

Cross Party Group on Smoking and Health

E-Cigarettes: An Evidence Update

REPORT

Cross Party Group Meeting

At a Cross Party Group meeting on Wednesday November 30th, chaired by John Griffiths MS, we heard findings from the recent independent report on vaping which was conducted by researchers at King's College London (KCL). The independent report, commissioned by the Office for Health Improvement and Disparities (OHID), has been cited as the most comprehensive review of vaping to date.

More than 80 stakeholders from across the UK took part in the event, including: Members of the Senedd and their representatives, Welsh Government, Welsh youth services, substance misuse services, health practitioners and health service leads.

Background

Recent research from the Institute of Psychiatry, Psychology & Neuroscience (IoPPN) at King's College London has found that the use of vaping products rather than smoking leads to a substantial reduction in exposure to toxicants that implicate: cancer, cardiovascular disease, and lung disease.

The report reviewed over 400 international studies.

The report found that:

- **While vaping is not risk free (particularly for people who have never smoked), it poses a small fraction of the health risks of smoking in the short to medium term.**

The report reviewed many aspects of vaping, including:

- Who is vaping and what products are used.
- Vaping's effects on health (both absolute and compared with smoking).
- Public perceptions of vaping's harms.

- Biomarkers of exposure (measures of potentially harmful substance levels in the body).
- Biomarkers of potential harm (measures of biological changes in the body).

The strongest evidence, and where there was a greater volume of research, came from biomarkers of exposure. An exploration of the available studies found that levels of tobacco specific nitrosamines, volatile organic compounds and other toxicants implicated in the main diseases caused by smoking were found at significantly lower levels in vapers. When comparing biomarkers between people who vape and people who don't smoke or vape, they were often similar, but in some cases there was higher exposure when vaping. The investigators therefore concluded that whilst less harmful than smoking, vaping is likely to sustain some risks particularly for people who have never smoked.

In the meeting we heard the research findings, and explored the following:

- Health risks of vaping compared to smoking.
- Second-hand vape exposure (risks).
- E-cigarettes within smoking cessation (effectiveness).
- Reflections on vaping's long-term harms.

To read the independent report in full, please click [here](#).

Meeting Purpose: Towards A Unified Approach to Vaping in Wales

Currently, there is not a unified approach on the use of electronic cigarettes in Wales. The newly released Tobacco Control Strategy for Wales (A Smoke-free Wales) has committed to the following within the strategy's first delivery plan:

- **Explore the role of e-cigarettes and other nicotine products for smoking cessation** ¹

Welsh Government are currently formulating a position statement on e-cigarettes, which is expected to be published at the start of next year (2023). This meeting was launched to support the formation of this statement, through:

- Creating an open discourse between key stakeholders in Wales.
- Submitting latest evidence on vaping.
- Submitting recommendations.

According to ASH Cymru, a unified position statement is needed in Wales as:

- 76% of current vapers in Wales use e-cigarettes to help stop smoking ².
- 33% of Welsh adults, including 32% of smokers, wrongly believe e-cigarettes to be as harmful or more harmful than tobacco cigarettes, a significant increase from 25% in 2018 ³.

¹ Welsh Government. [Towards a Smoke-free Wales: Delivery Plan 2022-2024](#). 2022

² NSW. [Smoking Bulletin: Adult Smoking and E-cigarette Use](#). 2018-2019

³ ASH Cymru. [YouGov Smoke-free Survey](#). 2022

Speakers & Presentation

Professor Ann McNeill, Professor of Tobacco Addiction at King's College London, is one of the independent report's authors. Professor McNeill relayed:

- The report was published in September 2022 and is the sixth in series of reports that King's (KCL) have been commissioned by government (UK) to produce on e-cigarettes.
- The report holds 16 chapters and 1,400 pages, and it is King's largest report on vaping to date.

Routine survey data was used within the report (from England) to examine the behaviours of youth and adults. In addition, the report carried out two new systematic reviews of the international literature in this field (which focused on: the health risks on vaping, and vaping risk perceptions and communications).

