abuse was assessed using a modified version of the Drug Abuse Screening Test, Short Form.

Results: A total of 40.1% of respondents reported no lifetime use of at least 1 of 4 classes of prescription drugs, 39.7% reported medical use only, 15.8% reported both medical and nonmedical use, and 4.4% reported nonmedical use only. The odds of a positive screening result for drug abuse were greater among medical and nonmedical users (adjusted odds ratio, 5.5; 95% confidence interval, 3.4-7.3) and nonmedical users only (adjusted odds ratio, 6.5; 95% confidence interval, 4.0-10.6) compared with nonusers. The odds of a positive screening result for drug abuse did not differ between medical users only and nonusers.

Conclusions: Nonmedical users of prescription drugs are at heightened risk for drug abuse, whereas medical users without a history of nonmedical use are generally not at increased risk. Drug abuse screening should be routine for college students, especially among individuals with any history of nonmedical use of prescription drugs.


Several studies1-11 have reported recent increases in the prescription rates of abused medications in the United States, including stimulants, opioids, and benzodiazepines. These increases are likely the result of many factors, including improved awareness regarding the signs and symptoms of several disorders, increased duration of treatment, availability of new medications, and increased marketing.7,9,12 The increases in prescription rates have raised public health concerns because of the abuse potential of these medications13-16 and high prevalence rates of nonmedical use, abuse, and dependence, especially among young adults 18 to 24 years of age.17-21 The nonmedical use of prescription drugs is a well-documented problem among US college students.17,22,24 There is growing evidence that college students who report nonmedical use of prescription drugs are heavily involved with alcohol and other drug use behaviors (eg, cigarette smoking, heavy drinking, and marijuana and other illicit drug use).23,25-27 For example, the odds of reporting use of 3,4-methylenedioxymethamphetamine (Ecstasy) was more than 14 times greater among past-year nonmedical users of prescription drugs compared with college students who did not use prescription drugs in the past year.23 In contrast, the odds of Ecstasy use did not differ between college students who reported only past-year medical use of prescription drugs and those who did not use prescription drugs in the past year.23 Despite recent attempts to examine the association between prescription drug use status and substance use behaviors, research that assesses drug abuse as a function of medical and nonmedical use of prescription drugs is lacking.26,28,29

In response to the gap in knowledge, the main objectives of the present study
were to (1) assess the medical and nonmedical use of 4 classes of prescription drugs (opioid, stimulant, sleep-
ing, and sedative or anxiety medication) among under-
graduate college students and (2) compare probable drug
abuse among 4 mutually exclusive categories of medical
and nonmedical use of prescription drugs.

METHODS

This study was conducted from January 14, 2005, to February
28, 2005, drawing on a total undergraduate population of 20 138
full-time students (10 339 women and 9799 men) attending a
large US public research university. After the study received
institutional review board approval, a random sample of 3589
full-time undergraduate students was drawn from the total un-
dergraduate population. The entire sample was mailed $2.00
along with a prenotification letter that described the study and
invited students to self-administer a Web survey by using a URL
address and unique password. Informed consent was ob-
tained online from each participant. Nonrespondents were sent
up to 4 reminder e-mails. The Web survey was maintained on
an Internet site running with the secure socket layer protocol
to ensure privacy and security. By participating in the survey,
students became eligible for a sweepstakes that included cash
prizes, travel vouchers, tickets to athletic events, and iPods. The
final response rate was 68%, and potential nonresponse bias
was assessed by administering a short form of the question-
naire via telephone to a randomly selected sample of 159 stu-
dents who did not respond to the original Web survey.

The sample consisted of 3639 undergraduate students (53.6%
women and 46.4% men). The mean (SD) age of students in the
sample was 19.9 (2.0) years. The racial/ethnic distribution of
the sample was 67.4% white, 12.1% Asian, 6.0% African Ameri-
can, 4.2% Hispanic, and 10.2% other ethnic categories. The
sample was made up of 28.5% freshmen, 23.4% sophomores,
23.1% juniors, and 25.0% seniors. The demographic charac-
teristics of the sample closely resembled the overall student popu-
lation at this university. The family income distribution for the
sample was as follows: 12.4% less than $50 000, 23.0% from
$50 000 to $99 999, 17.9% from $100 000 to $149 999, 11.8%
from $150 000 to $249 999, 9.2% from $250 000 or more, and
25.8% did not know. A total of 46.3% of the sample lived in
university residence halls, 43.7% resided in a house or apart-
ment, 4.4% lived in a fraternity or sorority house, and 5.4% re-
708

sided in other living location. 13.1% of respondents were
active members of a social fraternity or sorority.

