



# Vaping: Curse or Cure?

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# Disclosure

I have received unrestricted research funding/grants, speaker's honoraria, consultation fees or product from the following in the previous 12 months:

- ◇ Health Canada
- ◇ University of British Columbia
- ◇ Ottawa Heart Institute
- ◇ Providence Health Care
- ◇ Horizon Health Authority
- ◇ Provincial Health Services Authority
- ◇ Fraser Health Authority
- ◇ TEACH (Centre for Addiction and Mental Health)



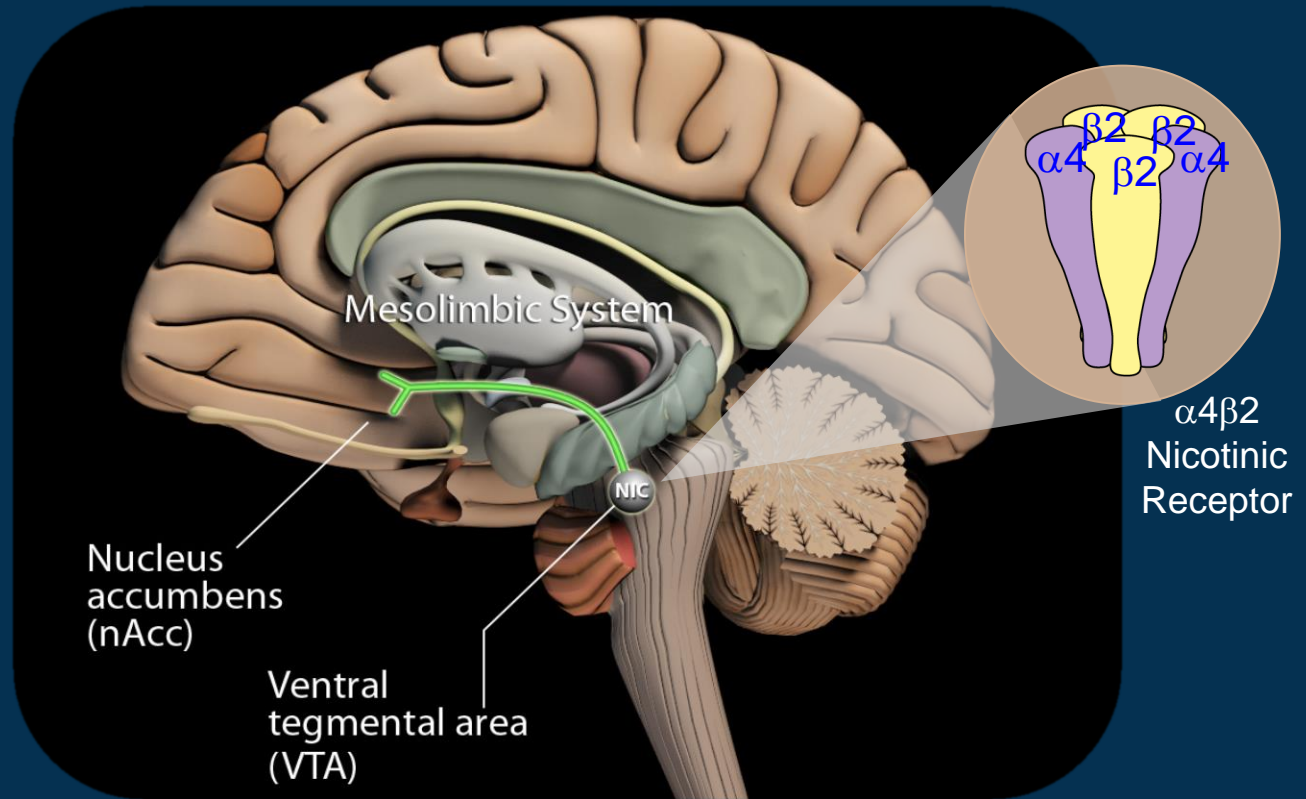
# Objectives

- ◇ Understand the growing practice of vaping amongst youth and its implications
- ◇ Consider the potential harmful effects of vaping
- ◇ Review the evidence exploring a potential role of vaping products as a “harm reduction” or cessation tool
- ◇ Reflect on the current regulatory framework for vaping products



Does “vaping” or smoking  
deliver nicotine to the brain  
more efficiently?

# The Neurobiology of Nicotine Addiction



“use of e-cigarettes results in dependence on the devices, though with apparently less risk and severity than that of combustible tobacco cigarettes”<sup>1</sup>

# The Evolution of E-Cigarette Products

## The Evolution of E-Cigarette, or Vaping, Products



1<sup>st</sup>  
GENERATION

Disposable  
e-cigarettes



2<sup>nd</sup>  
GENERATION

E-cigarettes  
with pre-filled  
or refillable  
cartridge



3<sup>rd</sup>  
GENERATION

Tanks or Mods  
(refillable)



4<sup>th</sup>  
GENERATION

Pod Mods  
(pre-filled or  
refillable)

