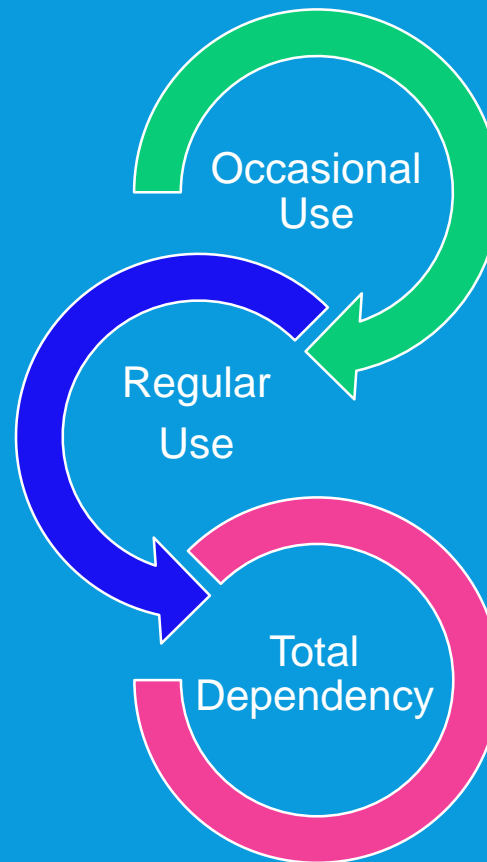


NICOTINE AND ADDICTION



Nicotine as a Gateway Drug.

- Cottler et al.
- Nicotine in Non-IVDU
- Nicotine in Alcoholism
- Nicotine in IVDU
- NOT IVDU-nicotine
- NOT Crack cocaine-nicotine
- NOT amphetamine-nicotine

Teens who smoke are —



- 3 times more likely to use alcohol
- 8 times more likely to use marijuana
- 22 times more likely to use cocaine

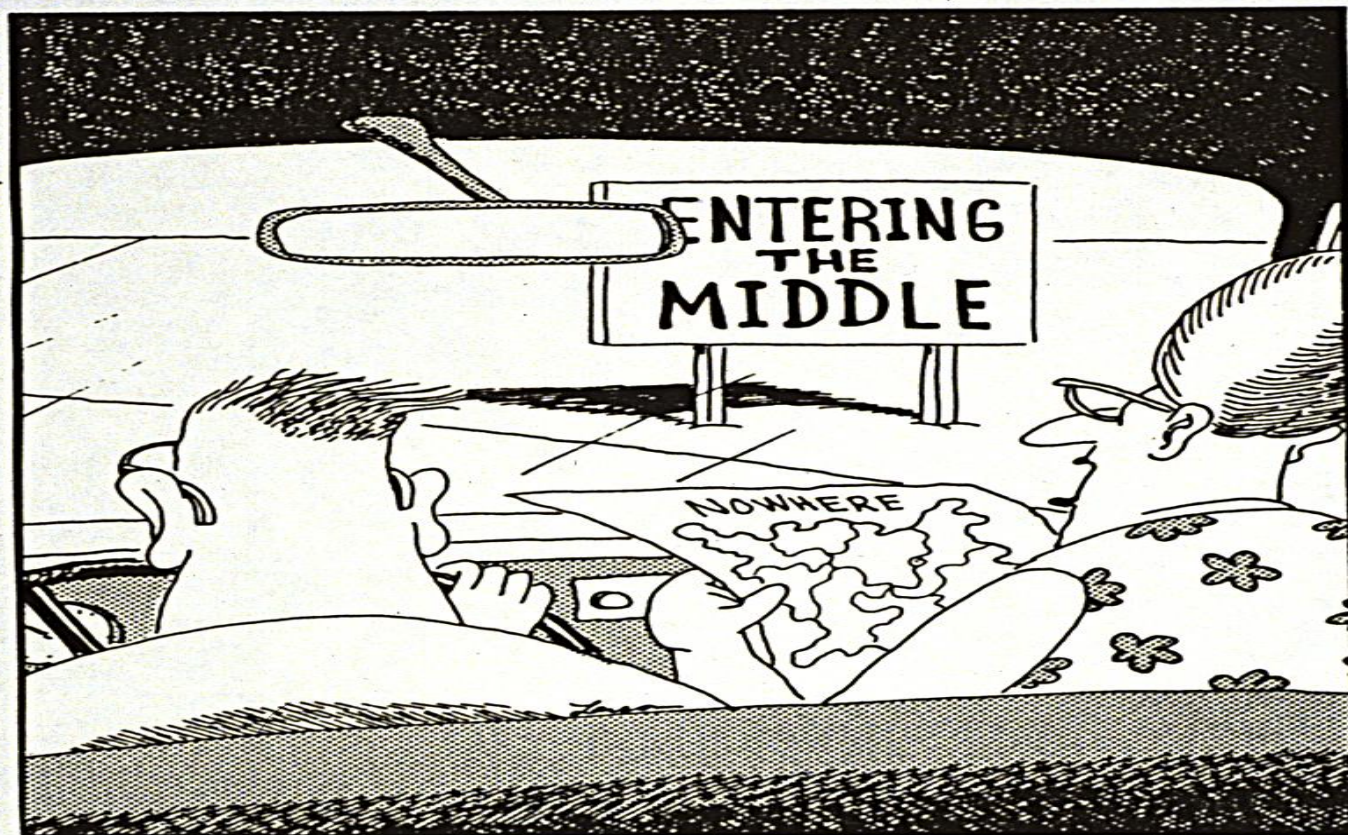
— than teens who don't ...



