Housekeeping Items

- Welcome to L.A. Care Provider Continuing Education (PCE) Program's Live Webinar!
- The Live Webinar is being recorded.
- Webinar participants are muted upon entry and exit of webinar.
- ***Webinar attendance will be noted via log in and call in with assigned unique Attendee ID #. Please log in through a computer (instead of cell phone) to Join Meeting / Webinar and please choose the Call In option to call in by telephone with the meeting call in number, meeting number access code and assigned unique attendee ID number. If your name does not appear on our WebEx Final Attendance and Activity Report (only as Caller User #) and no submission of online survey, no CME or CE certificate will be provided.***
- Questions will be managed through the Chat feature and will be answered at the end of the presentation. ***Please keep questions brief and send to All Panelists. One of our Learning and Development Team members and/or webinar host***, will read the questions via Chat when it's time for Q & A session (last 30 minutes of live webinar).
- Please send a message to the Host via Chat if you cannot hear the presenter or see the presentation slides.

L.A. Care PCE Program Friendly Reminders

- ***Partial credits are not allowed at L.A. Care's CME/CE activities for those who log in late (more than 15 minutes late) and/or log off early.***

- PowerPoint Presentation is allotted 60 minutes and last 30 minutes for Q&A session, total of 90-minute webinar, 1.50 CME credits for L.A. Care Providers and other Physicians, 1.50 CE credits for NPs, RNs, LCSWs, LMFTs, LPCCs, LEPs, and other healthcare professionals. Certificate of Attendance will be provided to webinar attendees without credentials.

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- Within two (2) weeks after webinar and upon completion of the online survey, you will receive the PDF CME or CE certificate based on your credential and after verification of your name and attendance duration time of at least 75 minutes for this 90-minute webinar.

- The PDF webinar presentation will be available within 6 weeks after webinar date on lacare.org website located at https://www.lacare.org/providers/provider-central/provider-programs/classes-seminars

- Any questions about L.A. Care Health Plan's Provider Continuing Education (PCE) Program and our CME/CE activities, please email Leilanie Mercurio at lmercurio@lacare.org

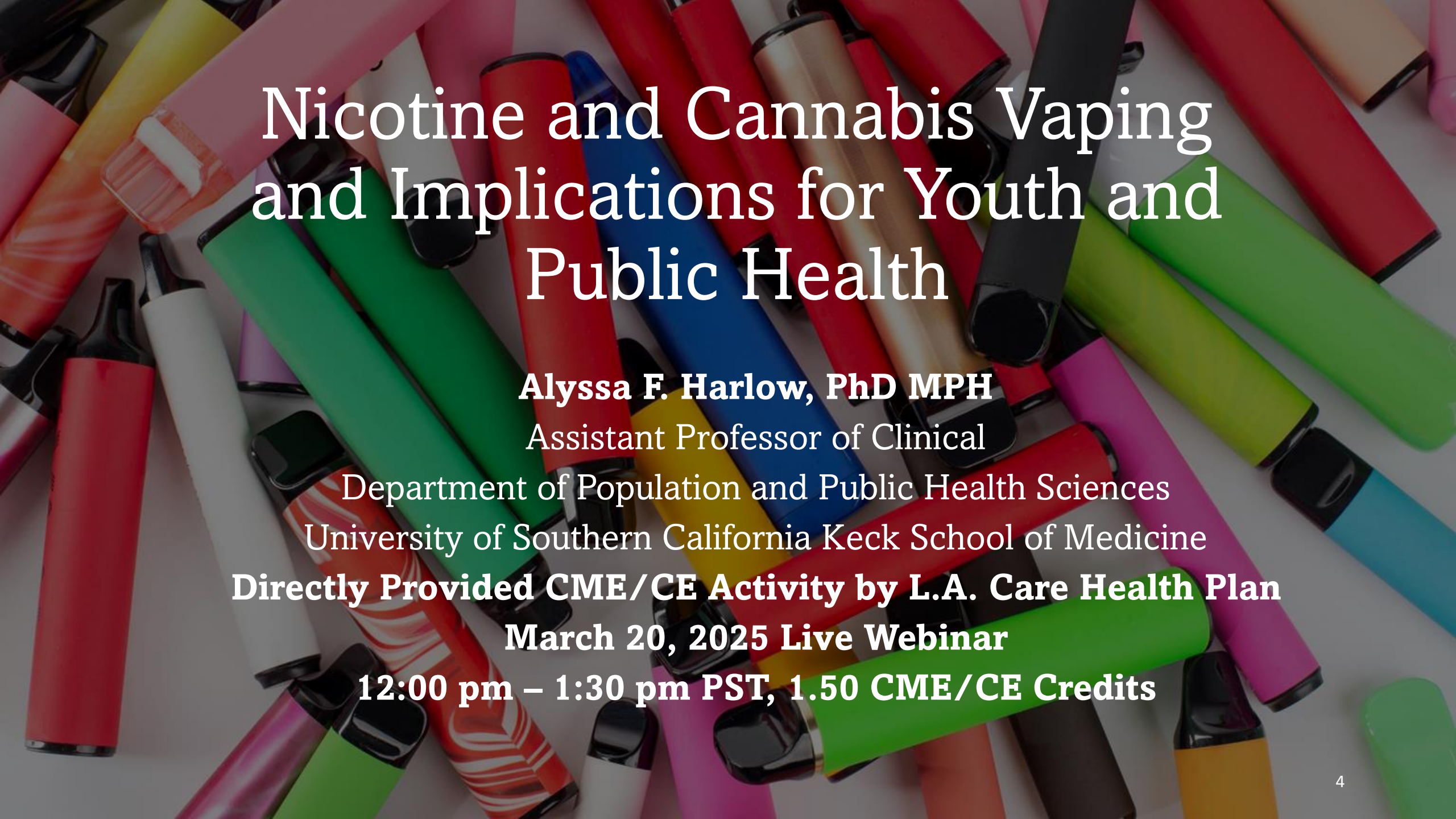
Presenter's Bio

Alyssa F. Harlow, PhD, MPH

Dr. Alyssa Harlow is an epidemiologist and Clinical Assistant Professor in the Department of Population and Public Health Sciences at the University of Southern California Keck School of Medicine.

Dr. Harlow's research integrates rigorous epidemiologic methods with addiction science to inform policies and interventions aimed at preventing the adverse health effects of substance use among youth and adults. An important focus of Dr. Harlow's research is identifying regulatory targets to reduce tobacco-related harms, and her research has directly impacted federal tobacco policy. Her work is published in high-impact journals (e.g., JAMA, Epidemiology, Addiction) and has been nationally recognized and featured in news outlets such as ABC Good Morning America, NBC News, and US News & World Report.

Dr. Harlow is currently the Principal Investigator (PI) of a research project funded by the National Institute on Drug Abuse (NIDA) through a "K01" grant (PI of a NIDA-funded K01 award) examining the influence of the tobacco and cannabis retail environment and neighborhood disadvantage on youth nicotine and cannabis vaping outcomes.



Nicotine and Cannabis Vaping and Implications for Youth and Public Health

Alyssa F. Harlow, PhD MPH
Assistant Professor of Clinical
Department of Population and Public Health Sciences
University of Southern California Keck School of Medicine

Directly Provided CME/CE Activity by L.A. Care Health Plan

March 20, 2025 Live Webinar

12:00 pm – 1:30 pm PST, 1.50 CME/CE Credits

Financial Disclosures

The following CME planners and faculty do not have relevant financial relationships with ineligible companies in the past 24 months:

* Leilanie Mercurio, Provider Continuing Education (PCE) Program Manager, L.A. Care Health Plan, CME Planner.
* Alyssa F. Harlow, PhD, MPH, Assistant Professor of Clinical Department of Population and Public Health Sciences, University of Southern California Keck School of Medicine, CME Planner and Presenter.

Ineligible Companies are those whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.

Commercial support was not received for this CME/CE activity.

Learning Objectives

1. Identify the ways in which e-cigarettes have evolved over time and describe five (5) reasons why youth and young adults vape.
2. State at least three (3) harmful and potentially harmful constituents of e-cigarettes.
3. Summarize the health effects of vaping overall and relative to cigarette smoking.
4. Distinguish the three (3) modes of cannabis vaping and summarize the adverse health outcomes of cannabis vaping.

Agenda

1. Overview of tobacco in the US
2. Evolution of E-cigarettes
3. Vaping and Youth Appeal
4. Vaping Health Effects
5. Cannabis vaping

1. Overview

Introduction to Tobacco

What is Tobacco?

- Plant derived from genus *Nicotiana*.
  - Most common *Nicotiana tabacum*.
  - Leaves dried & processed for smoking, chewing, snuffing/dipping.
  - Earliest evidence of human use is 12,000 years ago with cultivation 8,000 years ago.
- Most widely used and deadly addictive substance in the world.
  - 1.3 billion users worldwide & 34.2 million smokers in US.
  - Leading preventable cause of death and disease (including cancer).

What is a tobacco product?

- Any product made or derived from tobacco, or containing nicotine from any source

Cigarettes

Cigars, cigarillos, filtered cigars

Hookah

Smokeless (i.e., snuff, snus)

E-cigarettes

Pipe

Flavored oral nicotine

Heated tobacco

What is a tobacco product?

COMBUSTIBLE

Cigarettes

Hookah

MOST HARMFUL

Cigars, cigarillos, filtered cigars

Pipe

NON-COMBUSTIBLE

Heated tobacco

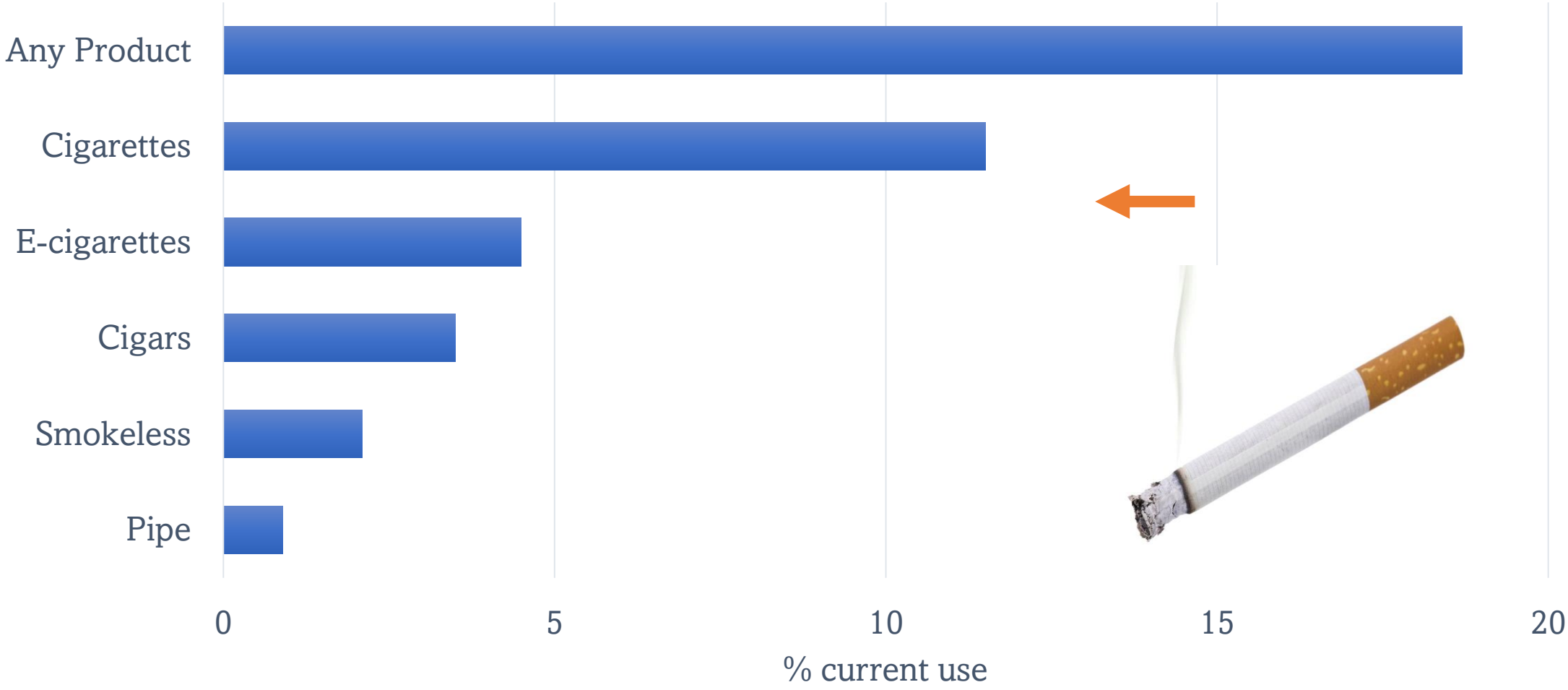
SLIGHTLY LESS HARMFUL

Smokeless (i.e., snuff, snus)

