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Willingness to Provide a Hair Sample for Drug Testing among Electronic Dance Music Party Attendees

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Abstract

Background: Non-disclosure of drug use on surveys is common and many drug users unknowingly ingest adulterant or replacement drugs, which leads to underreporting of use of these drugs. Biological testing can complement survey research, and hair-testing is an appealing method as many drugs are detectable for months post-use. We examined willingness to donate a hair sample to be tested among those surveyed in a population at high risk for consuming adulterated drugs—electronic dance music (EDM) party attendees.

Methods: We surveyed 933 adults entering EDM parties in New York City in 2017. Hair donation response rates and reasons for refusal were examined from this cross-sectional study.

Results: A third (n=312; 33.4%) provided a hair sample. Lack of interest (21.0%), lack of time (19.8%), not wanting a lock of hair cut (17.7%), and disinterest in having hair cut in public (13.8%) were the main reported reasons for refusal. 4.7% refused because they could not receive results. Past-year drug users were more likely to fear identification than non-users ($p<.001$). Asian participants were at lower odds of providing a hair sample (aOR=0.53, 95% CI=0.32–0.87), and those reporting past-year use of LSD (aOR=1.62, 95% CI=1.11–2.35), opioids (nonmedical; aOR=1.93, 95% CI=1.25–2.99), and/or methamphetamine (aOR=3.43, 95% CI=1.36–8.62) were at higher odds of providing a sample than non-users of these drugs.

Conclusions: Only a third of participants provided a hair sample and we found individual-level differences regarding willingness to provide a sample. Factors contributing to refusal should be considered to increase response rates and generalizability of results.

Keywords

Data collection methods; drug screening tests; epidemiology

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Author Contributions

All authors are responsible for this reported research. J. Palamar conceptualized and designed the study, and conducted the statistical analyses. All authors contributed to the conceptualization of the study, contributed to the drafting of the initial manuscript, interpreted results, and critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

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Introduction

Accurate data on prevalence of drug use is important to inform prevention and harm reduction efforts. Surveys are the most common source of data in drug epidemiology studies, but not all survey respondents provide accurate information about drug use. Dishonest reporting about drug use has always been a concern among researchers.[1,2] However, a newer concern is inaccurate reporting in which an individual may have thought he or she used a particular drug, but in fact used a different drug, or a drug containing adulterant drugs. It is important to investigate what drugs a user believes he or she used, but it is also important for epidemiologists to know what drugs were actually used. Biological testing is common in intervention research, but most surveys do not include biological measures—especially measures capable of detecting new psychoactive substances (NPS) and fentanyl analogs, which continue to emerge.[5–8] In this paper, we examine willingness of individuals to provide a hair sample to be analyzed for NPS during a survey of a population at high risk for unintentionally using adulterated drugs—electronic dance music (EDM) party attendees.[9,10]

Testing of drug products (e.g., pills, powders) has been the most common method used to test for drug adulteration. While seized drugs are typically tested for their contents,[7,8] drug content information is frequently sought by users of certain drugs to inform harm reduction.[8,11–15] Self-testing kits for drugs such as ecstasy have been popular for decades,[16] and drug checking has increased in popularity with some harm reduction organizations conducting on-site drug-testing outside of EDM festivals.[17–19] Other services throughout Europe allow users to drop off or send in drugs to be tested, and these organizations provide drug content results to users.[8,11–14] Testing illegal drugs, however, can lead to legal risk for both users and testers, so biological specimen testing is another option to determine drug adulteration. While this method can only test for drugs already used, such testing can serve as an objective measure of drug use in studies and test results can be used to inform prevalence estimates of use.[20] Providing users with their results can also inform prevention and harm reduction regarding future use.

