



Vaping

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Disclosures

I have no financial relationships or affiliations to disclose.

Objectives

- **WHAT:** Describe vape devices, nomenclature and appearance
- **WHO:** Describe use among adults and youth
- **RISKS:** Review scientific evidence of health effects - EVALI
 - Risk related to COVID-19
- **YOUR ROLE:** Discuss considerations for your patients who Vape or are considering Vaping.

What Vaping Looks Like



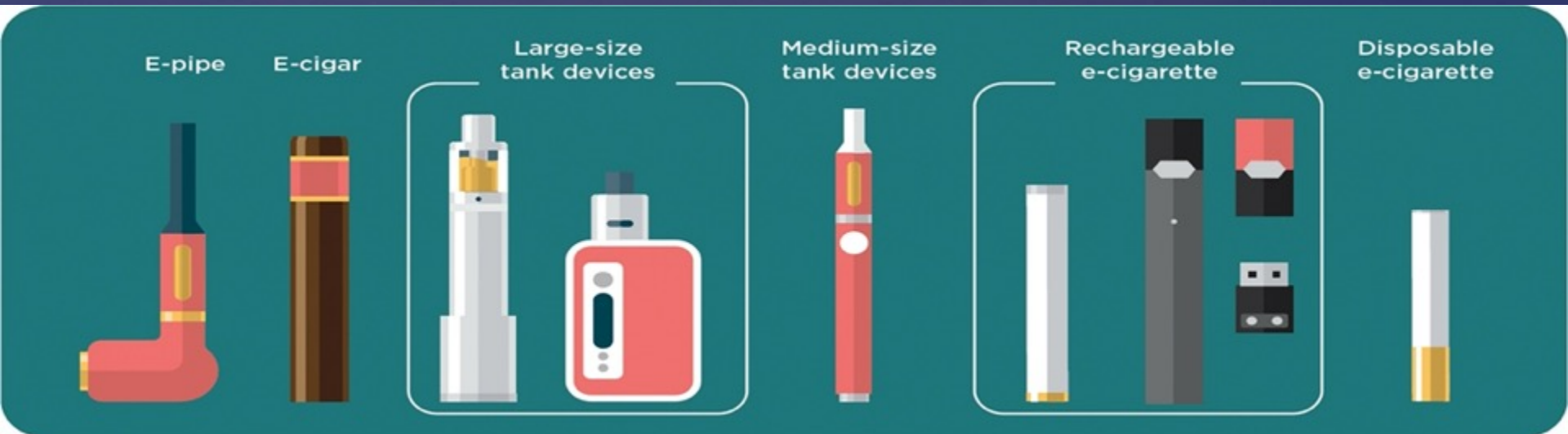
What are Vaping Devices?

- Originally developed by Hon Lik in 2003
- “an electronic atomization cigarette that functions as substitutes...for quitting smoking and cigarette substitutes.”^a
- Primarily manufactured in Shenzhen, China
- Devices that deliver an aerosol (vapor) with or without nicotine
- Create a vapor by heating nicotine, propylene glycol or glycerin, with or without additional flavoring agents – “juice” can be nicotine-free as well.

^a Patent No. 8,490,628 B2

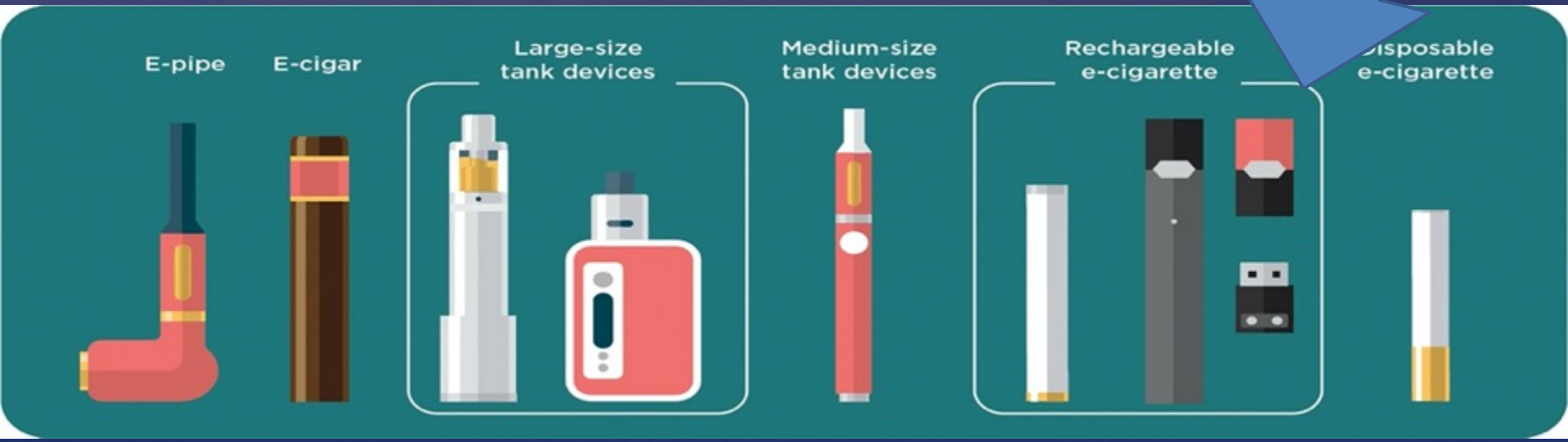
Nomenclature

- Electronic Nicotine Delivery Systems (ENDS)
- E-cigarettes
- Electronic cigars or e-cigars
- E-hookah or hookah pens
- Vaping devices, vapes, vape pens, and personal vaporizers
- Mods and tanks



Nomenclature

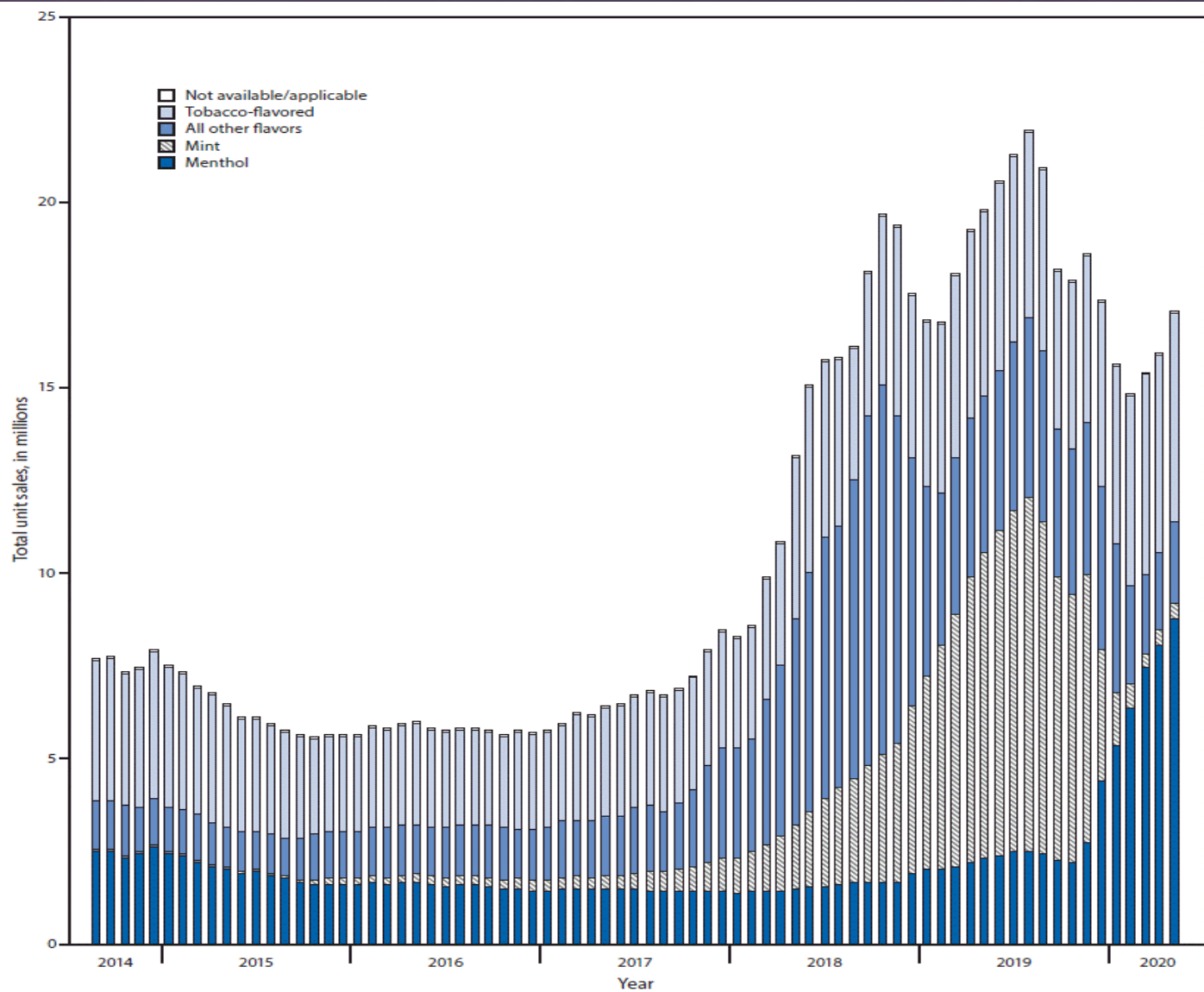
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E-liquid – Juice Constituents

