The UK Electronic Cigarette Research Forum

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Electronic Cigarette Research Briefing – November 2023

This research briefing is part of a series of quarterly updates aiming to provide an overview of new studies on electronic cigarettes. The briefings are intended for researchers, policy makers, health professionals and others who may not have time to keep up to date with new findings and would like to access a summary that goes beyond the study abstract. The text below provides a critical overview of each of the selected studies then puts the study findings in the context of the wider literature and research gaps.

The studies selected do not cover every e-cigarette-related study published each quarter. Instead, they include high profile studies most relevant to key themes identified by the UK Electronic Cigarette Research Forum, including efficacy and safety, smoking cessation, population level impact and marketing. For an explanation of the search strategy used, please see the end of this briefing.

Let's talk e-cigarettes – University of Oxford podcasts

Jamie Hartmann-Boyce and Nicola Lindson discuss emerging evidence in e-cigarette research. In the September 2023 episode, Andrea Leinberger-Jabari from the Public Health Research Center at New York University, Abu Dhabi, United Arab Emirates talks about her study of e-cigarettes and heated tobacco products in people in the United Arab Emirates (UAE). This podcast is a companion to the Cochrane living systematic review of e-cigarettes for smoking cessation and shares the evidence from the monthly searches. Subscribe with iTunes or Spotify to listen to regular updates or find all episodes on the University of Oxford Podcasts site. This podcast series is funded by Cancer Research UK (CRUK).

Cochrane Living Systematic Review of E-cigarettes for Smoking Cessation update

The latest update to the CRUK-funded Cochrane Living Systematic Review of E-cigarettes for Smoking Cessation was published in November 2022 and includes 17 new studies. Visit the website (https://www.cebm.ox.ac.uk/research/electronic-cigarettes-for-smoking-cessation-cochrane-living-systematic-review-1) for full information on the review, including briefing documents, and new studies found since the update. An update is currently underway, and will likely be available in the new year.

Cancer Research UK Policy Briefing on e-cigarette packaging and retail appeal

Cancer Research UK recently published a policy briefing on e-cigarette packaging and retail appeal, based on two CRUK-funded research reports. The policy briefing combines findings from both research projects and outlines Cancer Research UK's policy recommendations.

You can find our previous research briefings at www.cruk.org/UKECRF.

If you would prefer not to receive this briefing in future, just let us know.

Introduction

This quarter, we include one new systematic review, one mixed methods study in adults, and three studies examining product perceptions and visibility in youth. The latter is a highly topical research area as discussions regarding the best way to reduce youth vaping in the UK (and beyond) continue.

Taylor *et al* discuss the harm reduction evidence in their systematic review of tobacco specific nitrosamines (TSNAs). They found that switching from smoking to vaping reduced TSNAs, and that TSNAs were lower in people who exclusively vaped than those who exclusively smoked. There was no evidence of a difference in TSNAs between people who stopped smoking via vaping versus via other means.

Blackwell *et al* conducted an online experimental study to determine the effect of e-cigarette retail displays on children's susceptibility to smoking and vaping. In the full sample, there was no evidence to suggest susceptibility was increased by retail displays' visibility or proportion of e-cigarette images. However, in a subgroup of children who visit stores regularly and/or pay more attention to displays, viewing a higher proportion of e-cigarette images increased susceptibility to smoking, and viewing higher visibility e-cigarette displays reduced the perceived harm of smoking. Authors call for review of the current regulatory discrepancy between tobacco and e-cigarette point of sale marketing in the UK[1]. **Parnham *et al*** also call for review and reinforcement of existing UK policy. They analyzed data from the ASH (Action on Smoking and Health) youth survey (aged 11-18) regarding changes in probability of noticing tobacco cigarettes and e-cigarette displays in different types of shops and sources of these products over time. Likelihood of noticing tobacco cigarettes on display fell over time as the likelihood of noticing e-cigarettes on display rose. Teen e-cigarette users were more likely to get their e-cigarettes from small shops (as opposed to supermarkets) in 2022 compared to preceding years. The authors flag that these data suggest current policies to limit awareness of e-cigarette displays among adolescents in the UK are not effective, and that further work needs to be done to reinforce existing policies to deter use.

