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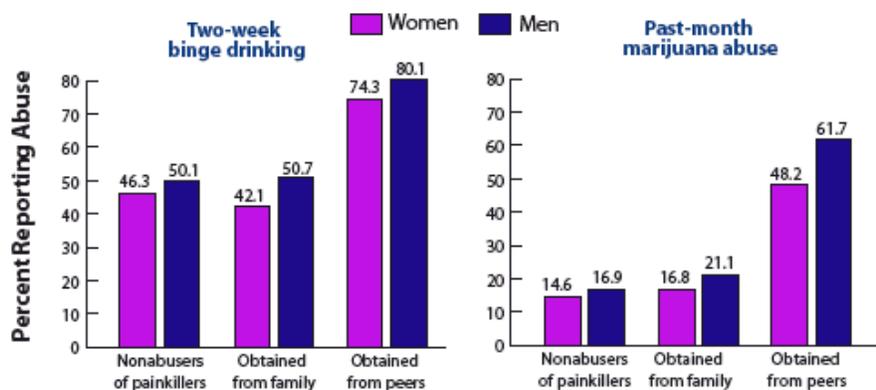
Research Findings  
Vol. 20, No. 4 (March 2006)

## Studies Identify Factors Surrounding Rise in Abuse of Prescription Drugs by College Students

By Lori Whitten, *NIDA NOTES* Staff Writer

Prescription drug abuse among students in U.S. colleges and universities has been rising for several years. The 2004 Monitoring the Future (MTF) Survey of College Students and Adults—the most recent data available—estimated that 7.4 percent of college students used the painkiller hydrocodone (Vicodin) without a prescription in that year, up from 6.9 percent in 2002, with similar increases for other opioid medications, stimulants, and sedatives. Three new NIDA-funded studies reveal which students and campuses have the highest rates of abuse and connect such abuse to other unhealthy behaviors. According to the research, rates of collegiate prescription stimulant abuse are highest among men, Whites, fraternity/sorority members, and at schools in the Northeast.

### Binge Drinking, Marijuana Abuse Are Elevated Among Students Who Obtain Painkillers From Peers



*At one university, students who obtained prescription painkillers from peers reported higher levels of binge drinking and marijuana abuse than nonabusers or those who received painkillers from family.*

### Stimulant Abuse Nationwide

Dr. Sean Esteban McCabe and colleagues at the University of Michigan and Harvard University analyzed the answers from the Harvard School of Public Health College Alcohol Study, which in 2001 surveyed 10,904 randomly selected students enrolled at 119 colleges across the United States. Overall, 4 percent of the respondents reported having taken a stimulant medication without a prescription at least once during the previous year. Men were twice as likely as women (5.8 percent versus 2.9 percent) to have abused methylphenidate (Ritalin), dextroamphetamine (Dexedrine), and amphetamine/dextroamphetamine (Adderall). Stimulant medication abuse was also more prevalent among students who were:

- White (4.9 percent versus 1.6 percent for African-Americans and 1.3

percent for Asians);

- Members of fraternities or sororities (8.6 percent versus 3.5 percent for nonmembers); and
- Earning lower grades (5.2 percent for grade point average of B or lower versus 3.3 percent for B+ or higher).

Students who abused prescription stimulants reported higher levels of cigarette smoking; heavy drinking; risky driving; and abuse of marijuana, MDMA (Ecstasy), and cocaine. Compared with other survey respondents, for example, they were 20 times as likely to report past-year cocaine abuse and 5 times as likely to report driving after heavy drinking.

The campus prevalence of past-year stimulant abuse ranged from 0 percent at 20 colleges—including the three historically African-American institutions included in the survey—to 25 percent. The prevalence was 10 percent or higher at 12 colleges. Students attending colleges in the Northeast, schools with more competitive admission standards, and noncommuter schools reported higher rates of abuse.

### One University's Painkiller Picture

At a large Midwestern university, about 9 percent of 9,161 undergraduates surveyed had taken a prescription pain medication without a doctor's order at least once during the past year; 16 percent reported such abuse in their lifetime. Of the latter, 54 percent said they had obtained the drugs from peers, while 17 percent said their source was a family member. Dr. McCabe and colleagues at the University of Michigan Substance Abuse Research Center found that students who obtained medications from peers were more likely to smoke and drink heavily and to have abused other substances—including marijuana, cocaine, and other illegal drugs—than those who obtained them from family members.

