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Concurrent E-cigarette Use and Marijuana Use and Health-Risk Behaviors among U.S. High School Students

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Abstract

The use of electronic cigarettes (e-cigarettes) and marijuana remain prevalent problems among adolescents nationwide. We assessed current (past 30-day) exclusive e-cigarette use, exclusive marijuana use, and concurrent use with unintentional injury and violent behaviors, alcohol and other drug use behaviors, and sexual behaviors among U.S. high school students. We analyzed 2017 Youth Risk Behavior Survey data including 12,578 high school students nationwide. Multivariable logistic regression models were performed to compare these health-risk behaviors among exclusive e-cigarette users, exclusive marijuana users, and concurrent users with non-users among the overall sample, and then to compare exclusive e-cigarette users and exclusive marijuana users with concurrent users among current users only. All models adjusted for adolescent sex, grade, and race/ethnicity, and other tobacco product use. Approximately 77% of students were non-users, 5.2% were exclusive e-cigarette users, 9.9% were exclusive marijuana users, and 7.8% were concurrent users. Compared to non-users, exclusive e-cigarette users and exclusive marijuana users were more likely to engage in most negative health-risk behaviors associated with unintentional injuries and violence, alcohol and other drug use, and sexual behaviors. Among current users only, exclusive e-cigarette users and exclusive marijuana users were at reduced odds of engaging in most of these health-risk behaviors when compared to concurrent users of both substances. The relationship between exclusive and concurrent e-cigarette and marijuana use and

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health-risk behaviors highlights the importance of comprehensive educational efforts during high school. Findings suggest need for more studies on influence of e-cigarette and marijuana use on injury and violence risk among youth.

INTRODUCTION

Electronic cigarettes (e-cigarettes) act as a gateway to combustible cigarette smoking initiation among adolescents,[1–3] which increases their probability for the development of nicotine dependence and addiction over time.[4,5] Despite these concerns, e-cigarettes are the most common tobacco product consumed by youth.[6] Data derived from the U.S. National Youth Tobacco Surveys show that current (past 30-day) use of e-cigarettes among high school students increased significantly from 2017–2018,[6] and about 28% of students reported current use in 2019.[7] An increase in frequency of use was also observed, with approximately 34% of current users reportedly using e-cigarettes on at least 20 of the past 30 days.[7]

Similarly, studies on marijuana trends indicate rising rates among high school students. An estimated one-in-three adolescents will have consumed marijuana by their senior year of high school.[8] Possibly stemming from expanding U.S. legalization policies, marijuana is widely accessed by teens, many of whom report low associated risk perception and high approval towards use.[9,10] This is evidenced by data indicating that 1-in-17 12th graders used marijuana daily, and 5.8% reported current use.[11] Of concern is the possibility that long-term, regular use of marijuana during adolescence may heighten the risk for a trajectory of adverse health outcomes, such as psychiatric illnesses.[12]

Research indicates that youth e-cigarette use is linked to physiological and psychosocial developmental effects including nicotine addiction which may cause cardiovascular problems,[13] impaired cognition, attention, mood, and greater impulsivity, increased anxiety, and poor academic performance.[13,14] These outcomes are key determinants of unintentional injury- and violence-related behaviors. Hence, prior work found that when compared to non-users, e-cigarette users more frequently engage in these behaviors such as texting or emailing while driving, getting into physical fights, carrying weapons, and attempting suicide.[15] Furthermore, youth e-cigarette users are more likely than non-users to report four or more lifetime sexual partners and be currently sexually active. However, the prevalence of no condom use at last intercourse was less among e-cigarette users than non-users.[15]

Marijuana, an intoxicant, may affect neurocognitive performance such as memory impairment, decreased coordination and attention, learning difficulties.[16,17] Marijuana use is also associated with participation in adolescent health risk behaviors, such as other illicit drug use among adolescents that can linger into young adulthood.[18,19] The connection to other illicit drugs is further fueled when marijuana is consumed with alcohol, either on the same day or within a monthly time frame.[20] Moreover, the odds of alcohol-impaired driving and riding with an alcohol-impaired driver are increased roughly by two times due to adolescent marijuana use.[21] Further, teens who used marijuana were 2.5 times more likely than non-users to have multiple sex partners, and were at 39% reduced odds of using a condom all the time.[22]

E-cigarette and marijuana use trends are similar among high school students, as young e-cigarette users are highly probable users of marijuana.[23] Adolescent e-cigarette and marijuana use represent independent but inter-related public health issues because both substances rank among the most common drugs consumed by adolescents.[6,8] Additionally, a national study among high school students found that nearly four-in-ten current e-cigarette users used marijuana or tetrahydrocannabinol (THC) related products as e-cigarette device ingredients.[24] The popularity of e-cigarette and marijuana use among adolescents provides reason to examine linkages to other health risk behaviors.

