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Trends in various e-cigarette devices used by high school adolescents from 2017-2019

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Abstract

Background: Adolescent e-cigarette use has increased recently; however, little is known about trends in use of specific devices by youth. This study aims to 1) compare rates of e-cigarette device use over time, 2) examine changes in frequency of device use, and 3) identify predictors of device use.

Methods: Cross-sectional surveys were distributed school-wide across 4 diverse Connecticut high-schools in 2017, 2018, 2019 and assessed current (i.e., past-30-day) use of various e-cigarette devices: disposables/cig-a-likes, vape pens, mods, JUULs, and other rechargeable pod devices (added in 2018 and 2019). Analyses compared rates of device use and frequency (i.e., number of days used in past 30) over time. Multivariable logistic regression models examined demographic and tobacco use characteristics (e.g., age first trying e-cigarettes) as predictors of current use of each device type in 2019.

Results: From 2017–2019, rates of using JUUL, disposables/cig-a-likes, and vape pens increased significantly, while use of mods and other pod devices decreased ($p < .001$). Over 59% of youth reported using more than one e-cigarette device in 2019. Over time, more youth were frequent

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Contributors:

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Author Disclosures

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users (using 20 out of 30 days) of disposable/cig-a-likes (32% to >46%) and JUUL (28% to >35%) devices. In multivariable models, first trying e-cigarettes at a younger age was associated with current use of disposable/cig-a-like, vape pens, mods, and other rechargeable pod devices.

Conclusions: From 2017–2019, JUUL, disposable/cig-a-like, and vape pens increased in popularity and were used frequently. Tobacco regulations designed to reduce youth use should consider various device types.

Keywords

e-cigarette; electronic cigarette; tobacco; adolescent; youth

1 Introduction

Youth e-cigarette use is a major public health problem (USDHHS, 2016). E-cigarettes have been the most popular tobacco product used among youth in the US since 2014 (Wang et al., 2019). Although national trends of current (i.e., past-30-day) e-cigarette use among high school youth decreased from 2015–2017, these prevalence rates more than doubled from 2017 (11.7%) to 2019 (27.5%) (Gentzke et al., 2019; Wang et al., 2019).

Increases in rates of youth e-cigarette use during this time may be due in part to the rising popularity of specific e-cigarette device types, most notably pod devices (Krishnan-Sarin et al., 2019; McKaganey & Russell, 2019; Vallone, Bennett, Xiao, Pitzer, & Hair, 2018). Early e-cigarette devices were either pre-filled disposable or rechargeable systems (e.g., cig-a-likes) or had e-liquid tanks that could be filled with various e-liquids (e.g., vape pens or mods), while more recent e-cigarette “pod” devices (e.g., JUUL, Suorin, Puffbars) are small and discreet to use, generating minimal vapor (Barrington-Trimis & Leventhal, 2018). Additionally, many of these newer pod devices contain nicotine salt e-liquids which can deliver higher nicotine concentrations with less irritation (Duell, Pankow, & Peyton, 2018; Spindle & Eissenberg, 2018). Exposure to high nicotine concentrations during adolescence is especially concerning due to increased risk of nicotine addiction (Case et al., 2018; Morean, Krishnan-Sarin, & O’Malley, 2018) and the negative effects of nicotine on the developing brain (Yuan, Cross, Loughlin, & Leslie, 2015). Reports indicate pod devices are the most popular e-cigarette products on the market according to sales data (Huang et al., 2018; King, Gammon, Marynak, & Rogers, 2018), and recent national survey results indicate that over 59% of youth e-cigarette users report JUUL is their usual brand (Cullen et al., 2019). However, little is known about trends in the use of specific e-cigarette device types among youth in recent years or characteristics associated with use of specific devices.

The current paper provides new information about specific e-cigarette devices used among Connecticut youth from 2017–2019. To date, no other local or national surveys have assessed rates of use of various e-cigarette devices over this period. Using school-wide surveys of local high-school students, we assessed use of specific e-cigarette devices including disposable/cig-a-likes, vape pens, mods, JUULs, and other rechargeable pod devices (e.g., Phix and Suorin) over three years (2017, 2018, 2019). The study aims to 1) compare rates of e-cigarette device use over time, 2) examine changes in frequency of device use, and 3) identify predictors of specific device use in the most recent wave in 2019.

