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Substance use among adult marijuana and nicotine e-cigarette or vaping product users, 2020

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Abstract

Introduction: Co-use of marijuana and tobacco/nicotine have unknown impacts on addiction and health. There are limited data on the extent to which adults are co-using tetrahydrocannabinol (THC)- and nicotine-containing products, in any of their various modes. This study describes adult use of THC- and nicotine-containing products among electronic vaping product (EVP) users.

Methods: Data on marijuana and tobacco use were collected from February 25– 29, 2020 through an online survey of adults aged 18 years who reported using THC- and nicotine-containing electronic vaping products (EVPs) in the past 3 months (n = 3,980). Survey respondents from 18 states participated in the U.S. YouGov panel, a proprietary opt-in internet panel survey of 1.8 million U.S. residents.

Results: Among those who reported using nicotine and THC-containing EVPs in the past 3 months, 90.1% of respondents reported smoking marijuana in the past 3 months; 82.7% reported smoking as the most frequent mode of marijuana use. Almost 63% of EVP users reported smoking cigarettes; 55.6% reported smoking for over 8 years, while 7.7% had been smoking cigarettes for under a year.

Conclusions: In this study, respondents reported cigarette smoking and marijuana smoking in addition to using marijuana- and nicotine- containing EVPs. Considering the unknown health effects of co-use of tobacco and THC-containing products, the finding that adults are vaping THC and nicotine alongside traditional modes of marijuana and tobacco use of these substances warrants further investigation.

Implications: Findings from this study provide evidence that adults who use nicotine and THC EVPs are also using a variety of other THC-containing and tobacco-containing products. This indicates the importance of continued surveillance to assess trends of polysubstance EVP and multi-modal marijuana and tobacco use. Monitoring various modes of marijuana and tobacco use may inform policies, prevention education, communication, and cessation tools.

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Disclaimer:

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Introduction

Electronic vaping products (EVPs) are the most commonly used noncigarette tobacco product among adults, with 4.5% of adults reporting current use in 2019.¹ EVPs can be used to aerosolize nicotine along with other substances, including marijuana, which refers to the dried flowers, leaves, stems, and seeds of the cannabis plant. The cannabis plant contains more than 100 compounds, or cannabinoids, including tetrahydrocannabinol (THC), the main psychoactive compound of marijuana, and cannabidiol (CBD).² There are currently several modes of use available for marijuana and tobacco products.^{3,4} Marijuana or THC-containing products have different modes of use including via EVPs, edibles, drinking, dabbing, and smoking. Cigarettes, smokeless tobacco, nicotine-containing EVPs, and cigars are some of the modes of use for nicotine-containing products. New products for both marijuana and nicotine are not only rapidly emerging, but the psychoactive chemical concentrations of THC are shifting as well, with unknown consequences for health and addiction.⁴ Newer THC-containing and nicotine products may have higher concentration than traditional modes of use.⁵ The nicotine concentration in EVPs has increased nearly 80% since 2013.⁵ Butane hash oils, THC concentrates, and waxes can have higher THC concentrations than in dried marijuana plant material, typically used for smoking.⁶

There is little information on multi-modal (using the same substance in different ways, e.g., using nicotine-containing EVPs and cigarettes) marijuana and nicotine use among adults, as most research is focused on youth. Marijuana EVP use is on the rise⁷ and use of EVPs has been shown to increase the likelihood of polysubstance use.⁸ Polysubstance use (using multiple substances, e.g., marijuana and nicotine) can encompass a variety of both legal and illicit substances. For the purposes of this paper, we will focus on the use of both nicotine- and THC-containing products. Multimodal and polysubstance use are a public health concern for a variety of reasons. There is some evidence that adults aged 25–54 years who use nicotine-containing EVPs are also more likely to use marijuana-containing EVPs than youth and young adults.⁹ Limited research also suggests that adults who smoke marijuana are also more likely to use menthol cigarettes.¹⁰ In addition to the health consequences of smoking cigarettes, using marijuana, and using EVPs,^{2,11,12} dual use of THC and nicotine-containing products has been associated with increased risk of alcohol dependence, other illicit substance use, and risky behaviors in young adults.^{13,14}