--- but teens that “JUUL” are 3 - 4 x >
likely to smoke combustible
cigarettes !!!

FDA – it's all about Nicotine

- Reduced/reducing nicotine in combustible/traditional cigarettes to point NOT addictive...?
- ENDS as another NRT product ?
- Harm reduction – **but not harmless** – and ? use for those failing already approved TUD Tx products
- But **no** harm reduction with **dual use**



"Well, this is just going from bad to worse."

OTP's

New and not so New Tobacco Products

- E-cigarettes/ENDS
-JUUL's
- Hookahs
- Bidi's
- Snus
- Camel Orbs & others

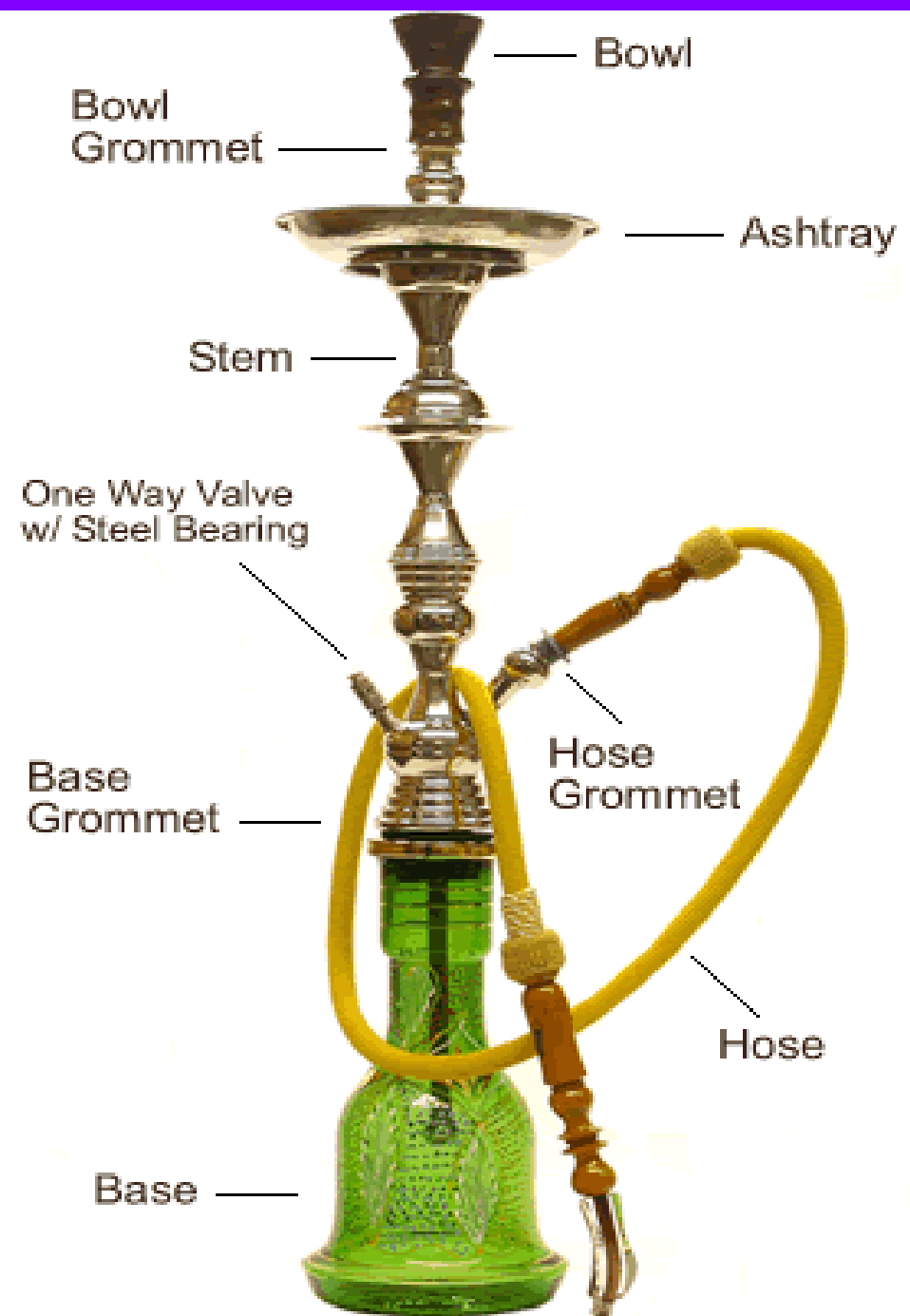
Hookah/"water pipe"