Predictors were selected a priori based on evidence that these factors are associated with youth e-cigarette use (i.e., demographic factors including race, sex, age, socioeconomic status (SES); age of first trying e-cigarettes; current use of cigarettes; current use of other tobacco products; peer and parent tobacco use) (Barrington-Trimis et al., 2015; Bold et al., 2017; Gentzke et al., 2019; Simon et al., 2018). Understanding trends in e-cigarette devices used among youth is critical for informing regulations and interventions to reduce use.

2 Materials and methods

School-wide surveys (grades 9–12) were conducted across the same four Connecticut high schools in 2017 (N=2945), 2018 (N=3170), 2019 (N=3075). Schools were drawn from a convenience sample and we selected schools from four different district reference groups (DRGs) to obtain a socio-demographically diverse sample; DRGs are school groupings based on family income levels, parental education and occupation levels, and use of non-English language in the home (Connecticut School Finance Project, 2016).

Study procedures were approved by the Yale University Institutional Review Board and school administrators. Parents were notified in advance of the study and could indicate if they did not want their child to participate (n = 3 parents declined in any given year). Students were informed that their participation was voluntary and data were anonymous.

2.1 Measures

2.1.1 Demographics—Youth reported demographic characteristics including age, sex (male/female), and race/ethnicity (coded as non-Hispanic White, Hispanic, non-Hispanic Black, non-Hispanic Other). Socioeconomic status (SES) was measured using the Family Affluence Scale (FAS), which is a reliable and valid measure of SES among adolescents (Boyce, Torsheim, Currie, & Zambon, 2006). A total SES score was calculated from four items (e.g., “Do you have your own bedroom for yourself?”), with higher scores indicating higher SES (range: 0–9).

2.1.2 E-cigarette use—Youth reported how many days in the past 30 they used each e-cigarette device: cig-a-like or disposable devices, vape pens, mods or advanced personal vaporizers, JUUL, other rechargeable pod devices. JUUL was assessed in 2017, and then as other rechargeable pod devices emerged, these questions were added in 2018 and 2019 (e.g., PHIX or Suorin). Each question showed an image of the device type and included a brief description with brand-name examples where appropriate (Krishnan-Sarin et al., 2019). Youth who reported using a device at least once in the past 30 days were classified as current users of that device at each wave. Youth were coded as frequent users of a specific device if they used the product on 20 or more of the past 30 days, consistent with previous definitions used by the CDC (Anic, Sawdey, Jamal, & Trivers, 2018; Gentzke et al., 2019; Wang et al., 2019). Age of first trying e-cigarettes was assessed by asking youth “how old were you when you first vaped, even just 1 or 2 puffs”.

2.1.3 Other tobacco product use—Youth reported how many days out of the past 30 they used other tobacco products, including cigarettes, cigars, cigarillos, hookah, blunts, or smokeless tobacco. Each question showed an image of the product and included a brief

description with brand names, where appropriate (e.g., “Black and Mild” as a type of cigarillo). Youth who reported cigarette use on 1 day in the past month were coded as current cigarette smokers (1=yes, 0=no). Youth who reported other tobacco use (excluding cigarettes) on 1 day in the past month were coded as current users of other tobacco products (1=yes, 0=no).

2.1.4 Peer tobacco use—Use of any tobacco product by peers was assessed with items asking how many of their closest friends used each tobacco product (i.e., e-cigarettes, cigarettes, cigars, cigarillos, hookah, blunts, or smokeless tobacco), with response options of “none of them”, “some of them”, “most of them”, or “all of them”. Any response other than “none of them” for each product was coded as peer tobacco use (yes=1, no=0).

2.1.5 Parent tobacco use—Use of any tobacco product by parents/guardians was assessed with items asking if their parents/guardians used each tobacco product (same as above), with response options of “yes” or “no.” Responses of “yes” to any product were coded as parent tobacco use (yes=1, no=0).

