

Adolescent Use of Different E-cigarette Products

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Table of Contents Summary

Most adolescents use open system e-cigarettes, especially frequent users. This pattern of use suggests a starter product phenomenon with graduation to potentially more dangerous products.

What's Known on This Subject

Tobacco companies tend to market closed-system products, whereas the vaping industry typically markets open-system products. The open-system devices tend to be more popular than those that are closed-system among adult current and former cigarette smokers.

What This Study Adds

Little is known about product preferences of adolescents. This study demonstrates that adolescent users prefer open-systems, especially more frequent users. This pattern of use suggests a starter product phenomenon with graduation to potentially more dangerous products with weaker quality controls.

Contributors' Statement Page

Dr. McMillen conceptualized and designed the study, conducted the initial analyses, and drafted the initial manuscript;

Drs. Wilson, Tanski, Klein, and Winickoff conceptualized and designed the study and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Abstract

Background: Little is known about the characteristics of e-cigarettes used by adolescents. Understanding the product landscape of adolescent e-cigarette use may inform counseling and policy strategies.

Methods: Results are from 13,651 adolescents in Wave 1 and 12,172 adolescents in Wave 2 of the Population Assessment of Tobacco and Health Study, a nationally representative, longitudinal study. Past 30-day regular e-cigarettes users were asked about the characteristics of the e-cigarette they use most of the time.

Results: In Waves 1 and 2, 2.1% and 2.8% were past 30-day regular users, respectively. These adolescents more often used rechargeable rather than disposable devices (Wave 1: 76.0%, Wave 2: 82.9%) and refillable rather than non-refillable devices (66.6%, 84.4%), and tended not to use cartridge systems (33.7%, 30.5%). Most adolescent past 30-day users (87.5% and 89.4%) reported using flavored e-cigarettes. Increased frequency of use was associated with use of rechargeable (AOR=2.7, AOR=2.7) and refillable e-cigarettes (AOR=2.0, AOR=2.7), ($p<.05$). Most users in Wave 1 did not continue regular use in Wave 2 (70.2%). Among those who continued to use and reported using closed systems (non-rechargeable and/or non-refillable) in Wave 1, most had progressed to open systems (rechargeable and refillable) in Wave 2.

Conclusions: Most adolescents use open system e-cigarettes, and frequent users are even more likely to use open system e-cigarettes. The majority of regular users use rechargeable devices that are refillable. Change in product preferences across waves suggests a starter product phenomenon with graduation to products which have weaker quality control and may increase health risks.

1 There are two main types of electronic cigarettes, open systems that are refillable with
2 nicotine solutions and closed systems that are disposable or use disposable cartridges.¹ E-
3 cigarettes that are not rechargeable are considered to be disposable close-systems; those that are
4 rechargeable, but not refillable are considered to be reusable closed systems; and those that are
5 refillable are considered to be open systems. Established tobacco companies and the newer
6 electronic cigarette industry companies currently utilize different systems to attract e-cigarette
7 users (see Figure 1). U.S. tobacco companies' products are not typically designed to be refillable
8 with non-proprietary e-liquid. Most of the MarkTen (Altria) and the Vuse products (Reynolds)
9 use closed systems with proprietary cartridge-based technology. On the other hand, vape shops
10 typically market rechargeable products, manufactured by smaller companies, that can be refilled
11 with any e-liquid.² The rechargeable systems with small reservoirs for nicotine solutions tend to
12 be non-modifiable, whereas many of the these open systems with larger tank reservoirs can be
13 modified to control voltage and wattage to increase flavor and aerosol production, airflow over
14 heating coils to manipulate the density of the aerosol, and other characteristics to customize the
15 nicotine and aerosol experience. Properties of both these closed and open system products
16 present unique risks to public health, as described below.