<i>Stimulant Abuse Varies by Campus Characteristics</i>	
<b>Selected Characteristics</b>	<b>Past-year Stimulant Abuse Rates, %</b>
<b>Admission criteria</b>	
More competitive	5.9
Competitive	4.5
Less competitive	1.3
<b>Geographical region</b>	
Northeast	6.3
South	4.6
West	3.2
North Central	2.8
<b>Commuter Status</b>	
Noncommuter school	4.6
Commuter school	1.2
<i>Students enrolled in the most selective colleges reported relatively high levels of past-year stimulant abuse, as did those attending schools in the Northeast. Residential schools reported higher rates than commuter colleges.</i>	

The researchers found that exposure to prescription pain medication early in life increased the likelihood of abuse in college. Women who had received prescriptions for pain relievers in elementary school were more than four times as likely as those with no prescribed use to report abuse in the past year. Men with early prescribed use were twice as likely as those without to report such abuse. In addition:

- Women students were more likely to be prescribed pain medication, while men were more likely to be approached to sell or give away prescribed medication.

- More men obtained the drugs from peers while more women obtained them from family members.
- Past-year prescription painkiller abuse was higher among fraternity members than nonmembers (17 percent versus 9 percent) and among sorority members compared with nonmembers (9.6 percent versus 8.6 percent).

"Students abuse prescription drugs to get high, to self-medicate for pain episodes, to help concentrate during exam time, and to try to relieve stress. Regardless of the motivation, people need to know the risks of abuse and the dangers of mixing drugs," says Dr. Lynda Erinoff, formerly of NIDA's Division of Epidemiology, Services and Prevention Research. Most people assume that if a medication is available on the market, it must be safe—even if it has not been prescribed for them, says Dr. Erinoff, "but a drug or dose that a doctor orders for one person is not necessarily appropriate for another, and prescription abusers are potentially taking a serious risk." NIDA continues to work with doctors and pharmacists and to link prevention specialists with researchers focusing on the problem. "Educating the public remains a critical challenge," says Dr. Erinoff.

*"... people need to know the risks of abuse and the dangers of mixing drugs."*

### Membership Matters

Based on responses from more than 5,000 young people who participated in the MTF when they were high school seniors in 1988 to 1997, and also when they were in college, Dr. McCabe and his Michigan colleagues found that active members of college fraternities or sororities engage in more heavy episodic, or "binge," drinking, cigarette smoking, and marijuana abuse than nonmembers.

The students who joined fraternities or sororities in college were the same ones who reported the highest levels of substance abuse in high school. Moreover, cigarette smoking, binge drinking, and drug abuse increased for all survey participants as they progressed through college. Fraternity and sorority members showed greater elevations in binge drinking and marijuana abuse over time compared with nonmembers. The picture that emerges is of students who are already heavy drinkers when they come to college selecting fraternities and sororities with a reputation for "partying" and then, as members, further increasing their drinking in an environment that supports the behavior.

"It's important for each student to explore, perhaps with counseling, a possible mismatch between his or her college environment and individual needs. Some students benefit from settings that emphasize socialization outside of the party scene; these might include group living arrangements based on shared academic or extracurricular interests," Dr. McCabe says.

### Sources

- McCabe, S.E., et al. Non-medical use of prescription stimulants among US college students: Prevalence and correlates from a national survey. *Addiction* 100(1):96-106, 2005. [[Abstract](#)]
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Research Findings  
Vol. 20, No. 6 (July 2006)

