Increasing Willingness to Use Synthetic Drugs if Offered among Electronic Dance Music Party Attendees, 2017–2019

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Abstract

Intention and willingness to use drugs are proximal predictors of drug use however, willingness to use requires more research to inform prevention efforts. This study examines willingness to use drugs among electronic dance music (EDM) party attendees, a population at high risk for drug use. Data were examined from a repeated cross-sectional study of 2,426 adult EDM party attendees surveyed entering nightclubs and festivals in New York City from 2017 to 2019 using time-space sampling. Trends and correlates of reporting whether participants would use 10 different synthetic drugs if offered by a friend in the next 30 days were examined. Ecstasy (31.9%), powder cocaine (25.5%), LSD (20.0%), and opioids (16.4%) were most likely to be used if offered. Willingness to use powder cocaine, LSD, ketamine, amphetamine, tryptamines, and 2C series drugs significantly increased from 2017 to 2019, particularly powder cocaine (increasing from 19.1% to 34.2%, p<.001). Any or more recent use of each drug was associated with increases in willingness to use. Past drug use is a consistent predictor of willingness to use if offered, and willingness to use is increasing in this population. Findings can inform prevention efforts by allowing better targeting of those at risk for use.

Keywords

willingness to use drugs; ecstasy; cocaine; ketamine; electronic dance music

INTRODUCTION

Electronic dance music (EDM) party attendees report high prevalence of synthetic drug use compared to the general population, and adverse effects resulting from use is common among attendees (Palamar, Griffin-Tomas, & Ompad, 2015; Palamar, Acosta, Le, Cleland, & Nelson, 2019). Use of illegal party drugs such as ecstasy/MDMA/Molly and powder cocaine in particular is common at EDM parties, which are commonly held at nightclubs and warehouses, and now also at large dance festivals (Hughes, Moxham-Hall, Ritter, Weatherburn, & MacCoun, 2017; Palamar, Acosta et al., 2019). According to music industry reports, popularity of EDM parties has been increasing (Watson, 2019), with over a fifth of the general population in the US estimated as having attended a dance festival (23%) or nightclub (22%) in 2018 (Watson, 2019). In addition, the drug landscape in the US continues

to change, particularly with regard to increasing proliferation of new psychoactive substances (NPS) (United States Drug Enforcement Administration, 2019; European Monitoring Centre for Drugs and Drug Addiction [EMCDDA], 2019). Nightclub and festival attendees in particular have been found to be at high risk for both intentional use of NPS and for unknown/unintentional exposure to NPS as adulterants (Krotulski, Mohr, Fogarty, & Logan, 2018; Oliver et al., 2018; Palamar et al., 2017). It light of increasing popularity of EDM and the shifting drug landscape, little is known regarding willingness to use synthetic drugs (e.g., NPS) in this high-risk population. Indeed, estimating prevalence of drug use within this population can inform prevention and harm reduction efforts, but estimating willingness to use may better allow us to determine who is at particularly high risk for future use.

According to the Theory of Planned Behavior, intention to engage in a health behavior is the most proximal predictor of engaging in that behavior (Ajzen, 1985). This theory posits that attitudes, subjective norms and perceived behavioral control influence intention to engage in specific behaviors. Newer, more complex theories, such as the Theory of Triadic Influence (TTI), also posit that intention to engage in a behavior is the most proximal predictor of engaging in that behavior, and regarding TTI, intention is posited to stem from various levels of biological, social, and cultural influence (Flay, Snyder, & Petraitis, 2009). Many studies have used such theoretical frameworks to delineate predictors of intention to use cigarettes, alcohol, marijuana, and amphetamine (Gagnon, Tessier, Cote, April, & Julien, 2012; Litchfield & White, 2006: Malmberg et al., 2012; Olds, Thombs, & Tomasek, 2005). With regard to synthetic drug use, a study focused on nightclub-attending men who have sex with men (MSM) found that perception of high prevalence of drug use at the party they were about to attend predicted use (among those intending to use) and intending to use was the strongest predictor of use (Ramchand, Fisher, Griffin, Becker, & Iguchi, 2013). Past use in relation to intentions to use, however, is understudied.

Although a number of studies have examined predictors of intention to use drugs, and/or intention to use as a predictor of future use, *willingness* to use as a predictor of drug use is under-researched. While intention and willingness are independent constructs, they are closely related(Gibbons, Gerrard, Blanton, & Russell, 1998a). However, intention implies a decision or plan to engage in a behavior, and willingness, unlike intention, implies that an individual is open to an opportunity; thus, willingness can be viewed as being more reactive than proactive (Gibbons et al., 1998a). Although both intention and willingness to engage in drug use have been found to predict drug use (Gibbons et al., 2016), it is arguably more important to focus on willingness to use drugs (rather than focusing on intention to use) among individuals who frequent scenes with high levels of drug availability. This is because opportunities to use may arise without individuals having experienced much forethought about use and potential consequences of use. Similarly, research has found that while many individuals do not specifically intend to engage in a behavior, many may be willing, given the situation (Roberts et al., 2014). Thus, this current study focuses on willingness as a risk factor rather than intention.

