

Institute for  
Global Tobacco Control

# What Are the Device and Liquid Characteristics Used with Sweet, Menthol/Mint, and Tobacco ENDS Liquid Flavors: Results from the Population-Based VAPER Study

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# Acknowledgements/Disclosures

- **Co-authors:** Jeffrey J Hardesty, MPH; Qinghua Nian, PhD; Joshua Sinamo, BS; Kevin Welding, PhD; Joanna E Cohen, PhD; Ryan David Kennedy, PhD
- **Funding:** Research reported in this presentation was supported by NIDA and FDA Center for Tobacco Products (CTP) under Award Number U54DA036105. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.
- **Conflicts of Interest:** No conflicts of interest to disclose





# Background

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Over 8.1 million premarket tobacco product applications (PMTAs) submitted to the FDA between 2020 and 2022



ENDS device and liquid characteristics (e.g., wattage, nicotine concentration, PG/VG ratio) are highly customizable



These characteristics influence perceived harm and appeal of the product, aerosol volume/nicotine levels, and toxicity



Gaps remain in examining user behaviors by flavor group, with consideration of specific device/liquid characteristics



# Specific Aims

To describe the device and liquid characteristics of menthol/mint, sweet, and tobacco flavor ENDS users



# Methods

# The VAPER Study

- Longitudinal cohort study of U.S. adult ( $\geq 21$ ) ENDS users (use  $\geq 5$  days/week)
- Participants initially recruited via Craigslist; Follow-up via email and text
- ~1200 participants each wave, including follow-up participants and baseline participants to replace those lost to follow-up
- Collect self-report survey responses about participants' ENDS use behaviors and device and liquid characteristics
- Collect photos of participants' most used device/liquid which are coded for key device/liquid characteristics using manufacturer, academic, retail, and review sites



# Study Design

- Cross-sectional analysis of data from waves 2 (Dec 2020-Apr 2021) and 3 (Sep 2021-Dec 2021) of the VAPER study
- Most recent responses from a total of 1809 unique participants
- Sample weighted to TUS-CPS using gender, age and race
- Flavor group determined by primary flavor of most commonly used liquid
- Chi-squared tests and simple linear regression utilized to examine differences in demographics and device and liquid characteristics by flavor group

## User Characteristics

Gender

Age

Income

Race

Smoking status

Reasons for continued ENDS use

## Device/Liquid Measures

Liquid flavor

Device-liquid grouping

Nicotine concentration

Wattage

Voltage

Resistance

Age of ENDS first use







# Results



Among our sample of adult frequent ENDS users:

**76.2% used sweet flavors (n=1135)**

**14.4% used menthol/mint flavors (n=214)**

**9.4% used tobacco flavors (n=140)**

# User Characteristics

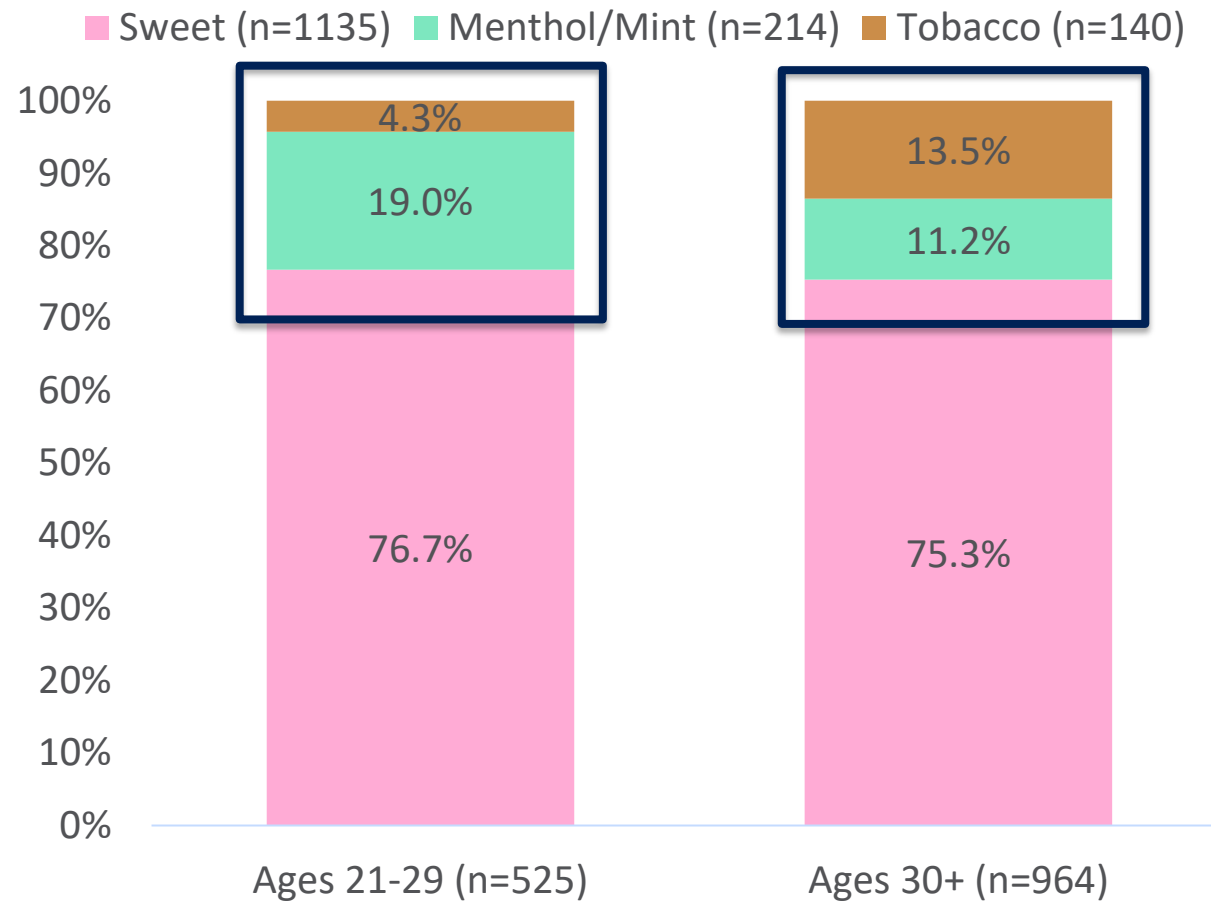


	Sweet (n=1135)		Menthol/Mint (n=214)		Tobacco (n=140)		Total (n=1809)
	n	%	n	%	n	%	n
<b>Gender (p=0.254)</b>							
Male	506	75.6	90	12.6	67	11.8	663
Female	609	76.0	118	15.7	71	9.3	798
Non-male/female	13	62.0	6	28.4	2	9.6	21
Prefer not to answer	7	100	0	0	0	0	7
<b>Income (p=0.289)</b>							
< \$40,000	599	76.5	115	14.1	67	9.5	781
≥ \$40,000	508	74.6	93	13.2	71	12.3	672
Prefer not to answer	28	83.2	6	12.2	2	4.6	36
<b>Race (p=0.409)</b>							
Black	52	84.1	5	10.8	3	5.1	60
White	836	75.3	158	13.5	115	11.2	1109
Non-Black/White	57	76.4	14	18.7	3	4.9	74
Multi-racial	161	76.5	31	14.3	18	9.3	210
Prefer not to answer	29	84.2	6	13	1	2.8	36
<b>Ethnicity (p=0.132)</b>							
Non-Hispanic/Latino	995	75.8	184	13.3	127	10.9	1306
Hispanic/Latino	118	74.3	27	18.6	11	7.1	156
Prefer not to answer	22	78.1	3	6.4	2	15.6	27
<b>Smoking status (p=0.199)</b>							
Current smoker	377	76.7	62	12.3	47	11	486
Recent former smoker	544	73.9	116	14.2	80	11.9	740
Never smoker	214	79.8	36	14.2	13	6.1	263

