Supplementary written evidence submitted by Action on Smoking and Health (YVP0005)

Introduction

1. This submission draws on recent systematic reviews and relevant studies in responding to the following request from Paul Blomfield MP at the Health & Social Care Committee oral evidence session on youth vaping on June 28th .

Paul Blomfield MP
"While we are on the point about further evidence, it would be useful if we could have further independent evidence—not anecdotal talk from lots of people—on the importance of flavours in smoking cessation."

2. The abstracts and links to peer reviewed research which address this question and underpin the summary below, are set out in the Appendix. Some of the papers also address the impact of flavours on vaping among young people.

Summary

The importance of flavours in smoking cessation

3. In the UK a trial found e-cigarettes to be nearly twice as effective as Nicotine Replacement Therapy when accompanied by behavioural support. Participants were given tobacco flavour to start with and subsequently allowed to make their own choice. Three quarters switched to other flavours, with fruit, menthol and sweet flavours the most popular (almost no-one switched to unflavoured vapes). (Hajek et al 2019)

4. In a similar trial in pregnant smokers (Hajek et al. 2022), e-cigarettes were also more effective than Nicotine Replacement Therapy and were more effective in preventing low birthweight. Here, participants were also given tobacco flavoured e-liquid to start, but within a few weeks, 91% switched to other flavours, mostly fruit flavours. (Hajek et al 2022)

5. A number of studies reported an association between quitting smoking successfully and using non-tobacco flavoured (e.g. fruit, sweet, menthol) as opposed to tobacco flavoured or unflavoured e-liquids. (Friedman, Xu 2020; Gades et al 2022; Gravely et al 2020;Li et al 2021; Mok et al 2023;)

6. Vaping non-tobacco flavoured e-cigarettes was not associated with increased youth smoking initiation compared to vaping tobacco flavours, but was associated with an increase in the odds of adult smoking cessation. (Friedman, Xu 2020)

The impact of restricting or banning flavours on underage vaping and uptake by never smokers

7. There is a longitudinal association between adolescent vaping and smoking initiation, but to conclude that this is proof of causation is premature as to date there has been inadequate adjustment for potential confounders, and high sample attrition. When these factors are taken into account, it is not clear how much of the relationship is causal (gateway effect) or is due to common liability. (Chan et al 2021)

8. ASH surveys show that flavours are a reason, but not the main reason, why young people who have never smoked start vaping. The most common reason for trying vaping among young never smokers is 'just to give it a try' (54%) followed by 'other people use them so I join in '(18%) and then 'I like the flavours' (12%). (ASH 2023 see Figure 8) Furthermore while flavours may be an important motivator for e-cigarette uptake in young people, the role of flavours in tobacco smoking uptake is unclear. (Notley et al 2022)

9. Findings are mixed but suggest that restricting or banning flavours is likely to lead to a reduction in e-cigarette sales but also an increase, or no change, in cigarette sales for both children and adults. Studies of hypothetical restrictions suggest decreased e- cigarette use, increased cigarette use, and increased use of illicit markets. (Cadham et al 2022), and a potential negative net population impact (Gibson et al 2022)

10. In the US different states implemented different policies at different times, allowing comparison of the impact of banning or restricting flavours compared to no regulation. Implementation of policies restricting or banning flavours was associated with a long run reduction in e-cigarette consumption but also an increase in cigarette consumption and 38% of the effect on cigarette sales stemmed from growth in brands popular with youth. Banning flavoured e-cigarettes led to a larger rise in cigarette sales than restricting flavours, especially for brands favoured by older adults. (Friedman et al 2023)

Conclusion

11. Taken together this evidence supports the conclusion that the risk of adverse unintended consequences is too great at the current time to implement ad hoc restrictions or bans on flavours. This is an area where more research is needed before action is taken.

APPENDIX: Sources and abstracts with links to full articles where available

Action on Smoking and Health. **Use of e-cigarettes (vapes) among young people in Great Britain.** London 2023.