Flavors

Fruit: apple, banana, cherry, melon

Candy: bubble gum, mint chocolate, cinnamon

Alcohol: pina colada, margarita



Flavored Cigars



Novel Smokeless Products

High School Student describing using Camel Snus:

“It’s easy, it’s super-discreet...and none of the teachers will ever know what I’m doing.”



Which is an E-cigarette (the new kid on the block)?



Answer: **All of Them**

Support the Bill to Ban the Sale of Electronic Cigarettes to Minors

History of E-cig's

- 2003 - pharmacist in China develops as new NRT to help quit
- 2007 - introduced USA market
- 2010 - NH one of first states to prohibit sales to minors under 18 with BNH Youth network, legislators, governor working together
- 2010-2018; CDC monthly nicotine poisoning reports from 1-->> 2000
- 2016 (August) - FDA deeming reg's for all ENDS as tobacco products
- 2017 - US senator requests review, repeal; delaying implementation → 2022!!
- 2018 - law suits against JUUL's; FDA *finally* back involved; JUULs trying...?



E-cigs/ENDS (electronic nicotine delivery systems) ? TUD-Tx (smoking cessation) Device

- USA/WHO perspective
 - not safe, not harmless, but less harmful
 - current smokers having failed all FDA/USPHS approved TUD -tx, then “harm reduction”
 - FDA deeming rules/regulations – 8/2016
- UK/EU perspective
 - British Public Health, Royal College of Physicians
 - 9/2018 epidemiology data

What Are E-Cigarettes?

E-Cigarettes & Vape Pens Components



Battery

The battery is the energy source of the device and powers the atomizer



Atomizer

The atomizer is the heating element that heats the e-liquid and is often coil shaped



E-Liquid

Sometimes called e-juice, this is put into the device and often contains flavors and nicotine



Cartridge

The cartridge (tank) holds the e-liquid and may also hold the atomizer



Aerosol

Heating e-liquid inside the device creates an aerosol that is inhaled into the body and out into the air

What does vaping produce?

- Vaping produces an **aerosol**, not a "harmless" water vapor
- An aerosol is a mixture of many different chemicals
- E-liquids produce chemicals during heating process
- Aerosol may also contain microscopic particles - metals from the heating coil