# JUUL Chemistry



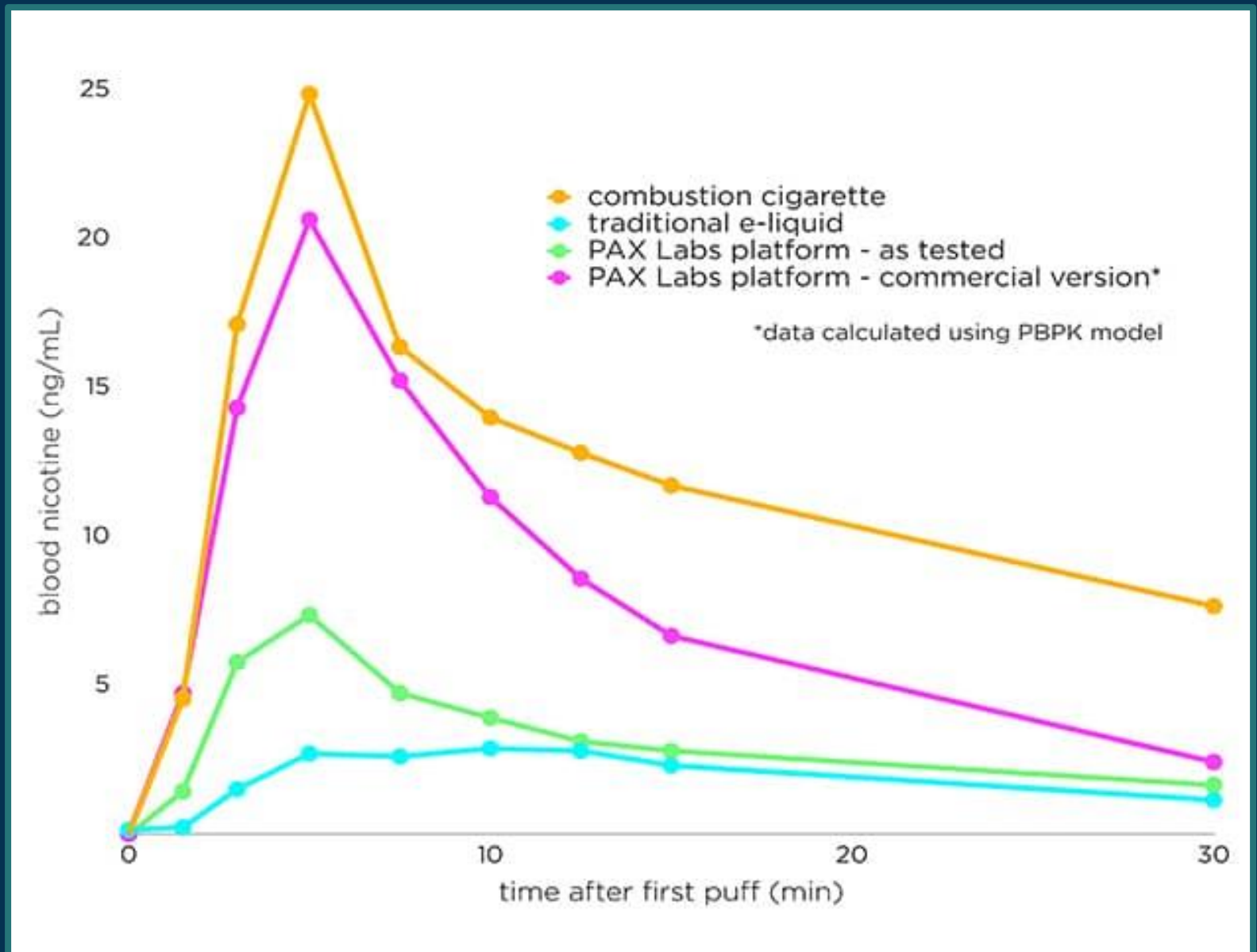
+BENZOIC ACID



**Basic pH**  
**Irritating**  
to throat  
**More vapor exhaled**

**Acidic pH**  
**Smoother "hit"**  
to throat  
**Less vapor exhaled**  
**More nicotine gets into**  
blood

# Nicotine Delivery

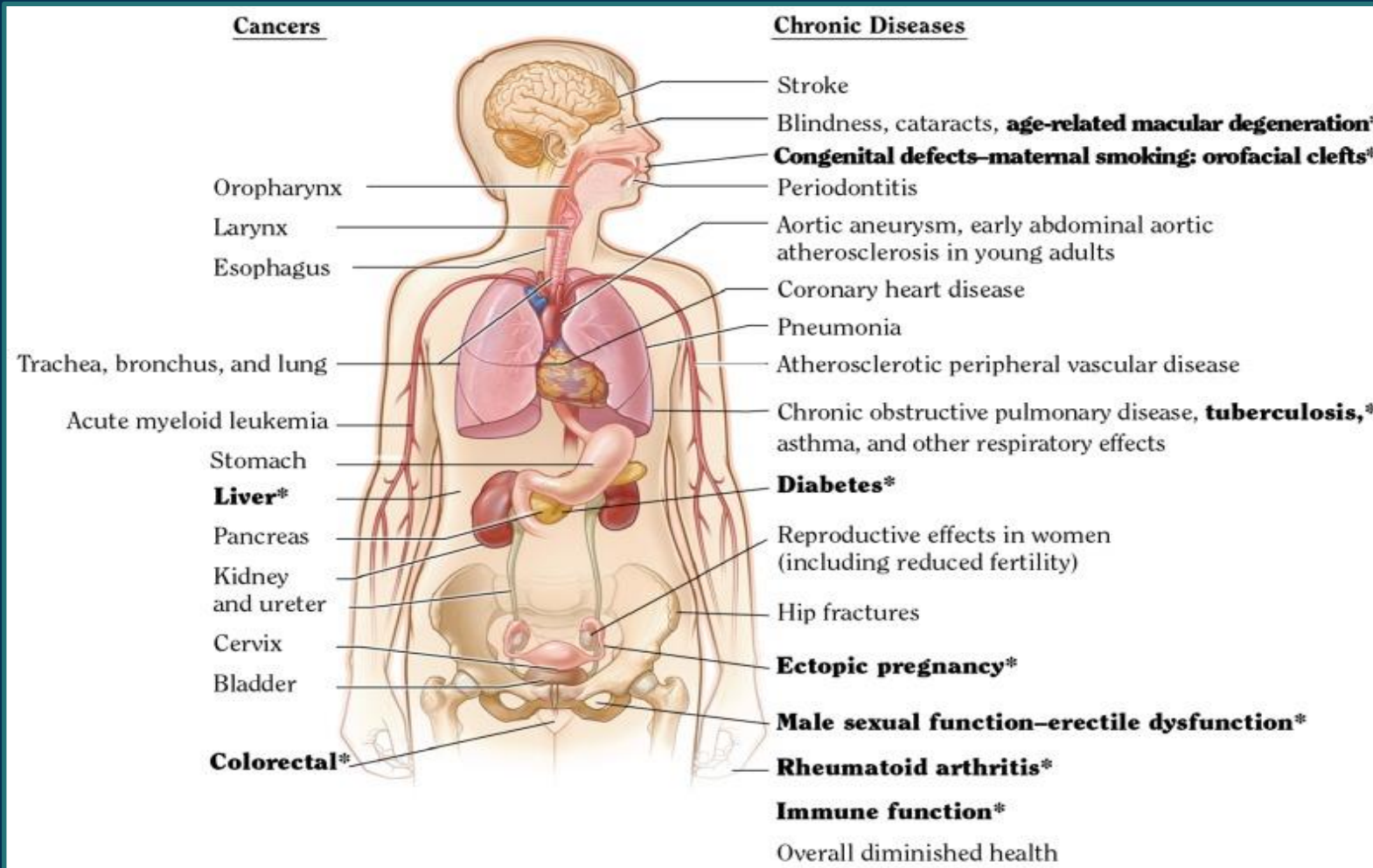




A close-up, side-profile photograph of a person's mouth and hand holding a silver vape pen. The person is exhaling a thick, white plume of vapor that fills the upper right portion of the frame. The background is dark, making the white vapor stand out. The text "Is vaping harmful?" is overlaid in the center of the image.

Is vaping harmful?

# The Consequences of Tobacco Smoking



- ◇ The leading preventable cause of death in Canada
- ◇ 37,000 smoking attributable deaths per year
- ◇ 1 in 2 smokers die prematurely from a smoking related illness
- ◇ 44% of tobacco consumption by the mentally ill

## Levels of selected carcinogens and toxicants in vapour from electronic cigarettes

Maciej Lukasz Goniewicz,<sup>1,2,3</sup> Jakub Knysak,<sup>3</sup> Michal Gawron,<sup>3</sup> Leon Kosmider,<sup>3,4</sup> Andrzej Sobczak,<sup>3,4</sup> Jolanta Kurek,<sup>4</sup> Adam Prokopowicz,<sup>4</sup> Magdalena Jablonska-Czapla,<sup>5</sup> Czeslawa Rosik-Dulewska,<sup>5</sup> Christopher Havel,<sup>6</sup> Peyton III Jacob,<sup>6</sup> Neal Benowitz<sup>6</sup>

Toxic compound	Conventional cigarette (µg in mainstream smoke) [35]	Electronic cigarette (µg per 15 puffs)	Average ratio (conventional vs. electronic cigarette)
