Use of "Lean" among Electronic Dance Music Party Attendees

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Abstract

Background and Objectives: Lean (a.k.a.: Sizzurp, Purple Drank) is a recreational beverage that commonly contains codeine cough syrup. Despite its popularization in the hip-hop music scene, few epidemiologic studies have examined use. This study examined prevalence and correlates of use among a population at high-risk for drug use—electronic dance music (EDM) party attendees.

Methods: 1,029 EDM party attendees (ages 18–40) were surveyed in New York City in 2018 using time-space sampling. Prevalence and correlates of use of Lean were estimated.

Results: An estimated 15.5% of attendees have ever used Lean, and 3.4% of attendees have used in the past year. Only an estimated 0.2% have used in the past month, but 14.2% would use in the next month if offered by a friend. Three-quarters (75.4%) of users believed their Lean ever contained codeine and 32.4% believed it always or usually contained codeine. Past-year use was strongly associated with past-year nonmedical prescription opioid use (aOR=10.77, p=.003), but not past-year use of other illegal drugs. Attendees who are black or bisexual are at higher odds for past-year use, and those with a college degree or higher are at lower odds for past-year use.

Discussion and Conclusions: While use of Lean is not as prevalent as use of various other drugs (e.g., ecstasy) in this high-risk population, over a tenth have tried it and/or are willing to use it if offered.

Scientific Significance: Prevention efforts need to target potential users as frequent use of beverages containing codeine products can lead to dependence.

Keywords

codeine; recreational drug use; party attendees

INTRODUCTION

The opioid crisis in the United States continues, with rates of deaths involving use of opioids continuing to rise.[1] Although prevention efforts now focus extensively on misuse of prescription opioids, heroin, and other synthetic opioids, research studies and prevention

efforts have focused very little on recreational use of opioid-containing concoctions which may place users at risk for overdose or dependence. "Lean", also commonly referred to as "Sizzurp" or "Purple Drank", is a soft drink concoction that often contains codeine cough syrup in order to get the user high.[2] The use of Lean appears to be particularly prevalent in the hip hop music scene,[3] and popular rap artists have discussed their struggles with addiction to the concoction, including Mac Miller who recently died from a fentanyl-related overdose.[4,5]

Although the main codeine product commonly used in this concoction (containing both promethazine and codeine) was taken off the market in 2014, it is still available on the black market. Likewise, products containing codeine and/or promethazine are still available in the United States with a prescription. Epidemiologic research is needed to estimate the prevalence and correlates of use of this potentially dangerous concoction—in the general population and in high-risk populations. Research is also needed to help determine the extent to which this concoction does in fact include codeine syrup, or whether users are aware that the concoction may include codeine syrup. This is important because users may not be aware that they are ingesting codeine and those who are aware they are ingesting codeine may not be educated about the potential dangers associated with nonmedical use. The aim of this study is to estimate prevalence and correlates of use of Lean in the electronic dance music (EDM) party scene, which is at high risk for use of various illegal drugs.[6,7] Results are intended to inform prevention efforts in this scene and in the general population.

METHODS

Procedure

EDM party attendees (ages 18–40) were surveyed outside of randomly selected nightclubs and festivals from June through September of 2018 in New York City (NYC). Time-space sampling was utilized, as this probability-based sampling strategy is ideal to recruit a targeted population that congregates at specific known locations.[8] Each week parties (primarily held at nightclubs) were randomly selected to survey attendees. A list of upcoming EDM parties in NYC (located primarily in Brooklyn and Manhattan) was created each week, based on EDM party ticket websites, party listings on social media (e.g., Facebook), and recommendations from key informants. Parties listed on ticket websites were considered eligible for random selection if at least 15 tickets were purchased for the party by mid-week and parties listed on Facebook were considered eligible if at least 100 people checked off that they were interested in attending. Parties were randomly selected using R software (R Development Team, 2013). Recruitment occurred one to two nights per week on Thursday through Sunday. Time slots, however, were not randomly selected with recruitment for night parties limited to hours of 11:30pm to 2:30am because most parties ended at 4am (with very few parties ending at 5am or 6am). While the majority of parties were held at nightclubs, participants were also surveyed outside of two large daytime festivals which were not formally randomly selected.