Cadham, C.J., Liber, A.C., Sánchez-Romero, L.M. et al. **The actual and anticipated effects of restrictions on flavoured electronic nicotine delivery systems: a scoping review**. BMC Public Health 22, 2128 (2022). https://doi.org/10.1186/s12889-022-14440-x

Abstract
Objective: To synthesize the outcomes of policy evaluations of flavoured electronic nicotine delivery systems (ENDS) restrictions.

Study selection: Studies that report sales, behaviour, or compliance outcomes related to implemented or hypothetical ENDS flavour restrictions.

Data extraction: Restriction details, whether implemented or hypothetical, whether additional products were restricted, jurisdictional level, study locations, and outcomes classified by sales, behaviour, and compliance.

Data synthesis: We included 30 studies. Of those, 26 were conducted exclusively in the US, two in India, and two surveyed respondents in multiple countries, including the US. Twenty-one evaluated

implemented restrictions, while nine considered hypothetical restrictions. Five studies evaluated product sales, 17 evaluated behaviour, and 10 evaluated

compliance, with two studies reporting multiple outcomes. Two studies reported an increase and one a reduction in cigarette sales following restrictions, while three reported reductions in ENDS sales. Behavioural studies presented a mixed view of the impacts of regulations on ENDS and cigarette use. However, the use of disparate outcomes limits the comparability of studies. Studies of hypothetical restrictions suggest decreased ENDS use, increased cigarette use, and increased use of illicit markets. Studies of compliance with flavoured product restrictions that included ENDS found that 6–39% of stores sold restricted flavoured products post-restrictions. Online stores remain a potential source of restricted products.

Conclusion: Our findings highlight the need for additional research on the impacts of ENDS restrictions. Research should further evaluate the impact of restrictions on youth and adult use of nicotine and tobacco products in addition to the effects of restrictions in countries beyond the US to enable a robust consideration of the harm-benefit trade-off of restrictions.

Abstract
Background and aims: Studies have consistently found a longitudinal association between e-cigarette use (vaping) and cigarette smoking. Many have interpreted such association as causal. This systematic review and meta-analysis evaluated the plausibility of a causal interpretation by (1) estimating the effect of adolescent vaping on smoking initiation, adjusted for study quality characteristics, (2) evaluating the sufficiency of adjustment for confounding based on the social development model (SDM) and the social ecological model (SEM) and E-value analyses and (3) investigating sample attrition and publication bias.

Methods: Systematic review and meta-analysis of longitudinal studies that examined the association between e-cigarette use at baseline and smoking at follow-up. Participants were non-smokers aged < 18 at baseline.

Results: Meta-analysis of 11 studies showed a significant longitudinal association between vaping and smoking [adjusted odds ratio (aOR) = 2.93, 95% confidence interval (CI) = 2.22, 3.87]. Studies with sample sizes < 1000 had a significantly higher odds ratio (OR = 6.68, 95% CI = 3.63, 12.31) than studies with sample sizes > 1000 (OR = 2.49, 95% CI = 1.97, 3.15). Overall, the attrition rate was very high (median = 30%). All but one study reported results from complete sample analysis, despite those dropping out having higher risk profiles. Only two studies comprehensively adjusted for confounding. The median E-value was 2.90, indicating that the estimates were not robust against unmeasured confounding.

Conclusions: There is a longitudinal association between adolescent vaping and smoking initiation; however, the evidence is limited by publication bias, high sample attrition and inadequate adjustment for potential confounders.

Findings In this cohort study with 17 929 participants, multivariable analyses of nationally representative, longitudinal survey data evaluated differences in smoking initiation and cessation

subsequent to vaping uptake among those who used flavored vs unflavored e- cigarettes, separately by age group. Relative to vaping tobacco flavors, vaping nontobacco-

flavored e-cigarettes was not associated with increased youth smoking initiation but was associated with an increase in the odds of adult smoking cessation.

Meaning In this study, adults who vaped flavored e-cigarettes were more likely to subsequently quit smoking than those who used unflavored e-cigarettes.

