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The presentation is in PDF format with the notes in text annotation.



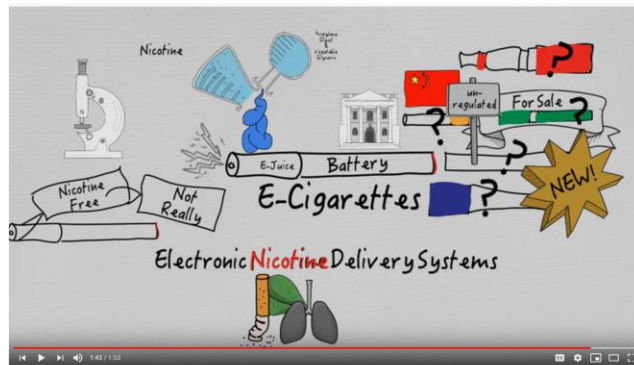
How to Use this Presentation

- **Purpose:** The purpose of the presentation is to increase basic knowledge of vapour products and provide the best evidence available to date with respect to their potential harm to health.
- **Audience and Customizing:** This presentation is designed for a general audience which can include school, community or municipal audiences. The presentation consists of nearly 50 slides and notes pages of which users may edit by including or excluding slides to meet the specific needs of their target audience.
- **Data:** This presentation contains national and provincial data.



Vapour Products 101





[Play video](#)



NOTE – requires internet connection

If there is internet connection, this a great video that provides an overview of all the issues and unknowns with regards to vaping products.

Link -

https://www.youtube.com/watch?list=PLwVxvUtgsPsgZvsQmKxv7U6b8DNY_Uolu&v=fDYBJuAXy00

History of Vapour Products

- 2003: E-cigarettes first developed by a company in China for smoking cessation
- 2007: First appeared in the Canadian market
- Vaping products or ENDS (electronic nicotine delivery device system) have many names



Source: Disease Interrupted, 2017



There are many, many different types of e-cigarettes and have many different names: hookah pens, e-hookahs, mods, vape pens, tank systems, clearomizer etc., though e-cigarette is the most common name.

E-cigarettes were first developed for cessation and in particular to reduce smoking in China in the build up to the Beijing Olympics. Invented by a Chinese pharmacist in 2003; produced and marketed by the Chinese company Ruyan which was subsequently bought by Imperial Tobacco in 2013.

Largely developed a 'lifestyle' consumer product (people choosing to use the vaping devices as their particular way of living) rather than a medicine therefore have been unregulated in most countries. Though e-cigarettes have largely been unregulated, this is now changing. Provincial (BC Tobacco and Vapour Products Control Act) and Federal (Bill S-5) regulations are now in place and discussed later in this presentation.

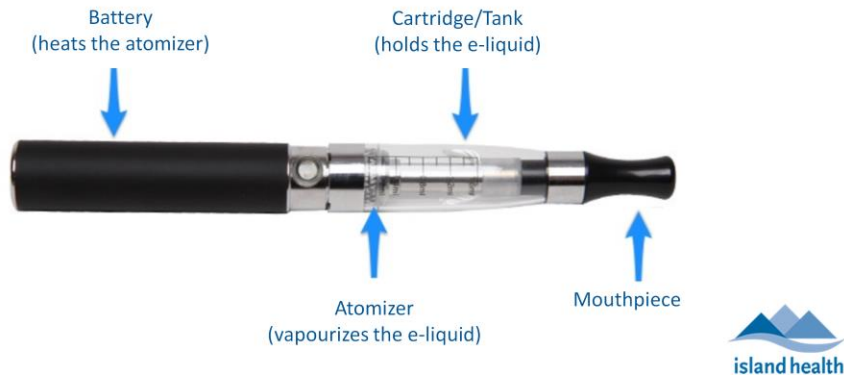
What are Vapour Products?

- They are devices that heat a liquid solution and deliver an aerosol or vapour
- They do not contain tobacco and do not involve combustion
- May or may not contain nicotine



How do Vapour Products Work?

- All vaping products are comprised of 3 main components: a lithium battery, an atomizer, and a tank or cartridge of vaping liquid



Components of an E-Cig

- i. Lithium Battery
- ii. Heater: atomizer, dripping atomizer, cartomizer or clearomizer
- iii. Cartridge:
 - contains a solution of e-juice/e-liquid
 - there are pre-filled disposable e-cigarettes or refillable rechargeable e-cigarettes
 - e-juice solution can contain: propylene glycol, vegetable glycerin, flavourings, additives, nicotine? other chemicals?
- iv. LED light: some have this to indicate when device is being used (lights up)

Contents of Vapour Liquid

- Vaping liquid, commonly referred to as e-liquid or e-juice, contains:
 - propylene glycol: provides throat hit
 - vegetable glycerin: makes the vapour/cloud
 - flavourings
 - often nicotine
- Heating the e-juice creates toxicants



Propylene glycol (PG) is a clear odorless colourless liquid, found in many household products including pharmaceuticals (asthma nebulizers), cosmetics, shampoo and shaving products. It is also used extensively as a humectant (moisture preservative) for human foods, pet food and tobacco. Long term effects of inhaling PG is not known, but it has been shown to be an irritant to the eyes, nose and throat. PG provides the throat hit of the inhalation.