Flavored oral nicotine

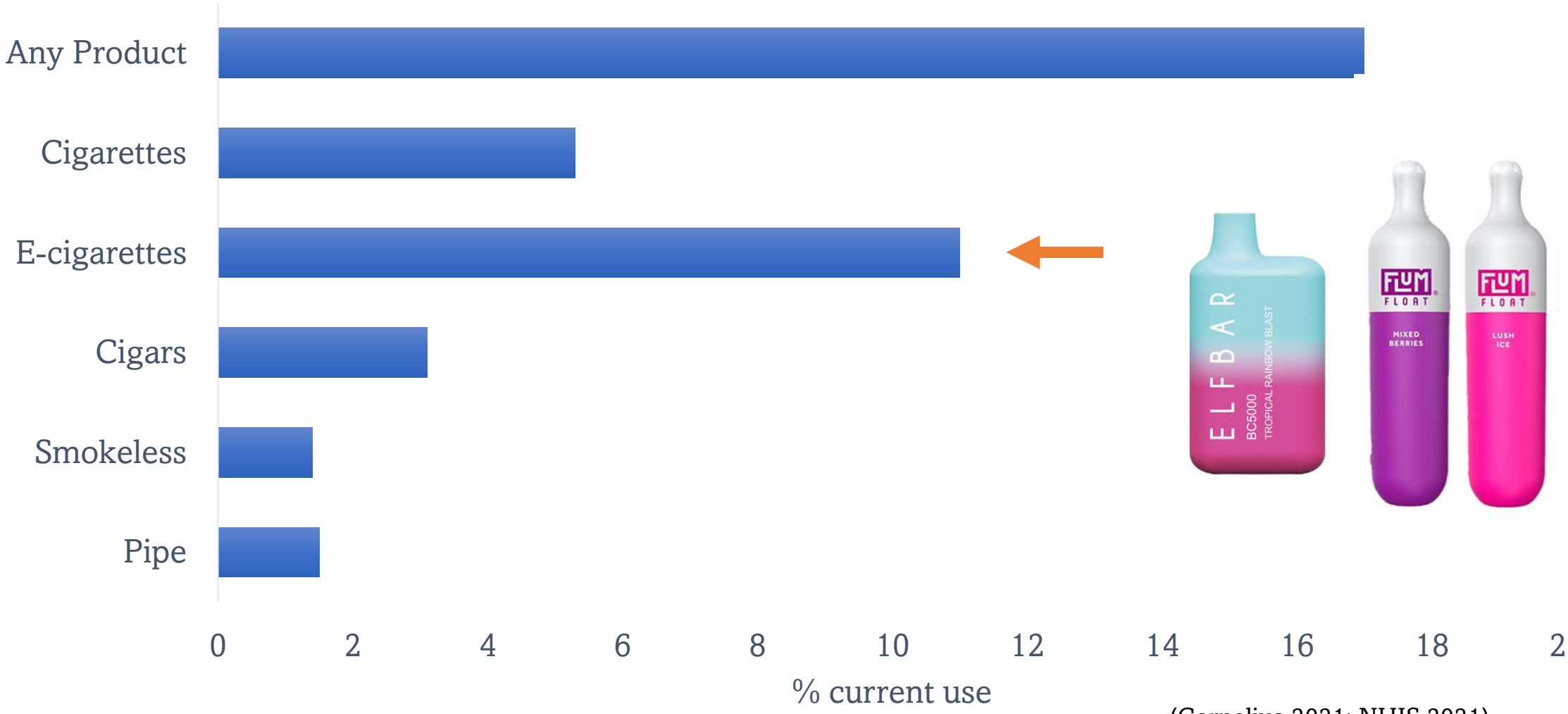
E-cigarettes

Tobacco use among US adults



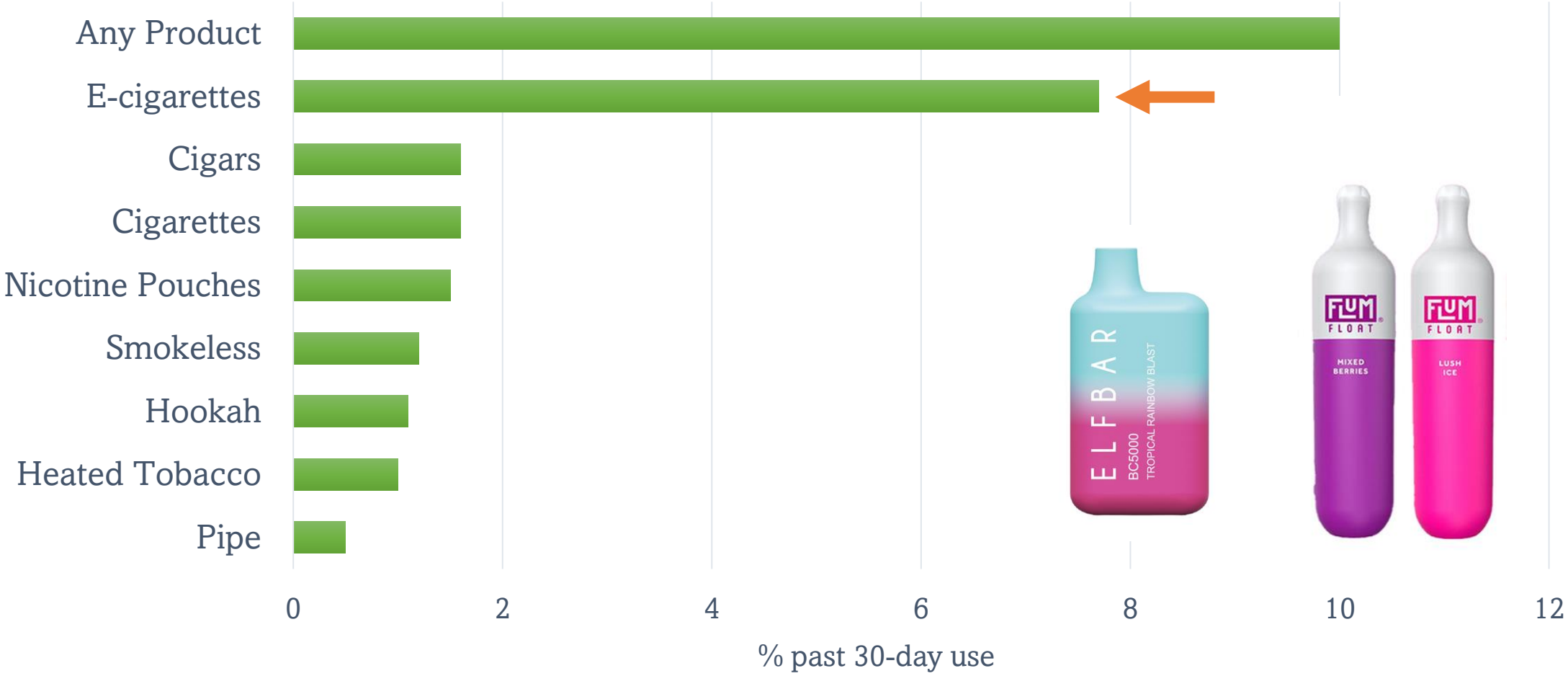
(Cornelius 2021; NHIS 2021)

Tobacco use among US adults 18-24 yr old



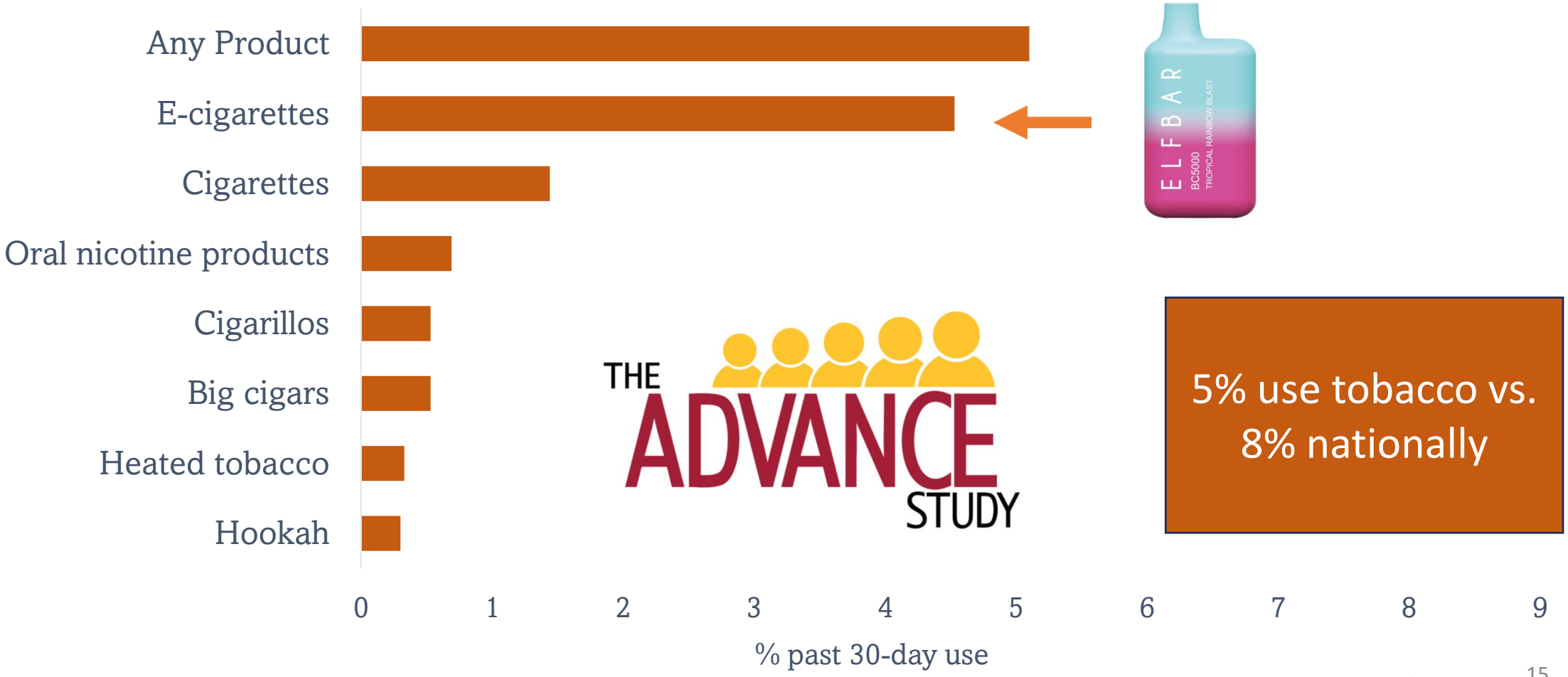
(Cornelius 2021; NHIS 2021)

Tobacco use prevalence among US youth



(Birdsey 2023; NYTS middle and high school students in US)

