THE UK ELECTRONIC CIGARETTE RESEARCH FORUM

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Electronic Cigarette Research Briefing – October 2020

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.

Cancer Grand Challenges: Dare to take on some of the most complex challenges in cancer

In August this year, Cancer Research UK and the US National Cancer Institute united to define a new era in cancer research and discovery: Cancer Grand Challenges.

Cancer Grand Challenges is a global funding platform founded by Cancer Research UK and the National Cancer Institute. Through a series of £20m ($25m) awards, Cancer Grand Challenges is giving international teams of researchers the freedom to think differently, act creatively and explore truly innovative science to take on complex questions in cancer.

We have recently revealed 9 new challenges to the international research community.

This includes an **E-cigarettes challenge – Determine the potential benefits and risks of e-cigarette use** – which will be looking for multinational and multidisciplinary proposals. The call is currently open for applications and will close on 22 April 2021.

If you have any questions, please don't hesitate to get in touch at info@cancergrandchallenges.org.

1. Electronic Cigarettes for Smoking Cessation

- **Study Aims**

This updated Cochrane review synthesised evidence from 50 studies in 12,430 adults (18+) on the effectiveness and safety of e-cigarettes in smoking cessation. Meta-analyses of randomised controlled trials (RCTs) were completed for three main comparison groups:

1) Nicotine electronic cigarette (EC) versus nicotine replacement therapy (NRT) for smoking cessation
2) Nicotine EC versus non-nicotine EC for smoking cessation
3) Nicotine EC versus behavioural support only/no support for smoking cessation

The review also included summaries of cohort follow-up studies and RCTs. Cessation was measured at the longest follow-up point (at least six months) and the most rigorous abstinence measures were used. The overall quality of the evidence was rated.

- **Key Findings**

Pooled data from 3 studies comparing nicotine ECs with NRT showed higher quit rates in the nicotine EC group (RR=1.69, 95%CI=1.25-2.27; I^2=0%, 1498 participants). Risk of bias in all these studies was rated "low".

Pooled data from 2 studies comparing nicotine ECs with NRT found no difference in the number of participants reporting adverse events (RR=0.98, 95%CI=0.80-1.19; I^2=485 participants). Risk of bias in these studies was rated "low".

Pooled data from 3 studies comparing nicotine ECs with non-nicotine ECs showed higher quit rates in the nicotine EC group (RR=1.71, 95%CI=1.00-2.92; I^2=0%, 802 participants). The effect size increased when removing one study rated 'high' risk of bias.

Pooled data from 2 studies showed no evidence of a difference in the number of participants experiencing adverse events when comparing nicotine EC to non-nicotine EC (346 participants).

Pooled data from 4 studies comparing nicotine EC to behavioural support only or no support showed higher quit rates in the nicotine EC group (RR=2.50, 95%CI=1.24-5.04; I^2=0%, 2312 participants). Risk of bias in these studies was rated "high" in at least one domain.

- **Limitations**

The majority of studies were either from the US or the UK. Therefore, the findings may not be applicable to the environment in other countries.

Many of the identified studies could not be included in meta-analyses meaning common effects could not be verified.

This review is vulnerable to any limitations of the individual studies included. A high risk of bias was found in at least one domain of many of the studies.

Half of the studies included used cartridge devices, 18 used refillable devices and none used pods. Therefore, the studies included may not reflect the devices now most commonly used.

Hartmann-Boyce J, McRobbie H, Bullen C, Begh R, Stead L, Hajek P. (2020). Electronic cigarettes for smoking cessation. Cochrane Database.;doi: 10.1002/14651858.CD010216.pub4.

2. Young people's use of e-cigarettes in Wales, England and Scotland before the introduction of the EU Tobacco Products Directive regulations: a mixed-method natural experimental evaluation

- **Study Aims**

  This mixed methods study analysed data from the 2013, 2015 and 2017 Welsh School Health Research Network survey (SHRN) (n=51,056) and the 2014 and 2016 English Smoking Drinking and Drug Use (SDDU) (n=8,178) survey. A time series analysis compared overall changes in e-cigarettes use in young people (aged 13-15) with changes since the implementation of the Tobacco Products Directive (TPD), adjusting for gender and age. Repeat qualitative interviews were carried out in 2017 and 2018 in young people from 11 schools in England and Wales to further explore changes in e-cigarette use and perceptions.

