Short communication

Widespread use of flavored e-cigarettes and hookah tobacco in the United States

Victoria L. Owens, Trung Ha, Julia N. Soulakova*

Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, 6900 Lake Nona Blvd., Orlando, FL 32827, United States of America

ABSTRACT

In 2009, the U.S. Food and Drug Administration banned the sale of flavored cigarettes (excluding menthol) in the U.S. However, the sale of flavored e-cigarettes (FE) and flavored hookah tobacco (FHT) is still legal. In this study (conducted in the US in the period from October 2018 to February 2019), we estimated the prevalence of use of FE and FHT across users' sociodemographic characteristics (e.g., age, sex, race/ethnicity) and identified the key characteristics of tobacco users associated with use of FE and FHT. We analyzed the 2014–2015 Tobacco Use Supplement to the Current Population Survey data for current e-cigarette (n = 3691) and hookah tobacco (n = 658) users. Among e-cigarette users, 65.5% used FE; and among hookah tobacco users, 87.3% used FHT. Among e-cigarette users, the prevalence of use of FE was significantly higher for 18–24 year-old than 45 + year-old adults; women than men; Southern than Northeastern residents; and never smokers of regular cigarettes than current smokers of regular cigarettes (all adjusted p's < 0.05). Among hookah tobacco users, the rates of FHT use were significantly higher for women than men, and never smokers of regular cigarettes than current smokers (all adjusted p's < 0.05). Because availability and accessibility of flavored tobacco products may promote tobacco use, revising regulatory guidelines concerning manufacturing and distribution of FE and FHT may help reduce the popularity of emerging tobacco products.

Implications: Among users of emerging tobacco products such as e-cigarettes and hookah tobacco, use of flavored products is very common. Among e-cigarette users, 66% consumed flavored e-cigarettes; and among users of hookah tobacco, 87% consumed flavored hookah tobacco. Use of flavored products was especially common among users who were young adults, women, or never and former smokers of regular cigarettes. Availability of emerging tobacco products in many different flavors could be a reason for tobacco use initiation and continued use of tobacco after cessation of regular-cigarette smoking.

1. Introduction

E-cigarettes and hookah tobacco are major emerging tobacco products in the U.S. Among adults, the prevalence of current e-cigarette use increased from 0.3% in 2010 to 6.8% in 2013 (McMillen et al., 2015). Similarly, among young adults, the prevalence of ever-use of hookah tobacco increased significantly from 7% in 2010–11 to 12% in 2014–15 (Soulakova et al., 2018a). While there are many potential reasons for increased popularity of these tobacco products, flavoring could be one of the main factors. In comparison to regular cigarettes that can be either menthol or non-menthol (i.e., unflavored), e-cigarettes and hookah tobacco are available in hundreds of flavors ranging from apple and chocolate to alcohol and coffee (Zhu et al., 2014). Candy and fruit flavors are especially appealing to younger populations; for example, in one study, 83% of young adult e-cigarette users reported using fruit-flavored e-cigarettes (Harrell et al., 2017). Indeed, many e-cigarette and hookah tobacco users cite flavoring as a reason for using the tobacco product. Specifically, over 70% of adolescent e-cigarette users and 80% of adolescent hookah tobacco smokers reported using their product of choice because the product was available in the flavors they liked (Ambrose et al., 2015); about 60% of adult e-cigarette users reported e-cigarette use for the same reason (Berg, 2016); and 80% of adult hookah tobacco smokers reported hookah tobacco use because they "enjoyed the taste" (Smith-Simone et al., 2008).

Availability of flavored tobacco products may encourage use of tobacco, especially among teenagers and young adults. Therefore, there is a critical need for new knowledge regarding association between flavoring and use of tobacco products (Ambrose et al., 2015; McDonald and Ling, 2015; Kong et al., 2015). The goals of this study were to (1) estimate the prevalence of use of FE and FHT among e-cigarette and

---

* Corresponding author.
E-mail address: Julia.Soulakova@ucf.edu (J.N. Soulakova).

hookah tobacco users, respectively, and evaluate potential differences across sociodemographic characteristics (e.g., age, sex) and (2) identify the users' sociodemographic characteristics and regular-cigarette smoking behaviors significantly associated with use of FE and FHT.