It's an Aerosol, Not a Vapor

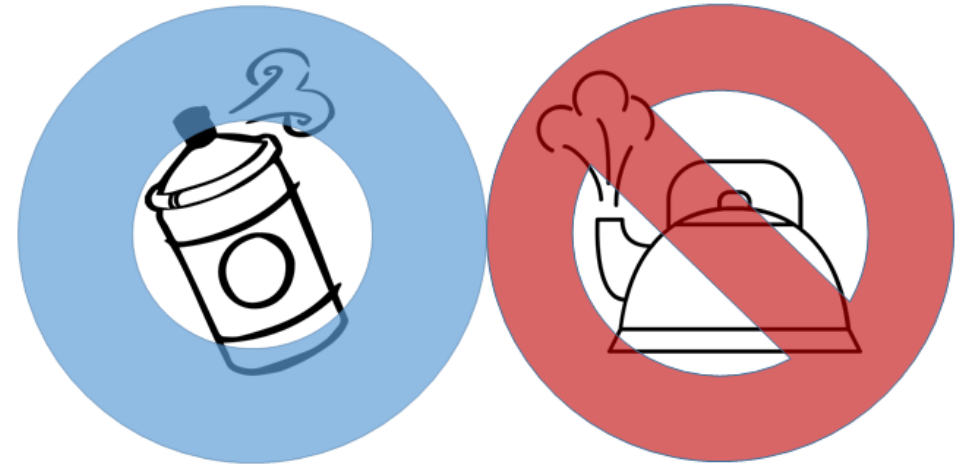


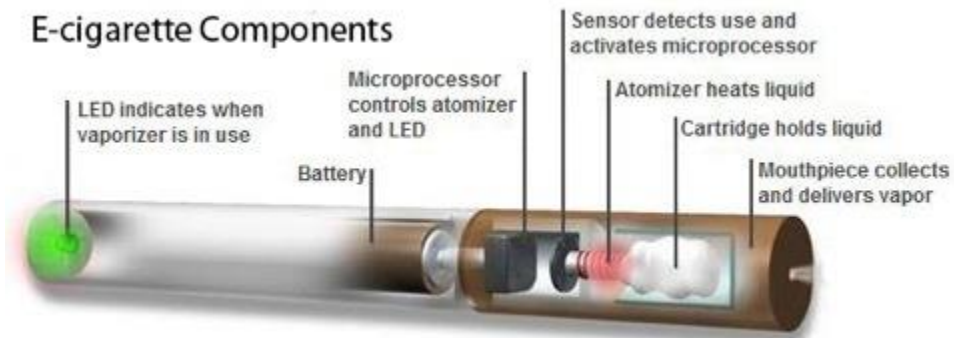
Image Credit: via thenounproject.com

VAPING VOCAB

- **Vaping**- the act of using an ENDS, e-cig or similar device; and with JUULs, called “JUULing”
- **E-juice**- also called e-liquid, available in a variety of flavors, packaging and nicotine levels
- **Cloud chasing**- the activity of blowing large clouds of vapor
- **Dripping**- using a modified device, or open heating coils, to create thicker vapor clouds with a stronger hit of flavoring and nicotine
- **Dabbing** – vaping using marijuana concentrates

Electronic Cigarettes

E-cigarette Components



E-Cigarettes & Vape Pens Generations



Cig-a-Like

E-cigarettes came onto the market around 2007.

Most delivered nicotine and were disposable.

Variations

Variations on the first e-cigarettes included products like e-hookah and rechargeable versions.

Vape Pens

These have batteries that can reach higher temperatures, have refillable e-liquid cartridges, and allow users to regulate the frequency of inhalations.

Mods

Large size, modifiable e-cigarettes allow for more aerosol, nicotine, and other chemicals to be breathed into the lungs, at a faster rate.

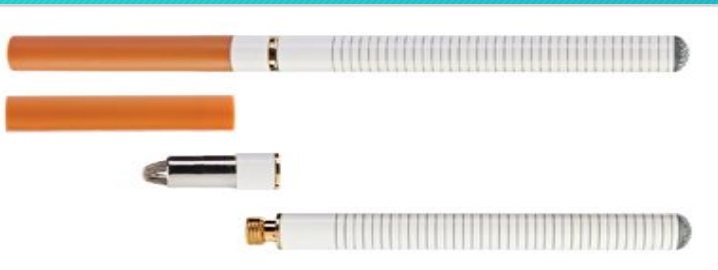
Pod-Based

These e-cigarettes are shaped like USBs and contain pods with higher amounts of nicotine than previous generations.



E-Cigarettes “evolving”

2007



2010



2018



Cig-alikes, Tanks, Mods and more





VAPE PENS



VAPE MODS



Are these safe? Regulated?

- No and no (more later on “policy; reg’s”)
- Neither the devices (again > 450 and increasing daily)
- Nor the “juice”, liquid, or other substances used with these devices