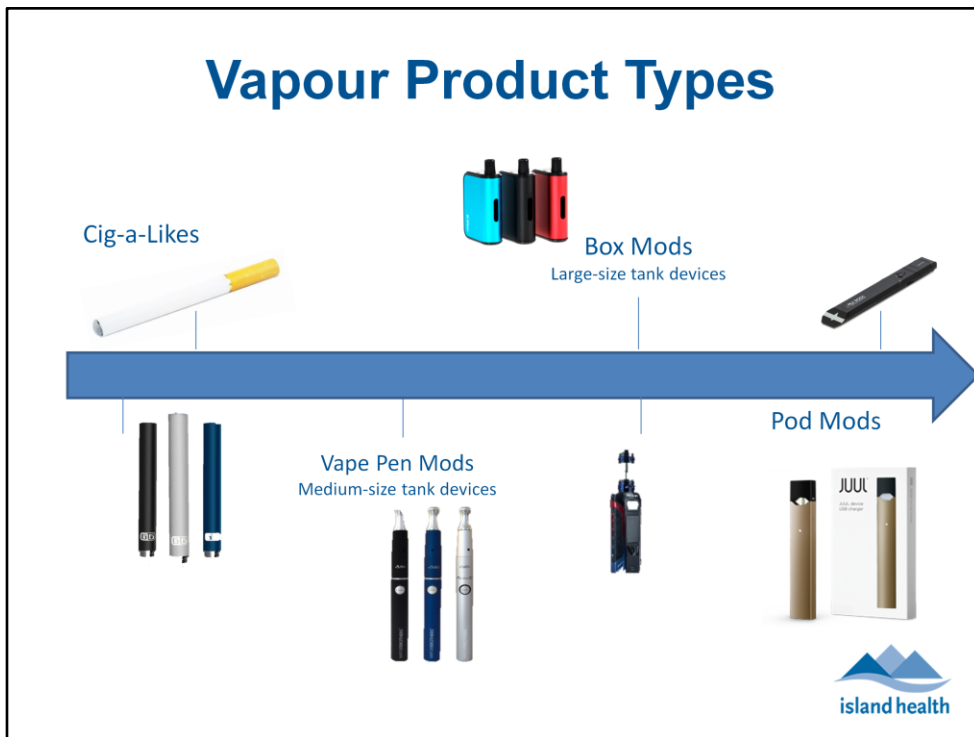
Vegetable glycerin (VG) or glycerine or glycerol, like glycol, is also a clear odorless colourless liquid, is widely used in the food industry as a sweetener, humectant and in pharmaceuticals. VG was historically used in antifreeze, giving rise to the urban legend that e-cigarettes contain antifreeze. VG provides the vapour or cloud created with exhalation.

Flavourings: These flavours mask the tastes and smell of chemicals present, and attract youth to these products. The presence of various flavours – cotton candy to mango and – make it difficult to identify who is using vaping products.

Heating the e-juice creates toxicants – more on this in a later slide.

Cannabis:

Technically, cannabis oil can be vaped with any device that is **refillable** although some devices are better than others for effective delivery. Apparently pens and box mods are popular for vaping cannabis. You can purchase devices online specifically designed for vaping dry product (cannabis flowers) these heat the dry product in a ceramic chamber.



Early e-cigarettes were made to look like cigarettes and are called Cig-a-likes. There now are a huge array of e-cigarettes on the market – they come in many different shapes and sizes. They look like anything from a pen to a smartphone and prices vary from affordable to expensive.

Newer generation e-cigs come with different types of batteries, tanks and atomizers – which can be mixed and matched to create a custom product. How these parts are selected and put together can vary the ‘throat hit’ (the sensation after vapor hits the throat, many vapers look to simulate the harsh throat hit of cigarettes, some prefer a smoother throat hit) and the ‘cloud’ produced. Users can also customize the flavour and nicotine strength with the e-juice they select. Those who start vaping and become regular vapers quickly move to more sophisticated devices that they can customize; e.g. the e-liquid, nicotine content and degree of vapour production.

Early e-cigs have been linked to explosions and fires; the lithium batteries is the cause of explosions e.g. substandard or faulty batteries, batteries that are overheated or kept in a pressurized areas.

According to Electronic Cigarette Fires and Explosions (https://www.usfa.fema.gov/downloads/pdf/publications/electronic_cigarettes.pdf), a report published by the U.S. Fire Administration in July 2017, fires and explosions are uncommon. Top 3 instances of fire or explosion was while in a pocket, while in use and when charging. Concern was raised over spare batteries exploding in user’s pockets when they come into contact with other metal objects e.g. keys, coins. Branded vaping products, which tend to cost more, are higher quality and safer. Manufacturers recommend using only the charger and batteries designed for the device. It is also recommended not to keep spare batteries in pockets with other metal objects - plastic cases can now be purchased to protect spare batteries.

Nicotine in Vapour Liquid

- Nicotine content of e-juice is available in different strengths e.g. 0, 3, 6, 12, 18, 24 mg/mL
- Earlier devices do not deliver nicotine very efficiently
- Newer devices that use nicotine salts can deliver nicotine as efficiently as a tobacco cigarette



Even higher nicotine concentrations are available for those who shop around e.g. 36 mg/mL

Guidance for use of nicotine replacement therapy (NRT) is typically the responsibility of health care professionals who have obtained some form of smoking cessation training. The use e-cigarettes for cessation, however, rests with vape shop owners/workers and/or their online information. They are the experts in the products, how to use and maintain the devices properly and also how to use them for cessation. Interesting concept and huge potential for conflict of interest.

E-cigarette technology is rapidly changing; e.g. getting better all the time; early nicotine containing versions were very poor at nicotine delivery – more comparable to nicotine replacement therapy than a cigarette. Some of the newer devices are able to deliver nicotine as efficiently as a cigarette which is a highly efficient delivery mechanism of nicotine.

Amount of nicotine delivered is highly variable. It will depend on nicotine concentration of the e-liquid, inhalation frequency and type of device. The earlier devices predominantly use free-base nicotine which is not readily absorbed. Many experts in the field liken absorption rates of the earlier devices to that of NRT.

Nicotine salt is created when free-base nicotine is combined with benzoic acid to create

a salt; in this form, nicotine benzoate, the nicotine is delivered with the same efficiency as a tobacco cigarette. In a traditional cigarette, the highly efficient carrier of free-base nicotine in a cigarette is tar - tobacco companies used ammonia to convert naturally occurring nicotine salts in the tobacco leaf to a free-base nicotine as the natural nicotine salts were not readily absorbed. Devices that use nicotine salts tend to have high nicotine content - like Juul which nicotine content is 5% or 59mg/mL.

Nicotine Effect & Safety

- Nicotine is an addictive drug - *"People smoke for nicotine but they die from the tar."*
- Nicotine causes increased heart rate and blood pressure increase; blood vessels constriction, alters brain waves and relaxes muscles
- Is known to alter brain development and can affect memory, mood, impulse control and concentration
- Has a detrimental effect on a developing fetus



Source: Health Canada, 2017



Michael Russell, the father of tobacco harm reduction theory and the developer of nicotine gum, coined this phrase in 1976: *"People smoke for nicotine but they die from the tar."*

Nicotine can elevate heart rate and blood pressure but it is the other constituents in smoke that cause tobacco-related disease.

The impact on brain development raises concern of nicotine containing e-cigarettes use among youth and young adults. Our brains do not fully develop until the age of 25, thus those who vape before this age are at risk for not fully developing parts of their brain responsible for memory, mood, concentration and impulse control.