2. Methods

We used the 2014–15 Tobacco Use Supplement to the Current Population Survey (TUS-CPS) data, pooled over three monthly survey waves (July 2014, January 2015, and May 2015) (US Department of Commerce, Census Bureau, 2016). We only considered self-reported data; reports provided by proxy-respondents were not considered (Ha and Soulakova, 2018; Rao and Scott, 1981; Mai and Soulakova, 2018). We identified two cohorts of adults (who were 18 years old or older): current e-cigarette users (n = 3691) and current hookah tobacco users (n = 658). These cohorts represented 5,503,817 e-cigarette users and 1,331,394 hookah tobacco users, respectively, in the U.S. in 2014–15.

Respondents were considered current users of either e-cigarettes or hookah tobacco if they reported using the product occasionally or daily. E-cigarette products included e-cigarettes, vape-pens, hookah-pens, e-hookahs, e-vaporizers, and e-cigars (US Department of Commerce, Census Bureau, 2016). Hookah tobacco products included hookah, water pipe, shisha, narghile, argileh, and hubble-bubble (US Department of Commerce, Census Bureau, 2016). Therefore, the surveyed tobacco products are expected to include all (or almost all) forms of e-cigarette and hookah tobacco products available in the U.S.

The respondents were surveyed either in person (about 45%) or by phone (about 55%). Table 1 presents sociodemographic characteristics as well as regular-cigarette smoking status for each cohort. We note that due to small group sample sizes, current e-cigarette users who were non-Hispanic (NH) Hawaiians/Pacific Islanders, as well as current hookah tobacco smokers who were NH Hawaiians/Pacific Islanders, NH American Indians/Alaskan Natives, or NH Multiracials, were included only in descriptive analyses.

Our key measures of interest were (1) use of FE and (2) use of FHT. These binary measures were defined, respectively, using Yes/No responses to the survey questions "Some tobacco products come in flavors such as menthol or mint, clove, spice, fruit, chocolate, alcohol, or other flavors. When you use an e-cigarette, is it usually flavored?" and "Some tobacco products come in flavors such as menthol or mint, clove, spice, fruit, chocolate, alcohol, or other flavors. When you smoke a water/hookah pipe filled with tobacco, is it usually flavored?" (US Department of Commerce, Census Bureau, 2016). Explanatory measures included user's sociodemographic characteristics and regular-cigarette smoking status (see Table 1).

We used Rao-Scott chi-squared tests to assess significance of associations between each primary and each explanatory measure (Soulakova et al., 2018b). Balanced Repeated Replications with survey weights were used to estimate the standard errors (SAS/STAT® 14.2 User's Guide, 2016). The significance level was fixed at 5% for each test. In the case of a significant overall difference for measures with more than two levels, we performed additional comparisons using Bonferroni adjustments. In addition, we fitted two design-based multiple logistic regression models, similar to the previously discussed models (Soulakova et al., 2018a; Ha and Soulakova, 2017; Villanti et al., 2015). Both models included all explanatory factors and survey mode (phone, in-person). For each significant odds ratio we report either 95% Confidence Interval (CI) or 95% Simultaneous Confidence Interval (SCI) based on Bonferroni adjustments. Computing was performed using SAS®9.4 Survey Package (Rath et al., 2016; Allen et al., 2016).

3. Results

Among current e-cigarette users, the rate of use of FE was 65.5%, and use of FE was significantly associated (overall) with user's age, race/ethnicity, marital status, highest level of education, employment

Table 1

Summary statistics for two cohorts from 2014–15 Tobacco Use Supplement to the Current Population Survey; study was conducted from October 2018 to February 2019.