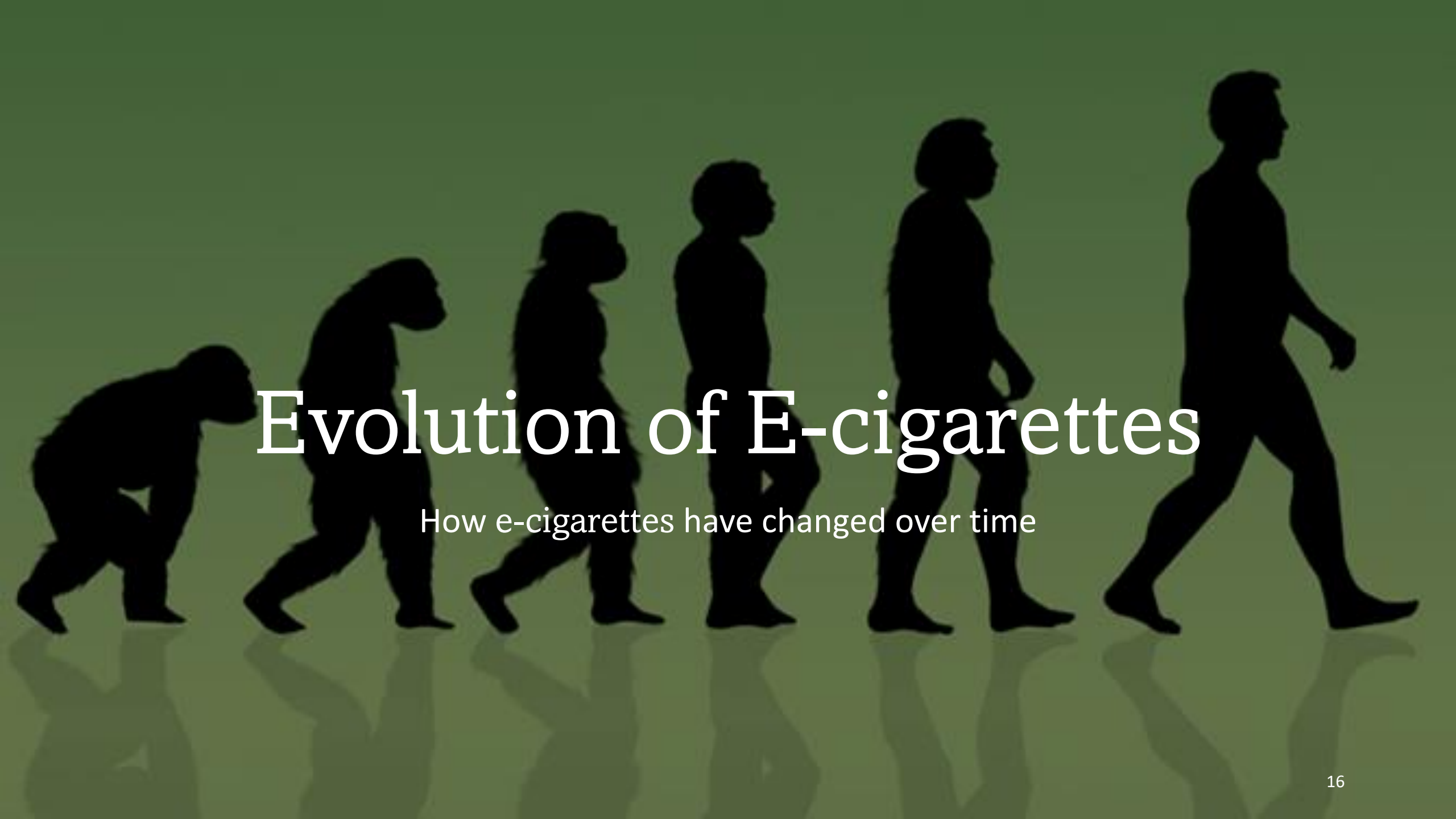
Tobacco use among Southern California youth



THE ADVANCE STUDY

5% use tobacco vs. 8% nationally

USC ADVANCE study 2024



Evolution of E-cigarettes

How e-cigarettes have changed over time

Evolution of E-cigarettes

Cig-a-Likes
2007

Vape Pens
2009

Mods/Box Mods
2012

JUUL
2015

Disposable
2020

E-cigarettes now (2025)

E-cigarette Use among Youth

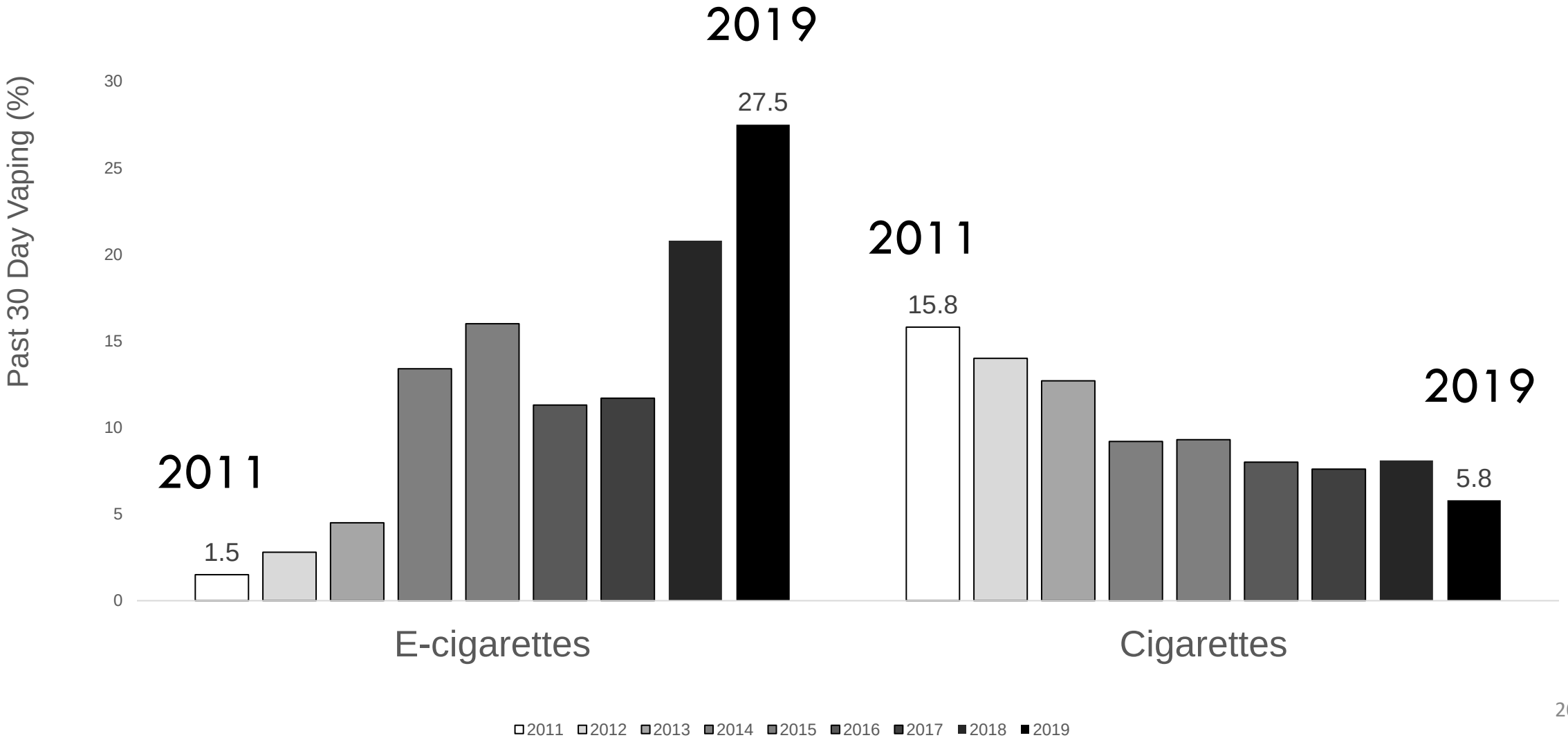
2019:
28%

E-cigarette use among High School Students
NYTS Data (2011-2024)

(Park-Lee 2024)

Trends in U.S. youth e-cigarette use (2011-2019)

national youth tobacco survey – high school students

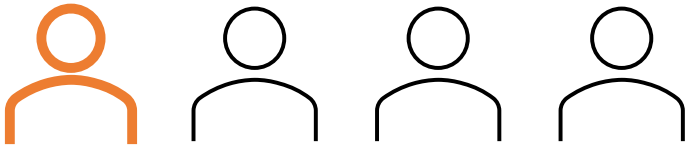


NYTS 2024

More than **1.6 million**

Youth currently use e-cigarettes

Among youth who reported current e-cigarette use:



More than **1 in 4**

use e-cigarettes daily

Most popular brands are disposables

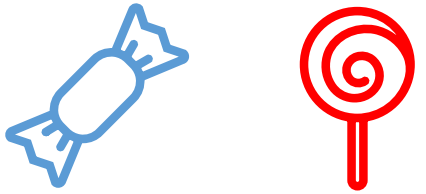
ELF BAR

BREEZE

MR. FOG

8 out of 10

use flavored e-cigarettes

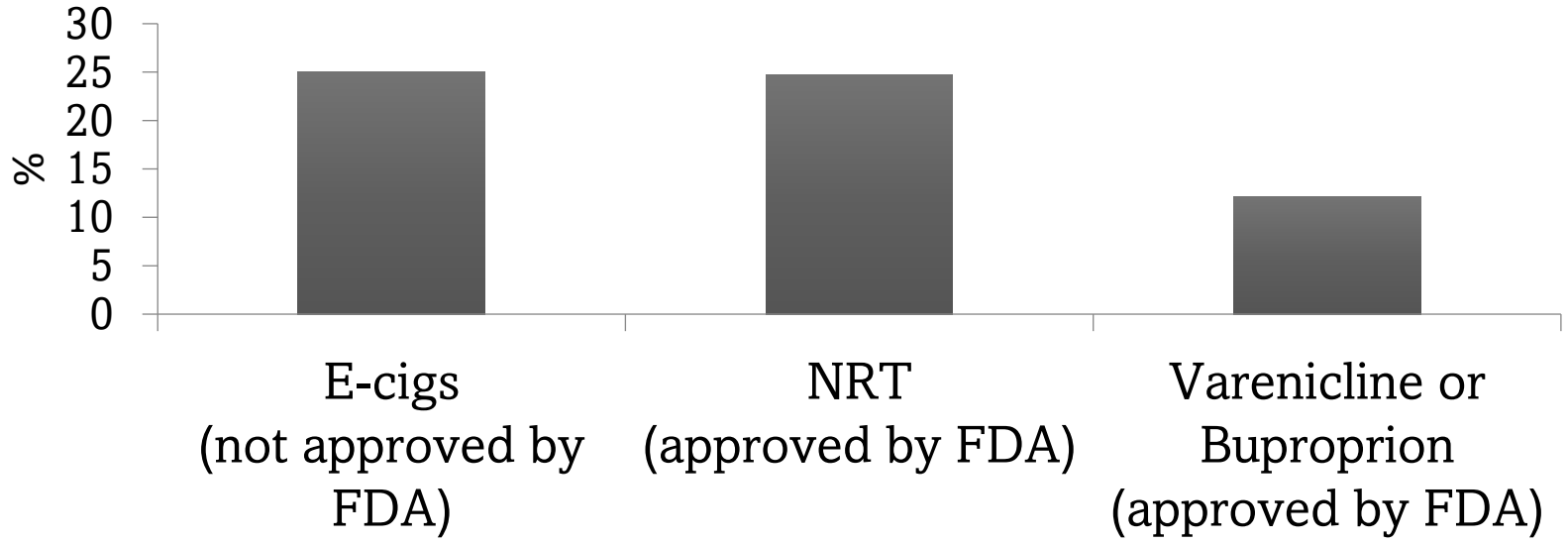


Fruit and candy most popular

More than half using “ice” flavors

E-cigarette use among US adults

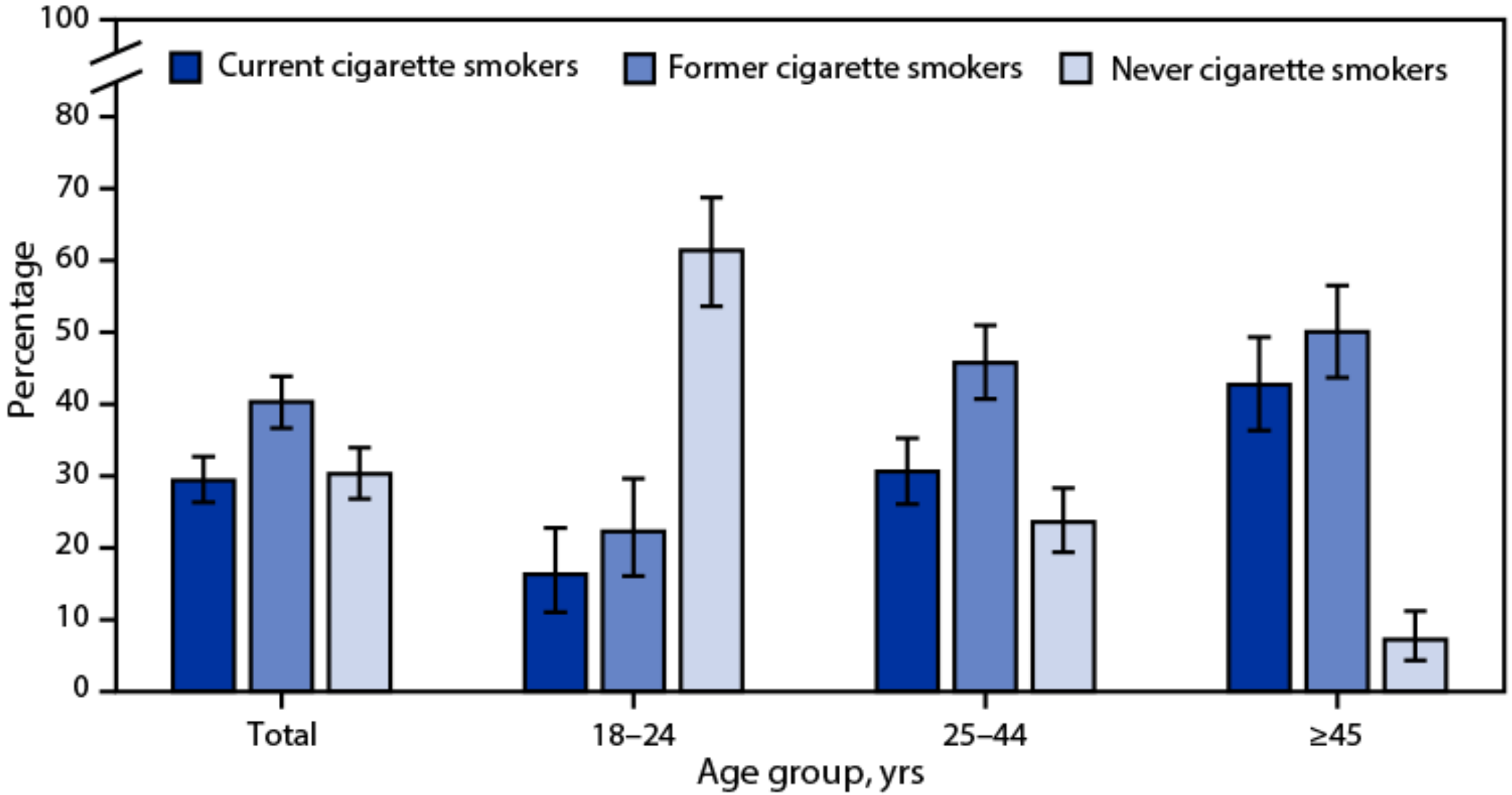
- 9.1 million US adults currently use e-cigarettes (4% of adults).
  - >90% history of cigarette smoking.
  - Vaping among never smokers is increasing over time.
- Common cessation aid (but not approved by FDA)



Cessation Aids among US Quit Attempters 2018-2019 TUS-CPS

Leventhal, Dai, Higgins 2022 JNCI

Distribution of Cigarette Smoking Among Adult E-cigarette Users



National Health Interview Survey data, 2021

Kramarow & Elgaddal, MMWR

E-cigarettes and Youth Appeal

Why are e-cigarettes so appealing to young people?

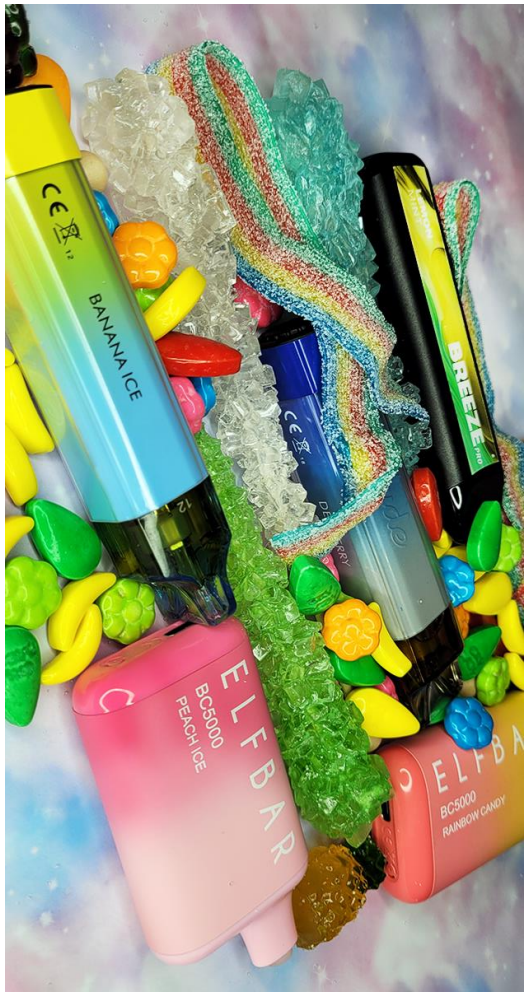
Why are e-cigarettes appealing to youth?

Why are e-cigarettes appealing to youth?

Attributes	E-cigarettes
Sleek Design	✓

Why are e-cigarettes appealing to youth?

Attributes	E-cigarettes
Sleek Design	✓
Flavors	✓



Why are e-cigarettes appealing to youth?

Attributes	E-cigarettes
Sleek Design	✓
Flavors	✓
Discrete	✓

Why are e-cigarettes appealing to youth?

Attributes	E-cigarettes
Sleek Design	✓
Flavors	✓
Discrete	✓
Nicotine Salts	✓

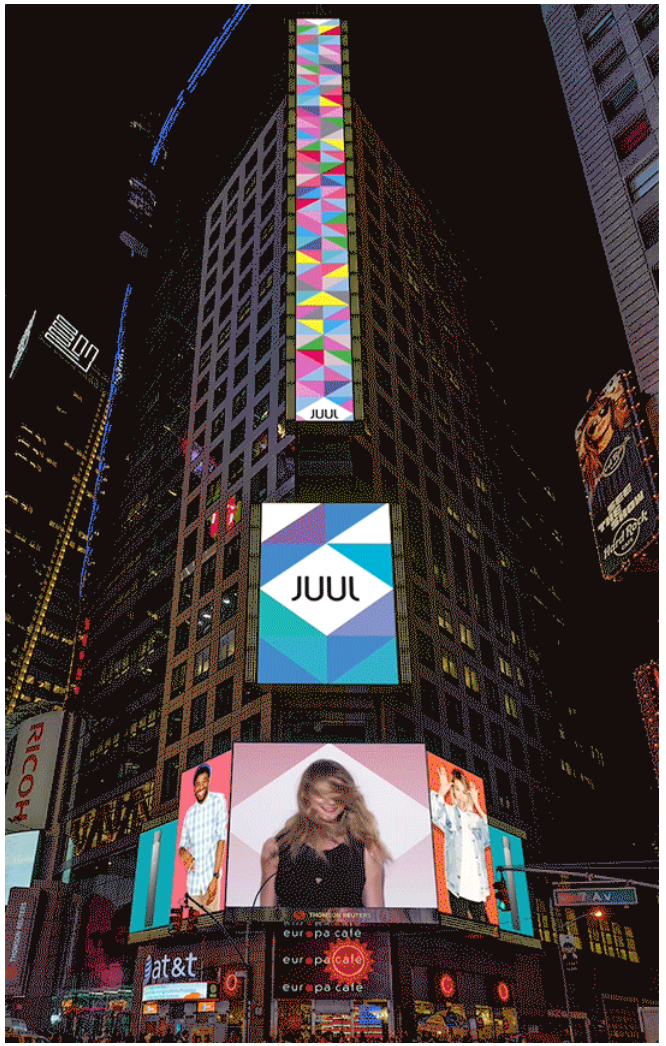
PAX Labs, Inc. Granted U.S. Patent For Nicotine Salt E-Cigarette

Patent Recognizes Company's Breakthrough Method of Providing Cigarette-Like Nicotine Delivery

Dec 22, 2015, 13:58 ET from PAX Labs, Inc.

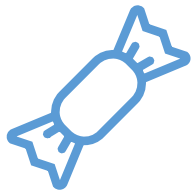
Why are e-cigarettes appealing to youth?

Attributes	E-cigarettes
Sleek Design	✓
Flavors	✓
Discrete	✓
Nicotine Salts	✓
Marketing	✓



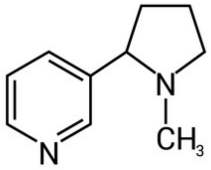
Among California Youth

25% believe e-cigarettes come in **“cool” and sleek designs**



95% vape flavors and 98% initiate with flavored e-cigarettes. Fruity (32.7%) and Candy/Dessert (42.9%) most common

39% believe e-cigs can be used **without other people knowing**

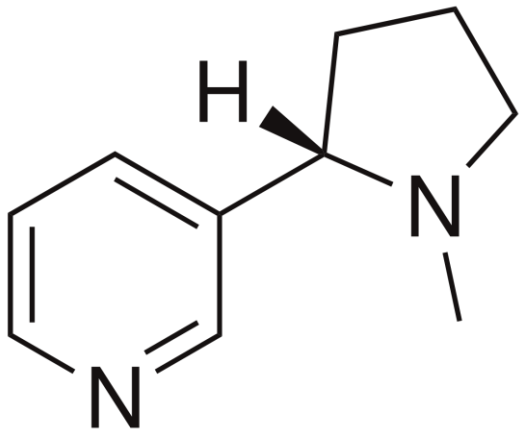


37% did not know nicotine concentration & **60%** use **≥5% nicotine**

Teens view posts about e-cigarettes ≥ weekly on:
Instagram (20.8%) | YouTube (15.7%) | TikTok (24.8%) | Snapchat (24.3%)