Nicotine Poisoning (note that young children are at greater risk of nicotine poisoning)

Nicotine Poisoning:

Liquid nicotine can be absorbed through the skin, inhaled or ingested—all can lead to nicotine poisoning

It can be lethal at 30 - 60 mg (adults) and 1-7mg/kg (children) (Mayer, 2014)

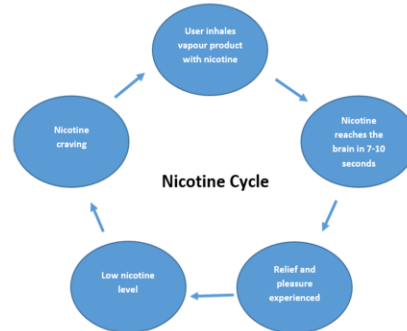
From Jan 2012 - Apr 2017 there were more than 8200 exposures of liquid nicotine to children under 6 in the US (Govindarajan, P. et.al., 2018)

Nicotine toxicity symptoms include pallor, diaphoresis, tremor, headache, dizziness,

confusion, tachycardia, palpitations, nausea, vomiting, diarrhea, abdominal pain and hyper-salivation.

Nicotine Addiction

- Once inhaled, nicotine reaches the brain rapidly
- It stimulates the release of neurotransmitters that affect the brain's reward center
- Increased alertness and euphoria are experienced
- Tolerance is developed and higher amounts of nicotine is needed to achieve the same feelings



Nicotine reaches the brain very quickly where it stimulates the release of a host of neurotransmitters that affect multiple areas of the brain, especially the brain's reward center. The result is that a person experiences rewards – such as increased alertness and euphoria, that positively reinforce the behaviours associated with smoking at a subconscious level . Over time, a person develops tolerance and must increase their intake to achieve the same results.

Toxicants in the Aerosol

- Level of known toxicants are lower than in cigarette smoke
- Levels of toxicants can vary enormously across and within brands
- Toxicants are created from heating the vaping liquid:
 - Heavy metals
 - Carbonyls
 - Volatile organic compounds
 - Tobacco nitrosamine
 - Polycyclic aromatic hydrocarbons (PAHs)
 - Particulate Matter
- Some of the above are carcinogenic compounds

Source: World Health Organization, 2015; Rubenstein, M.L., 2018



The number and level of known toxicants generated by the typical use of unadulterated ENDS/ENNDS (electronic non-nicotine delivery system) is on average lower or much lower than in cigarette smoke. However, they are still not harmless.

The levels of toxicants can vary enormously across and within brands and sometimes reach higher levels than in tobacco smoke. This is probably due, among other things, to the increased thermal decomposition of e-liquid ingredients with rising applied temperatures in open system devices.

Heavy metals: nickel, lead

Carbonyls: formaldehyde, aldehyde

Volatile organic compounds: benzene, ethanol, alcohol, toluene

Tobacco nitrosamine: nicotine and tobacco alkaloids

PAHs: group of more than 100 chemicals, (ie benzo(a)pyrene)

Particulate Matter: is particle pollution; all solid and liquid droplets in the air - all of the above plus others like dust, soot, smoke etc

A number of metals - including lead, chromium, and nickel and formaldehyde have been found in the aerosol of some ENDS/ENNDS at concentrations equal to or greater than traditional cigarettes under normal experimental conditions of use.

A recent study published in Pediatrics (Rubenstein et al) found that adolescent e-

cigarette-only users had levels of 5 volatile organic chemical toxicants detected in their urine in quantities up to 3 times greater than in matched controls, including metabolites of acrylonitrile, acrolein, propylene oxide, acrylamide, and crotonaldehyde. Levels of toxicant exposure in dual users were up to 3 times higher than in those who used only e-cigarettes.

Safety Issues

- Vaping devices are known to have exploded and cause fires and burns
- The root cause of these incidents is the lithium-ion battery
- Most incidents have occurred when the device or spare batteries were in a pocket or during use
- Some have also occurred during charging or while being stored



Early e-cigs have been linked to explosions and fires; the lithium batteries is the cause of explosions e.g. substandard or faulty batteries, batteries that are overheated or kept in a pressurized areas.

Though not common, these fires or explosions can be devastating and life-altering for the victims.

According to Electronic Cigarette Fires and Explosions (https://www.usfa.fema.gov/downloads/pdf/publications/electronic_cigarettes.pdf), a report published by the U.S. Fire Administration in July 2017, fires and explosions are uncommon. Top 3 instances of fire or explosion was while in a pocket, while in use and when charging. Concern was raised over spare batteries exploding in user's pockets when they come into contact with other metal objects e.g. keys, coins. Branded vaping products, which tend to cost more, are higher quality and safer. Manufacturers recommend using only the charger and batteries designed for the device. It is also recommended not to keep spare batteries in pockets with other metal objects - plastic cases can now be purchased to protect spare batteries.

BC Legislation

- *The Tobacco Control Act* was amended in 2016 to include vapour products
- To protect youth the Act stipulates:
 - Retail sales not allowed to those under 19 years
 - Retail displays do not target youth; and advertising is not visible to youth
 - Use is prohibited on public and private school grounds
- Sales in public buildings not permitted
- Banned in indoor public spaces workplaces



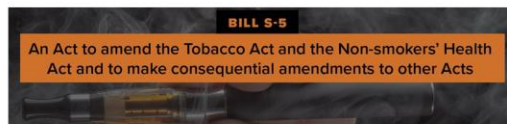
The *Tobacco Control Act* amended to include e-cigarettes '*Tobacco and Vapour Products Control Act*' (Sept 1st 2016). The rationale for regulating vapour products was to help curb the growing use of e-cigarettes by young people in BC and limit exposure to children of the potential dangers of e-cigarette vapour; for youth and children this specifically means preventing exposure to nicotine and potential toxins in the vapour. Also to prohibit the potential for e-cigarettes to normalize smoking behaviour.

Health Authority property is included in the provincial legislation unless that Health Authority permits designated smoking areas.

It is illegal to give or provide any **vapour product** to someone under the age of 19 (same as alcohol). Anyone who suspects someone who is providing vapour products to minors is advised to contact health authority enforcement staff.

Federal Legislation

- Prohibits promotion of vaping products that appeal to youth e.g. dessert or confectionery flavours
- The Act bans lifestyle advertising; sponsorships and celebrity endorsements
- Prohibits retailers to make health claims



The Act outlines a number of issues that require regulating but key to youth is:

BC Tobacco and Vapour Products Control Act supersedes the act with respect to sales to minors (in BC it is 19 yrs).

The Bill prohibits the promotion of vaping products that are appealing to youth, such as products with appealing flavours like dessert or confectionery flavours. Currently, there are nearly 8000 e-juice flavours.

