The UK Electronic Cigarette Research Forum

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Electronic Cigarette Research Briefing – August 2024

This research briefing is part of a series of quarterly updates aiming to provide an overview of new studies on electronic cigarettes (e-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 latest episode, Jamie Hartmann-Boyce and Nicola Lindson interview Louise Ross from the National Centre for Smoking Cessation and Training (NCSCT). 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 January 2024 and includes 10 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. A further update is currently underway.

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.

Summary

This quarter, we include two studies on disposable vapes, two studies conducted in pregnant people, and a final study evaluating secondhand nicotine exposure from vaping.

Tattan-Birch and colleagues set out to analyse trends in vaping and smoking following the rise of disposable e-cigarettes in England. Using data from the Smoking Toolkit Study, the authors found that before disposables were introduced to the English market, current vaping and smoking were stable or declining in all age groups. Following the introduction of disposables, vaping increased in all age groups and smoking remained stable in respondents aged 18-44, but rose among those aged over 45.

Notley et al. set out to investigate young people's motivations and experiences of using disposable vapes. Participants reported viewing disposable vapes as a product aimed at young people, and one that was normalised amongst their peers and online. Small size, ease of use, accessibility and social aspects, as well as a variety of flavours, brands, and colours were cited as appealing aspects of disposable vapes. Most participants believed that vaping was as harmful as smoking, with the two products often considered interchangeable.

Both studies in pregnant women were conducted in the UK. In the first, Lutman White et al. explored the perceptions of people offered an e-cigarette to help them quit smoking when pregnant. For the most part, participants reported positive perceptions of e-cigarettes, and indicated they preferred them to traditional nicotine replacement therapy (NRT). Participants reported that the desire to have a healthy pregnancy and baby, and the provision of non-judgmental behavioural support alongside the e-cigarette, helped facilitate their efforts to quit.

In a secondary analysis of data from the UK PREP trial, Pesola et al. investigated the safety of e-cigarettes and nicotine patches in pregnant people who smoked at the start of pregnancy. In people who reported dual using (smoking and use of e-cigarettes or use of nicotine patches), cotinine levels increased between baseline and end of pregnancy. Low birthweight is a known harm of smoking in pregnancy, which has often been attributed to nicotine. In this trial, the birthweight of infants born to people not smoking but using NRT or nicotine e-cigarettes was higher than in people who were smoking, and similar to that of people who weren't regularly using any nicotine products. This suggests that the causal link between smoking and low birthweight may be driven by factors other than nicotine exposure. Among those participants who had successfully quit smoking, people using nicotine products regularly were less likely to have an adverse pregnancy outcome than those not using any nicotine. Among participants who continued to smoke, there was no difference in birth outcomes between those also using nicotine replacement therapy or e-cigarettes, and those who were only smoking. Sample sizes for many of these analyses were small, and this is an important area for further research.

In the final study, Tattan-Birch and colleagues set out to examine secondhand nicotine absorption from e-cigarette vapour versus tobacco smoke in children. Children exposed to secondhand vapour had 83.6% lower levels of nicotine exposure (as measured via cotinine) than those exposed to secondhand tobacco smoke. Participants with no exposure to tobacco smoke or e-cigarette vapour had the lowest levels of nicotine exposure. Again, sample sizes were small, and further studies attempting to replicate these findings are needed.

Tattan-Birch *et al.* Trends in vaping and smoking following the rise of disposable e-cigarettes: a repeat cross-sectional study in England between 2016 and 2023

Study Aims

This modelling study uses data from adult (18+) respondents to the English Smoking Toolkit Study (n = 132,252, July 2016-May 2023). It estimates yearly age-stratified trends in inhaled nicotine use (smoking and/or vaping) 'pre-disposables' (July 2016-May 2021) and 'post-disposables' (May 2021-May 2023), based on when prevalence of disposable vaping began to increase. Odds of reporting current smoking and/or vaping per year are modelled. Covariates adjusted for were gender, occupational social grade and alcohol consumption.

