

THE UK ELECTRONIC CIGARETTE RESEARCH FORUM

cruk.org

UNIVERSITY of
STIRLING

UKCTAS
UK Centre for Tobacco & Alcohol Studies

CANCER
RESEARCH
UK

Electronic Cigarette Research Briefing – June 2017

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.

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

1. Electronic cigarette: a longitudinal study of regular vapers.

- **Study aims**

This study from Switzerland enrolled 3,868 regular adult e-cigarette users on the internet between 2012 and 2015, and followed them up after one, three, six and twelve months via an online survey. The study assessed changes over time in vaping and smoking behaviours, such as e-cigarette use motivations, nicotine concentrations used, smoking cessation rates, and smoking relapse. Participants were international: France (39%), US (18%), Switzerland (12%), UK (4%), and other countries (27%).

- **Key findings**

Among the daily e-cigarette users at baseline and after 12 months, reporting of any tobacco use in the past 7 days decreased significantly from 16% at baseline to 10% after 12 months. Most participants were still using their e-cigarettes after one, three, six and twelve months.

After 12 months, participants who stopped using their e-cigarette during the study were significantly more likely to relapse to smoking than those that continued to use their device (18% increase in daily smoking vs. 2% decrease).

Ex-smokers at baseline who relapsed were significantly less likely to be daily e-cigarette users at 12 months than ex-smokers who had not relapsed (31% decrease in daily use vs. 8% decrease).

Baseline e-cigarette users who had stopped using their device at 12 months were less likely to use nicotine-containing fluids, used lower nicotine concentrations, and inhaled fewer puffs per day, than those that continued to use their device.

Among those that exclusively used an e-cigarette at all time points, over time there was a decrease in nicotine concentrations used, amount of money spent on e-cigarettes, and the perceived addiction to e-cigarettes. Over time, more users in this group also selected enjoyment as a reason for use; becoming the most frequent reason.

Among ex-smoking vapers at baseline and 12 months, there were significant decreases in those reporting withdrawal symptoms (such as coughing, sore throat and insomnia) over time. But there were no significant differences between those who remained ex-smokers and those who had relapsed at 12 months.

- **Limitations**

This study used an online sample of people that were accessing a smoking cessation website or websites dedicated to e-cigarettes, and can't be generalised across the entire e-cigarette user community. The study likely overenrolled long-term e-cigarette users, former smokers and users of tank model e-cigarettes. Neither did the study appear to adjust results for differences in demographics between populations.

The study does not capture the effects of the first few months of using an e-cigarette before the surveys began, or experiences where people only tried e-cigarettes but didn't continue to use them and all results are self-reported.

There was significant attrition to the surveyed population: 42% remaining at one month, 35% at three, 30% at six and 23% at twelve. Only 15% of participants took part in all five surveys. There was also significant attrition from the first page of survey questions through to the final page, with only 50% completing the final page of the baseline questionnaire. The final sample characteristics were therefore very different to the initial population. This also led to very small populations for some analyses, meaning there wasn't high enough power to draw significant conclusions.

The study only takes into account changes in nicotine concentration used and doesn't assess other changes in usage that may affect satisfaction e.g. type of e-cigarette used or flavours of e-liquids.

Etter, J. F., Electronic cigarette: a longitudinal study of regular vapers. *Nicotine Tob Res* 2017 ntx132. doi: 10.1093/ntr/ntx132

2. Electronic cigarettes, quit attempts and smoking cessation: a 6-month follow-up.

- **Study aims**

This French study recruited a representative sample of 2057 smokers (1805 exclusive smokers and 252 dual users at baseline) that were followed up after 6 months. The study

assessed whether regular e-cigarette use is associated with a reduction in cigarettes smoked per day, quit attempts and subsequent smoking cessation of at least 7 days at the time of follow up.

- **Key findings**

Dual users were more likely to have reduced the number of cigarettes they smoked per day by at least 50% than exclusive smokers (AOR = 2.6, 95% CI: 1.8-3.8). E-cigarette use was significantly associated with a reduction in cigarettes per day in dependent smokers (AOR = 3.2, 95% CI: 1.9-5.4) but not those with none or low dependence (AOR = 1.9, 95% CI: 1.0-3.3).