- **Key Findings**

  In the analysis of Welsh data from 2013-2017, there was an overall increase in odds of ever e-cigarette use per month (OR=1.04, 95%CI=1.03-1.05, p<0.001). Data on regular use were available for 2015-2017, however showed no overall significant difference.

  In the analysis of English data from 2014-2016, there was an overall increase in both odds of ever e-cigarette use (OR=1.15, 95%CI=1.10-1.22, p<0.001) and regular e-cigarette use (OR=1.47, 95%CI=1.25-1.73), p<0.001).

  In the analysis of Welsh data for the trend of ever e-cigarette use post TPD implementation, a negative association was observed, however this did not reach statistical significance (p=0.125). The odds of ever e-cigarette use in never smokers declined post TPD implementation (OR=0.94, 95%CI=0.89-0.99, p=0.022).

  In original qualitative interviews (2017), a large majority of interviewees cited that e-cigarette use had risen rapidly among their age group, with most participants pointing to experimental use. Many participants speculated that e-cigarette use was a trend which they felt would decrease moving forward.

  A decline in reported use and approval of e-cigarettes was found in follow up (2018) versus original (2017) interviews. In follow-up interviews, using e-cigarettes to quit smoking was cited more frequently.

  Many participants reported obtaining e-cigarettes from informal sources, so were not aware of the packaging requirements of the TPD.

- **Limitations**

  All data was self-reported so may be subject to social desirability bias. This may be prone to change over time.

  Data was taken from different surveys in England and Wales meaning not all data is comparable. Data on e-cigarette use in England was only available up to 2016 meaning the impact of the TPD implementation could not be determined. Data from Scotland was unavailable meaning all three countries in Great Britain could not be compared.

  The time series analysis only adjusted for age and gender meaning the results may be subject to confounding.

  Surveys may have been vulnerable to response bias which could lead to under representation of substance use.

  It is unclear how representative of the UK the qualitative sample were. Therefore, the results may not be generalisable to the wider population.

Moore G, Brown R, Page N, Hallingberg B, Maynard O, McKell J, Gray L, Blackwell A, Lowthian E, Munafò M, Mackintosh AM, Bauld L. (2020). Young people's use of e-cigarettes in Wales, England and Scotland before and after introduction of EU Tobacco Products Directive regulations: a mixed-method natural experimental evaluation. Int J Drug Policy.;doi: 10.1016/j.drugpo.2020.102795.

3. Gateway or common liability? A systematic review and meta-analysis of studies of adolescent e-cigarette use and future smoking initiation

- **Study Aims**

  This study assessed the association between e-cigarette use in adolescents (≤18 year) who were never smokers at baseline and initiated smoking at follow up. Unadjusted and adjusted pooled odds ratios were calculated from 11 studies in a random effects model and a meta-regression was conducted to examine effects by study quality characteristics. E-values were calculated to estimate the strength a confounding factor would need to have to attenuate the association observed.

- **Key Findings**

  In the unadjusted analysis, e-cigarette use in non-smokers was associated with an increased odds of smoking initiation (OR=4.31, 95%CI=3.33-5.58, p<0.001). In the adjusted analysis, a weaker positive association was seen (OR=2.93, 95%CI=2.22-3.87, p<0.001).

  In the adjusted subgroup analysis, the odds of smoking initiation was greater in studies with less than 1000 participants compared with more than 1000 participants (OR=6.68, 95% CI=3.63-12.31 vs OR=2.49, 95% CI=1.97-3.15).

  In the meta-regression, studies with a larger sample size reported a significantly smaller effect size (þ=-0.99, 95% CI = -1.64--.033, p=0.003). The dropout rate and length of follow-up were not significantly associated with effect size (ps>0.5).

The median E-value of the estimate of the impact of adolescent vaping on smoking initiation was 2.90. This indicates that if an omitted confounder had a risk ratio of 2.90 on both vaping and subsequent smoking, the association would be fully explained by confounding in half the studies.

Only two of the 11 studies adjusted for more than half of the key confounding factors identified by the authors.

