Prevalence of using pod-based vaping devices by brand among youth and young adults

BACKGROUND

An estimated 10%–44% of youth and young adults have ever used JUUL, the leading e-cigarette brand in the USA,¹ while 8%–9% reported past 30-day use of JUUL.^{2–5} Although there is growing attention on the prevalence of JUUL use, prevalence of using other brands of pod-based vaping devices is unknown. This information is important to assess whether newer brands are gaining popularity among young people and to complement sales data which do not track online purchases and sales through non-participating retailers or provide information about characteristics of users.¹ This study assesses the prevalence of current use of JUUL, Suorin and Vuse across demographic and tobacco use characteristics among US youth and young adults.

METHODS

Study population and procedure

Data came from 2000 US youth and young adults recruited through the SSRS national online opt-in survey panel⁶: 15–17 years old (500 ever smokers, 500 never smokers) or 18–24 years old (500 who smoked within the past 30 days and had smoked ≥ 100 lifetime cigarettes, 500 who did not smoke in the past 30 days or had smoked < 100 lifetime cigarettes). Participants completed an online survey from December 2018 to January 2019.

Measures

Participants were asked if they have ever used JUUL, Suorin and Vuse. The question for Vuse referred to using the brand of e-cigarettes in general and was not limited to the pod-based sub-brand (ie, Vuse Alto). Response options were past 30-day use, ever use but not in the past 30 days, aware of the product but never used it, or not aware of the product. We computed a derived variable indicating past 30-day use of any of the three brands (yes/no).

Analyses

We estimated the prevalence of using JUUL, Suorin and Vuse, stratified by youth and young adults and by individual characteristics. Data were weighted to reflect the distribution of the US population of these age groups by demographics and smoking status.^{7,8} A final adjustment was made so that the youth and young adult

Figure 1 Weighted prevalence of current use (past 30 days) of JUUL, Suorin and Vuse among US youth (N=1000) and young adults (N=1000). *Statistically significant difference in prevalence between youth and young adults ($p < 0.05$).

groups are representative of the nationwide age distribution.⁹

RESULTS

Of the three brands, JUUL use was most prevalent among youth (12.9%) and young adults (18.1%), followed by Suorin (4.4% and 6.7%, respectively), and Vuse (2.1% and 6.2%, respectively; figure 1). Overall, 15.0% of youth and 22.0% of young adults reported using any of these three brands in the past 30 days. Prevalence of using JUUL and Vuse were significantly higher among young adults than youth. Over three in four youth (76.4%) and two in three young adults (68.8%) are aware of JUUL. In comparison, less than half the youth are aware of Suorin (36.7%) and Vuse (42.2%). Among young adults, 37.0% are aware of Suorin and 51.9% are aware of Vuse. Among youth, ever and past 30-day smokers and ever tried non-cigarette tobacco products were associated with JUUL, Suorin and Vuse use (table 1). Additionally, non-Hispanic white youth were more likely to use JUUL (compared with other races/ethnicities), while youth in 11th or 12th grades were more likely to use Suorin (compared with 10th grade or below). Among young adults, being male and ever tried non-cigarette tobacco products was associated with JUUL, Suorin and Vuse use. Furthermore, ever and past 30-day smoking was associated with JUUL use, while past 30-day smoking was associated with Suorin use.

DISCUSSION

The findings of higher rates of awareness and current use of JUUL compared with Suorin and Vuse e-cigarettes are aligned with JUUL as the market leader,¹ being

the most popular device among high-school youth who ever used e-cigarettes,¹⁰ increased media and news coverage, promotion on social media platforms,¹ online engagement about JUUL,^{11,12} and sharing about JUUL via word-of-mouth in recent years.¹³ The worrisome trend of social normalisation of e-cigarette use among young people could potentially renormalise combustible cigarette use due to a fourfold increased odds of initiating smoking among e-cigarette users.¹⁴ The high nicotine content of newer pod-based vaping devices may further increase the risks of nicotine addiction and initiating smoking.¹⁵ Efforts to restrict access of pod-based devices, ban flavours that appeal to young people, and counter-marketing campaigns on the addictiveness of vaping are needed to stem this growing trend. Surveillance of not just the use of JUUL but also other popular pod-based brands (eg, Suorin, Bo and PHIX)¹⁶ is recommended to more accurately assess the prevalence of vaping among young people.

