World Health Organization

Bulletin of the World Health Organization

## Perspectives

# Should e-cigarette use be included in indoor smoking bans?

Nick Wilson [a], Janet Hoek [b], George Thomson [a] & Richard Edwards [a]

a. Department of Public Health, University of Otago, Mein St, PO Box 7343, Wellington, 6021, New Zealand.
b. Department of Marketing, University of Otago, Dunedin, New Zealand.

Correspondence to Nick Wilson (email: nick.wilson@otago.ac.nz).

*(Submitted: 12 October 2016 – Revised version received: 26 December 2016 – Accepted: 06 January 2017 – Published online: 28 April 2017.)*

*Bulletin of the World Health Organization* 2017;95:540-541. doi: http://dx.doi.org/10.2471/BLT.16.186536

Electronic nicotine delivery systems, also called e-cigarettes, are devices that vapourize liquid, typically comprising nicotine, propylene glycol, glycerine and flavourings. Switching from smoking tobacco cigarettes to using e-cigarettes – known as vaping – may reduce user harm, by supporting quitting or acting as a lower risk substitute. However, the degree of harm reduction is uncertain. Governments that are considering policies to restrict vaping should consider the optimal regulation of e-cigarette products, including defining where vaping may occur. Here, we explore some of the arguments for and against extending indoor smoke-free laws to also cover vaping.

### Arguments for vaping

First, allowing vaping in indoor public places may encourage smokers to switch to vaping, by making it relatively more attractive as vaping would be allowed where tobacco smoking is not. Some e-cigarette users have voiced this potential benefit of normalization of vaping when arguing against any bans on public vaping.[1] Nevertheless, we are not aware of any clear evidence supporting this argument as an important driver for smokers switching to vaping. Other factors, such as health reasons or

the lower cost of vaping, seem to be more important for switching from smoking to vaping. Furthermore, if vaping indoors does actually normalize vaping for smokers, then logic would suggest it might also normalize vaping for non-smokers.

Second, allowing vaping in indoor public places where smoking is not permitted could minimize any discomfort that e-cigarette users may experience from nicotine withdrawal when being in such settings. However, evidence suggests that this discomfort is fairly modest. For example, in a survey conducted among exclusive e-cigarette users in the United States of America, only 12% (124 of 1034) reported finding it difficult to refrain from vaping in places where they were not supposed to.[2]

### Arguments for prohibiting vaping

First, at a distance, smoking and vaping may look similar to some people, since both activities produce visible clouds exhaled from people's mouths after they have drawn on a cigarette or device. Some e-cigarette users admit to this similarity, e.g. some cite visual similarity as a reason why they do not vape around people who are eating.[1] Given such similarities, permitting indoor vaping might renormalize tobacco smoking in smoke-free indoor environments and may lead smokers to query: if vaping is permitted, why is smoking not allowed. Renormalization of tobacco smoking would be particularly problematic if it increases the risk that children become susceptible to or initiate smoking. Indeed, some research suggests that children may misperceive vaping as smoking.[3] Nevertheless, the authors of this study speculated that "once these products are more common and the purpose of them is known, seeing people use them should normalize quitting behaviour."[3]

A second argument is that close exposure to vaping among people who have recently quit smoking or vaping might trigger them to relapse to smoking. For example, an experimental study among young-adult tobacco smokers reported that exposure to a video showing vaping significantly increased their urge to smoke as well as their desire for tobacco cigarettes and e-cigarettes.[4] Similarly, another experimental study found that exposure to the e-cigarette cue but not the tobacco cigarette cue also significantly increased desire to smoke an e-cigarette.[5]

Evidence suggests that many smokers support smoke-free areas, because this helps encourage them to quit.[6] It seems plausible that this reasoning would also apply to e-cigarette users, who wish to either constrain the level of their vaping or to quit vaping and may therefore favour indoor areas being vape-free.

Third, passive exposure to e-cigarette vapour might lead to adverse health effects according to a systematic review of 16 studies.[7] A 2016 report from the World Health Organization (WHO)[8] also concluded that second-hand aerosols from e-cigarettes are a new air contamination source for hazardous particulate matter (PM). The levels of some metals, such as nickel and chromium, in second-hand aerosols are not only higher than background air, but also higher than second-hand smoke. Furthermore, compared to background air levels, $PM_{1.0}$ and $PM_{2.5}$ in

second-hand aerosols are 14–40 times and 6–86 times higher, respectively. In addition, nicotine in second-hand aerosols has been found to be between 10–115 times higher than in background air levels, acetaldehyde between two and eight times higher, and formaldehyde about 20% higher.[8] The report suggested that the increased concentration of toxicants from second-hand aerosols over background levels poses an increased risk for the health of all bystanders, especially those with pre-existing respiratory conditions.[8]

As a result of the report, WHO recommends to Parties of the Framework Convention on Tobacco Control (FCTC) that they consider prohibiting by law the use of e-cigarettes in indoor spaces or at least where smoking is not permitted.[8] Furthermore, the International Agency for Research on Cancer[9] now considers particulates such as $PM_{2.5}$ to be carcinogenic. These data seem to support the case for fairly strong precautionary arguments for governments to protect the public from involuntary exposure to second-hand aerosols.