EVP use has additional public health implications, as evidenced by the national outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI), during which 2,807 people were hospitalized, 68 of whom died.¹⁵ Most EVALI cases reported using THC-containing EVPs; moreover, vitamin E acetate, an additive used in THC-containing EVPs, was strongly linked to the outbreak. However, 14% of EVALI patients reported only using nicotine-containing EVPs and therefore evidence is insufficient to rule out the contribution of other chemicals of concerns to EVALI, including from THC or non-THC containing products.¹⁵ This outbreak and its associated health effects underscore how multi-modal use of emerging products like EVPs have unknown impacts on public health. Given the health consequences of smoking cigarettes, using marijuana, increasing EVP use in youth and young adults, and the continuously evolving marijuana and nicotine product landscape,^{5,6,16,17} there is a need for timely surveillance on use of marijuana- and nicotine-containing

products among adults, including modalities and types of polysubstance use. This study provides cross-sectional data on adults who reported nicotine and marijuana containing EVP use and describes their use of other modes of nicotine and marijuana containing products after the onset of the EVALI outbreak. The results of this study will add to the limited existing literature of multi-modal THC and nicotine use among adults who report nicotine and marijuana- containing EVP use.

Methods

Data Source

Data were collected through an online survey of adults from February 25–29, 2020. Survey respondents were part of the U.S. YouGov panel, a proprietary opt-in internet panel survey of 1.8 million U.S. residents. YouGov utilizes several methods to maximize panel diversity, including web advertising campaigns, partner-sponsored solicitations, telephone-to-web recruitment, mail-to-web recruitment, and traffic to the YouGov website. YouGov survey respondents receive incentives for taking specific surveys through a points-based loyalty program (Ashley Grosse, YouGov, personal communication).

Analytic Sample

The inclusion criteria for respondents to the THC- and nicotine-EVP use survey were: 1) aged at least 18 years; 2) did not have a diagnosis of probable or confirmed EVALI in the past year; 3) reported THC-containing EVP use or dabbing (i.e., using a highly concentrated form of THC) at least five times in the preceding three months; 4) reported using nicotine-containing EVPs in the past three months; and 5) resided in one of 18 selected states (California, Colorado, Florida, Illinois, Michigan, Minnesota, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, Washington, and Wisconsin). States were selected to capture geographic diversity, burden of EVALI patients (low and high)¹⁸, and status of marijuana legalization (i.e., both nonmedical adult and medical use program, medical use program, and CBD/low THC program).¹⁹ A total of 110,807 respondents started this survey from the overall YouGov panel. Of these, 4,330 (3.9%) were eligible for and completed the survey. Three hundred and fifty cases were then removed due to data issues or inaccuracies (e.g., suspected duplicates, skipping) to produce the final analytic dataset of 3980 respondents.

Survey

This survey, which was specifically developed to better understand the EVALI outbreak, collected specific information on a demographically and geographically diverse convenience sample of individuals who reported vaping THC- and nicotine-containing products but did not develop EVALI. The YouGov survey questions were based on the national EVALI case questionnaire (https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/pdfs/National-Case-Report-Form-v01.pdf) which itself was adapted from existing state case questionnaires in use at the beginning of the EVALI outbreak.²⁰ The state and national case questionnaires were developed based on initial EVALI case reports from states and feedback from subject matter experts from the marijuana and tobacco fields and state partners involved in the EVALI outbreak. This

work was determined to be public health practice during human subjects review by CDC; therefore, IRB review was not required.