17 The U.S. tobacco companies have an established history of manipulating cigarettes to be
18 more addictive and designing marketing campaigns to attract youth.³ These companies also have
19 the resources and experience to produce reliable consumer products with accurate ingredient and
20 nicotine content labels. Although the open system e-cigarette industry may not have an
21 established record of targeting youth, they have struggled with consumer product safety issues in
22 a market that currently places no regulatory oversight over these products or e-liquids. Among

the concerns are inaccurate nicotine concentration labels,^{4,5} e-liquids containing diacetyl labeled as Diacetyl-free,⁶ and exploding lithium batteries.^{7,8}

Most investigations of whether users prefer one type of system over the other have focused on adult current and former cigarette smokers. The open system devices tend to be more popular than those that are closed system among this population. Surveys administered to convenience samples of adults recruited from vape shops⁹ and e-cigarette websites¹⁰ found that users overwhelmingly preferred open systems with tank reservoirs.¹⁰ Moreover, preference for these products is associated with more frequent¹ and established use.¹¹ Current and former smokers' preference for open systems with tank reservoirs in these studies may be attributed to these products' improved ability to deliver nicotine to the bloodstream over first generational closed systems.^{12,13} However, the closed system devices of the tobacco industry are much improved over their first generational counterparts in terms of nicotine delivery.¹⁴

Little is known about product preferences of adolescents, particularly more frequent users who account for more of youth consumption. Understanding the landscape of teen e-cigarette use may lead to targeted counseling strategies that will highlight the risks of these different systems. This paper uses data from Waves 1 and 2 of the Population Assessment of Tobacco and Health (PATH) Study to examine characteristics of the e-cigarettes used by adolescents and to examine the relationship between frequency of e-cigarette use and e-cigarette characteristics.

METHODS

Results are from 13,651 adolescents (aged 12-17 years) in Wave 1 (9/13-12/14) and 12,172 adolescents in Wave 2 (10/14-10/15) of the PATH Study, a nationally representative, longitudinal study. Among youth within participating households (weighted household screener

rate, 54%), 78.4% participated in an audio computer-assisted interview during Wave 1.^{15,16} The retention rate for Wave 2 was 88.4%, n=10,081. To supplement Wave 2, additional participants were added with 82.1% of those contacted agreeing to participate, n=2,091.

E-cigarette questions

All respondents in Wave 1 were asked, “Have you ever seen or heard of an electronic cigarette or e-cigarette before this study?” Those who replied yes (n=12,177, 89.5%) were asked, “Have you ever used an e-cigarette, such as NJOY, Blu, or Smoking Everywhere, even one or two times?” Those who replied yes (n=1,451, 11.9%) were asked, “In the past 30 days, on how many days did you use an e-cigarette?” Adolescents who reported use within the past 30 days were classified as past 30-day users (n=418, 3.1%), and asked, “How many disposable e-cigarettes or e-cigarette cartridges have you used in your entire life?” Among past 30-day users, the PATH protocol classified those respondents who reported having used 1 or more e-cigarettes in lifetime and last used an e-cigarette within the past 30 days as past 30-day “not-light” users.^{17,18} This paper refers to these adolescents as past 30-day regular users. Only past 30-day regular users (n=281, 2.1%) were asked, “Please think about the e-cigarette you use most of the time. Is your e-cigarette rechargeable?” Those who reported yes (n=215) were asked, “Does your e-cigarettes use cartridges?” All regular past 30-day users were asked, “Can you refill your [e-cigarette | e-cigarette cartridges] with e-liquid?”. All past 30-day users were also asked, “In the past 30 days, were any of the e-cigarettes / cartridges you used flavored to taste like menthol, mint, clove, spice, candy, fruit, chocolate, alcohol (such as wine or cognac), or other sweets?”

New respondents in Wave 2 were asked, “Have you ever seen or heard of electronic nicotine products before this study? (Electronic nicotine products include e-cigarettes, e-cigars, e-pipes, e-hookahs, personal vaporizers, vape pens and hookah pens.).” Those who replied yes or

were returning respondents (n=11,724) were asked, “Which of the following electronic nicotine products have you tried? e-cigarette (including vape pens and personal vaporizers), e-cigar, e-pipe, e-hookah (including hookah pens), or something else. Past 30-day regular users (n=330) were asked, “Please think about the e-cigarette you use most of the time. Is your e-cigarette rechargeable?” Those who reported yes (n=273) were asked, “Does your e-cigarettes use cartridges?”. All regular past 30-day users were asked, “Can you refill you [e-cigarette | e-cigarette cartridges] with e-liquid?”. Wave 2 included additional e-cigarette characteristics questions. Those who reported that their e-cigarette was rechargeable (n=277) were asked, “Can you change the voltage on your e-cigarette?”. Those who reported that their e-cigarette did not use cartridges were asked, “Does your e-cigarette use a tank system?” All past 30-day regular users (n=331) were asked, “Have you modified your e-cigarette at all?” and “In the past 30 days, how did you usually get your own [e-cigarette | e-liquid]?”. Those who reported that they “bought them myself” or “gave someone else money to buy them for me” (n=86) were asked “Where do [you/they] buy your [e-cigarette | e-liquid] most of the time?”. Response options were: a mall kiosk; a convenience store or gas station; a supermarket, grocery store, or drug store; a warehouse club, such as Sam’s or Costco; a smoke shop, tobacco specialty store or tobacco outlet store; a duty-free shop or military commissary; a bar, pub, restaurant or casino; a friend or relative; a swap meet or flea market; somewhere else; or at a vape shop or vapor lounge.