Federal Legislation allows all flavourings including Diacetyl. They also do not require companies to provide ingredient lists on their products

(Note to the presenter: Diacetyl is a flavouring chemical that provides a buttery/creamy flavour. Companies have used diacetyl in their e-juices/vaping liquids.

Studies have shown that workers in a popcorn making plant in Missouri in the 1980s developed lung conditions. Research showed that their respiratory illnesses were caused by Diacetyl, a flavouring used in making the instant popcorn. Due to the high exposure to this chemical, many workers developed the irreversible condition which came to be known as popcorn lung.

While England has banned the use of this chemical, Canada has not yet done so. However, there have not yet been enough studies looking into the diacetyl content in e-juice and linking it to Bronchiolitis Obliterans (popcorn lung). Regardless if this chemical is included or not, our message remains that vaping is not harmless.)

Federal Legislation also restricts the promotion of vaping products, including a ban on all lifestyle advertising. Other forms of promotion, such as sponsorships and celebrity endorsements, are also restricted.

Vapour product retailers will not be able to make health claims; e.g. compare the health impact of tobacco products relative to e-cigarettes

Who Sells Vapour Products?

- Tobacco giants like Philip Morris, Imperial Tobacco and British American Tobacco all own popular e-cigarette brands
- They are very well advertised/promoted



Lucky Strike Cigarettes
American Tobacco Company



blu E-Cigarettes
Imperial Tobacco Company



Though big tobacco is very much on the scene and is ensuring it is reaping profits from this emerging industry.

Big tobacco currently uses the same tactics they had been using for years to sell tobacco e.g. celebrities spokespersons, glamorous men and women, sexy men and women.

In December 2018 Atria Group (Phillip Morris) purchased 35% of Juul – a 12.8 billion dollar investment.

Five e-cigarette manufacturers collectively represent more than 97 percent of the current market for e-cigs — JUUL, Vuse, MarkTen, blu e-cigs, and Logic.

Tobacco Company

E-cigarette Product(s)

Altria

MarkTen, Green Smoke, IQOS Mesh, JUUL

British American Tobacco

Vype iSwitch, Vuse, Ten Motives, Chic

Imperial Tobacco

Myblu, Nixx

Reynolds (Lorillard)

Blu, SkyCig

Then



Marlboro Cigarettes
Philip Morris International

Now



blu E-Cigarettes
Imperial Tobacco Company



Kamel (Camel) Cigarettes
RJ Reynolds Company



E-Lites E-Cigarettes
Japan Tobacco Company



Purchasing Vapour Products in Canada

- Vaping products are available online, at convenience stores and from vape shops
- Currently, there are no municipal regulations on where shops are located or their density
- Adult-only stores can show customers how to use vapour products and do product testing in the store



Source: Surgeon General's Report: E-Cigarette Use Among Youth & Young Adults, 2016

Municipalities have the ability through zoning bylaws to prohibit vape stores from opening within a set distance from where youth congregate e.g. schools, rec centers etc. and / or restrict their density in any given neighbourhood. In the evidence this municipal action is rated as 'innovative' practice.

Vape store owners may allow up to 2 customers to sample their products, employee/owners are not allowed to join them in the sampling, further to this, retailers must take steps to ensure the second-hand vapour does not escape to adjacent premises or public areas.

Cost of Vapour vs Tobacco

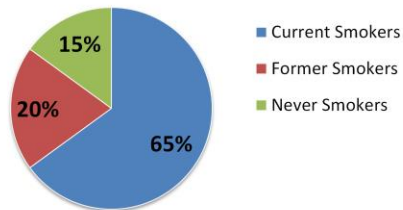
- Over 1 year e-juice is \cong 4 times less expensive than tobacco
 - 30ml bottle of e-juice is about \$20 and lasts about two weeks
 - 1 pack of cigarettes is \$13-15; lasts 1- 2 days (moderate to heavy smoker)
 - E-cigarette starter kits are \$25 - \$200
 - Single disposable e-cigarette \cong \$10



Although vaping products are cheaper than traditional cigarettes, they remain an unnecessary (and sometimes costly) expense for youth.

Patterns of Use

Smoking Status of Past 30-Day Users of E-Cigarettes, 2017



- Youth, young adults and adults who smoke are the main groups that use vapour products
- Most adult vapour product users start using vapour products to help them quit smoking

Source: Canadian Tobacco, Alcohol and Drugs Survey: 2017



The chart illustrated shows that majority (65%) of past 30-day users of e-cigarettes were current smokers, suggesting that dual use of cigarettes and e-cigarettes is high and that fewer (15%) of past 30-day users of e-cigarettes had never smoked.

Although 15% of never smokers is small, this is still a concern and needs to be addressed.

Potential Issues Among the Smoking Population:

Smokers who would otherwise quit switch to e-cigs

Former smokers begin using e-cigs rather than maintaining abstinence

Dual users – e-cigs and regular tobacco products

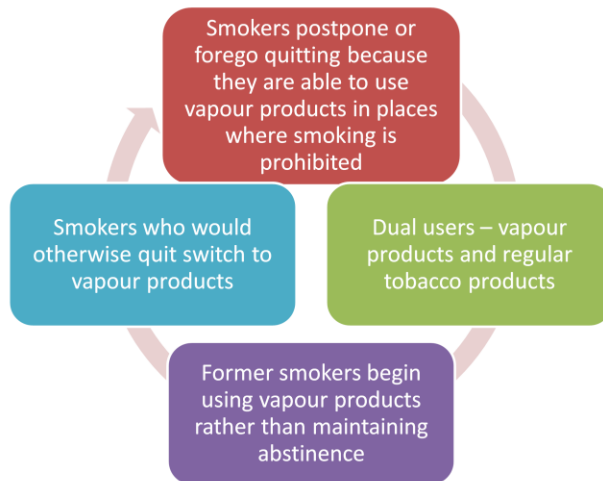
Smokers postpone or forego quitting because they are able to use e-cigs in places where smoking is prohibited

One of the issues that arise with using e-cigarettes for cessation is 'dual use'.

The ideal for cessation is to switch completely to e-cigarettes and then quit e-cigs but that doesn't seem to happen. The tendency for many is to become dual users; which is problematic as smoking only 1 cigarette has been shown to elevate cardiac risk. Dual use also perpetuates cigarette use and most dual users end up going back to only using conventional cigarettes.

In 2014 dual use was 60% in the UK, 83% in France and 93% in the US.