Characteristics	E-cigarette users		Hookah tobacco users	
	Sample count	Percent[a]	Sample count	Percent[a]
Age				
18–24	390	18.5%	252	50.4%
25–44	1607	42.3%	344	42.9%
45 +	1694	39.2%	62	6.7%
Sex				
Male	1773	53.4%	384	60.7%
Female	1918	46.6%	274	39.3%
Race/ethnicity				
Non-Hispanic (NH) White	3071	78.9%	419	57.3%
NH Black/African American	200	6.4%	82	14.9%
NH American Indian/ Alaskan Native	45	1.0%	9	0.6%
NH Asian	52	1.7%	29	3.8%
NH Hawaiian/Pacific Islander	11	0.4%	3	0.6%
NH Multiracial	97	3.7%	21	3.4%
Hispanic	215	8.0%	95	19.5%
Marital status				
Married (living with a spouse)	1492	37.4%	137	16.8%
Widowed, divorced or separated	1096	25.9%	76	9.2%
Never married	1103	36.7%	445	74.0%
Highest level of education				
High school or equivalent or less	1699	46.3%	197	33.7%
Some college or bachelor's degree	1852	50.8%	392	59.4%
Graduate degree or equivalent	140	2.9%	69	6.9%
Employment status				
Employed	2269	63.8%	506	73.6%
Unemployed or not in labor force	1422	36.2%	152	26.4%
Region of residency				
Northeast	499	14.9%	94	15.9%
Midwest	916	24.9%	144	22.4%
South	1369	40.2%	224	32.3%
West	907	19.9%	196	29.4%
Metro/non-metro area of residency				
Metropolitan area	2794	82.7%	583	91.1%
Non-metropolitan area	897	17.3%	75	8.9%
Regular-cigarette smoking status				
Never smoker	239	8.3%	354	56.3%
Former smoker	972	26.1%	87	11.2%
Current smoker	2480	65.6%	217	32.5%
Total (population count)	3691 (5,503,817)	100.0%	658 (1,331,394)	100.0%

[a] Percentages are based on the population counts.

status, region of residency and regular-cigarette smoking (see Table 2). Table 2 also illustrates the specific differences in the rates of use of FE across diverse sociodemographic groups and regular-cigarette smoking behaviors. Users' sex and metro/non-metro area of residency were not significantly associated with the use of flavored e-cigarettes.

Among users of hookah tobacco, the rate of use of FHT was 87.3%, and use of FHT was significantly associated (overall) with user's sex (p < 0.001), highest level of education (p = 0.038) and regular-cigarette smoking status (p = 0.002). Here we mention only significant individual comparisons among users of hookah tobacco. The rate of use of FHT was significantly higher for women (95.2%) than men (81.9%),

Table 2

Use of flavored e-cigarettes among e-cigarette users; 2014–15 Tobacco Use Supplement to the Current Population Survey; study was conducted from October 2018 to February 2019.

Characteristics	Rate of use of flavored e-cigarettes	Adjusted p-Value
Age	p < 0.001	
18–24	82.9%	< 0.001
25–44	72.5%	< 0.001
45 +	49.1%	Reference
Race/ethnicity	p < 0.001	
Non-Hispanic (NH) White	62.8%	Reference
NH Black/African American	65.4%	NS
NH American Indian/Alaskan Native	71.7%	NS
NH Asian	80.3%	NS
NH Hawaiian/Pacific Islander	77.9%	Not assessed
NH Multiracial	79.0%	0.039
Hispanic	77.9%	0.001
Marital status	p < 0.001	
Married (living with a spouse)	60.5%	Reference
Widowed, divorced, or separated	56.4%	NS
Never married	76.3%	< 0.001
Highest level of education	p = 0.047	
High school or equivalent or less	63.4%	Reference
Some college or bachelor's degree	67.2%	NS
Graduate degree or equivalent	59.1%	NS
Geographic region	p = 0.003	
Northeast	59.4%	Reference
Midwest	61.9%	NS
South	68.6%	0.012
West	66.7%	0.081
Regular cigarette smoking status	p < 0.001	
Never smoker	86.5%	Reference
Former smoker	74.3%	0.003
Current smoker	58.9%	< 0.001

Note: "NS" stands for "not significant".

and lower for current smokers of regular cigarettes (79.8%) than never smokers (90.3%, adjusted p = 0.009). While the rate of FHT smoking was the highest for former smokers of regular cigarettes (92.0%), the corresponding comparison versus never smokers was not significant. Users' age, race/ethnicity, marital status, employment status, region of residence and metro/non-metro area of residency were not significantly associated with use of FHT.

