The UK Electronic Cigarette Research Forum

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Electronic Cigarette Research Briefing – August 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 July 2023 episode, they interview Assistant Professor of Psychology, Joanna Streck, from the Department of Psychiatry at Massachusetts General Hospital in the US. Joanna Streck talks about her new study looking at the feasibility, acceptability and preliminary effects of switching from combustible cigarettes to e-cigarettes in individuals in treatment for opioid use disorder.

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.

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.

Commentary

Though many trials now show e-cigarettes can help people quit smoking[1], it is unclear how best to maximize the chances of e-cigarettes helping people to quit smoking, whist minimizing risks of uptake from non-smokers. Four of the studies contributing to this month's update provide some data relevant to this question, and the fifth looks at how different scenarios may play out.

The first study this quarter **(Tackett *et al*)** – a relatively small, short-term experimental study - looked at associations between appeal ratings for e-cigarette flavours and smoking history. Non-tobacco flavours were preferred over tobacco for all people who currently vaped, regardless of smoking history; however, in people who smoked but did not vape, there was no clear evidence that non-tobacco flavours were more appealing than tobacco. The authors conclude that non-tobacco flavour restrictions may eliminate products preferred by adults who vape without discouraging adults who smoke from trying to switch to e-cigarettes.

Gravely *et al* used data from a population-level survey of adults in the US, Canada and England to examine any associations between vaping device and vaping for smoking cessation. Overall, participants reporting using tank and cartridge/pod devices were more likely to report using the devices to try to stop smoking than those using disposable devices. This study was limited to adults who both smoked and vaped at least weekly at the time of the survey.

Nguyen *et al* conducted a longitudinal qualitative study of US young adults who tried to quit or reduce smoking by vaping. Participants who reported positive perceived physical effects of switching from smoking to vaping (e.g. reduced coughing), those who reported satisfaction and enjoyment from vaping, and those who reported changing environmental contexts (e.g. less exposure to smoking triggers) were more likely to successfully quit smoking. Perceived physical discomforts from vaping (e.g. dry mouth), perceived addictiveness, not finding e-cigarettes as satisfying as smoking, and device malfunction were all associated with continued smoking.

Kimber *et al* conducted an online experiment to try to identify effective components of interventions using e-cigarettes for smoking cessation. Participants randomized to receive both text message support and advice on flavour choice were more likely to succeed in quitting at 4 weeks than those who did not receive both components. No other significant effects were found.

Overall, these four studies contribute data relevant to people designing and testing interventions or policies which aim to support (or at least not discourage) switching from smoking to vaping. Our fifth study had a different scope. **Vu *et al*** conducted a systematic review of modelling studies aiming to predict the long-term effects of e-cigarette use on population health. They included 32 studies overall. Of the 21 investigating mortality, 18 projected improvements in mortality outcomes when comparing scenarios in which e-cigarettes were available alongside tobacco cigarettes compared to a hypothetical scenario where only cigarettes were available; 3 projected the opposite. Similarly, of the 23 investigating smoking prevalence, 19 projected reduced smoking following the introduction of e-cigarettes, and 4 projected the opposite. Most studies used data from the US, and seven were affiliated with the tobacco industry. Those that predicted worse health outcomes associated with e-cigarettes tended to assume high uptake of vaping among people who did not smoke, as well as e-cigarettes discouraging cessation. Modelling studies rely on solid underlying data, and these projections may well change over time.

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[1] Hartmann-Boyce J, Lindson N, Butler AR, McRobbie H, Bullen C, Begh R, Theodoulou A, Notley C, Rigotti NA, Turner T, Fanshawe TR, Hajek P. Electronic cigarettes for smoking cessation. Cochrane Database of Systematic Reviews 2022, Issue 11. Art. No.: CD010216. DOI: 10.1002/14651858.CD010216.pub7.

Tackett *et al.* [Appeal of e-cigarette flavors: Differences between never and ever use of combustible cigarettes](#)

Study aims

This US study aimed to identify any associations between nicotine use history and e-liquid flavour preference. 119 adults aged 21 or over who currently smoked and/or vaped took single standardized puffs of eight non-tobacco flavoured and two tobacco-flavoured e-liquids in both nicotine salts and freebase formulations using a pod-style device. Participants then rated the appeal of the e-liquids. Appeal ratings were compared between four use groups: people who never smoked/currently vaped, formerly smoked/currently vaped, currently smoked/currently vaped, and currently smoked/did not vape (with interest in vaping).