Potential Issues Among the Smoking Population

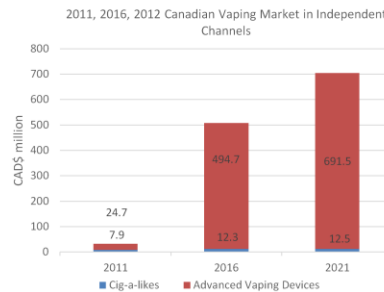


One of the issues that arise with using e-cigarettes for cessation is ‘dual use’. The ideal for cessation is to switch completely to e-cigarettes and then quit e-cigs but that doesn’t seem to happen. The tendency for many is to become dual users; which is problematic as smoking only 1 cigarette has been shown to elevate cardiac risk. Dual use also perpetuates cigarette use and most dual users end up going back to only using conventional cigarettes.

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Vapour Product Marketplace

- Global sales are estimated to at almost US\$10 billion (2015)
- The 2016 Canadian vaping market through independent channels was CAD\$507.1 million; representing 19.7 million units



Source: Euromonitor International 2017



Advanced vaping systems are all the non-Cig-a-like devices.

Independent channels include: convenience stores, tobacco/vape stores, online and kiosks.

Cig-a-likes are cheaper and has been the first type of e-cigarette that first time vapers will purchase. Growth in the advanced vaping devices is to continue.

At the time of this report industry was wary of the fate of vaping, particularly of advanced vaping devices due to the uncertain nature regarding regulations.

Vapour Products for Smoking Cessation

- The evidence for vapour products to be effective cessation aids is inconclusive
- The direction of the effect seems to be positive in the majority of moderate and strong studies
- There is *moderate* evidence that nicotine vapour products are a better cessation aid than no nicotine e-cigarettes



Source: Malas, M. et. al., 2016



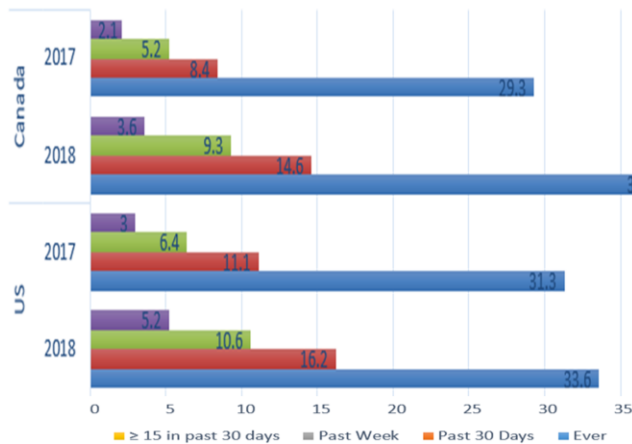
Newer-generation devices can be more useful due to using nicotine salts—more information on JUUL slides (29).

Evidence is inconclusive to date as there is too much uncontrolled variation e.g. many important variables are not accounted for – external validity issues.

What's the evidence? Malas M, van der Tempel J, Schwartz R, Minichiello A, Lightfoot C, Noormohamed A, et al. (2016). Electronic cigarettes for smoking cessation: A systematic review. *Nicotine & Tobacco Research*, 18(10), 1926-1936. Retrieved from <http://www.healthevidence.org/view-article.aspx?a=electronic-cigarettes-smoking-cessation-systematic-review-29830>

Source: US National Academies of Science, Medicine and Engineering

Adolescent Vapour Product Use



The prevalence of vaping in the past 30 days among adolescents aged 16-19 years increased 74% in Canada in 2018.



Source: Hammond, D., Reid, J.L., Rynard, V.L., Fong, G.T., Cummings, K.M., McNeill, A. et. al. (2019) Prevalence of vaping and smoking among adolescents in Canada, England, and the United States: repeat national cross sectional surveys. *British Medical Journal*, 365. Retrieved from <https://www.bmj.com/content/365/bmj.l2219>

This study found increases in the prevalence of vaping among adolescents aged 16-19 years in the US and Canada in 2018, to the highest levels recorded to date e.g. between 2017 and 2018, the prevalence of vaping in the past 30 days among the adolescents increased by 6 percentage points in Canada (74% ↑) and 5 percentage points in the US. Note that this same study looked at the vaping brands youth preferred; in the US JUUL was #1 in Canada #2 – though in Canada this product only became available for in-store purchases in the fall of 2018. This study provides support to the belief that young people have contributed to the increase use of JUUL and the market shift to nicotine salt products.

The McCreary Centre Society BC Adolescents Health Survey shows that in 2018, 21% of all BC students used a vaping product with nicotine and 19% used a vaping product without nicotine.

Note: the AHS which was completed by 38,015 Grade 7-12 students in schools across British Columbia.

The prevalence of vaping among the adolescents aged 16-19 years in the past 30 days increased 74% in Canada in 2018.

Youth Vaping



Reasons for use

- The flavours are appealing and the devices look cool
- It makes them feel rebellious: they vape in places that are not allowed as it is easy to conceal
- Their friends are vaping, it helps them fit in
- Curiosity and/or boredom
- They consider the vapour to be water vapour, harmless compared to tobacco smoke
- They like the “hit” they get from nicotine



Another reason for some youth who have already started to smoke may be too quit or cut down on smoking tobacco – this is probably more applicable to adults who smoke but it does not preclude youth.

(References for this information from a variety of sources e.g. Health Canada, CDC, Partnership for Drug-Free Kids)

Cool Devices

- Teens are attracted to the marketable technology of vaping products
- Juul is rapidly gaining popularity; looking like a USB flash drive, it is considered the iPhone of vaping devices
- Youth using the Juul have coined the phrase 'Juuling'

"Teens have taken technology that was supposed to help grownups stop smoking and invented a new kind of habit, moulded in their own image." The New Yorker - May 14, 2018



Despite being a relatively new product; at the end of 2017 Juul sales represented about 1/3 of the e-cig market

Juul is 'the iPhone' of e-cigarettes; it is easy to use, there are no buttons or switches

Concerns: Juuling

- A JUUL pod contains approximately 0.7mL with 5% nicotine by weight which is approximately equivalent to 1 pack of cigarette or 200 puffs
- The Juul vapourizes nicotine salts rather than free-base nicotine therefore delivers nicotine as efficiently as a tobacco cigarette



NICOTINE CONTENT



Each JUUL pod is designed to contain approximately 0.7mL with 5% nicotine by weight at time of manufacture which is approximately equivalent to 1 pack of cigarettes or 200 puffs.