Fourth, regardless of the potential health risks, some people find second-hand aerosols from nearby vaping to be a nuisance, since the e-cigarettes can include strong flavours and leave pungent odours. While such nuisance concerns do not appear to have been quantified in surveys, we note that the 2016 vaper-friendly Global Forum on Nicotine conference, actually banned participants from vaping in certain indoor areas due to the nuisance that aerosol clouds caused.[10]

Fifth, a law aiming to achieve high compliance needs to be readily understandable to people who vape and those around them, hence a law restricting smoking should support a smoke-free encompasses vape-free approach. Exemptions that permit vaping in some indoor smoke-free settings (e.g. certain workplaces, restaurants or pubs) but not others, may risk generating confusion. The problems with a lack of simplicity have been illustrated by jurisdictions that have adopted complex smoke-free laws (e.g. exemptions for some types of small pubs/bars, permitting smoking rooms and defining half an indoor area smoke-free). Simplicity might also favour citizen-led promotion and enforcement of the law by reducing confusion between a cloud of vaped aerosol at a distance and a cloud of cigarette smoke.

## Conclusion

Considering the above arguments collectively, we believe that, from a public health perspective, central and local governments should adopt regulations that effectively determine that all designated indoor smoke-free areas are also vape-free areas. We note that this approach is being implemented by many jurisdictions, with vaping being banned in enclosed public spaces, such as bars, restaurants and other workplaces, in 25 countries.[11] This approach is also recommended in the 2016 WHO report to the Parties of the FCTC.[8]

Nevertheless, further research on the risks of using e-cigarettes is still desirable.[12] Research is needed to determine whether smoke-free outdoor areas should also be vape-free or not, as the issues differ

somewhat from indoor public spaces (e.g. greater dilution of second-hand aerosols outdoors).

An important perspective is whether a society is considering vaping as a permanently acceptable activity or as a temporary way to provide nicotine for people giving up smoking and transitioning to be nicotine-free. If public health policies are based on the latter perspective, it may be unwise to adopt any policy permitting indoor vaping areas, since that could suggest vaping should be a permanently allowed activity. Furthermore, governments wanting to encourage smokers to shift to vaping might be better advised to evaluate the potential of other strategies, such as differential prices, that is, via high tobacco taxes and untaxed e-cigarettes. A potential advantage of price instruments over vape-free policies is that price instruments might be more easily and quickly adjusted via tax changes than changes to the legal designation of vape-free areas.

**Competing Interests:**
None declared.

**References**

1. Farrimond H. E-cigarette regulation and policy: UK vapers' perspectives. Addiction. 2016 Jun;111(6):1077–83. http://dx.doi.org/10.1111/add.13322 pmid: 26802864
2. Yingst JM, Veldheer S, Hammett E, Hrabovsky S, Foulds J. Should electronic cigarette use be covered by clean indoor air laws? Tob Control. 2017 Mar;26 e1:e16–8. http://dx.doi.org/10.1136/tobaccocontrol-2016-053074 pmid: 27596227
3. Faletau J, Glover M, Nosa V, Pienaar F. Looks like smoking, is it smoking?: children's perceptions of cigarette-like nicotine delivery systems, smoking and cessation. Harm Reduct J. 2013 11 18;10(1):30. http://dx.doi.org/10.1186/1477-7517-10-30 pmid: 24238406
4. King AC, Smith LJ, Fridberg DJ, Matthews AK, McNamara PJ, Cao D. Exposure to electronic nicotine delivery systems (ENDS) visual imagery increases smoking urge and desire. Psychol Addict Behav. 2016 Feb;30(1):106–12. http://dx.doi.org/10.1037/adb0000123 pmid: 26618797
5. King AC, Smith LJ, McNamara PJ, Matthews AK, Fridberg DJ. Passive exposure to electronic cigarette (e-cigarette) use increases desire for combustible and e-cigarettes in young adult smokers. Tob Control. 2015 Sep;24(5):501–4. http://dx.doi.org/10.1136/tobaccocontrol-2014-051563 pmid: 24848637
6. Nagelhout GE, Zhuang YL, Gamst A, Zhu SH. Do smokers support smoke-free laws to help themselves quit smoking? Findings from a longitudinal study. Tob Control. 2015 May;24(3):233–7. http://dx.doi.org/10.1136/tobaccocontrol-2013-051255 pmid: 24415730
7. Hess IM, Lachireddy K, Capon A. A systematic review of the health risks from passive exposure to electronic cigarette vapour. Public Health Res Pract. 2016 04 15;26(2):e2621617. http://dx.doi.org/10.17061/phrp2621617 pmid: 27734060
8. Electronic nicotine delivery systems and electronic non-nicotine delivery systems (ENDS/ENNDS). Geneva: World Health Organization; 2016. Available from:

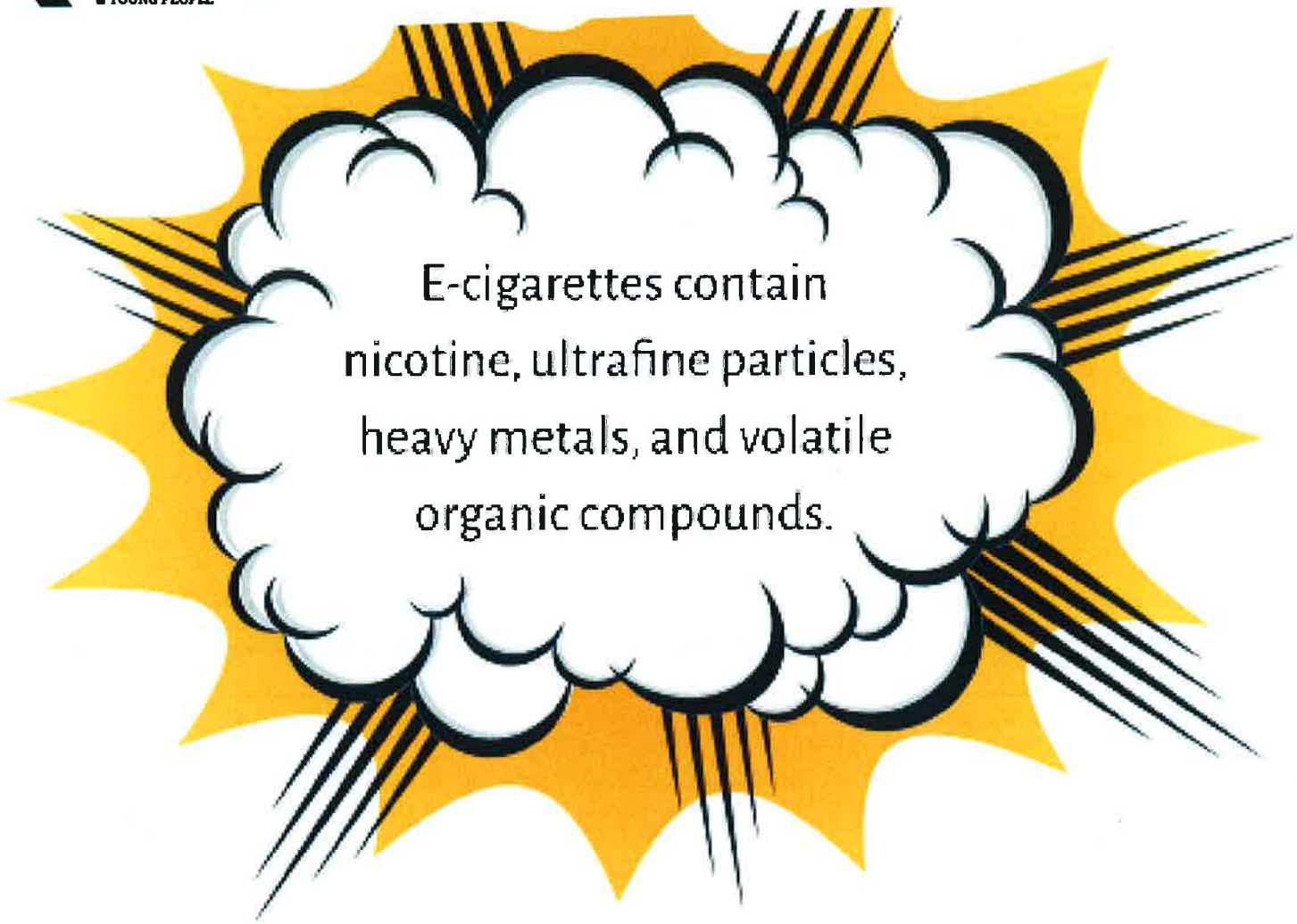
http://www.who.int/fctc/cop/cop7/FCTC_COP_7_11_EN.pdf?ua=1 [cited 2017 Apr 25].

9. Hamra GB, Guha N, Cohen A, Laden F, Raaschou-Nielsen O, Samet JM, et al. Outdoor particulate matter exposure and lung cancer: a systematic review and meta-analysis. Environ Health Perspect. 2014 Sep;122(9):906–11. pmid: 24911630
10. Global Forum on Nicotine. GFN 2016 vaping policy. London: Knowledge Action Change; 2016. Available from: https://gfn.net.co/venue-city-2016/vaping-policy [cited 2016 Oct 4].
11. Kennedy RD, Awopegba A, De León E, Cohen JE. Global approaches to regulating electronic cigarettes. Tob Control. 2016 Nov 30;tobaccocontrol-2016-053179. http://dx.doi.org/10.1136/tobaccocontrol-2016-053179 pmid: 27903958
12. Combes RD, Balls M. On the safety of e-cigarettes: "I can resist anything except temptation". Altern Lab Anim. 2015 Dec;43(6):417–25. pmid: 26753944

Source : Surgeon General.gov

KNOW THE RISKS
E-CIGARETTES & YOUNG PEOPLE

(default.htm)




## Aerosol and Other Risks

The aerosol from e-cigarettes is not harmless. It can contain harmful and potentially harmful chemicals, including nicotine; ultrafine particles that can be inhaled deep into the lungs; flavoring such diacetyl, a chemical linked to a serious lung disease; volatile organic compounds such as benzene, which is found in car exhaust; and heavy metals, such as nickel, tin, and lead. Scientists are still working to understand more fully the health effects and harmful doses of e-cigarette contents when they are heated and turned into an aerosol, both for active users who inhale from a device and for those who are exposed to the aerosol secondhand. Another risk to

E-cigarettes and Brain Development

E-cigarette use poses a significant – and avoidable – health risk to young people in the United States. Besides increasing the possibility of addiction and long-term harm to brain development and respiratory health, e-cigarette use is associated with the use of other tobacco products that can do even more damage to the body. Even breathing e-cigarette aerosol that someone else has exhaled poses potential health risks.