Demographic variables

Demographic variables used in multivariable analyses includes gender, race, age, and cigarette smoking status. Never smokers had never smoked a cigarette, ever smokers had smoked

at least one cigarette but had not done so in the past 30 days, and current smokers had smoked a cigarette in the past 30 days.¹⁷

Institutional Review Board approval

The PATH Study received approval from the Westat Institutional Review Board. The PATH Study also obtained a Certificate of Confidentiality from the National Institutes of Health. Amendment 2 of CC-DA-12-131, dated September 23, 2016, extends its expiration date from September 30, 2017 to August 31, 2022.¹⁸

Analyses

We used SPSS Complex SamplesTM to calculate all variance estimations, adjusting for the 92 strata and 156 Primary Sampling Units in sample design and applying the weights provided with the public use data set. We examined association of frequency of use with product preferences. Frequency of use was measured as a continuous variable, and then treated as both continuous and binary measures. The continuous measure preserves information and statistical power, whereas the binary measure leads to easier interpretation of results. Based on the distribution of the continuous variable, the binary variable levels were less frequent users (less than 10 of the past 30 days) and frequent users (10 or more of the past 30 days). Sample characteristics and comparison of e-cigarette characteristics of less frequent users and frequent users were calculated using CSTABULATE to conduct chi-squared tests of independence. Multivariable analyses included cigarette smoking status, age, sex, and race as covariates. These covariates were selected due to their association with e-cigarette use in previous research.¹⁹ To examine the association of frequency of use as a continuous variable with product preferences, logistic regression of e-cigarette characteristics on frequency of use were calculated using

CSLOGISTIC to estimate logistic regression equations using the previous covariates. Comparisons of retail source by e-cigarette characteristics in Wave 2 were calculated using CSTABULATE to conduct chi-squared tests of independence. Although past 30-day regular users were asked about retail source in Wave 1, the response options did not include vape shops or vapor lounges. Wave 2 data indicate that these are an important retail source, and that the Wave 1 data on this item may have decreased validity due to the omission of vape shops or vapor lounges.

RESULTS

Sample characteristics are presented in Table 1. In both waves, past 30-day regular e-cigarette users were more likely than non-regular users to be cigarette smokers, older adolescents, males, and non-Hispanic, white ($p < .01$).

Overall e-cigarettes characteristics

Overall, 3.1% and 3.6% of adolescents reported past 30-day e-cigarette use in Wave 1 and Wave 2, respectively, and 2.1% and 2.8% were past 30-day regular users. Most past 30-day regular users used rechargeable (76.0% and 82.9%) rather than disposable devices (24.0% and 17.1%) and refillable devices (66.5% and 84.4%) rather than non-refillable devices (33.5% and 15.6%), and only a third of past 30-day regular users used cartridge systems (33.7% and 30.5%). Most adolescent past 30-day users (87.5% and 89.4%) reported using a flavored e-cigarette in the past 30 days. One in ten adolescents usually bought their e-cigarettes themselves (10.7% and 11.6%), whereas most obtained them from social sources (78.8% and 77.4%). The remainder either stole them or got them some other way. For questions added to the survey in Wave 2,

almost a half of past 30-day regular users (46.2%) used tank systems. A minority of adolescents reported that the voltage in their e-cigarette could be modified (37.0%) or had been modified (24.9%).