THE DIFFERENT DEVICES



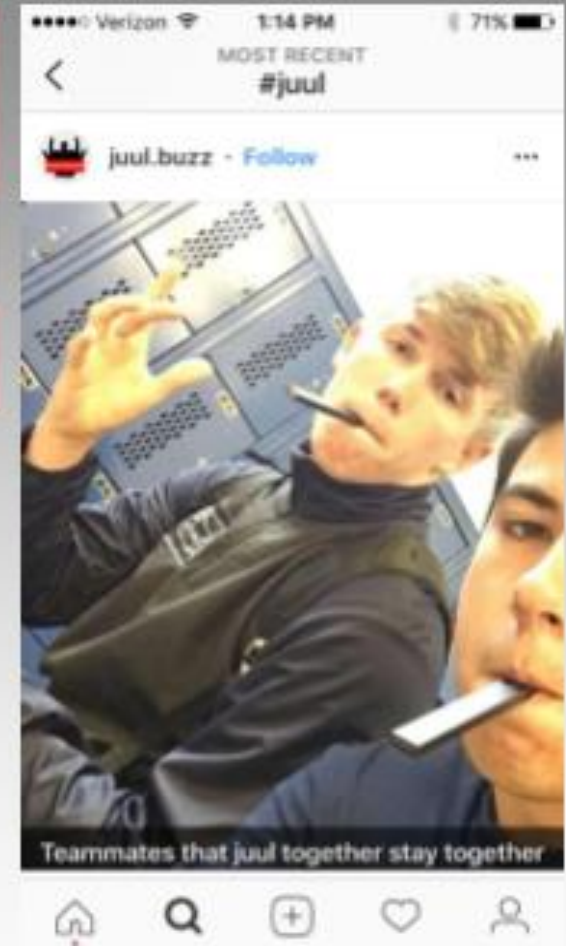
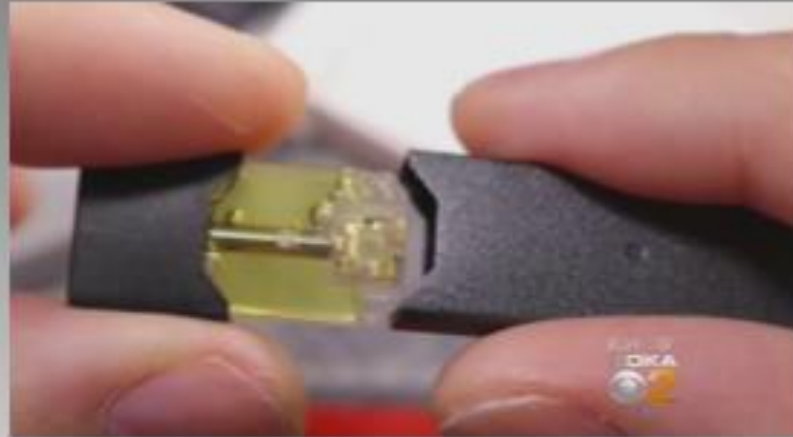


JUUL et al: The rise of the “pod mods”.



SUORIN AIR ULTRA PORTABLE SYSTEM

JUUL: High tech, portable, popular among youth.



Popular Products among Youth: JUUL

- Launched in 2015
- Compact size, similar to a flash drive, easily stored, rechargeable, discreet, affordable
- USB port for purchase, plug device into laptop to charge
- Fully charges in one hour and lasts full day
- Using a JUUL is referred to as “juuling” rather than vaping
- Nicotine content always the same, 5% or 50mg/ml; **1 JUUL pod roughly = 200 puffs, nicotine in 1 pack of cigarettes**
- These nicotine salts/made from tobacco give similar strong nicotine “hit” as combustible cigarette