Measures

THC-Containing Product Use—Questions for THC-containing product use included: [If selected use of marijuana in any form] “In the past 3 months, how did you most frequently use marijuana?” (select all that apply: Smoked it, Vaped it, Ate it, Drank it, Used it some other way); [If selected marijuana] “When you used marijuana during the past 3 months, was it for medical reasons or non-medical reasons?;” [If selected marijuana] “How often did you smoke marijuana in the past 3 months?;” “Within a day, on average how many times did you smoke marijuana in the past 3 months?;” “Did you use flavored THC-containing products in the past 3 months?” “If you used flavored THC-containing products in the past 3 months, what flavors did you use most often? (Select all that apply: Menthol, Mint, Fruit, Candy, Other).

Nicotine-Containing Product Use—Questions for tobacco product use included: [If selected cigarettes] “About how many cigarettes did you smoke per day in the past 3 months?;” [If selected cigarettes] “For how long have you smoked cigarettes?; If you smoked cigarettes in the past 3 months, were they menthol cigarettes?;” “Did you use flavored nicotine-containing products in the past 3 months?;” and “If you used flavored nicotine-containing products in the past 3 months, what flavors did you use most often?” (Select all that apply: Tobacco, Menthol, Mint, Fruit, Candy, Other). Questions for additional product use included: “Have you used any of the following substances in the past 3 months?” (Select all that apply: Cigarettes, Cigars, Hookah, Chewing Tobacco, Marijuana, Synthetic Marijuana, CBD, Other) and “Have you used any other substances or flavors in e-cigarettes and/or vaping devices in the past 3 months?” (Select all that apply: CBD, Synthetic marijuana, Flavors alone, other substances). The past 3-month time frame for all metrics was chosen to cast a wide net for possible EVALI exposures in the early days of the investigation and to be consistent with state questionnaires already in use in the field.

Demographics—Demographic measures included age at time of survey, sex, and race/ethnicity. Respondents were also characterized as living in a legalized nonmedical adult marijuana use state if they lived in a state where marijuana use for nonmedical purposes was legal at the time of the survey (i.e., at the time of the survey state-wide law allows for personal possession and consumption of marijuana for all adults 21 years and older in the following states included in the survey: California, Colorado, Illinois, Michigan, Oregon, and Washington).

Statistical Analysis—Descriptive statistics of the sample were calculated. Proportions were calculated, along with 95% confidence intervals (CIs) for the nicotine, THC, and additional product use measures assessed in the survey. Analyses were conducted using SAS version 9.4 and included descriptive statistics, counts, and proportions (%), along with 95% CIs. Unweighted data were analyzed and reported because the sampling frame only included selected states and is not representative of state or national populations.

Results

Among the 3,980 adult respondents (all of whom used nicotine – and marijuana – containing EVPs), 53.5% were female and the median age was 36 years (range 19–86 years). Seventy-one percent of respondents identified as non-Hispanic White, 10.0% non-Hispanic Black, 11.0% Hispanic, 4.4% Asian, and 3.7% all other groups (Table 1). In addition to use of nicotine- and THC-containing EVPs, 62.6% percent of respondents reported past 3-month cigarette smoking, 20.7% smoked cigars, 16.1% used hookah, and 9.0% used chewing tobacco. Approximately 66% used marijuana in any form other than in EVPs (Table 2). Over a third also reported use of cannabidiol (CBD) in any form, and 54.5% reported vaping CBD. Nearly 40% (38.6%) of respondents reported vaping flavors alone, without THC or nicotine, and 13.7% reported vaping synthetic marijuana (Table 2).

