Vaping - An inquiry into reducing rates of e-cigarette use in Queensland

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Electronic cigarettes and personal vaporisers

Submission to the Health and Environment Committee of the Queensland Parliament

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Introduction

Purpose and scope

We welcome the opportunity to comment on the Health and Environment Committee's inquiry on electronic cigarettes (e-cigarettes) and personal vaporisers (vaping). Our team has recently completed systematic reviews regarding the evidence on the health effects of e-cigarettes for the Australian Department of Health.[1,2] This submission therefore focuses on those aspects of the terms of reference of the inquiry relating to the risks of e-cigarette use. Summary points are presented below; further details are available in the full reports.

Background

Australia has an internationally unique prescription-only regulatory model of electronic cigarette (e-cigarette) use. The primary aim of the scheduling of nicotine as a prescription medicine is to minimise the use of e-cigarettes in non-smokers, particularly adolescents and young adults.[3-5] Additional regulatory goals are to: ensure medical supervision of e-cigarette use; help health practitioners and consumers access accurate information about e-cigarette contents; increase efficacious support for people who want to stop smoking; prevent poisonings, particularly in children; minimise the risks of other adverse effects of e-cigarettes including addiction, toxicity, burns, lung injury, negative impacts on tobacco control and smoking renormalisation; and to prevent adulteration of e-liquids. Nicotine e-cigarettes are not currently registered as therapeutic products in Australia or internationally.

Bearing in mind the known issues with accurate labelling of e-cigarette ingredients, the vast majority of e-cigarettes contain nicotine and the most common nicotine concentration in pod and disposable products is 5% or 59mg/mL.[6,7] Nicotine salt disposable products, the most common devices used by children and adolescents,[8,9] can deliver high nicotine concentrations, more rapidly and with less throat irritation than freebase nicotine products. New products on the market can deliver >10,000 puffs and with approximately 200-300 puffs the equivalent to one packet of cigarettes (in terms of nicotine), these can be comparable to 30-50 packets of cigarettes.[10,11]

The current global evidence, as reviewed in our recent report[1] indicates that:

- e-cigarettes are likely to be harmful when used for purposes other than smoking cessation, including use by non-smokers[1]
- a range of safety issues have been identified, along with uncertainty regarding their effects on major clinical conditions including cancer, cardiovascular disease, respiratory conditions other than lung injury, development and mental health.
- they are likely to be particularly harmful for adolescents and young adults, largely due to their effects on addiction, the developing brain and increased uptake of combustible tobacco smoking[1]
- 89% of the Australian population aged 14 and over are not current daily smokers[12,13]
- tobacco smoking is exceptionally harmful and quitting brings large benefits
- at a population level, while smoking cessation remains important, avoidance of uptake of smoking in youth is currently the main driver of declining smoking prevalence in Australia[12]

- e-cigarettes may benefit smokers who use them to quit completely and promptly, bearing in mind uncertainties regarding their effects on major clinical conditions
- most smokers quitting successfully do so unaided, with only a minority seeking medical support for quitting[1]
- among those who need support to quit, multiple approved smoking cessation products are available
- most smokers who use e-cigarettes continue to smoke.[12,13]

This evidence means that the avoidance of widespread use of e-cigarettes is important for public health, that e-cigarettes have a limited role in tobacco control, and a limited role in smoking cessation – as discretionary late-line therapy in clinical settings. Policies and regulations, and their enforcement must – first and foremost – enhance and not compromise measures to reduce e-cigarette use in non-smokers and youth, even when designed to improve access and other elements for the limited number of people who use them in the clinical setting to try to quit.

In Australia, e-cigarettes are currently readily available through illegal channels. Use has become common in children and adolescents, largely attributable to aggressive marketing to them via social media, product characteristics designed to appeal to children, their addictiveness and their ready availability.

To reduce e-cigarette use in non-smokers, especially youth, the current evidence indicates that the most important measures are to **reduce supply to these groups, including through enforcing existing regulations** and to reduce promotion/advertising. Evidence on the impacts of education and school-based programs on tobacco control is mixed and generally indicates that they work best as part of a comprehensive control framework, need to be relatively intensive and may be less effective than other, more structural measures.[14]

It is also important to be clear that the key drivers of the current issues are the tobacco and closely-related e-cigarette industries. If these industries would solely market and supply their products to smokers wanting to quit, the situation would be vastly different.