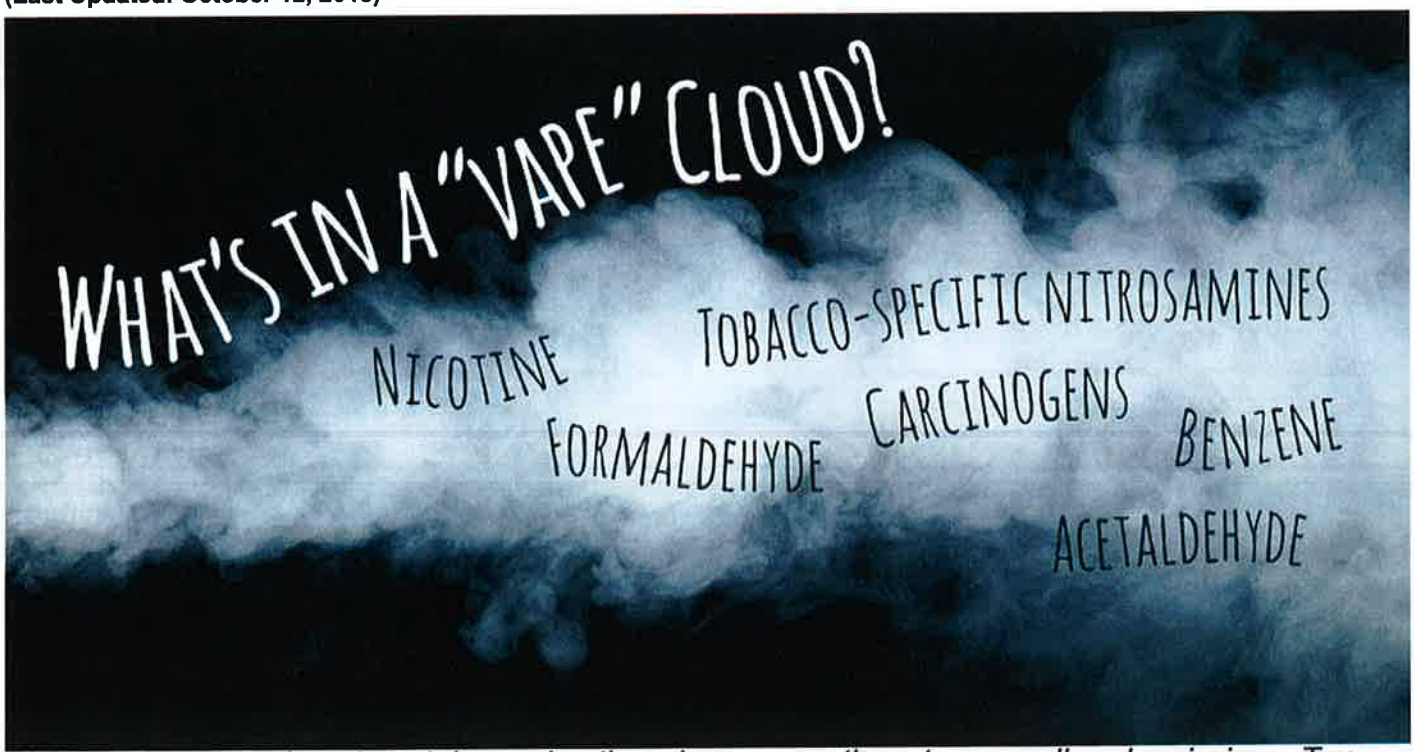
# Risks

EACH Breath
A Blog by the American Lung Association
www.lung.org > About Us > Blog > 2017 > June

# Don't Be Fooled, E-cig Aerosol Is Not Harmless for Kids

**by Editorial Staff | June 6, 2017**

**(Last Updated: October 12, 2018)**




*While e-cigarettes do not contain smoke, they do expose others to secondhand emissions. Two studies have found formaldehyde, benzene and tobacco-specific nitrosamines (all carcinogens) coming from those secondhand emissions. Other studies have shown that chemicals in the emissions contain formaldehyde, acetaldehyde and other potential toxins. The U.S. Surgeon General has concluded that e-cigarette aerosol is not harmless, and can contain harmful and potentially harmful chemicals, including nicotine.*

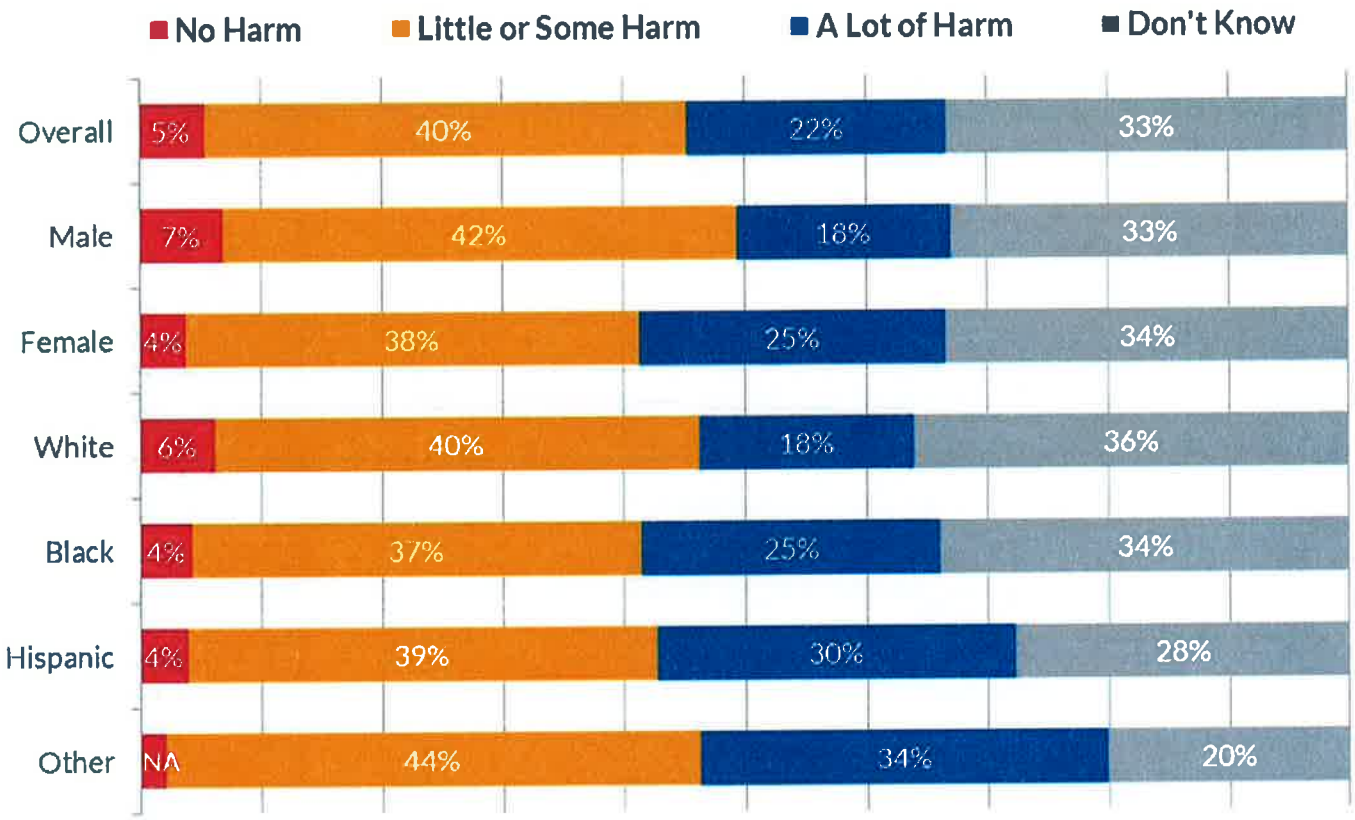
What's coming out of an e-cigarette (aerosol) may look different than secondhand smoke from cigarettes, but it's far from harmless. The Surgeon General warns e-cigarette emissions can contain harmful chemicals, including nicotine and volatile organic compounds. Children are