The relationship between intention to use a drug and actual use has been known for decades (Maddahian, Newcomb, & Bentler, 1988; Newcomb & Bentler, 1986). However, most

research focusing on intention or willingness to use has focused on tobacco, alcohol, and/or marijuana. Some studies have been conducted which found that intention to use ecstasy, the most prevalent drug used in the EDM scene, predicts future use (Orbell, Blair, Sherlock, & Conner, 2001; Umeh & Patel, 2004; Vervaeke, Benschop, van den Brink, & Korf, 2008). Although very little research has focused on attitudinal predictors of NPS use, one study did find that lifetime use of NPS such as "bath salts" and synthetic cannabinoids was related to both intention and willingness to use again among EDM party attendees (Palamar, Acosta, & Cleland, 2017). This same study found that willingness to use was a more robust correlate of use of 2C drugs and "bath salts" compared to intention to use.

While longitudinal designs are most ideal for examining intention or willingness to use drugs in relation to actual use, only two studies have focused on intention as a predictor of drug use, prospectively, at the event-level. These two studies examined intention to use drugs by surveying party-goers before entering a nightclub and then surveying them later about their drug use that night or weekend. The first study (of MSM entering nightclubs) found that there was high prevalence of intention to use drugs the weekend of the survey, with 44% reporting intention to use ecstasy, and about one in five reporting intention to use cocaine, GHB, and/or marijuana (Ramchand et al., 2013). Most (84%) of those reporting intention to use ecstasy or cocaine that weekend indeed used. There was also high concordance between intention to use and actual use of GHB, ketamine, and methamphetamine. However, 13% of those not reporting intention to use cocaine did in fact use. Specifically, 12% reporting no intention to use ecstasy used, and 6% and 3% of those reporting no intention to use GHB or methamphetamine, respectively, used. The other study of EDM nightclub and dance festival attendees found that 21% of those entering parties planned to use al drug that night and 34% later reported having used a drug that night (Palamar, Acosta, & Cleland, 2018). Among those who reported using a drug, 69% previously reported planning to use, all participants who intended to use LSD later used, and 69% of those who intended to use ecstasy later used. There was also unplanned use of marijuana (11%), ecstasy (7%), cocaine (5%), LSD (1%), and MDA (1%). These studies, while informative, focused on intention to use rather than willingness to use.

Greater focus is needed to examine willingness to use, and to examine willingness to use drugs as an outcome variable rather than as a predictor of drug use. This study estimates prevalence, trends and correlates of willingness to use various synthetic drugs in the high-risk EDM party scene. Focusing on willingness to use drugs can inform prevention as it allows us to go above and beyond what we know about prevalence of use, because not everyone who has used is willing to use again, and many individuals who have not used are willing to use. Thus, focusing on willingness as an outcome rather than use may help expose additional groups at risk for use and potential adverse effects resulting from use.

METHODS

Procedure and Participants

Each summer, from 2017–2019, participants were surveyed near the entrances of EDM parties in New York City (NYC). Time-space sampling (MacKellar et al., 2007) was used to randomly select recruitment venues each week throughout each year. Specifically, each week

we created a party selection sample space which contained a list of 1) nightclubs that consistently held EDM parties each week, and 2) of other parties advertised on EDM party ticket websites listed as having >15 tickets purchased by mid-week. Recruitment typically occurred on 1–2 nights per week on Thursday through Sunday. While most participants were surveyed entering nightclubs and warehouses, participants were also surveyed outside of 1–2 large daytime festivals each year.

Individuals were eligible if they were 18–40 years old and were about to enter the selected party. Individuals who appeared eligible were approached and asked if they were willing to take a 10-minute anonymous drug survey. Surveys were taken at the point of recruitment (typically on the sidewalk outside of the selected party) on tablets after informed consent was provided, and recruiters ensured privacy throughout survey administration. Those completing the survey were compensated $10. Surveys were administered outside of 88 parties (39 in 2017, 24 in 2018, and 25 in 2019). Parties at nightclubs and warehouses were randomly selected and festivals (with recruitment occurring on 13 separate days) were not randomly selected as such parties are rare in NYC. The survey response rate was 70% (74% in 2017, and 73% in 2018, 64% in 2019) and the total analytic sample size (with complete data) was 2,426 (933 in 2017, 1,006 in 2018, and 487 in 2019). These analyses do not include data on the 69 participants who ended the survey early and provided only partial data. In 2017, there was an optional follow-up internet survey to examine test-retest reliability of survey questions. This sub-study is described elsewhere (Palamar et al., 2018; Palamar, Le et al., 2019), but briefly, a quarter (n=236) of participants in 2017 completed the optional follow-up (63.1% of those who agreed to be contacted for follow-up). Follow-up surveys included all willingness to use items described below (to examine test-retest reliability) and were completed an average of 3.6 days later. All methods were approved by the New York University Langone Medical Center institutional review board.