Key Findings

- Pre-disposables, current smoking and vaping were stable or declining in all age groups. The odds of reporting current vaping were stable in all age groups and odds of respondents aged 18-24 reporting current smoking were declining by 9% per year (OR 0.91, 95% 0.85 to 0.97), 7% among those aged 45+ (OR 0.93, 95% CI 0.90 to 0.97) and stable in those aged 25-44. Overall inhaled nicotine use was declining (OR 0.95, 95% CI 0.93 to 0.98).

- Vaping increased in all age groups post-disposables. The odds of respondents aged 18-24 reporting current vaping increased by 99% per year (OR 1.99, 95% CI 1.71 to 2.31), 39% among those aged 25-44 (OR 1.39, 95% CI 1.26 to 1.52) and 23% for those aged 45+ (OR 1.23, 95% CI 1.12 to 1.35) and 44% overall (OR 1.44, 95% CI 1.36 to 1.54).

- Post-disposables, odds of current smoking were stable among respondents aged 18-24 and 25-44 and overall, although there was no change in trend, and rose by 12% per year among those aged 45+ (OR 1.12, 95% CI 1.05 to 1.20).

- Among respondents who had never smoked regularly, current vaping increased among all age groups post-disposables, most steeply among those aged 18-24 whose odds more than doubled each year (OR 2.5, 95% CI 1.82 to 3.43), followed by 25-44, who were about twice as likely to vape each year (OR 2.01, 95% 1.48 to 2.72) and 45+ whose odds of vaping increased by 48% per year (OR 1.48, 95% CI 1.00 to 2.18).

- Odds of current inhaled nicotine use increased post-disposables among respondents aged 18-24 by 18% per year (OR 1.18, 95% CI 1.05 to 1.33) and 45+ by 11% per year (OR 1.11, 95% CI 1.06 to 1.16) and remained stable among those aged 25-44. Overall rates of current inhaled nicotine use increased (OR 1.11, 95% CI 1.06 to 1.16).

Limitations

- The cross-sectional nature of the underlying data mean that the study cannot establish causality.

- Data for Scotland and Wales have only been collected since October 2020, so data from England were used, which may limit generalisability of the results to the wider UK population.

- Respondents were asked about the type of device that they mainly used, so results would not reflect those who used disposable vapes but not as their main device type.

- The analysis assumes that, had disposable vapes not entered the market, smoking and vaping prevalence would have continued to decline at the same rate.

- ‘Never smokers’ were defined as respondents who had never smoked for a year or more, so some respondents in this category may have had a smoking history.

Tattan-Birch H, Brown J, Shahab L, Beard E, Jackson S. Trends in vaping and smoking following the rise of disposable e-cigarettes: a repeat cross-sectional study in England between 2016 and 2023. Lancet. 2024 doi: 10.1016/j.lanepe.2024.100959

Notley *et al*. Young people's use of disposable vapes: A qualitative study

Study Aims

This UK qualitative study aimed to investigate young people’s motivations and experiences of using disposable vapes. The participants (n=29), aged 16-21 who used disposable vapes, discussed their experiences in friendship pairs, in small groups or in interviews with a researcher. Participants were encouraged to discuss their use of disposable vapes, the devices, flavours, patterns and situations of use, purchasing and social aspects. They were also invited to talk about tobacco smoking, quit attempts and their views on regulation

Key Findings

- Participants described disposable vapes as being a young person’s product and believed that disposable vaping was normalised among their peer groups, in their communities and online.

- Appealing aspects of disposable vaping included their small size, ease of use, accessibility, social aspects of vaping and buying vapes with others and experimenting with a variety of brands, flavours and colours. Some participants described vaping to cope with stress and anxiety.

- Some participants reported being addicted to nicotine, whereas others viewed vaping as a habit rather than an addiction. Vaping identities were reported, such as ‘heavy vapers’ and ‘social vapers.’

- Most participants had a smoking history and believed that vaping was as harmful as smoking tobacco. Smoking and vaping appeared to be considered as interchangeable, and participants reported using whichever nicotine product was available at the time or in the situation they were in.

- Illicit and risky behaviours were also reported, including purchasing vapes for people aged under 18, purchasing illicit vapes with larger tank capacity to save money and tampering with devices to enable them to be recharged.