- Each 5% JUULpod is designed to contain approximately 0.7mL with 5% nicotine by weight (approx. 40 mg per pod based upon 59 mg/mL) at time of manufacture.
- Each 3% JUULpod is designed to contain approximately 0.7mL with 3% nicotine by weight (approx. 23 mg per pod based upon 35 mg/mL) at time of manufacture (apparently available in Canada Jan 1, 2019).

The manufacturer of Juul has combined free-base nicotine with benzoic acid to create a salt which allows the nicotine to be delivered with the same efficiency as a tobacco cigarette (the highly efficient carrier of free-base nicotine in a cigarette is tar - tobacco companies actually used ammonia to convert naturally occurring nicotine salts in the tobacco leaf to a free-base nicotine as the natural salts were not readily absorbed).

Youth are Juuling everywhere including bathrooms and the classroom; they exhale the vapour down the front of their top or sleeve. In open air the vapour and the smell (which will be created by the flavour of the e-juice) dissipates very quickly.

Pregnant Women & Children Vaping

- Vapour products may have less harmful substances than in cigarette smoke; however, vapour products containing nicotine are not safe to use during pregnancy.
- Nicotine can damage a baby's developing brain, lungs and other organs.
- Flavourings and other additives in vapour products may also be harmful.

Centers for Disease Control and Prevention



Although the aerosol of e-cigarettes generally has fewer harmful substances than cigarette smoke, e-cigarettes and other products containing nicotine are not safe to use during pregnancy. Most e-cigarettes contain nicotine, which is addictive and toxic to developing brains and lung in fetuses'. The aerosol and flavourings can contain chemicals that are also harmful to a developing baby.

Schools, Boards & Principals

- Development of consistent policies across all school districts
- Work with Tobacco & Vapour Prevention and Control Program
- Education of vaping risk from Board level to school administrators, teaching and support staff, students and parents (PAC's)
- Incorporate vaping education into regularly scheduled school meetings
- Peer health education and leadership opportunities provided to youth
- Vaping resources and information distributed regularly to students and parents



Consistent policy development and enforcement across all schools

Clear communication of policies or regulations to school administrators, teachers, students, parents, other school staff and visitors

Clear messaging and understanding of consequences

Visible and clear signage

Parents

- Inform yourself of risks of vaping and share with your children
- Don't underestimate or downplay the power of nicotine addiction
- If you smoke or vape, talk to you children about it and think about quitting yourself



Inform yourself of risks of vaping and share with your children
If you smoke or vape, talk to you children about it and think about quitting yourself
Discuss nicotine-free options
Don't underestimate or downplay the power of nicotine addiction
Be patient and listen
Don't buy them vapes

‘Consider the Consequences’ Tour by Health Canada

Book your school

<https://considertheconsequences.ca/national-tour>

Download/order Health Canada resources

Posters, window-clings, Tip Sheet for teachers

<https://considertheconsequences.ca/resources>

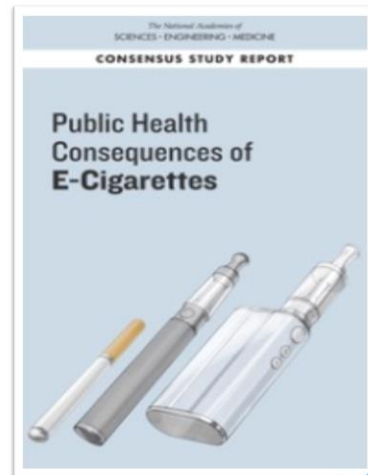
Health Effects: Emerging Health Evidence



Public Health Consequences

Conclusive Evidence:

- That indoor use increases airborne concentrations of particulate matter and nicotine
- Nicotine exposure is highly variable
- Most contain/emit numerous potentially toxic substances
- Devices can explode causing burns and projectile injuries; intentional or accidental exposure to e-liquids can result in adverse health effects



Source: National Academies of Science, Medicine and Engineering



The 2018 National Academies of Science, Medicine and Engineering Report is the most thorough review to date. Their evidence is rated as: conclusive; substantial, moderate, limited, insufficient or no available.

Studies of indoor exposure comparing e-cigarettes to conventional cigarettes have shown that the resulting air quality for both products does not meet the WHO air quality guidelines values. However, it is important to recognize that e-cigarettes may be less harmful than tobacco given the lack of tar, carbon monoxide, combustion products and all the other chemicals (more than 4000 substances, some of them proven toxic and carcinogenic) released from a “tobacco” cigarette, and the lower production of PM. (Pellegrino et. al., 2012)

Nicotine exposure depends on the type of device, e-liquid characteristics and how the device is operated; similar is true for potentially toxic substances emitted.

As per previous slide: risk of explosions, burns and projectile injuries is significantly increased when batteries are of poor quality, stored improperly or are being modified by users.

Adverse health effects from exposure (from drinking, eye contact, or dermal contact) includes but is not limited to seizures, anoxic brain injury, vomiting, and lactic acidosis.

Definitions of the Evidence (National Academies of Science, Medicine and Engineering):

- Conclusive evidence: There are many supportive findings from good-quality controlled studies (including randomized and non-

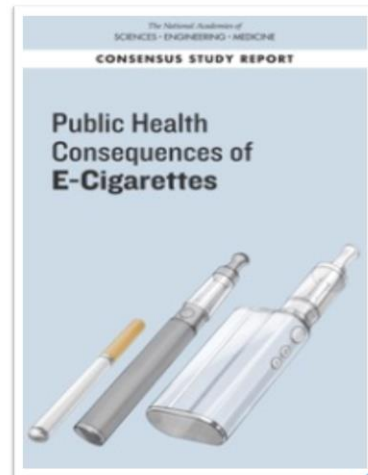
randomized controlled trials) with no credible opposing findings. A firm conclusion can be made, and the limitations to the evidence, including chance, bias, and confounding factors, can be ruled out with reasonable confidence.

- Substantial evidence: There are several supportive findings from good-quality observational studies or controlled trials with few or no credible opposing findings. A firm conclusion can be made, but minor limitations, including chance, bias, and confounding factors, cannot be ruled out with reasonable confidence.
- Moderate evidence: There are several supportive findings from fair-quality studies with few or no credible opposing findings. A general conclusion can be made, but limitations, including chance, bias, and confounding factors, cannot be ruled out with reasonable confidence.
- Limited evidence: There are supportive findings from fair-quality studies or mixed findings with most favoring one conclusion. A conclusion can be made, but there is significant uncertainty due to chance, bias, and confounding factors.
- Insufficient evidence: There are mixed findings or a single poor study. No conclusion can be made because of substantial uncertainty due to chance, bias, and confounding factors.
- No available evidence: There are no available studies; health endpoint has not been studied at all. No conclusion can be made.

