Electronic cigarette research briefing – May 2015

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 briefing also aims to provide a critical overview of individual studies and put them in the context of what we already know from previous research.

The studies selected in these briefings do not form an exhaustive list of every e-cigarette-related study published each month. Instead they include those most relevant to key themes identified by the newly formed UK Electronic Cigarette Research Forum. This includes mechanisms and safety, cessation, population level impact, marketing and unintended consequences. For an explanation of the search strategy used, please see the end of this briefing.

The text below provides an overview of the aims, key findings and limitations of each of the highlighted studies. The briefing concludes with a section that puts the study findings in the context of the wider literature and what we know about existing research gaps.

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1. Electronic cigarette use among young people in Wales: evidence from two cross sectional surveys

- **Study aims**
  This study aimed to explore the prevalence of e-cigarette use by age in young people in Wales, and any associations with socio-demographic characteristics, tobacco and cannabis use. Two nationally-representative samples were conducted in 1,601 10-11 year olds and 9,055 high school students in 2013-14.

- **Key findings**
  Although 5.8% of 10-11 year olds and 12.3% of secondary school children reported trying an e-cigarette (more than the proportion trying cigarettes until the age of 15), this rarely translated into regular use (use at least once a month) which was only reported in 1.5% of 11-16 year olds. The proportion of never-smokers trying e-cigarettes rose from 5.3% of 10-11 year old never-smokers, up to 8% of 15-16 year old never-smokers.

  Regular e-cigarette use was more likely among those who had smoked cannabis. There were no differences according to gender, ethnicity or family affluence.

- **Limitations**
  Unlike some other studies, this survey differentiated between ever and regular use of e-cigarettes, though not intensity of use or tracking of use over time – we can't know whether never smokers who try e-cigarettes go on to become smokers or would have if they hadn't tried e-cigarettes instead.

  This relies on self-report of e-cigarette use among children, which has not been validated, and comprehension of what an "e-cigarette" includes.

Moore G, Hewitt G, Evans J, Littlecott HJ, Holliday J, Ahmed N, Moore L, Murphy S, Fletcher A. Electronic-cigarette use among young people in Wales: evidence from two cross-sectional surveys. *BMJ Open* 2015;5:e007072 doi:10.1136/bmjopen-2014-007072

2. **Is use of electronic cigarettes while smoking associated with smoking cessation attempts, cessation and reduced cigarette consumption? A survey with a 1-year follow-up**

- **Study aims**
  This UK study aimed to assess the association between e-cigarette use while smoking with smoking cessation, quit attempts and substantial cigarette per day (CPD) reduction, taking into account frequency of use and key demographic and behavioural characteristics. A sample of 4,064 UK smokers were surveyed about smoking and vaping in 2012 and 1,656 were successfully followed up a year later. Results were adjusted for socio-demographic variables, dependence and nicotine-replacement therapy (NRT) use.

- **Key findings**
  Overall 46.2% of respondents had made a quit attempt and 12% had successfully quit. Almost 80% of respondents were not using e-cigarettes; only 5% were using them daily.

  Although daily e-cigarette users were twice as likely to have tried to quit, they were not more likely to have succeeded than smokers not using e-cigarettes. Daily users were also 2.5 times as likely to have substantially reduced their consumption. Non-daily e-cigarette use was not associated with cessation, quit attempts or reduction.

- **Limitations**
  This study looked at all smokers using e-cigarettes, not just those using them in a quit attempt and the sample was not representative of the UK population. There was also a low response rate to the follow up survey and only a small proportion were using e-cigarettes every day, so the number of people in this group was relatively small (5%).

Brose LS, Hitchman SC, Brown J, West R, McNeil A. Is use of electronic cigarettes while smoking associated with smoking cessation attempts, cessation and reduced cigarette consumption? A survey with a 1-year follow-up. *Addiction.* 2015. DOI: 10.1111/add.12917

3. **Associations Between E-Cigarette Type, Frequency of Use, and Quitting Smoking: Findings From a Longitudinal Online Panel Survey in Great Britain**

- **Study aims**
  This UK study aimed to explore differences in types of e-cigarette used and frequency, and how this is associated with cessation. A sample of 4,064 UK smokers were surveyed about smoking and vaping in 2012 and 1,643 were successfully followed up a year later. Devices were categorised into those that are disposable or use pre-filled cartridges (cigalikes) and those the user refills with liquids, whether tank or modified (tank-style).