Baseline dual users at follow up were significantly more likely to have had a quit attempt of at least 7 days in the past 30 days than exclusive smokers (AOR = 1.8, 95% CI 1.2-2.6). Under sub-group analysis, associations with quit attempts were only found to be significant in moderately or heavily dependent smokers.

There were no significant associations between using e-cigarettes at baseline and smoking cessation for at least 7 days (AOR = 1.2, 95% CI: 0.8-1.9) or 30 days (AOR = 1.1, 95% CI: 0.7-1.8) at follow up.

Among regular or occasional e-cigarette users at baseline who had stopped smoking for at least 7 days at follow up, 44% reported that e-cigarettes had helped them to quit. The older people were, the more likely they were to report this.

- **Limitations**

The study only included e-cigarette users who were dual users at baseline, so does not include users that may have already used an e-cigarette to help them stop smoking. The e-cigarette dual user population has distinct demographic differences compared to exclusive smokers that may affect comparisons. The study adjusted for sociodemographic confounders, but not for smoking related behaviours or nicotine dependence.

31.4% of participants dropped out between baseline and follow-up, with more drop outs from particular sociodemographic subgroups than others.

The study is a secondary analysis of self-reported data from a study to assess the effects of an emotive health campaign running at the same time. This limited the number of vapers to a relatively small sample size that may not pick up smaller associations with smoking cessation. Neither did this study appear to adjust for the effects of the campaign.

Pasquereau, A., Guignard, R., Andler, R., and Nguyen-Thanh, V. (2017) Electronic cigarettes, quit attempts and smoking cessation: a 6-month follow-up. *Addiction*, doi: 10.1111/add.13869.

3. Factors associated with future intentions to use personal vaporisers among those with some experience of vaping.

- **Study aims**

This study uses cross-sectional data from the International Tobacco Control Australia and UK surveys in 2014/15 to identify factors associated with future intentions to vape among smokers and ex-smokers who had ever tried personal vaporisers (n = 1,199). Participants were divided into four subgroups: smoking past vapers, smoking vapers, ex-smoking past

vapers and ex-smoking vapers. Results were adjusted for confounders, including demographics and smoking/vaping behaviours. The study also assessed effects on intention due to different policy environments by testing for any by country interactions.

- **Key findings**

Among past vapers only a small minority expressed any intention to vape again (24.6% of current smokers and 2.4% of ex-smokers). Similarly, a minority of current vapers intended to continue vaping (39.2% of smokers and 27.3% of ex-smokers).

Higher satisfaction from vaping or placing importance on satisfaction from vaping was positively associated with future intention to vape in all groups except ex-smoking past vapers. Intentions to vape were positively associated with perceived safety of vaping compared to smoking in all groups except ex-smoking vapers. Harm perception was the strongest predictor of intention among smokers.

Placing importance on vaping for stopping smoking was associated with lower intentions to continue vaping for smoking vapers and higher intentions for future vaping among smoking past vapers. While the importance of vaping for preventing relapse was positively associated with intentions to vape among ex-smoking past vapers but not ex-smoking vapers.

Placing importance on being able to vape in smoke-free areas was positively associated with vaping intention among smoking vapers. Whereas for smoking past vapers, having friends or family members vaping was associated with increased interest in future use.

The by country analysis showed that perceived safety of vaping compared to smoking was positively associated with vaping intention among smoking past vapers in the UK only.

- **Limitations**

This cross-sectional study only looked at intentions to vape, so cannot conclude what behaviours the participants would actually go on to take.

There was a small sample size of ex-smokers and smaller samples of vapers from Australia, meaning there wasn't sufficient power for all findings.

The study didn't clarify whether vapers or past vapers were regular users or had only tried the product. Never vapers were not included, so the study doesn't give indications on intention to vape in future among never vaping smokers. Neither did it look at any relationships between nicotine dependence and vaping intentions.

Between country comparisons may not equate to differences between policy environments, as there are other differences that must be accounted for e.g. societal norms.