Passersby were eligible if they were 1) between 18–40 years old, and 2) about to enter the selected party. Recruiters approached passersby (who were alone or in groups), and if eligible, were asked if they would be willing to take a survey about drug use. Recruiters

ensured that individuals approached were not visibly inebriated. Specifically, they ensured that individuals approached before entering parties did not exhibit slurred speech or display impaired attention or gait. Surveys were taken on tablets (at the point of recruitment on the sidewalk) after participants provided informed consent. Participants were discouraged from taking the survey in the view of others, and those who completed the survey were compensated $10 USD. The response rate was 73% and 1,029 participants completed the survey. The study was approved by the author's institutional review board.

Measures

Participants were first asked about demographic characteristics including gender, age, race/ethnicity, education, weekly income, and sexual orientation. Participants were also asked about frequency of EDM party attendance in the past year. They were then asked about past-year use of various drugs and they were also asked about nonmedical use of various prescription opioids. Nonmedical use was defined for participants as using without a prescription or in a manner in which it was not prescribed—for example, to get high. A variable indicating any nonmedical prescription opioid use was also coded according to responses of individual prescription opioid drugs. Participants were also asked if they had ever used "Sizzurp (a.k.a.: Lean, Purple Drank)". Those reporting lifetime use were asked if they had used in the past 12 months and whether they had used in the past 30 days. Those reporting use were also asked: "How often do you think your Sizzurp contained codeine cough syrup? (Not an over-the-counter cough syrup)". Response options were "always", "usually", "sometimes", "rarely", "never", and "don't know". All participants were asked whether they would use Lean if offered by a friend in the next 30 days.

Sample Weights

Since time-space sampling was utilized, sample weights were computed to account for the complex sample design. Self-reported frequency of participant party attendance and party-level response rates (based on the proportion of individuals entering the party during recruitment times—tracked via clicker) were used to estimate participant selection probabilities. Utilizing these weights allowed for up-weighting of those believed to have a lower probability of selection and down-weighting of those believed to have a higher probability of selection. This weighting method is commonly used in other studies with venue-based sampling.[8,9]

Analyses

First, descriptive statistics of sample characteristics were generated and prevalence of lifetime, past-year, and past-month use of Lean was estimated. Prevalence of willingness to use if offered was then estimated, and estimates were then compared according to lifetime and past-year use using chi-square. Next, prevalence of past-year Lean use was compared according to each demographic and drug use characteristic using chi-square. Finally, all demographic covariates and significant drug use-related covariates were fit into a binary logistic regression model to examine potential associations with past-year Lean use with all else being equal. Only drug use variables significant in bivariable models were fit into the multivariable model in order to prevent multicollinearity. The complex sample design was considered in analyses by utilizing sample weights, and Taylor series estimation which was

used to obtain accurate standard errors and to estimate prevalence of use in this population.[10] Data were analyzed using Stata 13 SE (StataCorp, 2013).

RESULTS

An estimated 15.5% (95% CI: 12.0–19.9) of EDM attendees in NYC have used Lean in their lifetime and an estimated 3.4% (95% CI: 1.6–7.3) of attendees have used in the past year. However, only an estimated 0.2% (95% CI: 0.1–0.8) have used in the past month. An estimated 14.2% (95% CI: 11.1–18.0) of attendees would use Lean if offered by a friend in the next 30 days. Willingness to use if offered was higher among those who have already used with 39.3% of lifetime users willing to use if offered (vs. 9.6% of never-users, p<.001) and 43.2% of past-year users willing to use if offered (vs. 13.2% of non-past-year users, p=.019). Three-quarters (75.4%) of users believe their Lean ever contained codeine. About a third (32.4%) believe it always or usually contained codeine (19.4%: always; 13.0% usually); 6.2% believe it sometimes contained codeine, 36.8% believe it rarely contained codeine, 11.2% believe it never contained codeine, and 13.3% reported not knowing if it contained codeine.

Table 1 presents participant demographic and drug use characteristics for the full sample and compares these factors according to whether past-year use of Lean was reported. The majority of the sample was male (61.3%) and had a college degree or higher (58.6%). The sample was racially and ethnically diverse with the plurality identifying as white (43.9%). Drug use was prevalent in this population with 30.5% estimated to have used ecstasy in the past year, and a fifth estimated to have used powder cocaine and/or LSD in the past year. Black participants were more likely to report Lean use than those of other races/ethnicities (14.1% vs. 1.8%–4.5%, p=.005). In bivariable models, no other demographic characteristics or past-year use of non-opioid drugs were related to Lean use. Past-year nonmedical opioid use, however, was strongly related to use with a fifth (20.4%) of these users reporting Lean use (vs. 2.9% of non-users, p=.002). Past-year nonmedical users of Tramadol (37.8%), hydromorphone (Dilaudid; 32.3%), OxyContin (oxycodone; 28.1%), and/or morphine (24.1%) in particular were at high risk for Lean use.