Pod-Based Systems: Significant Concerns

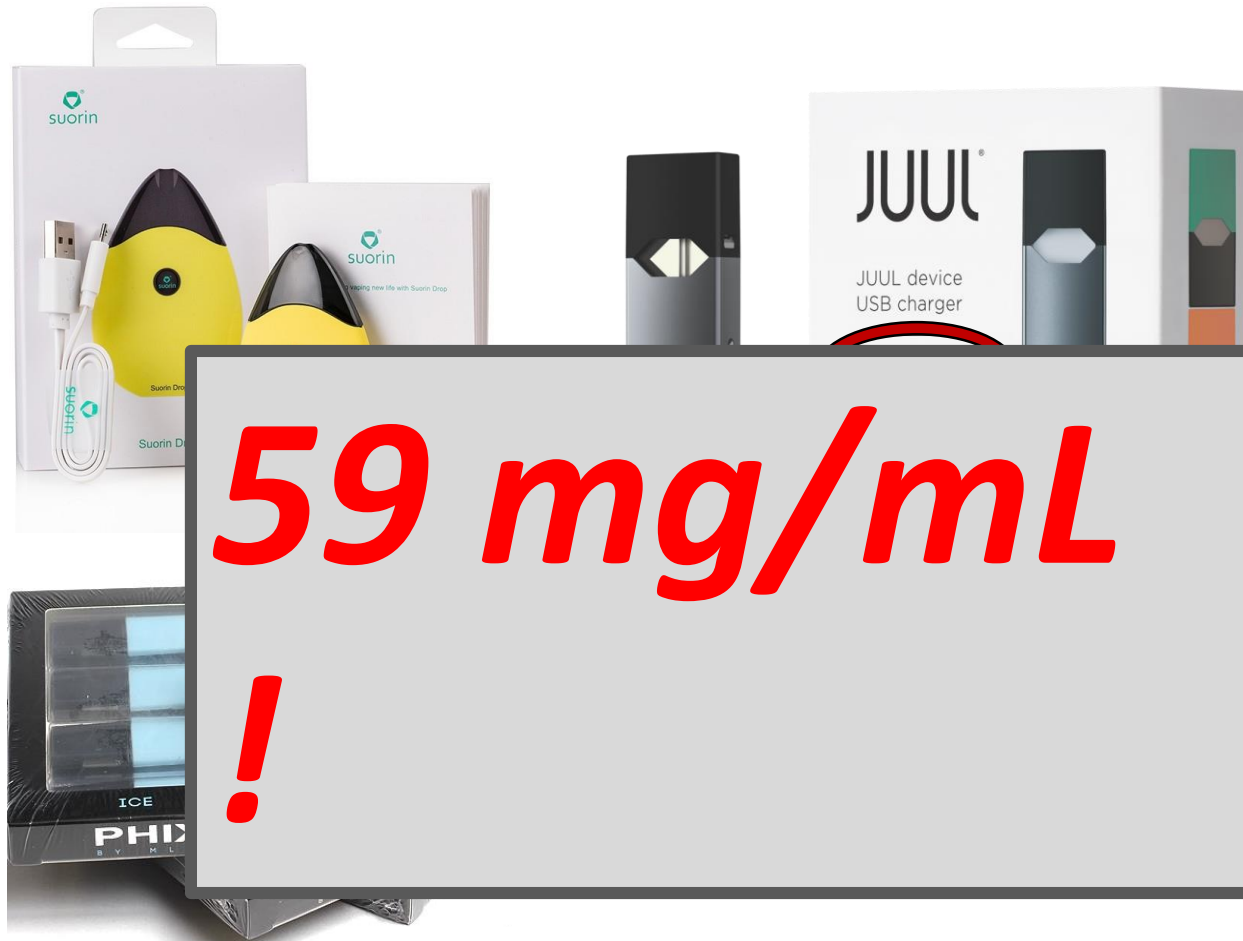


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tobaccopreventiontoolkit.stanford.edu

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How Much is That?











5% strength
of what?

How much is
5%?

Strength of a Pack

NOTE: ALL SALT-BASED E-JUICE/LIQUID CONTAINS **NICOTINE!**

	<i>Amount</i>	<i>Equivalent</i>
1 pack cigarettes 	20 cigarettes <i>(contains 8mg per cigarette, but only inhale 1mg)</i>	
1 JUULpod 	0.7 mL pod <i>"5% nicotine by volume"</i>	
1 PHIX pod 	1.5 mL pod <i>"5% nicotine by volume"</i>	
1 Suorin pod 	2 mL cartridge <i>"5.4% nicotine by volume "</i>	

More Nicotine = More Smoking & Vaping

Research

JAMA Pediatrics | [Original Investigation](#)

Associations of Electronic Cigarette Nicotine Concentration With Subsequent Cigarette Smoking and Vaping Levels in Adolescents

Nicholas I. Goldenson, BA; Adam M. Leventhal, PhD; Matthew D. Stone, BA;
Rob S. McConnell, MD; Jessica L. Barrington-Trimis, PhD

Keck
Medicine
of **USC**



JUUL

- E-liquid flavor pods, nicotine salts, 5 flavors produced by JUUL Labs: *Cool Mint, Crème Brûlée, Fruit Medley, Virginia Tobacco & Mango*
- 3 limited edition flavors (2018): *Cool Cucumber, Classic Tobacco & Classic Menthol*
- Other companies sell “companion” products, “JUUL-compatible” pods, more flavors with varying, unknown levels of nicotine.
- “Skins” or “wraps” in different prints available for personalization
- YouTube videos demonstrate how to take apart JUUL pods to re-fill with e-juice, suggest tricks and tips for devices



JUUL doing the right thing??