Formaldehyde	1.6-52	0.20-5.61	9
Acetaldehyde	52-140	0.11-1.36	450
Acrolein	2.4-62	0.07-4.19	15
Toluene	8.3-70	0.02-0.63	120
NNN	0.005-0.19	0.00008-0.00043	380
NNK	0.012-0.11	0.00011-0.00283	40

# Safety



**95%** LESS HARMFUL  
THAN SMOKING  
PUBLIC HEALTH ENGLAND (PHE)

*T H E M E S S A G E I S S I M P L E*

“....the opinions of a small group of individual with no pre-specified expertise in tobacco control..... It is on this extraordinarily flimsy foundation that PHE based the major conclusion and message of its report.”<sup>1</sup>

“Across a range of studies and outcomes, e-cigarettes appear to pose less risk to an individual than combustible tobacco cigarettes”<sup>2</sup>

1.E-cigarettes: Public Health England's evidence-based confusion. Editorial, Lancet August 2015

2.National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC

# Safety

## What are the respiratory effects of e-cigarettes?

### A review of the evidence



- ◇ measurable adverse biologic effects on organ and cellular health in humans, in animals, and in vitro
- ◇ e-cigarette effects have similarities to and important differences from those of cigarettes
- ◇ the population effects of e-cigarette use may not be apparent until the middle of this century

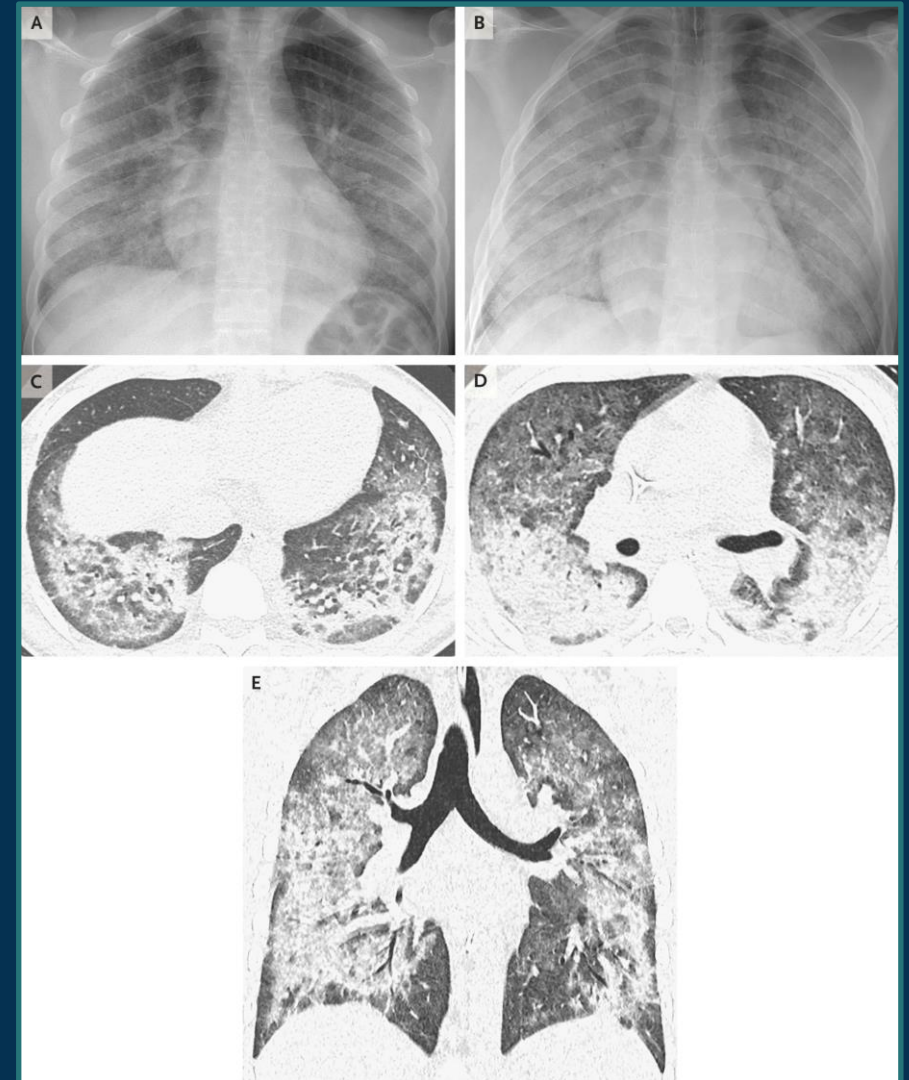
“We conclude that current knowledge of these effects is insufficient to determine whether the respiratory health effects of e-cigarette are less than those of combustible tobacco products.”