- **Limitations**

There was significant heterogeneity between studies (I^2 = 83.71%, P < 0.001). This could indicate methodological differences in the included studies, meaning that pooling of the data might not have been appropriate.

Different definitions of smoking were used across the studies, with some using the definition of 'ever trying a cigarette'. Therefore, the analysis does not necessarily show an association between e-cigarette use and current or regular smoking.

Publication bias was not assessed by funnel plots. Therefore, the extent to which this affected the associations is unclear.

Data was self- reported in most studies. Therefore, the order of e-cigarette/ cigarette use could have been incorrectly reported.

The confounding analysis only examined if certain confounders were adjusted for and did not test the quality of the methods used in studies.

Chan G, Stjepanovic D, Lim C, Sun T et al. (2020). Gateway or common liability? A systematic review and meta-analysis of studies of adolescent e-cigarette use and future smoking initiation. Addiction. doi.; 10.1111/add.15246

4. The Association of E-cigarette Flavors With Satisfaction, Enjoyment, and Trying to Quit or Stay Abstinent From Smoking Among Regular Adult Vapers From Canada and the United States: Findings from the 2018 ITC Four Country Smoking and Vaping Survey.

- **Study Aims**

This cross-sectional study combined 2018 survey data from the US and Canada to examine the use of e-cigarette flavours in adult (18+) exclusive e-cigarette users and dual users of e-cigarettes and cigarettes (n=1603). Analyses examined the relationship between flavour use and vaping satisfaction compared with smoking, enjoyment, reasons for using e-cigarettes and quit intentions/attempts. Analyses were adjusted for age, gender, country of residence, smoking status and vaping frequency.

- **Key Findings**

Significantly more vapers reported using fruit (29.4%) or tobacco (28.7%) flavours compared with all other flavours (p<0.0001) (menthol/mint, candy, tobacco/menthol mix, "other" and unflavoured). Compared with dual users, exclusive vapers were more likely to use fruit

(p=0.001) or candy flavours (p=0.02) and less likely to use tobacco (p=0.001) or tobacco/menthol mix flavours (p=0.003).

Overall, flavours were significantly associated with relative satisfaction with vaping compared to smoking (p<0.001). Reporting that vaping was more satisfying (vs less satisfying) than smoking was more likely in users of candy (OR=3.65, 95% CI=2.05-6.48, p<0.0001) and fruit flavours (OR=1.95, 95% CI = 1.22-3.11) compared with tobacco. No differences were observed between flavours and reporting being equally satisfied (vs less satisfied) with vaping compared to smoking.

Overall, in dual users, flavours were not associated with intending to quit smoking in the next six months (p=0.28), attempts to quit smoking in the past 18 months (p=0.46), or reporting vaping to reduce cigarette consumption (p=0.07).

Overall, in dual users, flavours were significantly associated with reporting vaping to help with quitting smoking (p=0.04). More dual users using candy (OR=2.46, 95%CI=1.37-4.42, p=0.003) or fruit (OR=1.68, 95%CI=1.02-2.76, p=0.04) compared with tobacco, reported that they were vaping to help them quit smoking.

In exclusive vapers who had recently quit smoking, flavours were significantly associated with reporting vaping to stay quit from smoking (p=0.03). Those who were using candy (OR=0.03, 95% CI=0.003-0.27, p=0.002) or fruit flavours (OR=0.01, 95% CI=<0.001-0.22, p=0.005) were less likely than those using tobacco flavours to vape in order to stay quit from smoking.

- **Limitations**

  The study was cross-sectional meaning it cannot determine causality. It also cannot determine transitions in flavour use over time.

  The study recorded current flavour use, meaning it is not possible to determine which flavours were used in successful and unsuccessful quit attempts.

  The overall sample size was small which may have affected the accuracy of estimates and the ability to detect statistical power, particularly in the analyses of recent exclusive smokers and certain flavour groups.

  The majority of participants were dual users (73.7%) meaning some results may misrepresent those who had successfully quit smoking using e-cigarettes.

  Participants were from the US and Canada where a similar variety of e-liquids are available Therefore, it is unclear how applicable these results are to other countries including the UK.