1. E-cigarette patterns of use, health impacts and current approaches to discourage uptake

Term of reference

1. The current status in Queensland relating to the:
    a. Prevalence of e-cigarette use, particularly amongst children and young people;
    b. Risks of vaping harmful chemicals, including nicotine, to individuals, communities, and the health system

Response

1a. Prevalence of e-cigarette use

Prevalence and trends in Australia

The current evidence indicates increasing and relatively common use of nicotine e-cigarettes in young people in Australia,[15] and that e-cigarettes are easy to access.[9] Over 90% of use is without a prescription and hence is illicit.[15]

The most recent national data on e-cigarette use in Australia are from the 2020-21 National Health Survey, which indicate an estimated 9.2% of Australians aged 15 and over reported ever having used e-cigarettes. Among Australian adults, e-cigarette use is most prevalent among younger people, with an estimated 21.7% of Australians aged 18-24 and 17.0% of Australians aged 25-34 reporting ever using an e-cigarette.

Use in relation to smoking

Data from the 2019 National Drug Strategy Household Survey indicate that, among people aged 14 and over who had ever used e-cigarettes, 42.7% were current smokers at initiation of e-cigarette use, 26.2% were occasional or social smokers, 7.9% were ex-smokers and 23.2% had never smoked. The proportion of e-cigarette users who were never smokers varied markedly with age, with 64.5% of those aged 14-17 being never-smokers at initiation in 2019 (Figure xx).

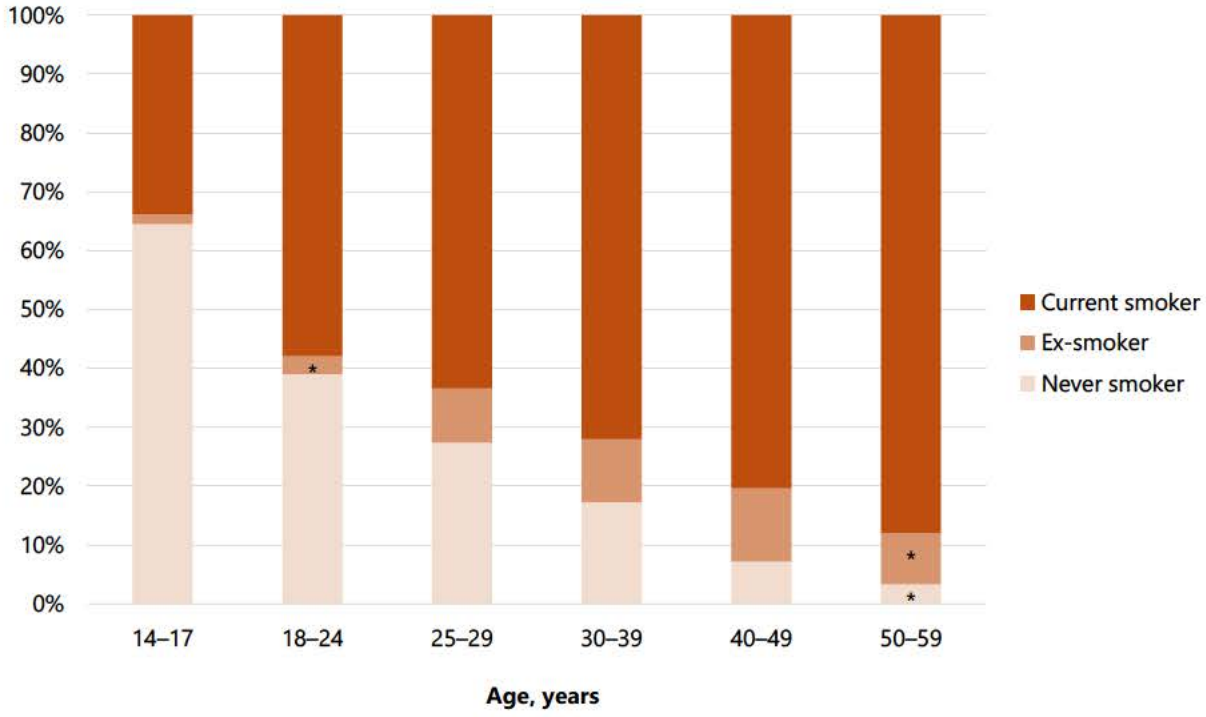

Figure 1. Smoking status at initiation of e-cigarette use in Australia among ever-users, by age, 2019[16]