particularly vulnerable because of their developing lungs—and nicotine is always harmful to adolescent brain development.

But many Americans think e-cigarette aerosol is safe. According to a new CDC study, 40 percent of U.S. adults believe that children's exposure to secondhand aerosol from e-cigarettes causes only some or little harm. Five percent think it causes no harm. And this misperception may be risking the health of those who breathe this aerosol, especially children who may be exposed.

**The Study of Perceptions**

In the study *Perceptions of Harm to Children Exposed to Secondhand Aerosol From Electronic Vapor Products, Styles Survey, 2015,* authors assessed the perceptions of e-cigarette aerosol harmfulness. They found that current and former adult cigarette smokers and e-cigarette users were more likely to perceive that secondhand aerosol exposure poses no harm to children. Here are more of the study's results:




The study's conclusions support the need for public education of health risks from secondhand e-cigarette emissions and protections for non-users, particularly children, as well as laws protecting everyone from secondhand e-cigarette emissions.

**Clean Air Should Be the Standard to Protect Health**


What's good for your lungs? Clean, healthy air. According to the study, "clean air — free of both smoke and [e-cigarette] aerosol — remains the standard to protect health." The American Lung Association wholeheartedly agrees!

That's why we continue our work to help smokers quit tobacco and educate the public about the realities of tobacco use (including e-cigarettes), and the importance of smokefree spaces. In fact, now that more and more public spaces and workplaces are going smokefree, it's important to include e-cigarettes under smokefree laws, to protect everyone from breathing in secondhand e-cigarette emissions. The aerosol is a cocktail of chemicals that's not safe for anyone to inhale. Currently, nine states, the District of Columbia and hundreds of communities have added e-cigarettes to their smokefree laws—prohibiting e-cigarette use in the same places where smoking is already not allowed. We're urging all states and communities to do the same.

Sign up for our Lung Action Network to help us create more smokefree spaces!

*Curious about what's in an e-cigarette or if they can help you quit smoking? Get the facts about e-cigarettes and lung health* at Lung.org/ecigs.

---

**Related Topics:** Tobacco & Smoking, Health & Wellness

---

## Leave a comment

You must be logged in to leave a comment. If you are new to the site, complete our quick Registration Form to create a User Name and Password.

**User Name:**

**Password:**

Sign-In

**Remember Me?**

U.S.News & WORLD REPORT HEALTH

# Secondhand Vaping: What Risks Does Aerosol From E-Cigarettes Pose for Kids?

Research finds parents more likely to vape around kids in the home and car, despite smoke-free policies.

By **Michael O. Schroeder, Staff Writer** July 9, 2019

This article is based on reporting that features expert sources.

**THE AEROSOL PRODUCED BY** e-cigarette use tends to garner little notice, if any at all. And even when it is noticeable, the airborne evidence of vaping, which typically involves inhaling and exhaling the aerosol from a battery-powered e-cigarette, tends to dissipate quickly. By contrast, smoke from a traditional combusted tobacco cigarette often lingers.

(GETTY IMAGES)

E-cigarettes' inconspicuous nature, in addition to their promotion as potential quit aids to help stop smoking, may contribute to the notion that vaping has no secondhand effects, experts say. But as further study continues to shine light on the negative health impacts of these unregulated products, it's becoming clear that besides not being entirely safe for the user, vaping may harm nonusers as well.

Most e-cigarettes contain nicotine, and even some e-cigarettes advertised as nicotine-free contain the highly addictive drug, according to the Centers for Disease Control and Prevention. Aerosol contains many other harmful or potentially harmful substances.

According to the CDC, substances found in vaping aerosol include:

- Ultrafine particles that can be inhaled deep into the lungs.
- Flavoring like diacetyl, a chemical linked to a serious, irreversible lung disease called obliterative bronchiolitis.
- So-called volatile organic compounds, or gases emitted into the air that may have adverse health effects.
- Cancer-causing chemicals.
- Heavy metals, including nickel, tin and lead.

The American Cancer Society notes that the cancer-causing substance formaldehyde, for one, may form "if e-liquid overheats or not enough liquid is reaching the heating element (known as a "dry-puff")."