Prior research indicates e-cigarette users are at a three-fold risk to use marijuana compared to non-users.[25] Another study found that the exclusive use of e-cigarettes, hookah or combustible cigarettes at baseline was associated with current use of marijuana (and tobacco) two years later.[26] Monitoring the Future (MTF) reports that 4.4%, 12.4%, and 13.1%% of 8th, 10th, and 12th graders, respectively, reported vaping marijuana in the past 12 months.[11] Recent research found that past 30-day vaping trajectories of nicotine and marijuana had similar patterns and increased over time from beginning of 11th grade to end of 12th grade, and co-occurrence of nicotine and marijuana vaping trajectories was also common especially among those with more frequent vaping behaviors[27]. Although few studies have examined the health effects of the concurrent use of both substances,[17,28] the growing literature has highlighted the emerging associated problems and public health effects, such as, impaired memory function, increased risk for mental health and other substance use problems, nicotine dependence, decreased motivation to quit tobacco use, and poor tobacco cessation outcomes.[17,28,29]

Concurrent use of e-cigarettes and conventional combustible cigarettes have been studied in relation to health risk behaviors among adolescents.[15] However, an explicit examination of current exclusive e-cigarette and marijuana use, and concurrent use of these drugs and the association with injury- and violence-related behaviors are not available within the literature. The purpose of this study was to assess the relationships between current e-cigarette and marijuana use and unintentional injury- and violence-related behaviors, alcohol and other drug use behaviors, and sexual behaviors among U.S. high school students. We defined four mutually exclusive groups based on students' reported e-cigarette and marijuana use patterns: 1) non-users (did not use either product); 2) exclusive e-cigarette users (past 30-day use of e-cigarettes only); 3) exclusive marijuana users (past 30-day use of marijuana only); and 4) concurrent users (past 30-day use of both products, but on separate occasions and not mixing them together). Compared to non-users, we hypothesized that exclusive e-cigarette users, exclusive marijuana users, and concurrent e-cigarette and marijuana users would be at increased odds of engaging in these behaviors including unintentional injuries and violence, alcohol and other drug use, and sexual behaviors. Among current users, we also posited that exclusive e-cigarette users and exclusive marijuana users would be at decreased odds of engaging in these health-risk behaviors than concurrent e-cigarette and marijuana users.

METHODS

Participants and Procedures

The present study used 2017 Youth Risk Behavior Survey (YRBS) data, the most recent dataset available at time of analysis. The YRBS was developed in 1990 and has continuously monitored the prevalence and trends of health-risk behaviors and co-occurring behaviors that are frequently established during the child and adolescent years.[30]

The 2017 YRBS used a three-stage cluster design to obtain a nationally representative sample of students enrolled in grades 9–12 at U.S. public and private schools. Among the 192 schools sampled, 144 participated in the survey (75% school response rate). Of the participating schools, 14,956 of the 18,324 sampled students responded to the survey; yielding 14,765 surveys with usable data (81% student response rate). The overall response rate (i.e., school * student response rate) was 60%, after accounting for both the school and student response rates. The Centers for Disease Control and Prevention's institutional review board (IRB) approved the original protocol and procedures for the 2017 YRBS.[31]

Of the 14,765 high school students who completed the survey, our analyses excluded 2,187 students with missing data on e-cigarette use and/or marijuana use. The final analytic sample was 12,578 students. A university IRB deemed the present study as "not human subjects" research since the 2017 YRBS data are de-identified and publicly downloadable at www.cdc.gov/healthyyouth/data/yrbs/data.htm.