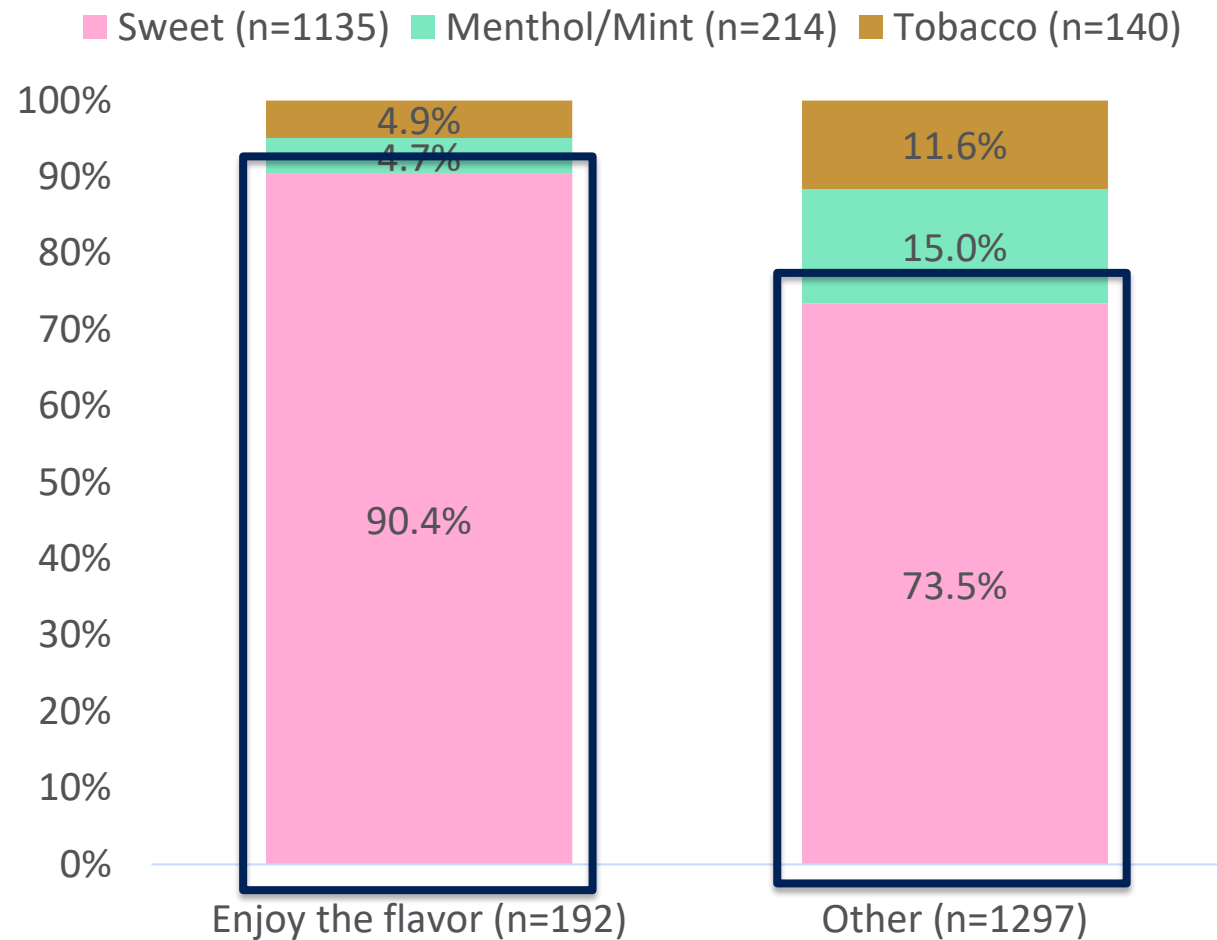
No significant difference in flavor used by gender, income, race, ethnicity, smoking status.