Lifet ime medical use of prescription medication was mea-
sured using the following question: “Based on a doctor’s pre-
scription, on how many occasions in your lifetime have you
used the following types of drugs?” A separate question was
asked for each of the following 4 classes of prescription drugs:
(1) sleeping medication (eg, Ambien [zolpidem], Halcion [tria-
zolam], Restoril [temazepam], temazepam, triazolam); (2) seda-
tive or anxiety medication (eg, Ativan [lorazepam], Xanax [al-
prazolam], Valium [diazepam], Klonopin [clonazepam], diazepam,
lorazepam); (3) stimulant medication (eg, Ritalin
[ methylphenidate], Dexedrine [dextroamphetamine], Adder-
all [dextroamphetamine and amphetamine], Concerta [meth-
ylphenidate], methylphenidate]; and (4) pain medication (ie,
opioids such as Vicodin [hydrocodone and acetaminophen],
OxyContin [oxycodone], Tylenol 3 [acetaminophen] with
codeine, Percocet [oxycodone and acetaminophen], Darvocet
[propoxyphene and acetaminophen], morphine, hydro-
codone, oxycodone]. The response scale for each question ranged
from (1) never to (7) on 40 or more occasions. Similar vari-
ables were used to assess past-year medical use of prescription
medication.

Lifetime nonmedical use of prescription medication was as-
sessed 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 your lifetime have you used the following types of
drugs, not prescribed to you?” There were separate ques-
tions for the same 4 classes of prescription drugs as medical
use with identical response scales and wording. Similar vari-
ables were used to assess past-year nonmedical use of prescrip-
tion medication.

Lifetime prescription drug use status was assessed by cre-
ating 4 distinct groups of lifetime prescription medication use:
(1) never used 1 or more of the 4 classes of prescription
medication (nonuse); (2) used only 1 or more of the 4 classes
of prescription medication as prescribed by their physicians
(medical use only); (3) used 1 or more of the 4 classes of pre-
scription medication as prescribed by their physicians and
prescription medication that was not prescribed to them
(both medical and nonmedical use]; and (4) used only 1 or
more of the 4 classes of prescription medication that was not
prescribed to them (nonmedical use only). Similar 4-level
variables were developed for each specific drug class and past-
year prescription medication use.

Screening for probable drug abuse was assessed using the
Drug Abuse Screening Test, Short Form (DAST-10), which is
a self-report instrument that can be used in clinical and non-
clinical settings to screen for probable drug abuse or depend-
ence on a wide variety of substances other than alcohol.

Respondents who used drugs other than alcohol in the past
days were asked whether they had experienced drug-
related problems (eg, inability to stop using drugs, simulta-
eaneous polydrug use, illegal activities to obtain drugs, black-
outs as a result of drug use, medical problems as a result of drug
use, withdrawal symptoms, feeling bad or guilty about drug use,
family complaints about drug use, and family avoidance be-
cause of drug use). The DAST-10 items were not drug spe-
cific, and respondents were informed that drug refers to use of
prescription drugs not prescribed to you or in a manner not
intended by the prescribing physician or use of other drugs such
as marijuana, cocaine, lysergic acid diethylamide, or Ecstasy.