The model for the logit of the probability of use of FE (Likelihood Ratio = 678,678, df = 20, p < 0.0001) indicated significance of several main effects: user's age (p < 0.001), sex (p = 0.017), region of residency (p = 0.008) and regular-cigarette smoking status (p < 0.001). Race/ethnicity and marital status were significant at the 10% level only; the highest level of education, employment status, metro/non-metro area of residency, and survey mode were not significant. The odds of use of FE were significantly higher for 18–24 year-old (OR = 3.6, SCI = 2.3:5.8) and 25–44 year-old (OR = 2.4, SCI = 1.9:2.9) users relative to 45 + year-old users (both adjusted p < 0.001); women than men (OR = 1.2, CI = 1.0:1.5); and Southern than Northeastern residents (OR = 1.5, SCI = 1.1:2.1; adjusted p = 0.013). In addition, the odds of use of FE were significantly lower for current smokers of regular cigarettes than never smokers (OR = 0.4, SCI = 0.2:0.7; adjusted p = 0.001). Fig. 1 illustrates these results. The other comparisons were not significant.

The model for the logit of the probability of use of FHT (Likelihood Ratio = 159,763, df = 18, p < 0.001) indicated significance of two main effects only: user's sex (p < 0.0001) and regular-cigarette smoking status (p = 0.024); the other main effects were not significant. The odds of use of FHT were significantly higher for women than men (OR = 5.9, CI = 2.8:12.6), and significantly lower for current smokers

of regular cigarettes than never smokers (OR = 0.4, SCI = 0.1:0.9; adjusted p = 0.029); the comparison between former and never smokers was not significant. Fig. 2 illustrates these results.

4. Discussion

Overall, the use of flavoring was prevalent among both e-cigarette and hookah tobacco users; this is consistent with prior research among adults and adolescents (Ambrose et al., 2015; Farsalinos et al., 2015). Additionally, among current e-cigarette and hookah tobacco users, the use of FE and FHT was highly prevalent across all sociodemographic groups examined in the study, e.g., across age, race/ethnicity, marital status, education, and geographic region of residence. The only exception was observed for 45 + year-old e-cigarette users, for whom the rate of use of FE was slightly below 50%. Unadjusted and adjusted (for other factors) analyses resulted in several consistent (significant) findings: among e-cigarette users, the use of FE was more prevalent among younger (18–24 and 25–44 year-old) adults than 45 + year-old adults, and Southern than Northeastern residents; and among hookah tobacco users, the use of FHT was more prevalent among women than men. These findings are also consistent with prior studies, where the use of flavored tobacco product has been shown to be associated with being younger and being female (Harrell et al., 2017; Farsalinos et al., 2015; Tierney et al., 2016).

In addition, unadjusted and adjusted (for other factors) analyses consistently indicated that the rate of use of FE (FHT) were very high among e-cigarette (hookah tobacco) users who never smoked regular cigarettes, the corresponding rates were 87% for FE and 90% for FHT. Moreover, the rates of use of FE and FHT were significantly higher among users who never smoked regular cigarettes relative to those users who were current smokers. Thus, flavoring could be the key reason for tobacco use among never smokers, causing non-smoker's exposure to nicotine and other harmful chemicals contained in tobacco products (Allen et al., 2016; Farsalinos et al., 2015; Tierney et al., 2016; Benowitz and Goniewicz, 2013; Callahan-Lyon, 2014; Flouris et al., 2012; Vardavas et al., 2012). We also observed that the rate of use of FE (FHT) is high among e-cigarette users who were former smokers of regular cigarettes. Although switching to e-cigarettes (hookah tobacco) may help reduce harmful effect of tobacco use among heavy smokers, continued use of tobacco products may delay complete cessation of tobacco use. In addition, use of FE and FHT was highly prevalent among current smokers of regular cigarettes: the corresponding rates were 60% for FE and 80% for FHT. Furthermore, most e-cigarette users were also current smokers of regular cigarettes (66%), which is consistent with prior studies that have demonstrated that dual use of e-cigarettes and regular cigarettes is prevalent in the U.S. (Finney Rutten et al., 2015; Lee et al., 2014)

The study has some limitations. First, we could not perform comparisons for several sociodemographic groups of e-cigarette and hookah tobacco users because these groups were not well-represented in the study cohort, e.g., among e-cigarette users, NH Hawaiian/Pacific Islander users accounted for only 0.3% of the weighted cohort (n = 11) and among hookah tobacco users, NH Hawaiian/Pacific Islander users accounted for only 0.5% of the weighted cohort (n = 3). In addition, we considered occasional and daily users simultaneously to assure that the statistical power is adequate. However, patterns of use of FE and FHT could be very different among occasional and daily users; thus, because the study results concern the overall population of current users, they might not be valid when limiting to occasional users only or daily users only.