Gravely S, Cummings M, Hammond D, Lindblom E, Smith D, Martin N, Loewen R et al. (2020). The Association of E-cigarette Flavors With Satisfaction, Enjoyment, and Trying to Quit or Stay Abstinent From Smoking Among Regular Adult Vapers From Canada and the United States: Findings From the 2018 ITC Four Country Smoking and Vaping Survey. Nicotine Tobacco Res.; doi: 10.1093/ntr/ntaa095.

Overview

This month our four studies are from researchers based in the UK, USA, Canada, New Zealand and Australia.

The first publication is an updated Cochrane review of e-cigarettes for smoking cessation. It was completed by the Cochrane Tobacco Addiction group at the University of Oxford. The authors are members of the group based in several different countries. The publication builds on two previous reviews on this topic conducted in 2014 and 2016. Since the last update a number of new studies were identified that met Cochrane's inclusion criteria.

Fifty studies were included that involved over 12,000 participants. To be included, studies had to report smoking cessation outcomes at six months or longer and/or had data on safety at one week or longer. A small number of these were included in meta-analyses that involve pooling results to find an overall effect. The majority of the included studies were new to the review update. Thus the amount of evidence available to assess whether e-cigarettes help people stop smoking has expanded over the past four years. The review found that nicotine containing e-cigarettes were more effective for smoking cessation than nicotine replacement therapy or e-cigarettes without nicotine, and that e-cigarettes containing nicotine may help more people to stop smoking than behavioural support alone or no support. The 2020 update found 'moderate certainty' evidence, compared to the 2016 review that concluded there are 'low to very low' certainty evidence that e-cigarettes help people stop smoking. The Cochrane team are now turning this into a 'living' review which means searches will be done monthly and thus the conclusions of the review could change in future.

Our second study examined changes in youth use of e-cigarettes in Great Britain from 2013 to 2017. This was a mixed methods study analysing survey data from England and Wales and focus groups with 14-16 year olds in England, Wales and Scotland in 2017. Survey data from Wales was available for 2013, 2015 and 2017 and from England for 2014 and 2016 only. The researchers were interested both in general trends but also whether anything changed following the 2016 implementation of the EU Tobacco Products Directive, that banned most forms of e-cigarette marketing along with introducing other measures.

They found that in Wales ever use of e-cigarettes increased during the initial survey years but not following the implementation of the TPD. There was little increase in regular use in Wales throughout the study period. Both ever and regular use increased between the two survey years in England but given that survey data was not available in England (at the time of analysis) beyond 2016, the post TPD period couldn't be covered. In the discussion section of the article, the authors do point to data now being available from the same repeat cross sectional survey in England for 2018 which has reported no further increase in either experimental or regular e-cigarette use in youth, suggesting that trends there may be similar to Wales - this will be the subject of a future paper.

Findings from group interviews complemented the survey findings. The researchers found 'widespread social approval of experimental vaping in social situations' but disapproval of regular use. They found limited evidence from the qualitative research of some TPD measures having a direct effect on use and limited awareness of mandated changes such as the nicotine warning on product labelling. However, there was little recall of product advertising (suggesting a possible effect of TPD restrictions). Young people were more aware of point of sale marketing displays and streaming videos of e-cigarette use online. The survey findings of emerging evidence of e-cigarette

use plateauing among youth may also be explained by a strong theme identified in the focus groups - that vaping was a fad that may have run its course in the UK. The authors are careful to point out that continuing product innovation and other factors need to be examined alongside longer-term trends in youth vaping in the UK.

This month's third paper also focuses on young people and involved a systematic review and meta-analysis of studies examining the topic of vaping and subsequently starting smoking. There have been a number of previous reviews looking at this (including a recent one funded by CRUK). However, given that new studies continue to be conducted, continuing to look across this body of evidence is useful. The Australian research team searched for longitudinal studies involving people under the age of 18 where participants were vaping at baseline and there was data available on smoking status at follow up. They identified 11 studies that met their inclusion criteria.