# Safety CDC: EVALI

Update Nov 5th 2019

- ◇ 2051 cases (median age 24y)
- ◇ 86% reported using THC
- ◇ 11% “exclusively” using nicotine
- ◇ 79% < 35 y
- ◇ 39 deaths (median age 53y)
- ◇ 29 BALF samples ALL contained Vitamin E acetate

“CDC recommends that you do not use vaping products that contain THC...do not return to smoking if using e-cigarettes to quit smoking”



A close-up photograph of a person's face in profile, using an e-cigarette. The person is holding the device in their mouth and inhaling. The background is a light, textured surface. On the left side of the image, there is a large teal circular graphic containing a faint silhouette of a person's head and shoulders.

# Harm Reduction

“Conclusive evidence that completely substituting e-cigarettes for combustible tobacco cigarettes reduces users’ exposure to numerous toxicants and carcinogens present in combustible tobacco cigarettes”

A young man and woman are shown in profile, facing right, against a brick wall. The man on the left is wearing a dark blue jacket over a plaid shirt. The woman on the right is wearing a dark, patterned jacket over a grey t-shirt. Both are holding e-cigarettes and exhaling thick plumes of white vapor. The text "Is vaping prevalence rising in youth?" is overlaid in white, centered in the image.

Is vaping prevalence rising in youth?



## Rampant student vaping leads B.C. high school to lock up bathrooms



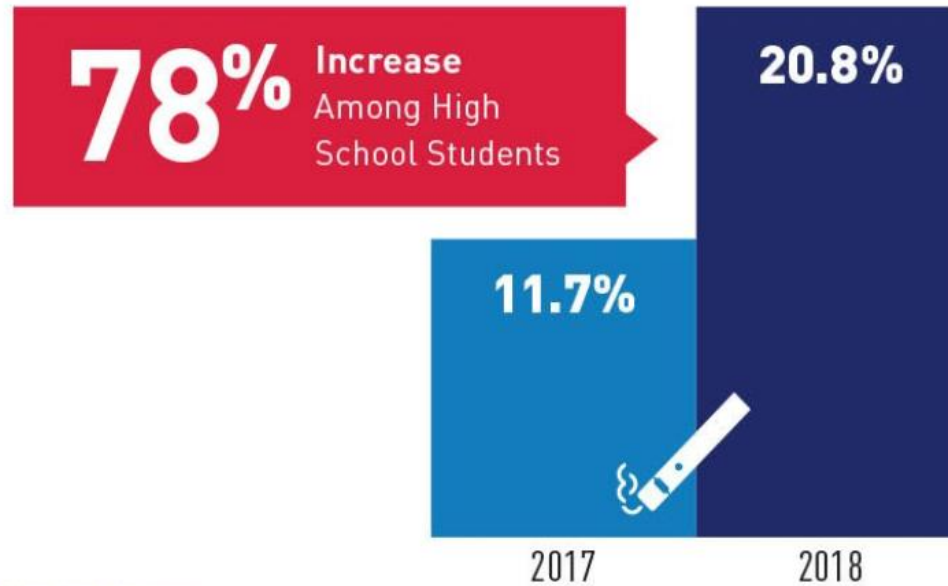
North Vancouver's Seycove Secondary says vaping has become 'a very serious issue'