Individuals in the EDM scene are not only at high risk for use of drugs such as ecstasy/Molly and various other drugs,[21–26] but they are also at high risk for using drugs adulterated with NPS.[9,10,17,19,27] Few studies, however, have added biological testing to surveys conducted at or outside of nightlife parties. Multiple studies focusing on nightclub scenes have tested attendees' saliva for various common drugs via oral assay,[23,28–30] and Mohr et al[27] tested saliva, urine, and blood of individuals entering EDM festivals for NPS and other drugs. However, test results were not compared to self-reported use in these studies, so it is unknown whether drugs were used intentionally or unintentionally. Palamar et al[9,10] added hair testing to two epidemiology surveys focusing on EDM attendees to determine the extent of unintentional use of NPS among ecstasy users, but like many studies, only a convenience sample of survey respondents were tested. While these studies incorporating biological assays are informative, most results are based on convenience sampling, which limits generalizability of findings. Systematic methods of obtaining biological specimens in addition to larger epidemiology surveys are needed.

Hair testing is beneficial because unlike urine, saliva, or blood, in which drugs are only detectable for days or hours post-use,[31–34] many drugs (e.g., NPS such as “bath salts”) are detectable in hair for months post-use.[35] Likewise, hair can be collected quickly, without pain, in almost any environment (e.g., in the dark, cold, or rain). Thus, collection is typically not as burdensome to participants as other biological testing methods. However, while hair-testing is an appealing method to test for both known and unknown drug use, studies have not examined acceptability of hair collection in at-risk scenes. Response rates and reasons for refusal have been examined in population and household studies,[36–39] but acquiring such data in at-risk scenes is needed to inform future studies that incorporate this method as an objective measure. We examined willingness of survey respondents in this high-risk scene to provide a hair sample for analysis as part of an epidemiology survey. We also examined barriers to participants providing samples by querying reasons for unwillingness to provide a sample, and we examined characteristics of individuals most likely to provide a sample. These findings can inform future studies that incorporate biological testing in a systematic manner.

Methods

Procedure

We utilized time-space sampling to recruit participants, which produces a probability sample of visits to parties within the sampling frame.[40] Specifically, every week, a list of upcoming EDM parties was created (based largely on EDM ticket websites). Parties at nightclubs and festivals were randomly selected each week to survey potential participants. Individuals were deemed eligible for this cross-sectional intercept survey study if they were 1) 18–40 years of age, and 2) were about to enter the randomly selected party. Passersby—who were alone or in groups—were approached by recruiters, and if confirmed eligible, were asked if they would like to take a drug survey. Participants provided informed consent and self-administered the surveys on tablets. A total of 933 participants completed the survey. The survey was conducted from June through September of 2017 and the survey response rate (for those approached) was 74%. This study was approved by the institutional review board of the first author’s institution.

Sociodemographics and drug use

The survey first asked about sociodemographics including age, gender, race/ethnicity, educational attainment, and sexual orientation, and participants were asked to report level of nightclub/festival/rave/party attendance in the past year. We also recorded whether the participant was surveyed outside of a nightclub or festival. Participants were asked about past-year use of various drugs via a validated rapid survey instrument developed by the lead author. In this analysis we focus on some of the most prevalent drugs in the scene;[21] specifically, we focus on use of ecstasy/MDMA/Molly, LSD, powder cocaine, methamphetamine, and nonmedical use of opioids.

Willingness to provide a hair sample

Near the end of the survey, participants were asked their willingness to provide a hair sample. Specifically, the survey asked, “Would you be willing to donate a small hair sample

to us when you complete this survey to be tested for a variety of drugs including 'bath salts'? If so, the recruiter will cut a small lock of hair from your head (or elsewhere). A lock is typically taken from the lower back of the head from close to the scalp and it is very rarely visible." It was further explained that we will use these results to inform prevention and harm reduction in the EDM scene and that the recruiter can answer any questions they may have. Answer options for willingness to provide a sample were "yes" and "no" and the response was piped to the last page of the survey to inform the recruiter whether the participant was willing to provide a sample (when the survey was completed). Those checking they were unwilling were provided with a checklist of 13 potential reasons for unwillingness to provide a sample. One reason was "other reason" with an option to type in a response. We created this checklist based on qualitative responses provided by participants in a similar study the previous year.