"People don't, I think, always realize that the secondhand smoke emissions from vaping or e-cigarette use can be harmful," says Dr. S. Christy Sadreameli, a pediatric pulmonologist at Johns Hopkins Hospital in Baltimore, and a volunteer spokesperson for the American Lung Association. The ultrafine particles and substances in aerosols "could be inhaled by children who are nearby, and so we worry about that," she says.

[**SEE:** Facts You Should Know About Lung Cancer.]

While the debate continues about how the risks of e-cigarettes stack up against traditional cigarettes, "we don't think they're harm-free, and we don't think the

secondhand emissions are safe for children," Sadreameli emphasizes.

Given that vaping is a modern trend compared with traditional smoking, research is limited on the dangers of firsthand use and the effects on those who may be around others who vape. Still, experts emphasize, there's ample reason to avoid using e-cigarettes when kids may be present.

"Exposure to any nicotine or tobacco product is dangerous for infants and children," says Dr. Jonathan Winickoff, the director of pediatric research at the Tobacco Research and Treatment Center at Massachusetts General Hospital. "The developing brain is exquisitely sensitive to nicotine." Nicotine can impact the developing structure of the brain – altering reward pathways that navigate positive reinforcement in the brain – so that a child becomes more vulnerable, or is at increased risk, for becoming addicted to products that contain nicotine and other drugs in the future.

Secondhand smoke from traditional cigarettes is known to cause tens of thousands of deaths annually in the U.S., and is implicated in some infant deaths, or sudden infant death syndrome. Likewise, chemicals in e-cigarette aerosol may also contribute to secondhand health problems.

"People who are doing the vaping themselves, can have lung irritation and can have worsening of asthma," says Dr. Thomas Houston, a family physician and former chair of the American Academy of Family Physicians Commission on Health of the Public and Science and Smoking Cessation Advisory Committee. "So whether this will translate to children having exacerbations of their asthma if they're in the same room with adults who are vaping, we just don't know yet."

But some reports show bystanders can experience excess cough and lung irritation from being around secondhand vaping, he notes. And a study published in the journal Chest in January 2019 found that teens with asthma who were exposed to secondhand aerosol, without vaping themselves, were more likely to have an asthma attack.

Besides the possibility of worsening asthma, ultrafine particles breathed deep into young lungs may impact lung development. "Lung tissue can be affected by nicotine exposure and exposure to e-cigarette aerosol," Winickoff says.

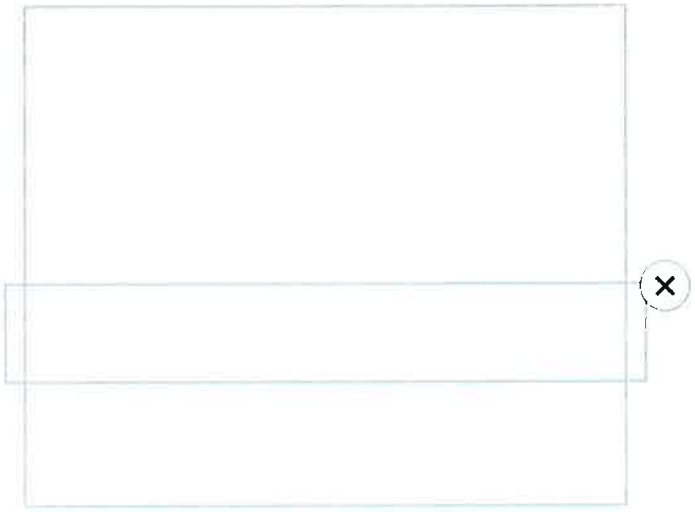
Animal research shows that exposure to e-cigarette vapor leads to a decrease in the growth of tiny air sacs called alveoli in developing lungs. Based on such findings, while not definitively known since e-cigarettes haven't been on the market for long, exposure to nicotine early on in childhood may mean decreases in lung function, he says. What's more, where secondhand smoke can contribute to higher levels of attention deficit hyperactivity disorder, secondhand vaping could possibly lead to problems with attention and hyperactivity as well, he says.

While experts emphasize more study is needed to understand the effects of vaping aerosol, they also reiterate there's enough potential for harm that parents should never vape around kids – or in spaces like the home or car, where they'll be.

[**SEE:** The 5 Latest Poison Control Threats Kids Face.]

## Smoke-Free Doesn't Mean Vape-Free

Survey data finds more than half of e-cigarette users are dual users, meaning they smoke and vape. Experts say some dual users vape with the intent to stop smoking altogether, using both e-cigarettes and traditional cigarettes during the transition. Others vape as a supplement to smoking, such as where smoking laws ban traditional cigarette use or where it's less socially acceptable to smoke. Although the survey data doesn't drill down to distinguish between the reasons for dual use, or show which is scenario is most common.



Even as some parents continue to smoke around kids, despite well-established science showing the harmful – and even deadly – effects of secondhand smoke, many more report that they vape around kids at home and in their cars.

"We saw three-fold higher rates of parents using electronic cigarettes inside their homes than smoking," says Winickoff, who was the senior author on research evaluating this dichotomy, which was published in the journal Pediatrics in April. Of the parents interviewed who were dual users, nearly 64% had a smoke-free home policy, compared with only 26%, who had a vape-free home policy. In addition, dual users and e-cigarette-only users together were more likely to have a smoke-free car policy, than a vape-free car policy. Still, only 35% had a smoke-free car policy and just 22% had a vape-free car policy.

The findings seem to underscore an errant perception of e-cigarettes as safe – though experts emphasize they're not. And that misperception is increasing kids' exposure to vaping not only firsthand – as more and more adolescents take up the habit, alarming public health officials – but secondhand, and even thirdhand.