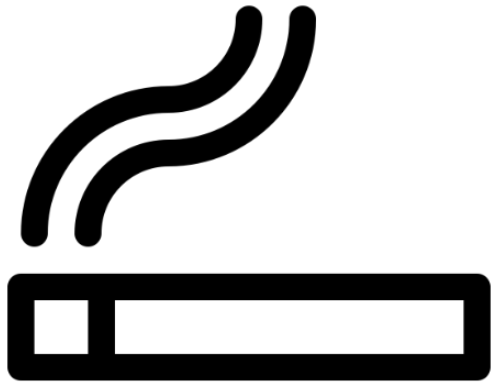
USC ADVANCE study 2024

Consequences of youth vaping



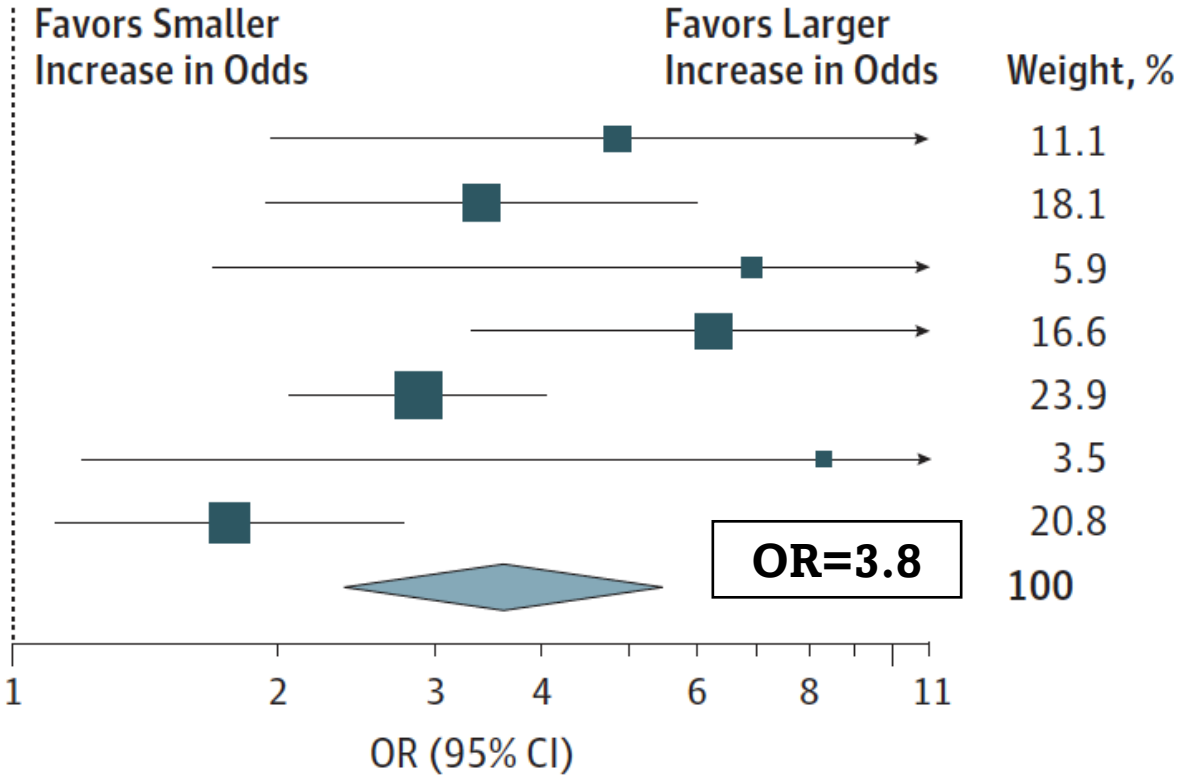
Nicotine Dependence

Health Effects

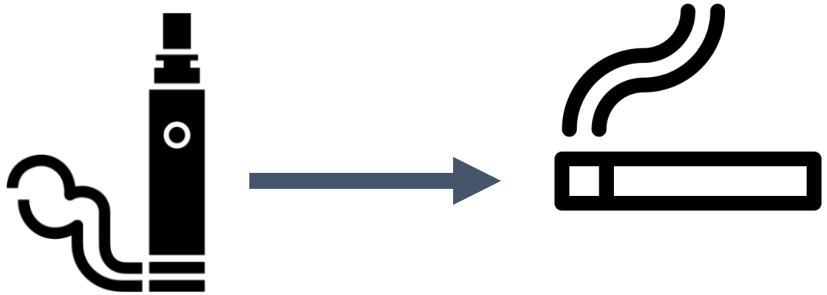


Transition to Smoking

Does vaping lead to smoking cigarettes?



Soneji et al. (2017)



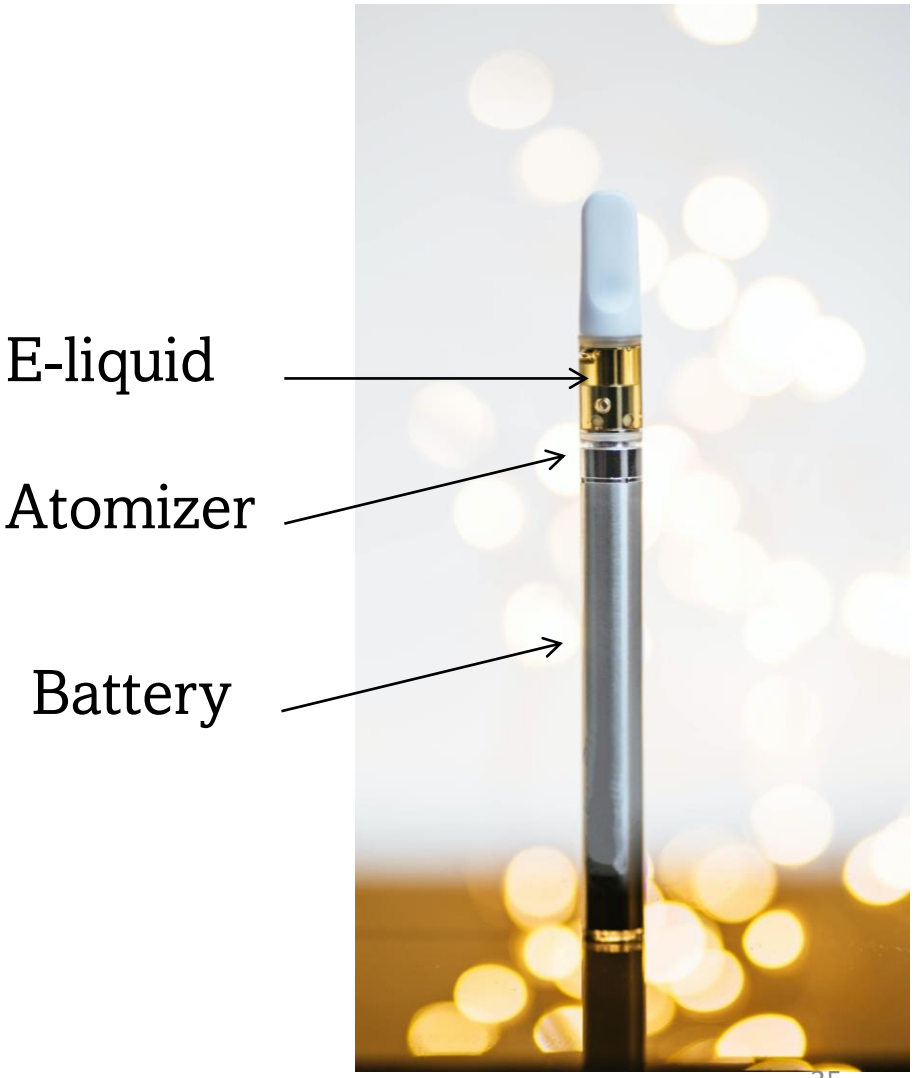
- Meta-analyses pooled aORs:
  - 3.8 (Soneji et al. 2017)
  - 2.9 (Khouja et al. 2020)
  - 2.9 (Chan et al. 2021)

Health Effects of E-cigarettes

Is it safer than smoking?

What are e-cigarettes?

- Battery powered device with atomizer that heats e-liquid to produce aerosol.
- Propylene Glycol/Vegetable Glycerin (PG/VG) base with additives:
  - Nicotine (usually nicotine salts)
  - Flavoring additives
  - Can have cannabis (more on that later)



Harmful and Potentially Harmful Constituents in E-cigarettes

Shared with Cigarettes	Unique to E-cigarettes
Nicotine Heavy metals Particulate Matter Volatile Organic Compounds Aldehydes Carcinogenic Chemicals	Solvents (PG/VG) Flavoring Additives

(NASEM 2018)

PG/VG

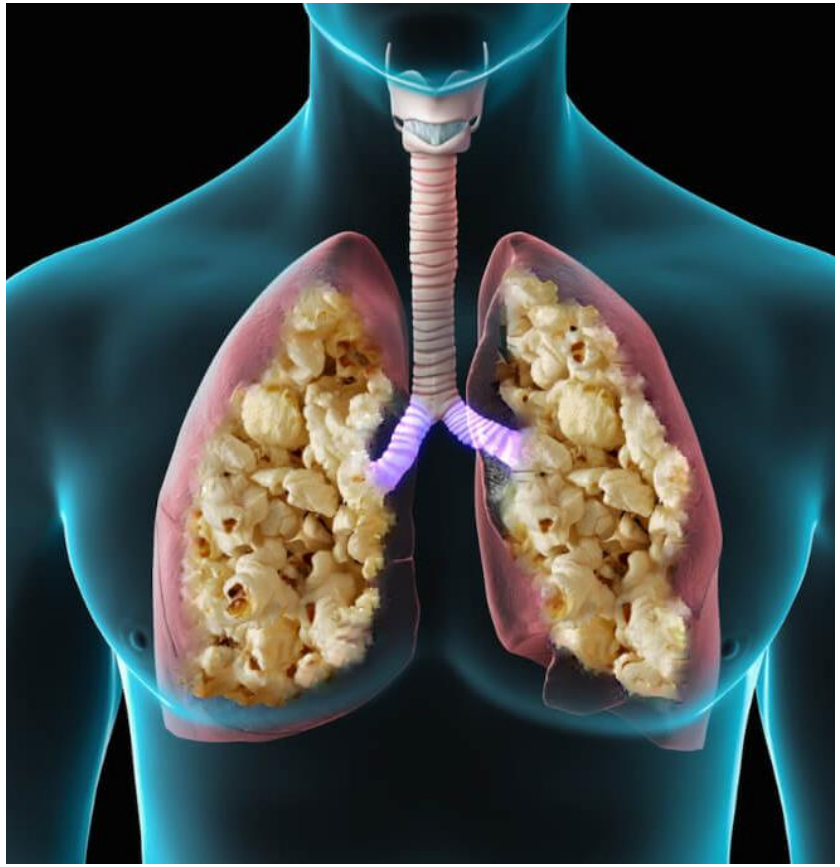
- Generally recognized as safe (GRAS) by FDA for oral ingestion and topical application.
- Common food additive and used for fog machines, paint, solvent, and antifreeze.
- When heated, PG/VG produces toxic volatile organic compounds and carcinogenic carbonyl compounds.
  - E.g., Formaldehyde, Acetaldehyde, Acrolein (accounts for 90% of noncancer risk of smoking).
- PG is lung irritant and promotes inflammation.

Nicotine Salts

- Before JUUL, e-cigs used alkaline free-base nicotine.
  - Bitter and irritating.
  - High nicotine concentrations unappealing to users.
- Now add acids to create protonated nicotine salt.
  - Reduces harshness and increases absorption.
  - High nicotine concentrations appealing to users.
- Nicotine salt formulas primary driver of high nicotine concentrations in e-cigarettes, contributing to addiction.

Flavoring Additives

- >7,700 flavorings available as additives in e-cigarettes
- *In vitro* studies demonstrate flavor compounds cause oxidative stress, endothelial dysfunction, inflammation, and cell death
- Some flavors particularly toxic:
  - Vanillin (*vanilla)*
  - Cinnamaldehyde (*cinnamon)*
  - Eugenol (*clove)*
  - Acetylpyridine (*burnt*)
  - Benzaldehyde (*cherry)*
  - Diacetyl (*butter)*



Are E-cigarettes safer than cigarettes?

- E-cigarettes are not without risks and expose users to toxic substances, but lower levels than cigarettes.
- Complete (but not partial) switching from cigarettes to e-cigarettes reduces harmful exposure (NASEM, 2018).

NASEM Conclusion 18-1. There is *conclusive evidence* that completely substituting e-cigarettes for combustible tobacco cigarettes reduces users' exposure to numerous toxicants and carcinogens present in combustible tobacco cigarettes.

(NASEM 2018)

Health effects of E-cigarette Use

- Addiction and nicotine dependence
- Respiratory symptoms and infections
- Hypertension and increased heart rate
- Sleep problems and mental health
- Propensity for cigarette smoking
- Need more research on longer-term effects
  - Lung disease (e.g., COPD) and CVD (e.g., stroke, MI) primary concerns
  - No demonstrated associations with cancer, but some concern for long-term effect

Variability in e-cigarette product characteristics (nicotine concentration, flavoring, etc.) is important determinant of risk and severity of health effects

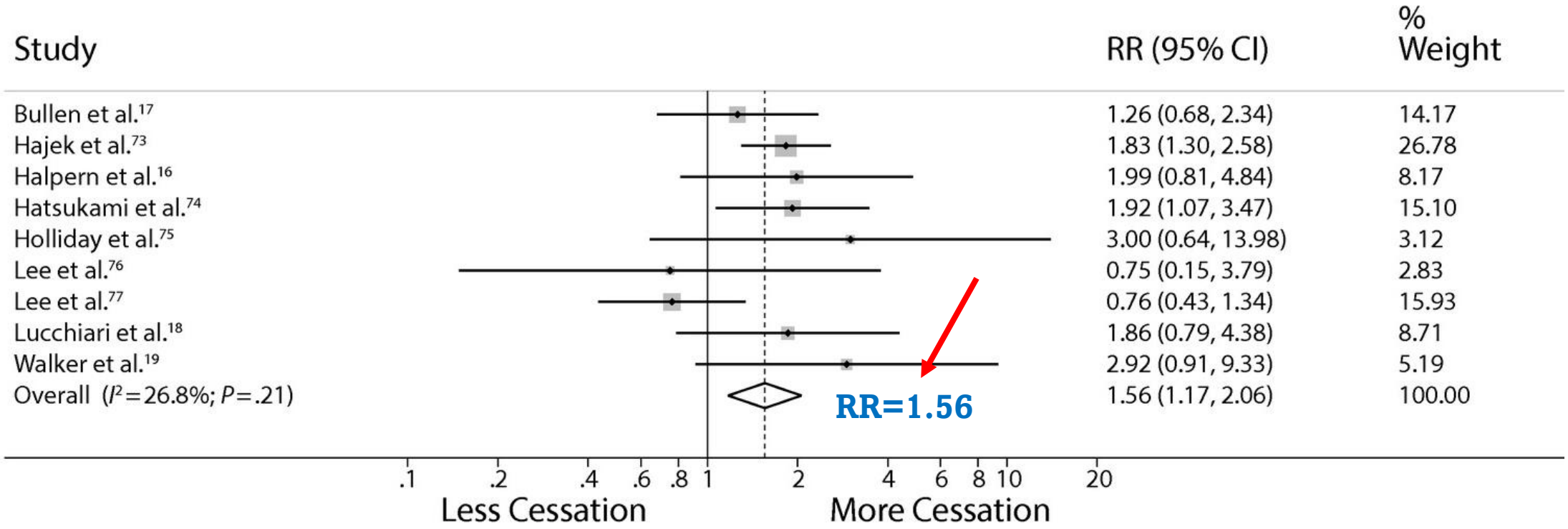
(NASEM 2018, Stokes 2021, Harlow 2024)

E-cigarettes and smoking cessation

- Not approved by the FDA as a cessation aid but many adults use e-cigarettes as a substitute for cigarettes.
- Randomized controlled trial evidence supports efficacy for cessation.
  - Equally or more effective as FDA-approved cessation therapies.
  - Real-world evidence inconclusive.