THC-Containing Product Use

Nearly all respondents who reported any marijuana use (90.1%) reported smoking marijuana in the past 3 months, and 82.7% reported marijuana smoking as the most frequent mode of use (Table 3). Vaping marijuana was the second most commonly reported mode of use (65.6%), followed by use of marijuana edible products (43.7%). Approximately 42.1% reported smoking marijuana a few days per week, while 32.2% smoked marijuana monthly or less. Approximately 42.3% of respondents reported using marijuana for medical reasons, while 75.1% reported non-medical marijuana use (respondents could choose both). Nearly 7 in 10 respondents (68.2%) reported using flavored THC-containing products in the past 3 months. The most commonly reported flavor was fruit (71.0%), followed by candy (39.4%), mint (35.2%), and menthol (34.3%).

Nicotine-Containing Product Use

In addition to use of nicotine- and THC-containing EVPs, approximately 63% of respondents reported cigarette smoking; 55.6% reported smoking for over 8 years, while 7.7% had been smoking cigarettes for under a year (Table 4). A quarter of a pack of cigarettes (28.8%) and a half pack of cigarettes (20.7%) were the most commonly reported amount of cigarettes smoked per day during the last 3 months. Over 19% of those reporting smoking cigarettes smoked at least a pack a day. Flavored nicotine-containing product use was common. Nearly 6 in 10 (57.2%) cigarette smokers reported smoking menthol cigarettes. Most respondents (81.6%) used flavored nicotine-containing EVPs in the past 3 months. The most commonly reported flavor in EVPs was fruit (59.9%), followed by menthol (45.6%), mint (37.3%), tobacco (34.2%), and candy (30.3%).

Discussion

This study contributes to the limited data on multi-modal THC and nicotine use by adults who reported nicotine and marijuana containing EVP use in a large multi-state sample. Our findings suggest that adults who vaped THC and nicotine used a variety of THC- and nicotine-containing products. In the current study, smoking marijuana was the most commonly reported mode of marijuana use, followed by vaping marijuana. Nearly half of respondents reported consuming edible marijuana and a smaller proportion of users reported

drinking marijuana beverages in the past three months. These results are comparable to previous literature on the modes of marijuana use.^{4,21} Further, flavor use was common among this sample. Studies have shown that flavors are particularly appealing to youth;²² this study provides evidence that they are also widely used among adults. Some adults could be using flavored EVP products to quit smoking, but the extent to which flavors may impact cessation is currently unknown.^{23,24} Menthol use was common for THC, nicotine, and other products. Of those reporting cigarette use, nearly 60% reported smoking menthol cigarettes in addition to vaping THC and nicotine. People who smoke menthol cigarettes have a harder time quitting smoking than those who smoke non-menthol cigarettes.²⁵ Relative to using non-menthol cigarettes, those reporting smoking menthol cigarettes were also likely using higher nicotine EVPs¹² and higher concentration THC EVPs.²⁶

Respondents in this study reported prolonged and frequent cigarette smoking and frequent marijuana smoking in addition to EVP use. This use of multiple products could indicate that some are being used for cessation for other products. Studies assessing EVP use as a cessation tool report mixed findings.²⁷ Some studies have demonstrated that EVP use is associated with cigarette smoking cessation²⁸ or reduction in cigarettes smoked per day;²⁹ others have found no association with cigarette smoking cessation³⁰ or cigarettes smoked per day.³¹ A recent Cochrane review found moderate evidence that nicotine-containing EVPs can increase quit rates when compared to non-nicotine EVPs and nicotine-replacement therapies.³² However, in order for adult smokers to achieve any meaningful health benefits from e-cigarettes, they would need to fully switch to EVPs and stop smoking cigarettes and other tobacco products completely.²⁷ Also, e-cigarettes are not an FDA-approved cessation modality.¹²

There is evidence that marijuana can have therapeutic benefits on adverse health outcomes like treating neuropathic chronic pain and chemotherapy-induced nausea.² Conversely, in addition to the health risks highlighted by the EVALI outbreak, there are documented health risks associated with marijuana use such as increased risk of temporary psychosis or schizophrenia (stronger association in people who begin using marijuana at an early age or use marijuana more frequently); impairment in the cognitive domains of learning, memory, and attention; and increased risk of car accidents.² However, health risks associated with newer marijuana products such as edibles and concentrates, are poorly understood. Given the increasing number of states legalizing cannabis use, and the increasing number of high concentration THC products available, more research is needed to better understand the relationship between adult use behaviors and health outcomes.