2.2 Statistical Analysis

Analyses were run using SPSS (version 26, IBM). First, to assess use of specific e-cigarette devices, chi-square analyses compared rates over time of using specific devices among current e-cigarette users (Figure 1). Next, ANOVA was used to compare the average number of days of use in the past month of specific devices over time. Additionally, chi-square analyses were used to compare rates of frequent users (i.e., use on 20 out of 30 days) (Wang et al., 2019) of each device type over time (Figure 2). Lastly, separate logistic regression models were used to identify characteristics associated with current use of each e-cigarette type. Because trends in e-cigarette devices change rapidly, we focused on predictors in the most recent wave in 2019. P-values were set to $p < .01$ for the models to adjust for multiple comparisons. Predictors included demographic factors (i.e., race, sex, age, SES), age of first trying e-cigarettes, and tobacco use variables (i.e., current use of cigarettes, current use of other tobacco products, peer tobacco use, parent tobacco use) (Barrington-Trimis et al., 2015; Bold et al., 2017; Gentzke et al., 2019; Simon et al., 2018). Multivariable logistic regressions were run with all available (i.e., non-missing) data, and complete data were available for 94.7% ($n=866$) of current users in 2019.

3 Results

3.1 Participants

The analytic sample comprised current e-cigarette users at each wave; 19.7% ($N=579/2945$) reported using e-cigarettes in the past month in 2017, with significantly higher rates reported in 2018 (34.0%, $N=1077/3170$) and 2019 (29.7%, $N=914/3075$), $\chi^2(2, N=9190)=162.38$, $p < .001$. Table 1 displays the sample demographics of the current e-cigarette users by time. Over half of the sample reported using more than one type of e-cigarette in the past month, with a greater proportion using more than one device in 2018 and 2019 compared to 2017, $\chi^2(2, N=2570)=18.21$, $p < .001$. Age of first trying e-cigarettes decreased significantly from

2017–2019, $F(2,2504)=13.11$, $p<.001$, and there were significant differences by time in race/ethnicity and SES (Table 1).

3.2 Rates of using various devices

There were significant changes in the device types used by time among current e-cigarette users (Figure 1). JUUL was the most popular device in each year, and there was a significant increase in rates of JUUL use from 2017 (78.1%) to 2018 (88.8%) that did not change significantly in 2019 (86.1%) $\chi^2(2,N=2570)=35.14$, $p<.001$. There was a significant increase in youth using disposable/cig-a-like devices $\chi^2(2,N=2570)=14.46$, $p<.001$, and vape pens $\chi^2(2,N=2570)=17.36$, $p<.001$, while there was a significant decrease in rates of mod use $\chi^2(2,N=2570)=255.30$, $p<.001$. Data were not collected for other rechargeable pod devices in 2017, but there was a significant decrease in the use of these devices from 2018 to 2019 $\chi^2(1,N=1991)=17.23$, $p<.001$.

3.3 Frequency of use by device type

Youth using disposable/cig-a-like devices reported the highest frequency of use (i.e., number of days of use in the past 30) at each wave, and the average frequency did not differ significantly by time, $F(2,448)=2.33$, $p=.10$ (average across 2017–2019, $M_{2017-2019}=16.2$ days, $SD_{2017-2019}=12.1$). There were significant changes in the average frequency among JUUL and mod users; youth used JUUL devices more frequently in 2018 ($M=13.6$, $SD=11.7$) and 2019 ($M=13.2$, $SD=11.6$) compared to 2017 ($M=11.3$, $SD=10.9$), $F(2,2192)=6.39$, $p=.002$, while mod devices were used less frequently in 2018 ($M=8.4$, $SD=10.0$) and 2019 ($M=8.3$, $SD=9.6$) compared to 2017 ($M=11.0$, $SD=11.1$), $F(2,730)=5.81$, $p=.003$. The average number of days using other devices did not change significantly, $p>.18$ (vape pen: $M_{2017-2019}=10.3$, $SD_{2017-2019}=10.8$; other rechargeable pods: $M_{2018-2019}=10.4$, $SD_{2018-2019}=10.6$).

Figure 2 displays rates of frequent use (i.e., use on most days, 20 out of 30 days) among current users of each device. Frequent use of disposable/cig-a-like devices increased over 50% from 2017 to 2018, $\chi^2(2,N=451)=6.32$, $p=.04$. Additionally, more youth were frequent users of JUUL devices in 2018 and 2019 compared to 2017 $\chi^2(2,N=2195)=10.03$, $p=.007$. The overall chi-square examining frequent use of mod devices by time was significant $\chi^2(2,N=733)=7.40$, $p=.03$, although the pair-wise comparisons were not statistically significant ($p>.05$). There were no significant differences in rates of frequent use over time for other devices (vape pens, other rechargeable pod devices, $p>.06$).