Measures

Participants were asked about demographic characteristics, about their frequency of past-year EDM party attendance, and about lifetime and past-year use of various drugs. While most drugs were queried as single items (i.e., powder cocaine), four drug categories were queried via lists of compounds within each group. Specifically, each year participants were asked about nonmedical use of 18 opioids (e.g., Vicodin, heroin), 13–24 synthetic cathinones ("bath salts"; e.g., methylone), 8–25 tryptamines (e.g., DMT), and 5–18 2C series drugs (e.g., 2C-B). Lists of specific compounds in three classes were shortened in later years due to no reported use of various compounds in previous years. However, compounds removed from checklists were then listed below the option for "other" compounds in each class not listed; thus, all drugs were still listed each year. An affirmative response to any compound in a class was coded as an affirmative response to use. Nonmedical use (of opioids and amphetamine) was defined for participants as use without a prescription or in a manner in which it was not prescribed; for example, to get high. Test-retest reliability (kappa) of these drug use questions (from the 2017 cohort) was high (k = 0.88–1.00) (Palamar, Le et al., 2019). After being asked about use of a drug, the following page then asked participants whether they would use the drug in the next 30 days if offered by a friend (yes/no). Focus was paid to willingness to use if offered by a friend (rather than willingness

in general) in order to prompt participants to think about potential real-life drug offers that may occur (inside or outside of the EDM party scene).

Analyses

First, self-reported characteristics of participants were summarized using univariable statistics. Next, test-retest reliability for each willingness-to-use item was calculated for those in the 2017 cohort who completed the optional follow-up survey. Test-retest reliability was estimated using kappa. Next, overall willingness to use (in the aggregated dataset) was estimated and then willingness to use each drug was estimated for each separate year. Absolute and relative differences between 2019 and 2017 were computed and tests for log-linear trends were conducted using logistic regression models by estimating odds of willingness to use as a linear function of time as a continuous predictor (Center for Behavioral Health Statistics and Quality, 2017). Models used to estimate trends controlled for age (continuous), sex, race/ethnicity, education, income, and sexual identity. These models were then repeated, stratified by age (18–25 vs. 26–40) and sex (male vs. female), and then stratified by recency of use of each drug. Specifically, trends in willingness to use each drug were examined for 1) those age 18–25, 2) those age 26–40, 3) males, 4) females, 5) those reporting non-lifetime use of the drug, 6) those reporting lifetime use but not reporting past-year use, and 7) those reporting past-year use. Finally, using aggregated data (of all cohorts combined), for each drug, comparisons in willingness to use were compared using Rao-Scott chi-square to compare willingness to use according to age, sex, and recency of use of the specific drug.

Sample weights were calculated based on response rate to survey invitation and on self-reported frequency of party attendance, given that those who have higher response rates, and those who attend more frequently have a higher likelihood of being sampled (MacKellar et al., 2007). Therefore, individuals believed to have a higher probability of being surveyed (e.g. frequent attendees) were down-weighted, and individuals believed to have a lower probability of being surveyed (e.g. infrequent attendees) were up-weighted. Thus, weights were not used in attempt to weight the analytic sample to match a specific known population, but were included to make results more generalizable to all EDM party attendees. Data were analyzed using Stata 13 SE (StataCorp, College Station, TX) and survey commands were used to generate estimates (Heeringa, West, & Berglund, 2010).

RESULTS

As shown in Table 1, the majority of the aggregated sample identified as a young adult (ages 18–25; 57.5%), male (57.6%), and/or heterosexual (81.4%). The plurality identified as white (45.3%), most participants had a college degree or higher (60%), and past-year use of various drugs was prevalent. Ecstasy (26.6%) and powder cocaine (26.1%), for example, were used by a quarter of the sample. While about half (51.8%) the sample reported no synthetic drug use in the past year, a third (32.6%) reported using 1–2 drugs, 11.5% reported use of 3–4 drugs, and 4.1% reported use of 5 drugs in the past year.

Test-retest reliability of willingness to use items in the 2017 cohort was high (kappa, k > .80) for all drugs examined. Specifically, willingness to use each drug was found to be in

high agreement (via k) as follows: "bath salts" (0.98), 2C series (0.96), GHB (0.97), ketamine (0.94), tryptamines (0.90), powder cocaine (0.88), amphetamine (0.87), LSD (0.86), opioids (0.86), and ecstasy (0.83). Thus, results suggest reasonable stability regarding self-reported willingness to use between baseline and the follow-up survey 2–14 days post-baseline.

Table 2 presents overall estimates for willingness to use each drug (via aggregated cohorts) and compares willingness to use across years. Participants were reportedly most willing to use ecstasy (31.9%), powder cocaine (25.5%), and/or LSD (20.0%) if offered. Less prevalent drugs were less likely to be used if offered. Willingness to use powder cocaine ($p < .001$), LSD ($p = .012$), amphetamine ($p = .013$), ketamine ($p = .042$), tryptamines ($p = .024$), and 2C series drugs ($p = .006$) all significantly increased between 2017 and 2019. Willingness to use powder cocaine in particular increased from 19.1% to 34.1% (a 15.1% absolute increase), and willingness to use 2C series drugs increased from 1.9% to 4.5% (a 136.8% relative increase).