Data from the 2019 National Drug Strategy Household Survey show that, among people aged 14 and over in Australia reporting current at least monthly use of e-cigarettes):

- 54.1% ± 95% MOE 5.6% reported being current smokers (daily, weekly or less than weekly; approximately 226,000 people)
- 32.2% ± 5.5% reported being ex-smokers (135,000)
- 15.8% ± 4.4% reported never having smoked (66,000).

Overall, 38.7% of current smokers in Australia aged 14 years and reported having ever used an e-cigarette in the 2019 NDSHS, having increased significantly from 18.8% in 2013 to 31.0% in 2016. Among non-smokers, 6.9% reported ever-use of e-cigarettes in 2019, compared to 1.8% and 4.9% in 2016.

Prevalence and trends in Queensland

According to the Queensland Preventive Health Survey, use of e-cigarettes has increased by approximately 40% between 2018-2022, with 19.7% of Queensland adults reporting ever having used e-cigarettes in 2022, and 5.0% reporting current use. Among Queensland adults, current and ever-use was most prevalent among younger age groups with an estimated 45.3% of people aged 18 to 29 years having ever used e-cigarettes, and an estimated 14.5% of this age group currently using e-cigarettes.

Children and young people

The 2017 Australian Secondary Students' Alcohol and Drug Survey indicated that 16.5% of Queensland high school students had tried an e-cigarette, with 26.8% of children aged 16 to 17 years, and 16.8% of children aged 14-15 years reporting ever-use. Ever-use was more prevalent among males (19.5%) when compared to females (11.3%). Of the students who had ever tried an e-cigarette, 6.9% had vaped in the past month, and this prevalence was similar between sex and age groups.

1b. Risks of vaping harmful chemicals, including nicotine, to individuals, communities, and the health system

This section presents the findings from our systematic review of the current global evidence on the health outcomes of e-cigarettes[2,17] and considered the heath effect of nicotine, the toxicology of non-nicotine constituents, the health harms of e-cigarettes and their impacts on smoking uptake.

Nicotine

Nicotine is one of the most addictive substances known and the primary agent responsible for addiction in tobacco.[18] The risk of nicotine addiction increases with the rate of delivery, the rate of absorption and the blood concentration of nicotine attained. Nicotine is associated with several adverse health outcomes including:

- Acute nicotine toxicity, a well-recognised effect of nicotine exposure, can occur with symptoms ranging from nausea vomiting to cholinergic syndrome and more severe poisonings progressing to seizures and respiratory depression, which can be fatal. Toxicity risk is dependent on dose (including concentration, duration and frequency), product type, route of exposure and individual variability. The potentially lethal dose of nicotine is 5mg/kg.[18] Risk of accidental and intentional poisoning from nicotine e-liquids is increased with greater nicotine concentrations and "at home" preparation of e-liquids.[17]
- Foetal growth restriction, preterm delivery and stillbirth are associated with in utero exposure to nicotine – ascertained largely through studies of maternal smoking – and it can also negatively effects foetal lung structure and functions.[19] Maternal smoking during pregnancy, including exposure to nicotine, has been linked to sudden infant death syndrome (SIDS), cognitive, attentional and auditory processing deficits, disruptive behaviours and smoking initiation in offspring.[20]
- Comorbid substance abuse and addiction, impairments in memory, anxiety disorders, depression and disruptive disorders, which may persist long term, have been attributed to nicotine exposure during adolescence.[19] There is an age-dependent susceptibility to nicotine, with greater susceptibility at younger ages, in which exposure at a young age increases the likelihood of nicotine use later in life.[20]
    - In 2016, the US Surgeon General concluded that *"given the existing evidence from human and animal studies of the detrimental impact of nicotine exposure on adolescent brain development, the use of e-cigarettes by youth should be avoided and actively discouraged".*[20]

Evidence on the effects of nicotine on many outcomes is mostly derived from smoker populations and the presence of other constituents in tobacco cigarette smoke make the discrimination of the role of individual potential causative agents difficult.