# Young adults (aged 21-29) were less likely to use tobacco and more likely to use menthol/mint than those aged 30+ ( $p < 0.001$ )



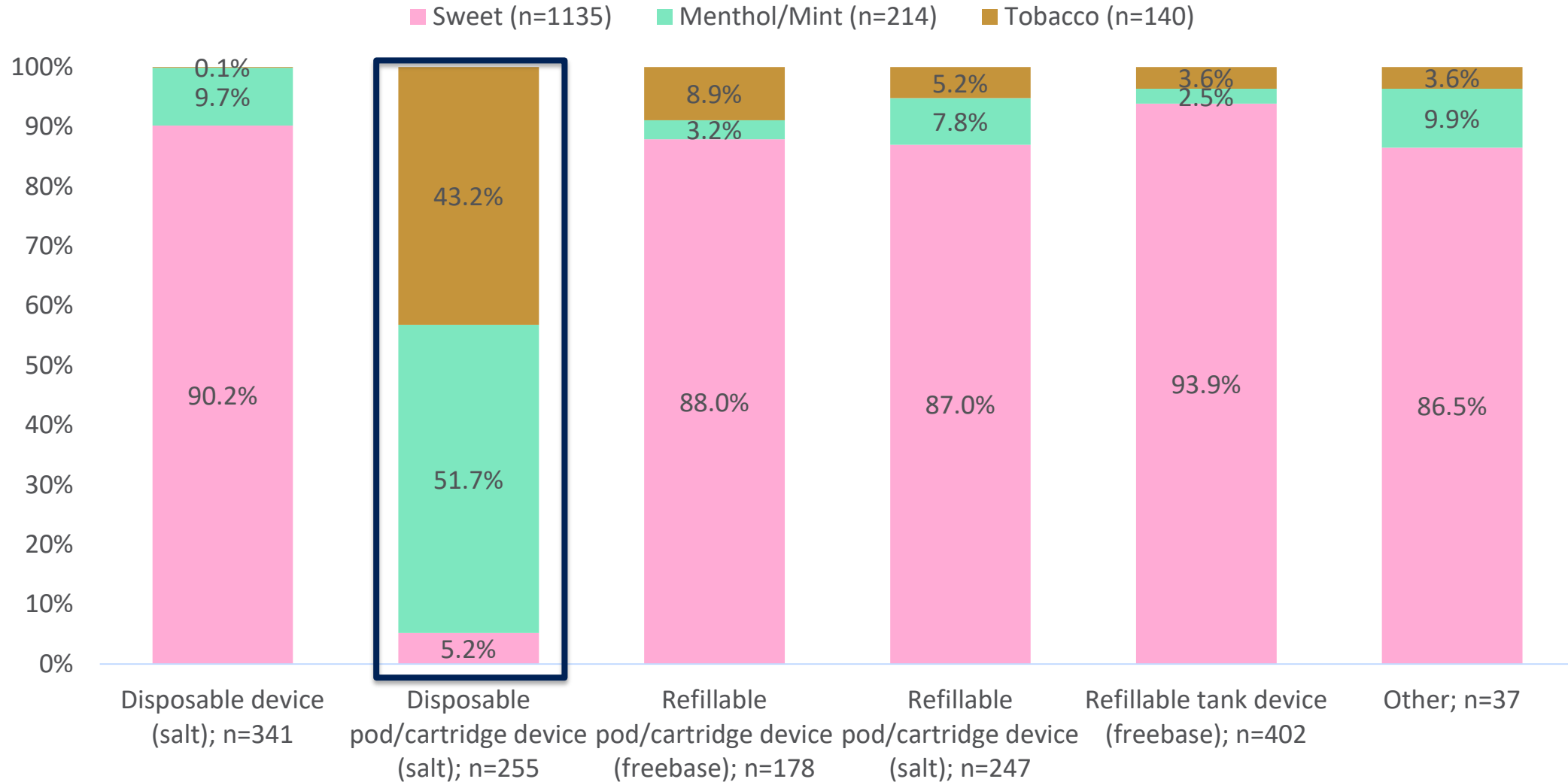
# Those reporting using ENDS for the flavor were more likely to use sweet flavors ( $p < 0.001$ )