Public Health Consequences

Substantial Evidence:

- Nicotine intake can be comparable to tobacco
- The aerosol contains metals
- Use results in symptoms of dependence
- Use increases the risk of ever using combustible tobacco cigarettes among youth and young adults
- Switching from tobacco use results in reduced short-term adverse health outcomes in several organ systems



Source: National Academies of Science, Medicine and Engineering



**** For Point Four: contradicting evidence surrounding vaping leading to smoking initiation in youth**.**

The source used promotes the 'gateway theory' or 'catalyst hypothesis' the idea that vaping leads to smoking in youth. Other studies disagree and present the joint susceptibility hypothesis (common liability) which states that vaping more likely to occur with population with a propensity to use cigarettes due to shared risk factors. Additionally presented in reports is the diversion hypothesis which states that vaping partially replaces and/or substitutes completely for cigarette smoking. However, data and studies have shown both sides of the story due to sample size, time frame, and other variables not controlled for. Thus we need to be aware of current evidence when discussing youth initiation.

Contrary to the National Academies of Science review (and other individual studies), other major reviews deny the strength of the evidence showing that youth who use e-cigarettes are at increased risk to transition to combustible cigarettes. E.g. 'Clearing the Air' a CARBC publication and the England Public Health 'E-Cigarettes: An Evidence Update'.

Nicotine intake is comparable to combustible cigarettes among **experienced adult e-cigarette users**.

The origin of the metals could be the metallic coil used to heat the e-liquid, other parts of the e-cigarette device, or e-liquids; product characteristics and use patterns may

contribute to differences in the actual metals and metal concentrations measured in e-cigarette aerosol.

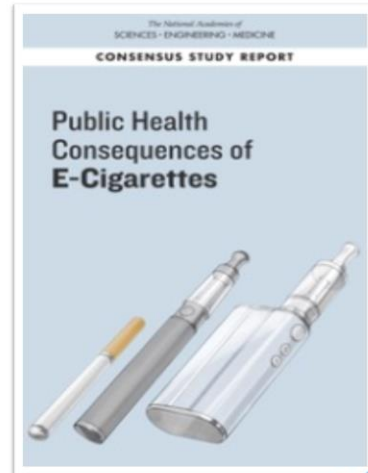
Other findings classified as having 'substantial evidence' result in some physiological responses and changes at the cellular level:

- Heart rate increases shortly after nicotine intake from e-cigarettes.
- E-cigarette aerosols can induce acute endothelial cell dysfunction, although the long-term consequences and outcomes on these parameters with long-term exposure to e-cigarette aerosol are uncertain.
- Components of e-cigarette aerosols can promote formation of reactive oxygen species/oxidative stress. Although this supports the biological plausibility of tissue injury and disease from long-term exposure to e-cigarette aerosols, generation of reactive oxygen species and oxidative stress induction is generally lower from e-cigarettes than from combustible tobacco cigarette smoke.
- Some chemicals present in e-cigarette aerosols (e.g., formaldehyde, acrolein) are capable of causing DNA damage and mutagenesis. This supports the biological plausibility that long-term exposure to e-cigarette aerosols could increase risk of cancer and adverse reproductive outcomes. Whether or not the levels of exposure are high enough to contribute to human carcinogenesis remains to be determined.

Public Health Consequences

Moderate Evidence:

- There is increased cough and wheeze in adolescents who use vapour products
- There is an association with vapour product use and an increase in asthma exacerbations
- Youth and young adults who use vapour products and move on to smoke combustible tobacco will smoke tobacco more frequently and with greater intensity



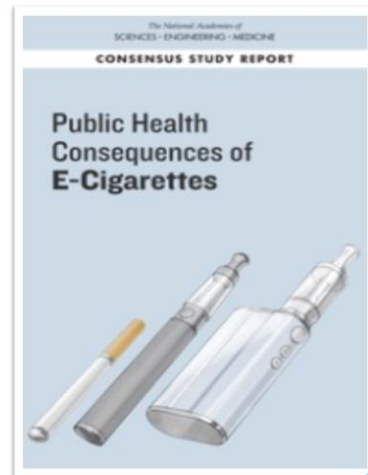
Source: National Academies of Science, Medicine and Engineering



Public Health Consequences

Emerging Potential Concerns:

- That there is an adverse effect on cardiovascular health, blood pressure, cancer risk, respiratory health and changes at the cellular level
- That COPD exacerbations are reduced for smokers who switch to vapour products and if there is improved lung function/reduced respiratory symptoms in those with asthma who smoke



Source: National Academies of Science, Medicine and Engineering



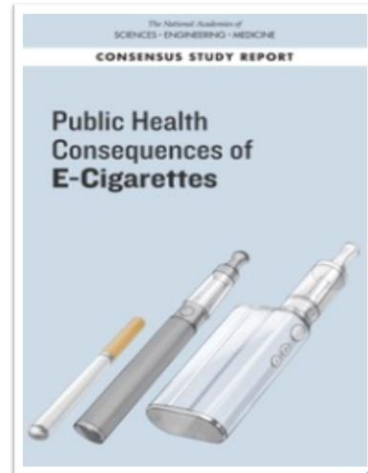
In addition to the above; there is limited evidence:

- If e-cigs increase the levels of nicotine and other e-cig constituents on indoor surfaces
- If there are more metals in e-cig aerosols compared to tobacco cigarettes
- If switching to E-cig use improves periodontal disease in smokers
- And finally, that e-cig use increases, in the near term, duration of subsequent combustible tobacco use

Public Health Consequences

Emerging Potential Concerns:

- That an outbreak of EVALI (E-cigarette Vaping Associated Lung Injury) will emerge in Canada and cause severe respiratory illness and death as identified in the United States.
- All EVALI patients have reported a history of using vapour products.
- November 8, 2019-first detection of chemical of concern, vitamin E acetate, in all fluid samples taken from 29 patients.



Source: Centers for Disease Control and Prevention



Centers for Disease Control and Prevention
Updated November 8, 2019

Recent CDC laboratory testing of bronchoalveolar lavage (BAL) fluid samples (or samples of fluid collected from the lungs) from 29 patients with EVALI submitted to CDC from 10 states found vitamin E acetate in **all** of the BAL fluid samples.