- **Key findings**
  Two thirds of respondents had not used e-cigarettes, 27% used cigalikes, and 9% used tanks. Tank users were more likely to be 40–54 versus 18–24 year olds and those with low versus moderate/high education.

Only those using tank-style e-cigarettes daily were more likely to have quit smoking, non-daily users of tanks or cigalikes were no more or less likely and occasional cigalike user were significantly less likely to have quit than smokers not using e-cigarettes. The only other factors significantly associated with quitting were motivation and low strength of urges to smoke.

- **Limitations**
  This study looked at all smokers using e-cigarettes, not just those using them in a quit attempt and the sample was not representative of the UK population. There was also a low response rate to the follow up survey and only a small proportion were using e-cigarettes every day, so the number of people in this group was relatively small (5%).

  Only two time points were assessed so we can't know the patterns of use over time and whether tank-style users started on cigalikes for example. It's not clear what characteristics of tank-style devices or their users made these quit attempts more successful. Also any e-cigarettes with pre-filled cartridges were classified as cigalikes regardless of whether they actually looked like cigarettes.

Hitchman SC, Brose LS, Brown J, Robson D, McNeil A. Associations Between E-Cigarette Type, Frequency of Use, and Quitting Smoking: Findings From a Longitudinal Online Panel Survey in Great Britain. *Nicotine Tob Res.* 2015. doi: 10.1093/ntr/ntv078

4. **E-cigarette use in the past and quitting behavior in the future: a population-based study**

- **Study aims**
  This US prospective longitudinal study explored whether 236 e-cigarette users, within 1,000 smokers, were more or less likely to have quit, attempted to quit or reduced their cigarette consumption by 20% or more 1 year on. The responses were weighted to match demographic characteristics of Californian smokers and results were controlled for demographic variables, intention to quit, time to first cigarette and smoking status.

  Participants were asked at baseline and follow-up whether they had ever used an e-cigarette (defined as a device that looks like cigarettes and contains nicotine but do not produce tobacco smoke, some brands were also listed). Only those reporting consistent ever/never use at baseline and follow up were included, those who said they might use e-cigarettes were excluded.

- **Key findings**
  Smokers who reported ever using e-cigarettes at both baseline and follow-up were significantly less likely to quit for 30 days or more and less likely to decrease cigarette consumption. There was no significant increase in quit attempts.

  Demographic variables associated with e-cigarette use were female gender, non-Hispanic white ethnicity and daily vs non-daily smokers.

- **Limitations**
  The main limitation of this study is that they asked about ever rather than current or regular e-cigarette use. They also did not ask about other quitting aids that might have been used.

  The responses were adjusted to be representative of Californian smokers but it's not clear whether these results could be extrapolated to UK smokers. Also the survey was conducted

July 2011-April 2012 and November 2012-January 2013 so these are likely to be users of very early devices.

Al-Delaimy WK, Myers MG, Leas EC, Strong DR, Hofstetter CR. E-cigarette use in the past and quitting behavior in the future: a population-based study. *Am J Public Health.* 2015;105(6):1213-9. doi: 10.2105/AJPH.2014.302482

Overview

This month's briefing includes four articles on electronic cigarettes, three from the UK and one from the USA. Three of these focus on use in adults and smoking cessation, and one on youth uptake. The first article from Graham Moore and colleagues reports findings from two separate surveys in Wales, one with 10-11 year olds and the second, more detailed, with 11-16 year olds. This latter study forms part of the well-established Health Behaviour in School Children survey, in which Wales participates along with other countries. The Welsh HBSC survey was conducted between November 2013 and February 2014 and included new questions on e-cigarettes. One of the key contributions of this survey is that it examined not just 'ever use' of e-cigarettes amongst teenagers but also frequency of use, and differentiates between young people who use tobacco and never smokers. Findings were similar to other surveys in the UK, in particular those reported in the Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS) which was conducted in a very similar time period (Sept 2013 to March 2014) amongst 13 to 15 year olds in Scotland[1]. Both the HBSC and SALSUS found about one in eight young people had tried e-cigarettes but fewer than 2% (0.4% in SALSUS) had used them more frequently (more than monthly). Use was highly concentrated amongst smokers. In never smoking young people in Wales 8.3% (n=637) had ever tried an e-cigarette but just 0.7% (n=54) reported regular use. No regular use in never smoking young people was found in SALSUS. It will be important to examine changes the next time the HBSC reports but for now these findings suggest that regular use is very rare in young people who don't smoke.