Recall of past experiences may be affected by participants' current intentions, shaping their reported beliefs and reasons for vaping intentions.

Ma, B. H., Yong, H.-H., Borland, R., McNeill, A., and Hitchman, S. C. (2017) Factors associated with future intentions to use personal vaporisers among those with some experience of vaping. *Drug and Alcohol Review*, doi: 10.1111/dar.12574.

4. Perceptions of Harm to Children Exposed to Secondhand Aerosol From Electronic Vapor Products, Styles Survey, 2015.

- **Study aims**

This US study assessed the perceptions of harm related to children's exposure to secondhand aerosol from e-cigarettes among US adults. The data came from the 2015 Styles survey with 4,127 participants, and assessed perceptions by different demographics.

- **Key findings**

Overall, 5% of participants responded that children's exposure to aerosol from e-cigarettes caused "no harm," 40% responded "little harm" or "some harm," 22% responded "a lot of harm," and 33% responded "don't know."

Current smokers (AOR = 4.1, 95% CI: 2.1-7.8) and former smokers (AOR = 1.9, 95% CI: 1.2-2.8) were more likely to perceive that e-cigarette aerosol causes no harm to children than never smokers. Current e-cigarette users (AOR = 17.9, 95% CI: 8.0-39.9) and former users (AOR = 7.5, 95% CI: 3.9-14.2) were more likely to perceive no harm than never users, and also more likely to perceive little or some harm than never users.

Men were significantly more likely than women to perceive e-cigarette vapour as less harmful. Whereas ethnic minority groups were all significantly less likely to perceive that e-cigarette vapour causes no harm to children than non-Hispanic whites.

There were no significant differences in perception by education level, household income, marital status, or whether there were children living in the household.

- **Limitations**

This study only assesses perceptions around harms of secondhand vapour from e-cigarettes, it did not assess whether these perceptions affected attitudes to e-cigarettes or personal use behaviours among participants. Neither did the study compare the perceptions of harm from secondhand vapour with perceptions of harm from secondhand smoke or explore what people defined as "harm".

The participants were recruited from a list of web panellists, which may limit generalisability, but data were weighted to be nationally representative of the US adult population.

The study didn't have enough power to assess any relationships with dual users and their perceptions. While former e-cigarette users included those that had only tried the product, not just those that had used them regularly.

The reference populations for some differences between sociodemographic groups aren't able to make it clear whether there were other inter-group differences e.g. all age comparisons were compared to 18-24 year olds, and race/ethnicity comparisons to non-Hispanic whites.

Nguyen KH, Tong VT, Marynak K, King BA. Perceptions of Harm to Children Exposed to Secondhand Aerosol From Electronic Vapor Products, Styles Survey, 2015. *Prev Chronic Dis* 2017;14:160567. DOI: <http://dx.doi.org/10.5888/pcd14.160567>

Overview

This month we include four articles, one from Switzerland, one from France, a third from the ITC study in Australia and the UK, and the final paper from the USA.

The study conducted by Jean-Francois Etter at the University of Geneva involved a longitudinal online survey of vapers to examine changes in vaping and smoking behaviour through time. Participants came from a number of countries, signed up via a website about smoking cessation and were all e-cigarette users at recruitment. As with many longitudinal surveys, loss to follow up was an issue, with only around one in four of the original sample still participating in the study at the fourth follow up point which took place one year after recruitment. Despite this and some other limitations, interesting findings emerge.

The study included both ex-smokers at recruitment and people who were dual users. Over 12 months, vaping and/or smoking status did change for some participants. In the relatively small sample of dual users at baseline who answered the follow-up surveys, around one in four had stopped smoking after 12 months. Some continued to be dual users throughout and didn't significantly reduce their cigarette consumption. A small proportion of people who were ex-smoking vapers at baseline (9% of the 687 for whom data were available) relapsed to smoking by 12 months. Those who returned to smoking also tended to stop using an e-cigarette when they took up tobacco again.

People who were ex-smokers and kept vaping throughout the study reported gradually reducing the nicotine content in their e-liquids (suggesting an intention to do so, less dependence, or perhaps devices improving in nicotine delivery). Reasons for vaping also changed over time, from wanting to address urges to smoke and tobacco withdrawal symptoms, to vaping for enjoyment. This is useful information for those interested in motivations to keep using e-cigarettes over the longer term.