Measures

Current E-cigarette and Marijuana Use Variable

To answer our study aims, we collapsed the following two variables to create a single four-category primary predictor variable: 1) "During the past 30 days, on how many days did you use an electronic vapor product?" and 2) "During the past 30 days, how many times did you use marijuana". The YRBS dichotomized these two variables into: no current use (i.e., 0 days/times) and current use (i.e., 1 or more days/times). After combining these dichotomous variables, our primary predictor variable includes the following categories: 1) non-users: did not use e-cigarettes and marijuana in the past 30 days; 2) exclusive e-cigarette users: used e-cigarettes, but did not use marijuana in the past 30 days; 3) exclusive marijuana users: used marijuana, but not e-cigarettes in the past 30 days; and 4) concurrent users: used e-cigarettes and marijuana in the past 30 days, but on separate occasions and not mixing products together. We also assessed frequency of patterns of e-cigarette use (i.e., 0 days, 1–19 days, 20–29 days, all 30 days) and marijuana use (i.e., 0 times, 1–19 times, 20–39 times, ≥40 times).[30]

Unintentional Injuries and Violence Outcome Variables

We assessed six outcome variables individually that measured behaviors related to unintentional injuries and violence. Four variables assessed whether students did the following in the past 30 days (no, yes): 1) rode in a car or other vehicle with a driver who had been drinking alcohol; 2) drove a car or other vehicle when they had been drinking

alcohol; 3) texted or emailed while they drove a car or other vehicle; and 4) carried a weapon (e.g., gun, knife, or club) in any location. Two variables were also included to assess whether students engaged in the following behaviors in the past 12 months (no, yes): 5) were in a physical fight in any location; and 6) actually attempted suicide.

Alcohol and Other Drug Use Outcome Variables

We assessed four alcohol and other drug use behaviors individually as outcome variables. To measure alcohol, we included two variables on past 30-day (no, yes): 1) alcohol use; and 2) binge drinking. Binge drinking was defined as four or more drinks of alcohol in a row for females and five or more drinks of alcohol in a row for males. Two variables were also included to measure other lifetime drug use (no, yes): 3) illicit drug use including cocaine, inhalant, heroin, methamphetamine, ecstasy, hallucinogens; and 4) pain medication use (e.g. Codeine, Vicodin, OxyContin, Hydrocodone, Percocet) without a prescription or differently than as prescribed (i.e., nonmedical pain prescription use).

Sexual Behavior Outcome Variables

We assessed three sexual behaviors that may lead to sexually transmitted infections (STIs) and unintended pregnancies. The following two variables were asked among all students: 1) the number of people they had sexual intercourse with during their lifetime; and 2) the number of people they had sexual intercourse with during the past three months. The YRBS 2017 provided two recoded variables that dichotomized response options in the following two categories to indicate risk behavior: a) never had sex; or 1–3 persons; and b) four or more persons. Students who reported having sexual intercourse were also asked: 3) whether they used or their partner used a condom the last time they had sexual intercourse (no, yes).

Demographic Variables

We included the following demographic variables: 1) sex (male, female); 2) race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic/Latino, and Other); and 3) grade level (9^{th}, 10^{th}, 11^{th}, and 12^{th}).

Statistical Analyses

Data were weighted on sex, race/ethnicity, and grade level to allow for survey design and differences in school and student nonresponse and oversampling of Non-Hispanic Black and Hispanic students. First, we performed chi-square analyses to assess differences in participant demographics based on their current e-cigarette and marijuana use. Then, separate adjusted logistic regression analyses were conducted for each health-risk behavior (unintentional injuries and violence, alcohol and other drug use, and sexual behavior) to assess differences between non-users of e-cigarette use and marijuana use (reference category) with exclusive e-cigarette users, exclusive marijuana users, and concurrent e-cigarette and marijuana users. For follow-up analyses, we performed adjusted logistic regression analyses for each individual health-risk behavior to assess differences between exclusive e-cigarette users, exclusive marijuana users, and concurrent e-cigarette and marijuana users (reference category). Logistic regression analyses controlled for sex, race/ethnicity, and grade level. To account for potential confounding effects of adolescents who

co-used other types of tobacco products that also deliver nicotine during the same past 30-day period, regression analyses adjusted for past 30-day use of all other tobacco products asked by the YRBS including combustible cigarettes, cigars, and smokeless tobacco. Results were considered significant when the 95% Confidence Interval (CI) does not include 1. Adjusted odds ratio was calculated using the complex samples logistic regression procedure (CSLOGISTIC) in IBM SPSS Statistics 26.

