Cost of Living Cost of Smoking: Evidence Brief 2

Electronic cigarettes (e-cigarettes): contemporary issues

What e-cigarettes are, what is contained in them, and some health implications of use

Electronic cigarettes (e-cigarettes, vapes) are devices that contain an "e-liquid" for inhalation. Devices range from "cigalikes" to refillable pen and larger tank devices, pods, and disposable products. E-cigarette users inhale a complex mixture of chemicals, many of which are associated with adverse health effects.[12] The published evidence indicates that use of nicotine e-cigarettes increases the risks of adverse health outcomes, including addiction, toxicity from inhalation (eg seizures), and lung injury (due to THC/vitamin E acetate-containing products). There is only limited evidence that nicotine e-cigarettes are effective smoking cessation aids. [13]

Up-to-date stats on vaping [14]

Adults

- The percentage of adults in Scotland reporting current use (generally includes those who vape once a week or more and those who vape only occasionally) is likely to be somewhere between 5% according to the Scottish Health Survey and 13.2% as shown by the Smoking Toolkit Study and has increased over the past couple of years.
- The percentage reporting having ever tried vaping is estimated to be around 15%.
- Current vaping is less common in older age groups.[15]
- In Scotland, a large percentage (around 40%) of those who currently vape are also smoking tobacco (dual use).
- Vaping is more common in more disadvantaged groups.[16]

Children

- The proportion reporting regular vaping (once a week or more) varies between 0.2% for UK 10–15-year-olds (Understanding Society 2020/21) and 6.7% for Scottish 13- and 15-year-olds (Health and Wellbeing Census 2021/22).
- Current use may be increasing. According to the most recent data from the ASH GB Youth survey, the rate among 11–17-year-olds was 7% in 2022, up from 3.3% in 2021 and 4.1% in 2020.
- The most recent data on prevalence among children who have ever tried vaping comes from the ASH GB Youth Survey 2022, which reports 15.8% for 11–17-year-olds.
- Smokers or those who have ever tried a tobacco cigarette are more likely to have tried vaping than non-smokers or those who have never tried a tobacco cigarette. Dual use is also common. For example, the ASH GB Youth Survey 2022 estimated that 55.4% of current vapers aged 11-17 were dual users.

Contemporary issue no 1: E-cigarettes and nicotine addiction in young people

The direct health risks, the association of e-cigarette use with taking up tobacco smoking, and the uncertainty about their effects on major outcomes mean that e-cigarette use by non-smokers, especially children and adolescents, is an important public health problem (Ball

et al., 2021; Banks et al., 2023). Indeed, Jankowski and colleagues (2019) found that e-cigarettes may be more addictive than traditional cigarettes among young adults. This may be due to regular use and high concentration of nicotine in e-cigarettes, making it a worrying new trend into nicotine addiction (Hanafin, Sunday & Clancy, 2023). However, some studies did not find such effects. Tokle and colleagues (2022) found that adolescents most commonly used e-cigarettes without nicotine, and Jarvis et al. (2020) found that e-cigarette dependence remained rare in students who had only ever used e-cigarettes and never any other tobacco products.

Contemporary issue no 2: E-cigarettes acting as a gateway to smoking in young people

The literature in this topic is mixed as there are ongoing heated debates in this area. Reviews of longitudinal studies (i.e., following up participants over time) have found that e-cigarettes are associated with higher incidence of combustible cigarette smoking (Chan et al., 2021; Chatterjee et al., 2018). This was the case even after accounting for demographic, psychosocial, and behavioural risk factors for cigarette smoking, meaning that it is more likely that e-cigarette use led to cigarette smoking (Soneji et al., 2017). In addition, yet more longitudinal evidence shows that adolescents who had ever used e-cigarettes compared with non-users were more likely to report initiation of combustible tobacco use over the next year.

However, there is a line of research which suggests that no such 'gateway to smoking' exists. Lee, Coombs and Afolalu (2018) argue that studies assessing the gateway effect rarely considered psychosocial factors such as psychiatric disorders, school performance, anxiety, parent smoking and peer attitudes. This means that if we were to account for those factors, it may substantially reduce the estimated gateway effect. The researchers also suggest that introducing e-cigarettes likely reduces smoking-related disease. {Note: authors have financial

ties to tobacco company Philip Morris International.} Bauld et al. (2017) also found that most e-cigarette experimentation does not turn into regular use, and that levels of regular use in young people who have never smoked remain very low.

Studies referenced in more detail

E-cigarettes and nicotine addiction in young people.