11/2018

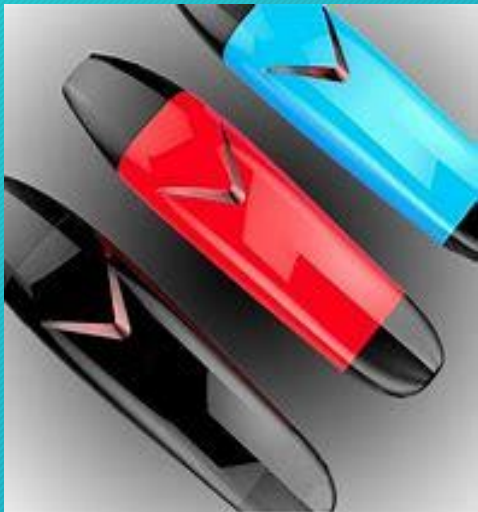
- Off the convenience store “shelf” – “crème brulee, fruit medley, cool cucumber, and mango....
- BUTT still on-line, in “adult” vape stores and everywhere, still tobacco (Virginia or classic), menthol and cool mint
- Pulled their “school” program as well as making their on-line sales “stricter”
- Butt...Altria buy in...?
- ...and then there are all the “JUUL 2.0’s”

JUUL

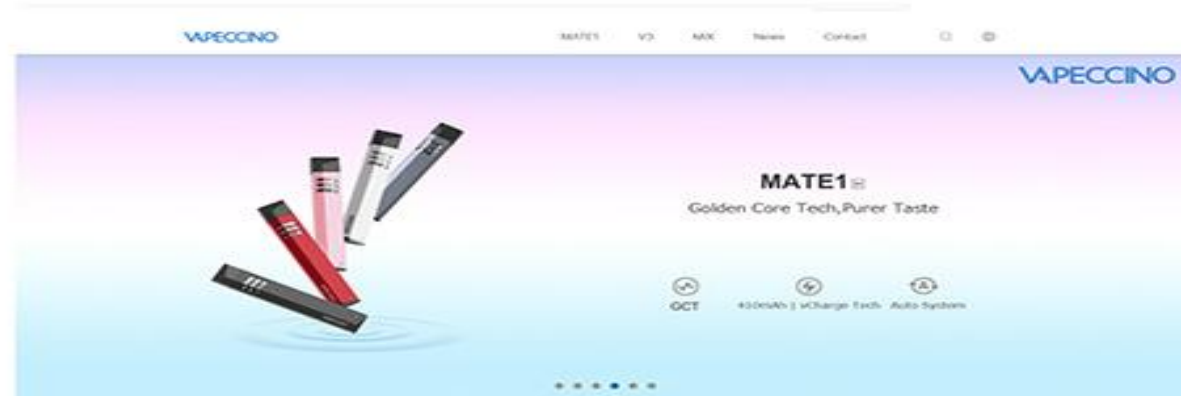
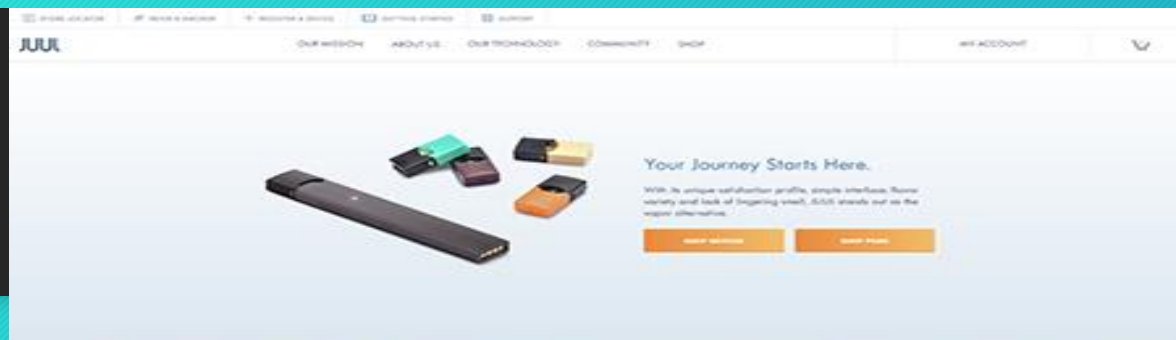
- **Last quarter of 2016**, JUUL had **25%** of the market share. April 2018, JUUL reached **50%** of the market share (WSJ). June 2018, **JUUL had captured 68% of U.S.** e-cigarette market (LA Times) By end of August, **72%!!**
- JUUL is now more popular than the devices produced by Big Tobacco companies (Blu, MarkTen, Vuse etc.)
- According to JUUL they produce **20 million products, including devices and cartridges, per month** and struggle keep up with demand
- JUUL company is based in California. Developed by two Stanford graduate students for thesis on smoking alternatives (both founders were smokers)
- CA tobacco sales age is 21. Website states you must be 21 to purchase online or receive emails. Device is also sold in retail stores - varies depending on state tobacco sales age