RESULTS

Among high school students in 2017, 77.2% were non-users (did not use e-cigarettes and marijuana in the past 30-days), 5.2% were e-cigarette users (exclusive e-cigarette use in the past 30-days), 9.9% were marijuana users (exclusive marijuana use in the past 30-days), and 7.8% were concurrent users (used e-cigarette and marijuana in the past 30-days) (Table 1). Concerning frequency of use among exclusive e-cigarette users, 0.9% reported frequent use on 20–29 days and 2.4% reported daily use on all 30 days. A total of 1.8% of exclusive marijuana users reported frequent use of 20–39 times and 3.9% reported use of ≥40 times in the past 30 days. Frequency of use patterns among concurrent users indicated 7.9% and 20.9% used e-cigarettes on 20–29 days and on all 30 days, respectively, and 12.7% and 29.9% used marijuana in the past 30 days on 20–39 times and ≥40 times, respectively.

Males had a higher prevalence of exclusive e-cigarette use and concurrent use (6.7% and 8.9, respectively), while females had a higher prevalence of exclusive marijuana use (10.5%). A total of 17.8% of non-Hispanic black youth reported exclusive marijuana use (17.8%), and concurrent use was highest (8.6%) among non-Hispanic white youth. We found an inverse relationship between grade level and use, with 12th grade students having the highest rates of exclusive e-cigarette use (7.0%), exclusive marijuana use (12.9%), and concurrent use (11.0%) while 9th grade students had lowest use rates (3.9%, 5.8%, and 5.5% respectively).

Compared to non-users, current exclusive e-cigarette users, exclusive marijuana users, and concurrent users were at significantly increased odds for engaging in all behaviors assessed related to unintentional injuries and violence and alcohol and other drug use after adjusting for sex, race/ethnicity, grade level, and other tobacco product use (Table 2). For sexual behaviors, compared to non-users, exclusive e-cigarette users were significantly more likely to report they had lifetime sexual partners ≥4 and were currently sexually active. Exclusive marijuana users and concurrent users were also significantly more likely to report they had lifetime sexual partners of at least four or more and were currently sexually active than non-users. Only exclusive marijuana users were significantly more likely to report not using a condom at last sexual intercourse than non-users.

Table 3 presents the results from analyses examining the odds of health risk behaviors among exclusive e-cigarette users and exclusive marijuana users compared to concurrent users. Overall, exclusive e-cigarette users and exclusive marijuana users had lower odds of engaging in alcohol use binge drinking, illicit drug use, and prescription drug misuse compared to concurrent users. For unintentional injuries and violence, compared to concurrent users, exclusive e-cigarette users had lower odds of: riding with a driver who had been drinking alcohol, driving when drinking alcohol themselves, engaging in a physical

fight, and attempting suicide. Compared to concurrent users, exclusive marijuana users also had lower odds of: riding with a driver who had been drinking alcohol, driving when drinking alcohol themselves, and texting or emailing while driving. Regarding sexual behaviors, compared to concurrent users, exclusive e-cigarette users and exclusive marijuana users had lower odds of being currently sexually active. Compared to concurrent users, exclusive e-cigarette users had lower odds of having had lifetime sexual partners of at least four or more, while exclusive marijuana users were more likely to report not using a condom at last sexual intercourse.

DISCUSSION

Findings suggest that exclusive e-cigarette use, exclusive marijuana use, and concurrent use of e-cigarettes and marijuana are associated with unintentional injuries and violence, alcohol and other drug use, and sexual behaviors among a national sample of high school students. Although previous studies have demonstrated an association between e-cigarette use,[15,32] marijuana use,[33–36] and unintentional injuries and violence, this study extends the literature by examining the concurrent use of e-cigarettes and marijuana. Our research also found that exclusive e-cigarette use, exclusive marijuana use, and concurrent use of these products increased the risk of engaging in several unintentional injury and violence-related behaviors (e.g., drinking alcohol and driving). Our study also assessed these behaviors among current users. We found that relative to concurrent users, exclusive users of e-cigarettes and marijuana had decreased odds of engaging in most of these behaviors. This finding is consistent with other studies that have shown adverse health outcomes of concurrent tobacco and marijuana use, such as exacerbation of mental health symptoms[37] and decline in cognitive function.[17]. Given the strong association between e-cigarette and marijuana use observed among adolescents,[38–40] additional studies are needed to assess how and why the concurrent use of these products are linked to increases in unintentional injuries and violence in an effort to inform injury prevention strategies. Moreover, given that over 30% of all deaths among children between the ages of 1–19 years are from unintentional injuries or violence,[41] it is important to identify modifiable risk factors, such as single, concurrent and poly substance use, that might be targeted in injury prevention initiatives.