Table 3 presents estimates of willingness to use, stratified by age and sex. In the full aggregated sample, bivariable comparisons suggest that compared to younger participants (ages 18–25), older participants (ages-26–40) were more likely to report willingness to use powder cocaine ($p = .003$), amphetamine ($p = .011$), ketamine ($p = .011$), and GHB ($p = .030$). Compared to females, males were more likely to report willingness to use powder cocaine ($p = .031$), opioids ($p = .003$), ketamine ($p = .010$), tryptamines ($p = .005$), GHB ($p = .001$), 2C series ($p = .024$), and "bath salts" ($p = .008$). Table 3 also presents trends in willingness to use stratified by age and sex. Between 2017 and 2019, there was a significant increase in willingness to use from cocaine among younger adults (a 162.0% relative increase; $p < .001$), and among both males and females (with 62.6% and 95.5%% relative increases, respectively; $ps = .001$). There was a significant increase in willingness to use LSD among older adults ($p = .004$) and among males ($p = .025$), and there was a significant increase in willingness to use amphetamine among younger adults (a 124.2% relative increase; $p = .006$). There were also significant increases in willingness to ketamine among younger adults (a 137.8% relative increase; $p = .011$), and significant increases in willingness to use 2C drugs among males (a 145.4% relative increase; $p = .004$). Finally, there was a significant *decrease* in willingness to use opioids among older adults (a 61.1% relative decrease; $p = .027$) and in willingness to use 2C drugs among females ($p = .031$). With regard to willingness to use according to recency of use, as shown in Table 4, of those reporting past-year use or lifetime use, tryptamine users were most likely to report willingness to use if offered with 79.5% of past-year users reporting willingness to use (again). "Bath salt" users were least likely to report willingness to use (again) with only 19.9% of past-year users reporting willingness to use again if offered. Over a tenth (11.7%) of those reporting they had never used ecstasy reported willingness to use the drug. Among those reporting never using the other drugs queried, 1.3–6.9% expressed willingness to use if offered. Bivariable comparisons suggest that within the full aggregated sample, willingness to use was significantly less prevalent if the specific drug was used and/or used less recently (all $ps < .001$). Table 4 also presents trends in willingness to use stratified by recency of use. Between 2017 and 2019, among those reporting no lifetime use of powder cocaine, there was a significant increase in willingness to use from 2.6% to 10.7% (a 311.5% relative

increase; $p = .004$), and willingness to use among past-month powder cocaine users also increased from 60.2% to 70.3% ($p = .020$). There were also significant increases in willingness to use among those reporting never having used tryptamines or 2C series drugs. Specifically, among those reporting having never used tryptamines, willingness increased from 2.1% to 5.5% (a 161.9% relative increase, $p < .001$) and among those reporting having never used 2C series drug, willingness increased from 0.3 to 2.7% (an 800.0% relative increase; $p = .001$).

DISCUSSION

This study estimated prevalence, trends and correlates of willingness to use various synthetic drugs among adult EDM party attendees in NYC. Over a quarter of attendees were estimated to have used ecstasy and/or powder cocaine in the past year and prevalence of willingness to use if offered is comparable to these estimates. Likewise, attendees were less willing to use less prevalent drugs (e.g., "bath salts") if offered. However, willingness to use powder cocaine, LSD, amphetamine, ketamine, tryptamines and 2C series drugs all significantly increased between 2017 and 2019 in this scene. In addition, males and older participants (ages 26–40) were not only more likely to report willingness to use various drugs, but increases in willingness were observed over time in these groups for many drugs. These detected increases in willingness to use are alarming as increased willingness to use if offered may eventually translate into increased use.

Willingness to use powder cocaine in particular increased from 19.1% to 34.1% between 2017 and 2019, and patterns were similar when stratified by age and sex. This trend is particularly alarming considering that willingness to use not only increased among past-year users, but also increased from 2.6% to 10.7% among those reporting no lifetime use. Although underreporting of drug use is a possibility, this tripling in prevalence of willingness to use indicates greater willingness to use powder cocaine for the first time. This finding appears to corroborate the recent steep increase in estimated prevalence of cocaine initiation in the US from 601,000 individuals in 2013 to 1,085,000 individuals in 2016 (Substance Abuse and Mental Health Services Administration, 2019). Cocaine is among the most dangerous illegal drugs (Gable, 2004; Nutt, King, & Phillips, 2010) and deaths related to drug overdoses involving cocaine have recently increased (34%) between 2016 and 2017 in the US, from 10,375 to 13,942 (Kariisa, Scholl, Wilson, Seth, & Hoots, 2019). Thus, more focus is needed to prevent initiation of this drug, particularly in high-risk populations.