Another finding was that there were no significant changes in reported appetite or weight across participants, and including those who were ex-smokers and kept vaping during the study. This may be because they had gained some weight on cessation but before joining the survey, or because vaping prevented some of the weight gain ex-smokers can experience. This and a number of other findings from the study merit further research.

This month's second article from a team at the National Public Health Agency in France reports results from another internet survey, this one of smokers and dual users who completed a baseline questionnaire and were followed up 6 months later. Participants were recruited as part of study aiming to look at the effects of a tobacco control mass media campaign, rather than one set up to look at smoking and vaping. This secondary analysis from the original study aimed to assess whether regular use of e-cigarettes while smoking was associated with stopping smoking and measured: a minimum 50% reduction in smoking; quit attempts of at least 7 days; and smoking cessation for at least 7 days at 6 months. Most of the sample used only tobacco (n=1805) with a smaller group (n=252) of dual users. Analysis compared responses between the two groups after adjusting for socio-demographic differences. Perhaps unsurprisingly, dual users were much more likely than smokers to have cut down their smoking by at least 50%. They were also more likely to have made a quit attempt. However, there were no significant differences in stopping smoking for at least 7 days between the two groups. These findings are similar to some other studies that have looked at the possible effect of vaping on smokers who were not necessarily motivated to quit and because of its design, excluded ex-smokers who might have tried vaping and then stopped smoking. It didn't account for key factors that other research has found to be important in affecting whether vaping

leads to smoking cessation including frequency and duration of e-cigarette use, nicotine content or reasons for use – all of which may be important factors in determining whether dual users eventually become ex-smokers.

We then include the latest article from members of the team who conduct the International Tobacco Control survey. This particular article focused just on the UK and Australia and aimed to identify factors associated with future intentions to vape among smokers and ex-smokers. This adds to very recently [published work](#) from the same team looking at how different regulatory frameworks in the UK and Australia (and also Canada and the US) affect vaping.

The article looked at four groups: people who smoke and used to vape, dual users, ex-smokers who used to vape but don't anymore, and ex-smokers who still vape. Future intentions varied between these groups.

Satisfaction with vaping was important for current vapers in terms of their intentions to continue use. This is relevant in terms of maintaining or improving product standards of e-cigarettes as an alternative to smoking. Smokers in the survey who were not currently vaping were also influenced by perceptions about possible satisfaction from these products, and their value as cutting down and quitting aids. This suggests that information about e-cigarettes that effectively deliver nicotine and that could be used for smoking cessation is important to convey to current smokers who might switch in the future.

Believing that e-cigarettes were less harmful than tobacco was a predictor of future intention to vape among all groups except ex-smokers who still vape, perhaps indicating that this group had already made their choice about using these products and were not as susceptible to available (and often confusing) messages in the public domain about relative risk. When looking at country differences, smokers who used to vape but don't anymore were influenced by harm perceptions in the UK but not Australia. The authors suggest that difficulties accessing products in Australia and greater uncertainty about harm overall within Australia's more restrictive policy framework might mask the importance of risk perceptions as a factor in intention to use e-cigarettes again in smokers who had tried them in the past. Misbeliefs may inhibit e-cigarette use and possible smoking cessation through vaping. Clearly more research is needed about the barriers and facilitators to trying e-cigarettes amongst smokers, and this research could inform policy and practice.

Finally we included a cross-sectional survey of 4,127 adults in the USA who were asked whether secondhand aerosol from e-cigarettes was harmful to children. One third of those taking part reported that they simply did not know, perhaps reflecting current confusion over whether exposure, particularly indoors, is a cause for concern. Very few (5%) thought second hand vapour posed no harm to children, four in ten thought a little or some harm, and one in five thought it could cause a lot of harm to children. Current and former smokers and current and former vapers were more likely to think second hand vapour did not pose a risk to child health. Much of the discussion section of the article sets out the need to educate adults about risks from e-cigarette aerosol in the US context where at least 8 states have banned use in smokefree indoor areas. The context is different in the UK, where no national legislation prohibits use indoors but many workplaces and premises do ban or restrict vaping. It would be interesting to assess public perceptions of any harm to children from e-cigarette aerosol in the UK.