Regardless of their survey response regarding willingness to provide hair, participants were still asked verbally by the recruiter if they were willing to provide a sample. Participants were either asked shortly before completing the survey or when they had completed the survey. This was done for three reasons. First, recruiters were not always able to view the participants' piped responses regarding willingness because some participants closed the last page of the survey containing the piped response. Second, sometimes recruiters asked participants' willingness before finishing the survey in order to save time for the participant and collect the specimen early. Third, recruiters asked participants their willingness, verbally, regardless of their survey response, as many misunderstood what providing a hair sample entailed or they required additional information from the recruiter. For example, some participants asked recruiters to confirm anonymity, that we were not analyzing their DNA, or that hair could be cut from nonvisible areas.

Hair collection

If the participant verbally agreed, the recruiter cut a small lock of hair from the participant—as close to the scalp as possible using a clean scissor. Since willingness to provide a sample was the main factor examined, unlike some previous epidemiology studies,[20,36,37] short hair (e.g., <1cm) did not preclude sample donation eligibility.[38] In some cases, male participants agreed to have hair clipped from the beard, arm, chest, or leg. Some participants also provided pubic hair. Hair was folded in a piece of tin foil and placed in a small envelope labeled with the participant's study ID number. This ID was linked to the participant's survey responses. Participants were compensated $10 USD for completing the survey, but they were not provided extra compensation for providing a hair sample. Samples were collected to record response rates to inform a larger future study and participants did not receive results.

Statistical analysis

We first examined sample characteristics, hair response rates, and reasons for unwillingness to provide a hair sample. We then determined whether there were differences in reasons for unwillingness according to each demographic covariate and by whether use of any of the five drugs included in this analysis (coded into an overall drug use variable) were used in the past year. This was done using chi-square and Fisher's exact tests. To prevent inflation of

Type I Error which may result from repeated testing on 13 separate variables indicating different reasons for unwillingness, we utilized a Bonferroni correction (α=.05/13=.004).

We then examined the degree of overlap between those who checked off willingness to provide a sample and those who actually provided a sample, and examined whether sociodemographic and drug use covariates were related to whether or not a hair sample was provided. This was examined using chi-square. Finally, we computed a multivariable logistic regression model with hair donation (yes/no) as the outcome, and covariates that were significant or approached significance (p<.10) in bivariable models were included as independent variables. Each of the covariates included in the model was thus adjusted for all the other covariates in that model. Data were analyzed using Stata 13 SE (StataCorp, 2013).

Results

Sample characteristics are shown in Table 1. The majority (56.3%) of the sample identified as white, and nearly six out of ten (59.2%) participants reported having a college degree or higher. Most (70.3%) participants were surveyed outside of a nightclub, and past-year drug use was prevalent.

A third (33.4%, n=312) of those surveyed provided a hair sample. However, while 83.3% of those providing a sample (260 of 312) indicated willingness to provide a hair sample on the survey, 16.7% (n=52) of participants providing a hair sample originally reported unwillingness on the survey. Of those not providing a sample (n=621), 94.4% (n=586) provided a concordant response on the survey regarding willingness; 5.6% (n=35) reported willingness to provide a sample and then did not provide one.

Table 2 summarizes reasons for refusal among the two-thirds (n=638) of the sample reporting unwillingness to provide a hair sample via the survey question. It also presents comparisons according to gender and drug use. Lack of interest (21.0%), lack of time (19.8%), not wanting a lock of hair cut (17.7%), and disinterest in having hair cut in public (13.8%) were the main reported reasons for refusal. In addition, 8.0% refused because they thought we would not detect any drugs, 7.4% feared identification, 6.6% thought their hair was too short, 4.7% refused because they could not receive results, and 2.8% refused because they thought drugs would be detected. Three out of ten (30.7%) reported that they were unwilling for none of the listed reasons. We also determined that males (10.1%) were more likely than females (2.9%) to think their hair was too short ($X^2(1)=13.89$, p<.001), and past-year drug users (3.6%) were less likely than non-past-year users (12.1%) to report unwillingness because they thought we would not detect drugs ($X^2(1)=14.11$, p<.001). Past-year drug users (23.8%) were also less likely than non-past-year users (37.2%) to check off no listed reasons ($X^2(1)=13.40$, p<.001). Drug users (11.4%) were more likely to fear identification than non-users (3.6%; $X^2(1)=14.11$, p<.001) and drug users (9.5%) were more likely to fear that testing may lead them to get into trouble compared to non-users (0.9%; $X^2(1)=24.38$, p<.001). Comparisons according to all other demographic covariates are presented in Supplemental Table 1 and no comparisons were significant.

