THE UK ELECTRONIC CIGARETTE RESEARCH FORUM

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Electronic Cigarette Research Briefing – October 2019

This research briefing is part of a series of monthly 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 and further reading list do not cover every e-cigarette-related study published each month. 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.

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.

Research Call from The Tobacco Advisory Group (TAG)

Cancer Research UK's TAG has recently opened its June 2020 funding call, for which they are accepting proposals **themed around the impact of electronic cigarettes (ECs) on youth**. Applicants within the UK are eligible to apply for funding of around £400k, and this call would provide a funding for up to three years. A guidance document containing some further information can be found on the TAG webpage here.

1. Association of prevalence of electronic cigarette use with smoking cessation and cigarette consumption in England: a time series analysis between 2006 and 2017

- **Study aims**

This English study reviewed data collected from 222,856 people (aged 16+) in the Smoking Toolkit Study from 2006-2017. A time series analysis was used to explore the relationship between prevalence of e-cigarette use (overall and during a quit attempt) and the number of quit attempts,

overall quit rate and quit success rate. Results were adjusted for changes in anti-tobacco advertising spending and changes in tobacco control policies.

- **Key findings**

There was a 0.054% (95% CI 0.032- 0.076, p<0.001) increase in overall quit rate for every 1% increase in the prevalence of overall e-cigarette use among current smokers.

There was a 0.050% (95% CI 0.031 – 0.069, p<0.001) increase in overall quit rate for every 1% increase in the prevalence of e-cigarette use during a quit attempt.

There was a 0.06% (95%CI 0.043-0.078, p<0.001) increase in quit success rates in past-year smokers (those who had smoked in the past year) for every 1% increase in the prevalence of e-cigarette use during a quit attempt.

Using this, it was estimated that, in 2017, 50,700 additional past-year smokers no longer smoked as a result of using an e-cigarette in a quit attempt. This increased to 69,390 when estimating the number of additional past-year smokers who no longer smoke as a result of e-cigarette use.

In both adjusted and unadjusted analyses, there was no association between e-cigarette use among current smokers and prevalence of quit attempts (p=0.689) or cigarette consumption (p=0.542).

- **Limitations**

This study looked at an association between trends rather than a causal link. The prevalence of e-cigarette use was based on current use or use in a quit attempt, as opposed to regular use. The Smoking Toolkit Study definition of a successful quit includes short-term quitters who may relapse.

Estimates of the number of additional quitters were extrapolated from point estimates from the main analysis and no confidence intervals were provided.

Participants self-reported all data. Therefore, results could be subject to bias. Specifically, the use of cessation aids was reported retrospectively for the past 12 months which could cause recall bias.

The study only assessed the short-term (pulse) effects of the change in age of sale and introduction of the smoking ban so was not able to consider more prolonged or delayed effects of these legislative changes.

Reported associations could be confounded by other factors such as funding cuts to Stop Smoking Services which were not considered in the analysis.

Beard E, West R, Brown J. (2019) Association of prevalence of electronic cigarette use with smoking cessation and cigarette consumption in England:
a time series analysis between 2006 and 2017. Addiction. doi: 10.1111/add.14851

2. Association between electronic cigarette use and smoking reduction in France

- **Study aims**

This longitudinal French study aimed to examine the association of regular e-cigarette (EC) use with the number of cigarettes smoked per day and smoking cessation among 5,400 current smokers, and with smoking relapse among 2,025 former smokers who quit after 2010. Data were collected between 2012-2017, with a mean follow-up of 23 months. Results were adjusted for sociodemographic characteristics, duration of follow-up and smoking patterns and history.

- **Key findings**

Among current smokers, in univariate analyses EC users smoked more cigarettes per day than non-users ($p<0.001$), but after adjustment the reverse was found. EC users smoked an estimated 11.2 cigarettes per day compared to 12.2 cigarettes in non-users ($p<0.001$).

Among current smokers at follow-up, after adjustment, EC users had decreased the number of cigarettes smoked by 4.4 cigarettes per day, compared to 2.7 cigarettes in non-users ($p<0.001$)

EC users were more likely to quit smoking during follow-up compared with non-users (RR=1.67 95% CI 1.51-1.84).