Frequency of e-cigarette use and product characteristics, flavors, and retail locations

Bivariate and multivariable comparisons found that frequent users were more likely than less frequent users to use open system rechargeable, refillable, tank systems, voltage modifiable e-cigarettes, and modified e-cigarettes. Frequent and less frequent users were equally unlikely to use cartridge-based systems (in Wave 1) and equally as likely to report using a flavored e-cigarette in the past 30 days (see Table 2). As reflected in the percentages reported for individual characteristics, unadjusted odds ratios for the association between e-cigarette characteristics and use more than 10 days a month were in the same direction (data not shown) as the adjusted ratios. Logistic regression analyses treating frequency of use as a continuous variable and including adjustments for covariates produced similar results and are not presented in this paper.

Past 30-day regular users who reported buying their own e-cigarettes or giving someone else money to buy them were asked about the retail source of their e-cigarettes (n=101).

Adolescents who used e-cigarettes with open features tended to buy their e-products at vape shops, whereas those who used e-cigarettes with closed features tended to buy them at retail stores (see Table 3). However, the sample size for adolescents who used e-cigarettes with closed features was small and only the comparison for having modifiable voltage was statistically significant.

Longitudinal patterns

Most regular e-cigarette users in Wave 1 did not continue regular use in Wave 2. Among those who reported regular use in Wave 1, 11.3% were exclusively using e-cigarettes, 20.4% were dual using e-cigarettes and cigarettes, 23.1% were exclusively smoking cigarettes, and 45.1% were not using e-cigarettes or cigarettes at Wave 2. Product preferences at baseline were not statistically associated with e-cigarette and cigarette use at follow-up.

Among those who continued regular use and reported using closed systems in Wave 1, most of those who reported continued e-cigarette use had switched to open systems in Wave 2. Very few adolescents reported using closed systems at Wave 2 after using open systems at Wave 1 (see Table 4).

DISCUSSION

Similar to adults,¹ most adolescent e-cigarette users in this representative sample use open system, refillable devices, and this finding was stronger among more frequent users. Approximately nine out of 10 adolescent users reported using flavored e-cigarettes, and frequent and infrequent users were equally as likely to do so. Among the third of adolescents who continued using e-cigarettes at follow-up, almost all had either transitioned to or continued to use open systems. These results suggest that the vaping industry products are more appealing to youth than the closed system products of the tobacco companies. This preference for refillable devices may be of concern due to quality control and labeling inaccuracy, including nicotine presence in e-liquids labelled 0 nicotine, leading to unintended nicotine exposure.^{4,5} Most of the labelling discrepancies detected in “zero-nicotine” products involved trace amounts of nicotine, however in one study, two out of five solutions tested had nicotine levels higher than 10 mg per mL.⁴ These discrepancies could lead to unintended nicotine exposures and potential addiction to

1 tobacco products. The U.S. Surgeon General report found that 99% of e-cigarette products on the
2 US market contain nicotine.²⁰

3 Speculation that open systems deliver higher levels of nicotine could explain their
4 popularity as a cessation strategy for adult smokers.¹ However, these same delivery properties
5 that satisfy the nicotine needs of adult smokers might also increase adolescents' risk for nicotine
6 addiction. Use of e-cigarettes with higher nicotine concentrations have been found to predict
7 increased subsequent frequency and intensity of use among high school students.²¹

8 Our results also highlight the need for policies restricting adolescents' access to e-
9 cigarettes. We found that a significant number of adolescents are getting products from peers or
10 that older friends were buying for them, suggesting that social sources are a popular means for
11 underage adolescents to obtain e-cigarettes. Additionally, adolescents who bought open system
12 products themselves tended to be more likely to do so at vape shops than those who bought
13 closed system products. Having fewer retail outlets with tighter enforcement of existing
14 regulations would help limit teen access to these products. These data also support moves to
15 include e-products in Tobacco 21 sales regulation. Adults who purchase cigarettes for
16 distribution to minors are frequently under 21 years of age.²² High school students are less likely
17 to have 21-year-olds than 18-year-olds in their social circles, suggesting reduced opportunities to
18 access tobacco from older buyers.²³ Raising the age of sale for tobacco can break this distribution
19 cycle by reducing minors' ability to buy e-cigarettes from other high school students.²⁴

20 Understanding the landscape of teen e-cigarette use may improve prevention and
21 cessation efforts. Screening may miss teen e-cigarette use if teens do not consider their nicotine
22 aerosol products of choice to be e-cigarettes. In addition to reducing adolescents' access to e-
23 cigarettes, targeted counseling strategies could highlight the risks of these different systems. The

finding that teens are more attracted to open-system and flavored products suggests counseling and policies should address these features.