CBC News · Posted: Dec 03, 2018 12:49 PM PT | Last Updated: December 4, 2018



# Youth Prevalence

## SURGE IN YOUTH CURRENT E-CIGARETTE USE

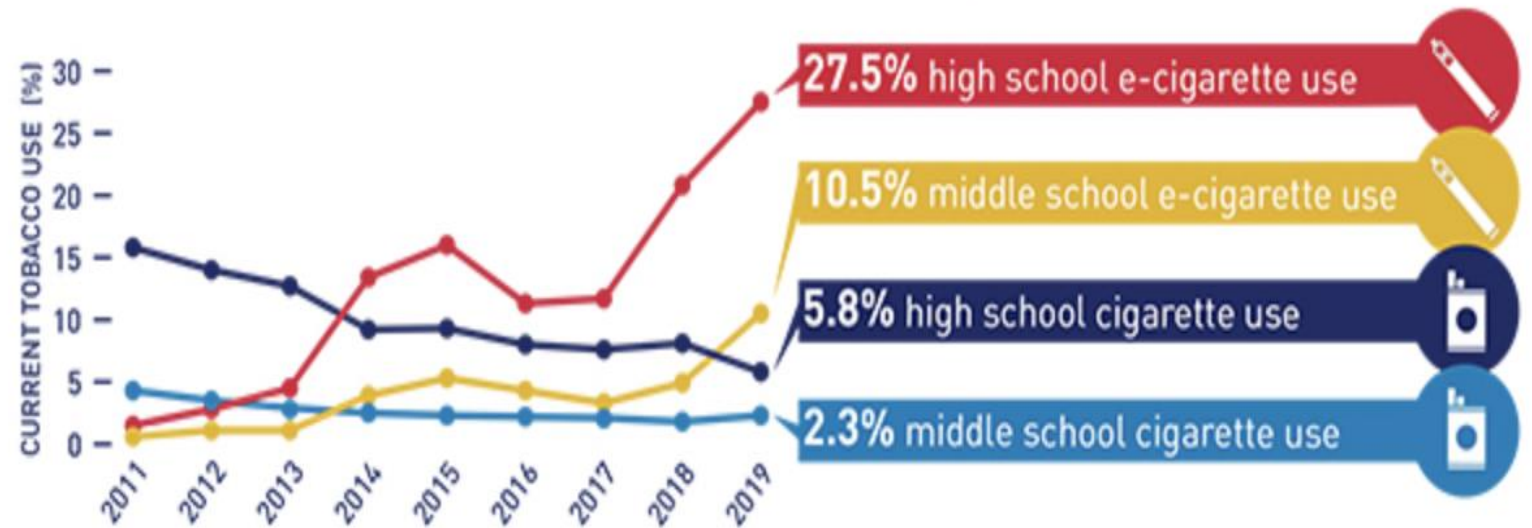


CENTER FOR TOBACCO PRODUCTS

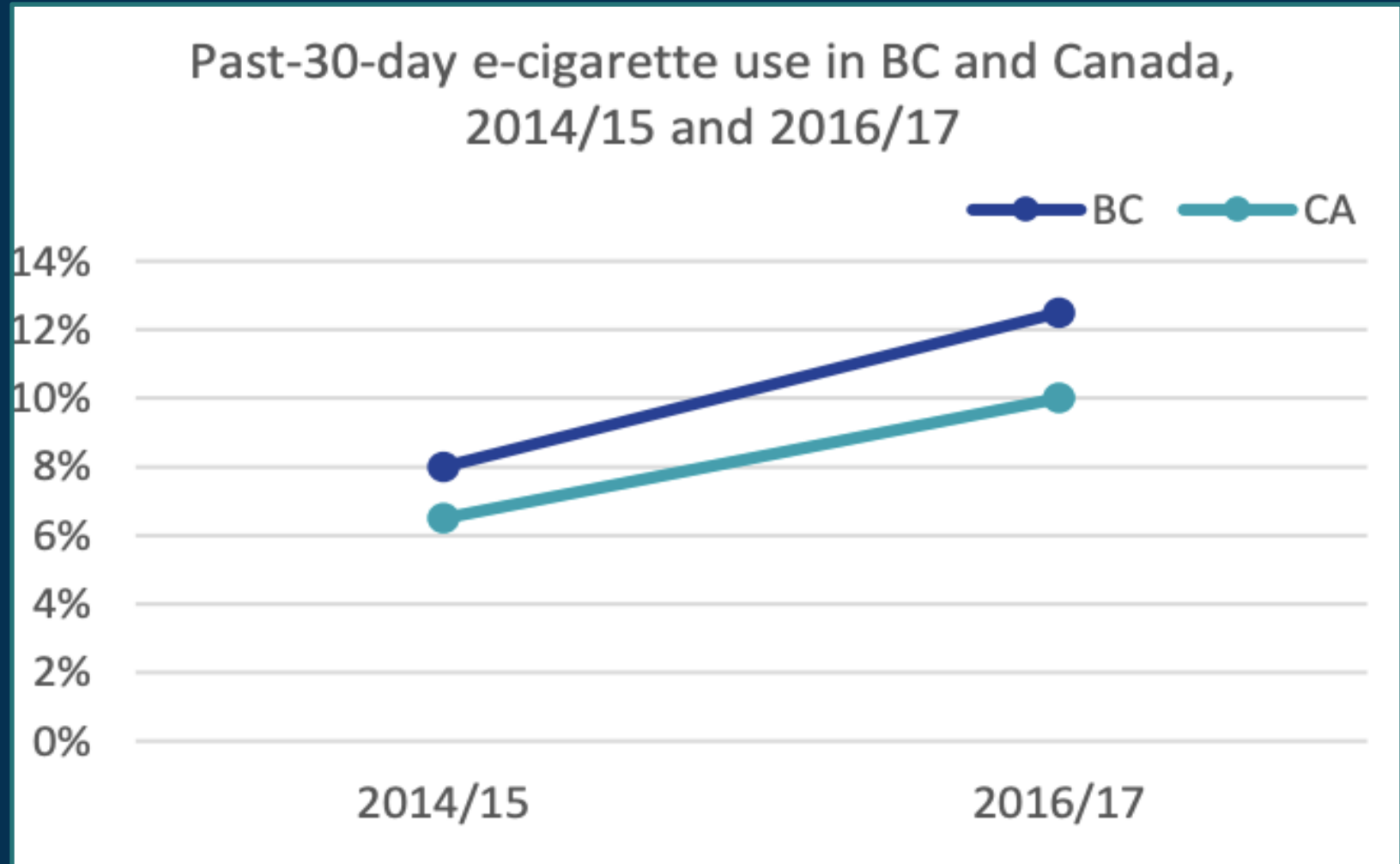


# Youth Prevalence

Current e-cigarette use has **INCREASED DRAMATICALLY**, while current cigarette use has dropped, **UNDERMINING PROGRESS** toward reducing overall tobacco use



# Youth Prevalence



# Youth Prevalence

**Table 2** Changes in prevalence of smoking and vaping between 2017 and 2018 among adolescents aged 16-19 years, by country. Values are weighted percentages (numbers) unless stated otherwise