Former smokers who used ECs were more likely to relapse to regular smoking than those who did not (RR=1.70 95% CI 1.25-2.3). The risk of relapse decreased between 2010-2013; EC users who had quit from 2013 onwards were no more likely to relapse than non-users (RR=0.94 95%CI 0.57-1.52).

- **Limitations**

This was an observational study and no data were collected on the motives for EC use. Similarly, no data were collected on when EC use was started in former smokers. Therefore, a causal relationship between EC use and cessation or relapse cannot be established.

Participants' nicotine dependence or abstinence were not biochemically verified, and all data was self-reported. Therefore, results could be subject to bias.

The mean duration of follow-up was 23 months. As smokers often need several quit attempts for long-term cessation, this may have affected the study estimates of effectiveness.

No data on patterns of EC use, device type or nicotine strength were collected so this study was unable to consider how these factors might affect smoking cessation and relapse.

Gomajee R, El-Khoury F, Goldberg M, Zins M, Lemogne C, Wiernik E, Lequy-Flahault E, Romanello L, Kousignian I, Melchior M.(2019). Association Between Electronic Cigarette Use and Smoking Reduction in France. JAMA Intern Med: doi: 10.1001/jamainternmed.2019.1483.

3. Nicotine patches used in combination with e-cigarettes (with and without nicotine) for smoking cessation: a pragmatic, randomised trial

- **Study Aims**

This New Zealand trial randomised 1,124 adult smokers who were motivated to quit, to either receive nicotine patches (n=125), nicotine patches plus a nicotine(18mg/ml) e-cigarette (n=500) or patches plus a nicotine-free e-cigarette (n=499). All groups were offered 6 weeks of telephone support in their quit attempt. Abstinence was self-reported at 1, 3 and 6 months and biochemically verified at 6 months. Treatment adherence and adverse event were also recorded.

- **Key Findings**

Verified abstinence at 6 months was 7% in the patches plus nicotine e-cigarette group and 4% in the patches plus nicotine free e-cigarette group (RR=1.75 95%CI 1.02-2.98, p=0.038).

There was no significant difference in 6-month verified abstinence between the patches plus nicotine e-cigarette and patches only group (7% vs 2%, RR=2.92 9%CI 0.91-9.33, p=0.05). When the proportion of those with verified abstinence at 6 months was applied to self-reported data, 17% of the patches plus nicotine e-cigarette group were estimated to be abstinent and 7% in the patches only group (RR=2.36 95%CI 1.22-4.56, p=0.006).

At 6 months, 40% in the patches only group were still adhering to using patches compared to 22% and 29% of participants in the patches plus nicotine and nicotine free e-cigarette groups. 45% of participants were still using nicotine e-cigarettes and 36% were still using nicotine-free e-cigarettes.

The per protocol analysis showed a significant difference in effectiveness for patches plus nicotine e-cigarette vs patches plus nicotine free e-cigarette (RR=1.95, 95%CI 1.10-3.40, p=0.02). There was no significant effect of patches plus nicotine e-cigarette compared to patches only in the per-protocol analysis (RR=2.38 95%CI 0.76-7.48, p=0.11).

- **Limitations**

The target sample size was not reached and the loss to follow up was higher than predicted (34% in patches only group and 30% in the e-cigarette groups). 15% of the patch only group and 11% of the patch plus nicotine free e-cigarette group crossed over and used a nicotine e-cigarette during the trial. This will have reduced the power to detect differences between groups and the results may not be representative of the wider population.

Participants in the nicotine patches plus nicotine e-cigarettes group received slightly more behavioural support calls than the patches only group which could have influenced their success in quitting.

The biochemical validation of smoking cessation could only detect 24-hour abstinence from smoking. Participants may have misreported their smoking status which could bias the results if they were not truly abstinent for the whole follow-up period.

The trial only compared e-cigarettes and nicotine patches and did not examine the relative effectiveness of other quitting tools (e.g. combination NRT, prescription medication). Therefore, it cannot give an overall picture of which may be the most effective method of smoking cessation.

