# Vaping Products Duty Consultation Response

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**COIs**: the authors have no direct or indirect links to, or receive funding from, the tobacco industry.

## Structure of the duty (chapter 4)

**Q5. The authors do NOT agree that the rates and structure outlined in Chapter 3 of the consultation will achieve the stated objectives of the duty.**

The intention is to reduce the number of non-smokers and young people that vape, and encourage consumers to use, and manufacturers to produce, lower nicotine strength products. However, **the progressive tax proposed is based on the erroneous assumption that switching to lower or non-nicotine e-liquids will have a health benefit.**

**In fact, the opposite is likely to be the case** because encouraging the use of lower nicotine concentrations will lead to increased consumption, and greater exposure to other (non-nicotine) constituents which are potentially harmful (see our evidence summarised to question 7).

The progressive duty is also likely to exacerbate health inequalities by disproportionately affecting the poorest and most disadvantaged smokers because they are more nicotine dependent and need higher nicotine concentrations to completely stop smoking.

Finally, the proposed tier structure would increase misperceptions around the harms of nicotine. If smokers consider nicotine harmful, they will be less inclined to try and switch to reduced risk nicotine products.

In short, **the proposed progressive tax structure will have unintended consequences, likely harming public health and exacerbating existing health inequalities.**

**Q6. The authors do NOT agree that the rates and structure will encourage manufacturers to reduce the nicotine content of their products.**

As indicated above, the evidence does not support the proposal to encourage manufacturers to reduce the nicotine content of their products because doing so results in consumers using more e-liquid which can increase exposure to potentially harmful chemicals.

The consultation report misses the point that **nicotine, although addictive, is probably one of the least harmful chemicals in e-liquid. Any harms associated with vaping likely come from the inhalation of heated propylene glycol, vegetable glycerine, and flavours.**

The evidence (outlined in question 7 below) suggests that consumers who are vaping to quit smoking, should be encouraged to use higher nicotine concentrations, which is associated with inhaling less vapour, lower harm, and increased smoking cessation rates.

**Q7. The authors agree that there will be an impact on vaping behaviour but not the intended impact of improving public health and reducing health inequalities.**

The progressive rate structure will encourage the use of cheaper, lower nicotine concentrations which in turn, will lead to users increasing the amount they vape or return to smoking.

**Our research in smokers and vapers has consistently shown that using lower nicotine concentrations is associated with consuming more e-liquid through i) taking longer puffs; ii) more frequent puffs [1,2,5]; and iii) increasing device power (in devices where this is possible) [2], in turn increasing exposure to potentially harmful chemicals [2,3,4].** Switching to lower nicotine concentrations will therefor come, not only with a financial cost to the user, but possibly also with a health cost.

We have demonstrated this effect both in the laboratory and under real world conditions across numerous studies (several of which were funded by Cancer Research UK) described below:

- In our first study [1], eleven experienced vapers completed 60 minutes of ad libitum vaping under low (6 mg/mL) and high (24 mg/mL) nicotine e-liquid conditions in two separate sessions in a laboratory setting. We measured puff number, puff duration and volume of liquid consumed. Number of puffs was significantly higher, and puff duration significantly longer, in the low compared with the high nicotine concentration condition, resulting in a doubling of e-liquid consumed. Our results suggest that, like tobacco smokers, when switching to lower nicotine concentration, vapers engage in "compensatory puffing" in an attempt to obtain satisfactory and optimal level of nicotine.

- We subsequently replicated this effect of compensatory puffing in a group of 20 vapers in a real-world setting [2]. Participants used a device provided by the research team for 4 weeks using low (6mg/mL) or high (18mg/mL) nicotine concentrations. In some conditions they were permitted to adjust the power (voltage) of the device; in other conditions, power was fixed. Participants increased their daily puff number and puff duration and consumed more liquid a day in the low versus high nicotine condition. This was particularly pronounced when participants were unable to adjust the power on their device. Where power adjustments were possible, participants increased the power on the device in the low (but not in the high) nicotine condition to allow greater production of vapour.

- Despite the more intensive puffing with the lower nicotine concentration e-liquid, nicotine craving, and withdrawal symptoms were higher, and overall satisfaction was lower, in the low nicotine e-liquid condition. This suggests that even with compensatory puffing, many users (particularly those who are more nicotine dependent) will be unlikely to achieve the nicotine levels they need which could lead to dissatisfaction with vaping and possible continuation of, or return to, smoking. This was also shown in an additional study with a sample of 50 smokers with little experience in using vapes[6].

- In the aforementioned real-world study of 20 vapers[2] we also measured urinary levels of formate, a metabolite of the known human carcinogen, formaldehyde. Formate levels were significantly higher when participants used a low nicotine concentration e-liquid with increased power, suggesting an increase in toxicant exposure.

- We have also replicated the puffing patterns obtained from participants in our first study (described above)[1] using a smoking machine to generate e-cigarette (vape) aerosol in the lab. Formaldehyde, acetaldehyde and acetone levels were significantly higher in aerosols from the 6mg/mL compared with 24mg/mL puffing regimen [3]. The same was observed based on our real-world puffing patterns from the 20 vapers in the CRUK funded study [2,4]. Based on those data, **in an estimation of cancer risk associated with compensatory behaviour, our simulation suggests a 2fold increase in cancer risk when switching from**

**high to low nicotine e-liquid** [4]. It should be noted however, that this still remains substantially lower than the cancer risk associated with tobacco smoking.