With regard to differences in hair donation according to sample characteristics, as shown in Table 3, there was a difference according to sexual orientation with those identifying as bisexual or other sexuality being more likely to provide a sample (16.4% vs. 9.6% not providing a sample; $X^2(2)=10.01$, p= .007). Compared to non-past-year users, past-year users of ecstasy (43.3% vs. 34.1%, $X^2(1)=7.41$, p=.006), LSD (34.0% vs. 21.3%, $X^2(1)=17.68$, p<.001), powder cocaine (39.7% vs. 33.2%, $X^2(1)=3.92$, p=.048), opioids (nonmedical; 16.7% vs. 8.2%, $X^2(1)=15.11$, p<.001), and/or of methamphetamine (4.8% vs. 1.3%, $X^2(1)=110.70$, p=.001) were more likely to provide a sample. We then fit sexual orientation and use of ecstasy, LSD, cocaine, opioids, and methamphetamine into the multivariable model, along with race/ethnicity (p=.086) and venue type (p=.060), as these variables approached significance in bivariable models. The model met all statistical assumptions and, as a group, predictors were significantly associated with providing a hair sample ($X^2=53.63$, p<.001). Compared to white participants, those identifying as Asian were at about half the odds of providing a sample (aOR=0.53, p=.012) and compared to those surveyed outside of a nightclub, those surveyed outside of a festival were at higher odds of providing a sample (aOR=1.39, p=.036). Sexual orientation was no longer significant; however, past-year use of three different drugs was associated with increased odds of providing a sample. Specifically, past-year users of LSD (aOR=1.62, p=.011), opioids (nonmedical; aOR=1.93, p=.003), and/or methamphetamine (aOR=3.43, p=.009) were at higher odds for providing a hair sample.

Discussion

Only a third of individuals surveyed in a high-risk scene were willing to provide a hair sample to be analyzed without being provided extra compensation. We believe results of this study yield important information to inform future research.

Previous studies have found that black or Hispanic participants were less willing (or less able) to provide a hair sample than white participants.[36,37,39] We, however, found that Asian Americans were less likely to provide a sample. Previous research suggests that Asian Americans are more likely to participate in research if they trust or know the researcher,[41] so additional effort may be required to increase trust. Beliefs among individuals of various ethnicities should also be considered.[42]

Those surveyed outside of festivals were more likely to provide a sample than those surveyed outside of nightclubs. Festivals tend to have over 10,000 attendees per day[43,44] and have a wider audience than most nightclubs. It is possible that this diversity led to increased response rates. Festivals also take place during the day and attendees may be more willing to participate in the daylight. They may also be in less of a hurry, compared to when attending parties at night.

Past-year users of drugs such as LSD, opioids, and methamphetamine were more likely to provide a hair sample and this corroborates an older study focusing on a general population sample.[36] While these differences in response rates can in fact bias results, drug users being more willing to provide a sample is an important finding because it is these individuals who are more likely to use (adulterated) drugs. Such willingness among users suggests potential

concern about adulterants; therefore, interactions with users in a study setting may present an opportunity to provide information (e.g., providing them their results in the future or providing them results from past studies in real-time) to inform prevention or harm reduction.