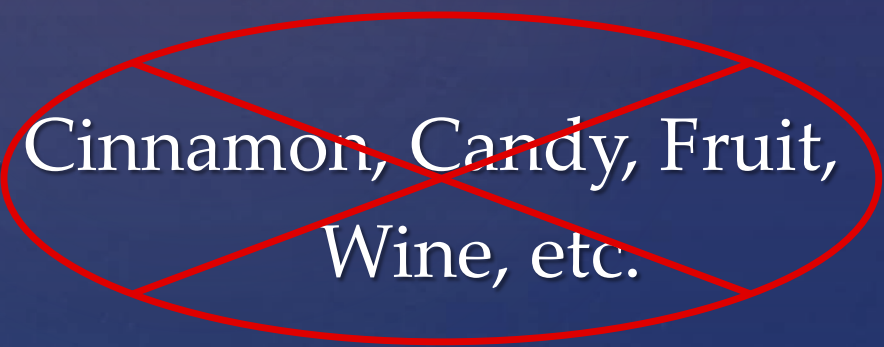
- **Nicotine**
 - Varying levels, including nicotine-free
- **Carrier Solutions**
 - Propylene glycol or Vegetable glycerin
- **Flavorings**
 - Tobacco, Menthol, Cinnamon, Candy, Fruit, Wine, etc.

Total US e-cigarette unit sales, by flavor (9-2011 to 5-2020)



Ali FRM, Diaz
MC, et al,
MMWR 2020

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E-liquid – Vapor

NICOTINE

- Labeled amount frequently doesn't match actual amount^a
- Each puff delivers 0 to 35ug nicotine^b

CARRIER SOLUTIONS

- Propylene glycol and Vegetable glycerin –toxic to lung cells, increasing with dose^c

FLAVORINGS

- Some influence satisfaction and health effects.

^aTrehy et al 2011; ^bGoneiwick et al *Nic Tob Res* 2013; ^cSassano MF, Davis ES et al 2018