Currently, there is a lack of comprehensive understanding of the potential harmful effects of use of FE and FHT on population health. While there is some debate regarding switching to e-cigarettes while trying to cut back on regular cigarettes, e-cigarettes (as well as hookah tobacco) are not yet recognized as evidence-based smoking cessation methods. Additionally, implementing policies that limit product
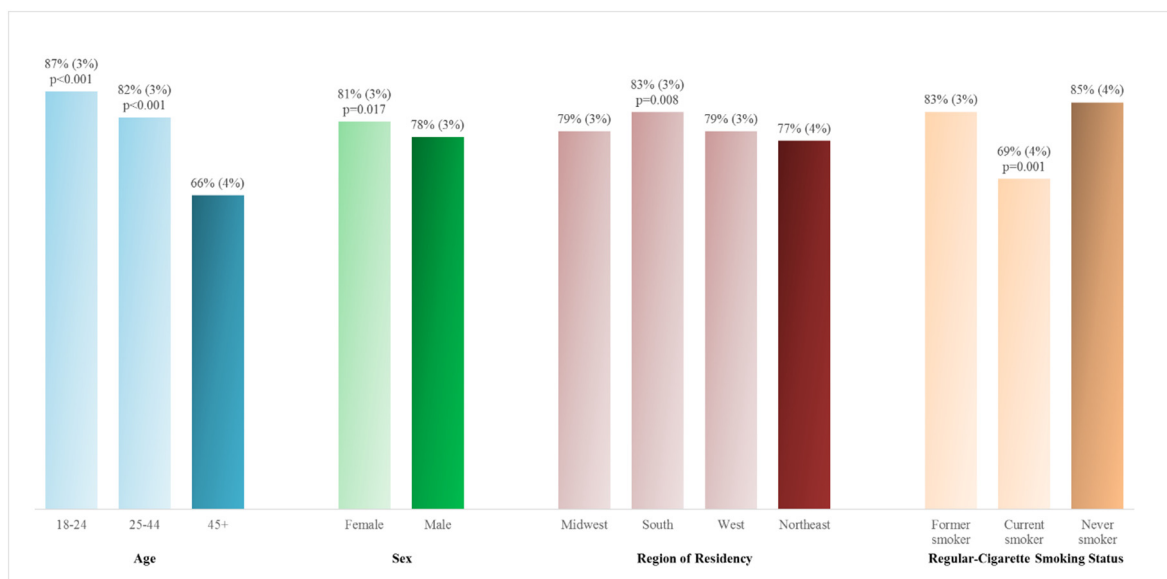
Fig. 1. Rate (and standard error) of use of flavored e-cigarettes among e-cigarette users: Design-based logistic regression results; 2014–15 Tobacco Use Supplement to the Current Population Survey; study was conducted from October 2018 to February 2019.
Notes: adjusted p-values are reported only for significant differences; each reference level is dark-shaded.
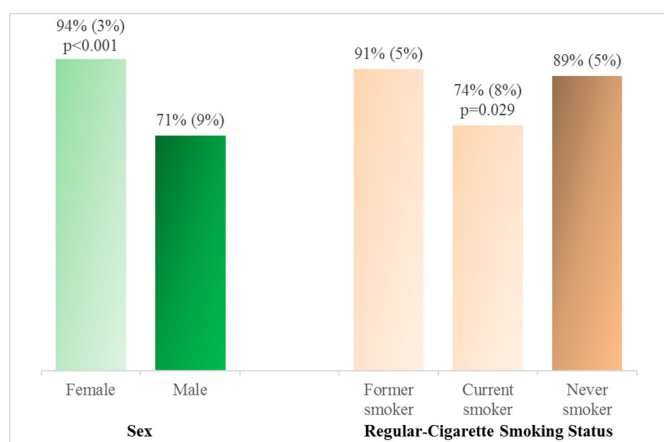

