

The Potential that Electronic Nicotine Delivery Systems (ENDS) can be a Disruptive Technology: Results from a National Survey

Tobacco Center of Regulatory Science

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Introduction

- Electronic Nicotine Delivery Systems (ENDS) use has increased dramatically in recent years among U.S. adults
- There is concern among the public health community as to whether ENDS will be a gateway to cigarettes, especially among youth and vulnerable populations and that “dual use” of ENDS and cigarettes may be delaying smokers from completely quitting.
- Whereas others believe that ENDS might become a disruptive technology that would compete with combusted tobacco products as a satisfying and efficient nicotine delivery system without the harm of cigarettes.
- National surveys to monitor the potential that ENDS could become a disruptive technology that would replace combusted tobacco products, or will be a potential population harm, are being conducted.

Study Aims

To evaluate the acceptance of ENDS and perceptions of benefits and risks of using ENDS among current and former cigarette smokers

Method

- Data source: 2014 Tobacco Products and Risk Perceptions Survey conducted by the Georgia State University (GSU) Tobacco Center of Regulatory Science (TCORS)
- Online survey of traditional and novel tobacco products awareness, usage, and perceptions of benefits and risk, using a nationally representative sample

Inclusion & Exclusion Criteria

Adults residing in the U. S., age ≥ 18 years

- Current or former smokers
- Ever users of ENDS
- Excluded: if they were former smokers and had used any other combustible tobacco products in past 30 days (viz., little cigars or cigarillos, hookahs, or large cigars)

Definitions

E-Cig Rejecters: Current cigarette smokers + ever used ENDS

E-Cig Dual Users: Current cigarette smokers + current users of ENDS

Quit All Products: Former smokers + ever used ENDS (no longer using ENDS)

Switchers: Former smokers + Current ENDS users

Analytic Plan

- SAS survey procedures to account for complex sampling design of GSU-TCORS survey
- Weighted proportions and means, Rao-Scott chi-square tests

Results

Of 5,717 adult current, former and never smokers, 731 were current and former smokers and had used ENDS

Table 1. Respondent Characteristics among Current and Former Smokers using ENDS

Characteristics	Total (N=731)	E-Cig Rejecters (n=337)	E-Cig Dual Users (n=248)	Quit All Products (n=103)	Switchers (n=43)
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Sex					
Male	50.7 (46.6-55.0)	50.3 (44.2 - 56.4)	51.28 (44.0 - 58.6)	49.0 (38.8 - 59.2)	55.6 (39.4 - 71.8)
Female	49.3 (45.1-53.4)	49.7 (43.6 - 55.8)	48.7 (41.4 - 56.0)	50.9 (40.8 - 61.2)	44.4 (28.1 - 60.6)
Age (years)					
18-34	33.0 (29.0-37.1)	29.0 (23.2 - 34.8)	36.90 (29.5 - 44.3)	36.1 (26.2 - 46.01)	32.0 (15.7 - 48.2)
35-54	39.9 (35.9-44.0)	43.2 (37.1 - 49.2)	37.3 (30.2 - 44.3)	37.8 (27.8 - 47.8)	38.4 (22.8 - 53.9)
>55	27.0 (23.6-30.5)	27.8 (22.6 - 33.0)	25.8 (20.1 - 31.6)	26.1 (17.6 - 34.6)	29.7 (15.2 - 44.2)
Race/ Ethnicity					
White, NH	72.3 (68.3-76.3)	74.2 (68.5 - 79.9)	67.0 (59.6 - 74.3)	76.2 (66.7 - 85.7)	73.1 (56.7 - 89.5)
Others	27.7 (23.6-31.7)	25.8 (20.1 - 31.5)	33.0 (25.7 - 40.4)	23.8 (14.2 - 33.3)	27.0 (10.5 - 43.2)
Education (p<.05)					
HS or less	48.4 (44.3-52.6)	54.0 (48.0 - 60.0)	51.3 (44.1 - 58.6)	36.0 (26.0 - 45.8)	39.6 (23.1 - 56.1)
Some college	36.9 (32.9-40.8)	35.0 (29.4 - 40.6)	33.0 (26.4 - 39.6)	47.4 (37.2 - 57.5)	34.3 (18.5 - 50.1)
College degree +	14.7 (12.0-17.4)	10.9 (7.4 - 14.5)	15.7 (10.8 - 20.5)	16.7 (9.5 - 23.8)	26.1 (13.4 - 38.7)
Household income					
<30K	33.7 (29.7-37.7)	37.3 (31.3 - 43.3)	36.5 (29.3 - 43.8)	23.6 (14.8 - 32.3)	30.1 (14.2 - 46.1)
30K-60K	29.7 (26.0-33.5)	30.3 (24.8 - 35.8)	31.1 (24.5 - 37.8)	29.1 (19.9 - 38.3)	22.9 (10.1 - 35.7)
>60K	36.5 (32.5-40.5)	32.4 (26.7 - 38.0)	32.3 (25.6 - 39.0)	47.3 (37.1 - 57.5)	47.0 (30.7 - 63.3)
Perceived health status					
Excellent/ Very Good	34.6 (30.5-38.7)	31.2 (25.4 - 37.0)	36.8 (29.4 - 44.2)	39.7 (29.4 - 50.0)	31.7 (16.5 - 46.9)
Good	42.0 (37.9-46.1)	43.3 (37.3 - 49.4)	38.7 (31.6 - 45.8)	46.0 (35.6 - 56.4)	37.0 (20.7 - 53.4)
Fair/Poor	23.4 (19.7-27.1)	25.5 (19.9 - 31.1)	24.5 (18.1 - 30.9)	14.3 (6.8 - 21.8)	31.2 (14.5 - 47.9)