This study is subject to some limitations. First, our results are limited by its focus on adults who report using both THC- and nicotine-containing EVPs in selected states; therefore, results cannot be generalized to specific states, nationally, or to those with different usage patterns. Despite this, the percentage of adults who screened into the survey from those who started (3.9%) is similar to the overall prevalence of adult e-cigarette use in 2019 (4.5%).¹ Second, our sample was mostly comprised of non-Hispanic White respondents, which could result in limited generalizability to other racial/ethnic groups. The sample had a greater number of White respondents (71%) versus the overall YouGov panel as a whole (~63%). This may be due in part to the combination of states selected in the sampling,

many of which are less diverse than the nation as a whole. Also, e-cigarette use is higher among White persons than in most other racial/ethnic groups¹. Third, participants were not asked about motivations for THC use, so results were not analyzed separately for medical versus non-medical THC use. It is likely that experiences and behaviors would be different based on reasons for THC use, and this is an area for additional research. Also, product use was self-reported and may be subject to recall error and social desirability bias. Finally, many people may not know what is in their marijuana or tobacco products, so asking about THC-containing products and CBD may have led to misclassification.³³

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Public Health Implications

In addition to using both nicotine and THC-containing EVPs, respondents also reported frequent and prolonged cigarette and marijuana smoking, use of CBD products, synthetic marijuana, and flavored EVP use. They also reported consuming THC-containing edibles, as well as using hookah and chewing tobacco. These findings underscore that among a sample of adults who are nicotine and marijuana – containing EVP users, use of other products and substances is common. This highlights the importance of continued rapid surveillance of marijuana, tobacco, and other substance use and expanded education and awareness about the potential risks associated with their use. The EVALI outbreak highlighted how little is known about the variety of substances people use in EVPs and how rapidly these products can change. If adults are using increasing the variety of EVP products used, there is an increased risk for another EVALI-like outbreak to occur. As more states consider legalizing medical or nonmedical marijuana sales to adults, shifts in attitudes, availability, and use of marijuana may continue to occur. Monitoring the adult prevalence of modes of marijuana, tobacco, and other substance use at national and state levels may inform policies, prevention education, communication, and cessation tools.

Table 1.

Demographic characteristics among adults (18+ years) reporting polysubstance EVP use— Selected States, United States, February 2020

Characteristics	No./Total No. (% ¹)
Demographics	
Sex	
Male	1850/3980 (46.5)
Female	2130/3980 (53.5)
Median age, years (range)	36 (19–86)
Age Group	
18–24	585/3980 (14.7)
25–34	1145/3980 (28.8)
35–44	987/3980 (24.8)
45–64	1071/3980 (26.9)
65–86	192/3980 (4.8)
Race/Ethnicity	
Non-Hispanic White	2825/3980 (71.0)
Non-Hispanic Black	399/3980 (10.0)
Hispanic	436/3980 (11.0)
Non-Hispanic Asian	174/3980 (4.4)
Other	146/3980 (3.7)

¹ Percentages may add up to more than 100% due to rounding.

Table 2.

Additional substances used among adults (18+ years) reporting polysubstance EVP use— Selected States, United States, February 2020

Have you used any of the following substances in the last 3 months? ¹	Frequency	Percent	95% Confidence Limits	
Cigarettes	2490	62.6	61.1	64.1
Cigars	822	20.7	19.4	21.9
Hookah	642	16.1	15.0	17.3
Chewing Tobacco	359	9.0	8.1	9.9
Marijuana	2636	66.3	64.8	67.7
Synthetic Marijuana	258	6.5	5.7	7.3
CBD	1463	36.8	35.3	38.3
Other	139	3.5	2.9	4.1
Have you used any other substances or flavors in e-cigarettes and/or vaping devices in the last 3 months?¹				
CBD	2165	54.5	53.0	56.1
Synthetic marijuana	542	13.7	12.6	14.7
Flavors alone	1534	38.6	37.1	40.2
Other substances	647	16.3	15.1	17.4

¹Response options were not mutually exclusive

Table 3.

