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An Estimate of the Proportion of Drug-Facilitation of Sexual Assault in Four U.S. Localities*

ABSTRACT: In recent years, drugs including flunitrazepam, gamma-hydroxybutyrate, ketamine, and ethanol, have become popularly associated with drug-facilitated sexual assault. Other drugs are also candidates as factors in "drug facilitated sexual assault" (DFSA). The true extent of DFSA is not known, and is difficult to estimate. We recruited sexual assault complainants at four clinics in different parts of the U.S. to anonymously provide urine and hair specimens, and to answer questions about suspected drugging, drug use, and the sexual assault incident. Urine and hair specimens were tested for 45 drugs, including ethanol, and those pharmacologically capable of inducing sedation, amnesia, or impairment of judgment. Analytical test results were used to estimate the proportion of subjects, and the proportion of all complainants to the clinic in the same time period, who were victims of DFSA. Overall, cases of 43% of 144 subjects, and 7% of 859 complainants, were characterized as DFSA. Subjects underreported their use of drugs. The role of toxicological results and history in characterizing DFSA cases is discussed.

KEYWORDS: forensic science, sexual assault, drug facilitated sexual assault

Sexual assault is a major problem in the U.S. The FBI Uniform Crime Reports system (1) tracks specific crimes, including what the report terms "forcible rape," reported to the police. In 2005 there were 93,934 rapes reported. Historically, the highest number reported for a calendar year was 109,060 in 1992; the lowest was 89,411 in 1999. The true number of rapes is unknown, but is probably higher, since it is traditionally among the more underreported of violent crimes. The Bureau of Justice Statistics annually estimates the number of criminal victimizations using sampling methodology and in-depth interviewing in an effort to determine the extent of underreported crime (2).

In recent years, anecdotal reports of drugging victims for purposes of sexual assault have become more common. It is not clear whether the phenomenon is actually on the rise, there is greater awareness, or reporting is more common. The drugs most often mentioned in this context are flunitrazepam, gamma-hydroxybutyrate (GHB), and ketamine. The term "drug facilitated sexual assault" (DFSA) has come into use to indicate sexual assault of a person whose ability to consent to sexual activity is impaired by the influence of a drug (3–5). The drugs mentioned most often in the DFSA context are also sometimes termed, usually with the addition of methylenedioxy-methamphetamine, "club drugs" (6,7). "Club drugs" suggests availability in night clubs and at rave parties. There is thus overlap between "club" drugs and drugs commonly associated with DFSA. Impairment from ethanol ingestion has long been identified as a risk factor for sexual assault (8,9). Moreover, it is common to find club drugs and ethanol ingested together.

Estimating the true extent of DFSA is difficult. Drug use epidemiology studies in general are complicated by the inaccuracy of self-reporting and by the impracticality of doing extensive laboratory testing on more than selected population samples (10–12).

With DFSA, it would be necessary to know the number of drug-facilitated cases among all sexual assault cases to state the prevalence of DFSA. Estimating this number is essentially impossible, because one cannot know the total number of sexual assault cases in the sample population.

Two prior DFSA studies have examined urine specimens for drugs and alcohol from sexual assault complainants nationwide in cases where drug-facilitation was believed to be a factor (13,14). Slaughter's (13) work showed that two-thirds of the 2003 specimens collected were positive for alcohol and/or drug. ElSohly and Salamone's (14) study involved 1179 specimens; 60.3% of them tested positive for at least one drug.

We report here the results of testing of urine and hair specimens for 45 different drugs from a total sample of 144 sexual assault complainants reporting to clinics in four different U.S. locations. Each complainant at each location had an equal probability of being recruited into the study.

Methods

Four clinics furnished subjects and specimens for this study: Scott & White Medical Center, Temple, TX (designated SW), Palomar-Pomerado Medical Center, Escondido, CA (designated

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PP), Hennepin County Medical Center, Minneapolis, MN (HC), and Providence Everett Medical Center, Everett, WA (PE).

The study protocol was approved by the UIC IRB as well as IRBs for three of the four recruitment clinics. A SPA from the sponsor was obtained for the fourth clinic. All subjects consented to participation.