As previous reviews on this topic have identified, the meta-analysis found a significant association between vaping and subsequent smoking at follow up, although this association was weaker in studies with larger samples. The authors identified a number of challenges in interpreting this finding including a high drop-out rate (median 30%) in the studies meaning that a sizeable proportion of the young people who took part in the initial data collection couldn't be followed up. Those who couldn't be followed up tended to have a higher risk profile for smoking (such as being from less affluent backgrounds, parents or friends who smoked or a higher intention to smoke in future). The authors also looked at factors (confounders) that might explain smoking at follow up rather than vaping alone and found that only two studies in the review comprehensively adjusted for these possible confounders. In a new development from previous reviews on this topic, the authors also looked at publication bias (that studies that find an effect or a larger effect are more likely to be published). They found that studies with smaller samples reported a larger effect size (i.e. that there was a strong relationship between initial vaping and then smoking at follow up) and that those with null findings or smaller effect sizes may not be published. This is an issue in the literature in general, including for clinical studies, and is not unique to e-cigarettes.

Our final paper is from the International Tobacco Control (ITC) Survey and examines e-cigarette flavours. The researchers were interested in exploring any associations between flavour choice and user satisfaction, enjoyment and quit attempts. Participants were just over 1,600 adults in Canada and the USA who were current smokers vaping or vapers who vaped at least weekly. Data were collected between February and July 2018. Participants were asked about any flavours they had used in the past month and then which flavour they used most often. Responses were grouped into tobacco and non-tobacco flavours with the latter category including menthol/mint, fruit, candy, other and unflavoured. Outcomes included satisfaction with vaping, level of vaping enjoyment, plans to quit smoking (within next 6 months or other), quit attempts in the past 18 months and reasons for vaping.

The study found that non tobacco flavours were used by the majority (63%), with fruit the most common non tobacco flavour category used. Only 2% reported using unflavoured products. Use of tobacco flavour was more common among dual users than exclusive vapers. In terms of satisfaction, those who used candy or fruit flavours found vaping more satisfying than smoking compared with vapers using tobacco flavours. Interestingly among dual users, those who reported using fruit or candy flavours were more likely to state that they were vaping as a means to quit smoking. The study didn't find, however, that choice of flavours was associated with making a quit attempt. It is worth noting that to date, a controlled study (such as a randomised controlled trial) of different flavours for smoking cessation hasn't been conducted. This type of research would provide valuable

evidence which could inform discussions about e-cigarette flavour regulation, which has received policy attention in some parts of the world.

Other studies from October you might find of interest:

Patterns of use

Associated Changes in E-cigarette Puff Duration and Cigarettes Smoked Per Day

Validation of an E-cigarette Purchase Task in Advanced Generation Device Users.

Reported patterns of vaping to support long-term abstinence from smoking: a cross-sectional survey of a convenience sample of vapers.

The Genetic and Environmental Influences Contributing to the Association between Electronic and Conventional Cigarette Initiation.

Factors Associated with E-Cigarette Use in U.S. Young Adult Never Smokers of Conventional Cigarettes: A Machine Learning Approach.

Pregnant women's use of e-cigarettes in the UK: a cross-sectional survey.

Prevalence and Factors Associated with Electronic Cigarette Use Among Young Adult Cancer Survivors Using Behavioral Risk Factor Surveillance System, 2016-2018.

Gender differences in reasons for using electronic cigarettes and product characteristics: Findings from the 2018 ITC Four Country Smoking and Vaping Survey.

Changes in Smoking and Vaping over 18 Months among Smokers and Recent Ex-Smokers: Longitudinal Findings from the 2016 and 2018 ITC Four Country Smoking and Vaping Surveys.

Cigarette smoking and E-cigarette use among young adults in the United States: Findings from the 2016-18 behavioral risk factor surveillance system.

Awareness, knowledge and perception of electronic cigarettes among undergraduate students in Jazan Region, Saudi Arabia.

Trends in E-Cigarette Use by Age Group and Combustible Cigarette Smoking Histories, U.S. Adults, 2014-2018.

E-cigarette use among young adults in Poland: Prevalence and characteristics of e-cigarette users.

Relations among cigarette dependence, e-cigarette dependence, and key dependence criteria among dual users of combustible and e-cigarettes.

Prospective associations of e-cigarette use with cigarette, alcohol, marijuana, and nonmedical prescription drug use among US adolescents.

E-cigarette Use Among Middle and High School Students - United States, 2020.