Experts emphasize kids' environments should be 100% vape-free. This is something pediatric health providers should be emphasizing with parents as well, researchers involved in the Pediatrics study add – and a message that's often missed. "To protect children from secondhand and thirdhand exposure, parents should adopt strictly enforced policies that prohibit e-cigarette use at all times in homes and cars," they urge.



Increasingly research shows how nicotine and other harmful substances settle on surfaces, like furniture, window dressing and flooring, as well as clothing. These lingering substances may cause harm thirdhand, even after a person is done smoking. But

cigarettes aren't the only culprit: Aerosols from e-cigarettes can leave a chemical residue as well. Past research finds, for example, that "e-cigarettes leave deposits of nicotine on surfaces when used inside," researchers note in the Pediatrics study.

Apart from possible secondhand and thirdhand effects, e-juice flavors can be enticing to kids. Small children have put the small pods filled with vape juice in their mouths, which has led to nicotine poisoning in some cases and even child deaths, when the pods were swallowed. So experts say it's critical these products are always kept locked away, out of reach of children.

The best – and often most difficult – solution is to quit smoking and vaping altogether, experts say.

[**SEE:** The 11 Most Dangerous Places in Your Home for Babies and Small Kids.]

"If you are interested in quitting tobacco use, first try using the FDA-approved smoking cessation medicines including two forms of nicotine replacement therapy: the patch plus either gum or lozenge for breakthrough cravings," Winickoff says. "Then talk to your doctor about other safe medicines to help you quit."

Aside from a parent's own health, quitting is best because kids often follow the example of their parents. "Kids whose parents use cigarettes are up to four times more likely to use – to become smokers themselves – during the teenage years," he says. But for parents who are able to quit, that "social modeling" could decrease the likelihood their child will ever start smoking or vaping.

"There's a very clear path from electronic cigarette use to traditional tobacco products," Winickoff says. "So if parents set a good example and are able to quit – and in fact the earlier they quit, the greater chance their children will never become smokers themselves."



**Michael O. Schroeder,** Staff Writer

**Michael O. Schroeder** has been a health editor at U.S. News since 2015. He writes health ... **READ MORE »**

## Sources

S. Christy Sadreameli, MD, MHS; Jonathan Winickoff, MD; Thomas Houston, MD

**Tags: health, patients, patient advice, smoking and tobacco, parenting, children, children's health, lung cancer, asthma, vaping, pulmonology**

# What Do We Know About E-cigarettes?

E-cigarettes are known by many different names, and sometimes people find it hard to understand what is really known about these devices. Here we address some of the common questions people ask about e-cigarettes.

## What are e-cigarettes?

E-cigarettes are known by many different names, including e-cigs, electronic nicotine delivery systems (ENDS), alternative nicotine delivery systems (ANDS), e-hookahs, mods, vape pens, vaporizers, vapes and tank systems. JUUL is one popular brand of e-cigarette.

E-cigarettes are available in many shapes and sizes. They can look like cigarettes, cigars, pipes, pens, USB flash drives, or may be in other forms.

E-cigarettes include a battery that turns the device on, a heating element that heats the e-liquid and turns it into an aerosol of tiny particles (sometimes called a “vapor”), a cartridge or tank that holds the e-liquid, and a mouthpiece or opening used to inhale the aerosol.

E-cigarettes do not contain tobacco, but many of them contain nicotine, which comes from tobacco. Because of this, the Food and Drug Administration (FDA) classifies them as "tobacco products."

## What is vaping?

"JUULing" refers to using one brand of e-cigarette called JUUL, which is very popular among kids, teenagers and young adults. All JUULs contain nicotine. JUULs and similar devices are typically small, sleek, high tech-looking, and easy to hide. They look like USB flash drives and can be charged in a computer. They can be hidden in the palm of the hand and are hard to detect because they give off very little vapor or smell. Kids and teenagers are known to use them in school restrooms and even in the classroom.

# How do e-cigarettes work?

E-cigarettes heat a liquid – called e-liquid or e-juice – to turn it into an aerosol (sometimes called a "vapor"). E-cigarette users inhale this into their lungs.

# Do e-cigarettes (including JUULs) contain nicotine?

The e-liquid in all JUULs and most other e-cigarettes contains nicotine, the same addictive drug that is in regular cigarettes, cigars, hookah, and other tobacco products. However, nicotine levels are not the same in all types of e-cigarettes, and sometimes product labels do not list the true nicotine content.

JUULs typically have a significantly higher amount of nicotine per puff than some other types of e-cigarettes and cigarettes. Because of this, JUUL and JUUL-like products may be more addictive than other types of e-cigarettes. Some kids have become physically dependent on nicotine by using these products.

There are some e-cigarette brands that claim to be nicotine-free but have been found to contain nicotine.

# What is in the aerosol ("vapor") of an e-cigarette?

Besides nicotine, e-cigarettes and e-cigarette vapor typically contain propylene glycol and/or vegetable glycerin. These are substances used to produce stage or theatrical fog which have been found to increase lung and airway irritation after concentrated exposure.

In addition, e-cigarettes and e-cigarette vapor may contain the chemicals or substances listed below.

- **Volatile organic compounds (VOCs):** At certain levels, VOCs can cause eye, nose and throat irritation, headaches and nausea, and can damage the liver, kidney and nervous system.
- **Flavoring chemicals:** Some flavorings are more toxic than others. Studies have shown that some flavors contain different levels of a chemical called diacetyl that has been linked to a serious lung disease called bronchiolitis obliterans.
- **Formaldehyde:** This is a cancer-causing substance that may form if e-liquid overheats or not enough liquid is reaching the heating element (known as a "dry-puff").