This study found that exclusive users and concurrent users of e-cigarettes and marijuana had increased odds of engaging in alcohol use, binge drinking, illicit drug use and prescription drug misuse than non-users. This finding is consistent with prior work. For example, Gilbert and colleagues[42] found that 93% of adolescent e-cigarette users reported using other substances, with alcohol use as the most frequently reported in poly-substance combinations. Similarly, marijuana use is related to an increase in using other substances, including alcohol use,[43] prescription opioid use,[44] and cocaine use,[45] as well as an increase in the development of substance use disorders.[43,46] Not surprisingly, exclusive use of e-cigarettes and marijuana was associated with reduced odds of using alcohol and other substance uses relative to concurrent use. The additive health risks are concerning given that e-cigarettes and combustible marijuana is one of the more common tobacco and marijuana co-use patterns among adolescents and young adults.[47] Our results indicate poly-substance use is highly prevalent among youth, suggesting that future studies should target multiple substances and risk profiles in prevention and treatment research.

In the current study, relative to non-users, exclusive and concurrent users were significantly more likely to report more lifetime sexual partners and be currently sexually active. These findings confirm that substance use among adolescents is associated with higher rates of engaging in sexual behaviors.[48] Other studies have identified that e-cigarette and/or marijuana use is correlated with having more sexual encounters and partners in high school.[15,38] While the causality of these relationships is unknown, studies suggest low general behavioral risk perceptions, high impulsivity, and normative perceptions of peers' engagement in risk behaviors may contribute to concurrent poly-substance use, sexual behaviors, and other health risk behaviors.[48–51] As such, findings suggest the need to consider intrapersonal and normative factors associated with risky behaviors when attempting to develop and implement prevention- and treatment-based interventions among adolescents.

Limitations

Findings from this study are subject to limitations. First, data were self-reported, and the extent of underreporting or overreporting of behaviors could not be determined. Second, the item used to assess e-cigarette use does not specify device ingredients and whether the product vaped contained flavoring, nicotine, and/or THC. The item used to asses marijuana use did not differentiate between use of vaping products to consume THC versus combustible marijuana use. Thus, we were unable to assess students' co-administration of using nicotine and marijuana ingredients mixed in the same vaping device and used on the same occasion. Future research should assess co-administration of nicotine and marijuana ingredients mixed in the same delivery system since this type of use pattern has been shown to pose greater engagement in other health-risk behaviors.[52–54] Additionally, the YRBS did not collect past 12-month e-cigarette or marijuana use, and we were unable to assess whether past 30-day exclusive e-cigarette users used marijuana not in the past 30 days, but during the past 12 months, for example. Future research should consider assessing longer-term prevalence of use patterns among students. Third, data examined were cross-sectional; therefore, the temporality and causal nature of these health risk relationships could not be determined. Fourth, although the YRBS questions have demonstrated good reliability and have been shown to be representative of all persons aged 16–17 years in the U.S.,[55] the YRBS includes only youth enrolled in a public or private high school. Therefore, results might not be representative of out-of-school youth who are more likely than youth attending school to engage in health risk behaviors.[56] Fifth, socioeconomic indicators play a significant role in the health-risk behaviors examined in this study;[57] however, the 2017 YRBS did not ask questions related to socioeconomic status, and therefore, was unable to be accounted for in the study.

Conclusions

Despite limitations, study strengths include the analysis of a large, nationally representative sample of U.S. adolescents and the use of valid and reliable[55] measures that capture the outcomes of interest. Summarily, findings from this study suggest that exclusive use of e-cigarettes and marijuana increases the odds of many negative health behaviors related to unintentional injuries and violence, alcohol and other drug use, and sexual behaviors. Our findings also indicate that concurrent use of e-cigarettes and marijuana further magnifies the

odds of engaging in these risk behaviors when compared to exclusive use of these substances. It is plausible that adolescents who engage in concurrent use of substances develop a much lower inhibition for risk behaviors and are therefore more likely to downplay the magnitude of the health risks posed by these behaviors. This is problematic particularly for adolescents as they transition to emerging adulthood, an age period that is developmentally associated with sensation seeking, impulsivity, the feeling of invincibility and risk-taking behaviors.[58] These findings strengthen the rationale for integrated prevention programs and policies that target multiple health risk behaviors among adolescents, including the exclusive and concurrent use of e-cigarettes and marijuana as well as associated unintentional injuries and violence, use of alcohol and other drugs and sexual behaviors. Such programs are likely to be most effective and efficient at improving adolescent health.