- Jankowski and colleagues (2019) [17] assessed patterns of e-cigarette use and compared nicotine dependence among cigarette and e-cigarette users in a group of highly educated young adults. Participants were 30 cigarette smokers, 30 exclusive e-cigarette users, and 30 dual users (using both tobacco and e-cigarettes) were recruited. Nicotine dependence levels were over two times higher among e-cigarette users compared to traditional tobacco smokers. Similarly, among dual users, nicotine dependence levels were higher when using an e-cigarette compared to using traditional cigarettes. The findings suggest that e-cigarettes may have a higher addictive potential than smoked cigarettes among young adults.
- Ball et al. (2021) [18] investigated smoking and vaping in secondary school students (aged 13-18 years) in New Zealand following the introduction of pod e-cigarettes, which have been associated with the rapid escalation of youth vaping elsewhere. Participants were over 7,500 young people. It was found that a significant proportion of New Zealand adolescents, many of whom had never smoked, use nicotine containing e-cigarettes regularly.
- Vallone and colleagues (2019) [19] estimated the prevalence of e-cigarette use (specifically JUUL) and identified demographic and psychosocial factors affecting use among youth and young adults in the USA. There were over 14,000 participants aged 15-34. Participants were surveyed about e-cigarette use, tobacco use, harm perceptions, sensation seeking and demographic characteristics. E-cigarette use was significantly higher among young people, with those under 21 having significantly higher odds of ever and current use. Frequency of use patterns suggest youth may not be experimenting with the device but using it regularly. Given the high nicotine content of e-cigarettes, there is concern over the potential for addiction and other serious health consequences among young people.

- Hanafin, Sunday and Clancy (2023) [20] further examined the social determinants of adolescent e-cigarette current use. Participants were over 3,000 students aged 15-17. Boys, smokers, binge drinkers, problem cannabis users, and sport-playing teenagers from higher-educated families, are at particular risk. As the number of young people using e-cigarettes continues to rise, including teenagers who have never smoked, improved regulation of e-cigarettes, similar to other tobacco-related products, is needed to prevent this worrying new trend of initiation into nicotine addiction.
- Tokle and colleagues (2022) [21] examined the prevalence of nicotine and nicotine-free vaping in a sample of Norwegian adolescents (over 2,000 adolescents with average age 15 years). Adolescent vapers most commonly used e-cigarettes without nicotine, few of these transitioned into nicotine vaping, and a majority became non-users. However, nicotine vapers were more likely to use other tobacco products and have more conduct problems and symptoms of depression compared to nicotine-free vapers.
- Jarvis et al. (2020) [22] analysed e-cigarette use and dependence in relation to lifetime history of use of tobacco products in over 10,000 US high-school students. Contrary to findings above, they found that while use of e-cigarettes in high-school students increased sharply between 2017 and 2019, frequent use and signs of e-cigarette dependence remained rare in students who had only ever used e-cigarettes and never any other tobacco product.

Studies for the gateway hypothesis

- Chatterjee et al. (2018) [23] conducted a review of longitudinal studies reporting effects of e-cigarette use on onset of smoking among adolescents and young adults. Researchers looked at four longitudinal studies with a pooled sample of over 10,500 participants (age < 30 years) who were followed up after 12 months. There was strong evidence that e-cigarettes were associated with higher incidence of combustible cigarette smoking, even among adolescents who were not susceptible to smoking.
- Similarly, in a systematic review and meta-analysis, Chan and colleagues (2021) [24] looked at 11 longitudinal studies examining the association between e-cigarette use at baseline and smoking at follow-up. Participants were non-smokers aged < 18 (pooled sample size was over 49,500). Follow-up periods ranged from 6 months to 2 years. The researchers found that there is a longitudinal association between adolescent vaping and smoking initiation, however, this finding is limited by publication bias, high sample attrition (i.e., large number of participants dropping out at follow-up) and not accounting for potential confounding factors.
- Soneji et al. (2017) [26] also performed a systematic review and meta-analysis of longitudinal studies that assessed initial use of e-cigarettes and subsequent cigarette smoking. They looked at 9 studies comprising over 17,000 adolescents and young adults, with ages ranging between 14 and 30 years. Longitudinal studies reported on cigarette smoking initiation associated with ever use of e-cigarettes, or past 30-day cigarette smoking associated with past 30-day e-cigarette use. Researchers found that e-cigarette use was associated with greater risk for subsequent cigarette smoking initiation and past 30-day cigarette smoking. This effect persisted even after accounting for demographic, psychosocial, and behavioural risk factors for cigarette smoking, meaning that it is more likely that e-cigarette use led to cigarette smoking.
- A longitudinal study by Leventhal and colleagues (2015) evaluated whether e-cigarette use among 14-year-old adolescents who have never tried combustible tobacco is associated with risk of initiating use of 3 combustible tobacco products (i.e., cigarettes, cigars, and hookah). Participants were 2,530 students who reported never using combustible tobacco at baseline and completed follow-up assessments at 6 or 12 months. Researchers found that those who had ever used e-cigarettes at baseline compared with non-users were more likely to report initiation of combustible tobacco use over the next year.