(Wang 2021)

RCT evidence supports efficacy of e-cigarette use for smoking abstinence



(Wang 2021)

Many smokers who vape to quit cigarettes continue vaping long-term

E-cigs

18% quit smoking

80% sustained e-cig use

NRT

10% quit smoking

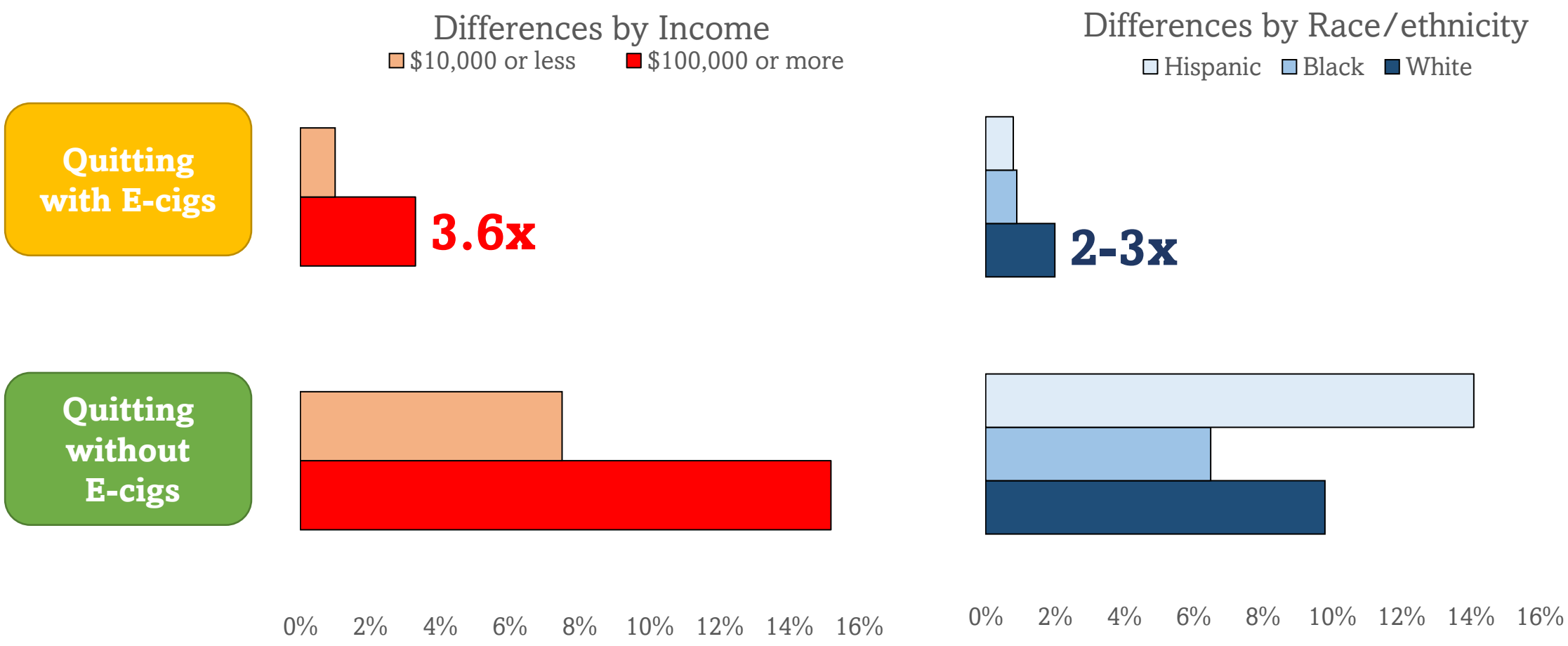
9% sustained NRT use

Hajek et al. (2019)

Disparities implications

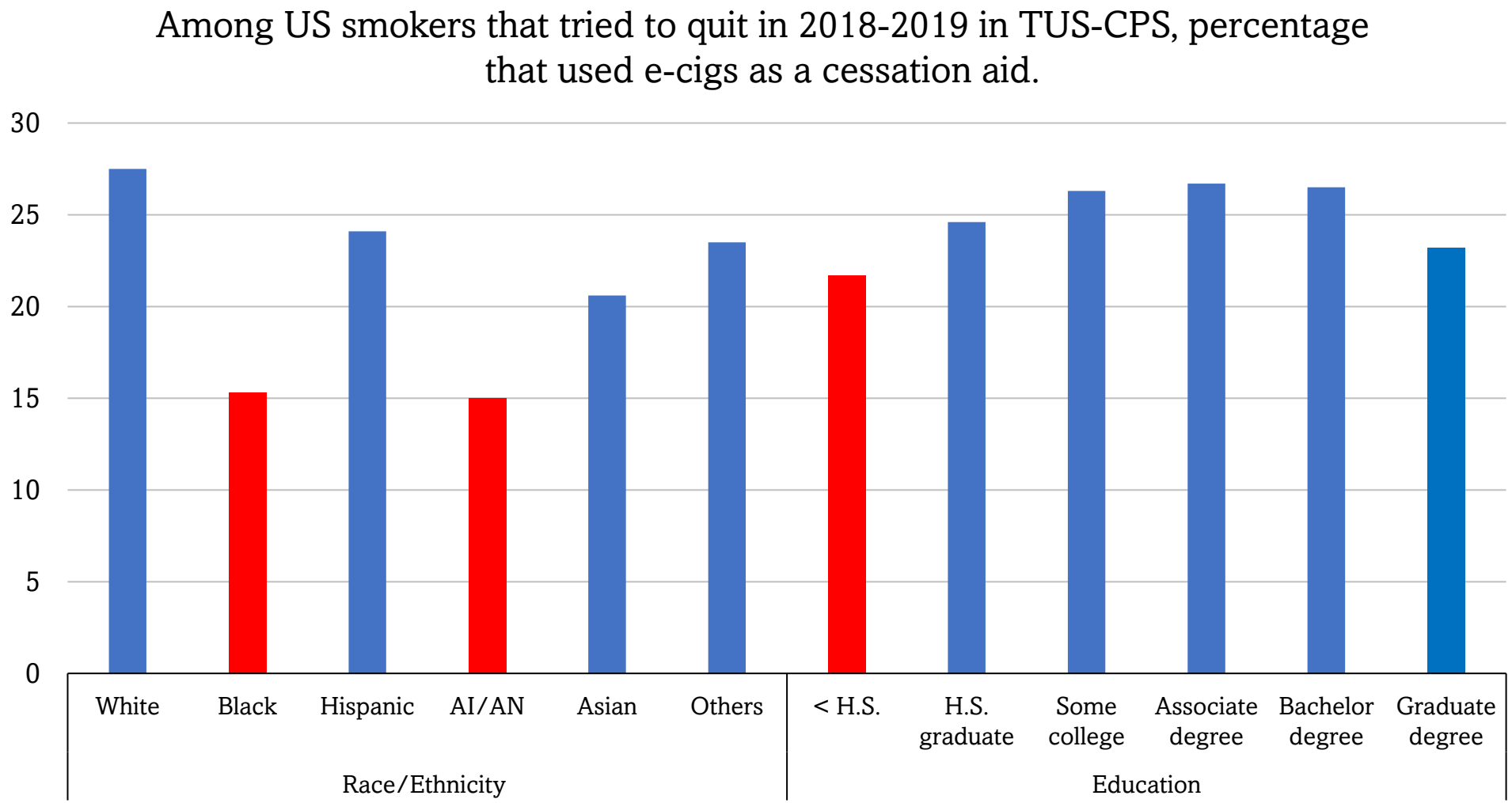
- Cigarette smoking has declined, but disparities in prevalence, cessation, and disease persist for some groups.
  - Lower SES.
  - Certain race/ethnicity groups.
- Are e-cigarettes being used by populations disproportionately impacted by high rates of smoking and/or related-disease?

Disparities in e-cigarettes as a cessation aid



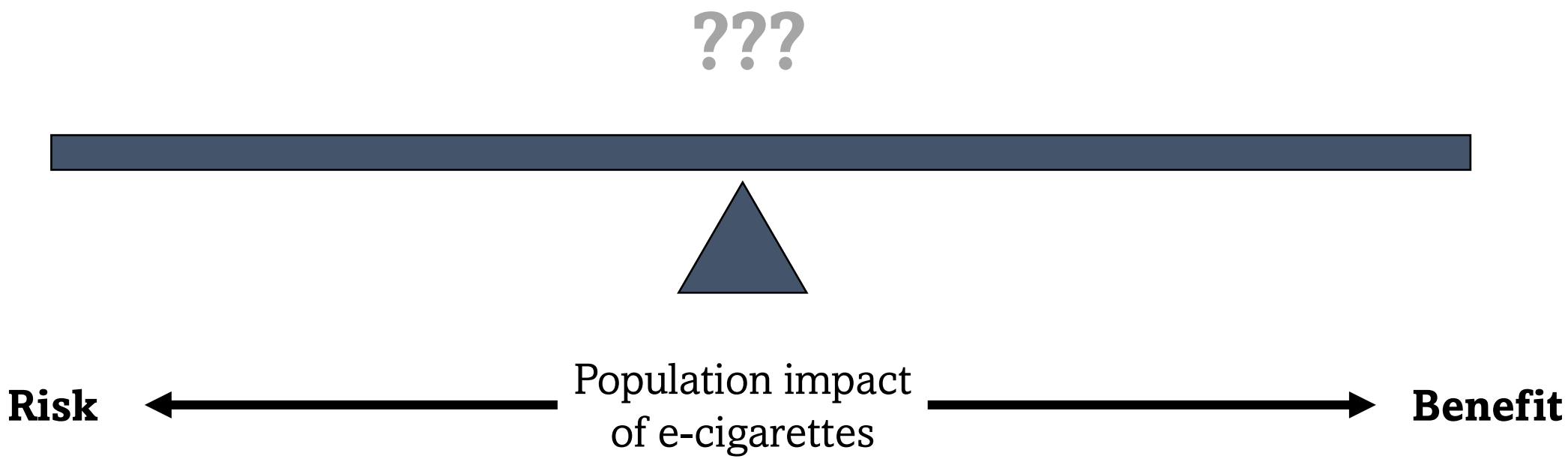
Harlow et al. AJPM (2023)