Walker N, Parag V, Verbiest M, Laking G, Laugesen M, Bullen C. 2019. Nicotine patches used in combination with e-cigarettes (with and without nicotine) for smoking cessation: a pragmatic, randomised trial. Lancet Respiratory Medicine. doi: 10.1016/S2213-2600(19)30269-3

4. Electronic-cigarette smoke induces adenocarcinoma and bladder urothelial hyperplasia in mice

- **Study aims**

This US study assessed the effects of e-cigarette vapour on tumour formation in the bladders and lungs of mice. The mice were split into three groups; the first (n=45) were exposed to e-cigarette vapour (nicotine 36mg/mL) and the second (n=20) to vapourised e-liquid vehicle components (isopolypropylene glycol and vegetable glycerine) only (Veh group). The third group (n=20) were exposed to filtered air. Mice were subject to whole-body exposure for 4 hours per day, 5 days per week for 54 weeks. Tumour formation in different organs was examined.

- **Key Findings**

Mice exposed to e-cigarette vapour had a significantly higher incidence of lung adenocarcinoma than Veh exposed mice ($p=0.0454$) as well as Veh and filtered air exposed mice combined ($p=0.0154$). There was no significant difference in lung adenocarcinoma in nicotine vapour exposed mice compared with filtered air ($p=0.1498$).

There were no visible bladder tumours in any of the groups. 57.5% of mice exposed to electronic cigarette vapour vs 6.3% of Veh exposed mice had hyperplastic changes to the bladder urothelium ($p<0.001$). 0% of filtered air exposed mice showed hyperplastic changes; there was no significant difference between the Veh group and the filtered air group ($p=0.628$).

There was no significant difference in the frequency of urothelial hyperplasia in mice with lung tumours compared to those without lung tumours.

Tumour-like growths were found in other organs of all groups. There was no significant difference between tumour formation in other organs and lung tumour formation.

- **Limitations**

Studies in mice aren't able to assess real-world exposure to e-cigarette vapour and actual harms or establish a causal relationship, but can only provide a basis for potential mechanisms of harm.

The concentrations and volume of vapour that mice were exposed to (36 mg/ml, 4 hours per day, 5 days per week for 54 weeks at a particulate matter concentration of 130mg/ml^3) are not comparable to real-world consumption of e-cigarette vapour and may not represent actual use. Only one type of e-cigarette vapour was tested, and no comparisons to tobacco smoke were made.

Filtered air and Veh are not suitable background exposure controls, as these do not represent regular exposure to unfiltered air.

Some point estimate and confidence interval estimates were wide, including ∞. The implications of this are unclear and therefore any estimate of relative risk is uncertain.

Tang MS, Wu XR, Lee HW, Xia Y, Deng FM, Moreira AL, Chen LC, Huang WC, Lepor H. (2019). Electronic-cigarette smoke induces lung adenocarcinoma and bladder urothelial hyperplasia in mice. doi: 10.1073/pnas.1911321116

5. Youth self-reported exposure to and perceptions of vaping advertisements. Findings from the 2017 International Tobacco Control Youth Tobacco and Vaping Survey.

- **Study aims**

This study aimed to examine differences in youth perceptions of vaping advertising and products and the impact of legislative advertising restrictions across Canada, England and the US. In 2017 Canada imposed a complete ban on e-cigarette advertising, England banned advertising on some channels and the US had no restrictions. 12,064 youth (aged 16-19) self-reported the frequency of exposure to vaping adverts in the past 30 days, their perception of the appeal of e-cigarettes and the perceived advert target audience. Results were adjusted for age, sex race/ethnicity and tobacco/vaping product use.

- **Key Findings**

Vaping ad exposure in the past 30 days was 81%, 74% and 83% for participants in the US, Canada and England respectively. The average exposure score (scale 1-4 [never/don't know-very often]) was 0.26 points lower in young people from Canada compared to the US (95%CI-0.32—0.20). Frequency of exposure was 0.09 points higher in young people from England compared to the US (95%CI 0.03-0.15).

Compared to never-users of either product, ever-users, exclusive vapers, exclusive smokers and dual users all reported more frequent exposure to vaping adverts (all p values <0.05).

After adjustment, there was no significant difference in the appeal of e-cigarette ads across all countries.