Studies against the gateway hypothesis

- Lee, Coombs and Afolalu (2018) [27] looked at various aspects of the gateway issue in youth. Researchers reviewed 15 studies (pooled sample of over 40,000 participants between 20-30 years old) of the gateway effect examining how extensively they accounted for confounders associated with smoking initiation youths. It was found that the list of smoking predictors accounted for in studies reporting a significant gateway effect is not comprehensive, rarely considering psychosocial factors such as psychiatric disorders, school performance, anxiety, parent smoking and peer attitudes. This means that if we were to account for those factors, it may substantially reduce the estimated gateway effect. Finally, researchers suggest that even with some true gateway effect, introducing e-cigarettes likely reduces smoking-related disease. {Note: authors have financial ties to tobacco company Philip Morris International.}
- A study by Bauld and colleagues (2017) [28] reported on e-cigarette and tobacco cigarette ever and regular use among 11–16-year-olds across the UK. Data came from five large scale surveys conducted between 2015-2017. Cumulatively these surveys collected data from over 60,000 young people. Researchers found that these surveys show a consistent pattern: most e-cigarette experimentation does not turn into regular use, and levels of regular use in young people who have never smoked remain very low.

[12] Examples of such complex chemicals include the following: nicotine, solvent carriers, flavourings, tobacco-specific nitrosamines, volatile organic compounds, phenolic compounds, tobacco alkaloids, aldehydes, free radicals, reactive oxygen species, furans, and metals.

[13] Electronic cigarettes and health outcomes: umbrella and systematic review of the global evidence (mja.com.au)

[14] Vaping - understanding prevalence and trends among adults and children: research - gov.scot (www.gov.scot)

[15] The highest proportion of current e-cigarette users in 2021 was recorded among those aged 25-34 (8%) with the lowest proportions among those aged 75 or older (1%) and those aged 65-74 (2%).

[16] Least deprived: 4%, most deprived: 10%

[17] IJERPH | Free Full-Text | E-Cigarettes are More Addictive than Traditional Cigarettes—A Study in Highly Educated Young People (mdpi.com)

[18] New Zealand Youth19 survey: vaping has wider appeal than smoking in secondary school students, and most use nicotine containing e-cigarettes - Ball - 2021 - Australian and New Zealand Journal of Public Health - Wiley Online Library

[19] Prevalence and correlates of JUUL use among a national sample of youth and young adults | Tobacco Control (bmj.com)

[20] E-cigarettes and smoking in Irish teens: a logistic regression analysis of current (past 30-day) use of e-cigarettes | SpringerLink

[21] Adolescents' Use of Nicotine-Free and Nicotine E-Cigarettes: A Longitudinal Study of Vaping Transitions and Vaper Characteristics | Nicotine & Tobacco Research | Oxford Academic (oup.com)

[22] Epidemic of youth nicotine addiction? What does the National Youth Tobacco Survey 2017-2019 reveal about high school e-cigarette use in the USA? - UCL Discovery

[23] Is vaping a gateway to smoking: a review of the longitudinal studies (degruyter.com)

[24] Gateway or common liability? A systematic review and meta-analysis of studies of adolescent e-cigarette use and future smoking initiation - Chan - 2021 - Addiction - Wiley Online Library

[25] Association Between Initial Use of e-Cigarettes and Subsequent Cigarette Smoking Among Adolescents and Young Adults: A Systematic Review and Meta-analysis | Adolescent Medicine | JAMA Pediatrics | JAMA Network

[26] Association of Electronic Cigarette Use With Initiation of Combustible Tobacco Product Smoking in Early Adolescence | Adolescent Medicine | JAMA | JAMA Network

[27] Considerations related to vaping as a possible gateway into cigarette smoking: an analytical review - PMC (nih.gov)

[28] IJERPH | Free Full-Text | Young People's Use of E-Cigarettes across the United Kingdom: Findings from Five Surveys 2015–2017 (mdpi.com)

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