On the basis of previous research, we included 3 or more DAST-10 items, this was considered a posi-
tive screening result, denoting risk for probable drug abuse or de-
dependence.31-33 The DAST-10 has been shown to have good
reliability (Cronbach \( \alpha =0.86 \)) and temporal stability (test-
retest intraclass correlation coefficient \( =0.71 \)) and identifies in-
dividuals who need more intensive assessment for substance
abuse problems.31 Evidence for concurrent validity comes from
previous work based on these data, which showed that the DAST-10 was positively correlated with frequency of illicit drug
use and negatively correlated with age at onset of illicit drug
use.34 Maisto et al10 evaluated the DAST-10 using the Diagno-
tic and Statistical Manual of Mental Disorders (Fourth Edition
(DSM-IV))10 drug use disorder diagnosis as the criterion and found
levels of sensitivity and specificity of 0.70 and 0.80, respec-
tively, when using a cutoff point of 3. The Cronbach \( \alpha \) in
the present study was 0.69 for the DAST-10 items.

Data analyses included 3639 respondents, and all statisti-
cal analyses were performed using SPSS statistical software,
version 13.0 (SPSS Inc, Chicago, Illinois). We used \( \chi^2 \) tests to com-
pare the prevalence of medical use and nonmedical use according
to student characteristics. We used \( \chi^2 \) tests, analysis of vari-
ance tests, and multiple logistic regression models to compare
DAST-10 scores across the following 4 mutually exclusive groups
of lifetime and past-year prescription medication users: (1) non-
use, (2) medical use only, (3) both medical and nonmedical
use, and (4) nonmedical use only. Multiple logistic regression
models were conducted with nonusers serving as the refer-

(Reprinted) Arch Pediatr Adolesc Med/Vol 162 (No. 3), Mar 2008 WWW.ARCHPEDIATRICS.COM

©2008 American Medical Association. All rights reserved.

Downloaded From: on 04/27/2018
ence group and were adjusted for the following covariates: sex, race/ethnicity, class year, family income level, living arrangement, social fraternity or sorority membership, and age at onset for use of alcohol, tobacco, and marijuana. Adjusted odds ratios and 95% confidence intervals were reported.

RESULTS

To begin, prevalence rates of lifetime medical and nonmedical use of 4 classes of prescription drugs (pain, sleeping, sedative or anxiety, and stimulant medications) among undergraduate college students were examined. As indicated in Table 1, the lifetime use of at least 1 in 4 classes of prescription drugs was as follows: 1425 (40.1%) never used a prescription drug (nonuse), 1412 (39.7%) used a prescription medication as prescribed by their physicians (medical use only), 563 (15.8%) used a prescription medication as prescribed by their physicians and also used a prescription medication that was not prescribed to them (both medical and nonmedical use), and 156 (4.4%) used a prescription medication that was not prescribed to them (nonmedical use only). Notably, most students reported lifetime medical use of at least 1 in 4 classes of prescription drugs, whereas approximately 1 in every 5 students reported lifetime nonmedical use.

We used χ² tests to compare 4 categories of lifetime medical and nonmedical prescription drug use according to student characteristics. Bivariate analysis indicated significant associations among the 4 mutually exclusive categories of lifetime prescription drug use in terms of sex (P<.05), race/ethnicity (P<.001), class year (P<.001), family income (P<.001), living arrangement (P<.001), social fraternity or sorority membership (P<.01), and age at onset for use of alcohol (P<.001), tobacco (P<.001), and marijuana (P<.001). We used χ² tests to assess the associations between lifetime prescription drug use and each DAST-10 item. As indicated in Table 2, significant bivariate associations were found between every DAST-10 item and lifetime prescription drug use. For each DAST-10 item, the prevalence was higher among individuals who reported lifetime nonmedical use only than those who reported medical use only of prescription drugs. For example, simultaneous poly-drug use was more prevalent among nonmedical users only (33.3%) than among medical or nonmedical users (29.5%), medical users only (4.0%), and nonusers of prescription drugs (2.6%) (χ²=530.2; P<.001). Furthermore, not being able to stop using drugs when they wanted was more prevalent among nonmedical users only (16.0%) than among medical or nonmedical users (11.7%), medical users only (3.8%), and nonusers of prescription drugs (3.7%) (χ²=91.7; P<.001).

Bivariate analyses were used to examine the associations between lifetime prescription drug use and a positive screening result for drug abuse (ie, ≥3 DAST-10 items). The χ² analysis revealed statistically significant associations between lifetime prescription drug use status and a positive screening result for drug abuse (P<.001). In particular, the past-year prevalence of having a positive drug abuse screening result was 3.7% for lifetime nonusers, 3.9% for lifetime medical users only, 30.2% for lifetime medical and nonmedical users, and 35.9% for lifetime nonmedical users only.