Young people from England were less likely to perceive e-cigarette advertisements to target non-smokers compared with the US (AOR=0.67 p<0.05). They were more like to report they targeted smokers (AOR=1.31 95%CI 1.09-1.58.

- **Limitations**

The data was cross-sectional and therefore cannot establish a causal effect of exposure to e-cigarette adverts and vaping among youths.

Current vaping and smoking were defined as any past 30-day use, so this study was unable to consider how patterns of smoking of vaping might affect the relationship with advertising perceptions.

People who vaped reported more frequent ad exposure than those who did not, which may due to heightened awareness ads rather than actual exposure. All data was self-reported by participants. Therefore, results could be subject to bias.

The survey did not examine exposure to specific brands of e-cigarettes.

The study looked at only approximately 4000 individuals in each country meaning the results may not be generalisable to the wider youth population.

Cho YJ, Thrasher, Reid KL, Hitchman S, Hammond D. Youth self-reported exposure to and perceptions of vaping advertisements. Findings from the 2017 International Tobacco Control Youth Tobacco and Vaping Survey. Preventative Medicine. doi: 10.1016/j.ypmed.2019.105775

Overview

This month we include five articles from the UK, France, New Zealand, USA and the three country (USA, Canada, England) International Tobacco Control Youth Tobacco and Vaping survey.

Our first article is one of the latest outputs from the CRUK funded Smoking Toolkit study in England. The team at UCL aimed to examine any association between vaping, smoking cessation and cigarette consumption between 2006 and 2017 by conducting a time-series analysis. The sample included just over 50,000 participants who reported smoking in the past year. The authors were interested in: the prevalence of quit attempts, overall quit rates, quit success rate, mean cigarette consumption and the relationship with e-cigarette use.

They didn't find any significant relationship between vaping and quit attempts or cigarette consumption during the study period overall. A sensitivity analysis limiting the analysis to after July 2009 did find some evidence of a decline in average cigarette consumption, although this requires further research to determine if the association is causal. The study did find that both overall quit rates and quit success rates increased as a result of e-cigarette use, after adjusting for a range of confounders. Based on their results, the authors estimated that e-cigarettes helped up to 70,000 smokers to quit in England in 2017. This type of study cannot determine if e-cigarettes directly caused an increase in quit rates or quit success because the data are observational and self-reported. But they do add to existing evidence that e-cigarettes are helpful for smoking cessation and that they are not undermining recent reductions in smoking prevalence in England.

This month's second paper reports results from a longitudinal study of smokers and ex-smokers in France. Results are from the CONSTANCES cohort and focused on 5400 smokers and 2025 former smokers recruited between 2012 and 2015 with a mean follow up of around two years. The former smokers had quit in 2010 (when e-cigarettes were introduced in France) or later. Regression modelling was used to examine any association between vaping and smoking cessation and also relapse to smoking.

Among daily smokers, regular vaping was associated with a significant reduction in the number of cigarettes smoked per day. Daily vapers also had higher rates of smoking cessation than smokers who did not use e-cigarettes. However, the study also found that former smokers who reported e-cigarette use were more likely to relapse to smoking. This effect was not sustained when the analysis was restricted to ex-smokers who had quit in 2013 or later, leading the authors to suggest that more recent vaping devices may be more effective for relapse prevention. The CONSTANCES study is ongoing so we should expect future papers with longer term follow up.

Our third article reports results from the most recent randomised controlled trial of e-cigarettes for smoking cessation, conducted in New Zealand. This is the fifth RCT published anywhere in the world on the effectiveness of e-cigarettes for smoking cessation with six months abstinence as a primary outcome. It builds on an earlier trial conducted by some members of the same team. At the time of the study, nicotine containing e-cigarettes couldn't be bought in New Zealand although products could be bought online from overseas. The authors were interested in studying the effect of e-cigarettes with or without nicotine when provided with NRT. The trial therefore had three arms - NRT patch only, NRT patch plus nicotine containing e-cigarettes and NRT patch plus nicotine free e-cigarette. The e-cigarette arms were provided with a second generation refillable device and four bottles of tobacco-flavoured e-liquid (18mg/ml or 0mg/ml nicotine) and after that needed to purchase their own supplies. All participants were offered behavioural support once a week for 6 weeks over the phone by trained researchers. The primary outcome was CO verified continuous abstinence from smoking at 6 months.

