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Use and reasons for use of electronic vapour products shaped like USB flash drives among a national sample of adults

Kristy L Marynak[1], **Fatma Romeh M Ali**[1], **Gillian L Schauer**[2,3], **Michael A Tynan**[1], **Brian A King**[1]

[1]Office on Smoking and Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

[2]Carter Consulting, Inc, Contractor to Office on Smoking and Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

[3]Department of Health Services, School of Public Health, University of Washington, Seattle, Washington, USA

Abstract

Objectives—Assess use and reasons for use of electronic vapour products (EVPs) shaped like universal serial bus (USB) flash drives among adults in the USA.

Methods—Data came from *SummerStyles*, an internet survey of US adults aged ≥18 (N=4088) fielded in June to July 2018. Respondents were shown product images and asked about ever use, current (past 30 days) use and reasons for use. Weighted point estimates and adjusted ORs were assessed.

Results—In 2018, 7.9% of participants had ever used flash drive-shaped EVPs, including 25.7% of current cigarette smokers and 45.9% of current EVP users. Moreover, 2.0% reported current use, including 6.8% of cigarette smokers and 34.3% of EVP users. Leading reasons for ever use were ‘to deliver nicotine’ (30.7%) and ‘friend or family member used them’ (30.2%).

Conclusions—About one in 13 US adults have ever used flash drive-shaped EVPs, with use being highest among current EVP users. Nicotine content and friend/family use are drivers of ever use.

Public health implications—Understanding use of emerging EVP types can inform strategies to maximise any potential benefits for adult cessation and minimise risks of youth initiation.

Correspondence to: Kristy L Marynak, Office on Smoking and Health, Centers for Disease Control and Prevention, Atlanta, GA 30341, USA; KMarynak@cdc.gov.

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INTRODUCTION

Since their 2007 debut in the USA, the landscape of electronic cigarettes (e-cigarettes) and other electronic vapour products (EVPs) has continuously evolved.[1] This diversifying landscape has important implications for public health.[1] Youth e-cigarette use is of public health concern because nicotine exposure during adolescence can cause addiction and harm brain development.[1] In contrast, e-cigarettes could benefit non-pregnant adults who smoke cigarettes if used as a complete substitute for all combusted tobacco products.[1 2] However, the evidence is insufficient on the long-term effectiveness of e-cigarettes for smoking cessation,[2] and a majority of adults who use e-cigarettes continue to smoke cigarettes.[3]

E-cigarette use is more prevalent among youth than adults; in 2017, 11.7% of US high school students currently used e-cigarettes compared with 2.8% of US adults.[4 5] Although a sustained decline in youth e-cigarette use occurred during 2015–2017, an increase was observed during 2017–2018[5] that has been largely attributed to increased sales and use of JUUL.[5–7] JUUL is a universal serial bus (USB) flash drive-shaped e-cigarette that became the top-selling brand in the USA in December 2017.[6] In a national study, 9.5% of 15–17 year olds and 11.2% of 18–21 year olds reported ever use of JUUL in 2018, while 6.1% and 7.7% reported current use, respectively.[7]

JUUL sales in the USA increased 641% from 2016 to 2017, and as of October 2018, it held approximately 75% of US market share.[6 8] JUUL's popularity spurred the rapid introduction of lookalike products, including Altria's MarkTen Elite, Imperial Tobacco's myBlu and independent brands such as PHIX and SMOK.[9] JUUL and other flash drive-shaped e-cigarettes typically contain high levels of nicotine compared with other EVPs.[9] Additionally, some flash drive-shaped EVPs can be modified for marijuana use, or are marketed specifically for marijuana use (eg, Pax Era).[9]

The swiftly changing array of EVP offerings worldwide reinforces the importance of monitoring emerging use patterns and understanding factors driving EVP use and initiation, which can inform public health policy and practice. No study has assessed use of flash drive-shaped EVPs, including JUUL, among US adults—a topic of particular importance as JUUL expands from the USA to markets across the globe, including the UK and Canada. Therefore, we assessed US adult use and reasons for use of flash drive-shaped EVPs in 2018.

METHODS

Study sample

Data came from questions added by CDC to *SummerStyles*, an internet survey of US adults aged ≥18 years (N=4088) fielded by Porter Novelli in June to July 2018. Respondents were drawn from GfK's Knowledge Panels, and data were weighted based on gender, age, household income, race/ethnicity, household size, education, census region and metro status to match US Current Population Survey distributions. As this study analysed deidentified, secondary data, human subjects review was not required.

Measures

Respondents were shown product images and asked, “Have you ever tried an EVP shaped like a USB flash drive, such as JUUL, MarkTen Elite, or myBlu, even just one time?”. Those who responded ‘yes’ were asked, “In the past 30 days, have you used an EVP shaped like a USB flash drive, such as JUUL, MarkTen Elite, or myBlu?”.