Vaping and smoking measures	Canada				England				US			
	2017 (n=4038)	2018 (n=3853)	Adjusted odds ratio (99% CI) for change*	P value	2017 (n=3995)	2018 (n=3902)	Adjusted odds ratio (99% CI) for change*	P value	2017 (n=4095)	2018 (n=4045)	Adjusted odds ratio (99% CI) for change*	P value
<b>Vaping</b>												
Ever	29.3 (1182)	37.0 (1425)	1.50 (1.31 to 1.71)	<0.001	33.7 (1348)	32.7 (1276)	0.96 (0.84 to 1.09)	0.38	31.3 (1283)	33.6 (1360)	1.11 (0.97 to 1.28)	0.05
Past 30 days	8.4 (340)	14.6 (562)	1.95 (1.58 to 2.40)	<0.001	8.7 (347)	8.9 (346)	1.03 (0.82 to 1.29)	0.77	11.1 (454)	16.2 (655)	1.55 (1.28 to 1.88)	<0.001
Past week	5.2 (208)	9.3 (357)	1.99 (1.53 to 2.60)	<0.001	4.6 (184)	4.6 (178)	0.99 (0.73 to 1.36)	0.96	6.4 (262)	10.6 (429)	1.74 (1.37 to 2.22)	<0.001
≥15 days in past 30 days	2.1 (85)	3.6 (139)	1.86 (1.23 to 2.79)	<0.001	2.0 (80)	2.2 (87)	1.13 (0.71 to 1.79)	0.49	3.0 (124)	5.2 (210)	1.75 (1.23 to 2.49)	<0.001

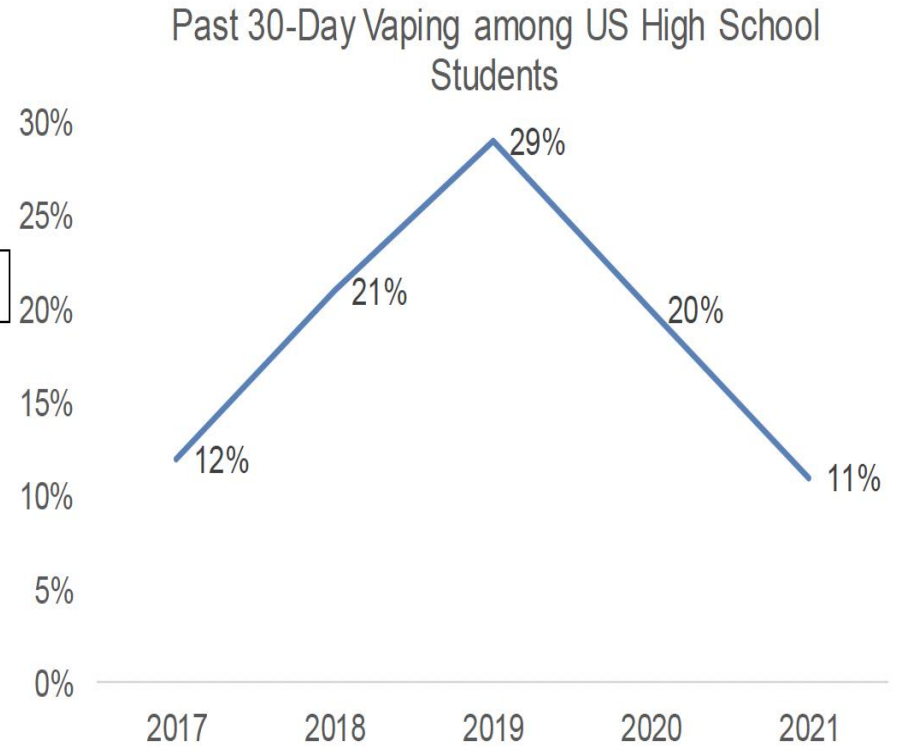
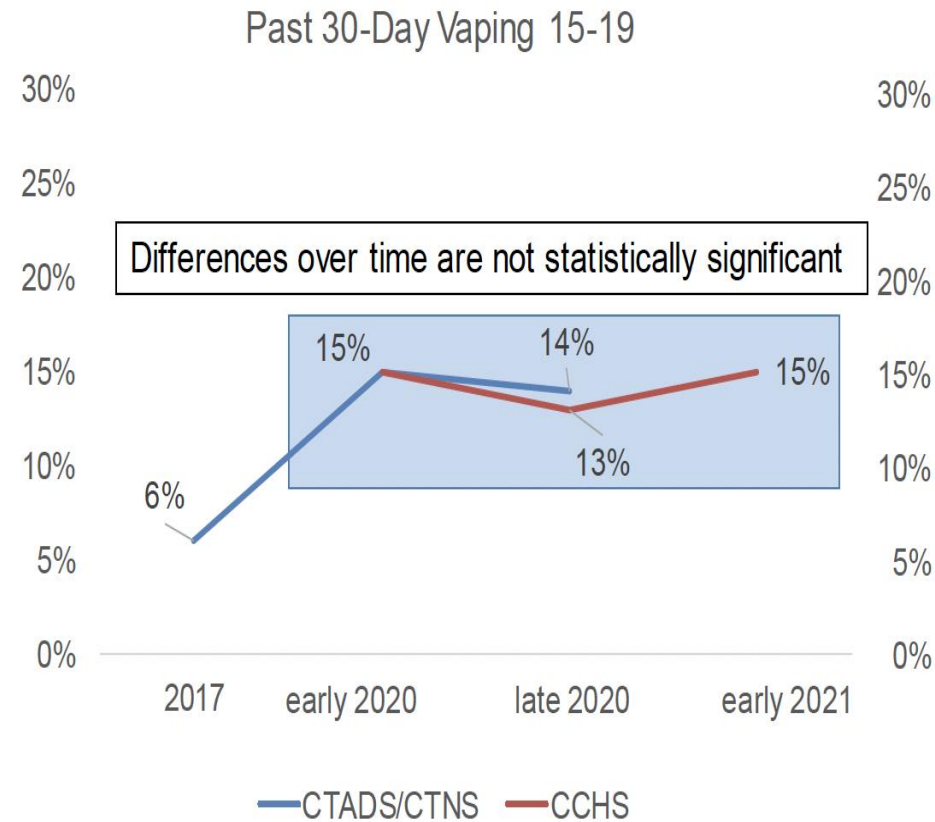
Prevalence of vaping and smoking among adolescents in Canada, England, and the United States: repeat national cross sectional surveys<sup>1</sup>



1. National samples 16-19 y, 2017 and 2018

2. Hammond, David et al. Prevalence of vaping and smoking among adolescents in Canada, England, and the United States: repeat national cross sectional surveys BMJ 2019; 365 :l2219

## Vaping stable in Canada while declining among US students



# AMONG HIGH SCHOOL CURRENT E-CIGARETTE USERS — Rise in Frequency



Is vaping a “gateway” to tobacco smoking?