Like Blackwell, **Simonavicius *et al*** also conducted an online experimental study in youth, aiming to compare the appeal and harm perceptions associated with e-liquid packaging in participants aged 16-19. They tested different variations of packaging and found that standardized packaging of e-liquids was associated with lower interest in trying the e-liquid and perceptions of greater health risk. The authors conclude that standardized packaging may be an avenue for reducing the appeal of vaping to young people, but that it may discourage people who smoke from switching to vaping as a means to reduce harm.

Finally, **Ward *et al*** explored perceptions on merging commercial and medical routes to vaping in the UK. Views were mixed, reflecting different concerns around vaping and its potential medicalization. Some people viewed a medical route as positive and others raised concerns including conflicts of interest, normalizing nicotine use in young people, and removing some of the pleasurable aspects of vaping. Informal referral by a heath care provider to a vape shop was most popular intervention among respondents, with over three quarters indicating they thought it would be helpful; this is compared to just over half of respondents agreeing that e-cigarettes on prescription would be helpful.

[1] Tobacco is required to be kept behind the counter and out of sight, whereas there is no regulation of vaping product displays.

Taylor *et al.* **Exposure to Tobacco-Specific Nitrosamines Among People Who Vape, Smoke, or do Neither: A Systematic Review and Meta-Analysis**

Study aims

This systematic review and meta-analysis aimed to add to the findings of the September 2022 report commissioned by the Office for Health Improvement and Disparities. The study investigated tobacco-specific nitrosamines ('TSNAs'), a group of toxicants found in tobacco and tobacco smoke, in people who exclusively smoked, exclusively vaped and neither smoked nor vaped. Databases were searched between August 2017 and March 2022 for peer-reviewed articles reporting TSNA metabolites (NNAL, NNN, NAB, and NAT) levels in bio-samples. 22 papers were included and meta-analyses were conducted where possible.

Key findings

- Levels of all TSNAs fell in longitudinal studies when participants switched from smoking to vaping and were lower among people who exclusively vaped than among those who exclusively smoked in cross-sectional studies. Where significance was tested, most results were significant.

- In longitudinal studies, levels of TSNAs were similar among people who stopped smoking using e-cigarettes and those who stopped smoking without use of nicotine products. In cross-sectional analyses, TSNA levels were found to be lower among people who neither smoked nor vaped than among those who exclusively vaped.

- In longitudinal studies, levels of TSNAs reduced over time in both participants who continued vaping and those who stopped.

Limitations

- There was considerable heterogeneity between studies, limiting ability to pool and compare results.

- Seven of the 22 included studies were funded by the tobacco industry and therefore subject to bias.

- Small subgroup sizes may have limited power to detect effects.

- There was potential for confounding by previous tobacco use and second hand smoke exposure.

- Not all studies biochemically verified smoking abstinence, so some results may have been affected by noncompliance.

Taylor E, Simonavičius E, McNeill A, Brose LS, East K, Marczylo T, Robson D. Exposure to Tobacco Specific Nitrosamines among people who vape, smoke or do neither. A Systematic Review and Meta Analysis. Nicotine Tob Res. 2023 Aug 24:ntad156. doi: 10.1093/ntr/ntad156. Epub ahead of print. PMID: 37619211.Ward et al.

Blackwell *et al.* Impact of e-cigarette retail displays on attitudes to smoking and vaping in children: an online experimental study

Study aims

This UK online experimental study aimed to investigate the effects of retail displays of e-cigarettes on children's susceptibility to smoking and vaping. 1,034 children aged 13-17 were recruited via a research agency to complete an online survey. Participants viewed 12 images of retail displays that contained e-cigarettes or unrelated products. E-cigarette display images were either high or low visibility, based on a conspicuousness score, and made up of a low (25%) or high (75%) proportion of e-cigarettes. Participants were randomised to one of four groups: (1) 75% e-cigarettes, high visibility; (2) 25% e-cigarettes, high visibility; (3) 75% e-cigarettes, low visibility; (4) 25% e-cigarettes, low visibility. The reference categories for visibility and proportion were low visibility and 25% e-cigarettes respectively. The primary outcome was susceptibility to smoking (among those who had never smoked, n = 781). The secondary outcomes were susceptibility to vaping (among participants who had never vaped, n = 825) and harm perceptions of cigarette smoking and vaping (among all participants).