Conclusions and Relevance: In this study, adults who began vaping nontobacco-flavored e-cigarettes were more likely to quit smoking than those who vaped tobacco flavors. More research is needed to establish the relationship between e-cigarette flavors and smoking and to guide related policy.

Friedman A, Liber Ranganathan R, Crippen A, Pesko M. First look: Sales of Electronic Nicotine Delivery Systems and Cigarettes after the Adoption of Flavour Bans. Funded by US National Cancer Institute and Food and Drug Administration. *Presentation from the US e-cig summit on May 16th 2023 available from Dr Friedman.*

Methods: A study of retail sales data compared per capita sales of nicotine containing e- cigarettes (ENDS) and cigarettes across 44 US states between January 2018 and March 2023 before and after flavour restrictions or bans were implemented. Common time trends, time-invariant state effects, level of exposure and an array of additional policies and environmental controls, were adjusted for.

Findings: Banning flavoured e-cigarettes led to a larger rise in in cigarette sales than restricting flavours. especially for brands favoured by older adults. 38% of the long-run effect on cigarette sales stemmed from growth in brands popular with youth.

Implications: Any public health benefit of reducing ENDS use could lead to offsetting public health damage by increasing cigarette sales.

Gades MS, Alcheva A, Riegelman AL, Hatsukami DK. The Role of Nicotine and Flavor in the Abuse Potential and Appeal of Electronic Cigarettes for Adult Current and Former Cigarette and Electronic Cigarette Users: A Systematic Review, Nicotine & Tobacco Research, Volume 24, Issue 9, September 2022, Pages 1332–1343, https://doi.org/10.1093/ntr/ntac073

Abstract
Introduction: Many adult cigarette smokers use electronic cigarettes (e-cigarettes) to cut down on or quit smoking cigarettes. E-cigarettes with higher abuse potential and appeal might facilitate complete switching. E-liquid nicotine concentration and flavor are two of the characteristics that may affect the abuse potential and appeal of e-cigarettes. The objective of this systematic review was to compile results from survey, animal, human laboratory, and clinical studies to understand the possible effects of nicotine concentration and flavor on abuse potential and appeal of e-cigarettes in adult current and former cigarette and e- cigarette users.

Aims and Methods: A comprehensive literature search was conducted in Ovid Medline and PsycINFO followed by citation tracking in Web of Science Core Collection. Peer-reviewed studies published in English between 2007 and August 2020 were selected that analyzed differences between e-liquid nicotine concentration and/or flavors, had outcome measures related to abuse potential and/or appeal, and included adult humans (18+) or animals. A total of 1624 studies were identified and screened. A qualitative synthesis of results was performed.

Results: Results from 104 studies included in this review suggest that higher nicotine concentration and access to a variety of flavors are likely to be associated with higher abuse potential and appeal of e-cigarettes for adult current and former cigarette and e-cigarette users.

Conclusions: Higher nicotine concentrations and the availability of a variety of flavors in e- cigarettes might facilitate complete substitution for cigarettes. Future e-cigarette regulations should take into account their impact on smokers, for whom e-cigarettes may be a cessation tool or reduced-harm alternative.

Implications: E-cigarettes may provide a reduced-harm alternative to cigarettes for smokers unwilling/unable to quit or serve as a path for quitting all nicotine products. Higher nicotine concentrations and flavor variety are associated with higher abuse potential and appeal of e-cigarettes. Higher abuse potential and appeal products may help facilitate complete switching from cigarettes to e-cigarettes. Regulation of nicotine concentration and flavors aimed at decreasing naïve uptake may inadvertently decrease uptake and complete switching among smokers, reducing the harm reduction potential of e-cigarettes. Evidence- based effects of regulating nicotine concentration and flavors must be considered for the population as a whole, including smokers.

Abstract

Background Policy decisions should be evidence-based, but the magnitude of intended and unintended impacts cannot always be easily estimated from the available data. For example, banning flavours in electronic cigarettes (e-cigarettes) to reduce appeal to non-smoking young people could have the intended impact by reducing youth vaping but could have negative consequences for adult smokers and vapers.