# Gateway?

## Association of Electronic Cigarette Use With Subsequent Initiation of Tobacco Cigarettes in US Youths



- ◇ Cohort study using PATH data 2013-16
- ◇ n=6123, mean age 13.4y, 8.6% reported e-cigarette use first
- ◇ At 2 years, prior e-cigarette use increased risk of current cigarette use (OR 2.75)
- ◇ In “low-risk youth”, more marked increase risk (OR 8.57)

“e-cigarette use is associated with increased risk for cigarette initiation and use, particularly among low-risk youths”

Can e-cigarettes be used  
for smoking cessation?



## E-Cigarette Use For Smoking Cessation



- ◇ Vaping to quit smoking is one of the most frequently used methods tried by smokers
- ◇ **The evidence to support e-cigarettes as an effective smoking cessation aid remains inconclusive**
- ◇ Newer e-cigarette devices may be more effective than earlier generation devices
- ◇ Future research regarding the efficacy of e-cigarettes with combination cessation therapies is needed

## A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy



The NEW ENGLAND  
JOURNAL of MEDICINE

- ◇ n=886, randomized to ENDS or NRT
- ◇ Primary outcome: sustained abstinence for 12mos (biochemically confirmed)
- ◇ ENDS v NRT abstinence rate: 18% v 9.9% (RR 1.83)
- ◇ At 52w, 80% using ENDS v 9% NRT
- ◇ “E-cigarettes were more effective for smoking cessation than nicotine-replacement therapy, when both products were accompanied by behavioral support”

# Cochrane review of e- cigarettes for smoking cessation

Jamie Hartmann-Boyce\*, Hayden McRobbie, Nicola Lindson, Chris Bullen, Rachna Begh, Annika Theodoulou, Caitlin Notley, Nancy ARigotti, Tari Turner, Ailsa Butler, Thomas Fanshawe, Peter Hajek

\*Centre for Evidence-Based Medicine and Cochrane Tobacco Addiction Group, Nuffield Department of Primary Care Health Sciences, University of Oxford. [jamie.hartmann-boyce@phc.ox.ac.uk](mailto:jamie.hartmann-boyce@phc.ox.ac.uk)

November 2021



## Implications for practice

- Evidence suggesting nicotine EC can aid in smoking cessation is consistent across several comparisons. There was moderate certainty evidence, limited by imprecision, that EC with nicotine increased quit rates at six months or longer compared to non-nicotine EC and compared to NRT. There was very low certainty evidence that EC with nicotine increased quit rates compared to behavioural support only or no support.
- The effect of nicotine EC when added to NRT was unclear.
- None of the included studies (short- to mid-term, up to two years) detected serious adverse events considered possibly related to EC use.
- The most commonly reported adverse effects were throat/mouth irritation, headache, cough, and nausea, which tended to dissipate over time. In some studies, reductions in biomarkers were observed in people who smoked who switched to vaping consistent with reductions seen in smoking cessation.



**REGULATION**

## TVPA – Youth Protection Measures

Youth protection measures under the TVPA relating to vaping products include:

- A **ban on furnishing** vaping products to young persons (**under 18**);
- A prohibition on the promotion of vaping products through any indication or illustration of flavour that could be appealing to youth, as well as certain flavours including confectionary, dessert, cannabis, soft drinks and energy drinks;
- A **prohibition on the promotion and sale** of vaping products **with design features** that could reasonably be **considered appealing to young persons**;
- A **prohibition on** the promotion of vaping products by means of **lifestyle advertising**, **on advertising that could be appealing to young persons**, and **on promotion by means of testimonials and endorsements**, including through the depiction of cartoon characters; and
- **Authority to make regulations** respecting various aspects of vaping product promotion, including advertising (e.g., content and placement of permitted ads).



# Reasons for Vaping

Health Canada

Vapers Panel Survey

## Main Reasons for Vaping

Q46., Q55. And Q58. Which of the following best describes the main reason(s) you vape?	Dual Users (n=1,217)	Former Smokers (n=462)	Never Smokers (n=318)
To reduce the number of cigarettes I smoke	49%	n/a	n/a
I'm trying to quit smoking/ I used it to help me quit smoking	45%	<b>63%</b>	n/a
I like the flavours and/or smell	27%	<b>40%</b>	<b>55%</b>
It's less harmful to my health than smoking	27%	<b>50%</b>	32%
It's cheaper than smoking	25%	<b>37%</b>	14%
I vape where smoking is restricted/not allowed	20%	n/a	n/a
As an alternate source of nicotine	18%	21%	n/a
It's less harmful to others/family/children than smoking	17%	<b>26%</b>	13%
I vape in certain social settings where it is more socially acceptable than smoking	15%	n/a	n/a

# JUUL



### Current JUUL pod offerings

Tobacco and menthol-based products



Virginia Tobacco



Classic Tobacco



Mint



Menthol

Flavored products



Cucumber



Mango



Creme



Fruit

# JUUL Marketing



“We support reasonable regulation of nicotine products and comply with all relevant laws and regulations. We share public health concerns about protecting the health of young persons. We did not create JUUL to undermine years of effective tobacco control, and we do not want to see a new generation of smokers. We are committed to understanding JUUL’s performance and impact. Incorporating the latest research from leading scientists in the field drives our innovation.”

# The Tobacco and Vaping

## Product Act (2018)

- ◇ Ban on sale to <18 years
- ◇ Restrictions on marketing of certain flavours (“dessert or confectionary”)
- ◇ Ban on “lifestyle” advertising (eg celebrity endorsements, sponsorship etc)



# Protecting Youth?



## TALKING WITH YOUR TEEN ABOUT VAPING

### A TIP SHEET FOR PARENTS



### BEFORE THE TALK: GET THE FACTS

#### Vaping is not harmless

- > Vaping can increase your exposure to harmful chemicals.
- > Vaping can lead to nicotine addiction.
- > The long-term consequences of vaping are unknown.
- > It's rare, but defective batteries in vaping products have caused fires and explosions.