Key findings

- No association was found between retail visibility and smoking susceptibility in the main analysis or subgroup analyses. There was a negative association between retail visibility and harm perceptions of smoking (mean difference -0.19, 95% CI −0.34 to −0.04, p=0.016). There was no significant association between the proportion of e-cigarette images displayed and susceptibility to smoking in the main analysis.
- There was a significant association between proportion of e-cigarette images and susceptibility to smoking in subgroup analysis of children who responded that they visited retail stores frequently (n=524, OR=1.59, 95% CI 1.04 to 2.43, p=0.034) and who passed the 'attention check,' (n=880, OR=1.43, 95% CI 1.03 to 1.98, p=0.031).There was no significant association between proportion of e-cigarette images and harm perceptions of smoking.
- There was no significant association between e-cigarette retail visibility or proportion and susceptibility to vaping and harm perceptions of vaping.

Limitations

- The study used self-reported outcomes of susceptibility and harm perception and so was unable to measure behavioural outcomes.
- Significant effects were only observed in subgroup analyses with relatively small sample sizes and so the study may be underpowered to detect effects.
- There may be confounding effects of retail displays viewed by participants in their day to day lives outside the study. For example, e-cigarettes may be displayed near to tobacco storage units, exposing participants to smoking cues.

- The participants in this study were the children of members of the research agency's existing panel and parents were asked to pass on the study task for their child to complete (or to choose one of their children to pass it to, if they had more than one), introducing possible sampling bias.
- The images used in the study were taken in 2020 and may not be representative of current displays, particularly of disposable devices.
- Data were collected in January 2021, during Covid-19 restrictions and prior to the increase in popularity of disposable devices, and so may not reflect current perceptions.
- Survey questions about the area where participants lived, including information on socioeconomic position, were not mandatory, so it was not possible to investigate any effect of socioeconomic position.

Blackwell AKM, Pilling MA, De-Loyde K, Morris RW, Brocklebank LA, Marteau TM, Munafò MR. Impact of e-cigarette retail displays on attitudes to smoking and vaping in children: an online experimental study. Tob Control. 2023 Aug;32(e2):e220-e227. doi: 10.1136/tobaccocontrol-2021-056980. Epub 2022 Apr 13. PMID: 35418506; PMCID: PMC10423515.

Parnham *et al.* Changing awareness and sources of tobacco and e-cigarettes among children and adolescents in Great Britain

Study aims

This study analysed data from 12,040 respondents to the Action on Smoking and Health Smokefree Great Britain Youth Survey between 2018 and 2022. It investigated changes in probability of noticing tobacco cigarette and e-cigarette displays in different types of shops and sources of these products over time.

Key findings

- Respondents were significantly less likely to report noticing tobacco cigarettes in both supermarkets (aOR 0.71, 95% CI 0.61-0.82, p<0.001) and small shops (aOR 0.45, 95% CI 0.38-0.54, p<0.001) in 2022 than in 2018. Respondents were significantly more likely to notice e-cigarettes in supermarkets (aOR 1.57, 95% CI 1.35-1.81, p<0.001) in 2022 than in 2018, but there was no significant difference between 2018 and 2022 in small shops.
- There were no significant differences in sources of tobacco cigarettes between 2018 and 2022.
- Participants were significantly more likely to acquire e-cigarettes from small shops in 2022 than in 2019 (aOR 2.02, 95% CI 1.24-3.29, p<0.01) and less likely to acquire them online (aOR 0.32, 95% CI 0.17-0.58, p<0.001).
- Compared to respondents aged 18, those aged 14-15 (aOR 0.33, 95% CI 0.14-0.77, p<0.05) and 16-17 (aOR 0.54, 95% CI 0.31-0.95, p<0.05) were less likely to acquire e-cigarettes from supermarkets.
- Compared to respondents aged 18, those aged 14-15 (aOR 4.28, 95% CI 2.45-7.47, p<0.001) and 16-17 (aOR 1.77, 95% CI 1.20-2.60, p<0.01) were more likely to acquire e-cigarettes from other sources such as from friends and family.