3.4 Predictors of current use of each device type

Logistic regression models were used to identify characteristics associated with current use of each e-cigarette type in the most recent wave. The binary outcomes modeled use of each device type vs. use of other devices. Table 2 presents the univariate associations between each predictor and outcome. Table 3 presents the adjusted odds ratios when all predictors are included simultaneously in the model.

Older age of first trying e-cigarettes was significantly associated with lower odds of current device use across all univariate models ($p<.01$); in other words, youth who first tried e-

cigarettes at a younger age were more likely to be current users. This association remained significant in the multivariable models for disposable/cig-a-likes, vape pens, mods, and other rechargeable pod devices. Specifically, every year increase in age of first trying e-cigarettes was associated with 27% lower odds of currently using disposable/cig-a-like devices, 13% lower odds of currently using vape pens, 18% lower odds of using mods, and 27% lower odds of using other rechargeable pods.

Current use of cigarettes or other tobacco products was significantly associated with use of each device type except for JUUL in univariate models ($p < .01$). In multivariable models, current use of other tobacco products remained significantly associated with disposable/cig-a-likes (106% greater odds), vape pens (97% greater odds), mod devices (147% greater odds), and other rechargeable pod devices (53% greater odds), and current use of cigarettes remained significantly associated with greater odds of using mod devices (159% greater odds).

Other significant demographic predictors included higher SES, which was associated with greater odds of using JUUL and other rechargeable pods, and older age, which was associated with greater odds of using other rechargeable pods. Additionally, other demographic predictors including being Hispanic or Non-Hispanic Black (vs. NH White) and being female (vs. male) were associated with lower odds of using other rechargeable pods.

4 Discussion

The current study provides important new information about e-cigarette use among high school youth in Connecticut over three years from 2017–2019. Consistent with national data (Gentzke et al., 2019), our findings indicate that more youth reported current use of e-cigarettes in 2018 and 2019 compared to 2017. This study adds new information by further examining trends in specific e-cigarette devices over time. Understanding trends in use of specific types of e-cigarettes is critical for informing regulations and interventions to reduce use among youth.

Among the e-cigarette devices assessed, JUUL was the most popular in each wave, and the rate of youth using this device increased significantly over time. In 2019, over 86% of high school youth who were using e-cigarettes reported using JUUL. Additionally, frequency of JUUL use increased over time. Over 35% of youth who were using JUUL reported frequent use (i.e., 20 out of 30 days) in 2019. High rates of JUUL use are particularly concerning given that JUUL pods contain high concentrations of nicotine salt (Barrington-Trimis & Leventhal, 2018; Willett et al., 2018). In fact, evidence from one study indicates that youth using JUUL had higher urine cotinine levels than youth who regularly smoked combustible cigarettes (Goniewicz, Boykan, Messina, Eliscu, & Tolentino, 2018) indicating greater exposure to nicotine and potential for developing nicotine addiction.

Our evidence also indicates significant changes in the use of other types of e-cigarettes during this time; use of disposable/cig-a-like devices and vape pens increased, while use of mod and other rechargeable pod devices decreased. Our finding showing increased use of

disposable e-cigarettes is consistent with recent national reports (Wang et al., 2020), and our results provide new information that frequency of use of these devices also increased over time. Specifically, frequent use of disposable/cig-a-like devices increased from 2017 to 2018, and almost half (46%) were using this device type on 20 or more days in the past month in 2019. It will be important to continue to examine how use of these device types that are disposable or refillable change over time, especially since current regulations restricting e-liquid flavors only pertain to closed pod or cartridge systems, like JUUL, that have prefilled pods that insert into a device (Food and Drug Administration, 2020a). If disposable/cig-a-like and vape pen use continue to increase over time, regulations that only apply to closed pod or cartridge systems may not effectively reduce overall youth e-cigarette use. Additionally, most youth e-cigarette users (over 59%) used more than one device in the past month. Few studies have reported rates of current use of multiple e-cigarette devices among youth, although one study indicated that youth who were using multiple devices were more likely to also use other tobacco products (Krishnan-Sarin et al., 2019). Examining multiple device use among youth is important because this may increase nicotine exposure and risk for dependence (Ali, Gray, Martinez, Curry, & Horn, 2016) and also reduce the effectiveness of tobacco regulations; regulations that apply only to specific device types could lead to increases in use of other device types if youth tend to sample various device types rather than using only one type as seen with our rates of multiple device use.