CO verified abstinence rates at 6 months were 7% for the nicotine containing e-cigarette plus patches group, 4% for the nicotine-free e-cigarette plus patches group, and 2% in the patches only group. Loss to follow up was high, around a third in both e-cigarette arms and half of the patches only group. There was also contamination, which is not unusual in smoking cessation trials with different treatment options. 15% of the patches only group and 11% of the zero-nicotine e-cigarette group reported using nicotine containing vaping products during the study period. Despite these challenges and fairly low rates of biochemical validation obtained, this trial adds to the evidence relating to e-cigarettes for smoking cessation and should contribute to a forthcoming updated Cochrane review on the subject. Abstinence rates in this trial were comparatively lower to those observed in the recent randomised trial of E-cigarettes versus Nicotine Replacement Therapy in UK Stop Smoking Services. The six month abstinence rate for the e-cigarette group in this trial was 35.4%, compared with 25.1% in the nicotine-replacement group.

The fourth study we include this month was conducted by a team based in New York in the USA and involved mice rather than humans. The team had previously conducted a short term e-cigarette emission exposure study with mice that found DNA damage in the heart, lungs and bladder and impaired DNA repair – we covered this in a previous bulletin. In the current study, the researchers aimed to assess whether e-cigarette emissions were carcinogenic. They exposed 40 mice to high nicotine-containing e-cigarette emissions five days per week for just over a year. They then compared the extent to which lung and bladder tumours formed in these mice, compared to two other groups of mice exposed to either vapourised glyclol and glycerine, or filtered air.

One in five of the mice in the e-cigarette group (22.5%) developed lung tumours, a significantly higher proportion than in either of the other two groups. Bladder tumours were not found but the lining of the bladder was more likely to develop lesions in just over half of the mice in the e-cigarette group. These were rare (6%) in the vapourised glycol/glycerine group and not present in the group of mice exposed to filtered air. The authors concluded that e-cigarette emissions are a lung and potential bladder carcinogen in mice. As with all rodent model studies, it is not possible to determine whether

these findings have relevance to humans and whether the conditions used in the study bear any resemblance to how humans are exposed to e-cigarettes. In addition, the effects of vaping compared with tobacco smoke exposure in mice were not examined, so no conclusions about relative risk can be drawn.

This month's final paper is from the youth arm of the ITC study and included young people in Canada, England and the USA. It used data from the 2017 survey to examine young people's exposure to and perceptions of vaping marketing in all three countries. At the time, e-cigarette sale and marketing was illegal in Canada although these restrictions were not well enforced. Most forms of marketing were permitted in the USA, and in England broadcast, print and direct online marketing was banned but outdoor (i.e. billboards) and point of sale were allowed.

Just over 12,000 young people aged 16-19 years were included, around 4,000 in each country. Most participants (83% England, 81% USA, 74% Canada) had seen some form of vaping promotion in the last 30 days. The most common promotion seen was point of sale in stores that sell cigarettes (60% England and USA, 46% Canada). This was followed by on websites or social media (40% England, 41% USA, 38% Canada). Youth also reported TV and radio ads even though these were banned in the UK - with one in five young people in England reporting having seen these. It is possible that this relates to historical recall prior to May 2016 when the ban came into place, or confusion about the source of exposure. Direct online marketing was also banned in England from February 2017 but the way the survey question was phrased (websites or social media) means it is likely that young people in England were still exposed to user generated or other forms of marketing. Perhaps unsurprisingly, young people who vaped or smoked reported higher exposure to marketing in all three countries, but young people in England were less likely to report that they thought vaping ads targeted non-smokers (36%) compared to the USA (48%) and Canada (47%). The study provides useful information that could be used as the basis for further research in the UK (and elsewhere) on youth exposure to the remaining forms of e-cigarette marketing and possible exposure through routes that are intended to be prohibited.