# Device/Liquid Characteristics

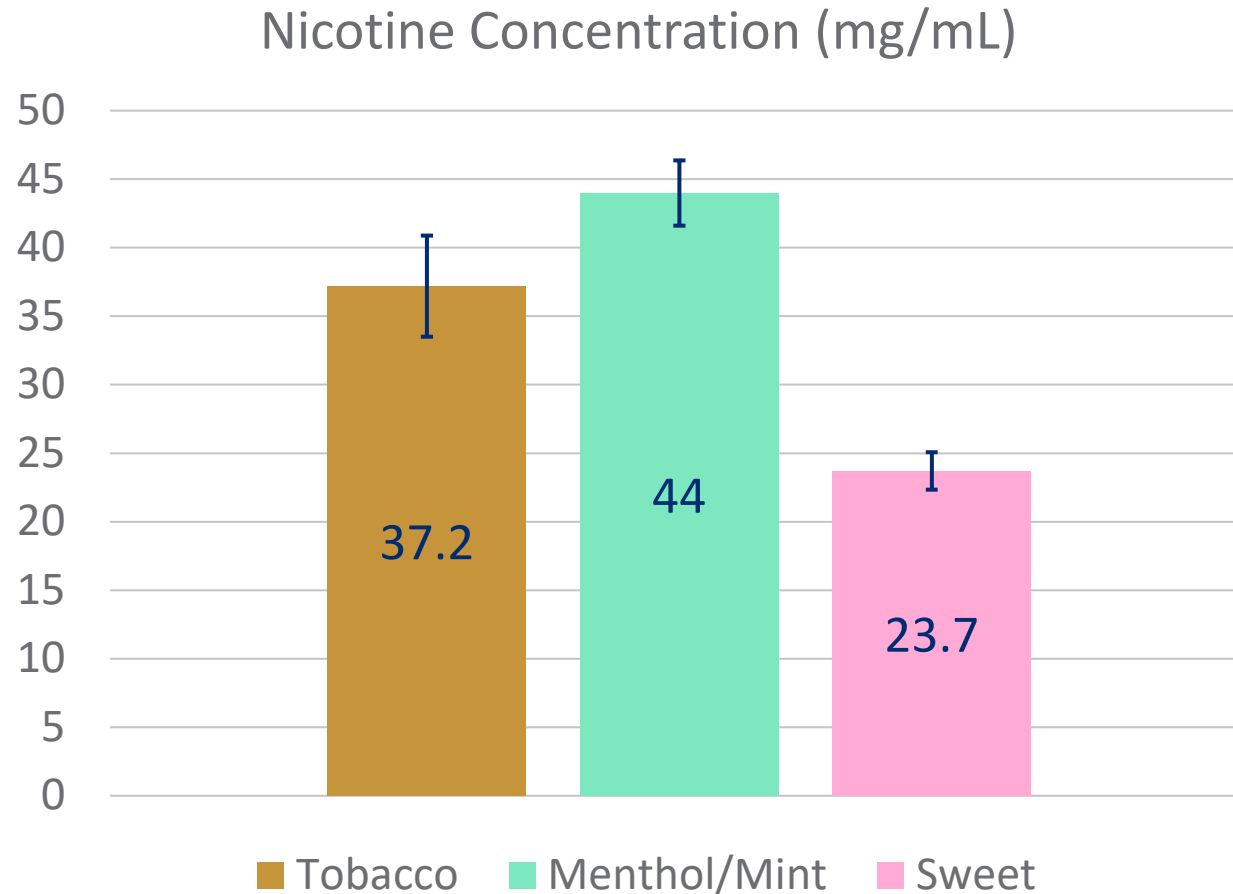


# Those using refillable devices with disposable pods/cartridges and nicotine salts were less likely to use sweet flavors (p<0.001)