Multiple logistic regression results reinforced the bivariate findings; the odds of a positive screening result for drug abuse were significantly higher among individuals who reported lifetime nonmedical use only of prescription drugs after adjusting for covariates (Table 3). The higher rates of a positive screening result for drug abuse among lifetime nonmedical users of prescription drugs held steady across each of the 4 classes of prescription drugs. In addition, the odds of a positive screening result for drug abuse among individuals who reported both lifetime medical and nonmedical use of prescription drugs was significantly greater than in nonusers. In contrast, the odds of a positive screening result for drug abuse generally did not differ between individuals who reported lifetime medical use only and individuals who reported no lifetime use of prescription drugs.

The past-year use of at least 1 in 4 classes of prescription drugs was as follows (Table 1): 2409 students (67.8%) had not used an abusable prescription drug in the past year (past-year nonuser), 702 (19.7%) used prescription medication prescribed to them (past-year medical user only), 232 (6.5%) used both prescription medication prescribed to them and an abusable prescription medication that was not prescribed to them (past-year medical and nonmedical user), and 212 (6.0%) used an abusable prescription medication that was not pre-

Table 1. Frequency Distributions of Lifetime and Past-Year Prescription Drug Use

<table>
<thead>
<tr>
<th>Type of Prescription Drug</th>
<th>Prescription Drug Use Status, No. (%) of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lifetime</td>
</tr>
<tr>
<td>Nonuse</td>
<td>1425 (40.1)</td>
</tr>
<tr>
<td>Medical use only</td>
<td>1412 (39.7)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>563 (15.8)</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>156 (4.4)</td>
</tr>
<tr>
<td>Pain medication</td>
<td></td>
</tr>
<tr>
<td>Nonuse</td>
<td>1622 (45.6)</td>
</tr>
<tr>
<td>Medical use only</td>
<td>1422 (40.3)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>407 (11.4)</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>104 (2.9)</td>
</tr>
<tr>
<td>Sleeping medication</td>
<td></td>
</tr>
<tr>
<td>Nonuse</td>
<td>3193 (89.8)</td>
</tr>
<tr>
<td>Medical use only</td>
<td>203 (5.7)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>50 (1.4)</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>108 (3.0)</td>
</tr>
<tr>
<td>Sedative or anxiety mediation</td>
<td></td>
</tr>
<tr>
<td>Nonuse</td>
<td>3209 (90.3)</td>
</tr>
<tr>
<td>Medical use only</td>
<td>189 (5.3)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>45 (1.3)</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>110 (3.1)</td>
</tr>
<tr>
<td>Stimulant medication</td>
<td></td>
</tr>
<tr>
<td>Nonuse</td>
<td>3148 (88.5)</td>
</tr>
<tr>
<td>Medical use only</td>
<td>107 (3.0)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>73 (2.1)</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>228 (6.4)</td>
</tr>
</tbody>
</table>

*The 4 classes of prescription drugs include pain, sleeping, sedative or anxiety, and stimulant medications.*
The association between past-year prescription drug use status and a positive screening result for drug abuse (based on endorsing at least 3 DAST-10 items) was examined using χ² analysis and revealed statistically significant associations (P < .001). In particular, the past-year prevalence of a positive screening result for drug abuse was 4.6% for past-year nonusers, 8.1% for past-year medical users only, 34.5% for past-year medical and nonmedical users, and 44.8% for past-year nonmedical users only. The multivariate logistic regression results indicated that the odds of a positive screening result for drug abuse did not differ significantly between past-year medical users and past-year nonusers after adjusting for covariates. In contrast, past-year medical and nonmedical users were more than 4 times more likely than past-year nonusers to experience 3 or more DAST-10 items (adjusted odds ratio, 4.3; 95% confidence interval, 3.0-6.2; P < .001). Similarly, past-year nonmedical users were more than 6 times more likely than past-year nonusers to experience 3 or more DAST-10 items (adjusted odds ratio, 6.2; 95% confidence interval, 4.3-9.0; P < .001).