Subject enrollment began on January 1, 2002, and ended on March 31, 2004, though the recruitment periods were not identical at all the clinic sites. Subjects enrolled in the study were individuals who presented to the clinics to complain of sexual assault. Study subjects agreed to furnish a urine specimen at the time of enrollment, and an additional urine specimen plus a hair specimen 5–7 days later. They also agreed to answer a brief questionnaire concerning drug and alcohol use, suspected drugging, time elapsed since the sexual assault incident, and to provide their ages. A modest cash payment to offset expenses connected to returning for the second visit was provided to subjects who returned. Not all of them did. The clinics retained all signed consent forms, but forwarded an unsigned copy to UIC as evidence that the approved protocols had been followed. Specimens were held refrigerated until they were picked up by a commercial courier service and overnighted to UIC, where they were frozen until they were analyzed. Subjects were fully anonymized to the UIC researchers. The initial urine specimen was collected to look for drugs present at the time of presentation to the clinic. Any drugs found in this specimen could potentially be related to the assault incident. The follow-up urine and hair specimens were collected: (i) to identify any drugs ingested by the subject between clinic visits, and (ii) to find out whether we could detect drugs persisting in the hair that were no longer detectable in urine specimens. In addition, subjects' self-reporting of drug and alcohol ingestion, or their suspicion of drugging by another person, was correlated with the findings in the initial urine specimen. Some drugs, including certain benzodiazepines, are detectable in hair for many days following a single dose, long after they are no longer detectable in urine (15,16).

Besides the several drugs mentioned above that are popularly associated with drug facilitation of sexual assault, there is a larger number of drugs potentially able to cause impairment of judgment, and thus of the ability to render consent to sexual activity.

Inability to give consent caused by impairment due to one or more drugs, or a combination of one or more drugs along with alcohol, constitutes drug facilitation of sexual assault.

The Society of Forensic Toxicologists formed a committee in the 1990s to examine the problem more closely, and among other things, the committee report listed 48 drugs that had been or could be associated with DFSA based on laboratories' experience, on the known pharmacological properties of the drugs, and on any known synergistic effects with ethanol [Table 1; (3)].

Of the 48 drugs in the table, we screened for 45 in the present study. Specimens were screened by immunoassay or mass spectrometry. Gas chromatography–mass spectrometry was used to confirm the presence of any drugs reported as detected in any specimens. Analytical details have been reported elsewhere (17,18). The drugs in the table include the SAMHSA (Substance Abuse and Mental Health Services Administration) drugs of abuse (amphetamines, marijuana, cocaine, phencyclidine, and opiates), along with prescription and over-the-counter drugs from a number of classes. Some of the drugs are not very good candidates for the drug facilitation of sexual assault. They were included in the study because they are commonly abused, and one aim of the study involved correlating toxicological findings with self-reporting of drug ingestion by subjects. Drugs that are good candidates for DFSA include CNS depressants, and drugs that, with or without the added presence of ethanol, lead to excessive relaxation, lowered consciousness, and/or anterograde amnesia.

TABLE 1—*Drugs associated with or potentially able to facilitate sexual assault.**

Class/category	Drugs/substances
Narcotic/analgesic	Codeine, hydrocodone, hydromorphone, morphine, methadone, oxycodone, propoxyphene†
Stimulants	Amphetamine cocaine methamphetamine
Depressants, hypnotics, tranquillizers, general anesthetics	Alprazolam, amobarbital 1,4-butanediol† (NMU), butalbital, carisoprodol, chloral hydrate†, chlordiazepoxide, clonazepam, diazepam, ethanol, flunitrazepam, GHB, ketamine, meprobamate, oxazepam, pentobarbital, phenobarbital, secobarbital, triazolam, zolpidem
Hallucinogens	PCP, MDMA (NMU)
Psychomimetics	THC
SSRIs, tricyclic antidepressants	Amitriptyline, citalopram, doxepin, fluoxetine, imipramine, paroxetine, sertraline
Anticonvulsants	Valproic acid
Cough suppressant	Dextromethorphan (OTC)
Muscle relaxant	Cyclobenzaprine
Antihistamines	Diphenhydramine, doxylamine (OTC), chlorpheniramine
Antihypertensive	Clonidine
Anticholinergic	Scopolamine

NMU, no approved medical use; GHB, gamma-hydroxybutyrate; PCP, phencyclidine (phenylcyclohexylpiperidine); MDMA, methylenedioxy-methamphetamine (3,4-methylenedioxy-*N*-methylamphetamine); THC, tetrahydrocannabinol; SSRI, selective serotonin reuptake inhibitor; OTC, over the counter.

*From reference (3).

†Drugs not included for screening in the present study.