Table 2 presents results from the multivariable logistic regression model. Compared to the youngest participants (ages 18–21), participants ages 24–25 (aOR=8.50, p=.010) and 29–40 (aOR=7.51, p=.020) were at higher odds of reporting use, and compared to white participants, black participants were at higher odds of reporting use (aOR=9.21, p=.014). Those identifying as bisexual were also at higher odds for reporting use (compared to heterosexuals; aOR=9.03, p=.036). Those with a college degree or higher (aOR=0.19, p=.023) were at lower odds of reporting use. With regard to other drug use, past-year nonmedical prescription opioid use was strongly associated with increased odds of reporting Lean use (aOR=10.77, p=.003).

DISCUSSION

Results of this study suggest that use of Lean is not as prevalent as use of various other drugs (e.g., ecstasy) in this high-risk population, but over a tenth have tried it and/or are willing to

use it if offered. An estimated 15.5% of EDM party attendees have ever used this concoction and an estimated 3.4% of attendees have used it in the past year. Alarmingly, these estimates are double that of estimates from a nearly identical survey of the same population in NYC in 2017 which estimated 7.5% of attendees had used in their lifetime and 1.6% had used in the past year.[11] Thus, it appears prevalence of lifetime and past-year use is increasing—at least within this high-risk scene. An estimated 14.2% would use Lean if offered by a friend in the next 30 days, and this estimate is also more than double the estimate from the study the previous year (of 6.4%).[11] Previous users were found to be much more likely than others to report willingness to use (again). While increasing use in this population is indeed alarming, prevalence of use was lower than most common party drugs such as ecstasy, cocaine, LSD, and ketamine. In addition, less than 1% of attendees are estimated to have used Lean in the past month, which indicates that the majority of use was not recent, and likely infrequent.

This study also delineated many significant correlates of past-year Lean use in the multivariable model. With regard to age, compared to the youngest participants (ages 18–21), those who were ages 24–25 and 29–40 were at higher odds of reporting use. Thus, risk for past-year use does appear to increase with age, but in a staggered manner. Higher prevalence among adults in their 30s appears to be somewhat unique as nationally representative surveys in the US suggest the majority of past-year drug use takes place in young adulthood (ages 18–25) with a decrease among those in their later 20s, and then a much larger dip in prevalence of use by one's early 30s.[12,13] Those with a college degree or higher, however, were at lower risk for use, which corroborates results from nationally representative samples in the US which suggest that those with less than a college degree are at higher risk for past-year drug use.[12]

Results also suggest that those identifying as bisexual were at higher risk for using Lean. Those identifying as a sexual minority (particularly as bisexual) have been found to be at high risk for opioid misuse in national studies,[14] and results also corroborate findings from previous studies examining correlates of lifetime Lean use among 2,349 students at a large southeastern university in the US, which also found that sexual minority participants were at high risk for use.[2,15] One of these studies also found that Hispanic and Native American individuals were more likely to report use than other races/ethnicities;[2] however, this current study found that black individuals were at particularly high risk for Lean use. It should be noted that black individuals were somewhat underrepresented in the current study (10.0% of the sample), compared to NYC Census counts in which 24.3% of the population identifies as black.[16] In light of differences in attendance of EDM parties by race/ethnicity, perhaps further research is needed to compare how Lean use differs by musical preference. For example, one study found that preference for rap/hip-hop music was a consistent correlate of use,[15] and studies have found that many users appear to be influenced to use Lean because it is commonly mentioned in rap or hip-hop lyrics.[17]

An unexpected finding was that use of Lean was not related to use of most drugs examined. This was somewhat surprising as previous studies have found that past-month use of marijuana, ecstasy (or other club drugs), new psychoactive substances, and/or pharmaceutical drugs were correlates of reporting Lean use.[2,15] A previous study of this population also found that past-year use of various drugs (e.g., ecstasy, cocaine,

methamphetamine) was a risk factor for past-year nonmedical opioid use.[11] This current study determined that nonmedical prescription opioid use is a robust correlate of Lean use, but it is still unclear how nonmedical use of other opioid drugs affects—or is affected by—Lean use.