Limitations

There are some limitations to this study. First, the PATH dataset is limited in that respondents were not asked about whether the solution they used contained nicotine, or about the concentration of nicotine in their preferred products. Second, the number of youth who reported past 30-day regular e-cigarette use was a small percentage of the overall sample. Some analyses, particularly those examining retail locations of e-cigarette purchase, were under-powered. Third, the classification of open versus closed system e-cigarettes is complicated by the dual nature of cartridges. Some cartridge-based e-cigarettes are open systems in which the cartridge can be refilled, others are based on proprietary cartridges that are not intended to be refilled. Finally, the most recent publicly available data is from more than two years ago. The dynamic e-cigarette market could have changed over this time. To illustrate, recent media suggest that the closed, cartridge-based JUUL systems appear to be gaining popularity among youth and young adults.²⁵⁻
²⁹ The JUUL device is small and allows for discreet use; resembles a flash drive; is available in several flavors, including cool mint, crème brulee, fruit medley, mango, and menthol; and “accommodates nicotine levels akin to a cigarette’s” according to the manufacturer.³⁰

Conclusion

Understanding the choices that lead to adolescent nicotine addiction through e-cigarette use has implications for more effective prevention and enforcement of the Family Smoking and Protection Act’s mandate to prevent youth initiation of tobacco use. Most adolescents use open

1 system e-cigarettes, and frequent users are even more likely to use these products. Furthermore,
2 we found evidence of adolescents transitioning from closed to open system e-cigarettes that can
3 be modified to deliver higher levels of nicotine. Change in product preferences across waves
4 suggests a starter product phenomenon with graduation to potentially more dangerous products
5 with weaker quality controls. The lack of quality control regulation should be of urgent concern
6 and should be acted on immediately without waiting for premarket reviews. Products that are
7 potentially mislabeled or contaminated with nicotine should be treated as defective and
8 dangerous to youth and removed from stores. These data support efforts to restrict adolescent
9 access to nicotine containing products and to regulate the use of flavor additives in the e-
10 cigarettes used by youth.

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1 Table 1. Sample Characteristics

	Wave 1		Wave 2	
	Overall Sample (N=13,651)	Past 30-day Regular E- Cigarette Users (N=281)	Overall Sample (N=12,172)	Past 30-day Regular E- Cigarette Users (N=332)
Age				
12-14 years old	6,997 (50.4%)	46 (15.3%)	6,266 (50.7%)	67 (19.2%)
15-17 years old	6,653 (49.6%)	235 (84.7%)	5,906 (49.3%)	263 (80.8%)
Sex				
Male	6,993 (51.3%)	182 (65.4%)	6,225 (51.3%)	201 (60.0%)
Female	6,657 (48.7%)	99 (34.6%)	5,918 (48.7%)	129 (40.0%)
Race or ethnic group				
Non-Hispanic white	9,471 (70.7%)	219 (80.3%)	7,832 (69.7%)	254 (82.9%)
Non-Hispanic black	2,086 (15.2%)	19 (6.6%)	1,826 (15.7%)	13 (4.6%)
Other	2,093 (14.1%)	43 (13.1%)	1,823 (14.6%)	50 (12.5%)
Cigarette Smoker				
Current Smoker	634 (4.6%)	148 (49.4%)	481 (4.0%)	149 (44.1%)
Ever Smoker	1,86 (8.7%)	78 (30.7%)	938 (7.7%)	84 (25.7%)
Nonsmoker	11,792 (86.7%)	54 (19.8%)	10,720 (88.4%)	95 (30.2%)

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Table 2. Association of frequency of use and characteristics of e-cigarette used most of the time, Chi-Square Test for Independence and Logistic Regression Analyses