Notably, our survey assessed disposable and cig-a-like type devices as one category, so we are unable to differentiate these device types. However, it is possible that some of the increases observed in this category are due to new disposable devices (e.g., Eonsmoke ST!K, Puffbars). Many of these disposable devices are designed to look similar to popular reusable pod devices like JUUL; have a small, discreet product design; high concentration nicotine salt; and unlike JUUL, do not currently have flavor restrictions, so are available in a variety of sweet and fruit flavors that appeal to youth (Delnevo, Giovenco, & Hrywna, 2020). Many of these disposable pod-like devices come in multi-packs and are less expensive than pod systems like JUUL, which may enhance the appeal and accessibility of these products. Additional research is needed to understand youth use of these disposable pod devices.

The current study also identified demographic characteristics that may inform targeted interventions. Specifically, the average age of first trying e-cigarettes decreased significantly from 2017–2019, and a younger age of first trying e-cigarettes was associated with current use of disposable/cig-a-likes, vape pens, mods, and other rechargeable pods. Preventing e-cigarette use at a young age is especially important given evidence that youth who try e-cigarettes at a younger age are at greater risk for dependence (Morean et al., 2018). In addition to younger age of first trying e-cigarettes, older current age was also associated with greater odds of using other rechargeable pods, perhaps indicating these devices are appealing to both younger and older adolescents or that these devices are used by those with more vaping history. Building upon other research indicating an association between high SES and e-cigarette use (Krishnan-Sarin et al., 2019; Simon et al., 2018) our findings indicate that high SES is associated with use of JUUL or other rechargeable pod devices. These associations may reflect the price differences of the devices or may be related to other factors such as exposure to advertisements (Simon et al., 2018). Research indicates youth JUUL users frequently endorse disliking the cost of JUUL (Kong et al., 2019), so it is

possible that intervention strategies such as raising prices or restricting advertisements may be important to reduce youth use.

Furthermore, current use of other tobacco products was associated with greater odds of current use of multiple device types including disposable/cig-a-like devices, vape pens, mods, and other rechargeable pods, while current use of cigarettes was also associated with greater odds of current use of mod devices. These findings are consistent with national reports of youth poly-tobacco use (Gentzke et al., 2019) and raise concerns about nicotine exposure and risk for nicotine addiction among youth (Ali et al., 2016; Harrell, Naqvi, Plunk, Ji, & Martins, 2017).

Results should be interpreted in light of study limitations. Data were from four high schools in Connecticut, so findings should be replicated in larger national and state representative samples. Although data were drawn from a local convenience sample, rates of youth reporting past-month e-cigarette use in our sample are comparable to national samples (e.g., (Gentzke et al., 2019)). Furthermore, an advantage of local surveys is the ability to respond rapidly to monitor changes over time, such as use of various e-cigarette device types as they change. Data were cross-sectional and not matched longitudinally, which allows us to examine trends across the entire age range of high school students (grades 9–12) in each year. Additional longitudinal studies are needed to understand how e-cigarette use patterns change within-person. Also, as previously noted, disposable and cig-a-like devices were assessed in the same category, so additional surveillance is needed to further understand use of newer disposable pod systems. Lastly, data were collected prior to the implementation of tobacco regulatory policies such as increasing the federal minimum purchase age from 18 to 21 (Food and Drug Administration, 2020b) and banning specific flavors in prefilled e-cigarette pod devices (Food and Drug Administration, 2020a). Thus, additional research is needed to evaluate the impact of these policies on youth e-cigarette use and the use of specific devices.

4.1 Conclusions

In conclusion, the current study provides important new information about the types of e-cigarette devices used over time among high school youth from 2017–2019. While JUUL was the most popular device used in all three years, other device types such as disposable/cig-a-like devices also increased in popularity and were used frequently. Additionally, we identified demographic predictors associated with use of specific devices that may inform targeted interventions to reduce youth e-cigarette use. Further research is needed to evaluate how trends in youth use of specific e-cigarette device types are influenced by tobacco regulatory policies.