Methods We developed a decision aid to help policymakers make informed decisions on the potential net impact of a ban on e-cigarette flavours. We estimated the number of non- smoking youth who would be deterred from ever vaping and subsequently ever smoking, and the number of smokers and ex-smokers who would be deterred from quitting or encouraged to relapse, to determine whether the benefits to youth outweigh the costs to existing smokers and vapers. This aid then outputs a report with the results graphically depicted to aid interpretability.

Results We demonstrated the value of this decision aid using data from various sources to estimate the impact of a flavour ban in three populations: the general UK population, low- socioeconomic position UK population, and the general US population. All three examples suggested a negative net population impact of a ban. These reports were then presented to the all-party parliamentary group for vaping.

Conclusions We demonstrate how decision aids can be used to help policymakers arrive at evidence-based decisions efficiently and can be used to quickly obtain up-to-date estimates as new data becomes available.

Policy decisions should be evidence-based and lead to positive, beneficial impacts in the affected population. However, sourcing relevant evidence that can be easily interpreted can be a difficult task for policymakers working under time constraints. Creating decision aids for

policymakers that can quickly provide brief, digestible guidance can be particularly useful in areas where existing evidence suggests the proposed policy change may have positive and negative implications on the target population.

One example is electronic cigarette (e-cigarette) policy. Some jurisdictions have banned flavours in e-cigarettes to reduce appeal to non-smoking young people and the UK could do the same; this could have the intended impact by reducing youth vaping but could have negative consequences for adult smokers and e-cigarette users (vapers). Although e- cigarettes are considered to be less harmful than cigarettes [1], and can be used by smokers to help them quit [2], there have been concerns that the wide range of available flavours encourage non-smoking youth to vape and subsequently smoke. While there is some evidence to suggest that flavours encourage youth vaping in both the US and the UK, there is no clear evidence that they encourage subsequent smoking [3-6]. The emergence of disposable vapes, which are most popular and relatively accessible among young people in both the US and UK, has further fuelled concerns about flavours in e-cigarette products [7, 8]. These concerns have led to bans of e-cigarette flavours (i.e., all but unflavoured, tobacco and menthol) in several jurisdictions. Evidence of the actual and predicted effect of bans is conflicting with some studies suggesting a reduction of vaping rates [9, 10] and others suggesting no reduction [11] or an increase in smoking rates in both youth [12] and adults [10, 13].

Contrasting evidence on the effectiveness of a potential ban makes it difficult for policymakers to reach an informed decision. Therefore, to help policymakers make informeddecisions on a potential e-cigarette flavour ban, we aimed to develop a decision aid for policymakers to specifically estimate the impact of a ban in any given population, and to illustrate the potential value of such decision aids in general.

Abstract
Aims: This study examined whether nontobacco flavors are more commonly used by vapers (e-cigarette users) compared with tobacco flavor, described which flavors are most popular, and tested whether flavors are associated with: vaping satisfaction relative to smoking, level of enjoyment with vaping, reasons for using e-cigarettes, and making an attempt to quit smoking by smokers.

Methods: This cross-sectional study included 1603 adults from Canada and the United States who vaped at least weekly, and were either current smokers (concurrent users) or former smokers (exclusive vapers). Respondents were categorized into one of seven flavors they used most in the last month: tobacco, tobacco–menthol, unflavored, or one of the nontobacco flavors: menthol/mint, fruit, candy, or "other" (eg, coffee).

Results: Vapers use a wide range of flavors, with 63.1% using a nontobacco flavor. The most common flavor categories were fruit (29.4%) and tobacco (28.7%), followed by mint/menthol (14.4%) and candy (13.5%). Vapers using candy (41.0%, p < .0001) or fruit flavors (26.0%, p = .01) found vaping more satisfying (compared with smoking) than vapers using tobacco flavor (15.5%) and rated vaping as very/extremely enjoyable (fruit: 50.9%; candy: 60.9%) than those using tobacco flavor (39.4%). Among concurrent users, those using fruit (74.6%, p = .04) or candy flavors (81.1%, p = .003) were more likely than tobacco

flavor users (63.5%) to vape in order to quit smoking. Flavor category was not associated with the likelihood of a quit attempt (p = .46). Among exclusive vapers, tobacco and nontobacco flavors were popular; however, those using tobacco (99.0%) were more likely than those using candy (72.8%, p = .002) or unflavored (42.5%, p = .005) to vape in order to stay quit.