Key findings

- When all non-tobacco and all tobacco flavours were combined, appeal was significantly higher for non-tobacco than tobacco flavours in those who never smoked/currently vaped (difference in mean appeal ratings (B) 13.6, 95% CI 4.1–23.1, p = 0.028), formerly smoked/currently vaped (B 11.6, 95% CI 4.2–18.9, p = 0.022) and currently smoked/currently vaped (B 9.3, 95% CI 2.5–16.0, p = 0.028) but not among those who currently smoked/did not vape.

- Among people who had never smoked and currently vaped, appeal was significantly higher for strawberry (B 24.4, 95% CI 9.5–39.3, p = 0.022), peppermint (B 23.2, 95% CI 8.3–38.0, p = 0.028), and menthol (B 20.3, 95% CI 5.5–35.1, p = 0.028) than tobacco flavours combined.

- Among people who had formerly smoked and currently vaped, appeal was significantly higher for strawberry (B 24.1, 95% CI 13.4–34.8, p < .001), peppermint (B 20.0, 95% CI 8.9–31.2, p = 0.009), and vanilla (B19.9, 95% CI 9.1–30.8, p = 0.009) than tobacco flavours combined.

- Among people who currently both smoked and vaped, appeal was higher for peppermint (B 16.6, 95% CI 6.0–27.3, p = 0.022) and vanilla (B 18.9, 95% CI 8.8–29.0, p = 0.009) than tobacco flavours combined.

- Among people who currently smoked and did not vape, none of the non-tobacco flavours were found to be significantly more appealing than the tobacco flavours combined.

Limitations

- Participants were recruited from the Los Angeles region, limiting generalisability.

- The mean nicotine concentration used was 23.4, which is higher than the legal limit in the UK.

- Participants sampled a single standardised puff of 20 different flavour/formulation combinations using the same device, which may have made it difficult for them to meaningfully differentiate between so many combinations.

- Subsample sizes were small (n = 14-53) and confidence intervals were wide.

- The use groups also differed by characteristics such as age, ethnicity and level of tobacco dependence, which may also limit generalisability of the findings.

- As both tobacco flavours were combined, it was not possible to assess whether either was found more appealing than the other flavours in the study.

Tackett AP, Dai HD, Han DH, Vogel EA, Coreas SI, Jafarzadeh N, Gonzalez Anaya MJ, Patel D, Peraza N, Mason TB, Leventhal AM. Appeal of e-cigarette flavors: Differences between never and ever use of combustible cigarettes. Drug Alcohol Depend. 2023 May 1;246:109849. Doi: 10.1016/j.drugalcdep.2023.109849. Epub 2023 Mar 23. PMID: 37028103; PMCID: PMC10161874.

Gravely *et al.* [An examination of quitting smoking as a reason for vaping by the type of nicotine vaping device used most often among adults who smoke and vape: Findings from the Canada, England and the United States 2020 ITC Smoking and Vaping Survey](#)

Study aims

This study used data from the 2020 ITC Smoking and Vaping Survey to examine any association between type of device mostly used and selecting 'Vaping might help me stop smoking cigarettes' in response to a question about reasons for vaping. Responses from adults in the US, Canada and England (n=2,324) who reported both smoking and vaping at least weekly were analysed. The percentage of participants who reported vaping to stop smoking was compared between those who mainly used disposable, cartridge/pod and tank devices. Results were adjusted for age, sex, country (except for country-specific results), smoking frequency and vaping frequency.

Key findings

- Respondents using tank (aOR 2.53, 95% CI 1.73–3.68, p < 0.001) or cartridge/pod (aOR 1.56, 95% CI 1.09–2.23, p = 0.02) devices were significantly more likely than those using disposable devices to respond that they were vaping to stop smoking. Respondents using tanks were also significantly more likely than those using cartridges/pods (aOR 1.62, 95% CI 1.21–2.17, p = 0.001) to report this reason.

- In England, participants using tank (aOR 2.90, 95% CI 1.56–5.37, p = 0.001) or cartridge/pod (aOR 2.01, 95% CI 1.10–3.69, p = 0.03) devices were also significantly more likely than those using disposable devices to report vaping in order to quit smoking, but there was no difference between tank and cartridge/pod devices.

- Participants aged 25-39 were significantly less likely than those aged 18-24 to report that they were vaping to quit smoking (aOR 0.68, 95% CI 0.51-0.92, p = 0.001). There was no significant difference between those aged 40+ and those aged 18-24 in vaping to quit smoking.

- Participants who vaped weekly were significantly less likely than those who vaped daily to report vaping in order to stop smoking (aOR 0.72, 95% CI 0.55-0.94. p = 0.02).

- Participants who smoked weekly were significantly more likely than those who smoked daily to report vaping in order to stop smoking (aOR 1.4, 95% CI 1.02-1.91, p = 0.04).