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Highlights

- Youth e-cigarette use has increased yet little is known about trends in use of specific devices.
- School-wide survey data examined trends in e-cigarette devices used by youth over time 2017–2019.
- While JUUL was the most popular, use of other device types also increased over time.
- Past-month use of disposable and refillable devices increased over time.

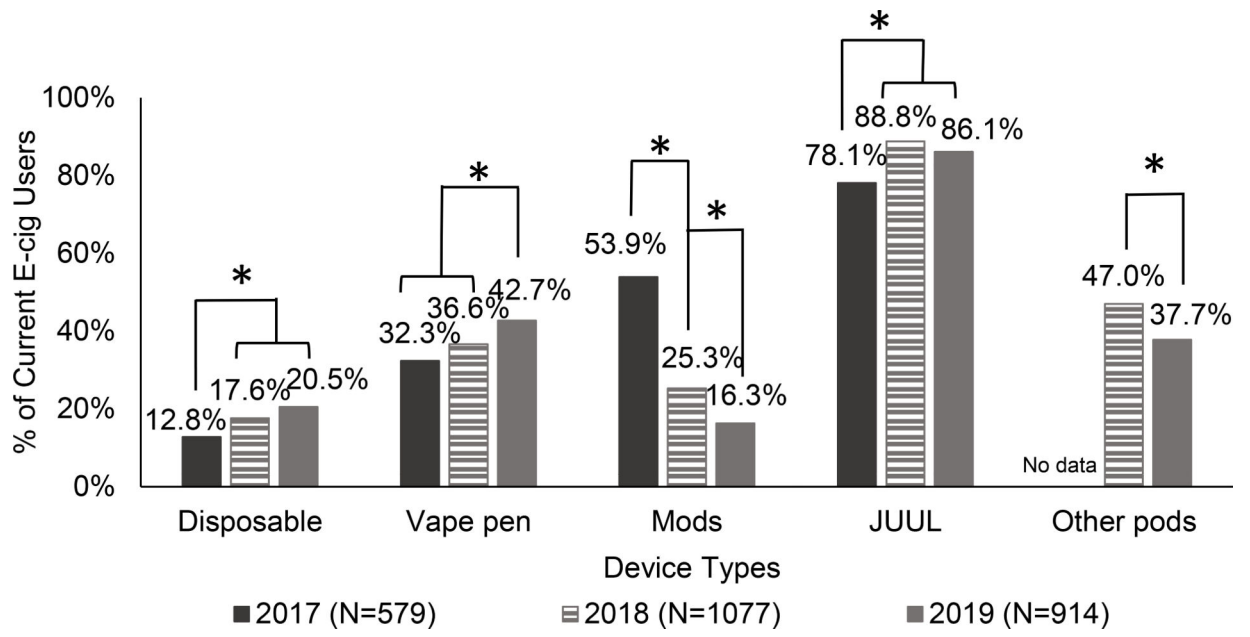


Figure 1. Rates of Past Month Use of Various E-cigarette Device Types Among Current E-cigarette Users 2017–2019.

Note: Values reflect the rates of youth reporting use of each device type by year. * $p < .05$; No data collected on other pod devices in 2017.