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Highlights

- Adolescent exclusive and concurrent use of marijuana and e-cigarettes is associated with injury and violence.
- E-cigarette users are more likely to engage in risky behaviors than non-users.
- Marijuana users are also at increased odds to engage in health-risk behaviors.
- Concurrent users are more likely to engage in health-risk behaviors than non-users.
- Among current users only, concurrent use is associated with magnified odds of health-risk behaviors.
- Substance use prevention programs should target injury and violence-related behaviors.

Table 1:

Participant characteristics based on current e-cigarette use and marijuana use, YRBS 2017

Demographic Variable	Overall	Concurrent Use (%)	Exclusive E-cigarette Use (%)	Exclusive Marijuana Use (%)	Non-use (%)
Overall		7.8	5.2	9.9	77.2
Sex					
Male	48.2	8.9	6.7	9.3	75.0
Female	51	6.5	3.8	10.5	79.2
Race/ethnicity					
White, non-Hispanic	42.4	8.6	6.8	7.2	77.4
Black, non-Hispanic	18.9	5.5	2.4	17.8	74.3
Hispanic/Latino	24.7	7.9	3.0	12.8	76.3
Other	11.7	5.2	4.7	8.5	81.6
Grade					
9^{th}	26.6	5.5	3.9	5.8	84.8
10^{th}	25.2	6.5	4.5	9.5	79.5
11^{th}	24.4	8.1	5.6	12.3	74.0
12^{th}	22.9	11.0	7.0	12.9	69.2
Frequency of Current E-Cigarette Use					
0 days	86.8	-	-	-	-
1–19 days	9.9	71.1	79.6	-	-
20–29 days	0.9	7.9	5.5	-	-
30 days	2.4	20.9	15	-	-
Frequency of Current Marijuana Use					
0 times	80.2	-	-	-	-
1–19 times	14	57.4	-	76.7	-
20–39 times	1.8	12.7	-	7.6	-
≥40 times	3.9	29.9	-	15.6	-

Abbreviations: YRBS, Youth Risk Behavior Survey; e-cigarette, electronic cigarette use; Percentages are weighted.

Table 2:

Current e-cigarette and marijuana use and health-risk behaviors, YRBS 2017

	Non-users		Exclusive E-cigarette Users		Exclusive Marijuana Users		Concurrent Users	
Health-Risk Behavior	**%**		**%**	**aOR (95% CI)**	**%**	**aOR (95% CI)**	**%**	**aOR (95% CI)**
Unintentional Injuries and Violence								
Rode with driver who had been drinking alcohol[1]	11.5	Ref	22.0	1.54 (1.20–1.99)	22.3	1.74 (1.40–2.18)	43.6	3.24 (2.69–3.90)
Drove when drinking alcohol[1,2]	1.4	Ref	7.4	2.63 (1.45–4.78)	8.7	4.28 (2.59–7.07)	27.3	9.28 (5.61–15.34)
Texted or emailed while driving[2]	30.3	Ref	58.2	2.60 (1.94–3.49)	48.4	2.06 (1.51–2.80)	66.6	4.09 (2.71–6.17)
Carried a weapon[1]	11.1	Ref	38.4	1.71 (1.24–2.37)	16.6	1.33 (0.98–1.81)	34.4	2.17 (1.47–3.21)
In a physical fight[3]	15.9	Ref	36.6	1.92 (1.45–2.54)	38.8	3.02 (2.43–3.76)	54.1	3.57 (2.52–5.07)
Attempted suicide[3]	4.5	Ref	8.6	1.43 (0.88–2.32)	13.5	3.11 (2.03–4.77)	19.6	3.34 (2.00–5.58)
Alcohol and Other Drug Use								
Current alcohol use[1]	14.2	Ref	71.1	7.68 (5.42–10.88)	59.1	6.70 (5.48–8.19)	88.2	18.27 (13.70–24.38)
Current binge drinking[1]	4.2	Ref	37.3	5.94 (3.86–9.15)	27.8	6.37 (4.72–8.59)	64.7	16.37 (12.06–22.23)
Lifetime illicit drug use	5.8	Ref	15.7	1.42 (0.99–2.03)	26.8	4.54 (3.56–5.77)	58.0	8.79 (6.55–11.81)
Lifetime prescription drug misuse	6.9	Ref	23	2.08 (1.51–2.85)	27.4	3.56 (2.77–4.59)	50.3	5.16 (4.06–6.57)
Sexual Risk Behavior								
Lifetime sexual partners ≥4	3.9	Ref	15.9	3.24 (2.03–5.16)	23.6	4.69 (3.71–5.92)	36.4	4.70 (3.18–6.93)
Currently sexually active[4]	17.6	Ref	49.9	3.18 (2.37–4.27)	54.5	4.06 (3.29–5.00)	66.0	5.59 (4.28–7.30)
No condom use at last intercourse[5]	38.6	Ref	38.8	0.92 (0.68–1.25)	50.7	1.63 (1.32–2.01)	49.1	1.15 (0.88–1.51)