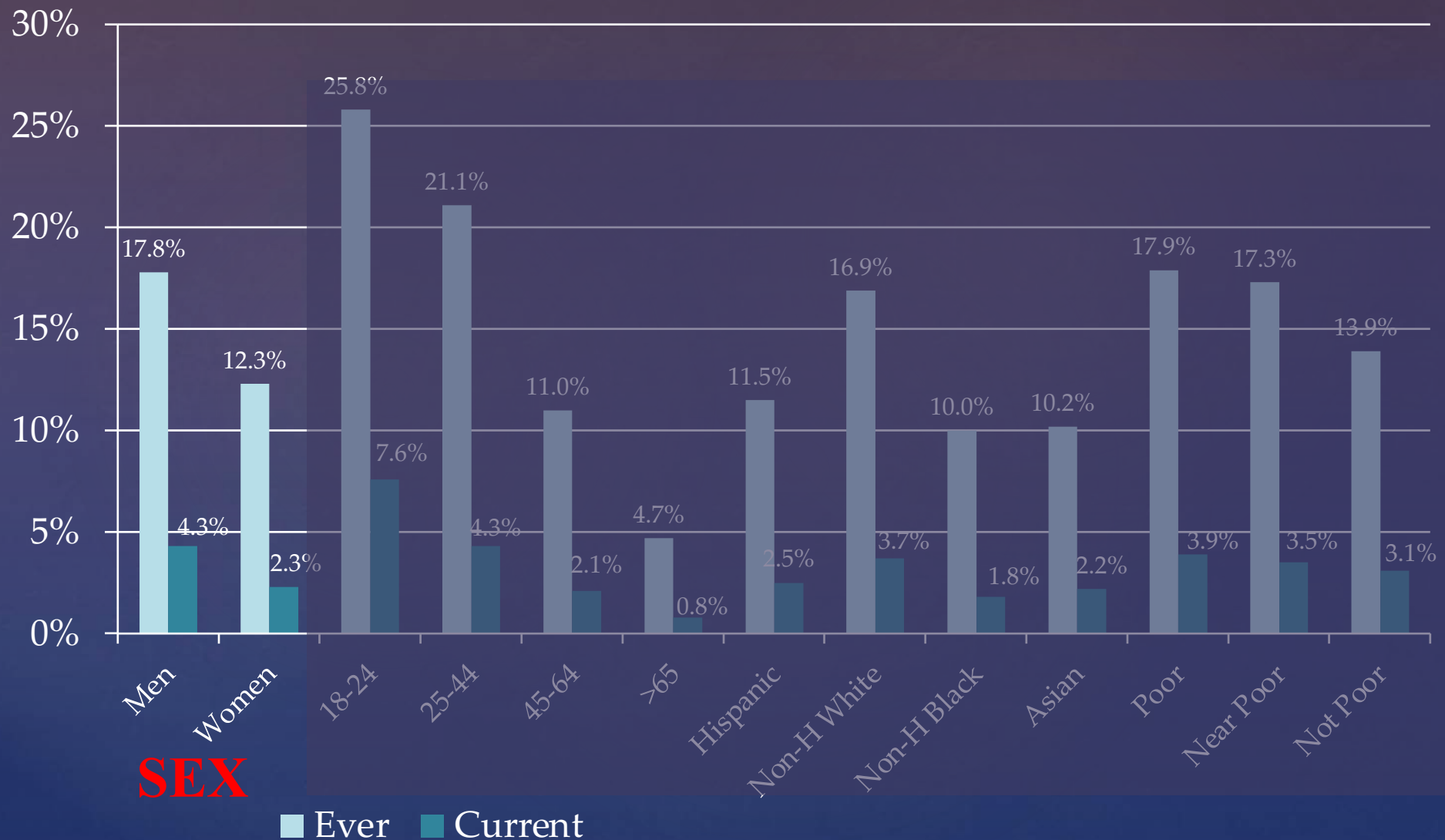
E-liquid (“juice”) and Vapor

TOXINS, CARCINOGENS, and PARTICULATES

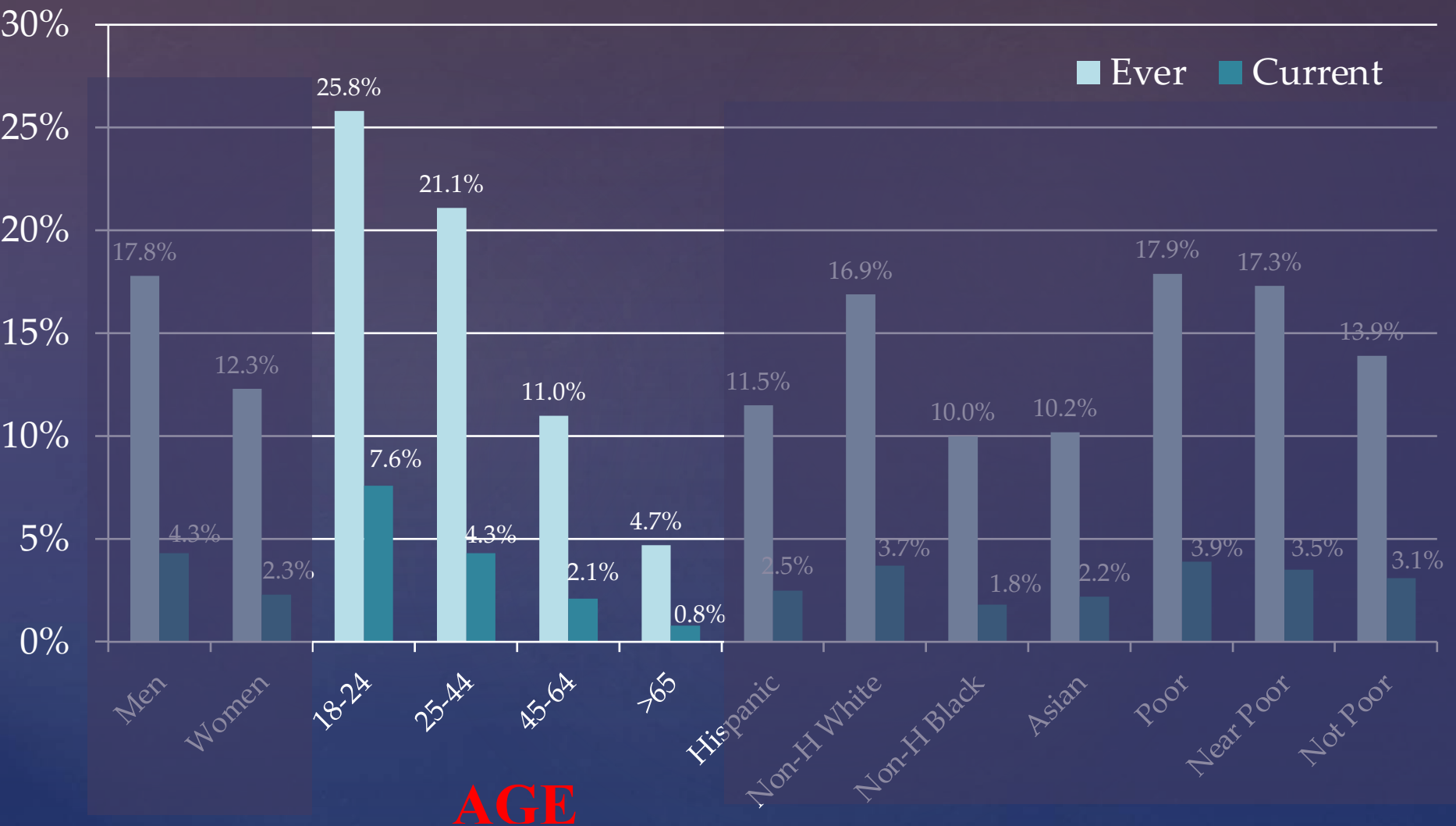
- 1-2 order of magnitude lower than cigarettes^a
(Aldehydes, metals, volatile organic compounds, phenolic compounds, polycyclic aromatic hydrocarbons, tobacco alkaloids)^b
- Tobacco-specific nitrosamines range variability from 330-8600 ul/mL^c
- Higher nicotine content = higher particles in vapor
- Particle size of ~120-165 nm (similar to conventional cigarettes)
- Acrolein, a herbicide, causes acute lung injury and COPD and may cause asthma and lung Cancer^d

^aGoneiwick et al *Tob Con* 2013; ^bCheng *Tob Con* 2014; ^cKim and Shin *J Chromatogr A* 2013; ^dBein K and Leikauf *GD Imol Nutr Food Res* 2011.