Conclusions: A majority of regular vapers in Canada and the US use nontobacco flavors. Greater satisfaction and enjoyment with vaping are higher among fruit and candy flavor users. While it does not appear that certain flavors are associated with a greater propensity to attempt to quit smoking among concurrent users, nontobacco flavors are popular among former smokers who are exclusively vaping. Future research should determine the likely impact of flavor bans on those who are vaping to quit smoking or to stay quit.

Implications: Recent concerns about the attractiveness of e-cigarette flavors among youth have resulted in flavor restrictions in some jurisdictions of the United States and Canada.
However, little is known about the possible consequences for current and former smokers if they no longer have access to their preferred flavors. This study shows that a variety of nontobacco flavors, especially fruit, are popular among adult vapers, particularly among those who have quit smoking and are now exclusively vaping. Limiting access to flavors may therefore reduce the appeal of e-cigarettes among adults who are trying to quit smoking or stay quit.

Hajek P, Phillips-Waller A, Przulj D, Pesola F, Myers Smith K, Bisal N, Li J, Parrott S, Sasieni P, Dawkins L, Ross L. A randomized trial of e-cigarettes versus nicotine-replacement therapy. New England Journal of Medicine. 2019 Feb 14;380(7):629-37.

Abstract
BACKGROUND: E-cigarettes are commonly used in attempts to stop smoking, but evidence is limited regarding their effectiveness as compared with that of nicotine products approved as smoking-cessation treatments.

METHODS: We randomly assigned adults attending U.K. National Health Service stop- smoking services to either nicotine-replacement products of their choice, including product combinations, provided for up to 3 months, or an e-cigarette starter pack (a second- generation refillable e-cigarette with one bottle of nicotine e-liquid [18 mg per milliliter]), with a recommendation to purchase further e-liquids of the flavor and strength of their choice.
Treatment included weekly behavioral support for at least 4 weeks. The primary outcome was sustained abstinence for 1 year, which was validated biochemically at the final visit. Participants who were lost to follow-up or did not provide biochemical validation were considered to not be abstinent. Secondary outcomes included participant-reported treatment usage and respiratory symptoms.

RESULTS: A total of 886 participants underwent randomization. The 1-year abstinence rate was 18.0% in the e-cigarette group, as compared with 9.9% in the nicotine-replacement group (relative risk, 1.83; 95% confidence interval [CI], 1.30 to 2.58; P<0.001). Among participants with 1-year abstinence, those in the e-cigarette group were more likely than those in the nicotine-replacement group to use their assigned product at 52 weeks (80% [63 of 79 participants] vs. 9% [4 of 44 participants]).

Overall, throat or mouth irritation was reported more frequently in the e-cigarette group (65.3%, vs. 51.2% in the nicotine-replacement group) and nausea more frequently in the nicotine-replacement group (37.9%, vs. 31.3% in the e-cigarette group). The e-cigarette group reported greater declines in the incidence of cough and phlegm production from baseline to 52 weeks than did the nicotine-replacement group (relative risk for cough, 0.8;

95% CI, 0.6 to 0.9; relative risk for phlegm, 0.7; 95% CI, 0.6 to 0.9). There were no significant between-group differences in the incidence of wheezing or shortness of breath.

CONCLUSIONS: E-cigarettes were more effective for smoking cessation than nicotine- replacement therapy, when both products were accompanied by behavioral support. (Funded by the National Institute for Health Research and Cancer Research UK; Current Controlled Trials number, ISRCTN60477608. opens in new tab.)