Changes in adults' vaping and smoking behaviours associated with aerosol-free laws.

Perceptions and Experiences of Vaping Among Youth and Young Adult E-Cigarette Users: Considering Age, Gender, and Tobacco Use.

Patterns of Use of Vaping Products Among Smokers: Findings from the 2016-2018 International Tobacco Control (ITC) New Zealand Surveys.

Systematic review of electronic cigarette use (vaping) and mental health comorbidity among adolescents and young adults.

Awareness and use of e-cigarettes among university students in Shanghai, China.

Association between e-cigarette use and sleep deprivation in U.S. Young adults: Results from the 2017 and 2018 Behavioral Risk Factor Surveillance System.
Gateway or common liability? A systematic review and meta-analysis of studies of adolescent e-cigarette use and future smoking initiation.

Potential risk factors for cigarette use among a sample of college JUUL users.

E-cigarette sharing behavior among college students: An exploratory study.

A Longitudinal Analysis of Nicotine Dependence and Transitions From Dual Use
of Cigarettes and Electronic Cigarettes: Evidence From Waves 1-3 of the PATH Study.

Association Between E-cigarette Use and Depression in US Adults.

Worry and e-cigarette cognition: The moderating role of sex.

Young adult e-cigarette use: A latent class analysis of device and flavor use, 2018-2019.

Changes in knowledge, perceptions and use of JUUL among a cohort of young adults.
Cannabis use and the onset of cigarette and e-cigarette use: A prospective, longitudinal study among youth in the United States.

Association between electronic cigarette use and metabolic syndrome in the Korean general population: A nationwide population-based study.

Use of Cigarettes and E-Cigarettes/Vaping Among Transgender People: Results From the 2015 U.S. Transgender Survey.

Associations of home and workplace vaping restrictions with e-cigarette use among U.S. adults.

Perceptions

Harsh and sweet sensations predict acute liking of electronic cigarettes, but flavor does not affect acute nicotine intake: a pilot laboratory study in men

Assessing young adults' ENDS use via Ecological Momentary Assessment and a Smart Bluetooth enabled ENDS device

Reasons for stopping e-cigarette use among smokers: findings from the 2018 ITC New Zealand Survey

E-Cigarette Use and Perceptions Among Veterans Receiving Outpatient Treatment in Veterans Affairs Substance Use and Mental Health Clinics.

From the Deeming Rule to JUUL-US News Coverage of Electronic Cigarettes, 2015-2018.

Perception of the relative harm of electronic cigarettes compared to cigarettes amongst US adults from 2013 to 2016: analysis of the Population Assessment of Tobacco and Health (PATH) study data.

Aerosol, vapor, or chemicals? College student perceptions of harm from electronic cigarettes and support for a tobacco-free campus policy.

Vape shop owners'/managers' attitudes about CBD, THC, and marijuana legal markets.

Sources of awareness, perceptions, and use of JUUL e-cigarettes among adult cigarette smokers.

Cessation

A qualitative study of the views about smoking, licensed cessation aids and e-cigarettes in people with schizophrenia spectrum disorders

The Association of E-cigarette Flavors With Satisfaction, Enjoyment, and Trying to Quit or Stay Abstinent From Smoking Among Regular Adult Vapers From Canada and the United States: Findings From the 2018 ITC Four Country Smoking and Vaping Survey

Is vaping cessation like smoking cessation? A qualitative study exploring the responses of youth and young adults who vape e-cigarettes.

Smoking cessation among US adults: use of e-cigarettes, including JUUL, and NRT use.

Patterns of e-cigarette use and subsequent cigarette smoking cessation over two years (2013/2014 to 2015/2016) in the Population Assessment of Tobacco and Health (PATH) Study.

Effectiveness of Electronic Cigarettes in Smoking Cessation: a Systematic Review and Meta-Analysis.

Role of e-cigarettes and pharmacotherapy during attempts to quit cigarette smoking: The PATH Study 2013-16.

A Randomized Clinical Trial Examining the Effects of Instructions for Electronic Cigarette Use on Smoking-Related Behaviors and Biomarkers of Exposure.