Fig. 2. Rate (and standard error) of use of flavored hookah tobacco among hookah tobacco users: Design-based logistic regression results; 2014–15 Tobacco Use Supplement to the Current Population Survey; study was conducted from October 2018 to February 2019.
Notes: adjusted p-values are reported only for significant differences; each reference level is dark-shaded.

accessibility for groups with high use rates (particularly teenagers and young adults) is highly important. Moreover, there is a need for studies evaluating the long-term effects of use of emerging tobacco products (including FE and FHT) among never, former and current smokers of regular cigarettes. These studies will help better our understanding of tobacco and polytobacco use behaviors and improve programs for tobacco use cessation.

Funding

Declaration of interests

None declared.

Acknowledgments

References

Allen, J., Flanigan, S., LeBlanc, M., Vallarino, J., MacNaughton, P., Stewart, J., Christiani, D., 2016. Flavoring chemicals in e-cigarettes: diacetyl, 2,3-pentanedione, and acetoin in a sample of 51 products, including fruit-, candy-, and cocktail-flavored e-cigarettes. Environmental Health Perspectives. 124 (6), 733–739. https://doi.org/10.12889/ehp.1510185.

Ambrose BK, Day HR, Rostron B, et al. Flavored tobacco product use among us youth aged 12–17 years, 2013–2014. JAMA. 2015;314(17):1871. doi:10.1001/jama.2015.13802.

Benowitz, N., Goniewicz, M., 2013. The regulatory challenge of electronic cigarettes. JAMA. 310 (7), 685–686. https://doi.org/10.1001/jama.2013.109501.

Berg, C.J., 2016. Preferred flavors and reasons for e-cigarette use and discontinued use among never, current, and former smokers. International J Public Heal. 61 (2), 225–236.

Callahan-Lyon, P. Electronic cigarettes: human health effects. Tob Control. 2014;23:ii36-ii40. doi:10.1136/tobaccocontrol-2013-051470

Farsalinos, K., Kistler, K., Gillman, G., Voudris, V., 2015. Evaluation of electronic cigarette liquids and aerosol for the presence of selected inhalation toxins. Nicotine Tob Res. 17 (2), 168–174. https://doi.org/10.1093/ntr/ntu176.

Finney Rutten, L., Blake, K., Agunwamba, A., Grana, R., Wilson, P., Ebbert, J., Okamoto, J., Leischow, S., 2015. Use of E-cigarettes among current smokers: associations among reasons for use, quit intentions. and current tobacco use. Nicotine Tob Res. 17 (10), 1228–1234. https://doi.org/10.1093/ntr/ntv003.

Flouris, A., Poulianiti, K., Chorti, M., Jamurtas, A., Kouretas, D., Owolabi, E., Tzatzarakis, M., Tsatsakis, A., Koutedakis, Y., 2012. Acute effects of electronic and tobacco cigarette smoking on complete blood count. Food Chem Toxicol. 50 (10), 3600–3603. https://doi.org/10.1016/j.fct.2012.07.025.

Ha, T., Soulakova, J.N., 2017. Statistical analyses of public health surveys using SAS® Survey package Trung Ha and Julia Soulakova. In: SESUG Paper 189..

Ha, T., Soulakova, J.N., 2018. Importance of adjusting for multi-stage design when analyzing data from complex surveys. In: Zhao, Y., Chen, D.-G. (Eds.), New Frontiers of Biostatistics and Bioinformatics. Springer Nature Switzerland, pp. 257–268. https://doi.org/10.1007/978-3-319-99389-8.

Harrell MB, Weaver SR, Loukas A, et al. Flavored e-cigarette use: characterizing youth, young adult, and adult users. Prev Med Reports. 2017;5:33-40. doi:10.1016/j.pmedr.2016.11.001.

Kong, G., Morean, M.E., Cavallo, D.A., Camenga, D.R., Krishnan-Sarin, S., 2015. Reasons for electronic cigarette experimentation and discontinuation among adolescents and young adults. Nicotine Tob Res. 17 (7), 847–854.