		Wave 1		Wave 2	
E-cigarette characteristic		Use less than 10 days	Use at least 10 days a month	Use less than 10 days	Use at least 10 days a month
E-cigarette used most of the time is rechargeable	X ² Test	71.8% (n=208)	87.3%, p=.006 (n=70)	77.5% (n=203)	90.9%, p=.006 (n=123)
	LR	REF	AOR 2.7 (1.4-5.3)	REF	AOR 2.7 (1.5-5.1)
E-cigarette used most of the time uses cartridges	X ² Test	35.5% (n=200)	28.5%, ns (n=70)	34.4% (n=203)	23.0%, p=.049 (n=121)
	LR	REF	AOR 0.7 (0.4-1.3)	REF	AOR 0.6 (0.4-1.1)
E-cigarette used most of the time can be refilled	X ² Test	61.6% (n=206)	79.6%, p=.005 (n=70)	79.7% (n=206)	91.4%, p=.012 (n=123)
	LR	REF	AOR 2.0 (1.2-3.5)	REF	AOR 2.7 (1.6-4.6)
E-cigarette used most of the time is a tank system	X ² Test	n/a	n/a	38.8% (n=205)	58.3%, p=.001 (n=123)
	LR			REF	AOR 1.9 (1.2-3.0)
E-cigarette used most of the time has modifiable voltage	X ² Test	n/a	n/a	29.1% (n=205)	50.1%, p=.001 (n=123)
	LR			REF	AOR 2.5 (1.6-3.9)
E-cigarette used most of the time has been modified at all	X ² Test	n/a	n/a	17.5% (n=204)	36.7%, p<.001 (n=123)
	LR			REF	AOR 2.8 (1.7-4.6)
Used a flavored e-cigarette in the past 30 days	X ² Test	84.6% (n=330)	88.2%, ns (n=83)	88.3% (n=245)	87.8%, ns (n=122)
	LR	REF	AOR 0.8 (0.4-1.5)	REF	AOR 1.1 (0.6-2.1)

AOR, adjusted for smoking status, age, sex, and race

Table 3. Retail location used most of the time to purchase e-cigarette products, Wave 2, Chi-Square Test for Independence

	Brick and mortar retail	A smoke shop, tobacco specialty store, or tobacco outlet shop	Vape shop
Disposable	60.8% (n=8)	14.5% (n=2)	24.7% (n=3)
Rechargeable	35.9% (n=30)	15.6% (n=13)	48.5% (n=44)
Uses cartridge	56.4% (n=14)	14.9% (n=11)	28.6% (n=9)
Does not	31.6% (n=24)	15.7% (n=4)	52.7% (n=38)
Refillable	35.1% (n=31)	16.5% (n=14)	48.4% (n=44)
Not refillable	67.8% (n=7)	6.7% (n=1)	25.5% (n=3)
Uses a tank system	27.9% (n=15)	18.1% (n=9)	54.0% (n=28)
Does not	50.9% (n=23)	12.4% (n=6)	36.7% (n=19)
Voltage can be modified*	25.4% (n=12)	19.1% (n=8)	55.6% (n=26)
Cannot be modified	50.9% (n=26)	12.1% (n=7)	37.0% (n=21)
E-cig has been modified	32.4% (n=11)	19.3% (n=7)	48.3% (n=16)
Has not been modified	42.0% (n=27)	13.3% (n=8)	44.6% (n=31)
Used a flavored e-cigarette	36.5% (n=33)	17.7% (n=15)	45.8% (n=41)
Did not in past 30 days	60.7% (n=4)	0% (n=0)	39.3% (n=4)

p < .05

Table 4. Longitudinal Patterns of Use of E-Cigarette Products, Chi-Square Test for Independence

Characteristic of E-Cigarette Used at Wave 1	Wave 2 - No longer a past 30-day regular user	Wave 2 - Closed	Wave 2 - Open
Disposable (n=49)	68.6%	Wave 2 - Disposable 2.0%	Wave 2 - Rechargeable 29.4%
Rechargeable (n=111)	68.4%	4.5%	27.2%
Uses cartridge (n=50)	75.7%	Wave 2 – Cartridge 0.0%	Wave 2 – No cartridge 24.3%
Does not (n=103)	64.0%	2.4%	33.5%
Refillable (n=61)	72.6%	Wave 2 – Not refillable 1.4%	Wave 2 – Refillable 26.0%
Not refillable (n=97)	61.4%	4.7%	33.9%

* No tests were statistically significant

1 Figure 1. Categories of e-cigarettes
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Closed system: Disposable e-cigarette



Closed system: Rechargeable, cartridge-based e-cigarette



Open system: Rechargeable, refillable e-cigarette



Open system: Rechargeable, refillable, and tank system