The FDA does not currently require e-cigarette manufacturers to stop using potentially harmful substances. It's also hard to know exactly what chemicals are in an e-cigarette because most products do not list all of the harmful or potentially harmful substances contained in them. Some products are also labeled incorrectly.

It's important to know the US Centers for Disease Control and Prevention (CDC) has stated that sometimes e-cigarette products are changed or modified and can have possibly harmful or illegal substances from unknown sources. You can read more about this statement on the CDC newsroom page (https://www.cdc.gov/media/).

# What are the health effects of e-cigarettes?

E-cigarettes are still fairly new, and more research is needed over a longer period of time to know what the long-term effects may be. The most important points to know are that

- Nausea, vomiting, or diarrhea
- Fatigue, fever, or weight loss

Some cases have been severe enough to require hospitalization, and some people have died from their illness. However, it's not yet clear exactly how widespread these cases are, or if they all have the same cause. There are a huge number of different vaping devices on the market, and an even larger number of different chemicals (in the form of e-juice) that can be used in them, including ones that users sometimes add themselves. Many (but not all) of the illnesses have occurred in people who reported using modified devices that contained THC, the mind-altering chemical in marijuana. The US Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), and state health departments are looking into these cases to try to figure out what else they might have in common. For the latest information on this topic, see this notice from the CDC (https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html).

The American Cancer Society is closely watching for new research about the effects of using e-cigarettes and other new tobacco products. (See "What is in the aerosol ("vapor") of an e-cigarette?" and "Do e-cigarettes [including JUULs] contain nicotine?)"

# What is known about the use of e-cigarettes by youth?

**No youth, including middle schoolers and high schoolers, should use e-cigarettes or any tobacco product.** (See "What is in the aerosol ("vapor") of an e-cigarette?")

It is important to know that all JUULs and most other e-cigarettes contain addictive nicotine. There is evidence that nicotine harms the brain development of teenagers.

Some studies have shown that vaping by some youth may be linked to later use of regular cigarettes and other tobacco products. Using e-cigarettes may play a part in some kids or teens wanting to use other, more harmful tobacco products.

Current e-cigarette use in youth has increased dramatically in recent years.

The FDA has the authority to regulate all tobacco products, including e-cigarettes and is working on several options to prevent youth access to e-cigarettes.

# Does e-cigarette use cause cancer?

Scientists are still learning about how e-cigarettes affect health when they are used for long periods of time. It's important to know that the aerosol ("vapor") from an e-cigarette contains some cancer-causing chemicals, although in significantly lower amounts than in cigarette smoke.

# Can e-cigarettes explode?

There have been reports of e-cigarettes exploding and causing serious injuries. Usually the explosions are caused by faulty batteries or because the batteries were not handled as they should be. Visit the Food and Drug Administration website (https://www.fda.gov/TobaccoProducts/Labeling/ProductsIngredientsComponents/ucm539362.htm?utm_source=FDATwitter&utm_medium=social&utm_term=Owned&utm_content=Infographic&utm_campaign=ctp-vapebattery) for safety tips to help avoid an e-cigarette battery explosion.

# Is exposure to secondhand e-cigarette aerosol harmful?

Although e-cigarettes do not give off smoke like tobacco cigarettes, they do expose people to secondhand aerosol or "vapor" that may contain harmful substances. Scientists are still learning about the health effects of being exposed to secondhand e-cigarette aerosol.

The smoke-free and tobacco-free policies at schools, businesses, healthcare

# Can e-cigarettes help people quit smoking (known as smoking cessation)?

E-cigarettes are not currently approved by the FDA as aids to help stop smoking. This is because there's just not enough research or evidence yet. On the other hand, there is a large body of evidence clearly showing that FDA-approved medications are safe and effective ways to help people quit smoking, especially when combined with counseling.

Some people who smoke choose to try e-cigarettes to help them stop smoking. Stopping smoking clearly has well-documented health benefits. But smokers who switch to e-cigarette use still expose themselves to potentially serious ongoing health risks. It's important to stop using all tobacco products, including e-cigarettes, as soon as possible both to reduce health risks and to avoid staying addicted to nicotine. If you're having trouble quitting e-cigarettes on your own, get help from your doctor or from other support services, such as your state quitline (1-800-QUIT-NOW) or the American Cancer Society (1-800-ACS-2345).

People who have already switched completely from smoking to e-cigarettes **should not** switch back to smoking (either solely or along with e-cigarettes), which could expose them to potentially devastating health effects.

Some people who smoke choose to use both cigarettes and e-cigarettes at the same time on an ongoing basis, whether they are trying to quit or not. This is known as "dual use." The dual use of e-cigarettes and tobacco cigarettes can lead to significant health risks because smoking any amount of regular cigarettes is very harmful. People should not use both products at the same time and are strongly encouraged to completely stop using all tobacco products.

# Where can I find more information about e-cigarettes?

(https://onlinelibrary.wiley.com/doi/full/10.3322/caac.21455)

- FDA announcement: FDA launches new, comprehensive campaign to warn kids about the dangers of e-cigarette use (https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm620788.htm)

To learn more about tobacco and its health effects, see Tobacco and Cancer (/cancer/cancer-causes/tobacco-and-cancer.html).

Written by References

The American Cancer Society medical and editorial content team (/cancer/acs-medical-content-and-news-staff.html)

Our team is made up of doctors and oncology certified nurses with deep knowledge of cancer care as well as journalists, editors, and translators with extensive experience in medical writing.

Last Medical Review: November 19, 2019 | Last Revised: November 19, 2019



## MORE IN CANCER A-Z