In the text and in the tables, we use the name(s) of the parent drugs. However, in urine, metabolites are frequently the species detected, sometimes along with the parent drug. For example, flunitrazepam is detected as 7-aminoflunitrazepam, clonazepam as 7-aminoclonazepam, tetrahydrocannabinol (THC) as THC-COOH, and cocaine as benzoylecgonine.

The clinics participating in this study were specifically established to see, examine, and treat sexual assault complainants. They are separate from, although administratively associated with, larger health service centers. All are staffed by forensic nurses, specifically trained as Sexual Assault Nurse Examiners (19). The total number of people at risk for sexual assault in each clinic's geographical service area is not known. The geographical service areas are not tightly defined. And further, sexual assault complainants in the geographical areas could have presented to another clinic or health service provider. Accordingly, we cannot estimate the prevalence of DFSA. However, the number of complainants seen by each clinic during the study time interval is known, and as a result we can calculate the proportions of complainants in whom the drugs were found using either: (i) the total number of complainants; or (ii) the number of enrollees in the study, as denominators. In addition, we did not perform laboratory tests normally associated with sexual assault (e.g., identifying semen on vaginal swabs, DNA typing) nor any case follow-up to ascertain the legal fate of the cases. We assumed, for purposes of calculating the proportions of DFSA, that all the sexual assault complaints were legitimate.

Another complication is defining criteria for the diagnosis of DFSA. The most obvious definition, common in the criminal statutes, is administering judgment- and/or memory-impairing drugs to another person in order to sexually victimize her (or him) (20–22). One federal statute establishes a sentence of up to 20 years for this

action. And, the Illinois statutes, as one example of state law, provide that drugging a potential victim is an aggravating factor in the sexual assault offense, enabling a charge of "aggravated criminal sexual assault" as against "criminal sexual assault," and thus making potential punishment more severe. However, taking sexual advantage of another person who is impaired because of voluntary drug (and/or alcohol) use is also drug-facilitated sexual assault.

The distinction between the two circumstances cannot be made on the basis of drug-testing results. An analyst has no way of knowing whether the drugs were clandestinely administered or voluntarily ingested. Moreover, a person could voluntarily drink alcohol, but be clandestinely administered another drug. In actual cases, a complainant's account of events, admission or denial of voluntary drug and/or alcohol use, and belief about the clandestine administration of drugs, must be considered. The time interval from incident to reporting is important in interpreting the laboratory findings in the context of the case. For example, GHB, in particular, has a very short half life in urine, and can easily be missed if specimens are not collected within a few hours of ingestion. Interpretation of GHB findings are further complicated by its being an endogenous compound in humans (23).

In the data analysis, we classified cases as DFSA if: (i) a drug or drugs were confirmed in urine that could have reduced the competency of the subject to give consent; and (ii) the clinic visit was within 72 h of the sexual assault incident.

There is no readily definable dose–response relationship for drugs or alcohol detected in urine. Thus, detecting urinary alcohol, for example, provides no information about the blood alcohol level at the time of the alleged assault, although it does establish that alcohol was consumed within hours of specimen collection.

Results and Discussion

Table 2 summarizes the age and ethnic group distribution of study subjects by site location. All subjects in this study were women although men were not excluded as potential subjects. The majority were White and between the ages of 18 and 25. The ethnic distribution of study subjects is close to that of the U.S. population according to the 2000 census.

A specific aim of this study was correlating drug use reporting by subjects with analytical findings in urine. This correlation study has not, to our knowledge, been previously done in this population. Table 3 summarizes the number of subjects who admitted to ingesting ethanol or certain drugs and compares that to the number in whom the substance(s) could be confirmed in urine. It is well known that ethanol does not persist in urine, so failure to detect it is not surprising in subjects who did not report to the clinics within a few hours. Thus, we cannot evaluate the accuracy of self-reporting of alcohol consumption. Except GHB, the other drugs or their metabolites have much longer half lives in urine. That data can be used to judge the accuracy of self-reporting of drug use in this population. It is evident that there is considerable underreporting. Our data provide no insight into the reasons for underreporting. Although not inconsistent with prior studies on the accuracy of self-reporting of drug use in other populations (24,25), this issue has not been previously examined in this population. The time between any drug ingestion and urine specimen collection also obviously affects the ability of an analytical technique to detect a drug or metabolite. Thus, complainants may state or believe they were given drugs but the drugs (or metabolites) may not be confirmable in urine. Depending on the different variables, they could in fact have been given drugs. In addition, complainants may not admit to the actual ingestion of drugs (or alcohol), when it has in fact occurred. These findings complicate defining criteria for classifying cases as DFSA that include self-reporting history.