Limitations

- There were some missing data and some subsample sizes were small, which may have limited ability to detect effects.
- The survey years included the Covid-19 pandemic, which may have influenced participants' activities.
- As the data is cross-sectional, causality cannot be confirmed.
- Participants were able to report multiple sources for acquiring their products, so the study is unable to explore any relationship between sources.
- Participants used their own judgment for responding to the question about sources and so may have used varying definitions of supermarkets and small shops.
- No information on participants' ethnicity was available.

Parnham JC, Vrinten C, Cheeseman H, Bunce L, Hopkinson NS, Filippidis FT, Laverty AA. Changing awareness and sources of tobacco and e-cigarettes among children and adolescents in Great Britain. Tob Control. 2023 Jul 30:tc-2023-058011. doi: 10.1136/tc-2023-058011. Epub ahead of print. PMID: 37524388.

Simonavičius *et al.* Impact of E-liquid Packaging on Vaping Product Perceptions Among Youth in England, Canada, and the United States: A Randomized Online Experiment

Study aims

This online experimental study aimed to compare the appeal and harm perceptions associated with e-liquid packaging. Participants (*n* = 13,801) aged 16-19 in the International Tobacco Control Policy Evaluation Project Youth Tobacco and Vaping Survey in England, Canada and the US were randomised to one of six conditions: (1) branded pack and low-nicotine e-liquid, (2) branded pack and high-nicotine e-liquid; (3) standardized white pack and low-nicotine e-liquid (4) standardized white pack and high-nicotine e-liquid, (5) standardized olive pack and low-nicotine e-liquid and (6) standardized olive pack and high-nicotine e-liquid. Participants viewed images of four brands of e-liquid packaging with health warnings and nicotine content labelling relevant to each individual country. They were asked which of the e-liquids they would be interested in trying and could select one of the images or respond that they had no interest in trying any of them, 'Don't know' or 'Refused'. Participants who refused were excluded from the study. Participants were also shown a 'youth-oriented' e-liquid pack and asked to select a response for how harmful it would be to vape the product. Participants who refused to answer this question were also excluded from the study. Outcomes were the proportion of respondents expressing no interest in trying any of the products and reported harm perceptions.

Key findings

- Compared with the branded e-liquid packs, participants were statistically significantly more likely to report no interest in trying e-liquids in the standardized white (aOR 1.48, 95% CI 1.34-1.64, p<.001) or the standardized olive (aOR 1.62, 95% CI 1.47-1.80, p<.001) packs.
- There was no significant association between nicotine content and reporting no interest in trying any of the products.

- Participants who had a history of smoking and/or vaping were significantly less likely to report having no interest in trying any of the products.
- Compared with the branded packaging, participants were less likely to respond that e-liquids in the standardised white packaging were 'not at all harmful' (aOR 0.62, 95% CI 0.46 to 0.84, p=.002) and more likely to respond that they were 'as harmful, more harmful or don't know' (aOR 1.22, 95% CI 1.11 to 1.34, p<.001).
- Compared with the branded packaging, participants were less likely to respond that e-liquids in the standardised olive packaging were 'not at all harmful' (aOR 0.75, 95% CI 0.56 -0.998) .049) and more likely to respond that they were 'as harmful, more harmful or don't know' (aOR 1.29, 95% CI 1.18 -1.41, p<.001).
- There were no significant differences in harm perceptions between the standardised white and olive packaging.

Limitations

- Some subgroups were relatively small, which may have limited power to detect effects.
- Participants were shown images of the products on a screen rather than the products themselves, which may affect the validity of the results.
- There was no nicotine-free version of the packaging image and participants were not asked whether they had noticed the nicotine level, so it is unclear whether or to what extent the nicotine condition affected the results.
- The sample was recruited from commercial research panels, which may limit the generalisability of the findings.

Simonavičius E, East K, Taylor E, Nottage M, Reid JL, Arnott D, Bunce L, McNeill A, Hammond D. Impact of e-liquid packaging on vaping product perceptions among youth in England, Canada, and the United States; a randomised online experiment. Nicotine Tob Res. 2023 Aug 5:ntad144. doi: 10.1093/ntr/ntad144. Epub ahead of print. PMID: 37542732.