Limitations

- The data were collected in February-June 2020, during the early stages of the Covid-19 pandemic and before the recent increase in use of disposable devices (13.8% of respondents reported using disposable devices), and so may not reflect the current situation.

- The study population was limited to adults who both smoked and vaped at least weekly and included a relatively small proportion who used disposable devices, so may not generalise to wider populations and patterns of use.

- The survey relies on self-reported data and so is subject to bias.

- Participants were asked about the type of device they used most often, so the data would not reflect use of more than one type by the same person.

- The survey question about reasons for vaping permitted participants to select more than one response, so stopping smoking may not have been the only or primary reason for using e-cigarettes for all respondents who chose this response.

- The phrasing of the response stated that vaping 'might' help with stopping smoking, so it is unclear whether or to what extent device types were being used in specific quit attempts.

- There may be additional confounders not adjusted for.

- The definition of disposable device given in the survey question specified that the device was not rechargeable and so would not capture any illicit rechargeable disposable devices with larger than permitted tank sizes.

Gravely S, Yong HH, Reid JL, East KA, Liber AC, Michael Cummings K, Quah ACK, Fong GT, Hammond D. An examination of quitting smoking as a reason for vaping by the type of nicotine vaping device used most often among adults who smoke and vape: Findings from the Canada, England and the United States 2020 ITC Smoking and Vaping Survey. Prev Med Rep. 2023 Apr 11;33:102201. Doi: 10.1016/j.pmedr.2023.102201. PMID: 37223550; PMCID: PMC10201827.

Nguyen *et al.* "I'm both smoking and vaping": a longitudinal qualitative study of US young adults who tried to quit smoking cigarettes by using electronic cigarettes

Study aims

This longitudinal qualitative study used annual interviews conducted between 2017 and 2019 with young adults aged 18-29 in California (n=25) who were using e-cigarettes to stop or reduce smoking. Participants were dual using at baseline. Changes in nicotine use patterns were examined between and within individual study participants.

Key findings

- By wave 2 of the study, 14 of the 25 participants continued to dual use with reduced smoking, 7 continued to dual use and did not reduce smoking and 4 transitioned to exclusive vaping.

- By wave 3 of the study, 8 participants continued dual use, 6 transitioned to exclusive vaping, 5 continued dual using with reduced smoking frequency, 4 transitioned to exclusive smoking and 2 participants stopped both smoking and vaping (although one reported still vaping occasionally).

- Three themes were identified associated with successfully replacing cigarette smoking with vaping:

  o perceived positive physical effects attributed to vaping rather than smoking (such as reduced coughing);

  o perceived satisfaction and enjoyment (nicotine satisfaction and enjoying the experience of vaping, such as flavours); and

  o context changes (less exposure to triggers for smoking such as drinking alcohol or spending time with friends who smoke, moving accommodation or employment).

- Four themes were identified associated with not succeeding in replacing smoking with vaping:

  - perceived negative physical discomforts (adverse physical effects such as dry mouth, difficulty breathing or headaches);

  - perceived addictiveness (such as 'chain vaping' resulting in higher nicotine consumption) and harm (such as concerns about chemicals in e-liquids);

  - unsatisfactory substitution for cigarettes (not finding e-cigarettes as satisfying as smoking, perceiving smoking as more effective for relieving stress); and

  - device malfunction (devices leaking or breaking and needing maintenance or replacement).

Limitations

- The participants in this study were drawn from a wider qualitative study, for which the eligibility criteria included using at least two of three products (cigarette, ENDS, smokeless tobacco). It is unclear whether any participants in this study were also using smokeless tobacco, which would be a potential confounder.

- Demographic characteristics of the study population included 76% male, 48% currently in college and 28% of Hispanic/Latino/a/x ethnicity, limiting generalisability to the UK population.

- The study relied on self-reported data, which is subject to bias, and smoking/vaping status was not biochemically verified.

- Due to the variety in devices, e-liquids and patterns of use among participants, it was not possible to identify potential factors contributing to the different experiences of vaping reported.

Nguyen N, Koester KA, Kim M, Watkins SL, Ling PM. "I'm both smoking and vaping": a longitudinal qualitative study of US young adults who tried to quit smoking cigarettes by using electronic cigarettes. Tob Control. 2023 Apr 18:tc-2022-057804. Doi: 10.1136/tc-2022-057804. Epub ahead of print. PMID: 37072166.