New Cancer Policy Research Centre Report

Cancer Research UK's Cancer Policy Research Centre has released a new report, *E-cigarettes and primary care: A cross-sectional survey of nurses and GPs across the UK*. The study, led by Anne Ferrey at University of Oxford, used a cross-sectional survey of 2002 nurses and GPs across the UK to examine advice given on e-cigarettes, as well as clinician beliefs, attitudes and knowledge around e-cigarettes. Please find the Executive Summary and Full Report.

Other studies from September and October that you might find of interest

Patterns of use

E-cigarette Retail Licensing Policy and E-cigarette Use Among Adolescents

Initiation Patterns and Trends of E-Cigarette and Cigarette Use Among U.S. Adolescents

Decreased Cigarette Smoking but No Change in Use of Electronic Cigarettes Following a University-Wide Smoking Ban.

Poor Perceived Health is Associated with Current use of Electronic Cigarette among Current and Former Smokers: Findings from the CONSTANCES Cohort.

Electronic cigarette use and mental health: A Canadian population-based study

Vaping patterns, nicotine dependence and reasons for vaping among American Indian dual users of cigarettes and electronic cigarettes.

The association between alcohol, marijuana, illegal drug use and current use of E-cigarette among youth and young adults in Canada: results from Canadian Tobacco, Alcohol and Drugs Survey 2017.

Examining the Psychometric Properties of the CEAC (Comparing e-Cigarette and Cigarette) Questionnaire and Its Usefulness as a Predictor of e-Cigarette Use

Depressive Symptoms and Suicidality in Adolescents Using e-Cigarettes and Marijuana: A Secondary Data Analysis From the Youth Risk Behavior Survey.

Positive perceptions of electronic cigarettes relative to combustible cigarettes are associated with weaker support for endgame policies on combustible cigarettes: A population-based cross-sectional study in Hong Kong..

The association between problematic alcohol use, risk perceptions, and e-cigarette use.

Perceptions and use of e-cigarettes among young adults in Hong Kong

Comparison of e-cigarette use characteristics between exclusive e-cigarette users and dual e-cigarette and conventional cigarette users: an on-line survey in France.

The relationship between family history of tobacco use and progression to tobacco use among young adult e-cigarette users

Prevalence and sociodemographic disparities in ever E-cigarette use among adults in Los Angeles County.

Physical activity among adolescent tobacco and electronic cigarette users: Cross-sectional findings from the Population Assessment of Tobacco and Health study

E-Cigarette Use and Future Cigarette Initiation Among Never Smokers and Relapse Among Former Smokers in the PATH Study.

Use of Flavored E-Cigarettes and the Type of E-Cigarette Devices Used among Adults and Youth in the US-Results from Wave 3 of the Population Assessment of Tobacco and Health Study (2015-2016).

An Examination of the Variation in Estimates of E-Cigarette Prevalence among U.S. Adults.

Where Do People Vape? Insights from Twitter Data.

Differential Effects of Anxiety Sensitivity on E-Cigarettes Processes: The Importance of E-Cigarette Quit Attempt History.

Policies for tobacco and e-cigarette use: a survey of all higher education institutions and NHS Trusts in England.

Associations of Tobacco Advertising Appeal With Intentions to Use Alternative Tobacco Products Among Young Tobacco Users Experiencing Homelessness.

E-Hookah Versus E-Cigarettes: Findings From Wave 2 of the PATH Study (2014-2015).

Electronic cigarette use and psychological distress in the Native Hawaiian and Pacific Islander adults compared with other racial/ethnic groups: Data from the National Health Interview Survey, 2014.

Prevalence of e-Cigarette Use Among Adults in the United States, 2014-2018.

Limited utility of detailed e-cigarette use measures: An analysis of NESARC-III.

Fatigue severity and electronic cigarette beliefs and use behavior.

Cessation

Reactions to electronic nicotine delivery system (ENDS) prevention messages: results from qualitative research used to inform FDA's first youth ENDS prevention campaign -

Electronic cigarette use among survivors of smoking-related cancers in the United States

Cost-effectiveness of e-cigarettes compared with nicotine replacement therapy in stop smoking services in England (TEC study): a randomised controlled trial.

