



SUMMARY BRIEF: REVIEW OF GLOBAL EVIDENCE ON THE HEALTH EFFECTS OF ELECTRONIC CIGARETTES

PURPOSE

This document summarises key findings from the review of the health effects of e-cigarettes (“vaping”), commissioned by the Australian Department of Health and conducted by the National Centre for Epidemiology and Population Health.

APPROACH

Systematic reviews of the current global evidence were conducted, incorporating data from major international reviews and primary research studies.

KEY POINTS

- Smoking is Australia’s leading cause of death and disability, responsible for >20,000 deaths annually and 8.6% of disability-adjusted life-years lost. It is estimated to cause 8.7 million deaths each year worldwide.
- Over time, smokers in Australia are increasingly motivated and able to quit and smoking is continuing to decline in Australia, including for Aboriginal and Torres Strait Islander peoples. A key and increasing driver of progress is declining smoking initiation in youth.
- The large majority of people quitting smoking successfully do so unaided.
- E-cigarettes or “vapes” are a diverse group of battery-powered or rechargeable devices that aerosolise a liquid (often referred to as “e-liquid”) for inhalation.
- At least 32 countries ban the sale of nicotine e-cigarettes, 79 countries – including Australia – allow them to be sold while fully or partially regulating them and the remaining 84 countries do not regulate them at all. In Australia, nicotine e-cigarettes are legal only on prescription, for the purpose of smoking cessation.
- Standard e-liquids include water, propylene glycol and vegetable glycerine and often contain flavourings and nicotine in freebase or salt form. Use of e-cigarettes results in inhalation of a complex array of chemicals. An Australian review of toxicological analyses of non-nicotine e-cigarette emissions identified 243 unique chemicals. Thirty-eight were listed poisons, one was not permitted in e-cigarette liquids, and three exceeded cut-off levels for the relevant Standard. Twenty-seven chemical reaction products were identified, including carbonyls such as acetaldehyde, acetone, acrolein and formaldehyde, which have been associated with adverse health outcomes in humans.
- Use of e-cigarettes is increasing and is greatest in young people in Australia. In 2019, 11% of the total Australian population aged 14 and over reported ever having used e-cigarettes, around a quarter of people aged 18-24 reported ever-use and 5% of this group reported current use. Over one-third of current e-cigarette users in Australia were aged under 25, and half were aged under 30.
- In Australia, in 2019, 53% of e-cigarette users were also smokers (“dual users”), 31% were past smokers and 16% had never smoked. Among people aged 18-24, half of all current e-cigarette users had never smoked. Hence, the majority of e-cigarette use is not for smoking cessation, particularly at young ages.
- There is strong evidence that non-smokers who use e-cigarettes are three times as likely to go on to smoke combustible tobacco cigarettes as non-smokers who do not use e-cigarettes, supportive of a “gateway” effect.
- There is limited evidence that freebase nicotine e-cigarettes are an effective aid for quitting smoking when used in the clinical setting. Use of e-cigarettes by smokers trying

to quit is likely to lead to greater long-term exposure to nicotine than the use of other smoking cessation measures. There is limited evidence that ex-smokers using e-cigarettes are around twice as likely to relapse to smoking as ex-smokers not using e-cigarettes.

- Identified risks of e-cigarettes include: addiction; intentional and unintentional poisoning; acute nicotine toxicity, including seizures; burns and injuries; lung injury; indoor air pollution; environmental waste and fires; dual use with cigarette smoking; and increased smoking uptake in non-smokers.
- Less direct evidence indicates adverse effects of e-cigarettes on cardiovascular health markers, including blood pressure and heart rate, lung function and adolescent brain development and function.
- Evidence on effects of nicotine and non-nicotine e-cigarettes on most major health conditions is lacking. No or insufficient evidence was available on health effects of e-cigarettes in relation to cardiovascular disease, cancer, respiratory conditions other than lung injury, mental health, development in children and adolescents, reproduction, sleep, wound healing, neurological conditions other than seizures, and endocrine, olfactory, optical, allergic and haematological conditions. This means their safety for these outcomes has not been established.
- High concentration nicotine salt products make high concentrations of nicotine palatable and are small and easily concealed. They have been identified by the US Surgeon-General and Health Canada as key drivers of high prevalences of e-cigarette use among youth.
- E-cigarette-related risks increase with: higher nicotine concentrations in e-liquids; greater e-liquid volumes; “at home” e-liquid preparation; adulteration of e-liquids; inadequate labelling; lack of child-resistant packaging; longer durations of use; potential for multiple prescriptions; personal importation; flavourings and other factors increasing attractiveness to children and youth; and factors increasing the likelihood of use of e-cigarettes in youth and non-smokers, including advertising and promotion, lack of enforcement of regulations and high concentration nicotine salt products.
- Overall, e-cigarettes are harmful for non-smokers, especially youth, and when used for purposes other than smoking cessation. Given the extreme harms of smoking, smokers who have not been able to quit by other means who switch promptly and completely to appropriate e-cigarette products may benefit, bearing in mind uncertainties about their effects on major health conditions. The overall balance of risk and benefits of e-cigarette use in smokers is unclear.

REPORT DETAILS

Banks E, Yazidjoglou A, Brown S, Nguyen M, Martin M, Beckwith K, Daluwatta A, Campbell S, Joshy G. Electronic cigarettes and health outcomes: systematic review of global evidence. *Report for the Australian Department of Health*. National Centre for Epidemiology and Population Health, Canberra: April 2022.

[Health impacts of electronic cigarettes](#)

Contact: emily.banks@anu.edu.au

National Centre for Epidemiology and Population Health
The Australian National University
Canberra ACT 2600 Australia
www.anu.edu.au
CRICOS Provider No. 00120C