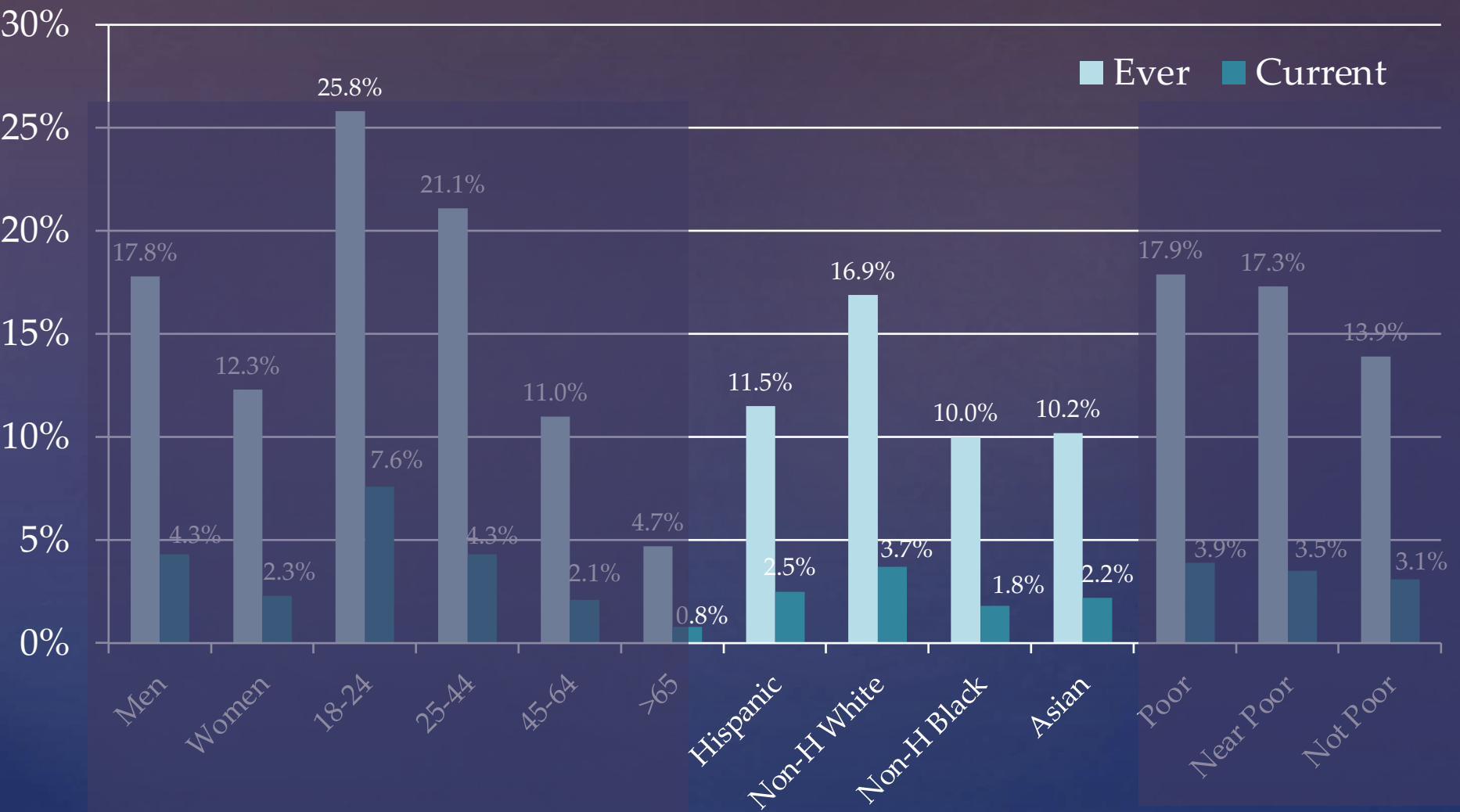
Adult Vaping – Current vs. Ever Use



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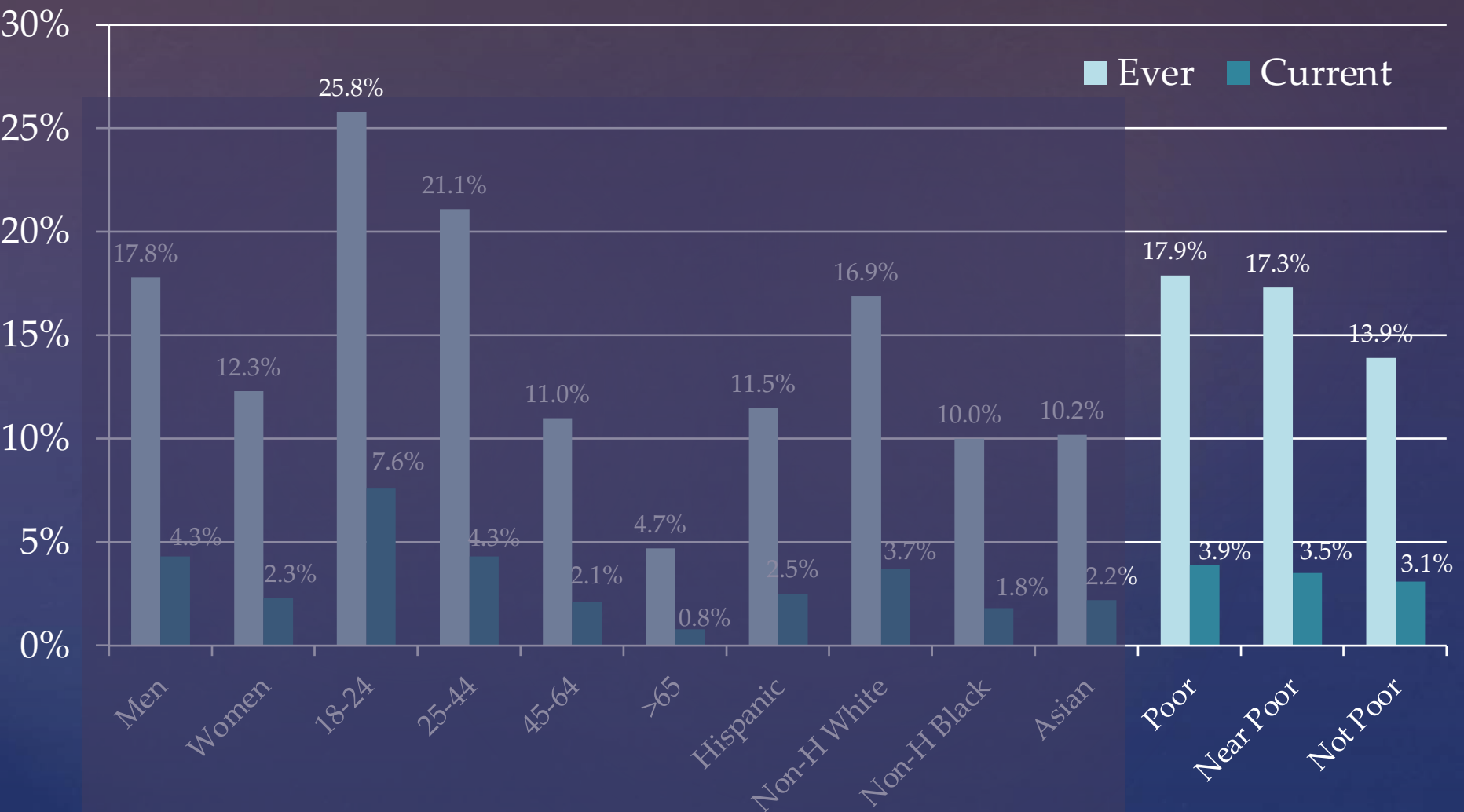


Adult Vaping – Current vs. Ever Use



RACE

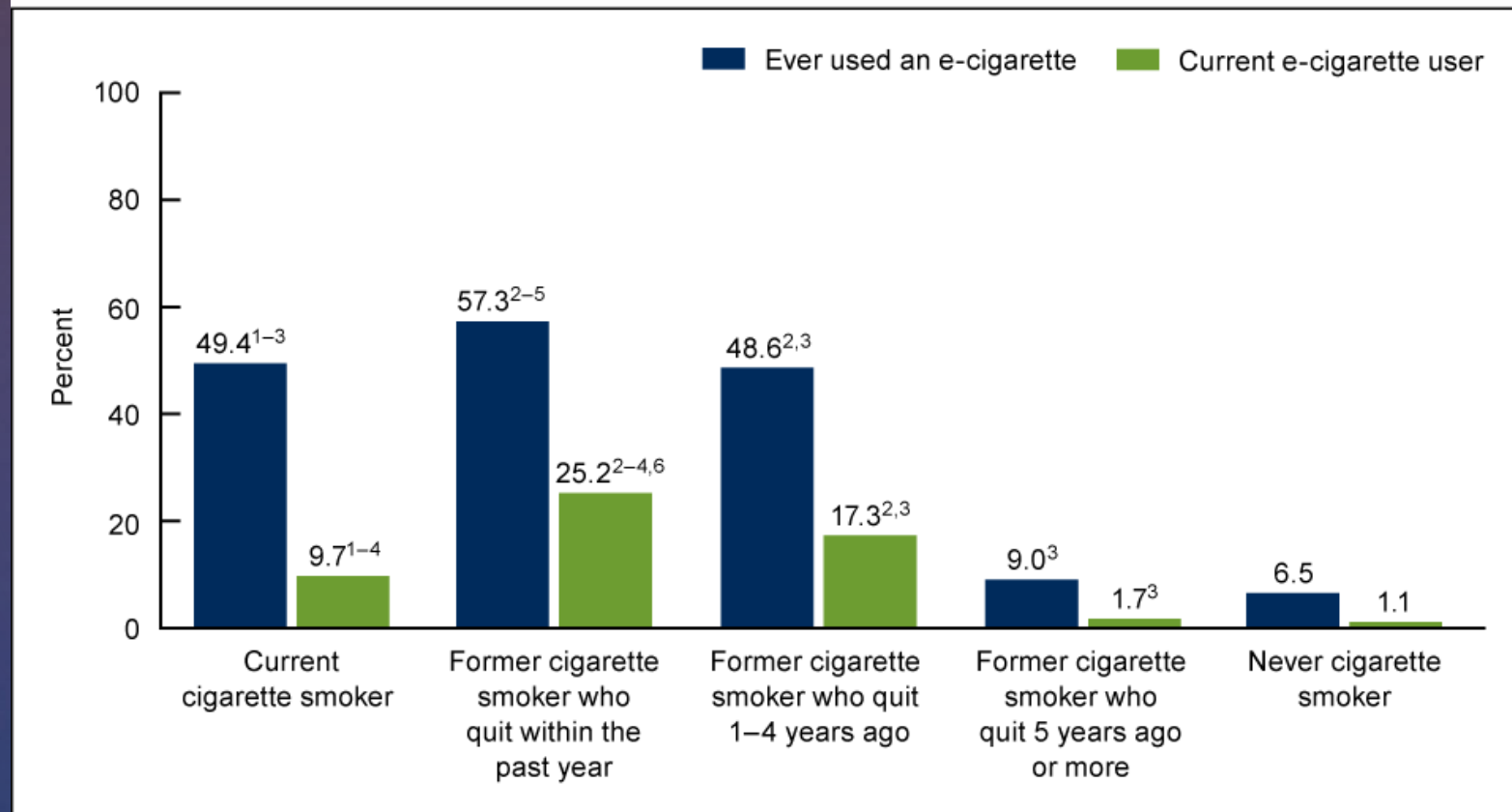
Adult Vaping – Current vs. Ever Use



INCOME

Adult Vaping by Smoking Status

Figure 3. Percentage of adults who had ever used an e-cigarette and were current e-cigarette users, by cigarette smoking status: United States, 2018



¹Significantly different from former cigarette smokers who quit within the past year ($p < 0.05$).