Colleagues in the Institute of Psychiatry at Kings College London published two studies with adults, one in the journal *Addiction* and the second in *Nicotine and Tobacco Research*. An important element of both studies is that they followed up e-cigarette users one year after baseline data collection to assess changes, although not all participants could be contacted at this timepoint (just over a third in the first study and four in ten in the second). The first study, by Leonie Brose and colleagues, examined a diverse group of smokers using e-cigarettes, and, importantly, not just those who were trying to stop smoking. Relatively few amongst the sample used e-cigarettes daily, but those who did were twice as likely to have made a quit attempt. This did not result in any higher rates of stopping smoking than amongst those not using e-cigarettes, but did find that vapers were far more likely to have reduced their cigarette consumption.

The study by Sara Hitchman and colleagues focused on types of devices and frequency of use. The e-cigarette market in the UK and other countries has evolved and a recent survey by YouGov for ASH shows that refillable 'tank' devices are now the most popular, with just under two thirds of vapers using them compared with 'cig-a-likes', which resemble traditional cigarettes and are used by just under a third of current vapers[2]. Tank devices allow the user to refill the device with an e-liquid of their choice with different flavours and nicotine content. Although a small proportion (9%) of users in the Hitchman et al study used tanks they were found to be more likely to have stopped smoking at

follow up. Some concerns about tank devices have been expressed (including non childproof liquid containers, for example) but previous studies[3,4] have also suggested that these types of e-cigarettes are better at supporting a quit attempt, probably because they are more effective in delivering nicotine to cope with withdrawal symptoms and cravings that can undermine many attempts to stop smoking.

The final study summarised here included a smaller sample of e-cigarette users and compared quit attempts, success at stopping smoking and cutting down tobacco use between baseline and follow up a year later. Wael Al-Delaimy and colleagues defined e-cigarette use as 'ever use' and did not examine whether there was any current use or its frequency unlike the studies above. Those who reported ever use at baseline and follow up were both less likely to have stopped smoking and less likely to have reduced consumption. However, it is impossible to tell from the study whether the ever users had simply tried e-cigarettes once or twice or had continued to use them, and no information was contained on what types of devices were tried or indeed what other stop smoking aids (i.e. licensed stop smoking medications such as Nicotine Replacement Therapy) anyone in the study used. These gaps place considerable caveats around the conclusions.

These studies add to a growing and sometimes contradictory evidence-based on e-cigarettes and smoking cessation, although clearly some study designs and questions are far more likely to deliver reliable results than others. What these three studies of e-cigarette use in adults highlight is that future research on e-cigarettes should ideally take into account the types of devices being used, how often and why they are being used, rather than more simplistic associations that lump these things together. This type of differentiation could inform better information to smokers about approaches stop smoking if they choose to use e-cigarettes as part of a quit attempt.

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

- Knowledge, attitudes and beliefs towards waterpipe tobacco smoking and electronic shisha (e-shisha) among young adults in London: a qualitative analysis
- Toxicity assessment of refill liquids for electronic cigarettes
- Tobacco use among middle and high school students - United States, 2011-2014
- Flavour chemicals in electronic cigarette fluids
- A pilot study on nicotine residues in houses of electronic cigarette users, tobacco smokers, and non-users of nicotine-containing products
- "Direct Dripping": A High-Temperature, High-Formaldehyde Emission Electronic Cigarette Use Method
- Tripling use of electronic cigarettes among new zealand adolescents between 2012 and 2014
- Changes in puffing behavior among smokers who switched from tobacco to electronic cigarettes

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 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.

References

1. ISD Scotland. Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS), Smoking among 13 and 15 year olds in Scotland 2013. 2014. http://www.isdscotland.org/Health-Topics/Public-Health/SALSUS/Latest-Report/
2. ASH. Electronic cigarette use among smokers slows as perceptions of harm increase. 2015. http://www.ash.org.uk/media-room/press-releases/:electronic-cigarette-use-among-smokers-slows-as-perceptions-of-harm-increase
3. Dawkins et al. 2013, Vaping profiles and preferences: an online survey of electronic cigarette users. *Addiction*. 108(6):1115-25. doi: 10.1111/add.12150
4. Farsalinos et al. 2014. Nicotine absorption from electronic cigarette use: comparison between first and new-generation devices. *Sci Rep*.4:4133. doi: 10.1038/srep04133

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