Prevalence and correlates of long-term e-cigarette and nicotine replacement therapy use: a prospective study in England.

Technology-based contingency management and e-cigarettes during the initial weeks of a smoking quit attempt.

Perceptions

The Relationship of the Terms Vape and E-Cigarette With Newspaper Content.

Nicotine addiction as a moral problem: Barriers to e-cigarette use for smoking cessation in two working-class areas in Northern England.

Nicotine vaping product use, harm perception and policy support among pharmacy customers in Brisbane, Australia

Beliefs, Attitudes, and Confidence to Deliver Electronic Cigarette Counseling among 1023 Chinese Physicians in 2018.

Knowledge and Beliefs of E-Cigarettes Among Physicians in Poland

Product attributes important to US adult consumers' use of electronic nicotine delivery systems: a discrete choice experiment

Did E-Cigarette Users Notice the New European Union's E-Cigarette Legislation? Findings from the 2015-2017 International Tobacco Control (ITC) Netherlands Survey

Parents' Awareness and Perceptions of JUUL and Other E-Cigarettes

Perceived threats, benefits and barriers of e-cigarette use during pregnancy. A qualitative analysis of risk perception within existing threads in online discussion forums.

Vaping Expectancies: A Qualitative Study among Young Adult Nonusers, Smokers, Vapers, and Dual Users.

E-Cigarettes: A Disruptive Technology? An Analysis of Health Actors' Positions on E-Cigarette Regulation in Scotland.

Youth use

Factors Associated With E-Cigarette Usage and the Reasons for Initiation Among Malaysian Adolescents

Social influence of e-cigarette smoking prevalence on smoking behaviours among high-school teenagers: Microsimulation experiments.

Adolescents' awareness of the nicotine strength and e-cigarette status of JUUL e-cigarettes

Who is JUULing and Why? An Examination of Young Adult Electronic Nicotine Delivery Systems Users.

Do population trends in adolescent electronic cigarette use coincide with changes in prevalence of cigarette smoking?

Exploring the association between E-cigarette retailer proximity and density to schools and youth E-cigarette use.

Initiation Patterns and Trends of E-Cigarette and Cigarette Use Among U.S. Adolescents

Frequency of E-cigarette use and cigarette smoking among Canadian students.

Underage JUUL Use Patterns: Content Analysis of Reddit Messages.

Schools Influence Adolescent E-Cigarette use, but when? Examining the Interdependent Association between School Context and Teen Vaping over time.

E-cigarette use and sleep-related complaints among youth.

Hookah and Electronic Inhalant Device Use and Perceptions Among African American Youth and Young Adults: Are We Asking the Right Questions?

E-cigarette use frequency and motivations among current users in middle school.

Harm and addiction perceptions of the JUUL e-cigarette among adolescents.

Expectancies and reasons for use of e-cigarettes among young adults: A longitudinal analysis.

JUUL in School: Teacher and Administrator Awareness and Policies of E-Cigarettes and JUUL in U.S. Middle and High Schools.

Effects of non-tobacco flavors and nicotine on e-cigarette product appeal among young adult never, former, and current smokers.

Bidirectional associations between young adults' reported exposure to e-cigarette marketing and e-cigarette use.

Harms and harm reduction

Acute Effects of Electronic Cigarette Aerosol Inhalation on Vascular Function Detected at Quantitative MRI.

Comparative effects of parent and heated cinnamaldehyde on the function of human iPSC-derived cardiac myocytes.

Poisoning exposure cases involving e-cigarettes and e-liquid in the United States, 2010-2018v

Effects of flavoring compounds used in electronic cigarette refill liquids on endothelial and vascular function.

Electronic cigarette use and sleep health in young adults

Withdrawal Symptoms from E-Cigarette Abstinence Among Adult Never-Smokers: A Pilot Experimental Study.

E-cigarettes and head and neck cancers: A systematic review of the current literature -

The Tear Function in Electronic Cigarette Smokers

Neurological effects in the offspring after switching from tobacco cigarettes to e-cigarettes during pregnancy in a mouse model.