Marijuana/THC product mode of use and characteristics among adults (18+ years) reporting polysubstance EVP use— Selected States, United States, February 2020.

In the past 3 months, how did you use marijuana? ¹	Frequency	Percent¹	95% Confidence Limits	
Smoked it	2,374	90.1	89.0	91.2
Vaped it	1,729	65.6	63.8	67.4
Ate it	1,202	45.6	43.7	47.5
Drank it	320	12.1	10.9	13.4
Used it some other way	46	1.8	1.3	2.3
In the past 3 months, how did you most frequently use marijuana? ¹				
Smoked it	2,179	82.7	81.3	84.1
Vaped it	1,149	43.6	41.7	45.5
Ate it	588	22.3	20.7	23.9
Drank it	185	7.0	6.0	8.0
Used it in some other way	18	0.7	0.4	1.0
How often did you smoke marijuana in the past 3 months?				
Monthly or less	433	32.2	29.7	34.7
A few days per month	345	25.7	23.3	28.0
A few days per week	566	42.1	39.5	44.8
When you used marijuana during the past 3 months, was it for				
Medical reasons	1,113	42.3	40.4	44.1
Non-medical reasons	1,978	75.1	73.4	76.7
Other	144	5.5	4.6	6.3
Did you use flavored THC-containing products in the past 3 months?				
Yes	2,713	68.2	66.7	69.6
No	1,266	31.8	30.4	33.3
If you used flavored THC-containing products in the past 3 months, what flavors did you use most often? ¹				
Menthol	930	34.3	32.5	36.1
Mint	955	35.2	33.4	37.0
Fruit	1,927	71.0	69.3	72.7
Candy	1,070	39.4	37.6	41.3
Other	99	3.6	2.9	4.4

¹Response options were not mutually exclusive

Table 4.

Nicotine product mode of use and characteristics among adults (18+ years) reporting polysubstance EVP use
— Selected States, United States, February 2020.

For how long have you smoked cigarettes?	Frequency	Percent	95% Confidence Limits	
<1 year	193	7.7	6.7	8.8
1–2 years	263	10.6	9.4	11.8
3–5 years	393	15.8	14.3	17.2
6–8 years	258	10.4	9.2	11.6
>8 years	1384	55.6	53.6	57.5
About how many cigarettes did you smoke per day in the past 3 months?				
<1 cigarette a day	419	16.8	15.4	18.3
Quarter of a pack of cigarettes	718	28.8	27.0	30.6
Half a pack of cigarettes	515	20.7	19.1	22.3
More than half but less than a pack of cigarettes	350	14.1	12.7	15.4
A pack of cigarettes	324	13.0	11.7	14.3
More than a pack of cigarettes	165	6.6	5.6	7.6
If you smoked cigarettes in the past 3 months, were they menthol cigarettes?				
Yes	1424	57.2	55.2	59.1
No	1067	42.8	40.9	44.8
Did you use flavored nicotine-containing products in the past 3 months?				
Yes	2709	81.6	80.3	82.9
No	611	18.4	17.1	19.7
If you used flavored nicotine-containing products in the past 3 months, what flavors did you use most often?¹				
Tobacco	927	34.2	32.4	36.0
Menthol	1236	45.6	43.7	47.5
Mint	1012	37.3	35.5	39.2
Fruit	1623	59.9	58.0	61.7
Candy	820	30.3	28.5	32.0
Other	70	2.6	2.0	3.2

¹Response options were not mutually exclusive