Those who responded ‘yes’ to either question were asked, “What are the reasons you have used an EVP shaped like a USB flash drive?”. Respondents could select multiple responses.

Weighted estimates of ever and current (past 30 days) use were assessed overall and by sex, age, race/ethnicity, education, cigarette smoking status and EVP use status. Categories were selected to align with previous studies of tobacco product use, including those using the same data source.[10] The ratio of current use to ever use (percentage of current use divided by percentage of ever use) was calculated for each age group. Adjusted odds ratios (AORs) for ever use were calculated using logistic regression, given that the outcome was binary, with all covariates (except EVP use) included in the model. The regression included only cases with values for both the dependent and independent variables. Statistical significance was defined as $p<0.05$. AORs were not presented for current use due to limited sample size. Analyses were conducted in 2018 using Stata, V.14.

RESULTS

A total of 4088 adults responded to the survey, of which 3991 provided an answer to the ever use question and were included in a regression model and descriptive analyses on ever use. Of the total sample (4088), 3985 responded to the question on current use and were included in descriptive analyses on current use.

In 2018, 7.9% of participants reported ever use of flash drive-shaped EVPs, including 25.7% of current cigarette smokers and 45.9% of ever EVP users (table 1). Overall, 4.4% of participants currently used any EVPs (data not shown).

Overall, 2.0% of participants currently used flash drive-shaped EVPs, including 6.8% of current cigarette smokers and 34.3% of current EVP users. Ever use was higher among: participants ages 18–24 (AOR: 10.5, 95% CI 4.9 to 22.5), 25–44 (AOR: 5.0, 95% CI 3.0 to 8.3) and 45–64 (AOR: 2.8, 95% CI 1.7 to 4.6) than participants 65+; non-Hispanic other races (AOR: 2.1, 95% CI 1.2 to 3.7) than whites and former (AOR: 6.0, 95% CI 3.9 to 9.2) and current (AOR: 12.6, 95% CI 8.0 to 19.8) smokers than never smokers. The ratio of current use to ever use was 0.42 for 18–24 year olds, 0.26 for 25–44 year olds and 0.17 for 45–64 year olds (data not shown). The decline in this ratio as age increases suggests greater transition of experimentation to recent use among younger adults.

Among ever users, ‘to deliver nicotine’ was the leading reason for use (30.7%), followed by ‘friend or family member used them’ (30.2%), ‘to try to quit other tobacco products’ (22.6%), other reasons (22.1%), and ‘to deliver marijuana or cannabis’ (18.7%).

DISCUSSION

This is the first study to assess use of flash drive-shaped e-cigarettes, including JUUL, among US adults. Few adults use these products overall, including current cigarette smokers. However, nearly half of current EVP users have tried the products, and more than one-third of current EVP users currently use them.

These findings, coupled with sales data[6] showing that flash drive-shaped EVPs now comprise a sizeable portion of the US e-cigarette market, suggest these products appeal to existing adult EVP users for multiple reasons. Our finding that the odds of ever use of the products increases as age decreases is unsurprising given the products' popularity among youth, as well as estimates from other studies of high rates of JUUL use among younger adults.[11] Notably, current use of JUUL among 15–17 year olds in 2018 (6.1%) is more than threefold higher than adult current use estimates in this study (2.0%).[7] Moreover, our study comprehensively assessed JUUL and other brands of flash drive-shaped EVPs, so a comparable youth estimate could be even greater.[7]

Nicotine delivery was a primary reason for use cited in our study. JUUL features nicotine salts, which allow for high nicotine levels to be inhaled with less irritation than freebase nicotine.[12] Stronger and more efficient delivery of nicotine in EVPs may increase their acceptability as a complete substitute for combusted tobacco products among adult smokers. However, the finding that 22.6% of ever users used the devices to try to quit tobacco products suggests that smoking cessation is not the predominant reason for use among adults. Additionally, the available scientific evidence on the use of these products among youth suggests that these products pose significant risks for youth, including the potential for nicotine addiction.[7] Of particular concern, frequency of JUUL use assessed among 15–17 year olds in 2018 suggests regular rather than experimental use.[7] Citing concerns about young people, the US Food and Drug Administration has enhanced enforcement of minor sales restrictions and plans to implement new regulatory efforts to prevent youth e-cigarette access and use.[13]

These findings, taken together with recent estimates of youth JUUL use,[7] have international significance because JUUL is currently expanding globally.[14] The company has amassed substantial investments which could fuel these expansions, including a 35% stake from tobacco manufacturer Altria.[15] JUUL recently launched in Canada and the UK and announced test markets in Switzerland, but was banned by Israel because of concerns about high nicotine levels.[15] Knowledge of the patterns of use of these products among both adults and youth can help inform public health policy and practice, including efforts to prevent youth access to and use of these products, while continuing to assess their potential to help adult smokers quit completely.