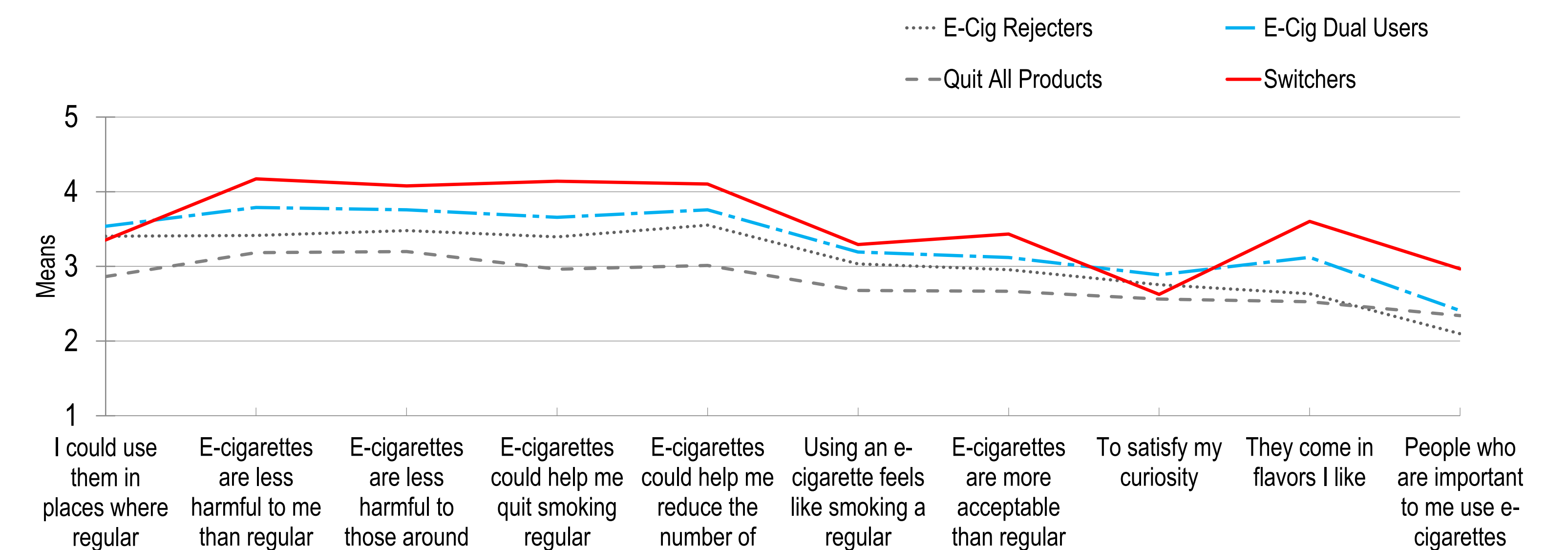
An estimated 9,443,788 were current smokers but non recent ENDS users (*Rejecters*), 6,766,362 were current smokers and used ENDS (*Dual users*), 4,571,473 were former smokers and former ENDS user (*Quit all products*) and 1,787,584 were former smokers and who currently use ENDS (*Switchers*)

Table 2. Most Often Used, Top 3 Choices For Electronic Nicotine Delivery System (ENDS) Devices