Reasons for refusal to provide hair were queried to inform the design of future studies and some reasons appear to be more addressable than others. For example, lack of overall interest was reported by a fifth of our sample. Participant compensation is often provided as a means to increase motivation or willingness to take a survey and additional compensation for providing a biological specimen may increase willingness.[36] A fifth of the sample also indicated they were unwilling to provide a sample due to lack of time. We believe verbally asking participants their willingness to provide a hair sample earlier during the survey instead of at or near the end of the survey may increase willingness to provide a sample during survey administration. This would help ensure that the participant will not have to wait until after the survey to provide a sample.

Regarding participants not wanting a researcher “messing with” their hair, similar to past studies, sometimes this was due to general disinterest and other times it was due to specific hairstyles.[39] For example, braids or dreadlocks may prevent donation.[37] Qualitatively, we learned that some participants were unaware that hair is usually cut from a nonvisible area of the head (typically loose hair above the nape). Some participants, primarily males, thought their hair was too short to provide, and short hair has been a barrier in previous studies.[37,39] While a shaved or bald head can in fact limit hair collection, in many cases we were still able to collect body hair or beard hair. Embarrassment or being uncomfortable having one’s hair cut in public were also concerns of some participants. These concerns are difficult to address in a street-intercept survey, but these concerns may apply less in other studies that are conducted in private.

Only 3% reported unwillingness because they thought we would detect drugs. This was unexpected considering this was an anonymous drug survey conducted on the street. This may be related to two other reasons for refusal—fear of identification and fear of getting into trouble. Drug users in particular reported not providing hair for these reasons, likely due to fear of legal sanctions, and perhaps additional information is needed to demonstrate that results are anonymous. Five percent indicated unwillingness to provide a hair sample because we were unable to provide them with their results. Drug checking is increasing in popularity and users of such services or test kits are provided with results of drug content. A recent study asking festival-attending drug users about drug checking found that 94% would use such services, yet of these, almost two-thirds reported they would not submit drugs if they could not receive results.[45] Providing the option for users to receive their results would likely increase willingness to provide a sample. While our study was not a drug-checking study, it is possible that such biological specimen testing can serve as a proxy for drug checking in a retrospective manner to inform prevention and harm reduction.

Regarding the efficacy of querying willingness to provide a hair sample via survey, many participants who reported unwillingness on the survey changed their mind and provided hair after receiving additional information. We believe providing the initial information and

gauging one's initial willingness may have a positive effect on response rates at the end of the survey when verbally asked willingness to provide a sample.

Limitations

Results may not be generalizable to collection of biological specimens other than hair and results may not be generalizable beyond the EDM party scene. We were unable to record reasons why 5% expressed willingness to provide a sample and then did not provide one. Likewise, we were unable to track what questions were asked by participants or what misconceptions about the study were most commonly discussed with recruiters. Finally, the reasons for refusal list was not validated and participants were unable to rate or rank level of importance for each reason for refusal.

Conclusions

Findings have implications for future research. Only a third of those surveyed provided a hair sample and we found individual-level differences regarding willingness to provide a sample, which can further limit results. So while hair analysis has utility in resolving issues with self-report,[9,10,20] generalizing findings to populations is limited due to selection bias. Similar surveys incorporating hair collection have found similar biases although response rates tended to be higher. For example, Fendrich et al[39] had a response rate of 57% during a household survey; however, $10 incentive was offered for hair submission in that study. We could not offer extra incentive for hair donation in this study, which likely contributed to lower response rates. While research is needed to determine adequate amounts for incentives, we recommend incentives as a method to potentially increase response rates. Higher response rates in household surveys are also expected as it can be difficult obtaining agreement to collect a hair sample late at night on the street when a participant is rushing into a party. Race/ethnicity, gender, and type of party also need to be considered, and tactics may need to be tested to increase response rates among those less likely to respond. We have learned, for example, that allowing submissions of body hair increases response rates among those with short head hair.

Much of the public is unfamiliar with hair testing and many individuals have negative attitudes toward drug-testing in general as their experience is likely limited to testing in the workplace or by law enforcement.[46] We believe that in this population it is necessary to acquire trust that collection is for research purposes and to inform prevention and harm reduction. Recruiters can also help response rates by "going the extra mile"[39] and trying harder to explain the importance of providing a sample to participants. Regardless, the reader must keep in mind that both surveying and collecting hair samples via street-intercept late at night can be difficult.