Ward *et al.* Medicalisation of vaping in the UK? E-cigarette users' perspectives on the merging of commercial and medical routes to vaping

Study aims

This UK mixed-methods study represented the second phase of a longitudinal study into patterns of use. It aimed to investigate the perspectives of people with experience of using e-cigarettes in a smoking cessation attempt on the helpfulness of interventions involving partnership working between the vaping industry and healthcare professionals. 147 participants completed an online survey, 25 took part in a telephone interview and 12 were interviewed in person. Participants were provided with 14 examples of these interventions and asked to rate how helpful each would have been for them or someone else to stay abstinent from smoking. The paper focuses on the 3 most common partnership practices in the UK: healthcare practitioner signposting to a vape shop; vape shop voucher schemes; in-house vape shop smoking cessation behavioural support; and the possible plans for e-cigarettes to be available on prescription. Participants completing the survey online could also fill in a free-text box to add further detail to their responses.

Key findings

- In the qualitative analysis, 3 overarching themes were identified: 'pro-partnership', 'anti-partnership' and 'medicalisation dissonance'.

- Pro-partnership views included that it could provide reassurance about the health effects, device safety and the quality of the advice received for those interested in using an e-cigarette to stop smoking, potential benefits for the NHS of preventing smoking-related harms and improving affordability for lower socioeconomic groups.

- Anti-partnership views included potential for fraud and abuse of vouchers or prescriptions, placing an additional financial burden on the NHS, ethical concerns about normalising the use of nicotine in young people and the potential for conflicts of interest where the vaping industry has a commercial interest in supplying its products.

- Medicalisation dissonance views included that vaping should remain predominantly commercial, as it has already been demonstrated to effectively help people to stop smoking, and the role of health professionals should be limited to providing advice about e-cigarettes as a cessation tool. Concerns were expressed that partnerships with healthcare professionals could lead to restrictions of the pleasurable aspects of vaping such as flavours and modifying and collecting different devices.

- Among respondents to the questionnaire, informal referral by a healthcare practitioner to a local vape shop was the most popular intervention, with 77% agreeing it to be very or extremely helpful in supporting themselves or others to stop smoking. 66.5% agreed that receiving a voucher from a healthcare professional would have been very or extremely helpful. The third most popular intervention was the potential availability of e-cigarettes on prescription, with 56% of respondents selecting that this would be very or extremely helpful, but this also had the highest proportion of responses (17.2%) that it would have not been at all helpful.

- No significant associations were found between gender, socioeconomic status and age and probability of giving any rating to the interventions.

Limitations

- Data were gathered between March 2018 and March 2019 and so may not reflect current perspectives, particularly with regard to disposable e-cigarettes.

- The sample was predominantly male and only 3 participants were from an ethnic minority background, limiting generalisability to the wider UK population.

- All participants already had experience of using an e-cigarette in a cessation attempt and most were abstinent from smoking, so the sample may have been more likely to feel positively about e-cigarettes for smoking cessation.

- As the sample was a convenience sample recruited as part of a wider study, participants were not recruited with the intention of addressing the question of partnership interventions.

- The sample size was relatively small, limiting power to detect effects in the quantitative analysis.

Ward E, Dawkins L, Holland R, Pope I, Notley C. Medicalisation of vaping in the UK? E-cigarette users' perspectives on the merging of commercial and medical routes to vaping. Perspect Public Health. 2023 Aug 6:17579139231185481. doi: 10.1177/17579139231185481. Epub ahead of print. PMID: 37544328.

Search strategy

The Pubmed database is searched in the middle of every third month, for the previous three months using the following search terms: e-cigarette*[title/abstract] OR electronic cigarette*[title/abstract] OR e-cig[title/abstract] OR (nicotine AND (vaporizer OR vapourizer OR vaporiser OR vapouriser OR vaping)).

Based on the titles and abstracts new studies on e-cigarettes that may be relevant to health, the UK and the UKECRF, key questions are identified. Only peer-reviewed primary studies and systematic reviews are included – commentaries are not included. Please note studies funded by the tobacco industry are also excluded.

This briefing is produced by Julia Cotterill from Cancer Research UK with assistance from Associate Professor Jamie Hartmann-Boyce at the University of Oxford, primarily for the benefit of attendees of the CRUK UK E-Cigarette Research Forum. If you wish to circulate to external parties, do not make any alterations to the contents and provide a full acknowledgement. Kindly note Cancer Research UK cannot be responsible for the contents once externally circulated.