Kimber *et al.* E-cigarette support for smoking cessation: Identifying the effectiveness of intervention components in an on-line randomized optimization experiment

Study aims

This online study explored any association between combinations of support interventions and smoking cessation. 1,214 UK adults (aged 18 and over) who smoked and were interested in using an e-cigarette to quit were randomised to receive one of 32 possible combinations of 5 online interventions: (1) tailored advice on E-cigarette device, (2) Tailored advice on nicotine strength, (3) Tailored advice on flavour, (4) brief information on relative harms and (5) text message support. Effects were determined by the average response when the intervention was 'ON' compared to average when it was 'OFF,' across the combinations. Participants received a product recommendation and a voucher for a free starter kit from an online vape shop. The primary outcome was 4-week abstinence at 12 weeks post-randomisation. Secondary outcomes were: the proportion who reported complete abstinence from smoking over the previous 7 days, the proportion who reported 50% or greater smoking reduction in baseline cigarette consumption and adherence to recommendations. Following identification of any significant interactions, remaining main effects were calculated for

intervention components not involved in those interactions. Potential confounders adjusted for were age, gender, ethnicity, socio-economic status (SES), MTSS (motivation to stop smoking), and TFC (time to first cigarette)).

Key findings

- There was a significant two-way interaction between advice on flavour and text message support on 4-week abstinence (OR 1.55, 95% CI 1.13–2.14, p = 0.007) and 50+% smoking reduction (OR 1.41, 95% CI 1.07–1.86, p = 0.016). The odds of abstaining or reducing were greater when both interventions were delivered together than when either was delivered alone or neither was delivered.

- The two-way interaction between flavour and text message support was also significant in relation to 7-day abstinence, but only in the adjusted (OR 1.38, 95% CI 1.02–1.87, p = 0.040) and not the unadjusted model.

- No other significant effects or interactions were found.

- Engagement was at least 86% for all interventions (as reported by participants when asked whether they had adhered to their product recommendation), apart from brief intervention on relative harms, which 19% of participants reported reading.

Limitations

- Data collection took place between April and October 2020, early in the Covid-19 pandemic, which may have influenced smoking and vaping behaviours.

- It was not possible to ensure that participants used the specific product allocated to them, although only study products were available through the link to the online shop.

- Abstinence was self-reported and not biochemically verified.

- Data for the primary outcome were only available from 52% of participants (44% who completed the follow-up survey in full and those who did not respond to the full survey but answered a single follow-up question about whether they had smoked in the previous 4 weeks), limiting the amount of data available and the power to detect effects.

- 97% of the sample was White, limiting generalisability to the wider UK population.

Kimber C, Sideropoulos V, Cox S, Frings D, Naughton F, Brown J, McRobbie H, Dawkins L. E-cigarette support for smoking cessation: Identifying the effectiveness of intervention components in an on-line randomized optimization experiment. Addiction. 2023 Jul 16. Doi: 10.1111/add.16294. Epub ahead of print. PMID: 37455014.

Vu *et al.* [Predicting the long-term effects of electronic cigarette use on population health: a systematic review of modelling studies](#)

Study aims

This systematic review aimed to synthesise the findings of modelling studies carried out into the potential effects of e-cigarettes on population health outcomes. 32 studies were included and assessed mortality, morbidity, health costs in financial terms and general public health costs.

Key findings

- 18 studies projected improvements in mortality when comparing scenarios in which e-cigarettes were available to a hypothetical scenario in which only tobacco cigarettes were available. 3 studies estimated potential detrimental effects on mortality of e-cigarette availability.

- 4 studies examined morbidity and projected positive effects of e-cigarettes on quality-adjusted life year ('QALY') or quality-adjusted life expectancy ('QALE'), in specific policy scenarios.

- 19 studies projected reduced smoking prevalence following the introduction of e-cigarettes. 4 studies projected higher smoking rates.

- Studies that predicted detrimental health outcomes associated with e-cigarettes generally assumed high uptake of vaping among people who did not smoke and that e-cigarettes would discourage smoking cessation.

Limitations

- Most studies used US population data, and no modelling studies were available from low- and middle-income countries, limiting their applicability to other countries.

- It was not possible to conduct a meta-analysis due to the heterogeneity of the underlying studies.

- It was also not possible to assess risk of bias, as no suitable tool exists for reviews of modelling studies.

- 7 studies were affiliated with the tobacco industry.

- Only 6 studies incorporated tobacco- and e-cigarette-related policies into their models. Most used historical data or expert opinions on transition probabilities between use states.

Vu GT, Stjepanović D, Sun T, Leung J, Chung J, Connor J, Thai PK, Gartner CE, Tran BX, Hall WD, Chan G. Predicting the long-term effects of electronic cigarette use on population health: a systematic review of modelling studies. Tob Control. 2023 Jun 9:tc-2022-057748. doi: 10.1136/tc-2022-057748. Epub ahead of print. PMID: 37295941.

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 and Alice Davies 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,