Flavour choices
A starter pack, called One Kit (Aspire, U.K. Ecig Store), was provided to facilitate initial use and teach participants how to use refillable e-cigarette products, along with one 30-ml bottle of Tobacco Royale flavor e-liquid purchased from U.K. Ecig Store, containing nicotine at a concentration of 18 mg per milliliter.

Most participants started to purchase their own e-liquids from the first week onwards, with only 7% requesting the second bottle. Flavours of e-liquids that participants purchased varied over time, with fruit flavours the most popular, followed by tobacco, mint and candy flavours. Some participants used multiple flavours only 2 said they ever used unflavoured products.

See Supplementary Appendix Supplementary Table 4: EC products used in EC arm

Hajek P, Przulj D, Pesola F, Griffiths C, Walton R, McRobbie H, Coleman T, Lewis S, Whitemore R, Clark M, Ussher M. Electronic cigarettes versus nicotine patches for smoking cessation in pregnancy: a randomized controlled trial. Nature medicine. 2022 May;28(5):958-64.

Abstract
Nicotine replacement therapy, in the form of nicotine patches, is commonly offered to pregnant women who smoke to help them to stop smoking, but this approach has limited efficacy in this population. Electronic cigarettes (e-cigarettes) are also used by pregnant women who smoke but their safety and efficacy in pregnancy are unknown.

Here, we report the results of a randomized controlled trial in 1,140 participants comparing refillable e-cigarettes with nicotine patches. Pregnant women who smoked were randomized to e-cigarettes (n = 569) or nicotine patches (n = 571). In the unadjusted analysis of the primary outcome, validated prolonged quit rates at the end of pregnancy in the two study arms were not significantly different (6.8% versus 4.4% in the e-cigarette and patch arms, respectively; relative risk (RR) = 1.55, 95%CI: 0.95–2.53, P = 0.08). However, some participants in the nicotine patch group also used e-cigarettes during the study.

In a pre-specified sensitivity analysis excluding abstinent participants who used non- allocated products, e-cigarettes were more effective than patches (6.8% versus 3.6%; RR = 1.93, 95%CI: 1.14–3.26, P = 0.02). Safety outcomes included adverse events and maternal and birth outcomes.

The safety profile was found to be similar for both study products, however, low birthweight (<2,500 g) was less frequent in the e-cigarette arm (14.8% versus 9.6%; RR = 0.65, 95%CI: 0.47–0.90, P = 0.01). Other adverse events and birth outcomes were similar in the two study arms. E-cigarettes might help women who are pregnant to stop smoking, and their safety for use in pregnancy is similar to that of nicotine patches. ISRCTN62025374

Flavour choices

As with the previous RCT comparing NRT to e-cigarettes in adult smokers, participants were provided with tobacco flavour e-cigarettes in the first instance, but from then on allowed to choose what, if any, flavour they used. In this group of pregnant smokers, almost all (91%) preferred other flavours, with fruit flavours by far the most popular.

See Supplementary table 3: E-cigarettes use in the e-cigarettes arm

Li, L., Borland, R., Cummings, K.M., Fong, G.T., Gravely, S., Smith, D.M., Goniewicz, M.L., O'Connor, R.J., Thompson, M.E., McNeill, A. (2021). How does the use of flavored nicotine vaping products relate to progression toward quitting smoking?
Findings from the 2016 and 2018 ITC 4CV Surveys. *Nicotine and Tobacco Research*, *23*(9), 1490-1497. doi: 10.1093/ntr/ntab033.

Abstract
Introduction: There is limited research on the role of flavors in nicotine vaping products (NVPs) in relation to smoking. We examined patterns of flavor use in NVPs in relation to progression toward quitting.

Aims and Methods: Data come from 886 concurrent users of NVPs (at least weekly) and cigarettes who were first surveyed in 2016 and then successfully recontacted in 2018 as part of the ITC 4CV Surveys conducted in Australia, Canada, England, and the United States.
Participants were asked about their main vaping flavor categorized as: (1) tobacco or unflavored, (2) menthol or mint flavored, and (3) "sweet" flavors (eg, fruit or candy). We examined whether flavor was associated with progression toward quitting smoking between survey years.