Youth

"Can I hit that?" Vaping knowledge, attitudes and practices of college students

Associations Between Family and Peer E-Cigarette Use with Adolescent Tobacco and Marijuana Usage: A Longitudinal Path Analytic Approach

Convenience Store Access and E-cigarette Advertising Exposure Is Associated With Future E-cigarette Initiation Among Tobacco-Naïve Youth in the PATH Study (2013-2016).

Vaping while high: Factors associated with vaping marijuana among youth in the United States.

Young people's use of e-cigarettes in Wales, England and Scotland before and after introduction of EU Tobacco Products Directive regulations: a mixed-method natural experimental evaluation.

Harms and harm reduction

Cellular effects of nicotine salt-containing e-liquids

Indoor Air Quality and Passive E-cigarette Aerosol Exposures in Vape-Shops.

Deposition of E-cigarette Aerosol in Human Airways through Passive Vaping.

Nicotine, Cotinine, and Tobacco-Specific Nitrosamines Measured in Children's Silicone Wristbands in Relation to Secondhand Smoke and E-cigarette Vapor Exposure.

Evaluation of Respiratory Symptoms Among Youth e-Cigarette Users.
Use of e-Cigarettes and Development of Respiratory Conditions in Women of Childbearing Age.
Electronic cigarettes cause alteration in cardiac structure and function in diet-induced obese mice.

E-cigarette constituents propylene glycol and vegetable glycerine decrease glucose uptake and its metabolism in airway epithelial cells in vitro.

Use of E-Cigarettes and Self-Reported Lung Disease Among US Adults.

Electronic cigarettes may not be a "safer alternative" of conventional cigarettes during pregnancy: evidence from the nationally representative PRAMS data.
Impact of Atomizer Age and Flavor on In Vitro Toxicity of Aerosols from a Third-Generation Electronic Cigarette against Human Oral Cells.
Comparative analysis of the impact of e-cigarette vapor and cigarette smoke on human gingival fibroblasts.

Elevated Cellular Oxidative Stress in Circulating Immune Cells in Otherwise Healthy Young People Who Use Electronic Cigarettes in a Cross-Sectional Single-Center Study: Implications for Future Cardiovascular Risk.

Chronic electronic cigarette use elicits molecular changes related to pulmonary pathogenesis.

Electronic Nicotine Delivery System Aerosol-induced Cell Death and Dysfunction in Macrophages and Lung Epithelial Cells.

Electronic cigarette (e-cigarette) use and frequency of asthma symptoms in adult asthmatics in California.

Prenatal Exposure to E-Cigarette Aerosols Leads to Sex-dependent Pulmonary Extracellular Matrix Remodeling and Myogenesis in Offspring Mice.

The Effects of E-Cigarette Vapor Components on the Morphology and Function of the Male and Female Reproductive Systems: A Systematic Review.

Electronic-Cigarette Vehicles and Flavoring Affect Lung Function and Immune Responses in a Murine Model.

Marketing

Cartoon Images on E-juice Labels: A Descriptive Analysis.

Objective Facts or Misleading Hype? Associations between Features of E-Cigarette Marketing and Sales on a Chinese E-Commerce Platform.

Exposure to e-cigarette advertising, attitudes, and use susceptibility in adolescents who had never used e-cigarettes or cigarettes.

Investigating the Attitudes of Adolescents and Young Adults Towards JUUL: Computational Study Using Twitter Data.

Misc

Implications of electronic cigarette use for depressive mood: A nationwide cross-sectional study.

Emotion dysregulation, fatigue, and electronic cigarette expectancies.

A systematic review of refillable e-liquid nicotine content accuracy.

Effect of free-base and protonated nicotine on nicotine yield from electronic cigarettes with varying power and liquid vehicle.

E-cigarette Unit Sales, by Product and Flavor Type - United States, 2014-2020.

Impacts of COVID-19 on Electronic Cigarette Purchasing, Use and Related Behaviors.

Rethink Vape: Development and evaluation of a risk communication campaign to prevent youth E-cigarette use.

Influence of battery power setting on carbonyl emissions from electronic cigarettes.

Investigation on the antibacterial activity of electronic cigarette liquids (ECLs): a proof of concept study.

A quasi-experimental test of a virtual reality game prototype for adolescent E-Cigarette prevention.

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 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.