Disparities in e-cigarettes as a cessation aid

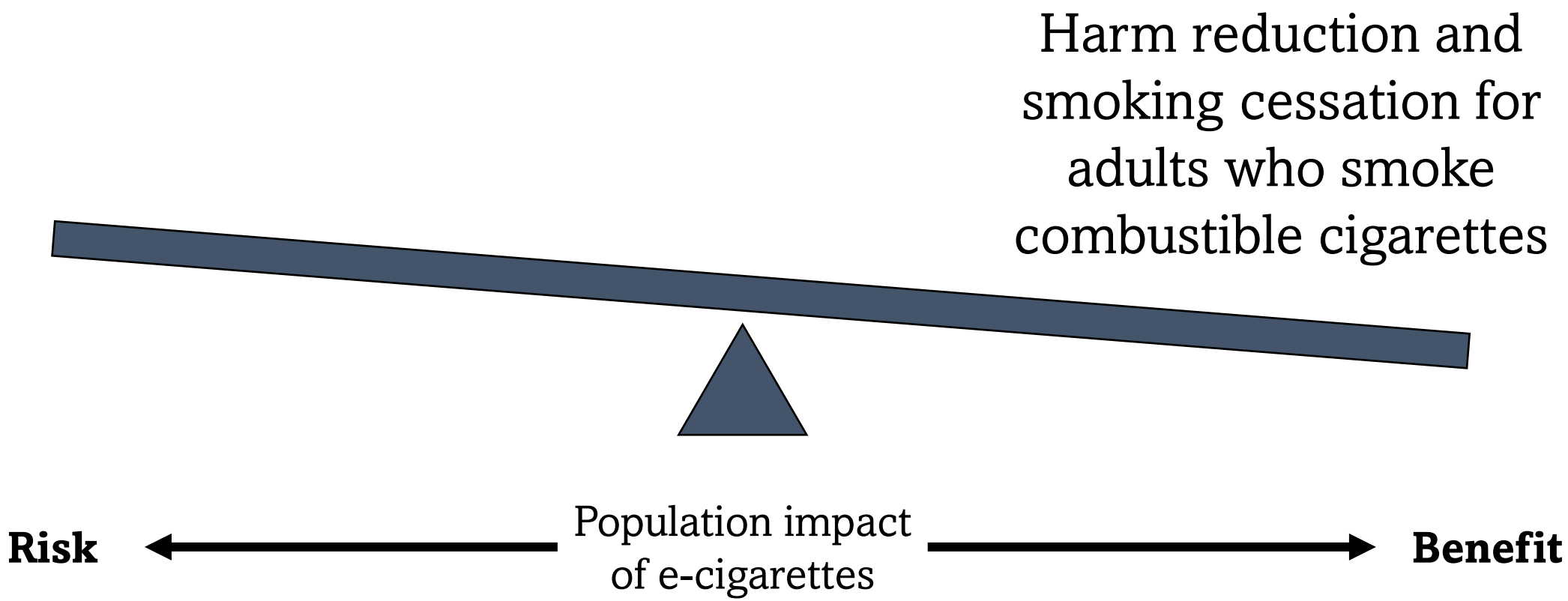


Leventhal, Dai, Higgins 2022 *JNCI*

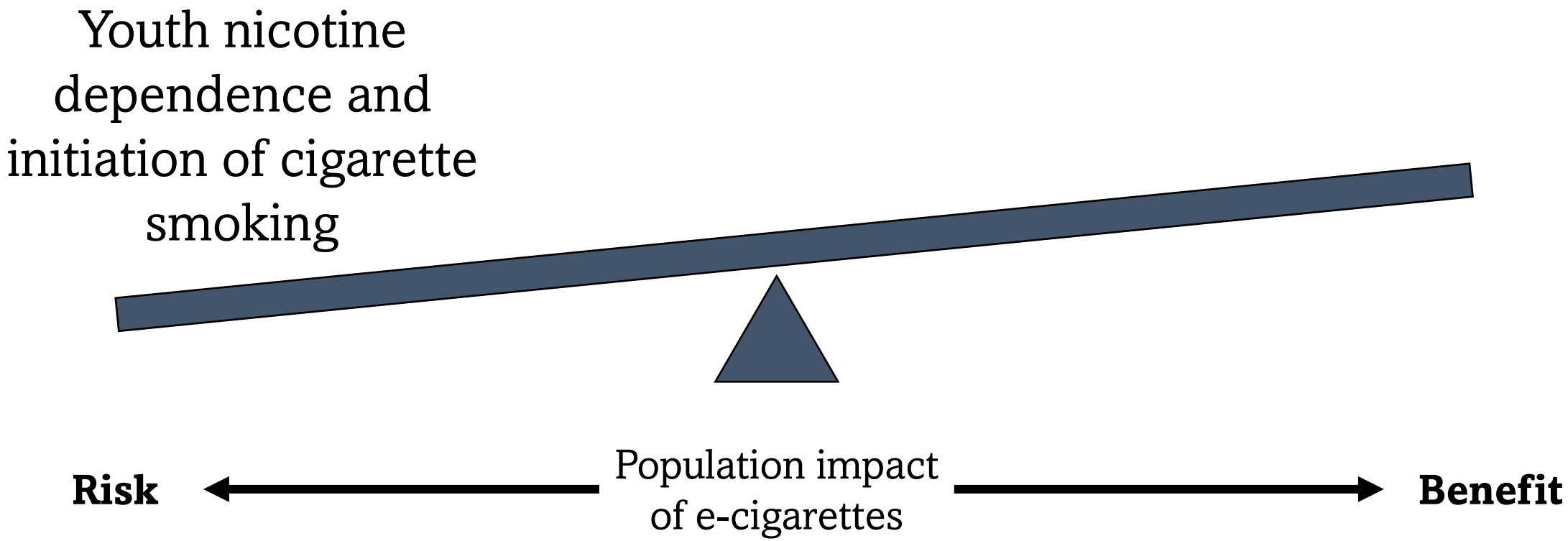
Public Health Implications of E-cigarettes



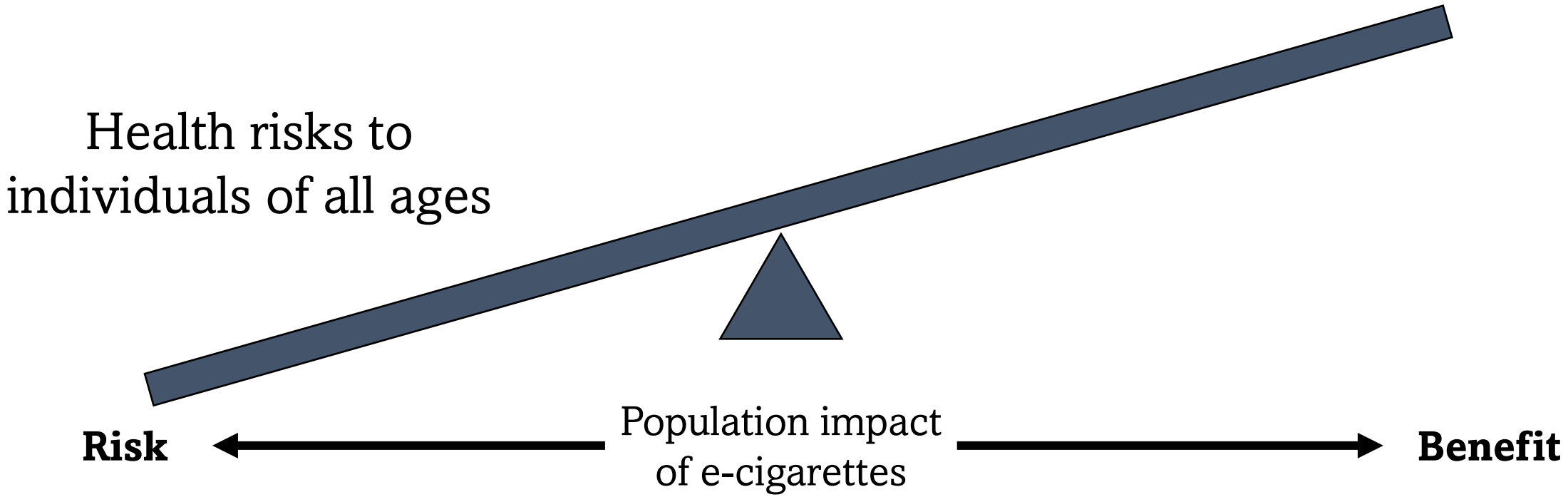
Public Health Implications of E-cigarettes



Public Health Implications of E-cigarettes



Public Health Implications of E-cigarettes



E-cigarette summary

- E-cigarettes widely used by young people, less so among adults aged >30, and available in numerous variants.
- E-cigarettes are less harmful than cigarettes but pose some harms.
- E-cigarettes can increase risk of youth smoking, but can also help adult smokers quit.
  - But smokers who switch to e-cigarettes may prolong nicotine dependence and increase risk of relapse back to smoking.
- There are disparities in who uses e-cigarettes for smoking cessation.

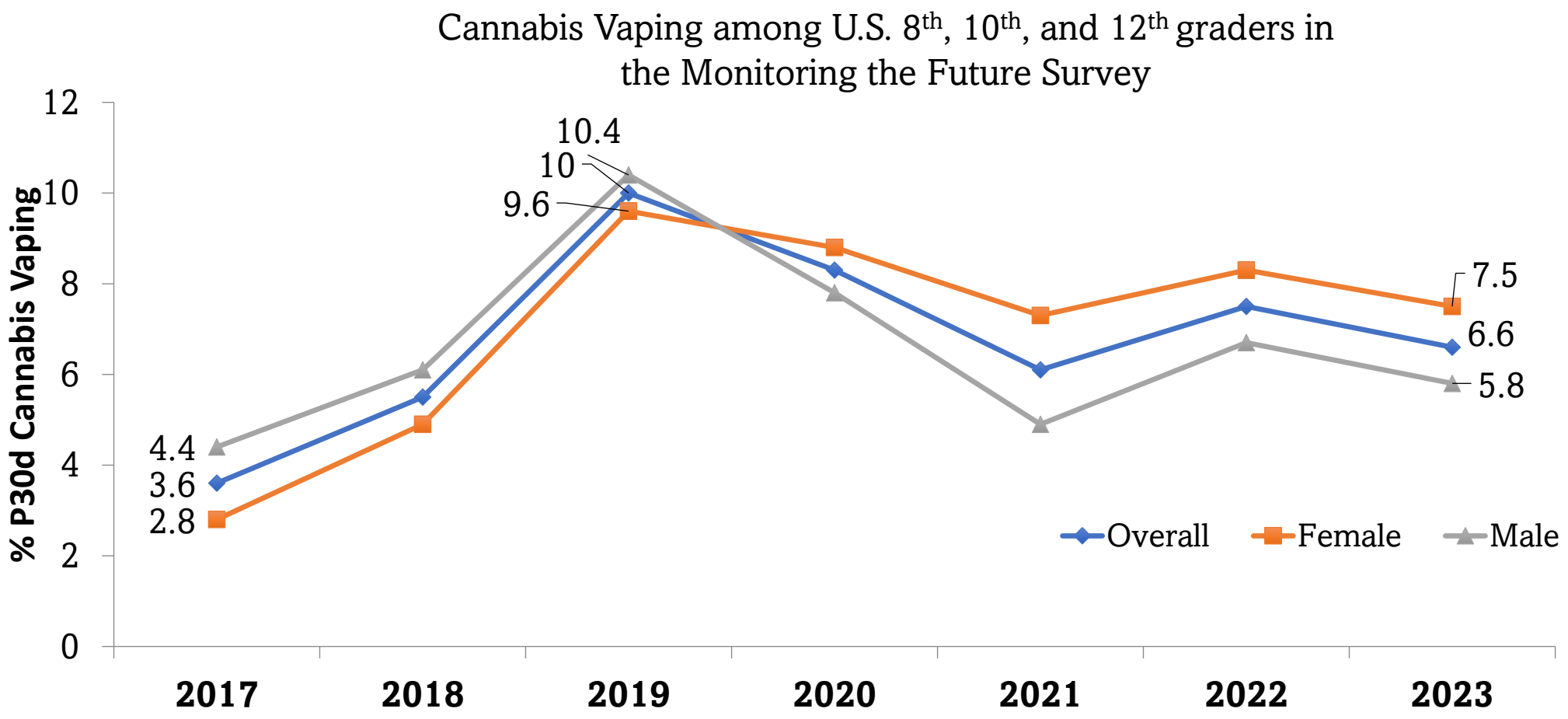
Cannabis Vaping

Changing cannabis landscape

- Rapid shifts in legalization and commercialization have led to increasingly diversified cannabis products.