In sum, while hair collection is a non-invasive method of biological specimen collection, it is in fact a challenging method when added to street-intercept surveys. Hair testing has high utility in adding information to survey data, but future research needs to examine how to increase feasibility and response rates in such at-risk scenes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Sample characteristics (*N*=933).

	N	%
Age		
18–24	424	45.4
25–40	509	54.6
Sex		
Male	480	51.5
Female	453	48.5
Race/Ethnicity		
White	525	56.3
Black	72	7.7
Hispanic	169	18.1
Asian	108	11.6
Other/Mixed	59	6.3
Education		
High School or Less	120	12.9
Some College	261	28.0
College Degree	419	44.9
Graduate School	133	14.3
Sexual Orientation		
Heterosexual	756	81.0
Gay/Lesbian	66	7.1
Bisexual/Other Sexuality	111	11.9
Level of EDM Party Attendance		
Never or a Couple of Times per Year	195	20.9
Every Couple of Months	245	26.3
Monthly	176	18.9
Biweekly	166	17.8
Weekly or More Often	151	16.2
Type of Venue Where Surveyed		
Nightclub	656	70.3
Festival	277	29.7
Past-Year Drug Use		
Ecstasy/MDMA/Molly	347	37.2
LSD	238	25.5
Powder Cocaine	330	35.4
Opioids (nonmedical)	103	11.0
Methamphetamine	23	2.5

Table 2.

Reasons for being unwilling to provide a hair sample (*N*=638).

	Full Sample		Sex			Past-Year Drug Use		
	N	%	Male % (n)	Female % (n)	X^2	No % (n)	Yes % (n)	X^2
I'm simply not interested	134	21.0	17.9 (58)	24.2 (76)	3.82	17.8 (59)	24.4 (75)	4.19
I don't have the time	126	19.8	21.0 (68)	18.5 (58)	0.64	15.7 (52)	24.1 (74)	7.08
I don't want anyone messing with my hair	113	17.7	14.8 (48)	20.7 (65)	3.79	17.2 (57)	18.2 (56)	0.11
I would not want to have a piece of my hair cut in public	88	13.8	10.5 (34)	17.2 (54)	6.03	12.7 (42)	15.0 (46)	0.71
I know you won't find any drugs in it	51	8.0	6.5 (21)	9.6 (30)	2.05	12.1 (40)	3.6 (11)	15.65 *
I fear I will be identified	47	7.4	8.0 (26)	6.7 (21)	0.42	3.6 (12)	11.4 (35)	14.11 *
It may be embarrassing	45	7.1	9.0 (29)	5.1 (16)	3.61	5.1 (17)	9.1 (28)	3.86
My hair is probably too short	42	6.6	10.2 (33)	2.9 (9)	13.89 *	7.0 (23)	6.2 (19)	0.15
I fear I may somehow get in trouble	32	5.0	5.6 (18)	4.5 (14)	0.40	0.9 (3) ≠	9.5 (29)	24.38 *
Because you're not able to give me the results	30	4.7	4.6 (15)	4.8 (15)	0.01	2.4 (8)	7.2 (22)	8.02
I know you will find drugs in it	18	2.8	2.8 (9)	2.9 (9)	0.00	1.5 (5)	4.2 (13)	4.31
Other reason	12	1.9	2.5 (8) ≠	1.3 (4)	1.23	1.2 (4) ≠	2.6 (8)	1.72
None of the above	196	30.7	34.6 (112)	26.8 (84)	4.58	37.2 (123)	23.8 (73)	13.40 *

Note. Only those who checked that they were unwilling to provide a hair sample were asked for reasons for unwillingness. Percentages according to gender and drug use are absolute percentages.