TABLE 2—*Age and ethnic group distribution of subjects by site.*

	SW	PP	HC	PE	Total
Ethnic					
White	22	40	26	14	102
Black	6	0	6	0	12
Hispanic	2	14	2	0	18
Other/unknown	1	2	8	1	12
Age (years)					
18–25	18	33	26	10	87
26–30	7	4	4	3	18
31–35	2	7	4	1	14
36–40	3	6	3	0	12
≥41	1	6	5	1	13
Site subtotal	31	56	42	15	144

SW, Scott & White Medical Center, Temple, TX; PP, Palomar-Pomerado Medical Center, Escondido, CA; HC, Hennepin County Medical Center, Minneapolis, MN; PE, Providence Everett Medical Center, Everett, WA.

TABLE 3—*Self-reporting use of drugs (admission) and confirmation in urine among study subjects.*

		Alcohol	Marij	Coc	Opiates	Benzo	Amphet
SW	Admitted	12	2	1	0	0	1
	Confirmed	1	7	5	2	1	0
PP	Admitted	26	5	2	0	0	3
	Confirmed	4	11	5	2	3	7
HC	Admitted	15	3	5	0	0	0
	Confirmed	6	16	13	5	0	2
PE	Admitted	13	3	0	0	0	1
	Confirmed	3	4	3	1	1	1
Total	Admitted	66	13	8	0	0	5
	Confirmed	14	47	26	10	5	10

Alcohol, ethanol; Marij, THC metabolite; Coc, cocaine metabolite; Opiates, any member of the opiate class; Benzo, any benzodiazepine; Amphet, any member of the amphetamine class; SW, Scott & White Medical Center, Temple, TX; PP, Palomar-Pomerado Medical Center, Escondido, CA; HC, Hennepin County Medical Center, Minneapolis, MN; PE, Providence Everett Medical Center, Everett, WA.

We have thus classified cases in the study as DFSA based on confirmed findings of drugs in urine and a 72-h time window. The data are shown in Table 4, along with a summary of the numbers of subjects and numbers of complainants seen during the study time period. DFSA proportions were determined using both the number of subjects in the study, and the total number of complainants seen at that clinic site over the study period, as denominators.

The table also summarizes the numbers of subjects who provided questionnaires and who returned for the second clinic visit. In the original study design, the questionnaire was to be completed at the second visit. That was changed once we realized that a significant number of subjects would fail to return. Because the start of recruiting varied among sites, there are differences in the questionnaire return rate. Using our criteria, DFSA proportions may be understated, because both alcohol and GHB clear rapidly, and some other drugs, depending on the initial dose, could fall below the limits of quantitation within the 72-h time window.

The PP clinic furnished the most subjects and PE the fewest. Overall, just over 43% of the subject cases could be classified as DFSA, with a range of about 30–60% across the clinics. Just over 7% of the total patient population could be similarly classified. We originally thought that it might be possible to estimate the proportion of involuntary drugging versus voluntary drug ingestion cases,

TABLE 4—*Subject reporting characteristics and DFSA proportions.*

	SW	PP	HC	PE	Total
Subjects	31	56	42	15	144
Total patients*	171	317	353	18	859
Reporting interval**	2–60	1.5–456	3–67	3–66	–
Questionnaire	24	56	24	15	119
Second visit	24	8	18	9	59
DFSA	14	17	22	9	62
Proportion subjects	14/31 = 0.452	17/56 = 0.304	22/42 = 0.524	9/15 = 0.60	62/144 = 0.431
Proportion patients	14/171 = 0.082	17/317 = 0.054	22/353 = 0.062	9/18 = 0.50	62/859 = 0.072

Proportion values are rounded to three places.

SW, Scott & White Medical Center, Temple, TX; PP, Palomar-Pomerado Medical Center, Escondido, CA; HC, Hennepin County Medical Center, Minneapolis, MN; PE, Providence Everett Medical Center, Everett, WA; DFSA, drug facilitated sexual assault.

*Total sexual assault complainants seen at this clinic during the recruiting period.

**Reported time (h) between incident and presentation at the clinic.

but these estimates necessarily depend on history and self-reporting by subjects. Limitations on the ability to detect certain drugs within the time window, and the demonstrable under-reporting of actual drug use, make self-reporting an unreliable criterion.