Non-nicotine constituents and toxicology

- Evidence to date indicates e-liquid ingredients include a range of hazardous substances, including formaldehyde, acetaldehyde and acrolein.[21-23]
- The 2019 National Industrial Chemicals Notification and Assessment Scheme (NICNAS) report identified 243 unique chemicals found in e-liquids or e-cigarette emissions.[22] Thirty-eight chemicals are listed as poisons on the Australian Poisons standard, one chemical identified is not permitted in e-cigarette liquids, and three chemicals exceeded cut-off levels for the relevant standard. The majority of chemicals identified were flavouring chemicals with a number associated with health harms such as diketone which has been linked to lung damage known as 'popcorn lung'.[22]

E-cigarette health outcomes

The current worldwide evidence indicates that use of nicotine e-cigarettes increases the risk of certain adverse health outcomes.[1,24] There is:

- **Conclusive** evidence that e-cigarettes can cause: toxicity through inhalation, including seizures and loss of consciousness; and increased uptake of smoking. Fourteen per cent of cases of e-cigarette or vaping product use-associated lung injury (EVALI) in the largest study to date were from reported use of standard nicotine e-cigarettes.[25]
- **Conclusive** evidence that there are adverse effects of the e-cigarette device, including trauma and burns from exploding devices.
- **Conclusive to substantial** evidence that nicotine e-cigarettes cause addiction and that their environmental impacts include waste, fires and indoor airborne particulate matter. The latter are, in turn, likely to have adverse health impacts, the extent of which cannot be determined.
- **Moderate** evidence that nicotine e-cigarettes can cause less serious adverse events, such as headache, cough, throat irritation, dizziness, and nausea.
- **Moderate** evidence that, among smokers use of e-cigarettes increases heart rate, systolic blood pressure, diastolic blood pressure and arterial stiffness acutely after use.
- **Limited** evidence that use of e-cigarettes in non-smokers leads to acute reductions in lung function and other respiratory measures.
- **Insufficient** evidence regarding ceasing smoking and switching completely to e-cigarettes with respect to exacerbations of respiratory disease or changes in respiratory symptoms, lung function and other respiratory measures, and effects on the developing brain.

The effect of nicotine e-cigarettes, on major health conditions – including cancer, cardiovascular disease, respiratory disease and reproductive and mental health conditions – is not known. Hence, safety for these products has not yet been established.

The effects of e-cigarettes on combustible smoking uptake

The review also finds that there is substantial and consistent evidence from observational studies that never smokers who have used e-cigarettes are more likely than those who have not used e-cigarettes to try smoking conventional cigarettes and to transition to becoming regular tobacco smokers.

Results from our meta-analyses found that there is:[1,24,26]

- **Strong** evidence that never smokers who use e-cigarettes are on average around three times as likely than those who do not use e-cigarettes to initiate cigarette smoking.
- **Strong** evidence that non-smokers who use e-cigarettes are also around three times as likely as those who do not use e-cigarettes to become current regular cigarette smokers
- **Limited** evidence that ex-smokers who use e-cigarettes have around double the likelihood of relapse to resuming smoking than ex-smokers who do not use e-cigarettes.

Risks to communities and the health system

Among non-smokers, there is currently strong evidence that use of e-cigarettes is harmful to health overall, with multiple health harms and no health benefit through increased smoking cessation identified in this population. Non-smokers and young people are disproportionately affected by and most vulnerable to e-cigarette adverse events.

There is limited evidence that e-cigarettes are efficacious for smoking cessation compared to nicotine replacement therapy. E-cigarettes may be beneficial for smokers who use them to completely and promptly quit smoking, but the limited evidence in this regard, their risks, uncertainty about their effects on major clinical outcomes, and continued smoking by most users render their overall safety and unclear. This issue si covered in detail in our review.