Lee, Y., Hebert, C., Nonnemaker, J., Kim, A., 2014. Multiple tobacco product use among adults in the United States: cigarettes, cigars, electronic cigarettes, hookah, smokeless tobacco, and snus. Prev Med. 62, 14–19. https://doi.org/10.1016/j.ypmed.2014.01.014.

Mai, Y., Soulakova, J.N., 2018. Retrospective reports of former smokers: receiving doctor's advice to quit smoking and using behavioral interventions for smoking cessation in the United States. Prev Med Reports. 11, 290–296. https://doi.org/10.1016/j.pmedr.2018.07.012.

McDonald, E.M., Ling, P.M., 2015. One of several "toys" for smoking: young adult experiences with electronic cigarettes in New York City. Tob Control. 24 (6), 588–593.

McMillen, R.C., Gottlieb, M.A., Shaefer, R.M.W., Winickoff, J.P., Klein, J.D., 2015. Trends in electronic cigarette use among U.S. adults: use is increasing in both smokers and nonsmokers. Nicotine Tob Res. 17 (10), 1195–1202. https://doi.org/10.1093/ntr/ntu213.

Rao, J.N.K, Scott, A.J., 1981. The analysis of categorical data from complex sample surveys: chi-squared tests for goodness of fit and independence in two-way tables. J Am Stat Assoc. 76 (374), 221–230. https://doi.org/10.1080/01621459.1981.10477633.

Rath, J.M., Villanti, A.C., Williams, V.F., Richardson, A., Pearson, J.L., Vallone, D.M., 2016. Correlates of current menthol cigarette and flavored other tobacco product use among U. S. young adults. Addict Behav. 62, 35–41. https://doi.org/10.1016/j.addbeh.2016.05.021.

SAS/STAT® 14.2 User's Guide, 2016. SAS Institute, Inc., Cary, NC.

Smith-Simone, S., Maziak, W., Ward, K., Eissenberg, T., 2008. Waterpipe tobacco smoking: knowledge, attitudes, beliefs, and behavior in two U. S. samples. Nicotine Tob Res. 10 (2), 393–398. https://doi.org/10.1080/14622200701825023.

Soulakova, J.N., Pham, T., Owens, V.L., Crockett, L.J., 2018a. Prevalence and factors associated with use of hookah tobacco among young adults in the U. S. Addict Behav. 85. https://doi.org/10.1016/j.addbeh.2018.05.007.

Soulakova, J.N., Tang, C.-Y., Leonardo, S.A., Taliaferro, L.A., 2018b. Motivational benefits of social support and behavioural interventions for smoking cessation. J Smok Cessat. 13 (4), 216–226. https://doi.org/10.1017/jsc.2017.26.

Tierney, P., Karpinski, C., Brown, J., Luo, W., Pankow, J., 2016. Flavour chemicals in electronic cigarette fluids. Tob Control. 25, e10–e15. https://doi.org/10.1136/tobaccocontrol-2014-052175.

US Department of Commerce, Census Bureau, 2016. National Cancer Institute and Food and Drug Administration co-sponsored tobacco use supplement to the current population survey. In: 2014–15, . https://thedataweb.rm.census.gov/ftp/cps_ftp.html#cpssupps.

Vardavas, C., Anagnostopoulos, N., Kougias, M., Evangelopoulou, V., Connolly, G., Behrakis, P., 2012. Short-term pulmonary effects of using an electronic cigarette: impact on respiratory flow resistance, impedance. and exhaled nitric oxide. Chest. 141 (6), 1400–1406. https://doi.org/10.1378/chest.11-2443.

Villanti, A.C., Cobb, C.O., Cohn, A.M., Williams, V.F., Rath, J.M., 2015. Correlates of hookah use and predictors of hookah trial in U. S. young adults. Am J Prev Med. 48 (6), 742–746. https://doi.org/10.1016/j.amepre.2015.01.010.

Zhu S-H, Sun JY, Bonnevie E, et al. Four hundred and sixty brands of e-cigarettes and counting: implications for product regulation. Tob Control. 2014;23 Suppl 3(Suppl 3):iii3-9. doi:10.1136/tobaccocontrol-2014-051670.