Limitations

- The sample was relatively small, all participants were of White British ethnicity and over half were from Index of Multiple Deprivation bands 1–4, so the findings may not generalise to the wider UK population.

- Discussions in friendship pairs provided variable quality and detail of data gathered compared with interviews with a researcher.

- Participants were recruited from the community and data on smoking and vaping behaviour were self-reported, so there is potential for sampling, recall and social desirability bias.

Notley C, Varley A, Pope I, Dawkins L, Ward E. Young people's use of disposable vapes: A qualitative study. Addiction. 2024 Jun 16. doi: 10.1111/add.16570. Epub ahead of print. PMID: 38880489.

Lutman-White *et al.* Provision of E-Cigarettes for Smoking Cessation in Pregnancy: Perceptions and Experiences of Pregnant Women from Two UK Sites

Study Aims

This qualitative UK study aimed to explore the views of people offered an e-cigarette in addition to standard behavioural support to help with smoking cessation during pregnancy. Two pilot studies were set up, one in Warwickshire and one in Bath and Northeast Somerset. A total of 14 women aged over 18 took part in semi-structured interviews about their experiences.

Key Findings

- Most participants reported having stopped or reduced their smoking during the pilot studies using the e-cigarettes.

- There was less consistency in participants' future intentions in terms of whether they expected to continue smoking and/or vaping.

- The pregnancy and the health of the baby were key motivating factors for stopping smoking. Participants also reported being motivated by the possibility of saving money and being encouraged to stop smoking by partners, family members or health professionals.

- Barriers to cessation included the duration of smoking history, seeing other people smoking and perceiving smoking as a way to relieve stress.

- Participants' flavour preferences varied, as some preferred e-liquids that more closely resembled tobacco, while others preferred contrasting flavours or changed their flavour use over time.

Limitations

- The sample size was small, drawn from two sites and all participants reported a White ethnicity, so the results may not generalise to the wider UK population.

- Following up participants for interview was found to be challenging, for example some could not be contacted after agreeing to be interviewed.

- As only participants who agreed to take part in the pilot studies were interviewed, the study was unable to explore barriers to uptake.

Lutman-White E, Patel R, Bell L, Lycett D, Hayward K, Sampson R, Arulrajah J, Whelan M. Provision of E-Cigarettes for Smoking Cessation in Pregnancy: Perceptions and Experiences of Pregnant Women from Two UK Sites. Int J Environ Res Public Health. 2024 Apr 12;21(4):472. doi: 10.3390/ijerph21040472. PMID: 38673383; PMCID: PMC11049941.

Pesola *et al.* Safety of e-cigarettes and nicotine patches as stop-smoking aids in pregnancy: Secondary analysis of the Pregnancy Trial of E-cigarettes and Patches (PREP) randomized controlled trial

Study Aims

This secondary analysis of data from the UK 'PREP' trial compared birth weight, pregnancy and smoking cessation outcomes between participants who used NRT and/or e-cigarettes and those who did not. Participants from 23 hospitals in England and a stop-smoking service in Scotland who were 12-24 weeks pregnant and motivated to stop smoking (n=1,095) received telephone support calls and were randomised to receive either NRT or e-cigarettes. They were followed up at 35 weeks' gestation and again three months post-partum to collect safety data.

Key Findings

- Cotinine levels in dual users (participants who reported smoking and using e-cigarettes or NRT at end of pregnancy) using e-cigarettes increased by 19% (median difference 24 ng/ml, bootstrapped 95% CI = 3.5–68) between baseline and end of pregnancy. In dual users using NRT at end of pregnancy, cotinine levels increased by 16% (median difference 20 ng/ml, bootstrapped 95% CI = −34.1 to 103.5).

- There was no difference between rates of relapse to smoking in participants reporting abstinence at four weeks between those using e-cigarettes and those using NRT.

- There was no difference in birth weights of infants of participants using e-cigarettes and those using NRT. The birth weight of infants of abstainers regularly using nicotine was higher (difference 0.15 kg, 95% CI = 0.05–0.25) than birth weight of those of smokers and not different from abstainers not regularly using nicotine products.