Results: Overall, 11.1% of baseline concurrent users quit smoking by 2018. Compared with users of tobacco flavors, those vaping "sweet" flavors were more likely to quit smoking between surveys (13.8% vs. 9.6%; adjusted odds ratio [aOR] = 1.61, 95% confidence interval [CI] 1.01–2.58, p < .05), but those using menthol flavors were no more likely to quit smoking (8.3% vs. 9.6%, aOR = 0.87, 95% CI 0.43–1.47, p = .69). Among those who had quit smoking in 2018, 52.0% were still vaping, which was lower than the 65.8% among continuing smokers (aOR = 0.60, 95% CI 0.39–0.92, p = .02). Sweet flavor users were no more likely to continue vaping compared with tobacco flavor users, either for those continuing smoking or those having quit smoking by 2018. There was a net shift away from tobacco flavor among those who continued to vape at follow-up.

Conclusions: Use of fruit and other sweet flavored e-liquids is positively related to smokers' transition away from cigarettes.

Implications: With multiple jurisdictions considering limiting or banning the sale of flavored NVPs, it is important to consider how such policies may impact smokers using NVPs to transition away from cigarette smoking. Our results indicate that vapers who used sweet flavors were more likely to transition away from cigarette smoking and quit cigarette use, at least in the short term, compared with those who used tobacco or unflavored NVPs.
Randomized clinical trials are needed to establish if the observed association between use of flavored e-liquids and smoking cessation is due to self-selection or is truly causal.

Lindpere V, Winickoff JP, Khan AS, Dong J, Michaud TL, Liu J, Dai HD. Reasons for E- cigarette Use, Vaping Patterns, and Cessation Behaviors Among US Adolescents.
Nicotine Tob Res. 2023 Apr 6;25(5):975-982. doi: 10.1093/ntr/ntac278 Abstract

Introduction: This study sought to examine reasons for youth e-cigarette use in association with vaping patterns and cessation behaviors.

Aims and methods: A national representative sample of current (past 30-day) e-cigarette users in grades 6-12 was analyzed using the National Youth Tobacco Survey (NYTS), conducted from January to March 2020. An exploratory oblique factor analysis using a rotated pattern matrix to select salient variable-factor relationships yielded four subscales related to reasons for youth e-cigarette use. Multivariate logistic regressions were performed to assess the associations of each subscale with vaping patterns (frequent e-cigarette use, dual use of e-cigarettes and other tobacco products) and vaping cessation behaviors (intention to quit vaping and past-year quit attempts).

Results: The 2020 NYTS sampled 180 schools with 1769 current e-cigarette users. Four main reasons for vaping were identified through factor analysis, including (1) replacing cigarettes, (2) product characteristics [eg, flavors, concealability, and vape tricks], (3) family/friend use, and (4) curiosity. Curiosity was associated with lower odds of frequent e- cigarette use (adjusted odds ratio [AOR] = 0.5, $p < .0001$) and dual use of e-cigarettes and other tobacco products (AOR = 0.6, $p = .01$) but higher odds of intention to quit (AOR = 1.2, $p = .26$) and past year quit attempts (AOR =1.5, $p = .01$). Vaping due to product characteristics was associated with higher odds of frequent e-cigarette use (AOR = 1.7, $p <
.0001$) and lower odds of intention to quit (AOR = 0.3, $p < .0001$) and past year quit attempts (AOR = 0.9, $p = .01$).

Conclusions: Adolescents vape for various reasons that follow distinct patterns and user characteristics. Overall, interventions tailored to address heterogeneous reasons for vaping may help optimize the reduction in youth e-cigarette use.

Implications: E-cigarettes have surpassed cigarettes and become the most commonly used tobacco product by US youths. Adolescents choose to vape for different reasons. This study examined reasons for youth e-cigarette use and their associations with vaping patterns and cessation behaviors. The product characteristics factor (eg, flavors, concealability, and vape tricks) was associated with more frequent e-cigarette use and lower odds of cessation behaviors, suggesting a need for flavor bans and product design regulation.