Device Types	E-Cig Rejecters % (95% CI)	E-Cig Dual Users % (95% CI)	Quit All Products % (95% CI)	Switchers % (95% CI)
	n=321	n=247	n=95	n=43
E-cigarettes (electronic cigarettes)	89.5 (85.5 - 93.6)	71.7 (64.9 - 78.6)	87.0 (79.7 - 94.2)	64.7 (49.0 - 80.4)
Tank system containing e-liquid	1.9 (0 - 3.8)	11.8 (6.7 - 17.0)	3.7 (0.0 - 7.4)	35.3 (19.6 - 51.0)
Vape pens	1.2 (0 - 2.5)	9.9 (5.5 - 14.3)	4.9 (0.4 - 9.5)	-

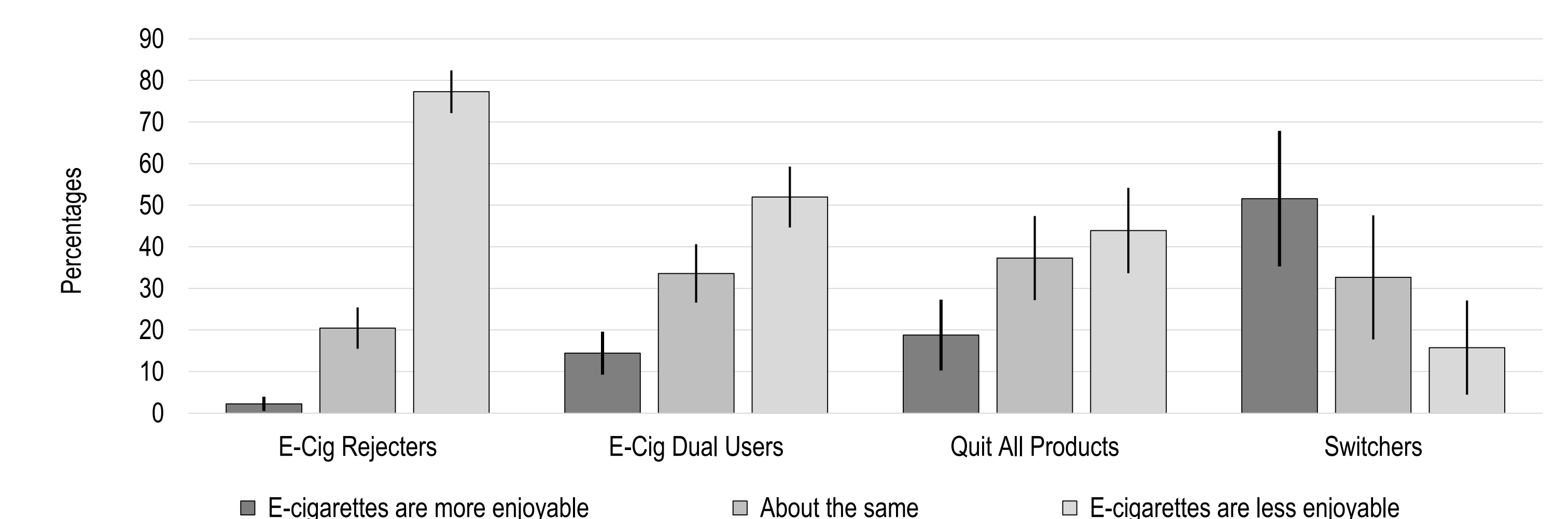
Findings: Across all groups E-Cigarettes were the most commonly used ENDS device. However, approximately one-third of *Switchers* preferred tank system.

Figure 1. Self-Reported Reasons for Using ENDS



Findings: ENDS were considered to be less harmful than regular cigarettes and as a tool to help quit. ENDS helped 24.8% of former smokers who *Quit all product*, and 80.9% of *Switchers* to quit.

Figure 2. Experience of using e-cigarettes compared to smoking regular cigarettes



Conclusions

- About 1 in 10 of current and former smokers who have tried ENDS reported that ENDS helped them quit smoking regular cigarettes.
- Approximately 80% of former smokers who are current ENDS users (*Switchers*) reported ENDS were a satisfying alternative to regular cigarettes.
- Continued surveillance is needed to evaluate if the evolving ENDS can become a disruptive technology that most smokers will adopt in place of the much more lethal cigarette.

Limitations:

- The use of the internet panel may raise concerns about sample representativeness, especially if the panel has been used in prior tobacco research
- The rapidly changing nature of the ENDS makes accurate questionnaire descriptions and terminology difficult to define.

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