2. Waste management and environmental impacts

Term of reference

1. Consideration of waste management and environmental impacts of e-cigarette products.

Response

Waste management

E-cigarette products and their use pose an increasingly difficult challenge to waste management in Australia. E-cigarettes, particularly fourth generation devices (pods, pod mods, and disposables) generate substantial plastic waste as they are designed to be single-use or contain a replaceable pod cartridge, in addition to associated packaging waste.27,28 E-cigarettes also create electronic waste in the form of lithium-ion batteries and circuit boards which can leach battery acid and other toxic heavy metals into the environment.27,28 Finally, the e-liquid itself generates chemical waste through nicotine-containing e-liquid which is considered an acute hazardous waste by the US Environmental Protection Agency and therefore subject to strict regulations concerning its safe disposal.29

Regulations on the safe disposal of e-cigarettes and their constituent products vary widely.30 With current waste disposal options, e-cigarettes should be disassembled into their components, removing the battery, rinsing out the e-liquid, and separately recycling the plastic and electronic waste.30 However, this is not always possible as some e-cigarette products cannot be safely dismantled or are otherwise designed to be disposed of whole, such as many fourth generation products.30

There is no national recycling program in Australia for e-cigarettes.30 E-cigarettes are also not eligible for collection as part of the National Television and Computer Recycling Scheme.30 However, some local councils do accept e-cigarettes in their waste management programs. Individual e-cigarette components can be recycled via specific disposal pathways if they can be disassembled. For example, the Battery Stewardship Scheme, or B-Cycle, does accept batteries that have been removed from e-cigarette devices.31 At present, there is no national stewardship program for e-cigarettes or nationally coordinated recycling program.

Environmental impacts with health implications

This section presents the evidence on e-cigarette products and their use that are associated with environmental impacts with direct implications for human health as identified in our recent global systematic review.[1,2] This review considered evidence published July 2017 – July 2020 and examined air quality (airborne particulate matter, carbonyls, gases, and volatile organic compounds), surface contamination (nicotine and cotinine), fire (occurrence of fire, reported fires, fire spread and structural damage or loss due to fire/explosion) and waste (discarded e-cigarette devices, e-liquid cartridges, pods, e-liquids or nicotine salts). Our synthesised findings from previous reviews and our 'top up' review of evidence up to July 2020 identified:

- **Conclusive** evidence that e-cigarette use results in increased airborne particulate matter in indoor environments.
- **Limited** evidence that e-cigarette use results in increased concentrations of airborne nicotine and of nicotine and cotinine on indoor surfaces.
- **Insufficient** evidence that e-cigarette use results in increased air levels of carbon dioxide, carbon monoxide, propylene glycol, volatile organic compounds and carbonyls.
- **Substantia**l evidence that e-cigarettes can cause fires and environmental waste and **insufficient** evidence as to the extent that these present a hazard to human health.

Indoor air quality and contamination of indoor surfaces

Our combined evidence from previous reviews and the top up review identified 20 studies examined indoor air quality and nicotine on home surfaces of e-cigarette users. Only studies in which the aerosol was generated by a person using the e-cigarette, reflecting the most realistic exposure to bystanders, were included.

The National Academies of Sciences, Engineering and Medicine (NASEM) conducted a review[32] which identified nine studies,[33-41] eight non-randomised intervention studies examining the characteristics and chemical composition of second-hand e-cigarette aerosol (air quality) and one study assessing nicotine on home surfaces of users of e-cigarettes Air quality studies were conducted in a variety of settings (exposure chambers and rooms, homes, conventions) investigating mainly particulate matter and nicotine, with some other constituents assessed by some studies. Across studies, significantly elevated levels were consistently found for particulate matter,[34-36,38-41] and nicotine,[33,37,38,40,41] with a dose-response relationship observed demonstrating higher nicotine levels with increasing rates of active ENDS use.[34,36] Total volatile organic compounds were elevated with e-cigarette use,[36] and one study identified specific compounds that increased (benzene, isoprene, toluene)[33] while others showed no significant effect.[33,40] Elevated compound levels from e-cigarette use were also reported for propylene glycol and glycerol,[33] aluminium,[38] some carbonyls (acetaldehyde, hexaldehyde),[33] and polycyclic aromatic hydrocarbons.[38] The NASEM review stated[32] that, “Overall, these exposure studies indicate that e-cigarette vaping contributes to some level of indoor air pollution, which, although lower than what has been observed from second-hand combustible tobacco cigarettes, is above the smoke-free level recommended by the Surgeon General and the WHO FCTC.”