²Significantly different from former cigarette smokers who quit 5 years ago or more ($p < 0.05$).

³Significantly different from never smokers ($p < 0.05$).

⁴Significantly different from former cigarette smokers who quit 1-4 years ago ($p < 0.05$).

⁵Significant quadratic trend by duration of quitting cigarette smoking among former smokers ($p < 0.05$).

⁶Significant linear trend by duration of quitting cigarette smoking among former smokers ($p < 0.05$).

NOTES: Estimates are based on household interviews of a sample of the civilian noninstitutionalized U.S. population. Access data table for Figure 3 at:

<https://www.cdc.gov/nchs/data/databriefs/db365-tables-508.pdf#3>.

SOURCE: NCHS, National Health Interview Survey, 2018.

Smokers satisfaction with Vaping

- Largely determined by:
 - “throat hit”
 - Relief of urge to smoke
 - Mouthpiece fit
 - Draw resistance
 - Vapor Cloud
- Refillable devices generally rated higher for satisfaction than cigarette look-alikes.

Youth – 2019 Current Use

Youth Age	E-cigarettes	Cigarettes	All Tobacco Products
Middle School ^a	10.5%	2.3%	12.5%
High School ^a	27.5%	5.8%	31.2%

*2018

Trend in Current Use of any Tobacco Product^b

3.6 million
2017



5.4 million
2019

67% ↑
from 2017

^aMMWR 2019:68(12); ^bCDC

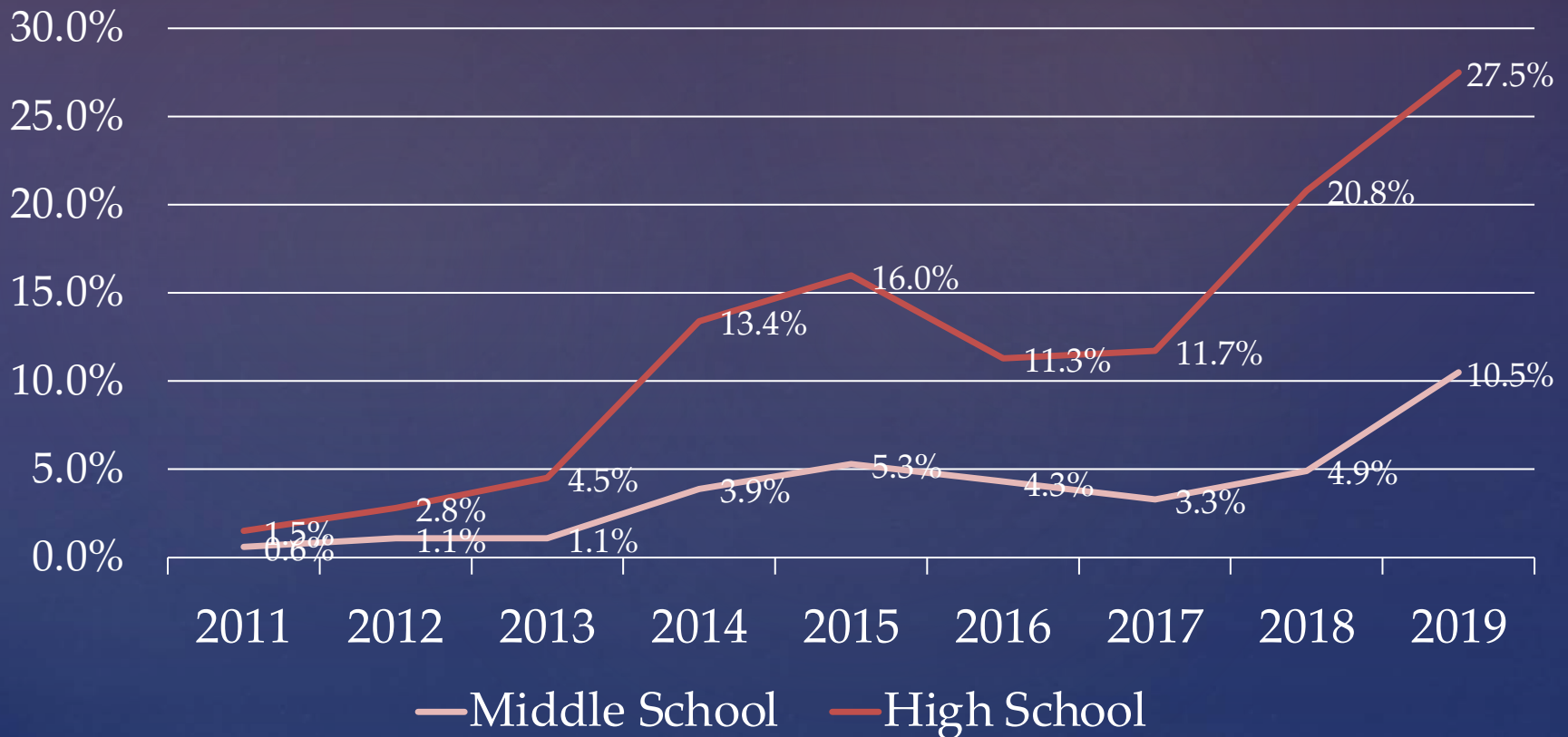
E-cigarette Juice Flavorings

Among middle and high school students who currently vape: 68% have used a flavored product



Youth trends: 2011-2019

Current E-cigarette Use (last 30 days)



Youth – Vaping Concerns

- Adolescent brains still developing^a
 - Impacts how brain works
 - Increased risk for: other addiction, impulsivity and mood disorders
- Increased risk of combustible cigarette use^b, especially when flavored use is first^c

^aUSDHHS 2016; ^bNASEM 2018; ^cVillanti AC, Johnson AL, et al 2017

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7x risk of
combustible
cigarettes in 6
months if vaper in 9th
grade