Willingness to use tryptamines (e.g., DMT) and/or 2C series drugs (e.g., 2C-B) also increased, particularly among those reporting no lifetime use, indicating willingness of party attendees to initiate drugs in these classes. While recent research has shown not only that new drugs in these classes continue to emerge (EMCDDA, 2019), prevalence of use also appears to have recently increased in the US general population (Palamar & Le, 2018, 2019). Findings from this report add to these previous findings in that willingness to use drugs in these classes is increasing, at least in this high-risk scene, indicating that prevalence may indeed increase.

Lifetime use and more recent use tended to be associated with willingness to use the drugs examined in this analysis. Thus, those who have ever used a drug, especially more recently, appear to be at highest risk for using that drug again. Another recent study found that use alcohol, tobacco, and/or other drugs was associated with intention to use marijuana in a national sample of young adults (Cohn, Johnson, Rose, Rath, & Villanti, 2017). All of these findings build upon decades of work suggesting that use of one drug often increases risk for initiating other drugs (Lynskey & Agrawal, 2018).

This study is not without limitations. Limited recall could have affected reporting of past drug use and intentional underreporting of use or of willingness to use is also a potential limitation. Willingness was assessed in this study as willingness to use if offered by a friend. "Friend" can be interpreted differently among participants and willingness was conditional on drug offers from friends, but this wording was chosen in order to prompt participants to think about potential real-life offers. Willingness was also queried in a dichotomous manner which can limit findings as scales offer a wider range of responses. Individuals only reported on what drugs they believed they used. Drugs such as ecstasy/Molly are commonly adulterated or replaced with other synthetic drugs (Oliver et al., 2018). Use of some NPS (e.g., "bath salts") is likely also underreported because many users of other synthetic drugs are unknowingly exposed to such compounds as adulterants (Oliver et al., 2018). The smaller sample size in 2019 limits precision in prevalence estimates, and there were minor shifts in the order of questions about drug use and willingness to use across years, but order effects were unlikely because the survey typically only took ~10 minutes to complete. The number of drugs listed on survey checklists for some drug classes shifted across years, but specific drugs removed from checklist were included as examples for "other" drugs in each class. Surveys were limited to summer months, but this was consistent across years. While it is unlikely that potential seasonal effects would greatly influence past-year use, it is possible that results of willingness to use may in fact be dependent on season. The upper age limit of 40 can also be a limitation because although attendance by individuals older than 40 appears to be somewhat rare, older individuals were underrepresented. Finally, while methods of sampling and collecting data were similar across years, it is possible that changes in the scene over time may affect outcomes of interest. Models estimating trends in this study controlled for demographic characteristics, but it is possible that unmeasured characteristics indeed could have affected trends in willingness to use.

In conclusion, results of this study suggest that not only is synthetic drug use prevalent among EDM party attendees, but that willingness to use various synthetic drugs is also prevalent, and willingness to use various drugs appears to be increasing, overall and across various subgroups. This evidence further suggests that EDM party attendees are at high risk for drug use and willingness to use various synthetic drugs. This study determined that past use is a strong predictor of willingness to use if offered, but also detected subgroups who report having never used a specific drug, but report willingness to use if offered. While risk is often determined by examining prevalence of reported drug use in populations, this study also helped detect those at risk for continuing use and for initiating use among those who have not already used. Findings can inform prevention efforts not only in this high-risk scene, but also in the general population.

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Table 1 –

Characteristics of the aggregated sample, 2017–2019 ($n = 2,426$)

	Weighted % (95% CI)	*n*
Age		
18–25	57.5 (54.4, 60.6)	1,338
25–40	42.5 (39.4, 45.6)	1,088
Sex		
Male	57.6 (54.4, 60.8)	1,364
Female	42.4 (39.2, 45.6)	1,062
Race/Ethnicity		
White	45.3 (42.1, 48.6)	1,223
Black	8.8 (6.8, 11.3)	202
Hispanic	21.9 (19.1, 25.0)	460
Asian	16.2 (14.0, 18.6)	356
Other/Mixed	7.8 (6.2, 9.6)	185
Education		
High School or Less	17.7 (14.9, 20.8)	306
Some College	23.3 (20.8, 26.0)	600
College Degree	44.0 (40.8, 47.3)	1,141
Graduate School	15.0 (12.9, 17.4)	379
Income		
$500 per week	58.5 (55.3, 61.7)	1,432
<$500 per week	41.5 (38.3, 44.7)	994
Sexual Identity		
Heterosexual	81.4 (78.8, 83.7)	1,886
Gay/Lesbian	10.0 (8.2, 12.2)	241
Bisexual	7.0 (5.6, 8.6)	235
Other	1.6 (1.1, 2.5)	64
Past-Year Drug Use		
Ecstasy	26.6 (24.1, 29.3)	952
Powder Cocaine	26.1 (23.4, 29.1)	863
LSD	15.3 (13.5, 17.4)	598
Amphetamine (nonmedical)	12.4 (10.6, 14.5)	446
Opioids (nonmedical)	9.2 (7.2, 11.7)	233
Ketamine	8.5 (6.8, 10.7)	393
Bath Salts	2.9 (2.0, 4.1)	76
GHB	2.3 (1.7, 3.2)	101
Tryptamines	1.8 (1.2, 2.8)	79
2C Series	1.2 (0.8, 1.7)	65
Number of Drugs Use in Past Year		
0 drugs	51.8 (48.6, 55.1)	985
1–2 drugs	32.6 (29.7, 35.7)	786