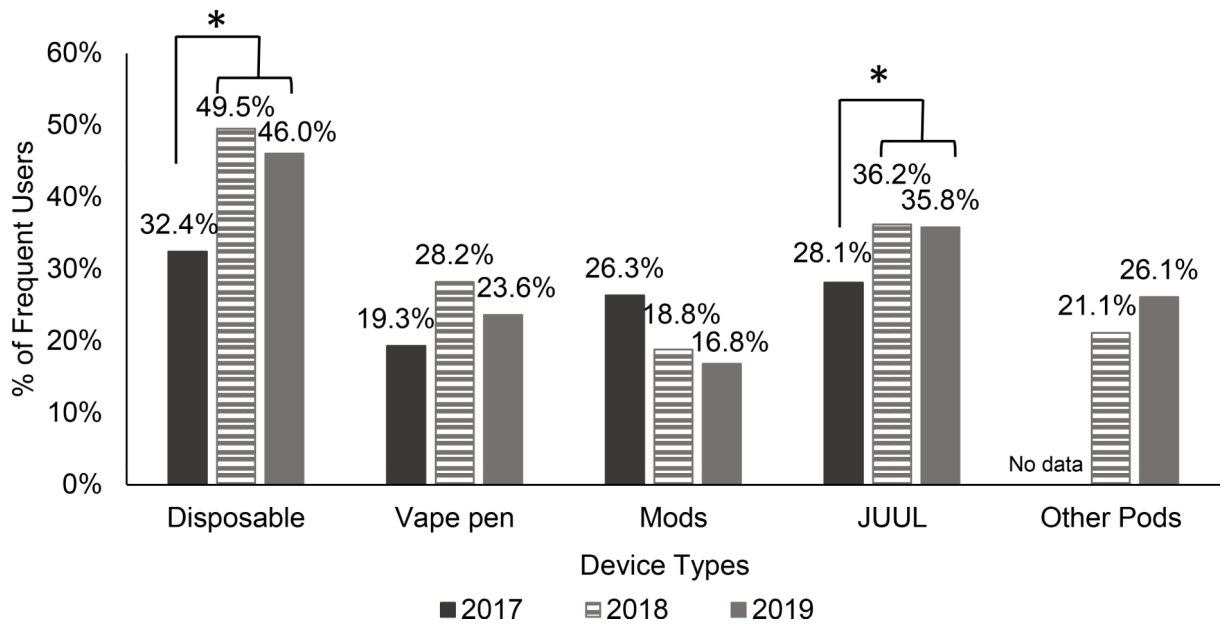


Figure 2. Percent Using 20 of the Past 30 Days Among Current Users of Each Device

Note: Values reflect the rates of youth who were frequent users (i.e., using on 20 of the Past 30 Days) of each device by year. $p < .05$; No data collected on other rechargeable pod devices in 2017.

Table 1.

Sample demographics among current e-cigarette users in 2017–2019

	2017	2018	2019
	N=579	N=1077	N=914
Female (%)	49.8%	52.4%	55.4%
Age (M, SD)	16.3 (1.2)	16.2 (1.2)	16.2 (1.3)
Age first trying e-cigarettes (M, SD)	14.6 (1.7) ^a	14.3 (1.8) ^b	14.1 (1.8) ^c
Non-Hispanic White (%)	71.3% ^a	63.1% ^b	60.2% ^b
SES (M, SD range 1–9)	6.8 (1.7) ^a	6.6 (1.7) ^b	6.6 (1.8) ^b
Total e-cig devices used in past month (M, SD)	1.8 (0.9) ^a	2.2 (1.2) ^b	2.0 (1.1) ^c
Current use of more than one e-cig device (%)	53.0% ^a	63.8% ^b	59.6% ^b

Note:

^{a,b,c} Columns with different superscripts indicate column proportions that differ significantly from one another, $p < .05$.

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Table 2.

Univariate associations between predictors and current use of each device in 2019

	Disposable and Cig-a-like OR (95% CI)	Vape Pen OR (95% CI)	Mod OR (95% CI)	Juul OR (95% CI)	Other pod OR (95% CI)
Hispanic (ref: NH White)	1.14 (0.79–1.64)	1.31 (0.97–1.78)	1.67 (1.14–2.45)*	0.58 (0.39–0.86)*	0.56 (0.40–0.78)*
NH Black (ref: NH White)	0.85 (0.45–1.58)	1.15 (0.71–1.86)	0.92 (0.47–1.79)	0.64 (0.35–1.19)	0.49 (0.28–0.85)
NH Other (ref: NH White)	1.41 (0.80–2.48)	0.85 (0.52–1.41)	1.09 (0.57–2.08)	1.76 (0.74–4.15)	1.14 (0.69–1.88)
Female (ref: Male)	0.75 (0.54–1.04)	0.87 (0.67–1.14)	0.61 (0.43–0.86)*	1.64 (1.12–2.39)*	0.68 (0.52–0.90)*
Age	1.08 (0.95–1.22)	0.93 (0.84–1.04)	1.03 (0.89–1.18)	0.78 (0.67–0.91)*	1.07 (0.96–1.19)
Age first trying e-cigarettes	0.70 (0.64–0.77)*	0.83 (0.77–0.89)*	0.74 (0.68–0.82)*	0.82 (0.72–0.92)*	0.77 (0.71–0.84)*
SES ^a	0.99 (0.90–1.08)	0.96 (0.89–1.03)	0.90 (0.81–0.99)	1.25 (1.12–1.38)*	1.12 (1.04–1.22)*
Current use of cigarettes	3.98 (2.43–6.50)*	2.61 (1.59–4.30)*	3.99 (2.41–6.64)*	1.55 (0.70–3.47)	2.57 (1.58–4.18)*
	Current use of other tobacco				
products ^b	2.73 (1.96–3.79)*	2.47 (1.88–3.23)*	3.79 (2.61–5.51)*	0.96 (0.66–1.41)	1.84 (1.40–2.42)*
Peer Tobacco Use	0.66 (0.42–1.05)	0.78 (0.52–1.16)	0.78 (0.47–1.31)	1.95 (1.18–3.21)*	1.19 (0.78–1.81)
Parent Tobacco Use	0.88 (0.62–1.23)	1.33 (1.01–1.75)	1.38 (0.96–1.98)	1.29 (0.86–1.93)	1.38 (1.05–1.82)