Eight controlled experimental studies on air quality related to e-cigarette use were identified in our top up review. Three were from Italy,[42-44] and one each were from Greece,[45]Portugal,[46] Spain,[47]Canada[48] and Germany.[49] In the study by Coppeta et al., indoor particulate matter concentration during and immediately after ecigarette use was higher than that of cigarette smoking although no statistical test was reported (49,690pp/cm3 vs. 42,645pp/cm3).[44] Concentrations return to baseline five minutes after e-cigarette use and 30 minutes after smoking. Loupa et al. found the higher concentrations of indoor particulate matter during e-cigarette use than that of combustible cigarette smoking for PM10 (ENDS: 74.78mg/m3 vs. cigarette: 55.32mg/m3) and PM2.5 (ENDS: 82.06mg/m3 vs. cigarette: 62.19mg/m3), however no statistical tests were reported.[45] In the study by Protano,[43]indoor PM1 concentrations were significantly higher after e-cigarette use for each for the four different e-liquids ($p<0.001$). In an

earlier study by Protano,[42] indoor PM1 concentrations were significantly higher after e-cigarette use for each generation, voltage and resistance manipulation ($p<0.001$). Compared to no indoor smoking conditions, e-cigarette use significantly increased indoor concentrations of PM1, PM2.5, PM10 and ultrafine particles ($p<0.05$), but not black carbon, carbon monoxide or carbon dioxide in the study by Savdie et al.[46] The authors conducted the same experiment inside a medium volume car and found only PM10 to be significantly higher during e-cigarette use compared to no use. Van Drooge et al. found higher indoor concentrations of PM10, PM2.5, PM1, particle number concentrations and nicotine during e-cigarette use compared to no use, however, no statistical tests were reported.[47] In the study by Volesky, average indoor PM2.5 and ultrafine concentrations were significantly higher during e-cigarette use than before or after ($p<0.001$) but only when measured one metre from the user rather than half a metre from the user.[48] In the German study by Schober, particulate number concentration, PM2.5, propylene glycol and nicotine were all higher during e-cigarette use than no use in each of the seven different model of car tested, but no statistical test was reported.[49]

Seven of the studies were rated of high methodological quality [42,43,45-49] and one of moderate methodological quality[44] using the Joanna Briggs Institute's critical appraisal checklist. No conflicts of interest were noted for any study.

Four natural experiments relating to indoor environmental impacts of e-cigarettes were identified: two on nicotine and cotinine surface deposits, and two on particulate matter concentration in the air.

Two natural experiments on air quality were identified. Cammalleri et al.,[50] conducted in the US, found a statistically significant increase in outdoor PM1 concentrations after e-cigarette use over a 10 hour period ($p<0.023$). Outdoor PM1 levels during e-cigarette use peaked at 427 times higher than no e-cigarette use.[50] In the US study by Nguyen et al.,[51] six vape shops were measured for real time concentrations of fine and ultrafine particles on both busy and slow days, indoors and outdoors. Across the six vape shops, particle number concentration ranged from 5.5×103 to 3.3×104 particles/cm3 and PM2.5 ranged from 3.2 to 39µg/m3 in the absence of active e-cigarette use. During active e-cigarette use, particle number concentration ranged from 1.3×104 to 4.8×105 particles/cm3 and PM2.5 concentrations ranged from 15.5 to 37,500µg/m3 . Average outdoor particle number concentration ranged from 8.5×103 to 5.6×104 particles/cm3 and PM2.5 ranged from 7.5–72µg/m3. On average, particle number concentration was 1.5 times higher indoors than outdoors and 22 times higher for indoor PM2.5 than outdoor PM2.5, but no statistical tests were reported.

In one study, Khachatoorian et al.[52] assessed nicotine and cotinine deposits on fabric samples and air filters in a shop adjacent to a vape shop. Samples were collected after one, four, and eight days and after one, two and three months. Levels of nicotine and cotinine generally increased as exposure time increased, with nicotine the most abundant marker (highest concentration=23,260ng/g of fabric). The amount of nicotine and cotinine differed by the type of fabric and substance, with cotton found to have nicotine on it 100%, compared to 92% for paper towel, and paper towel 83% of the time by cotinine, compared to 22% for cotton towel. Only two control samples reported low nicotine levels; no nicotine or cotinine were otherwise detected in control fabrics. In the second study, Khachatoorian et al.[53] assessed accumulated levels of nicotine and cotinine in two indoor settings; a home and a vape shop. Fabric samples, one polyester