What is particularly unique about the risks related to Lean use is that many users are unaware whether their Lean has contained codeine, and it is possible that many are unaware that actual Lean is 'supposed' to contain codeine. Nevertheless, this is alarming as these data collected in 2018 suggest codeine may in fact still be a common ingredient in this concoction. Nonmedical use of such cough syrup is not always perceived to be illegal,[18] and this concoction is often consumed in plain sight (and flaunted in many rap and hip-hop videos). So more research is needed to determine whether and to what extent users know that Lean typically contains codeine (or is 'supposed' to contain codeine) and how this affects their decisions to use.

Although use of Lean is not as common as use of various other party drugs in this scene, attention needs to be paid to Lean use for a couple of reasons. First, an individual who consumes this colorful candy-flavored drink may be unaware that he or she is ingesting a concoction containing codeine (which is known to be the main psychoactive ingredient, not an adulterant). Unknown or unintentional use of codeine can place individuals in danger, especially if other drugs are used. Second, an individual may know that the concoction contains codeine, but he or she may be unaware of the dangers associated with recreational opioid use (e.g., high risk for dependence and overdose). While many EDM party attendees indeed have experience using party drugs, this is not necessarily associated with increased knowledge or familiarity with opioids which have very different effects compared to drugs like ecstasy (especially with regard to potential for dependence). Finally, polydrug use appears to be common in this scene, with one study finding that 80% of individuals co-used more than one drug (excluding tobacco) at their last "rave" party.[19] Co-use of opioids with alcohol and/or benzodiazepines in particular is dangerous as this can increase risk for impairment, central nervous system and respiratory depression, and fatal overdose.[20] Most fatal prescription opioid overdoses involve co-use of other drugs[21] and even co-use of stimulants such as cocaine can increase risk of poisoning or fatal overdose.[22] Concomitant use of alcohol with Lean is already reportedly prevalent,[3] which can increase risk of adverse outcomes.

Limitations

Results may not be generalizable to individuals outside of such party scenes. A true random sample was not utilized as this would not be feasible to recruit this population, but time-space sampling (a probability-based approach) and sample weights were used to generate estimates. The inclusion criteria which included an age cutoff of 40 years is a potential limitation, but the study's main focus was drug use among young adults. The survey did not assess whether individuals experienced substance use disorder and such information (specifically about opioid use disorder) could provide further insight into how Lean relates to patterns of more problematic drug use—particularly with regard to use or misuse of opioids. Finally, temporal associations could not be deduced, which limits causal inference.

Conclusion and Scientific Significance

The use of Lean appears to be fairly common in this at-risk scene, although not as common as use of traditional party drugs such as ecstasy. Continued research on Lean use is needed —particularly in the general population. Since national surveys do not query use of Lean when querying nonmedical use or misuse of other opioids, it is likely that underreporting of opioid (codeine) use may be occurring. More research is also needed to focus on attitudes toward use (e.g., disapproval towards use), perceived harm associated with use, and perceived access. Among users, more research is needed to determine sources of Lean (or its psychoactive components), contexts of use (e.g., whether it is used at EDM parties and whether it is used to "come down" from other drugs), and consequences resulting from use (e.g., overdose, dependence, progression to use of other opioids).

Results of this study suggest a strong relationship between Lean use and nonmedical use of other prescription opioids, but more research is needed to further examine this association to better inform prevention and treatment efforts. EDM party attendees appear to be increasingly aware about the dangers of drugs such as ecstasy being adulterated with other drugs (hence increased interest in drug testing);[23,24] however, better education about all drugs (including Lean) may be needed both in this population and in the general population. Lean has already become glamorized and somewhat integrated with popular culture (e.g., it is often displayed in a "double" Styrofoam cup throughout popular culture to indicate use).[3] Although artists have begun to speak out against the potential dangers associated with use,[4] more public education is needed to warn against the addictive potential of this concoction and the risk of overdose or poisoning when the concoction is combined with other drugs such as alcohol.

Acknowledgements:

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Table 1.

Sample Characteristics and Comparisons According to Past-Year use of Lean (n=1,029)