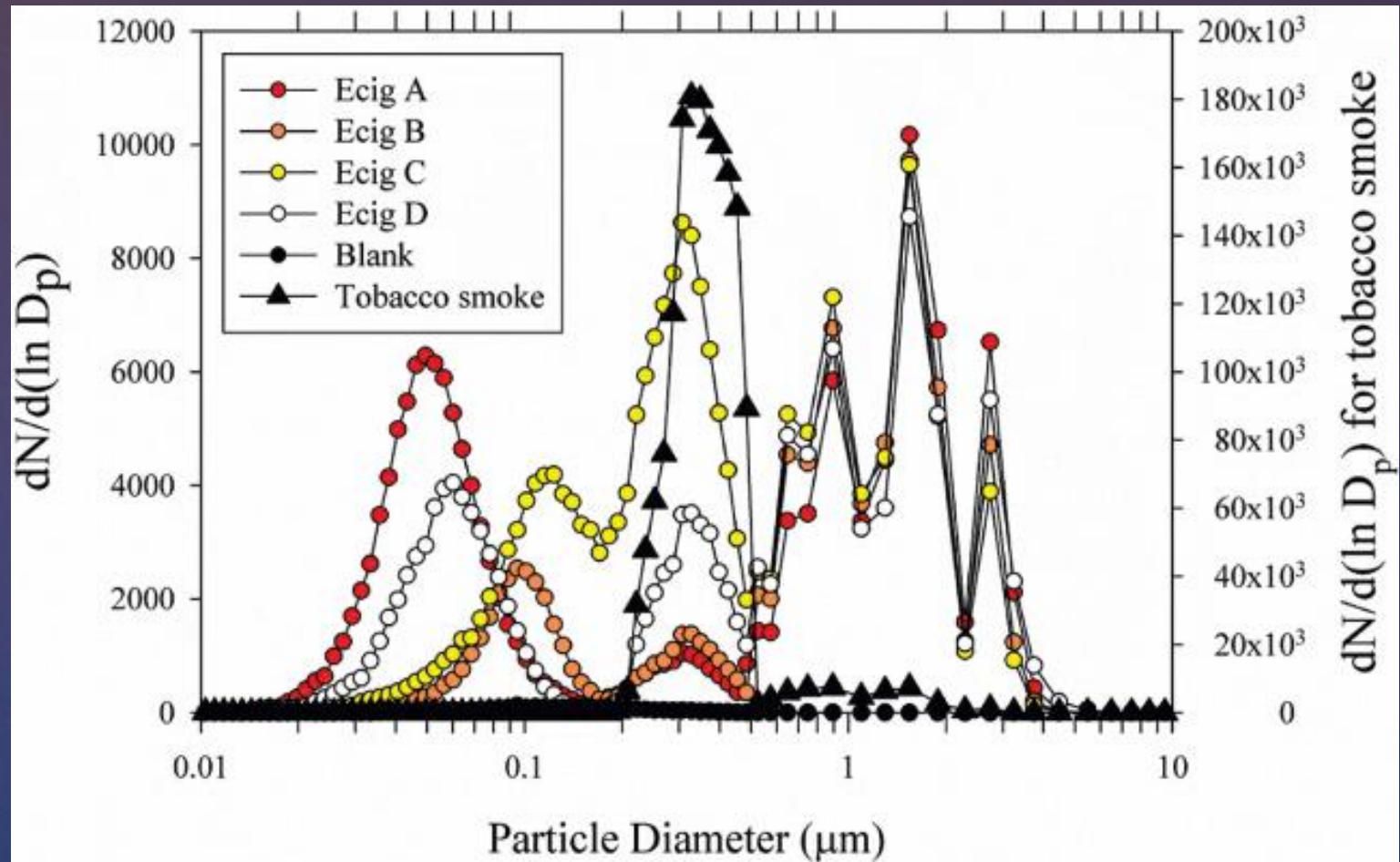
^aUSDHHS 2016; ^bNASEM 2018; ^cVillanti AC, Johnson AL, et al 2017

Secondhand Vapor

- No side-stream smoke from e-cigarette
- Exposure from exhalation of vapor
 - Toxins at much lower level than conventional cigarettes^a
 - Serum cotinine levels similar for secondhand exposure as conventional cigarettes in one study^b and at 1/10 the level in another^c

^aSchripp et al *Indoor Air* 2013 ^bFlouris et al *Inhal Toxicol* 2013; ^cCzogala et al *Nic Tob Res* 2014

Secondhand Vapor: More Than Water Vapor



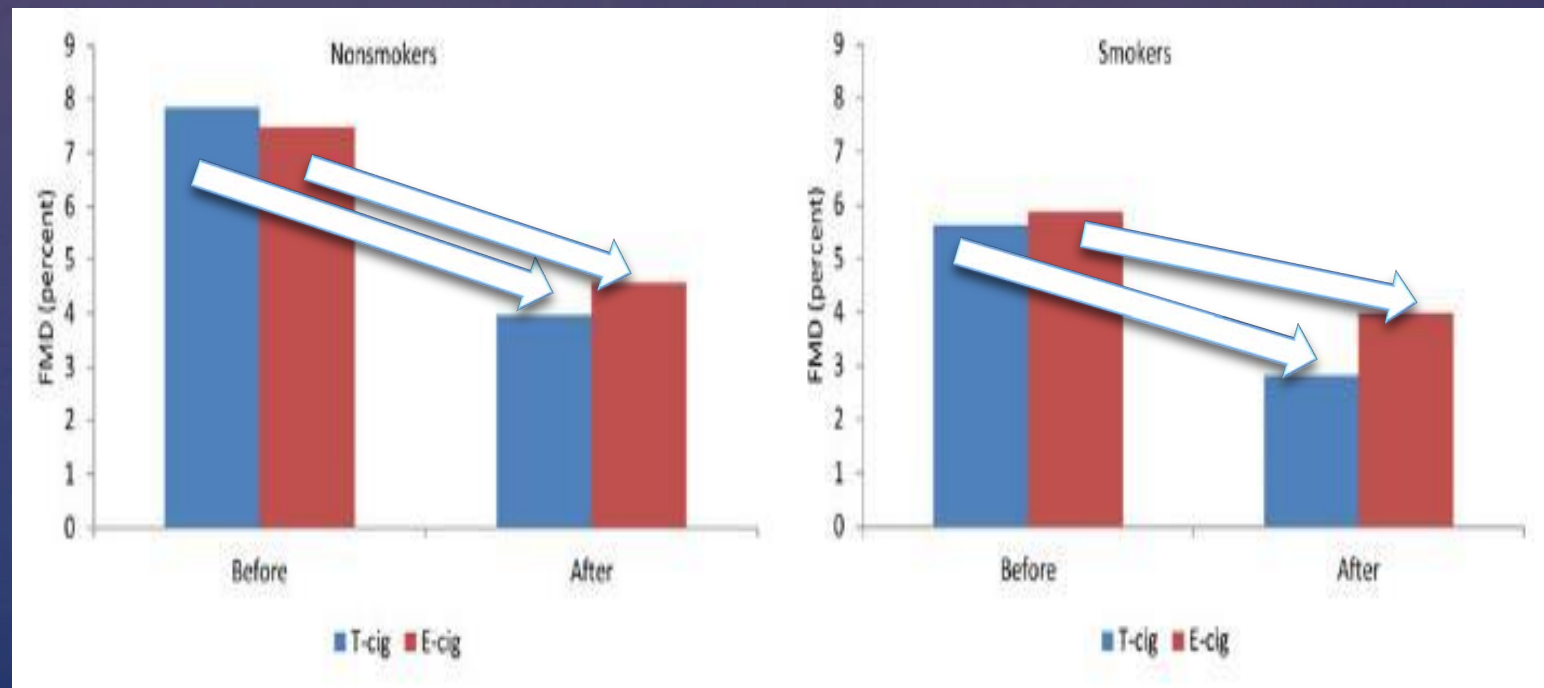
Overall particle number concentration (p/cm³) and size distribution data for all vapor and smoke samples

Health Effects

- Long term effects unknown at this time
- Health effects identified:
 1. Systemic
 - Oxidative Stress increased
 - Inflammation increased
 - Infections (e.g., pneumonia) increased
 - Dysregulation of repair/extracellular matrix (ECM) remodeling
 - Immunity reduced
 2. Nicotine poisoning – from e-liquid
 3. Mechanical injury – battery explosion

Vaping - Cardiac Effects

Similar to cigarettes for blood vessel impact and oxidative stress (whether user was a smoker before, or not)