Abbreviations: YRBS, Youth Risk Behavior Survey; e-cigarette, electronic cigarette use; aOR, adjusted odds ratio; CI, confidence interval.

Analyses adjusted for sex, race/ethnicity, grade level, and combustible cigarette smoking, cigar smoking and smokeless tobacco use.

Percentages are weighted.

[1] Past 30 days

[2] Excludes those who did not drive

[3] Past 12 months

[4] Past 3 months

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[5]Excludes those who have never had sexual intercourse

Table 3:

Exclusive e-cigarette use and exclusive marijuana use versus concurrent use based on health-risk behaviors, YRBS 2017

	Concurrent Users		Exclusive E-cigarette Users		Exclusive Marijuana Users	
Health-Risk Behavior	**%**		**%**	**aOR (95% CI)**	**%**	**aOR (95% CI)**
Unintentional Injuries and Violence						
Rode with driver who had been drinking alcohol[1]	50.3	Ref	17.0	0.48 (0.35–0.64)	32.7	0.52 (0.42–0.64)
Drove when drinking alcohol[1,2]	64.5	Ref	12.2	0.30 (0.17–0.53)	23.3	0.44 (0.29–0.66)
Texted or emailed while driving[2]	27.6	Ref	23.9	0.70 (0.44–1.10)	48.5	0.48 (0.30–0.75)
Carried a weapon[1]	42.2	Ref	31.6	1.35 (0.90–2.04)	26.2	0.66 (0.44–1.00)
In a physical fight[3]	41.8	Ref	19.0	0.57 (0.40–0.81)	39.2	0.79 (0.60–1.03)
Attempted suicide[3]	46.8	Ref	12.9	0.45 (0.29–0.72)	40.4	0.91 (0.60–1.38)
Alcohol and Other Drug Use						
Current alcohol use[1]	42.6	Ref	21.2	0.41 (0.27–0.62)	36.2	0.32 (0.23–0.45)
Current binge drinking[1]	50.4	Ref	20.7	0.37 (0.26–0.52)	28.8	0.36 (0.27–0.48)
Lifetime illicit drug use	57.4	Ref	10.2	0.16 (0.11–0.22)	32.4	0.52 (0.41–0.66)
Lifetime prescription drug misuse	50.0	Ref	15.2	0.40 (0.28–0.58)	34.8	0.73 (0.57–0.94)
Sexual Risk Behavior						
Lifetime sexual partners ≥4	46.7	Ref	13.4	0.42 (0.27–0.64)	39.9	0.72 (0.50–1.03)
Currently sexually active[4]	38.1	Ref	19.4	0.57 (0.42–0.76)	41.9	0.70 (0.54–0.90)
No condom use at last intercourse[5]	38.0	Ref	17.2	0.79 (0.54–1.15)	44.8	1.41 (1.08–1.83)

Abbreviations: YRBS, Youth Risk Behavior Survey; e-cigarette, electronic cigarette use; aOR, adjusted odds ratio; CI, confidence interval.

Analyses adjusted for sex, race/ethnicity, grade level, and combustible cigarette smoking, cigar smoking and smokeless tobacco use.

Percentages are weighted.

[1] Past 30 days

[2] Excludes those who did not drive

[3] Past 12 months

[4] Past 3 months

[5]Excludes those who have never had sexual intercourse