	Weighted % (95% CI)	*n*
3–4 drugs	11.5 (9.5, 13.8)	449
5 drugs	4.1 (3.3, 5.2)	206

Note. CI = confidence interval

Table 2 –

Trends in self-reported willingness to use synthetic drugs if offered

	2017–2019 (n=2,426) Weighted % (SE)	2017 (n=933) Weighted % (SE)	2018 (n=1,006) Weighted % (SE)	2019 (n=487) Weighted % (SE)	% Absolute Change from 2017 to 2019	% Relative Change from 2017–2019	p (trend)
Ecstasy	31.9 (1.5)	35.7 (2.4)	26.5 (2.0)	35.8 (3.8)	0.1	0.3	.928
Powder Cocaine	25.5 (1.4)	19.1 (1.8)	27.5 (2.1)	34.2 (4.1)	15.1	79.1	<.001
LSD	20.0 (1.2)	17.8 (1.8)	22.0 (1.9)	20.2 (2.6)	2.4	13.5	.012
Opioids	16.4 (1.3)	16.4 (1.9)	18.1 (1.8)	12.9 (3.9)	−3.5	−21.3	.659
Amphetamine	14.5 (1.1)	13.0 (1.6)	13.5 (1.6)	19.2 (3.1)	6.2	47.7	.013
Ketamine	11.5 (1.0)	9.9 (1.5)	11.8 (1.4)	14.1 (2.6)	4.2	42.4	.042
Tryptamines	6.7 (0.7)	5.4 (1.0)	7.2 (1.1)	7.9 (1.7)	2.5	46.3	.024
GHB	4.2 (0.5)	3.9 (0.8)	4.7 (1.0)	3.6 (1.0)	−0.3	−7.7	.817
2C Series	3.4 (0.5)	1.9 (0.5)	4.4 (0.9)	4.5 (1.5)	2.6	136.8	.006
Bath Salts	2.3 (0.5)	2.1 (1.0)	2.3 (0.6)	2.6 (0.9)	0.5	23.8	.571

Note. Opioids and amphetamine use represents nonmedical use. SE = standard error.

Table 3 –

Trends in self-reported willingness to use synthetic drugs if offered according to age and sex

	2017–19 (n=2,426) Weighted % (SE)	2017 (n=933) Weighted % (SE)	2018 (n=1,006) Weighted % (SE)	2019 (n=487) Weighted % (SE)	% Absolute Change 2017–19	% Relative Change 2017–19	*p* (trend)
Ecstasy							
Age 18–25	29.7 (2.0)	34.6 (3.2)	22.4 (2.5)	35.9 (5.4)	1.3	3.8	.894
Age 26–40	34.9 (2.2)	37.0 (3.5)	32.4 (3.4)	35.7 (4.8)	−1.3	−3.5	.854
Male	33.3 (2.1)	39.1 (3.5)	26.1 (2.7)	38.2 (5.3)	−0.9	−2.3	.777
Female	30.0 (2.0)	32.1 (3.1)	27.0 (3.2)	31.5 (5.1)	−0.6	−1.9	.856
Powder Cocaine							
Age 18–25 *	22.0 (1.8)	12.9 (1.8)	23.7 (2.6)	33.8 (5.8)	20.9	162.0	<.001
Age 26–40	30.3 (2.1)	25.9 (3.1)	33.0 (3.5)	35.0 (5.0)	9.1	35.1	.051
Male *	28.1 (1.9)	22.2 (2.8)	28.7 (2.8)	36.1 (5.4)	13.9	62.6	.001
Female	22.1 (1.9)	15.7 (2.3)	25.7 (3.2)	30.7 (6.1)	15.0	95.5	.001
LSD							
Age 18–25	18.5 (1.5)	17.0 (2.3)	21.7 (2.5)	14.4 (2.8)	−2.6	−15.3	.608
Age 26–40	22.1 (1.8)	18.6 (2.7)	22.3 (2.9)	30.2 (4.7)	11.6	62.4	.004
Male	20.4 (1.6)	18.1 (2.5)	21.6 (2.5)	21.4 (3.5)	3.3	18.2	.025
Female	19.5 (1.7)	17.4 (2.5)	22.5 (3.0)	17.8 (3.9)	0.4	2.3	.243
Opioids							
Age 18–25	15.2 (1.8)	13.1 (2.2)	16.6 (2.3)	15.8 (5.9)	2.7	20.6	.665
Age 26–40	18.0 (1.8)	20.1 (3.1)	20.2 (3.0)	7.8 (2.4)	−12.3	−61.1	.027
Male **	19.5 (1.9)	20.6 (2.8)	19.8 (2.6)	17.4 (5.7)	−3.2	−15.5	.935
Female	12.2 (1.5)	12.0 (2.5)	15.6 (2.5)	4.5 (1.7)	−7.6	−62.9	.387
Amphetamine							
Age 18–25 *	12.0 (1.4)	7.9 (1.4)	12.5 (2.2)	17.8 (4.3)	9.9	124.2	.006
Age 26–40	17.7 (1.8)	18.7 (2.9)	15.1 (2.5)	21.5 (4.4)	2.8	15.0	.642
Male	14.7 (1.5)	14.5 (2.3)	11.8 (1.9)	20.7 (4.3)	6.2	42.8	.147
Female	14.1 (1.7)	11.5 (2.2)	16.0 (2.8)	16.2 (4.3)	4.7	40.9	.069
Ketamine							
Age 18–25 *	9.5 (1.1)	5.8 (1.1)	10.3 (1.7)	13.7 (3.5)	7.9	137.8	.011
Age 26–40	14.3 (1.7)	14.5 (2.7)	14.0 (2.3)	14.7 (3.8)	0.2	1.4	.932
Male **	13.6 (1.4)	11.6 (2.2)	13.2 (2.0)	17.3 (3.8)	5.7	49.1	.053
Female	8.7 (1.2)	8.1 (1.9)	9.7 (1.9)	8.0 (2.7)	−0.1	−1.7	.421
Tryptamines							
Age 18–25	6.8 (0.9)	6.8 (1.5)	6.8 (1.4)	6.9 (2.1)	0.2	2.7	.461
Age 26–40	6.4 (1.0)	3.9 (1.2)	7.9 (1.7)	9.5 (3.1)	5.6	144.5	.050
Male **	8.3 (1.0)	7.5 (1.7)	8.4 (1.5)	9.2 (2.5)	1.6	21.5	.058
Female	4.5 (0.8)	3.1 (1.1)	5.5 (1.5)	5.5 (2.1)	2.4	75.4	.095
GHB							