#### Risks of nicotine

Nicotine is a highly addictive chemical. Youth are especially susceptible to its negative effects, as it is known to alter their brain development and can affect memory and concentration. It can also lead

#### Vaping liquids

The ingredients typically found in vaping liquids include glycerol, flavours, propylene glycol and varying levels of nicotine. The long-term safety of inhaling these substances in vaping products is unknown and continues to be assessed.

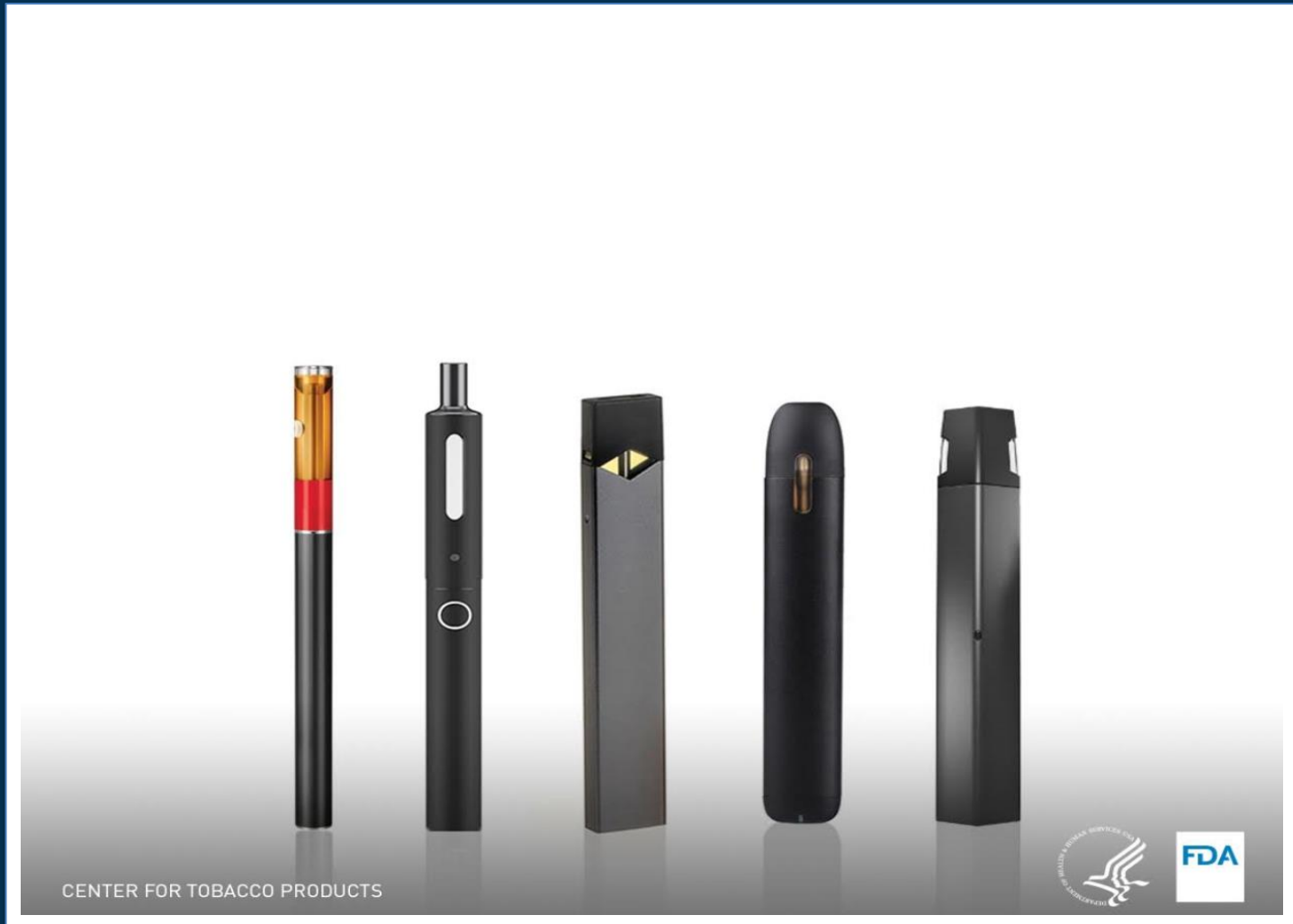
There is no burning during vaping, instead, the liquid is heated. This process can cause reactions and create new chemicals, such as formaldehyde. Some contaminants, such as metals, might also get into the vaping products and then into the vapour.

#### Quick facts

- > Vaping is intended to help smokers quit

# Key Points

1. Vaping amongst youth is a growing phenomenon
2. Health risks remain uncertain
3. Addiction to nicotine may have a dramatic effect on public health
4. Vaping may have a role in smoking cessation
5. “Big Tobacco” is quickly becoming the main promoter and seller
6. E-cigarettes are now regulated by the Health Canada TVPA





# Resources



<https://www.nap.edu/resource/24952/012318ecigaretteConclusionsbyEvidence.pdf>

NUFFIELD DEPARTMENT OF  
**PRIMARY CARE**  
HEALTH SCIENCES

 Cochrane  
Tobacco Addiction

 UNIVERSITY OF  
OXFORD

## Cochrane review of e-cigarettes for smoking cessation

Jamie Hartmann-Boyce\*, Hayden McRobbie, Nicola Lindson, Chris Bullen, Rachna Begh, Annika Theodoulou, Caitlin Notley, Nancy A Rigotti, Tari Turner, Ailsa Butler, Thomas Fanshawe, Peter Hajek

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<https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010216.pub6/full>



## Vaping in England: an evidence update including vaping for smoking cessation, February 2021

A report commissioned by Public Health England

### Authors

Ann McNeill, Leonie Brose, Robert Calder, Eriks Simonavicius, Debbie Robson  
King's College London



<https://www.gov.uk/government/publications/vaping-in-england-evidence-update-february-2021>




THANK YOU



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