Note: OR=Odds ratio. 95% CI=95% Confidence Interval. Boldface indicates p<.05

* p<.01 to adjust for multiple comparisons.

^aSocioeconomic status (SES) defined by the Family Affluence Scale (FAS, Boyce et al., 2006).

^bCurrent use of other tobacco products (cigars, cigarillos, hookah, blunts, or smokeless tobacco).

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Table 3.

Multivariable logistic regression results predicting current use of each device in 2019

	Disposable and Cig-a-like AOR (95% CI)	Vape Pen AOR (95% CI)	Mod AOR (95% CI)	Juul AOR (95% CI)	Other pod AOR (95% CI)
Hispanic (ref: NH White)	0.84 (0.53–1.31)	1.10 (0.78–1.57)	1.29 (0.81–2.05)	0.70 (0.43–1.12)	0.44 (0.30–0.66)*
NH Black (ref: NH White)	0.85 (0.42–1.72)	1.24 (0.73–2.11)	0.95 (0.45–2.00)	0.80 (0.40–1.60)	0.39 (0.21–0.74)*
NH Other (ref: NH White)	1.58 (0.82–3.04)	0.85 (0.48–1.51)	0.95 (0.42–2.15)	1.71 (0.64–4.56)	0.92 (0.51–1.64)
Female (ref: Male)	0.96 (0.67–1.38)	1.02 (0.77–1.36)	0.71 (0.48–1.05)	1.43 (0.96–2.14)	0.67 (0.49–0.90)*
Age	1.12 (0.96–1.31)	0.92 (0.81–1.04)	1.00 (0.84–1.18)	0.89 (0.73–1.07)	1.29 (1.12–1.47)*
Age first trying e-cigarettes	0.73 (0.65–0.81)*	0.87 (0.80–0.96)*	0.82 (0.73–0.91)*	0.86 (0.76–0.99)	0.73 (0.67–0.81)*
SES ^a	1.00 (0.90–1.12)	0.99 (0.91–1.08)	0.96 (0.85–1.08)	1.22 (1.08–1.38)*	1.16 (1.05–1.27)*
Current use of cigarettes	2.02 (1.14–3.56)	2.03 (1.17–3.53)	2.59 (1.43–4.67)*	1.35 (0.57–3.20)	1.44 (0.83–2.51)
Current use of other tobacco products ^b	2.06 (1.41–3.01)*	1.97 (1.46–2.66)*	2.47 (1.62–3.76)*	0.96 (0.62–1.48)	1.53 (1.12–2.11)*
Peer Tobacco Use	0.92 (0.52–1.64)	0.83 (0.53–1.31)	0.71 (0.39–1.30)	1.46 (0.83–2.58)	1.20 (0.72–2.00)
Parent Tobacco Use	0.76 (0.52–1.11)	1.21 (0.90–1.62)	1.28 (0.85–1.93)	1.30 (0.84–2.01)	1.44 (1.06–1.96)

Note: AOR=Adjusted odds ratio. 95% CI=95% Confidence Interval. Estimates are adjusted for all covariates in the model. Boldface indicates p<.05

* p<.01 to adjust for multiple comparisons.

^aSocioeconomic status (SES) define by the Family Affluence Scale (FAS, Boyce et al., 2006).

^bCurrent use of other tobacco products (cigars, cigarillos, hookah, blunts, or smokeless tobacco).

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