Gateway Theory

Professor McNeill relayed that the report did not focus on this area (vaping as a gateway into smoking), however Cochrane will be looking at this field in detail. However, Professor McNeill did offer some insight by marking that the gateway hypothesis is often contested, and that it implies a causal relationship between vaping and smoking, **but there is often no evidence given other than sequence of use.**

Professor McNeill marked that it is important to recognise that vaping could be seen as a gateway out of smoking.

In addition, Professor McNeill relayed:

- There is an alternative explanation to the gateway hypothesis, that is called 'common liability hypothesis'. The common liability hypothesis argues that traits such as impulsivity, or curiosity, are associated with the use of both drugs or both delivery systems (vaping and smoking).

At the very least, if vaping were a gateway into smoking: we would expect smoking prevalence to increase as vaping increases. Professor McNeill highlighted that even if there were a rise in tobacco use, this would not be substantial evidence of a gateway effect.

Biomarkers (harm and exposure)

Dr Erikas Simonavicius, is a research associate at King's College London, and is one of the independent review's authors. Dr Simonavicius relayed the report's findings on biomarkers of harm and biomarkers of exposure.

The researchers looked for studies published between August 2017 and July 2021. The researchers screened approximately 10,000 studies; 413 studies were included in the King's

report. 275 of the selected studies were human studies, which was supplemented with data from animal and cell studies.

The report relays both relative risks (comparing smokers to vapers) and absolute risks (comparing vapers to non-users). The report looked at two kinds of biomarkers:

- Biomarkers of exposure, which looked at measurements of toxicants levels in the human body (after a person: smokes, vapes, or uses nothing). This was used as a proxy for the harms to health, as we know that exposure to some toxicants may lead to specific diseases.
- Biomarkers of potential harm (measures of biological changes in the body).

Findings

‘When vaping was compared to smoking, disease specific toxicants were at significantly lower levels amongst vapers than smokers. This suggests that there is reduced harm amongst vapers when compared to smokers’ - Dr Simonavicius, King’s College London

Dr Simonavicius shared the main research findings, which were:

- In terms of biomarkers of exposure for vapers and smokers (relative risk), the report’s meta-analyses found that most toxicant levels were significantly lower in vapers than smokers, but in some cases there were similar levels.
- In terms of biomarkers of exposure for vapers and non-users (absolute risk), the report’s meta-analyses found that: in most cases, exposure to toxicants were at a similar level, but for some toxicants levels were significantly higher (but still these were at lower levels compared to smoking and non-use).

Dr Simonavicius summarised the report’s findings by relaying the following on biomarkers of exposure:

- i) Levels of toxicants were found to be significantly lower among vapers than smokers, suggesting much lower harms to health when vaping than smoking.**
- ii) Levels of toxicants were at a similar or higher levels amongst vapers and non-users, suggesting that vaping is not risk-free when compared to non-use.**

The researchers also analysed toxicants that are specific to the following diseases: cancer, respiratory disease and cardiovascular disease. The results were as follows:

- **When vaping was compared to smoking, disease specific toxicants were at significantly lower levels amongst vapers than smokers. This suggests that there is reduced harm amongst vapers when compared to smokers.**
- When comparing vapers to non-users, regarding respiratory and cardiovascular disease specific toxicants : these levels were similar, or similar for most of the

toxicants. With regard to cancer, some of the toxicant levels some were similar, and some were higher amongst vapers and non-users.

The researchers also reviewed biomarkers of potential harm. Dr Simonavicius relayed that that there are disease specific biomarkers of potential harm, for example: a sustained change in heart rate is a specific biomarker for harm for cardiovascular disease. These biomarkers are measured via biological changes in the body after a person smokes, vapes, or doesn't use anything. The report concluded the following for biomarkers of potential harm:

- For cancer, the report didn't identify many studies on humans; but the researchers supplemented this with animal and cell studies. The report also did not identify any studies that explored vaping's prevalence within people living with a cancer diagnosis, or a previous cancer diagnosis, and this is a serious limitation. Research on methylation and demethylation of specific genes would be potentially useful to identify how vaping might be associated with cancer.
- For respiratory diseases, the researchers found insufficient evidence on vaping's associations on lung function. There was also limited evidence that vaping negatively affects lung function amongst those living with asthma. Studies with the longest follow up (up to 5 years) were of smokers who had COPD, who switched to vaping. These studies found some improvements in lung function and a reduction in exacerbations in COPD symptoms.
- For cardiovascular disease, heart rate and blood pressure were lower in vapers than smokers; and similar to non-users after long term vaping. Furthermore, data on arterial stiffness and oxygen saturation were insufficient or had no evidence on these specific biomarkers of potential harm.

Dr Simonavicius relayed that an additional aspect of biomarkers of potential harm, are biomarkers that cut across multiple diseases. For example, one of these included oxidative stress (which is associated with both cancer and cardiovascular disease). Dr Simonavicius relayed that the report found the following:

Oxidative stress	Mostly no difference between vaping, smoking or not using tobacco or nicotine
Inflammation	Evidence mixed and no definite conclusions could be drawn
Endothelial function	Switching from smoking to vaping might improve endothelial function in the short-to-medium term
Platelet activation	Evidence insufficient for conclusions

In light of the above, the report found:

- i) Mixed evidence about negative vaping effects on biomarkers of potential harm.

However, the report found no major causes of concern regarding vaping's harm to health in acute and short to medium term.

Nicotine and Flavours

Dr Debbie Robson, is a Senior Lecturer in Tobacco Harm Reduction at King's College London, and is one of the independent reports authors. Dr Robson relayed 'nicotine and flavours' findings within the report, and the following points:

- When it came to acute vaping and smoking (exposed to a few puffs/or up to 7 days): people were exposed to lower levels of nicotine when vaping compared to smoking.
- However, the more experienced you are at vaping: you can extract similar levels of nicotine from vaping devices, that are comparable to smoking.
- In terms of flavours, the report found that the most popular flavours in adults and young people in England were fruit flavours followed by menthol flavours. In adults the third most popular flavour was tobacco, and for children it was sweet flavours.
- Non-tobacco flavours can be seen as important for helping smokers initiate vaping, and stay vaping, and go on to stop smoking.
- In terms of the health effects of flavours, the report found very few studies on the health effects of flavours in humans. This is because this is difficult to do (i.e. separating the carrier solution from the nicotine, and flavours, and seeing their individual effects). The report supplemented this area with data from animal and cell studies.
- Out of the thousands of flavours that were available, there was one particular flavouring that was a potential cause for concern: Cinnamaldehyde. However, this was less of a concern than in tobacco smoke. More research is needed in this area.

Poisons, Fires and Explosions

Dr Robson went on to relay findings on poisons, fires and explosions relating to e-cigarettes.

- Fortunately, instances of poisonings, fire and explosions are quite rare.
- Data (from the National Poisons Info Service in 2021) shows that out of 40,000 telephone enquiries 187 were about vaping products. Just under half of these calls (187) were about children under the age of 5 who had ingested e-liquids.
- Case reports were also examined, where there were some reports of intentional poisoning from e-liquids (one in which someone had died). There were 16 non-UK deaths from exposure to e-liquids.
- In terms of fires, data from the London Fire Brigade shows that between 2017-2021, they had attended: 15 fires related to vaping, and 5606 fires related to smoking.
- **There were no injuries or deaths related to vaping fires. There were approximately 40 deaths related to fires caused by smoking.**
- The report also looked at malfunctioning e-cigarettes (explosions). Instances were found to be rare, though injury could be seen as serious. Two case reports were found (in the period 2017-2021), these cases did not include fatalities. International case reports: 23 were found, 1 case included a fatality.

Risk Perceptions

Dr Leonie Brose, Reader in Addictions Education and Nicotine Research at King's College London, is one of the independent report's authors. Dr Brose relayed the report's findings on risk perceptions, and communications on relative risks.

- Data risks perceptions on vaping among adult smokers in England, showed that approximately 12% believed vaping to be more harmful than tobacco cigarettes. Only a third (34%) thought that vaping was less harmful than tobacco cigarettes.