Covariate	Full Sample (n=1,029), % (n)	No Lean Use (n=988), % (n)	Lean Use (n=41), % (n)	P
Sex				094
Male	61.3 (604)	95.4 (574)	4.6 (30)	
Female	38.7 (425)	98.5 (414)	1.5 (11)	
Age (Quintiles)				153
18–21	18.3 (183)	98.5 (171)	1.5 (12)	
22–23	19.0 (212)	98.2 (205)	1.8 (7)	
24–25	20.8 (199)	92.3 (193)	7.7 (6)	
26–28	15.9 (210)	98.8 (206)	1.2 (4)	
29–40	25.9 (225)	96.0 (213)	4.0 (12)	
Race/Ethnicity				020
White	43.9 (494)	98.3 (482)	1.8 (12)	
Black	10.0 (84)	85.9 (75)	14.1 (9)	
Hispanic	22.1 (207)	98.7 (202)	1.3 (5)	
Asian	15.4 (159)	96.3 (153)	3.7 (6)	
Other/Mixed	8.5 (85)	95.5 (76)	4.5 (9)	
Education				140
High School or Less	18.2 (134)	91.6 (123)	8.4 (11)	
Some College	23.2 (245)	97.9 (233)	2.1 (12)	
College Degree or Higher	58.6 (650)	97.6 (632)	2.4 (18)	
Weekly Income				176
$0-$499	33.8 (363)	94.5 (353)	5.5 (15)	
$500-$999	37.5 (377)	98.7 (366)	1.3 (11)	
$1,000	28.7 (284)	96.2 (269)	3.8 (15)	
Sexual Orientation				273
Heterosexual	81.5 (786)	96.5 (758)	3.5 (28)	
Gay/Lesbian	11.8 (108)	99.0 (106)	1.0 (2)	
Bisexual	5.7 (101)	92.4 (93)	7.6 (8)	
Other Sexuality	0.9 (34)	97.3 (31)	2.7 (3)	
Past-Year Drug Use				
Marijuana	64.8 (735)	96.1 (702)	3.9 (33)	549
Ecstasy/MDMA/Molly	30.5 (421)	96.8 (402)	3.2 (19)	892
Powder Cocaine	22.4 (341)	95.9 (319)	4.1 (22)	701
LSD	18.0 (235)	98.0 (225)	2.0 (10)	315
Ketamine	9.4 (166)	93.6 (156)	6.4 (10)	303
GHB	2.3 (47)	90.1 (42)	9.9 (5)	144
Methamphetamine	2.1 (38)	92.9 (33)	7.2 (5)	342
Heroin	0.3 (7)	97.7 (6)	2.4 (1)	734
Past-Year Nonmedical Opioid Use (Any)	3.4 (55)	79.6 (42)	20.4 (13)	<.001
Hydrocodone (e.g., Vicodin)	2.0 (26)	95.4 (20)	4.6 (6)	692

Covariate	Full Sample (n=1,029), % (n)	No Lean Use (n=988), % (n)	Lean Use (n=41), % (n)	P
OxyContin (oxycodone)	1.5 (28)	71.9 (20)	28.1 (8)	<.001
Tramadol	0.7 (18)	62.2 (13)	37.8 (5)	<.001
Morphine	0.4 (11)	75.9 (8)	24.1 (3)	006
Hydromorphone (Dilaudid)	0.2 (6)	67.7 (3)	32.3 (3)	002

Note. Percentages in the full sample column are column percentages. Percentages in columns comparing Lean use and no Lean use are row percentages in order to compare prevalence of use according to each level of each variable. The past-year nonmedical opioid use variable indicates whether any of the specific opioid drugs in the table were reportedly used.

Table 2.

Multivariable Model Delineating Correlates of Past-Year Use of Lean

Covariate	aOR (95% CI)
Sex	
Male	1.00
Female	0.40 (0.12, 1.36)
Age (Quintiles)	
18–21	1.00
22–23	1.86 (0.44, 7.83)
24–25	8.50 (1.68, 43.08)[*]
26–28	2.51 (0.27, 23.30)
29–40	7.51 (1.37, 41.26)[*]
Race/Ethnicity	
White	1.00
Black	9.21 (1.58, 53.74)[*]
Hispanic	0.96 (0.17, 5.54)
Asian	4.18 (0.74, 23.57)
Other/Mixed	3.62 (0.57, 22.98)
Education	
High School or Less	1.00
Some College	0.28 (0.03, 2.64)
College Degree or Higher	0.19 (0.05, 0.79)[*]
Weekly Income	
$0-$499	1.00
$500-$999	0.27 (0.06, 1.34)
$1,000	0.63 (0.17, 2.30)
Sexual Orientation	
Heterosexual	1.00
Gay/Lesbian	0.14 (0.01, 2.76)
Bisexual	9.03 (1.15, 70.88)[*]
Other Sexuality	2.56 (0.39, 16.60)
Past-Year Nonmedical Prescription Opioid Use	
No	1.00
Yes	10.77 (2.25, 51.49)[**]

Note. aOR = adjusted odds ratio; CI = confidence interval.

[*]
$p < .05$

[**]
$p < .01$