## Drugs Affect Men's and Women's Brains Differently

**Gender appears to influence biological responses to nicotine, cocaine, and alcohol.**

**By Carl Sherman, *NIDA NOTES* Contributing Writer**

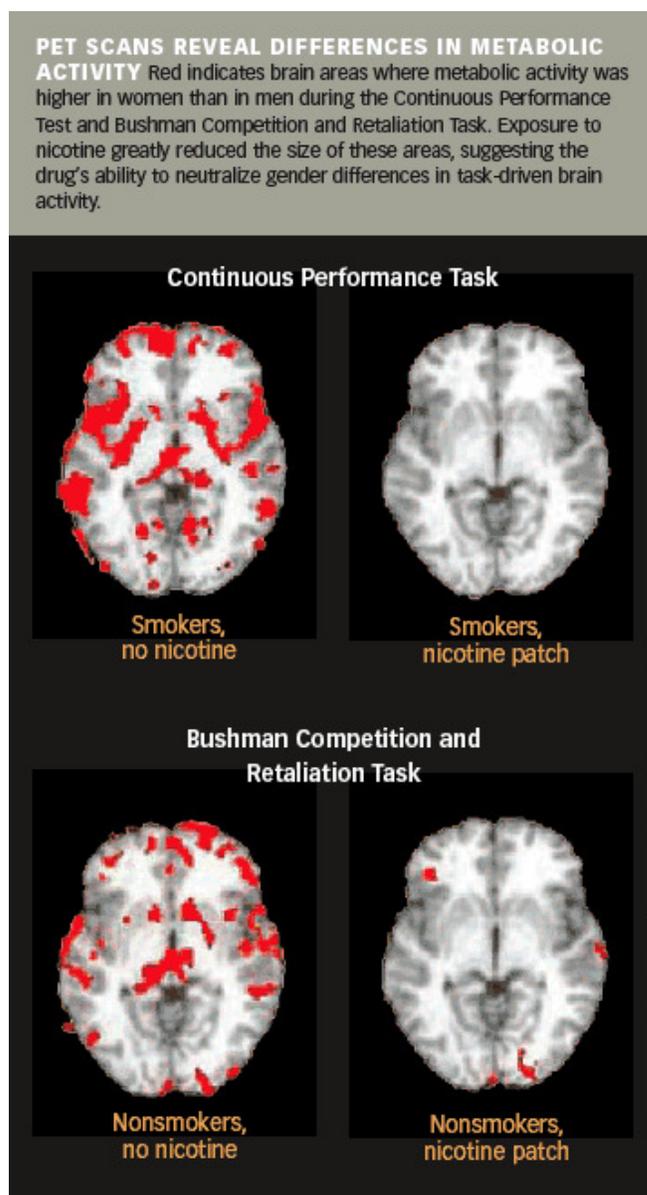
Two recent NIDA-funded studies cast new light on men's and women's different responses to nicotine, cocaine, and alcohol. Dr. Steven G. Potkin and colleagues at the University of California (UC), Irvine, demonstrated that various brain regions are more strongly activated in women than in men while they perform certain tasks, and that nicotine equalizes the response. Dr. Elinore F. McCance-Katz and colleagues at the Medical College of Virginia found that women registered greater feelings of physical and mental well-being than men after receiving cocaine and had higher heart rates after drinking alcohol.

### BRAIN EFFECTS OF NICOTINE

Men and women abuse the same drugs, but not always in the same ways. When women smoke cigarettes, they take shorter and fewer puffs and experience improvements in mood that men do not. Women generally are less successful in quitting. To the UC Irvine study team, these behavioral and experiential differences suggested that nicotine might affect men's and women's brains differently.

Using positron emission tomography (PET), the researchers tracked brain metabolism in 42 women and 77 men (55 smokers and 64 nonsmokers) while they performed two tasks. In the Continuous Performance Task (CPT), a test of vigilance, the study participant watched a series of numbers flashed on a screen and pressed a button when certain figures appeared. The objective of the Bushman Competition and Retaliation Task (BCRT) was to provoke an aggressive response: The participant and an unseen opponent (actually a computer) competed in a test of reaction time, with the loser receiving a blast of noise whose volume and duration were determined by the winner. When the participant lost, which was always the case in early rounds, he or she was shown the noise level that his or her opponent had set; when participants finally won, they could choose how loud and long to blast the opponent back. Participants performed each task once with a placebo patch and once with a transdermal nicotine patch.

When smokers performed the CPT wearing the placebo patch, women's brain metabolism was significantly higher than men's, particularly in the cortical and subcortical prefrontal systems—areas associated with choice, attention, executive function, mood, and memory. These differences largely disappeared when participants wore the nicotine patch: Brain metabolism increased for men and decreased for women. Among nonsmokers, there was little difference in brain activity in men and women while performing the CPT, either with the nicotine patch or with placebo.



With the BCRT, in contrast, it was among nonsmokers that the male-female difference was most marked: Women's brain activity was higher in virtually all regions when the task was performed with placebo, but both sexes exhibited equal activity with nicotine. The gender disparity was smaller among smokers, and this, too, disappeared when they wore the nicotine patch.

"Some effects of nicotine on brain metabolism was not due to the effects of chronic smoking, but rather a fundamental biological difference between men and women in their response to nicotine," Dr. Potkin says. "Everyone knew that there were differences in male and female smoking behavior and smoking rates, but assumed they were just cultural. Based on our findings, a more likely explanation is an interplay of cultural and biological differences. That provides an interesting starting point for devising gender specific interventions."