EVALI – E-cigarette or Vaping Product Associated Lung Injury

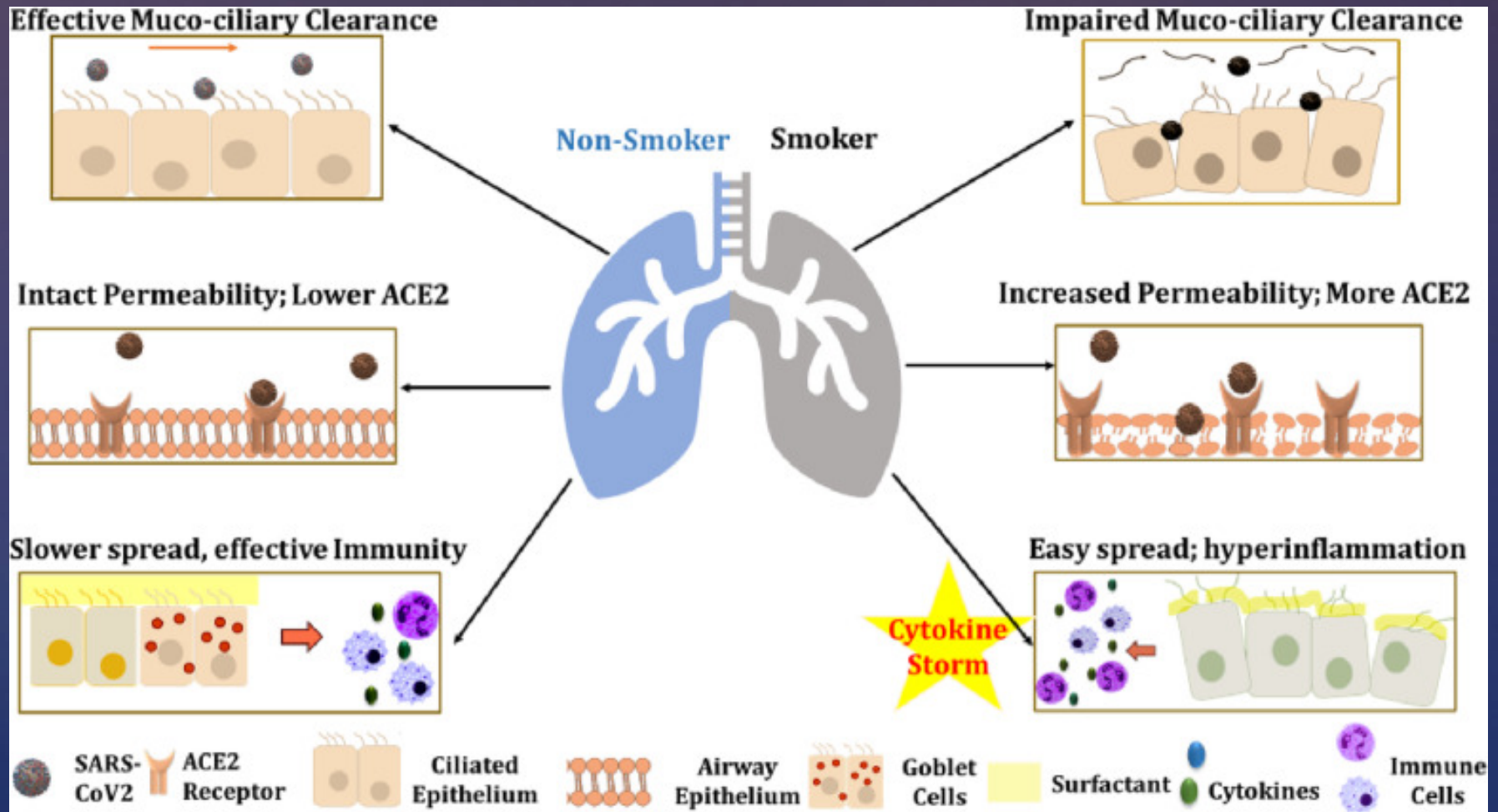
- DX by Exclusion:
 - Pulmonary infiltrates on scans
 - Vaping in last 90 days (THC and/or nicotine)
 - No other known cause
- Vitamin E acetate thought to be main ingredient of concern
- Primarily seen in 18-24 year old males

Vaping and COVID-19 Risk

- Along with smoking, vaping may critically exacerbate COVID-19 inflammation^a
- Nicotine and Flavors upregulate chemokines CCL5 and CCR1^a
- Young adults 5 times more likely to receive a + diagnosis with ever vaping^b
- Suspected increase in ACE2 (from nicotine) the cellular entry receptor

^aLee AC, Chaklaar J et al *In J Mol Sci* 2020; ^bGaiha SM, Chen J & Halpern-Felsher B, et al, *J Ado Health*, 2020

Smokers/Vapers - increased susceptibility and risk for COVID19



Potential effects of Vaping on health determined by

- E-cig brand
- Type of device
- Flavor additives
- User puffing pattern (duration and frequency)
 - Influenced by nicotine content
- Battery voltage

Potential Health Gains

- Assumes traditional cigarettes are replaced by e-cigs over 10 years^a
 - 1.6-6.6 million premature deaths avoided
 - 20.8-86.7 million life-years saved
 - For youth (15 years in 2006) life expectancy extended by .5 years
- Among smokers switching – reduction in BP, lung function and disease symptoms (asthma and COPD); improved mood and memory^{bc}

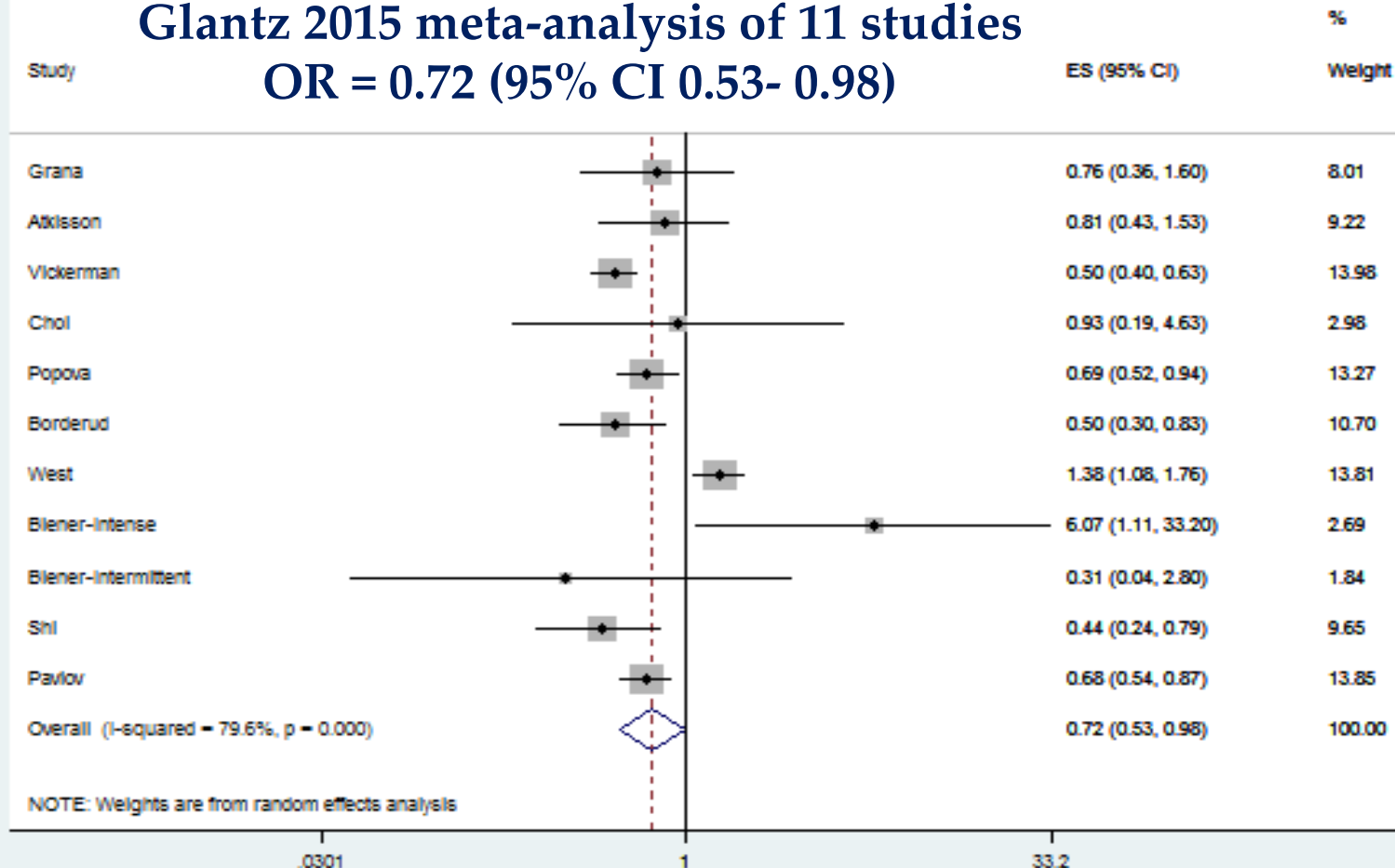
^aLevy et al, *Tob Control*, 2018; ^bLPolosa, *J Env Res Pub Health*, 2014; ^cLFarasalinos et al, *Intern Emerg Med*, 2016