Finally, the finding that flash drive-shaped EVPs are being used for marijuana reveals the diverse landscape of EVP product offerings and patterns of use. The devices' discreet shape and ability to be modified by consumers for use with nicotine or marijuana—coupled with a lack of characteristic odour from aerosolised cannabis—could complicate enforcement of

existing restrictions on public marijuana use, and could involuntarily expose bystanders to harmful toxicants.[1]

Limitations

This study is subject to limitations. First, *SummerStyles* is a web-based survey and may be subject to coverage and non-response biases. However, data are weighted to be nationally representative, and prior *Styles* tobacco use estimates align closely with large cross-sectional surveys.[16] Second, small sample sizes for some subgroups resulted in unstable estimates that were not presented. Third, self-reported data may be subject to bias.

Public health implications

Few US adults use flash drive-shaped EVPs, and less than one-fourth of ever users cite tobacco cessation as a reason for use. As these products are more commonly used among youth than adults, efforts are warranted to prevent youth access to and use of flash drive-shaped EVPs while continuing to assess their potential to help adult smokers quit completely.

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What this paper adds

- JUUL, a USB flash drive-shaped electronic vapour product (EVP), debuted in the USA and rapidly achieved 75% market share. JUUL is currently expanding to other markets outside the USA.
- This is the first national estimate of use and reasons for use of JUUL and other EVPs shaped like flash drives among adults.
- About one in 13 adults have ever used flash drive-shaped EVPs including JUUL in 2018, with nicotine content and friend or family use driving ever use.
- Understanding the use of emerging EVP types can inform strategies to maximise any potential benefits for adult cessation and minimise risks of youth initiation.

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Table 1

Ever use, current use and reasons for use of electronic cigarettes shaped like USB flash drives[*] among US adults, 2018

	Ever use[†] of USB-shaped EVPs			Current use[‡] of USB-shaped EVPs	
Characteristics	**Unweighted sample size (unweighted ever users)**	**Weighted % (95% CI)**	**AORs[§] (95% CI)**	**unweighted sample size (unweighted current users)**	**Weighted % (95% CI)**
Overall	3991 (276)	7.9 (6.8 to 8.9)	–	3985 (65)	2.0 (1.4 to 2.6)
Sex					
Male	1978 (144)	8.3 (6.8 to 9.8)	Ref	1976 (37)	2.2 (1.4 to 3.0)
Female	2013 (132)	7.5 (6.0 to 8.9)	1.09 (0.79 to 1.49)	2009 (28)	1.8 (1.0 to 2.6)
Age (years)					
65+	918 (24)	2.8 (1.6 to 4.0)	Ref	916 (4)	_[¶]
45–64	1650 (107)	7.1 (5.7 to 8.6)	**2.77 (1.68 to 4.57)**	1648 (20)	1.2 (0.7 to 1.8)
25–44	1253 (124)	10.1 (8.2 to 11.9)	**4.95 (2.96 to 8.28)**	1252 (33)	2.6 (1.6 to 3.6)
18–24	170 (21)	12.5 (7.3 to 17.7)	**10.52 (4.92 to 22.49)**	169 (8)	5.2 (1.6 to 8.7)
Race/Ethnicity					
White, non-Hispanic	2970 (185)	6.7 (5.7 to 7.8)	Ref	2968 (44)	1.7 (1.1 to 2.3)
Black, non-Hispanic	344 (29)	8.0 (4.9 to 11.1)	1.26 (0.76 to 2.10)	343 (6)	_[¶]
Other, non-Hispanic	300 (29)	10.2 (5.7 to 14.6)	**2.14 (1.24 to 3.68)**	299 (11)	5.5 (1.9 to 9.1)
Hispanic	377 (33)	11.2 (7.4 to 15.1)	1.59 (1.00 to 2.52)	375 (4)	_[¶]
Education					
College degree	1491 (68)	5.0 (3.8 to 6.3)	Ref	1490 (21)	1.5 (0.8 to 2.2)
Some college	1148 (93)	8.3 (6.4 to 10.3)	1.30 (0.88 to 1.92)	1145 (21)	1.6 (0.8 to 2.3)
High school	1114 (85)	8.4 (6.4 to 10.4)	1.12 (0.72 to 1.73)	1113 (17)	2.4 (1.1 to 3.8)
<High school	238 (30)	13.5 (8.5 to 18.4)	1.35 (0.75 to 2.41)	237 (6)	_[¶]
Cigarette smoking status[**]					
Never smoker	2301 (57)	3.4 (2.4 to 4.5)	Ref	2298 (13)	1.0 (0.4 to 1.6)
Former smoker	1167 (102)	10.3 (8.2 to 12.4)	**5.99 (3.91 to 9.19)**	1165 (23)	2.4 (1.3 to 3.5)
Current smoker	433 (110)	25.7 (20.9 to 30.5)	**12.60 (8.04 to 19.76)**	432 (28)	6.8 (3.9 to 9.7)
EVP use[††]					
Never EVP use	3434 (71)	2.4 (1.8 to 3.1)	–	3431 (28)	0.2 (0.1 to 0.4)