- We have recently replicated our laboratory-based findings in smokers using Juul (a pod-style vape device) (5). Under-double blind, placebo controlled, counterbalanced conditions, participants used a 59mg/mL vs. 20mg/mL nicotine pod. The amount of liquid consumed was doubled when using the 20mg/mL versus the 59mg/mL nicotine strength suggesting again, that users altered their puffing in order to compensate for the drop in nicotine content in the e-liquid.

- Finally, in a 12-month longitudinal study [7], whilst vapers reduced the nicotine concentrations in e-liquids (from 14mg/mL at baseline to 10mg/mL at the 12-month follow up), they significantly increased their e-liquid consumption (from 4.44 to 6.84mL). At the same time, the amount of nicotine delivery did not change (as measured via salivary cotinine levels). This suggests that like smokers, vapers alter their behaviour in order to regulate their nicotine intake and maintain a constant level of nicotine in their blood.

**Together, these findings provide strong and consistent evidence that, when vapers switch to a lower nicotine concentration e-liquid, they engage in compensatory behaviours: taking more puffs, increasing puff duration, and where possible, increasing device power. This, in turn, is associated with higher levels of exposure to carcinogens (formaldehyde, acetaldehyde and acetone).**

Aside from the research above, adding duty according to nicotine concentration sends the wrong message to users that nicotine is harmful. Indeed, much higher concentrations of nicotine are available in other countries, e.g. the US where concentrations up to 59mg/mL are permitted, and higher nicotine levels increase the chances of successfully quitting smoking [8,9,10]. More than half of people in the UK already think that vaping is as harmful, or more harmful, than smoking; this proposed regulation is likely to reinforce this misperception and could deter smokers from switching to a far less harmful product.

Moreover, the greatest burden of smoking-related death and disease falls on those who are most disadvantaged in society [11]: the poorest [12] those with other addictions or a mental health diagnosis [13,14,15], and those experiencing homelessness [16]. Smoking prevalence rates remain exceptionally high among these groups (up to 4 times higher than national averages) and nicotine dependence is high. High nicotine dependence and low socioeconomic status are predictive of poorer smoking cessation outcomes [13-15, 17]. Higher nicotine concentrations are necessary to adequately reduce craving and promote smoking cessation among the most disadvantaged in society; such groups should not have to pay more to quit smoking.

**Encouraging the use of lower nicotine concentrations is therefore NOT RECOMMENDED. A flat tax structure, regardless of nicotine concentration, is recommended, which would also be easier to implement and enforce.**

**Q.8 & 9. The authors do NOT agree that production of vaping products by individuals for their own use should be within scope of the duty.**

Adding duty to e-liquids prepared by individuals for their own use is disproportionate to the risk posed by vaping and is not in place for home production of wine or beer.

We explored 'home mixing' of e-liquids in 41 vapers in 2017 [18]. An analysis of samples provided was not associated with any greater variance in chemicals than in commercially

available e-liquids. Most users were also able to achieve their intended nicotine concentrations ± 20% demonstrating that home mixers are generally capable of creating nicotine e-liquids to a similar level of accuracy as commercial products.

This was a practice most associated with older, male vapers using more sophisticated, modular vaping devices. Therefore, it is unlikely that younger people (who generally purchase disposable devices from shops) would engage in this practice. Adding duty to e-liquids that people make at home is unnecessary in the context of the aims of reducing vaping in young people.

## Q59. Assessment of Impacts (chapter 10)

The assessment of impacts of the proposed duty is again, erroneously based on the premise that switching to lower or no nicotine vaping products will have a health benefit. As outlined in Chapter 4 questions 5-7 above, this is unlikely to be the case. It is more likely that encouraging use of lower nicotine strengths will result in overall public health harms.

This is because:

1. Using lower nicotine concentrations will lead to more vaping / more consumption of e-liquid as people will puff more, puff more intensely, and if possible, increase device power, to achieve the nicotine levels they need [1,2,5].
2. Even with this compensatory behaviour, more dependent smokers will be unlikely to achieve the nicotine levels they need to sufficiently reduce craving for cigarettes [2], leading to dissatisfaction and possible continuation of, or return to, smoking.
3. It sends the wrong message that nicotine is harmful. This would exacerbate the current common misperceptions of nicotine and vaping harms [19]. If smokers believe nicotine is harmful, there is less incentive to switch to a reduced risk alternative such as vaping.
4. It would disproportionately affect the poorest and most disadvantaged because they are more nicotine dependent and need the higher nicotine concentrations, which attract the higher duty. This would exacerbate health inequalities, which is opposite to what the government is trying to achieve.

The assessment of impacts in the consultation document only considers age and sex in relation to inequalities, ignoring the huge health inequalities associated with smoking. The most disadvantaged in society are also generally the most dependent smokers who need higher nicotine concentrations to quit smoking. Such individuals will be disproportionately affected by the progressive tax structure proposed; they will either have to pay more, or opt for cheaper, less effective, lower nicotine e-liquids. This is likely to lead to continued smoking and greater health inequalities.

The impact on businesses is also likely to favour larger companies (including the tobacco industry who manufacturer vaping products) who have the resources to deal with the new processes and procedures. Smaller companies may not have the expertise and manpower to deal with the new regulations and may go out of business. A reduction in product choice and availability will ultimately affect people trying to stop smoking.

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