and one cotton, placed inside the home and vape shop were compared to control locations (a non-smokers home and on an external window of the vape shop). Fabric samples were collected after one, two, three, four, five, and six months of exposure in the home and after six, seven, 18, 24, and 48 hours, one week and one month in the vape shop. In the home, nicotine was detected at each month over six months on cotton, but detected in only the final two months on polyester. On cotton, nicotine levels ranged from 2,000-3,000ng/gram with the exception of month three which was 5,100ng/gram. Cotinine was detected in each of the six months on cotton samples, but only in three months (months one, three and four) on polyester. Levels ranged from approximately 25 – 120ng/gram on cotton and 25 – 35ng/gram on polyester. Control results were not reported. In the vape shop, nicotine levels were highest on the display case (283,775ng/g) and lowest at the back of the store (17,655ng/g) after one month. The control site recorded very low levels of nicotine over the one-month exposure period with a maximum of 719ng/g. Cotinine followed the same pattern, with the highest amount recorded for the display case (approximately 900ng/g), lowest at the back of the store (175ng/g), and undetected in the control samples.

The three studies were of moderate[51-53] and one of high[50] methodological quality and no conflicts of interest for any study were noted.

Fires and environmental waste

The combined evidence from previous reviews and the top up review identified four studies examining the impact of e-cigarettes on fire risk and environmental waste.

The Public Health England review[54] reported on fire service data from the UK Fire and Rescue Incident Recording System.[55] The data covered a two-year period from April 2015 to March 2017, including data from 49 out of 52 services. They identified 151 fires relating to e-cigarettes and the outcomes of fires were not reported. A single service, the London Fire Brigade, reported 13 e-cigarette-related fires out of a total 3,527 smoking-related fires between April 2015 and March 2017 (0.4%). The review also included studies on air quality effects from use of heated tobacco products, but not e-cigarettes.

One natural experiment examined e-cigarette waste. Mock and Hendlin[56] reported the results of a garbology study (an ethno-archaeological study of a community or cultural group by analysing its waste) measuring waste from e-cigarettes (Table 4.12.2). They reported e-cigarette waste around 12 public high schools, most of which was from JUUL brand ecigarettes. There were 172 reported waste items identified, the large majority of which were pod caps, followed by pods. The authors concluded that “measures are needed to eliminate environmental contamination from e-cigarette…waste in and around schools”. This study was of moderate methodological quality and no conflicts of interest were identified.

Two surveillance reports reporting on the relationship of e-cigarettes to fires were identified. The identified grey literature report was from the US Fire Administration,[57] reporting on the scope and nature of explosions and fires attributable to e-cigarettes occurring between January 2009 and December 2016. A total of 195 incidents were reported. The most common incident context reported was when being carried in the individual’s pocket (n=61) and almost as frequent, when the device was in active use (n=60), followed by during charging (n=48). Less common were incidents whilst the device was in storage (n=18), and one incident occurred on a cargo aircraft. Of the 128

reports of fire spread, 10 were recorded as major (involved significant portions of a building, and required suppression by the fire department), 27 as moderate (the burned area was larger than six inches in diameter, but the fire was extinguished by occupants before the fire department arrived), and 91 as minor (the scorching or flames either self-extinguished or were extinguished very quickly by persons nearby). Authors made several concluding points, which included that consumers should look for and demand e-cigarette products that have been evaluated for safety and that lithium-ion batteries should not be used in e-cigarettes. Saxena et al.[58] reported surveillance and case data on fires and explosions attributable to e-cigarette use drawing on surveillance data from the US National Fire Data Centre over an eight-year period (2009 to 2016), and cases reported on a blog site (Ecigone) which captured reports from any country over a nineyear period (2009 to 2017). As data from the US National Fire Data Centre has already been described, only information from the blog will be described. The blog reported 243 fires/explosions of which 31% occurred in pockets, 31% while in use, 25% while charging, 0.01% while in transport and 4% were unknown. The methodological quality of the study was rated as low and no conflicts of interest were declared by the authors. As the US National Fire Data Centre report was not a peer-reviewed article, no quality assessment was conducted and conflicts of interest were not reported.

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