	2017–19 (n=2,426) Weighted % (SE)	2017 (n=933) Weighted % (SE)	2018 (n=1,006) Weighted % (SE)	2019 (n=487) Weighted % (SE)	% Absolute Change 2017–19	% Relative Change 2017–19	p (trend)
Age 18–25 *	3.2 (0.6)	3.2 (0.8)	3.2 (1.0)	3.2 (1.1)	0.0	1.6	.403
Age 26–40	5.5 (1.0)	4.6 (1.3)	7.0 (1.9)	4.3 (2.0)	−0.3	−7.1	.883
Male **	5.6 (0.8)	5.1 (1.2)	6.2 (1.5)	5.1 (1.6)	0.0	−0.4	.986
Female	2.3 (0.5)	2.5 (0.9)	2.6 (0.9)	0.8 (0.3)	−1.7	−68.0	.600
2C Series							
Age 18–25	3.5 (0.7)	2.1 (0.8)	4.6 (1.3)	3.5 (1.7)	1.5	71.4	.135
Age 26–40	3.4 (0.7)	1.8 (0.7)	4.1 (1.2)	6.3 (2.8)	4.5	255.1	.176
Male *	4.5 (0.8)	2.7 (0.9)	4.8 (1.1)	6.7 (2.3)	4.0	145.4	.004
Female	2.0 (0.7)	1.1 (0.6)	3.7 (1.5)	0.4 (0.2)	−0.6	−59.7	.031
Bath Salts							
Age 18–25	2.1 (0.7)	2.7 (1.7)	2.0 (0.7)	1.4 (0.7)	−1.3	−47.4	.312
Age 26–40	2.5 (0.6)	1.4 (0.7)	2.8 (1.1)	4.7 (2.0)	3.3	237.9	.292
Male *	3.2 (0.8)	3.1 (1.8)	3.3 (1.0)	2.9 (1.1)	−0.3	−8.6	.801
Female	1.1 (0.4)	0.9 (0.6)	0.8 (0.4)	2.2 (1.4)	1.2	134.3	.094

Note. Opioids and amphetamine use represents nonmedical use. SE = standard error. Within the full aggregated sample, bivariable comparisons were conducted for each specific drug to determine whether there are overall significant differences by age and sex. Asterisks next to age and sex indicate significance. For bivariable comparisons:

*
$P < .05$,

**
$P < .01$.

Table 4 –

Trends in self-reported willingness to use synthetic drugs if offered according to recency of use