The “Me Too’s”/JUUL “2.0”: Suorin, others

- **Suorin Air:** rectangle shaped, smaller than an iPhone, refillable cartridges
- **Suorin Drop:** tear-drop shaped, about palm sized, refillable
- Suorin devices are made to be re-filled with e-juice.
- Use USB and micro USB charging cable



JUUL look a-likes



Newer Products



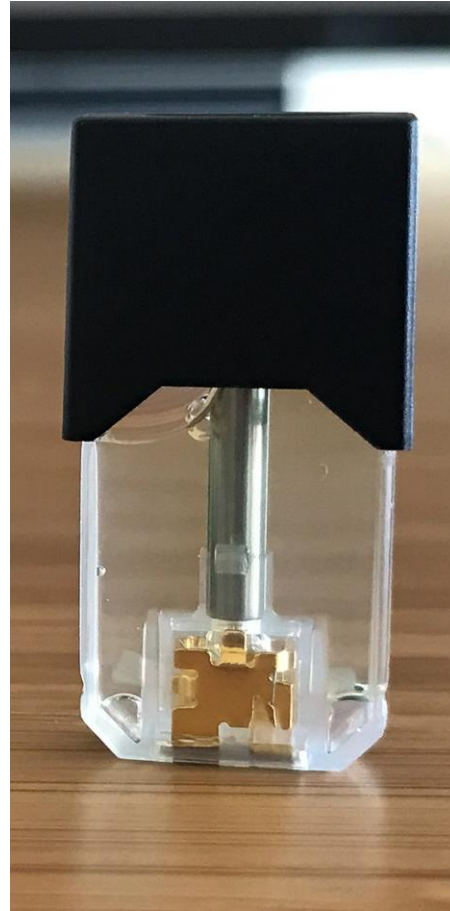
PUFFiT 2

- **Dry herb/extract** compatible, portable vaporizer that can provide up to 2.5 hours of usage on a single charge
- “On-demand” - heats up for 1-2 draws then turns off
- Uses USB charging system
- Marketed to be discreet - “**mimics look of asthma/medical inhalers**”



What's in that Pod?

- Nicotine
- Benzoic Acid
- Glycerol
- Propylene Glycol
- Natural Oils
- Extracts and Flavors
- ???



Over
20 Million
devices and pods
sold every month



Conclusions.

- “Pod mods” are convenient to use, easy to conceal, and popular among youth.
- Attempts to conceal products for use where/when not allowed suggests dependence.
- JUUL is low power with high concentration liquid and has some important safety features that could be standardized across ECIGs (e.g., puff duration and temperature limits).
- JUUL delivers nicotine effectively; nicotine delivery profile and topography in experienced users when using *ad libitum* uncertain.
- New tobacco products like JUUL and IQOS can be evaluated quickly when an array of methods are used in a coordinated fashion.

E-Cig Aerosol Composition

<ul style="list-style-type: none"> • Propylene glycol • Glycerin • Flavorings (many) • Nicotine • NNN • NNK • NAB • NAT • Ethylbenzene • Benzene • Xylene • Toluene • Acetaldehyde • Formaldehyde • Naphthalene • Styrene • Benzo(b)fluoranthene 	<ul style="list-style-type: none"> • Chlorobenzene • Crotonaldehyde • Propionaldehyde • Benzaldehyde • Valeric acid • Hexanal 	<ul style="list-style-type: none"> • Benzo(ghi)perylene • Acetone • Acrolein • Silver • Nickel • Tin 	<ul style="list-style-type: none"> • Cadmium • Silicon • Lithium • Lead • Magnesium • Manganese • Potassium • Titanium • Zinc • Zirconium • Calcium • Iron • Sulfur • Vanadium • Cobalt • Rubidium
<p>All of these have been found in e-cig aerosol</p>			
<ul style="list-style-type: none"> • Acenaphthylene • Acenaphthene • Fluoranthene • Benz(a)anthracene • Chrysene • Retene • Benzo(a)pyrene • Indeno(1,2,3-cd)pyrene 	<ul style="list-style-type: none"> • Aluminum • Chromium • Boron • Copper • Selenium • Arsenic • Nitrosamines, • Polycyclic aromatic hydrocarbons 	<p>Compounds in yellow are from FDA 2012, Harmful and Potentially Harmful Substances – Established List</p>	

Where Else Can You Find These Chemicals?

Propylene glycol → Antifreeze



Acetone → Nail Polish Remover



Ethylbenzene → Paints, Pesticides



Formaldehyde → Embalming



Nicotine → Cigarettes



Rubidium → Fireworks