Because DAST-10 items were asked only of respondents unless otherwise indicated.

©2008 American Medical Association. All rights reserved.

## Table 2. Drug Abuse Screening Test Results Based on Lifetime Use of 4 Classes of Prescription Drugs

<table>
<thead>
<tr>
<th>DAST-10 Item</th>
<th>Nonuse of Prescription Drugs (n = 1425)</th>
<th>Medical Use Only (n = 1412)</th>
<th>Medical and Nonmedical Use (n = 563)</th>
<th>Nonmedical Use Only (n = 156)</th>
<th>χ² Associations²³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you used drugs other than those required for medical reasons?</td>
<td>240 (16.9)</td>
<td>324 (22.9)</td>
<td>341 (60.7)</td>
<td>102 (65.4)</td>
<td>507.6</td>
</tr>
<tr>
<td>Have you used more than 1 drug at a time?</td>
<td>37 (2.6)</td>
<td>56 (4.0)</td>
<td>166 (29.5)</td>
<td>52 (33.3)</td>
<td>530.2</td>
</tr>
<tr>
<td>Are you always able to stop using drugs when you want to?²</td>
<td>53 (3.7)</td>
<td>53 (3.8)</td>
<td>66 (11.7)</td>
<td>25 (16.0)</td>
<td>91.7</td>
</tr>
<tr>
<td>Have you had blackouts or flashbacks as a result of drug use?</td>
<td>27 (1.9)</td>
<td>30 (2.1)</td>
<td>61 (10.9)</td>
<td>25 (16.0)</td>
<td>156.0</td>
</tr>
<tr>
<td>Have you ever felt bad or guilty about your drug use?</td>
<td>95 (6.7)</td>
<td>136 (9.6)</td>
<td>156 (27.8)</td>
<td>53 (34.0)</td>
<td>242.2</td>
</tr>
<tr>
<td>Have you experienced withdrawal symptoms (felt sick) when you stopped taking drugs?</td>
<td>11 (0.8)</td>
<td>22 (1.6)</td>
<td>62 (11.0)</td>
<td>18 (11.5)</td>
<td>186.8</td>
</tr>
<tr>
<td>Have you stayed away from your family because of your use of drugs?</td>
<td>8 (0.6)</td>
<td>16 (1.1)</td>
<td>48 (8.5)</td>
<td>19 (12.2)</td>
<td>172.7</td>
</tr>
<tr>
<td>Have you engaged in illegal activities in order to obtain drugs?</td>
<td>31 (2.2)</td>
<td>32 (2.3)</td>
<td>75 (13.3)</td>
<td>28 (17.9)</td>
<td>195.0</td>
</tr>
<tr>
<td>Have you used drugs other than those required for medical reasons?</td>
<td>4 (0.3)</td>
<td>4 (0.3)</td>
<td>41 (7.3)</td>
<td>11 (7.1)</td>
<td>167.3</td>
</tr>
<tr>
<td>Have you used drugs other than those required for medical reasons?</td>
<td>4 (0.3)</td>
<td>9 (0.6)</td>
<td>21 (3.7)</td>
<td>8 (5.1)</td>
<td>65.7</td>
</tr>
</tbody>
</table>

Abbreviation: DAST-10, Drug Abuse Screening Test, Short Form.

² lifetime prescription drug use includes pain, sleeping, sedative or anxiety, and stimulant medication. Data are presented as number (percentage) of respondents unless otherwise indicated.
³ χ² P < .001 for all comparisons.

The present study found that most undergraduate college students at this midwestern university reported lifetime medical use of at least 1 in 4 classes of prescription drugs, whereas approximately 1 in every 5 students reported lifetime nonmedical use. Most medical users of prescription drugs reported no history of nonmedical use. In contrast, most nonmedical users of prescription drugs reported a history of medical use of prescription drugs, but this was largely driven by prescription opioids. The finding that most nonmedical users also reported medical use suggests an important association between medical use and nonmedical use but also suggests that medical use is not necessary for the initiation of nonmedical use.