	2017–19 (n=2,426) Weighted % (SE)	2017 (n=933) Weighted % (SE)	2018 (n=1,006) Weighted % (SE)	2019 (n=487) Weighted % (SE)	% Absolute Change 2017–19	% Relative Change 2017–19	*p* (trend)
Ecstasy							
Never Used	11.7 (1.5)	14.6 (2.7)	6.7 (2.0)	15.2 (3.5)	0.6	4.1	.949
Used > 1 year Ago	30.7 (3.1)	36.8 (4.9)	23.6 (4.2)	35.6 (9.2)	−1.2	−3.3	.827
Past-Year Use	69.7 (2.6)	76.9 (4.0)	60.0 (3.8)	78.6 (5.9)	1.7	2.2	.471
Powder Cocaine							
Never Used	5.5 (1.0)	2.6 (1.2)	6.3 (1.5)	10.7 (3.1)	8.1	311.5	.004
Used Over A Year Ago	35.3 (4.5)	25.2 (7.3)	40.2 (6.5)	38.3 (10.3)	13.1	52.0	.058
Past-Year Use	69.8 (3.3)	60.2 (4.6)	79.3 (3.5)	70.3 (9.3)	10.1	16.8	.020
LSD							
Never Used	6.2 (0.9)	5.0 (1.3)	7.7 (1.6)	5.3 (1.4)	0.3	6.0	.213
Used Over A Year Ago	36.5 (3.8)	33.9 (5.8)	37.2 (6.0)	42.2 (9.3)	8.3	24.5	.527
Past-Year Use	72.9 (2.9)	65.0 (5.1)	78.3 (4.1)	76.3 (6.6)	11.3	17.4	.075
Opioids							
Never Used	6.9 (0.9)	5.7 (1.2)	9.4 (1.6)	4.6 (1.8)	−1.1	−19.3	.874
Used Over A Year Ago	34.3 (3.6)	34.1 (6.3)	33.6 (4.8)	38.8 (9.5)	4.7	13.8	.965
Past-Year Use	64.5 (5.7)	73.5 (6.7)	50.2 (8.6)	77.1 (13.1)	3.6	4.9	.712
Amphetamine							
Never Used	4.6 (0.7)	3.3 (1.1)	4.9 (1.1)	6.5 (2.1)	3.2	97.0	.052
Used Over A Year Ago	23.7 (4.0)	17.6 (4.7)	29.1 (8.7)	30.1 (8.7)	12.5	71.0	.102
Past-Year Use	69.8 (3.5)	66.0 (5.2)	70.3 (6.3)	75.6 (6.8)	9.6	14.5	.616
Ketamine							
Never Used	4.6 (0.7)	5.4 (1.3)	4.2 (1.0)	3.7 (1.4)	−1.7	−31.5	.941
Used Over A Year Ago	33.1 (5.2)	28.6 (9.1)	33.9 (7.6)	41.7 (11.2)	13.1	45.8	.104
Past-Year Use	62.0 (6.8)	56.6 (7.1)	69.7 (6.1)	57.7 (16.5)	1.1	1.9	.042
Tryptamines							
Never Used	4.2 (0.6)	2.1 (0.7)	5.5 (1.0)	5.5 (1.5)	3.4	161.9	<.001
Used Over A Year Ago	42.6 (8.4)	42.0 (11.7)	33.3 (10.2)	77.2 (16.0)	35.2	83.8	.324
Past-Year Use	79.5 (10.1)	89.7 (6.7)	67.9 (18.4)	88.7 (10.0)	−1.0	−1.1	.681
GHB							
Never Used	2.1 (0.4)	2.4 (0.7)	2.5 (0.7)	0.9 (0.3)	−1.5	−62.5	.349
Used Over A Year Ago	28.3 (9.6)	35.3 (11.4)	31.3 (16.7)	13.9 (8.9)	−21.4	−60.6	.886
Past-Year Use	66.9 (6.9)	69.7 (15.1)	72.4 (8.9)	58.9 (13.0)	−10.8	−15.5	.198
2C Series							
Never Used	1.7 (0.4)	0.3 (0.1)	2.5 (0.8)	2.7 (1.4)	2.4	800.0	.001
Used Over A Year Ago	31.2 (6.7)	29.5 (10.5)	29.9 (9.8)	42.0 (16.7)	12.5	42.4	.122
Past-Year Use	53.8 (9.8)	41.2 (18.1)	66.6 (13.8)	47.0 (14.7)	5.8	14.1	.821
Bath Salts							

	2017–19 (n=2,426) Weighted % (SE)	2017 (n=933) Weighted % (SE)	2018 (n=1,006) Weighted % (SE)	2019 (n=487) Weighted % (SE)	% Absolute Change 2017–19	% Relative Change 2017–19	*p* (trend)
Never Used	1.3 (0.4)	1.2 (0.9)	1.4 (0.5)	1.4 (0.7)	0.2	16.7	.761
Used Over A Year Ago	19.9 (6.8)	16.1 (11.1)	20.4 (10.0)	30.6 (14.0)	14.5	90.1	.092
Past-Year Use	19.9 (6.4)	52.5 (19.9)	9.0 (6.1)	44.4 (17.3)	−8.1	−15.4	.642

Note. Opioids and amphetamine use represents nonmedical use. SE = standard error. Bivariable comparisons also suggest that within the full aggregated sample, willingness to use was significantly less prevalent if the specific drug was used and/or used less recently (all *P*s<.001).