Other studies from the last month that you may find of interest:

- [Prevalence of use and perceptions of risk of novel and other alternative tobacco products among sexual minority adults: Results from an online national survey, 2014-2015.](#)
- [E-cigarettes and weight loss - product design innovation insights from industry patents.](#)
- [E-cigarette liquids: Constancy of content across batches and accuracy of labeling.](#)
- [Race/ethnicity modifies the association between school prevalence of e-cigarette use and student-level use: Results from the 2014 US National Youth Tobacco Survey.](#)
- [Biomarkers of Exposure to New and Emerging Tobacco and Nicotine Delivery Products.](#)
- [Development and validation of a HS/GC-MS method for the simultaneous analysis of diacetyl and acetylpropionyl in electronic cigarette refills.](#)
- [The relationships between sensation seeking and a spectrum of e-cigarette use behaviors: Cross-sectional and longitudinal analyses specific to Texas adolescents.](#)
- [Warning Statements and Safety Practices among Manufacturers and Distributors of Electronic Cigarette Liquids in the United States.](#)
- [E-cigarettes induce toxicological effects that can raise the cancer risk.](#)
- [Mining e-cigarette adverse events in social media using Bi-LSTM recurrent neural network with word embedding representation.](#)
- [Behavioral economic substitution between conventional cigarettes and e-cigarettes differs as a function of the frequency of e-cigarette use.](#)
- [Early Subjective Sensory Experiences with "cigalike" E-cigarettes Among African American Menthol Smokers: A Qualitative Study.](#)
- [Differences in Delay, but not Probability Discounting, in Current Smokers, E-cigarette Users, and Never Smokers.](#)
- [Electronic cigarette aerosols suppress cellular antioxidant defenses and induce significant oxidative DNA damage.](#)
- [Effect of brand and advertising medium on demand for e-cigarettes: Evidence from an experimental auction.](#)
- [Changes in resting state functional brain connectivity and withdrawal symptoms are associated with acute electronic cigarette use.](#)
- [Comparing the cytotoxicity of electronic cigarette fluids, aerosols and solvents.](#)
- [E-Cigarette Users' Attitudes on the Banning of Sales of Nicotine E-Liquid, Its Implication on E-Cigarette Use Behaviours and Alternative Sources of Nicotine E-Liquid.](#)
- [Does e-cigarette use predict cigarette escalation? A longitudinal study of young adult non-daily smokers.](#)

- [Vaporised nicotine and tobacco harm reduction for addressing smoking among people living with HIV: A cross-sectional survey of Australian HIV health practitioners' attitudes.](#)
- [A comparison of daily versus weekly electronic cigarette users in treatment for substance abuse.](#)
- [Nicotine delivery from the refill liquid to the aerosol via high-power e-cigarette device.](#)
- [Comparing the Effects of Electronic Cigarette Vapor and Cigarette Smoke in a Novel In Vivo Exposure System.](#)
- [Comparison of Ecological Momentary Assessment Versus Direct Measurement of E-Cigarette Use With a Bluetooth-Enabled E-Cigarette: A Pilot Study.](#)
- [Electronic cigarettes: age-specific generation-resolved pulmonary doses.](#)
- [The Relation between Frequency of E-Cigarette Use and Frequency and Intensity of Cigarette Smoking among South Korean Adolescents.](#)
- [Sales of Nicotine-Containing Electronic Cigarette Products: United States, 2015.](#)
- [Assessment of new-generation high-power electronic nicotine delivery system as thermal aerosol generation device for inhaled bronchodilators.](#)

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 e-cig*[title/abstract] OR (nicotine AND (vaporizer 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 UKERCf 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 Carl Alexander and Nikki Smith from Cancer Research UK with assistance from Professor Linda Bauld and Kathryn Angus at the University of Stirling and the UK Centre for Tobacco and Alcohol Studies, primarily for the benefit of members 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.