The findings of this study provide compelling evidence that nonmedical users of prescription drugs are at substantially higher risk of a positive screening result for drug abuse. On the basis of the high rates of drug use-related problems among nonmedical users, more research is needed to determine the subpopulations that...
are most at risk for developing substance use disorders. In contrast, medical users without any history of nonmedical use were at considerably lower risk of screening positive for drug abuse than medical users with a history of nonmedical use. For example, for those medical users who had no nonmedical use, less than 6% had a positive screening result for drug abuse based on the DAST-10; however, nearly 30% of medical users with a history of nonmedical use of prescription drugs had a positive drug abuse screening result. Finally, the odds of a positive screening result for drug abuse generally did not differ between individuals who reported medical drug use only and individuals who reported no use of prescription drugs. These results suggest that health care professionals should conduct routine screening for general drug abuse, especially among students who report a history of using prescription medication not prescribed to them. Individuals who screen positive for drug abuse should be referred for a more in-depth assessment, and medications that are less prone to abuse should be considered for individuals with a substance use disorder who are in need of prescription medication (eg, atomoxetine hydrochloride or bupropion hydrochloride). These results should also provide some level of assurance to health care professionals who prescribe abusable medications within college student populations that they can effectively treat patients with these medications.

Although stimulant medication had the lowest lifetime prevalence for medical use only, this same class of prescription drugs had the highest lifetime prevalence of nonmedical use only. The number of lifetime and past-year nonmedical users of stimulant medication was greater than the number of lifetime and past-year medical users of stimulant medication, respectively. Notably, findings indicate that medical users of stimulant medication without a history of nonmedical use were not at increased risk for drug abuse, whereas medical users of stimulant medication with a history of nonmedical use were at substantially increased risk for drug abuse. These findings complement previous evidence that proper medication management with stimulants for attention-deficit/hyperactivity disorder (ADHD) has a protective effect against the development of substance use disorders. Although there is evidence that most young adults prescribed stimulant medication for ADHD use their prescription medications appropriately, growing evidence suggests that nonmedical users have a direct impact on medical users of prescription stimulants. For example, a recent college-based study found that undergraduate students

### Table 3. Positive Screening Results for Drug Abuse Based on Lifetime Use of 4 Classes of Prescription Drugs

<table>
<thead>
<tr>
<th>Prescription drug class</th>
<th>Positive Screening Results for Past-Year Drug Abuse in Overall Sample</th>
<th>Positive Screening Results for Past-Year Drug Abuse in Drug Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respondents, No. (%)</td>
<td>Adjusted Odds Ratio (95% Confidence Interval)</td>
</tr>
<tr>
<td>Nonuse</td>
<td>46 (3.2)</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Medical use only</td>
<td>77 (5.5)</td>
<td>1.3 (0.8-1.9)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>164 (29.2)</td>
<td>5.0 (3.4-7.3)c</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>55 (35.3)</td>
<td>6.5 (4.0-10.6)c</td>
</tr>
<tr>
<td>Pain medication</td>
<td>Nonuse</td>
<td>83 (5.1) [Reference]</td>
</tr>
<tr>
<td>Medical use only</td>
<td>92 (6.5)</td>
<td>0.9 (0.7-1.3)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>123 (30.3)</td>
<td>3.8 (2.6-5.4)c</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>43 (41.3)</td>
<td>5.4 (3.2-9.1)c</td>
</tr>
<tr>
<td>Sedative or anxiety medication</td>
<td>Nonuse</td>
<td>238 (7.5) [Reference]</td>
</tr>
<tr>
<td>Medical use only</td>
<td>20 (10.6)</td>
<td>1.0 (0.5-1.7)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>16 (35.6)</td>
<td>3.3 (1.6-6.9)c</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>66 (60.0)</td>
<td>7.0 (4.4-11.2)c</td>
</tr>
<tr>
<td>Sleeping medication</td>
<td>Nonuse</td>
<td>245 (7.7) [Reference]</td>
</tr>
<tr>
<td>Medical use only</td>
<td>35 (17.3)</td>
<td>1.7 (1.1-2.6)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>21 (42.0)</td>
<td>3.7 (1.9-7.2)c</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>41 (38.0)</td>
<td>3.9 (2.4-6.4)c</td>
</tr>
<tr>
<td>Stimulant medication</td>
<td>Nonuse</td>
<td>183 (5.8) [Reference]</td>
</tr>
<tr>
<td>Medical use only</td>
<td>15 (14.0)</td>
<td>1.4 (0.7-2.7)</td>
</tr>
<tr>
<td>Medical and nonmedical use</td>
<td>35 (47.9)</td>
<td>6.1 (3.5-10.8)c</td>
</tr>
<tr>
<td>Nonmedical use only</td>
<td>109 (47.8)</td>
<td>5.3 (3.8-7.4)c</td>
</tr>
</tbody>
</table>