Does Vaping help to Quit Smoking?

- Evidence is mixed
 - More robust studies indicate can help some smokers
 - High quality Studies are needed

Are cigarette smokers who use e-cigarettes more likely to quit?

Glantz 2015 meta-analysis of 11 studies OR = 0.72 (95% CI 0.53- 0.98)



Public Health Concerns

- Addiction potential of nicotine for non and former smokers
- Potential to glamourize and re-normalize smoking
- Has not been found effective as a smoking cessation device (and thus not FDA approved)
- May maintain combusted tobacco use
- Risk of injury from battery explosions
- Increase in e-cigarette solution poisoning

Current Regulation-FDA Deeming Rule

- FDA issued the Deeming Rule to be in effect Aug 2016
 - Improved quality control and production standards
 - No sales <18 years – RECENT <21 years
 - Health warning labels
 - No vending machine sales
 - No marketing implying “healthy” or “safe”
- “Grandfather” period for products currently on the market – in March 2018 extended period to 2022
 - RECENT – no pre-filled flavor cartridges other than tobacco and menthol; no advertising to youth

Electronic Cigarette/Vaping

Key Points

- They are tobacco products
- Youth who vape more likely to progress to traditional cigarettes
- Juice and aerosol found to contain toxins that include nicotine, ultra-fine particles and carcinogens
- Negative health effects compared to no smoking but fewer short term health effects compared to smoking, except equal risk of EVALI and COVID-19.
- Long term effects unknown
- Mixed reports of effectiveness for smoking cessation

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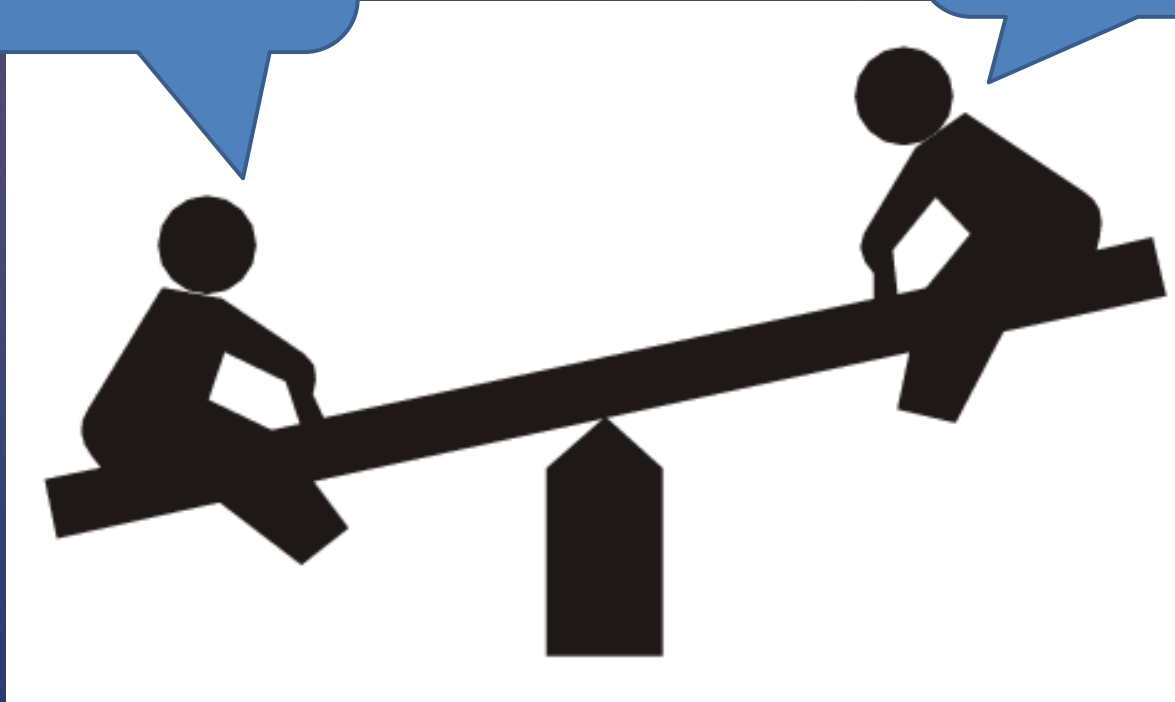
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What do the Public Health experts say?

They aren't safe; they maintain and promote nicotine addiction!

They are safer than smoking cigarettes! (Harm Reduction)



Recommendations:

What Can You Do in Clinical Practice?

For Youth:

- ASSESS youth for vaping when asking about tobacco
- ADVISE youth about the harms of vaping and strongly recommend they do not
- ADVISE parents and other caretakers to not vape or use other tobacco products
 - If they vape, caution about safe storage of juice

Recommendations: What Can You Do in Clinical Practice?

For Adults:

- ASSESS for vaping when asking about tobacco
- ADVISE NO tobacco use
- REFER to Tobacco Cessation Services
- ASSIST with additional pharmacotherapy to aide quit attempt

Nicotine Addition Pharmacotherapy

Medication	Contraindications	Dosage	Major Side-effects	Notes
Bupropion SR	History of seizure History of eating disorder Use of MAO-inhibitors in last 14 days	150 mg 3 days 1 am 4-84 days 1 am & 1 pm	Insomnia Dry mouth	Recommended for history of or current depression To reduce insomnia, take pm dose 8 hours after am dose. Start 1-2 weeks prior to quitting
Varenicline	Kidney disease or dialysis Psychiatric history	2 mg. 0.5 qd x 3 days 0.5 bid x 4 days 1 mg bid x 8-84 days	Impaired ability to operate machinery; Nausea; Vivid dreams; insomnia; taste perversion	Start 7 days in advance of quitting Taper dose up; no need to taper down
Nicotine Patch	Post MI Serious arrhythmia Unstable angina pectoris	21, 14 and 7 mg. Placed on torso Start with higher dose, taper down	Skin reaction Insomnia; Vivid dreams	8 weeks sufficient treatment Some quitlines will provide for free
Nicotine Gum	Post MI Serious arrhythmia Unstable angina pectoris	2 mg. <25 cigs./day 4 mg ≥25 cigs/day 1 q1-2 hours x 6 to 12 weeks	Mouth soreness Hiccups; Dyspepsia; Jaw ache	Patients chews briefly then parks the gum inside cheek Maximum of 20 pieces/day Taper down 1/day each week
Nicotine Inhaler	Post MI Serious arrhythmia Unstable angina pectoris	4 mg 80 inhalations /cartridge 6-12 doses/day	Mouth & throat irritation; Cough; Rhinitis	Taper down over 6-12 weeks, stop when reduced to 1-2 doses/day