≠ Indicates that Fisher's Exact Test p-value was used instead of chi-square when there were fewer than 5 participants in a cell. The majority (79.3%) of participants checked off one reason for unwillingness, 10.5% checked off two reasons and 10.2% reported three or more reasons. The mean number of reasons reported was 1.46 (SD = 1.23). "Past-year" drug use as defined as reporting past-year use of ecstasy, powder cocaine, LSD, opioids (nonmedical), or methamphetamine. A Bonferroni statistical correction was applied to reduce Type I Error due to multiple testing (alpha = .05 / 13 outcomes = .004).

* $p < .004$

Table 3.

Sociodemographic and drug use characteristics according to whether a hair sample was provided.

	Raw Proportions			Multivariable Model	
	Did Not Provide a Sample, % (n)	Provided a Sample, % (n)	X^2	aOR	95% CI
Age			0.15		
18–24 (reference)	45.9 (285)	44.6 (139)			
25–40	54.1 (336)	55.4 (173)			
Sex			0.24		
Male (reference)	52.0 (323)	50.3 (157)			
Female	48.0 (298)	49.7 (155)			
Race/Ethnicity			8.17		
White (reference)	54.1 (336)	60.6 (189)		1.00	
Black	7.4 (46)	8.3 (26)		1.20	(0.71, 2.04)
Hispanic	18.4 (114)	17.6 (55)		0.85	(0.58, 1.25)
Asian	13.5 (84)	7.7 (24)		0.53*	(0.32, 0.87)
Other/Mixed	6.6 (41)	5.8 (18)		0.76	(0.42, 1.38)
Education			2.11		
High School or Less (reference)	12.2 (76)	14.1 (44)			
Some College	27.5 (171)	28.9 (90)			
College Degree	44.9 (279)	44.9 (140)			
Graduate School	15.3 (95)	12.2 (38)			
Sexual Orientation			10.01**		
Heterosexual (reference)	82.5 (512)	78.2 (244)		1.00	
Gay/Lesbian	7.9 (49)	5.5 (17)		0.54	(0.29, 1.01)
Bisexual/Other Sexuality	9.7 (60)	16.4 (51)		1.47	(0.97, 2.25)
Level of EDM Party Attendance			5.29		
Never /Couple of Times per Year (reference)	22.2 (138)	18.3 (57)			
Every Couple of Months	26.6 (165)	25.6 (80)			
Monthly	17.9 (111)	20.8 (65)			
Biweekly	18.5 (115)	16.4 (51)			
Weekly or More Often	14.8 (92)	18.9 (59)			
Type of Venue Where Surveyed			3.53		
Nightclub (reference)	72.3 (449)	66.4 (207)		1.00	
Festival	27.7 (172)	33.6 (105)		1.39*	(1.02, 1.89)
Past-Year Drug Use					
Ecstasy/MDMA/Molly			7.41**		
No (reference)	65.9 (409)	56.7 (177)		1.00	
Yes	34.1 (212)	43.3 (135)		1.12	(0.79, 1.59)
LSD			17.68***		
No (reference)	78.7 (489)	66.0 (206)		1.00	

	Raw Proportions			Multivariable Model	
	Did Not Provide a Sample, % (n)	Provided a Sample, % (n)	X^2	aOR	95% CI
Yes	21.3 (132)	34.0 (106)		1.62*	(1.11, 2.35)
Powder Cocaine			3.92*		
No (reference)	66.8 (415)	60.3 (188)		1.00	
Yes	33.2 (206)	39.7 (124)		0.88	(0.62, 1.27)
Opioids (nonmedical)			15.11***		
No (reference)	91.8 (570)	83.3 (260)		1.00	
Yes	8.2 (51)	16.7 (52)		1.93**	(1.25, 2.99)
Methamphetamine			10.70***		
No (reference)	98.7 (613)	95.2 (297)		1.00	
Yes	1.3 (8)	4.8 (15)		3.43**	(1.36, 8.62)

Note. aOR = adjusted odds ratio (controlling for all covariates); CI = confidence interval. Asterisks next to covariate name indicate significance in bivariable model. Only bivariable findings that were significant or approached significance ($p < .10$) were included in the multivariable model.

* $p < .05$

** $p < .01$

*** $p < .001$