a Odds ratios are adjusted for sex, race, class year, family income, living arrangement, fraternity or sorority membership, and age at onset for use of alcohol, cigarette smoking, and marijuana (odds ratios for these variables were not shown).

b The 4 classes of prescription drugs include pain, sleeping, sedative or anxiety, and stimulant medications.

P < .001 based on logistic regression results.

P < .05.
who were prescribed stimulant medications for ADHD were considerably more likely to be approached to divert (eg, sell, trade, or give away) their medication (54%) in the past year than those who were prescribed opioid medication (26%), sedative or anxiety medication (19%), or sleeping medication (14%).

This study has some limitations. First, nonresponse bias was a concern because approximately 32% of those invited to participate did not complete the Web survey. Nonresponse bias was assessed by administering a short form of the questionnaire via telephone to a randomly selected sample of students who did not respond to the original Web survey. No significant differences were found in the rates of past-year alcohol use, heavy episodic drinking, 30-day cigarette smoking, and other problem behaviors between respondents who completed the original Web survey and respondents to the follow-up telephone survey. Second, the DAST-10 items were not drug specific, so the higher rates of a positive screening result for drug abuse based on the DAST-10 among nonmedical users of prescription drugs could be attributed to differences in substance use behaviors such as age at onset and polydrug use. Although age at onset of alcohol, marijuana, and cigarette smoking was adjusted in the regression analyses, future work should assess the consequences associated with nonmedical use of each prescription drug class. Third, DAST-10 cutoff scores were based on previous work conducted largely within clinical samples, and further validation work is needed using DSM-IV drug use disorder diagnosis via clinical interviews as the criterion measure to assess optimal levels of sensitivity and specificity of the DAST among college students. Finally, the sample from the present study was drawn from 1 university, and the findings may not generalize to other college samples because the nonmedical use of prescription drugs has been shown to vary across individual colleges and universities.

Despite the limitations, the findings of the present study have important implications for prescribing abusable medication among college students. Clearly, appropriate diagnosis, treatment, and therapeutic monitoring of college students who are receiving abusable prescription medications is crucial, not only to improve clinical outcomes but also to help prevent the abuse of these medications within a population that is largely responsible for its own medication management. Finally, any efforts aimed at reducing nonmedical use of prescription drugs will have to take into consideration that these drugs are highly effective and safe medications for most patients who use them as prescribed.

Accepted for Publication: August 31, 2007.

Correspondence: Sean Esteban McCabe, PhD, MSW, Substance Abuse Research Center, University of Michigan, 2025 Traverwood Dr, Ste C, Ann Arbor, MI 48105-2194 (plius@umich.edu).

Author Contributions: Dr McCabe had full access to all the data reported in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Financial Disclosure: None reported.

Funding/Sponsor: This study and the development of the manuscript were supported by research grants DA018239 and DA019492 from the National Institute on Drug Abuse, National Institutes of Health, Bethesda, Maryland.

Additional Contributions: Carol Boyd, PhD, James A. Cranford, PhD, Michele Morales, PhD, and Christian Teter, PharmD, provided helpful comments on an early version of the manuscript.

REFERENCES

22. Carroll BC, McLauglin TJ, Blake DR. Patterns and knowledge of nonmedical use of

©2008 American Medical Association. All rights reserved.


32. French MT, Roebuck MC, McGee KA, Chitwood DD, McCoy CB. Using the drug abuse screening test (DAST-10) to analyze health services utilization and cost for substance users in a community-based setting. Subst Use Misuse. 2001;36(6-7):927-946.