Mok Y, Jeon J, Levy DT, Meza R. Associations Between E-cigarette Use and E- cigarette Flavors With Cigarette Smoking Quit Attempts and Quit Success: Evidence From a US Large, Nationally Representative 2018–2019 Survey. Nicotine and Tobacco Research. 2023 Mar 1;25(3):541-52.

Abstract
Introduction: Although many studies have examined the association between e-cigarette use and smoking cessation, fewer have considered the impact of e-cigarette flavors on cessation outcomes. This study extends previous studies by examining the effects of e- cigarette use and e-cigarette flavors on quit attempts and quit success of smoking.

Aims and Methods: We used data from the 2018–2019 Tobacco Use Supplement-Current Population Survey (TUS-CPS) survey. Multivariate logistic regression analyses were used to investigate the associations between flavored e-cigarette use with quit attempts and quit success of smoking among individuals who smoked 12 months ago. Two current e-cigarette use definitions were used in these logistic regression analyses; currently use every day or some days versus 20+ days in the past 30 days.

Results: Compared to those not using e-cigarettes, current every day or someday e- cigarette use with all nontobacco flavors had an adjusted odds ratio (AOR) of 2.9 (95% CI: 2.4 to 3.5) for quit attempts and 1.7 (95% CI: 1.3 to 2.2) for quit success. 20+ days e-

cigarette use with flavors had stronger associations with quit attempts (AOR = 4.2, 95% CI: 3.1 to 5.5) and quit success (AOR = 4.0, 95% CI: 2.9 to 5.4). E-cigarette users with nontobacco flavors were more likely to succeed in quitting compared to those exclusively using non-flavored or tobacco-flavored e-cigarettes. Menthol or mint flavor users had slightly higher odds of quit attempts and success than users of other nontobacco flavors.

Conclusions: E-cigarette use is positively associated with both making smoking quit attempts and quit success. Those using flavored e-cigarettes, particularly menthol or mint, are more likely to quit successfully.

Implications: E-cigarette use is positively associated with both making a quit attempt and quit success, and those using flavored e-cigarettes are more likely to successfully quit smoking, with no statistically significant differences between the use of menthol or mint- flavored e-cigarettes versus the use of other nontobacco flavored products. This suggests that the potential for e-cigarettes to help people who currently smoke quit could be maintained with the availability of menthol or mint-flavored e-cigarettes, even if other nontobacco flavored products, which are associated with e-cigarette use among youth, were removed from the market.

Abstract
Background and Aims: There is concern that young people may be attracted to e-liquid flavours, prompting long-term vaping in naive users and potentially subsequent tobacco smoking. We aimed to review the use of e-liquid flavours by young people and describe associations with uptake or cessation of both regular vaping and tobacco smoking, adverse effects and subjective experiences.

Design: Systematic review, including interventional, observational and qualitative studies reporting on the use of e-cigarette flavours by young people (aged < 18 years).

Setting: Studies published in English language from any country or cultural setting.

Participants: Young people and their carers (aged < 18 years).

Measurements: A meta-analysis was not possible due to substantial heterogeneity, inconsistency in reporting of flavour categorizations and non-interventional study designs; thus, we narratively report findings.

Findings: In total, 58 studies were included. The quality of the evidence was extremely low. Most (n = 39) studies were cross-sectional survey designs. In total, 11 longitudinal cohort studies assessed trajectories; eight qualitative studies reported on user experiences. Studies reported views and experiences of a total of 512 874 young people. Both cross-sectional and longitudinal studies suggested that flavours are important for initiation and continuation of vaping. Qualitative evidence shows interest and enjoyment in flavours. There was judged to be insufficient evidence that use of e-liquid flavours specifically is associated with uptake of smoking. No studies found clear associations between flavours and cessation in this population. We found no included reports of adverse effects of flavours.

Conclusions: Flavours may be an important motivator for e-cigarette uptake, but the role of flavours in tobacco smoking uptake or cessation is unclear. The quality of the evidence on use of e-cigarette

flavours by young people is low overall.