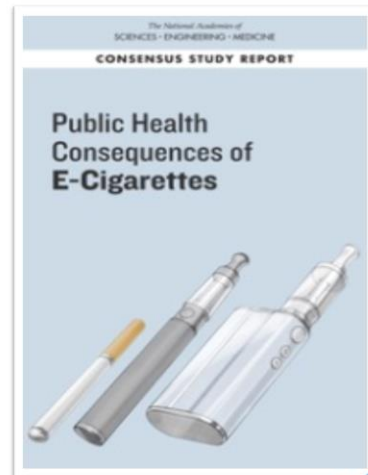
Vitamin E acetate is used as an additive in the production of e-cigarette, or vaping, products. **This is the first time that we have detected a potential chemical of concern in biologic samples from patients with these lung injuries.**

CDC continues to recommend that people should not use e-cigarette, or vaping, products that contain THC, particularly from informal sources like friends, or family, or in-person or online dealers. We will continue to provide updates as more data become available.

Public Health Consequences

EVALI

- As of January 7, 2020, there have been 2,602 cases of EVALI reported from all 50 states in the United States. 57 deaths have been confirmed
- As of January 2, 2020, there are 15 reported cases of severe lung illness related to vaping: 5 in Quebec, 4 in Ontario, 2 in New Brunswick, and 3 in British Columbia



Source: Centers for Disease Control and Prevention, Health Canada



Updated: January 7, 2020

Latest Outbreak Information updated every Thursday.
Centers for Disease Control and Prevention

As of January 7, 2020, a total of 2,602 hospitalized EVALI cases or deaths have been reported to CDC from all 50 states, the District of Columbia, and two U.S. territories (Puerto Rico and U.S. Virgin Islands).

Fifty-seven deaths have been confirmed in 27 states and the District of Columbia **(as of January 7, 2020)**.

[Syndromic dataexternal icon](#) on emergency department (ED) visits suggest that the EVALI outbreak began in June 2019. Cases have been declining since a peak in September.

Data suggest two distinct periods: a gradual increase in ED visits associated with e-cigarette use since 2017, followed by a sharp rise in June 2019.

Data suggest that the EVALI outbreak began in the summer of 2019, and has been on the decline since September 2019.

These data align with recently released CDC national epidemiologic data among EVALI patients suggesting that the number of new hospitalized EVALI cases has also been declining since a peak in September.

While ED visits associated with possible EVALI have declined, they have not returned to levels before June 2019 and EVALI remains a concern.

Although the number of reported cases appears to be declining, states are still

reporting new hospitalized EVALI cases to CDC on a weekly basis and should remain vigilant with EVALI case finding and reporting.

About Patient Exposure:

All EVALI patients have reported a history of using e-cigarette, or vaping, products.

Vitamin E acetate has been identified as a chemical of concern among people with e-cigarette, or vaping, product use-associated lung injury (EVALI).

THC is present in most of the samples tested by FDA to date, and most patients report a history of using THC-containing products.

The latest national and state findings suggest THC-containing e-cigarette, or vaping, products, particularly from informal sources like friends, family, or in-person or online dealers, are linked to most of the cases and play a major role in the outbreak.

CDC has analyzed [national data on use of THC-containing product brands](#) by EVALI patients.

Overall, 152 different THC-containing product brands were reported by EVALI patients.

Dank Vapes, a class of largely counterfeit THC-containing products of unknown origin, was the most commonly reported product brand used by patients nationwide, although there are [regional differences](#). While Dank Vapes was most commonly reported in the Northeast and South, TKO and Smart Cart brands were more commonly reported by patients in the West and Rove was more common in the Midwest.

The data further support that EVALI is associated with THC-containing products and that it is not likely associated with a single THC-containing product brand.

Public Health Consequences

More research is needed to determine:

- Short-term health effects
- Long-term health effects
- How vapour product use effects initiation of using combustible tobacco
- If vapour product is effectiveness as a smoking cessation aid



Source: National Academies of Science, Medicine and Engineering



More and better research will bring clarity to the question of whether e-cigarettes will prove to reduce harm or induce harm at the individual and the population levels.

Further to the last bullet; moderate evidences suggest that nicotine containing e-cigarettes are more effective for cessation than those that don't contain nicotine.

Vapour Products: A Public Health Controversy

Facts

- Vapour products as 'harm reduction' vs 'being harmful' is highly controversial
- Some health experts advocate for vapour products to reduce the harm caused by smoking tobacco
- Others are concerned about their harmful constituents, the risk they pose to initiation among non-smokers and smoking cessation effectiveness



E-cigarettes have sparked a controversy that has divided the scientific and health profession communities: harm reduction vs being harmful. Harm reduction proponents advocate for smokers to switch to e-cigarettes to reduce the health harms caused by traditional cigarettes. Those concerned about the harmful effects are more cautious with respect to the potential harmful constituents in e-cigarettes, the risk of non-smokers starting to use e-cigarettes (including youth) and their transition to smoking from vaping.

There is however some agreement among the 2 groups, it is agreed by all that vaping is less harmful than smoking and that the long term impact on health is not known

Summary and Conclusions



Conclusions

- A significant public health achievement would result if the great majority of tobacco smokers switched to vapour products, then stop using them; the caveat being only if minors and non-smokers weren't recruited
- The evidence is sufficient to warn children and adolescents, pregnant women, and women of reproductive age against nicotine containing e-cigarettes



World Health
Organization

Source: World Health Organization, 2015



Conclusions

- Vapour products are unlikely to be harmless; long-term use is expected to increase the risk of chronic obstructive pulmonary disease, lung cancer, and possibly cardiovascular disease as well as some other diseases also associated with smoking
- There is no specific figure on how much “safer” use of these products is compared to smoking – for a population benefit it would have to be 3 fold



World Health
Organization

Source: World Health Organization, 2015



Conclusions

- Disclaimer:
 - The multitude of past and current studies have presented *contradictory* evidence in regards to vaping products as a cessation aid as well as vaping being a gateway for youth smoking initiation.
 - The information is derived from sources which is believed to be the strongest and most current.



World Health
Organization

Source: World Health Organization, 2015



Questions?



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Contact Us

Tobacco & Vapour Prevention and Control Program

Courtenay

355-11th Street
Courtenay, BC, V9N 1S4
250.331.8620

Nanaimo

29-1925 Bowen Road
Nanaimo, BC, V9S 1H1
250.755.6285

Victoria

201-771 Vernon Avenue
Victoria, BC, V8X 5A7
250.519.3401