Characteristics	Ever use† of USB-shaped EVPs			Current use‡ of USB-shaped EVPs	
	Unweighted sample size (unweighted ever users)	Weighted % (95% CI)	AORs§ (95% CI)	unweighted sample size (unweighted current users)	Weighted % (95% CI)
Former EVP use	390 (137)	35.6 (30.0 to 41.2)	–	388 (11)	3.0 (1.0 to 5.1)
Current EVP use	156 (65)	45.9 (36.5 to 55.4)	–	155 (46)	34.3 (24.9 to 43.7)
Reasons for use‡‡					
To deliver nicotine	270 (85)	30.7 (24.3 to 37.2)	–	65 (33)	48.2 (33.1 to 63.3)
To deliver marijuana or cannabis	270 (43)	18.7 (12.8 to 24.7)	–	65 (15)	30.3 (15.5 to 45.2)
Its shape lets me use it unnoticed	270 (13)	5.4 (1.9 to 8.9)	–	65 (8)	14.4 (2.8 to 26.0)
To try to quit other tobacco products	270 (73)	22.6 (17.0 to 28.2)	–	65 (21)	25.9 (13.5 to 38.4)
A friend or family member used them	270 (76)	30.2 (23.5 to 37.0)	–	65 (15)	24.8 (11.2 to 38.4)
Other reasons	270 (59)	22.1 (16.2 to 28.0)	–	65 (6)	_¶

Note: Boldface indicates statistical significance (p<0.05).

*Respondents were provided images of product examples and asked about ever use, current (past 30 days) use and reasons for use of ‘an EVP shaped like a USB flash drive, such as JUUL, MarkTen Elite, or myBlu’.

†Defined as a response of yes to the question, “Have you ever tried an EVP shaped like a USB flash drive, such as JUUL, MarkTen Elite, or myBlu, even just one time?”. Those who reported don’t know or did not respond were excluded. Out of the 4088 adults who participated in the *SummerStyles* study, 97 were excluded, yielding an analytical sample of 3991 adults.

‡Defined as a response of yes to the question, “In the past 30 days, have you used an EVP shaped like a USB flash drive, such as JUUL, MarkTen Elite, or myBlu?”. Those who reported don’t know or did not respond were excluded. Out of the 4088 adults who participated in the *SummerStyles* study, 103 were excluded, yielding an analytical sample of 3985 adults.

§AORs calculated using logistic regression adjusting for sex, age, race/ethnicity, education and cigarette smoking status. 3901 observations were included in this regression, excluding 90 observations with missing information on cigarette smoking status.

¶Relative SE greater than 40.0%.

**Current smokers are defined as respondents who self-reported having smoked at least 100 cigarettes in their lifetime and currently smoked some days or every day. Former smokers are defined as respondents who reported having smoked at least 100 cigarettes within their lifetime, and currently smoked not at all. Never smokers are defined as those who smoked fewer than 100 cigarettes within their lifetime. Those who reported don’t know or did not respond (n=90) were excluded.

††Current EVP users are defined as respondents who self-reported use of EVPs (eg, e-cigarettes, e-hookahs, e-cigars, e-pipes, hookah pens, vape pens, or some other EVP) in the past 30 days. Former EVP users are defined as respondents who reported ever use of EVPs, but have not used them in the past 30 days. Never EVP users are defined as those who never tried EVPs in their lifetime. Those who reported don’t know or did not respond (n=11) were excluded.

‡‡Ever and current users of USB-shaped EVPs could choose all that apply from a list of reasons for use including ‘to deliver nicotine’, ‘to deliver marijuana or cannabis’, ‘its shape lets me use it unnoticed’, ‘to try to quit other tobacco products’, ‘a friend or family member used them’ and ‘other reasons’. Among the 276 respondents who were ever USB-shaped EVP users, a total of 270 responded to the question on reasons for use and were included in the descriptive analyses. Among the 65 respondents who were current USB-shaped EVP users, all responded to the question on reasons for use and were included in the descriptive analyses.

AOR, adjusted odds ratio; EVP, electronic vapour product; USB, universal serial bus.