- Abstainers using nicotine products regularly were significantly less likely to have any adverse pregnancy outcome (RR 0.45, 95% CI 0.24–0.84), including preterm birth (RR 0.29, 95% CI 0.12–0.70), than those not using nicotine. Rates of adverse outcomes among participants who continued to smoke did not differ between those who used other nicotine products and those who did not.

Limitations

- Trial products were provided for up to eight weeks, so being required to source their own products may have affected participants' experience and usage, particularly as participants would have had to pay for their own e-cigarettes.

- Planned biochemical verification of participants reporting smoking cessation or reduction of at least 50% was only undertaken in 297 of 607 eligible participants, as completing and returning the saliva test kit was challenging for participants in late pregnancy or with newborn babies.

- Not all participants used the product assigned to them and some used non-assigned products, so usage was self-selected rather than randomised.

- Some subsample sizes were small, such as 25 abstainers not using nicotine, 8 reducers using NRT, which may affect power and reliability of some findings.

- The study is only able to investigate any effect of nicotine product use in the later stages of pregnancy, as all participants smoked in the first trimester.

Pesola F, Smith KM, Phillips-Waller A, Przulj D, Griffiths C, Walton R, McRobbie H, Coleman T, Lewis S, Whitemore R, Clark M, Ussher M, Sinclair L, Seager E, Cooper S, Bauld L, Naughton F, Sasieni P, Manyonda I, Hajek P. Safety of e-cigarettes and nicotine patches as stop-smoking aids in pregnancy: Secondary analysis of the Pregnancy Trial of E-cigarettes and Patches (PREP) randomized controlled trial. Addiction. 2024 May;119(5):875-884. doi: 10.1111/add.16422. Epub 2024 Jan 17. PMID: 38229538.

Tattan-Birch *et al.* Secondhand Nicotine Absorption From E-Cigarette Vapor vs Tobacco Smoke in Children

Study Aims

This study measured levels of cotinine, an indicator of nicotine absorption, in blood samples from 1,777 children aged 3-11 surveyed as part of the US Continuous National Health and Nutrition Examination Survey (NHANES) between 2017 and March 2020. Levels were compared between those who had been exposed indoors to secondhand tobacco smoke, secondhand vapour from e-cigarettes or neither in the preceding seven days. Covariates adjusted for were age, sex, ethnicity, family income, body weight, and height.

Key Findings

- Participants exposed to secondhand tobacco smoke had the highest levels of cotinine (geometric mean 0.494µg/L, 95% CI 0.386-0.633 µg/L).

- Participants exposed to secondhand vapour had 83.6% (95% CI, 71.5%-90.5%, $p < .001$) lower cotinine levels (geometric mean 0.081 µg/L, 95% CI 0.048-0.137 µg/L) than those exposed to secondhand smoke.

- Participants exposed to neither had the lowest cotinine levels (0.016 µg/L, 95% CI 0.013- 0.021 µg/L), which were 96.7% (95% CI 95.6%-97.6%, $p < .001$) lower than those exposed to secondhand smoke and 80.1% (95% CI 64.9%-88.7%, $p < .001$) lower than those exposed to secondhand vapor.

- Similar results were found after adjusting for covariates, with differences between groups remaining significant.

- In sensitivity analysis excluding participants reported to have been exposed to vapour only who lived in a household with someone who smoked, cotinine levels were lower in this group (geometric mean 0.053, 95% CI 0.025-0.109, $p <.0001$).

Limitations

- Subsample sizes were small (270 exposed to smoke only and 53 exposed to vapour only).

- The study used data gathered in the US and so results may not generalise to the UK population.

- The study used self-reported data with regard to exposure, which could introduce social desirability bias.
- Data were compared as to whether participants had been exposed in the preceding seven days and did not take into account intensity of exposure.
- Data were collected prior to the increased popularity of disposable devices and so may not reflect current usage.

Tattan-Birch H, Brown J, Jackson SE, Jarvis MJ, Shahab L. Secondhand Nicotine Absorption From E-Cigarette Vapor vs Tobacco Smoke in Children. JAMA Netw Open. 2024 Jul 1;7(7):e2421246. doi: 10.1001/jamanetworkopen.2024.21246. PMID: 38990571; PMCID: PMC11240186.

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.