Limitations of this study include a non-probability-based sample, although we recruited a large sample nationally and weighted analyses to match the US population in this age group. We were not able to assess prevalence of using all available brands of pod-based vaping devices. Current use was based on self-reported measures which are subject to recall bias.

In sum, this study contributes new evidence on the prevalence of using JUUL, Suorin and Vuse among a national sample of US youth and young adults to inform future surveillance and intervention efforts.

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Table 1 Participant characteristics and weighted prevalence of past 30-day use JUUL, Vuse, and Suorin by characteristics of youth and young adults

Participant characteristics	Youth (N=1000)				Young adult (N=1000)			
	N (%) or mean (SD)	JUUL use (%)	Suorin use (%)	Vuse use (%)	N (%) or mean (SD)	JUUL use (%)	Suorin use (%)	Vuse use (%)
Age	16.3 (0.7)	–	–	–	20.9 (2.0)	–	–	–
Gender								
Male	397 (39.7)	13.3	4.6	1.9	436 (43.6)	23.3 [§]	9.3 [§]	9.2 [§]
Female	544 (54.4)	13.2	4.3	1.8	540 (54.0)	12.8 [§]	4.2 [§]	3.3 [§]
Transgender or other gender identities	57 (5.7)	8.2	4.1	5.8	24 (2.4)	19.2 [§]	3.6 [§]	1.9 [§]
Missing	2 (0.2)	–	–	–	0 (0.0)	–	–	–
Sexual orientation [*]								
Heterosexual	–	–	–	–	795 (79.5)	17.4	7.2	6.6
Lesbian or gay	–	–	–	–	40 (4.0)	20.9	4.7	2.1
Bisexual	–	–	–	–	133 (13.3)	24.7	4.0	2.6
Something else	–	–	–	–	14 (1.4)	10.7	0.0	0.0
Missing	–	–	–	–	18 (1.8)	–	–	–
Race/ethnicity								
Non-Hispanic white	448 (44.8)	16.1 [§]	5.6	1.6	490 (49.0)	19.8	7.2	5.6
Non-Hispanic black	179 (17.9)	6.3 [§]	2.9	2.2	184 (18.4)	11.7	7.1	7.2
Hispanic	215 (21.5)	12.1 [§]	2.3	3.4	219 (21.9)	19.9	4.7	6.8
Non-Hispanic other races	158 (15.8)	7.1 [§]	4.5	1.8	107 (10.7)	14.8	7.9	6.3
Highest grade of school completion								
9th grade or below	191 (19.1)	9.5	2.2 [§]	1.1	24 (2.4)	16.4	9.1	4.7
10th grade	286 (28.6)	13.4	3.2 [§]	1.7	18 (1.8)	0.0	0.0	12.7
11th grade	331 (33.1)	13.2	7.0 [§]	2.4	34 (3.4)	10.1	5.9	2.3
12th grade/high school degree/General Education Development (GED)	169 (16.9)	17.2	6.3 [§]	4.6	377 (37.7)	17.9	8.4	7.3
Some college, but no degree	0 (0.0)	–	–	–	303 (30.3)	21.4	7.3	5.5
Associate degree	0 (0.0)	–	–	–	94 (9.4)	15.2	6.3	6.3
Bachelor's degree and above	0 (0.0)	–	–	–	141 (14.1)	20.9	2.0	4.6
Missing	23 (2.3)	–	–	–	9 (0.9)	–	–	–
Cigarette smoking status								
Never Smoker	500 (50.0)	6.7 [§]	1.9 [§]	1.0 [§]	292 (29.2)	7.8 [§]	5.1 [§]	5.1
Ever but not past 30-day Smoker	379 (37.9)	28.8 [§]	9.7 [§]	4.8 [§]	159 (15.9)	27.0 [§]	5.1 [§]	4.8
Past 30-day Smoker [†]	121 (12.1)	50.3 [§]	22.0 [§]	9.0 [§]	549 (54.9)	30.0 [§]	12.5 [§]	10.2
Ever tried other tobacco products [‡]								
No	644 (64.4)	8.3 [§]	3.1 [§]	1.4 [§]	363 (36.3)	10.9 [§]	4.9 [§]	2.0 [§]
Yes	343 (34.3)	40.6 [§]	12.4 [§]	6.2 [§]	628 (62.8)	32.6 [§]	10.3 [§]	14.4 [§]
Missing	13 (1.3)	–	–	–	9 (0.9)	–	–	–

*Youth participants were not asked the sexual orientation question.