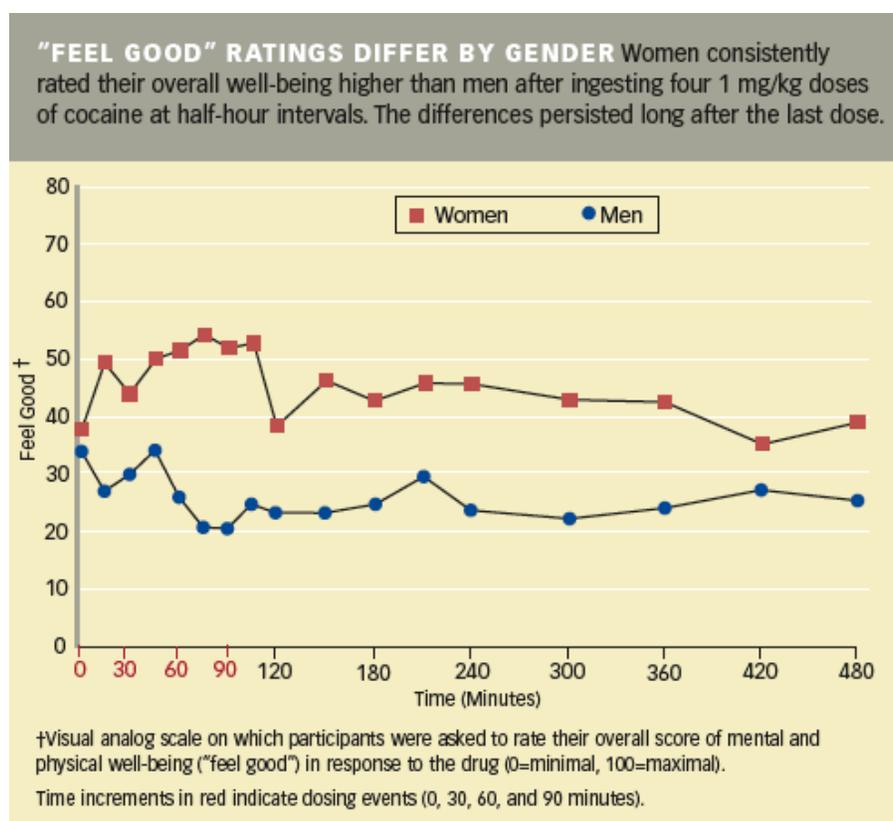
#### **EFFECTS OF ALCOHOL, COCAINE, AND BOTH COMBINED**

Dr. McCance-Katz's study took as a starting point the observation that people frequently consume alcohol and cocaine simultaneously. "We wanted to understand why that might be and whether responses differed in men and women," says Dr. McCance-Katz.

In the double-blind study, nine men and eight women who were addicted to both cocaine and alcohol participated in three experiments performed on successive days.

During the first, they received four 1 mg/kg intranasal doses of cocaine at 30-minute intervals, and two oral doses of alcohol 1 hour apart, in amounts calculated to maintain plasma alcohol concentrations of approximately 100 mg/dL; in the second, cocaine along with alcohol placebo; and in the third, alcohol along with cocaine placebo. The protocol was designed to approximate how cocaine and alcohol might be used together during a day-long binge, Dr. McCance-Katz says. The researchers monitored the participants' psychological and physiological status over an 8-hour period during and after the administration of the drugs.

By most measures, the men's and women's responses did not differ significantly. The researchers did note that women's hearts beat significantly faster than men's when given alcohol alone. Although men and women reported similar ratings of "rush," "any high," "cocaine high," "sad," "depressed," "nervous," or "paranoid" after taking cocaine, women consistently scored higher than men on "feel good"—a rating of combined mental and physical well-being—throughout an observation period starting with their first dose of cocaine and lasting until 6.5 hours after the last. On a scale from 0 to 100, the women's scores ranged from 36 to 54, whereas the men's ranged from a much lower 20 to 34, thus showing no overlap in scores. Gender differences in subjective response to cocaine and alcohol combined, or to alcohol alone, did not attain significance.



"We were a little surprised that women rated their well-being higher [after taking cocaine]," Dr. McCance-Katz says. In previous studies that involved single, somewhat larger doses, women had reported greater anxiety than men when they consumed cocaine. Although it is impossible to predict exactly how feelings of well-being might influence use of the drug, they could well increase the risk of toxicity, says Dr. McCance-Katz. "If you have a strong sense of good mental and physical well-being, you might not be attuned to the internal stimuli that signal the need to stop." Coupled with the fact that cocaine is the illicit drug most often cited by medical examiners in autopsies of female decedents, the finding underlines the importance of bringing more women into treatment and conducting further studies to explore which modalities are effective for women, she says.

Dr. Cora Lee Wetherington, Women and Gender Research Coordinator at NIDA, observes that Dr. McCance-Katz's findings echo animal research showing that female rats exhibit higher levels of motivation for cocaine self-administration than male rats

and may be particularly sensitive to the drug's reinforcing effects. "The results of all these studies attest to the importance of not taking a unisex approach to the analysis of data," comments Dr. Wetherington. "Otherwise, you could come up with averaged findings that don't apply to men or women."

Dr. Jamie Biswas, Chief of the Medications Research Grants Branch at NIDA, says that larger studies should explore why substances of abuse appear to elicit a greater perception of well-being among women. Future research might include women in diverse locales and situations and directly address whether they are more easily addicted or harder to treat than men.

#### SOURCES

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