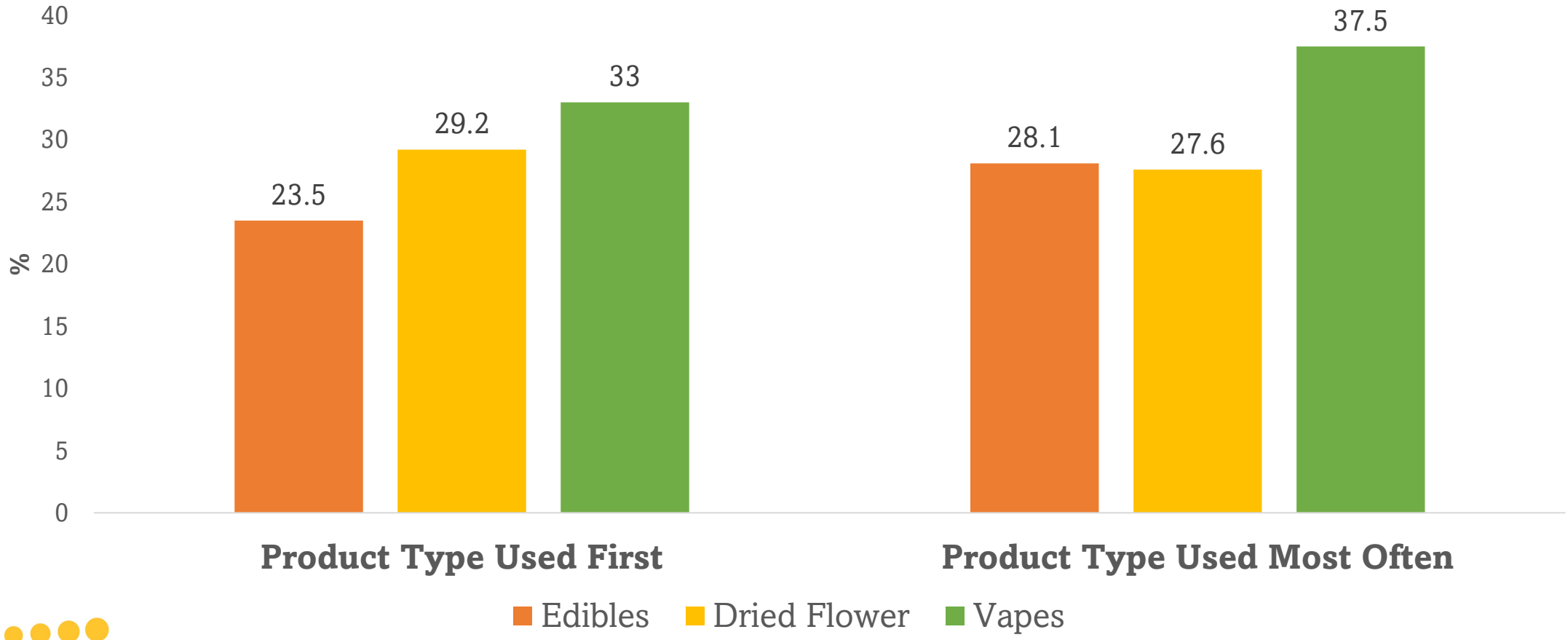
Cannabis Vape Products

Trends in Youth Cannabis Vaping



Miech 2024

Cannabis Product Used First and Most Often Among 10th and 11th Graders from Southern CA



THE ADVANCE STUDY

USC ADVANCE study 2024

What is cannabis vaping?

- Heat cannabis flower, e-liquid, or solid concentrates, to produce an aerosol that is then inhaled without combustion.
- Three main types:
  - Dry-herb vaporizers
  - Vaping liquid concentrates
  - Dabbing solid concentrates

MacCallum 2024; Meehan-Atrash & Rahman 2022

Dry-herb vaporizers

- Earliest mode of cannabis vaporizing.
- Devices heat ground dried cannabis flower to a temperature that releases cannabinoids as aerosol without combusting the plant material.
- Come in ‘desktop’ and ‘portable’ versions.

Vaping cannabis e-liquids (vape pens; oil pens)

- Cartridges containing liquid cannabis extracts (i.e., cannabis oil/hash oil).
  - Disposable or cartridges with reusable battery.
- Cannabis extracts:
  - **Solvent-based**: CO2, hydrocarbons, or alcohol used to dissolve and separate active ingredients from cannabis plant.
  - **Solventless**: Mechanical extraction (e.g., heat+ pressure) to extract the active ingredients.
  - Sometimes mixed with thinning agents or flavoring additives.
- Often contain very high concentrations of THC (>80%).

Dabbing cannabis concentrates

- Solid cannabis concentrates (e.g., wax, shatter) are placed *directly* on a heated surface at very high temperatures which melts the solid and produces an aerosol that is then inhaled.
- Dab-rig (e.g., water-filtrated pipe) or portable dab-pen.
- Often contain extremely high concentrations of THC (>90%).

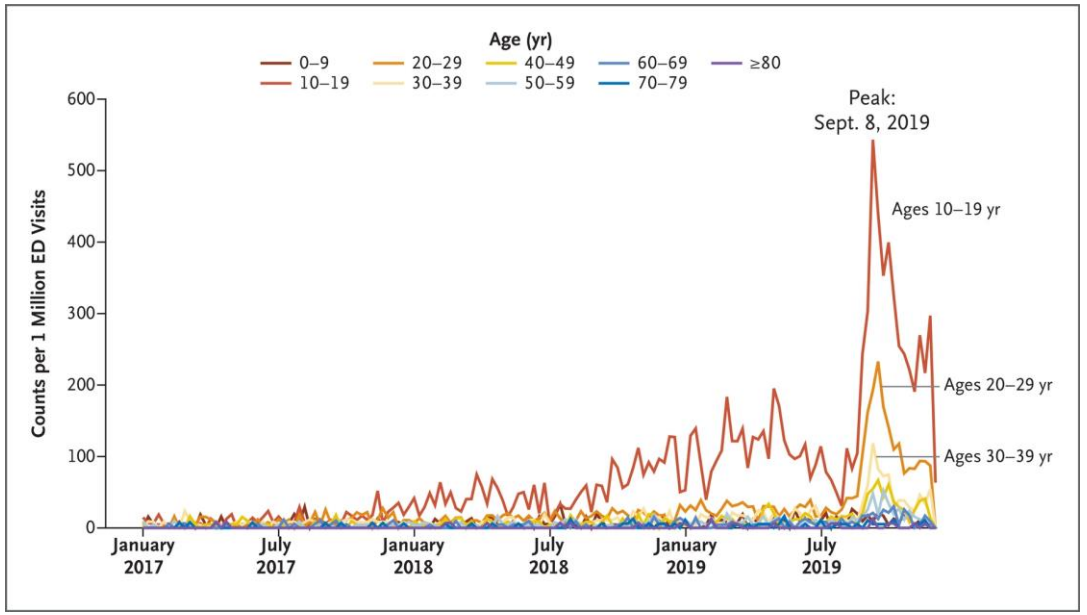
Adverse health outcomes

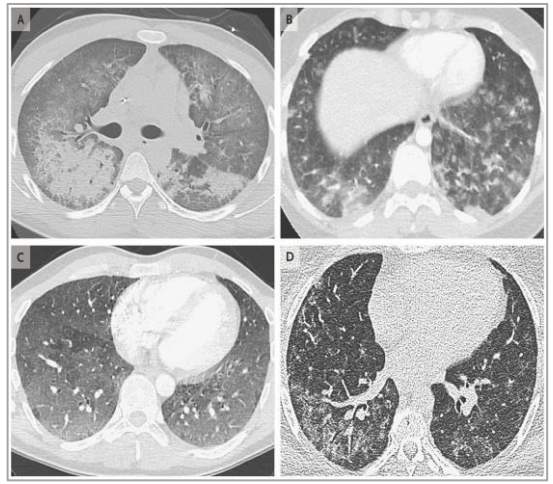
- **Similar risks as other cannabis:** addiction/cannabis use disorder (CUD), mental health, cognitive functioning, respiratory symptoms, cannabis-induced hyperemesis.
- **Unique risks of vaping cannabis:**
  - <u>High THC potency</u>
    - Cannabis use disorder.
    - Acute psychiatric reactions (e.g., paranoia, psychosis).
  - <u>Toxicants in aerosol</u>
    - Carbonyls, volatile organics, and heavy metals.
  - <u>Contamination:</u>
    - Pesticides, residual solvents, adulterants (e.g., EVALI from vitamin E acetate).
    - Biggest risk in unregulated products.

Chadi et al. 2020; Prince & Connor 2019

E-cigarette or vaping use-associated lung injury (EVALI) outbreak

- Outbreak of vaping related lung injuries occurred between September 2019–February 2020.
  - 2,807 cases, 68 deaths.
  - 76% under 35y, 24y median age.
- Acute lung injury with severe respiratory and gastrointestinal symptoms, accompanied by fever, chills.
- Probable cause = vape cartridges contaminated with vitamin E acetate.





Hartnett 2020; CDC 2020

Is vaping cannabis safer than smoking cannabis?

- Dry-herb vaporizers may generate fewer toxic chemicals than smoked cannabis flower.
- Lower risk of respiratory symptoms.
- But vaped concentrates can be highly processed with risks of contamination + higher THC potency.
- Need more research.

Chadi 2020; Loflin & Earleywine 2015; Fischer 2017

Cannabis Vaping Summary

- Cannabis vaping has emerged as a predominant mode of cannabis use among youth and young adults.
- Three types of cannabis vaping: dried flower, liquid concentrates, solid concentrates.
- Health concerns related to high THC potency, toxicity, and contamination.
- Vaping cannabis flower may be safer than smoking cannabis flower, but the comparative health risk depends on which type of cannabis vaping and there is more research needed.

Resources

CANNABIS RESOURCES

- **SAMHSA (Substance Abuse and Mental Health Services Administration) National Helpline**
  - 1-800-662-HELP (4357)
  - https://www.samhsa.gov/find-help/helplines/national-helpline
- **Marijuana Anonymous**
  - https://marijuana-anonymous.org/
- **CA Dept. of Public Health (CDPH) – "*Let's Talk Cannabis*"**
  - https://www.cdph.ca.gov/Programs/DO/letstalkcannabis/Pages/helpful-resources.aspx
  - https://www.cdph.ca.gov/Programs/DO/letstalkcannabis/Pages/Community-Toolkit.aspx

NICOTINE RESOURCES

- **Kick It California**
  - 1-800-NO-BUTTS
  - https://kickitca.org/
- **Asian smokers Quitline**
  - https://www.asiansmokersquitline.org/
- **Truth Initiative Vaping: Know the Truth Digital Curriculum**
  - https://truthinitiative.org/vaping-curriculum
- **CA Tobacco Control Branch (CDPH) Nicotine Cessation Resources**
  - https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/CTCB/Pages/CessationServicesAndResources.aspx

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Frequently Asked Questions (FAQs)

1. Why is vaping so common among youth and young adults?

a. Although e-cigarettes were first designed to help adults quit cigarette smoking, e-cigarettes have changed over time and now have features that appeal to youth, including sleek colorful designs that resemble tech products, availability in a wide array of sweet and fruity flavors, discrete devices that are easily hidden from authority figures, high concentrations of nicotine salts, and widespread digital and social media marketing.

2. What are the health effects of e-cigarette use?

a. E-cigarette aerosol exposes users to toxic chemicals, including nicotine, heavy metals, particulate matter, aldehydes, carcinogens, solvents, and flavoring additives. Vaping is associated with addiction and nicotine dependence, respiratory symptoms, hypertension and increased heart rate, sleep problems and mental health symptoms. Vaping nicotine increases the propensity for cigarette smoking among youth but may help some adults quit smoking cigarettes.

Frequently Asked Questions (FAQs)

3. Is vaping safer than smoking?

a. Although e-cigarettes expose individuals to toxic substances, the levels of toxicants emitted by e-cigarettes is substantially lower than combustible cigarettes. If patients completely switch from cigarettes to e-cigarettes this reduces exposure to toxicants and carcinogens.

4. Why should clinicians be aware of cannabis vaping?

a. Cannabis vaping is a predominant mode of cannabis use among youth and young adults and cannabis vape products contain very high concentrations of THC. Use of high potency THC vape products may be linked to adverse health outcomes including acute psychiatric reactions, cannabis use disorder, and lung injuries.

REBEL RESEARCH

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Thank you! Questions?

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Q & A Session

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