The research team conducted a systematic literature review on vaping risk perceptions and communications. This review was guided by two research questions:

- What interventions had been effective in changing vaping risk perceptions?
- To what extent are vaping risk perceptions predictive of any changes in vaping and smoking behaviour?
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Over 11, 000 records were identified, 53 of which were included in the above systematic review (data synthesis). The key take home messages from the review were:

1. **Communicating accurate information about the relative harms of vaping can help to correct misperceptions of vaping particularly among adults.**
2. **This is important because vaping harm perceptions can change vaping and smoking behaviours.**
3. **Interventions on absolute harms of vaping need to be carefully designed so as not to misinform young people (particularly smokers) about the relative harms of smoking & vaping.**

Vaping: Smoking Cessation

Dr Brose relayed vaping's role within smoking cessation, which was included in the report.

- Data on e-cigarettes within smoking cessation services in England from 2020-2021 showed that e-cigarettes were a successful quitting aid in the short term (comparable with varenicline).
- Population level data from the English Smoking Toolkit study showed that in recent years e-cigarettes have remained the most popular quitting aid (after no evidence-based support).

Cochrane

The living Cochrane Review on e-cigarettes for smoking cessation, which was recently updated in November 2022, concluded: there is **high certainty** evidence that e-cigarettes with nicotine increase quit rates compared to NRT, and there is moderate certainty evidence that they increase quit rates compared to e-cigarettes without nicotine. NB: the Cochrane review was not included in the independent report (King's).

Reflections on long term harms

Professor McNeill provided reflections on vaping's long-term harms. Based on the independent report's findings (substantially lower levels of toxicants of exposure found in vapers compared with smokers, and no major causes of concern when assessing biomarkers of potential harm): there is confidence that vaping also poses a fraction of the risk of smoking in the long-term. However, more long-term studies are needed to be carried out.

What did we learn?

- Vaping rather than smoking leads to a substantial reduction in exposure to toxicants that implicate: cancer, cardiovascular disease, and lung disease.
- Vaping carries only a fraction of the risk of smoking in the short to medium term.
- Vaping can be used as an alternative to smoking to reduce the health harms of smoking.
- Vaping is not risk-free, particularly for people who have never smoked.
- Never or long-term former smokers should be discouraged from taking up vaping (unless they would smoke instead).
- There is not substantial evidence to show that vaping is a gateway into smoking.
- Public misperceptions on the relative harms of vaping are apparent in both England and Wales: there is a need for accurate information and comms.
- E-cigarettes can be seen as a successful quitting aid in the short term (comparable with varenicline in supported quit attempts).
- E-cigarettes have remained the most popular quitting aid (after no evidence-based support) in both England and Wales.
- There is high certainty evidence that e-cigarettes with nicotine increase quit rates compared to NRT (Cochrane).

Recommendations

Welsh Government Action:

- Welsh Government should approach vaping from two separate action areas: smoking cessation and protecting youth and never-smokers from uptake.
- Welsh Government should produce accurate communications around the relative harms of vaping compared to smoking, to curtail growing misperceptions in Wales.
- Welsh Government should work with other UK administrations on reducing the environmental impact of disposable vapes.
- Work to enhance the regulatory framework for vaping products (marketing) should be mindful that actions to protect children could impact adults, and vice versa.

- Welsh Government should adopt a balanced approach to vaping, within its upcoming position statement on e-cigarettes. This balance should:
 - Recognise that vaping is significantly less harmful than smoking.
 - Support vaping in the context of smoking cessation (through a harm reduction approach).
 - Not recommend vaping to children, youth and never smokers.

Public Health Wales

- To support nicotine containing e-cigarettes as a front-line quitting aid along with traditional pharmacotherapy currently offered in Wales. This would be in line with NICE guidance on e-cigarettes ([1.12.2](#))⁴.
- To produce accurate communications around the relative harms of vaping compared to smoking, to curtail growing misperceptions in Wales.

⁴ NB: the NCSCT has published [recommended](#) models for supply.