†This category included all participants who smoked in the past 30 days, including those who may not have smoked 100 lifetime cigarettes.

‡Other tobacco products include hookah or waterpipe, cigars, cigarillos, or little cigars, smokeless (chew, snuff, or dip), roll-your-own, pipe, snus, dissolvables, and bidi.

§ χ^2 tests significant at $p < 0.05$.

questions used for the study collectively. MM, SS and ASLT performed the analysis. ASLT and SS wrote the manuscript. All authors contributed to revising the manuscript.

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Competing interests MM is serving as an expert witness for the prosecutor (Public Health Advocacy Institute) in litigation in which RJ Reynolds Tobacco Company was the defendant.

Patient consent for publication Not required.

Ethics approval and informed consent The Johns Hopkins University Bloomberg School of Public Health's Institutional Review Board reviewed and approved the study protocol (IRB00008763). Youth and young adult participants read an information sheet on the first page of the survey and clicked a button indicating they agreed to take the survey. We had a waiver of parental consent.

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REFERENCES

- 1 Huang J, Duan Z, Kwok J, *et al.* Vaping versus JUULing: how the extraordinary growth and marketing of JUUL transformed the US retail e-cigarette market. *Tob Control* 2019;28:146–51.
- 2 Willett JG, Bennett M, Hair EC, *et al.* Recognition, use and perceptions of JUUL among youth and young adults. *Tob Control* 2019;28:115–6.
- 3 Vallone DM, Bennett M, Xiao H, *et al.* Prevalence and correlates of JUUL use among a national sample of youth and young adults. *Tob Control* 2019;28:603–9.
- 4 McKelvey K, Baiocchi M, Halpern-Felsher B. Adolescents' and young adults' use and perceptions of Pod-Based electronic cigarettes. *JAMA Netw Open* 2018;1:e183535.
- 5 Morean ME, Camenga DR, Bold KW, *et al.* Querying about the use of specific e-cigarette devices may enhance accurate measurement of e-cigarette prevalence rates among high school students. *Nicotine Tob Res Off J Soc Res Nicotine Tob* Published Online First: 5 November 2018.
- 6 SSRS Online Solutions. Online solutions. SSRs. Available: <https://ssrs.com/online-solutions/> [Accessed 15 Mar 2019].
- 7 CDC - 2016 BRFSS Survey Data and Documentation, 2019. Available: https://www.cdc.gov/brfss/annual_data/annual_2016.html [Accessed 15 Mar 2019].
- 8 CDC's Office on Smoking and Health. National Youth tobacco Survey (NYTS). Smok. Tob. Use, 2019. Available: http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/ [Accessed 15 Mar 2019].
- 9 Flood S, King M, Rodgers R. 2018. Integrated public use Microdata series, current population survey: version 6.0.
- 10 Krishnan-Sarin S, Jackson A, Morean M, *et al.* E-cigarette devices used by high-school youth. *Drug Alcohol Depend* 2019;194:395–400.
- 11 Chu K-H, Colditz JB, Primack BA, *et al.* JUUL: spreading Online and Offline. *J Adolesc Health* 2018;63:582–6.
- 12 Malik A, Li Y, Karbasian H, *et al.* Live, love, Juul: User and content analysis of Twitter posts about Juul. *Am J Health Behav* 2019;43:326–36.
- 13 Moran MB, Chen-Sankey JC, Tan AS, *et al.* Sources of awareness of JUUL e-cigarettes in 2 surveys of adults in the United States. *Am J Health Behav* 2019;43:279–86.
- 14 Soneji S, Barrington-Trimis JL, Wills TA, *et al.* Association between initial use of E-cigarettes and subsequent cigarette smoking among adolescents and young adults: a systematic review and meta-analysis. *JAMA Pediatr* 2017;171:788–97.
- 15 Barrington-Trimis JL, Leventhal AM. Adolescents' Use of "Pod Mod" E-Cigarettes - Urgent Concerns. *N Engl J Med* 2018;379:1099–102.
- 16 Ramamurthi D, Chau C, Jackler RK. JUUL and other stealth vaporisers: hiding the habit from parents and teachers. *Tob Control* 2019;28:610–6.