Exposure to passive nicotine vapor in male adolescent rats produces a withdrawal-like state and facilitates nicotine self-administration during adulthood

Piloting a clinical laboratory method to evaluate the influence of potential modified risk tobacco products on smokers' quit-related motivation, choice, and behavior.

Influence of the E-Cigarette Emission Profile by the Ratio of Glycerol to Propylene Glycol in E-Liquid Composition

Does e-cigarette advertising encourage adult smokers to quit?

Lasting effects of repeated Δ9-tetrahydrocannabinol (THC) vapor inhalation during adolescence in male and female rats.

E-Cigarette Exposure Delays Implantation and Causes Reduced Weight Gain in Female Offspring Exposed In Utero.

E-cigarette health harm awareness and discouragement: Implications for health communication.

Analysis of Toxic Metals in Electronic Cigarette Aerosols Using a Novel Trap Design.

On the potential harmful effects of E-Cigarettes (EC) on the developing brain: The relationship between vaping-induced oxidative stress and adolescent/young adults social maladjustment.

In Vitro Consequences of Electronic-Cigarette Flavoring Exposure on the Immature Lung.

Comparison of systemic exposure to toxic and/or carcinogenic volatile organic compounds (VOCs) during vaping, smoking, and abstention.

Effects of E-cigarette E-liquid components on bronchial epithelial cells: Demonstration of dysfunctional efferocytosis.

The Effect of Flavored E-cigarettes on Murine Allergic Airways Disease.

Monoamine oxidase inhibitory activity of flavoured e-cigarette liquids.

Vascular effects of a single bout of electronic cigarette use.

Heavy metals (Cr, Pb, Cd, Ni) in aerosols emitted from electronic cigarettes sold in Malaysia.

Electronic cigarettes disrupt lung lipid homeostasis and innate immunity independent of nicotine.

The cardiovascular effects of electronic cigarettes: A systematic review of experimental studies.

The role of DJ-1 in human primary alveolar type II cell injury induced by e-cigarette aerosol.

E-cigarettes and the clinical encounter: Physician perspectives on e-cigarette safety, effectiveness, and patient educational needs.

Marketing

Electronic Cigarette Advertising Impacts Adversely on Smoking Behaviour Within a London Student Cohort: A Cross-Sectional Structured Survey

Misc

Compliance of e-cigarette refill liquids with regulations on labelling, packaging and technical design characteristics in nine European member states.

Concurrent Quantification of Emerging Chemicals of Health Concern in e-Cigarette Liquids by High-Performance Liquid Chromatography–Tandem Mass Spectrometry

The Analysis of Aerosolized Methamphetamine From E-cigarettes Using High Resolution Mass Spectrometry and Gas Chromatography Mass Spectrometry

The Use of HPLC-PDA in Determining Nicotine and Nicotine-Related Alkaloids from E-Liquids: A Comparison of Five E-Liquid Brands Purchased Locally.

Real-Time Assessment of E-Cigarettes and Conventional Cigarettes Emissions: Aerosol Size Distributions, Mass and Number Concentrations.

Analysis of the geographical accessibility of vape shops in the vicinity of Quebec's secondary and college educational institutions.

Evaluating smoking control policies in the e-cigarette era: a modelling study.

Design Features in Multiple Generations of Electronic Cigarette Atomizers.

Sensory evaluation of e-liquid flavors by smelling and vaping yields similar results.

Effects of Model, Method of Collection, and Topography on Chemical Elements and Metals in the Aerosol of Tank-Style Electronic Cigarettes.

Nicotine or expectancies? Using the balanced-placebo design to test immediate outcomes of vaping.

Search strategy

The Pubmed database is searched in the middle of each month, for the previous month using the following search terms: e-cigarette*[title/abstract] OR electronic cigarette*[title/abstract] OR ecig[title/abstract] OR (nicotine AND (vaporizer OR vaping OR vapourizer OR vaporiser OR vapouriser)) 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 will not be included. Please note studies funded by the tobacco industry will be excluded.

This briefing is produced by Alice Davies and Sophia Lowes from Cancer Research UK with assistance from Professor Linda Bauld at the University of Edinburgh and the UK Centre for Tobacco and Alcohol Studies, primarily for the benefit of attendees of the CRUK & PHE 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.