The four clinics that were developed as study sites were intentionally selected to be in different parts of the country. Efforts to develop a number of additional sites were unavailing. Our estimates of the proportions of sexual assaults that fit our DFSA criteria are clearly limited to the sample tested. The number of subjects in the study is relatively small, and there is no way to know without additional studies how representative the data might be for larger populations.

Hair specimens were obtained from subjects at the second clinic visit. Specimens from 59 subjects were collected, but many fell short of the quantity required for both screening and confirmation tests—50 mg after pulverization. Only 10 specimens contained enough hair for both.

Twenty-one hair specimens screened positive for one or more of the compounds in Table 1. There were no cases in which the hair analysis changed the DFSA classification of the case. The 1 week between presentation visit and follow-up visit is not sufficient time in most cases for a drug ingested at or near the time of the initial visit to accumulate in hair to detectable levels. The time was chosen to coincide with the usual clinical follow-up time. Drugs confirmed in hair in this study likely represent ingestion in the weeks preceding presentation to the clinic. This information could be helpful in determining that a person was regularly taking (or abusing) a drug. Sampling hair around a month after presentation would be more likely to reveal drugs ingested around the time of presentation.

Table 5 summarizes data from a representative sample of specific cases to illustrate the complexities of interpretation of history and toxicological findings in potential DFSA case situations.

In Case 1, the complainant stated she suspected she was given a drug. She had a prescription for and was taking clonazepam, which was found in the presenting visit urine specimen. She further stated that she was drinking alcohol. No drugs other than clonazepam were found. The combination of the benzodiazepine and alcohol could have rendered her incompetent to consent to sex. It was unclear if she knew about the potential effects of alcohol and the prescription drug. This case was classified DFSA. The findings comport with the history, except that the complainant believed she had been drugged.

The complainant in Case 2 had 7-aminoflunitrazepam in her presentation visit urine, along with citalopram. She stated that she was drinking alcohol, but not that she had taken any drugs. Flunitrazepam metabolite was also found in the second clinic visit urine in quantities exceeding those of the initial visit, suggesting recreational ingestion between clinic visits. The case was classified as DFSA. She could well have been impaired. The finding of drugs in urine that are not admitted to in the history suggests but does not prove voluntary ingestion.

In Case 3, the complainant's presentation visit urine had flunitrazepam metabolite, alcohol, hydromorphone, and THC metabolite. The subject admitted to drinking alcohol, and further stated she suspected she had been drugged, but did not admit to taking any drugs. The second visit urine specimen contained amitriptyline, nortriptyline, oxycodone, and THC metabolite. Interpretation is complicated by the drugs she took before the presentation visit and between visits and did not admit taking. This case was classified as DFSA.

In Case 4, the subject admitted to using marijuana and drinking alcohol. The presentation visit urine contained oxazepam, cocaine, and doxylamine in addition to THC metabolite. Alcohol was not present but its absence could be explained by the passage of time. She stated she accepted one drink from the suspected assailant after

TABLE 5—*Summary of findings in illustrative representative cases.*

Case	Drugs confirmed in presenting visit urine	Drugs confirmed in second visit urine	Drugs confirmed in hair
1	Clonazepam metabolite	NA	NA
2	Flunitrazepam metabolite; citalopram	Flunitrazepam metabolite	None
3	Fluintrazepam metabolite; alcohol; hydromorphone; THC-COOH	Amitriptyline; nortriptyline; oxycodone; THC-COOH	None
4	Oxazepam; THC-COOH; cocaine; doxylamine	THC-COOH	Cocaine
5	Cocaine metabolite	Cocaine metabolite; THC-COOH	Cocaine
6	Doxylamine; nortriptyline	NA	NA

NA, not available.

meeting him, and then remembered nothing further until she woke up hours later. The second visit urine and hair testing results indicate that she did not seem to be regularly abusing depressants. The case was classified as DFSA, and could well represent an involuntary drugging.

Case 5 was not classified as DFSA. The Case 5 complainant admitted to taking cocaine, and it was found. It was also found, along with THC, in the second visit urine, and cocaine was found in the hair specimen. She stated she did not believe she was impaired or drugged.

Case 6 was classified as DFSA because of the drugs found in the presentation visit urine specimen. Although it would not change the classification, additional information about how to interpret the case might have been obtained from a second-visit specimen and a history.

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Disclaimer

Views and opinions expressed are not necessarily those of the National Institute of Justice, nor of the U.S. Department of Justice.

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