# Nicotine Concentration

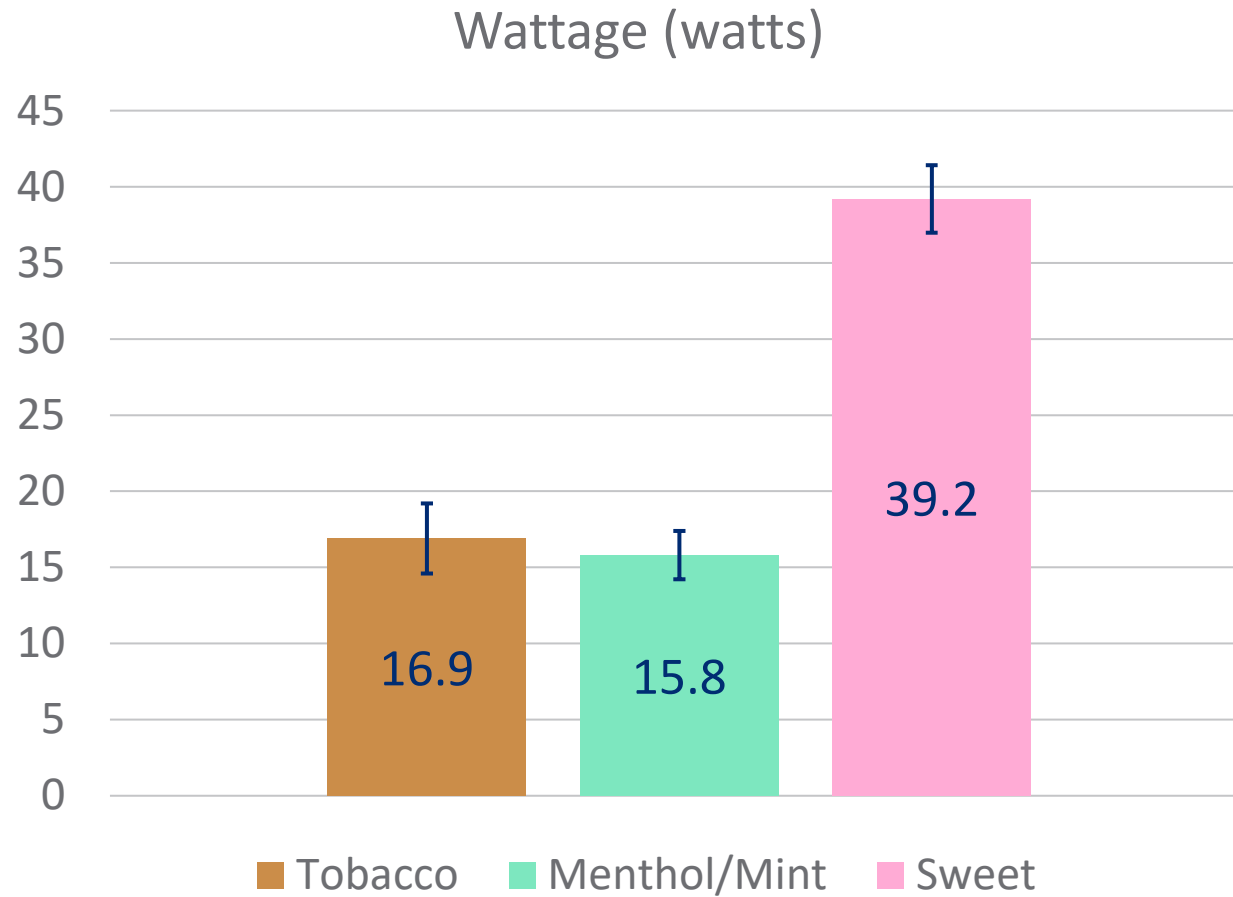


Compared to tobacco flavor users:

- **Menthol/mint** flavor users use **higher** nicotine concentrations ( $p=0.002$ )
- **Sweet** flavor users use **lower** nicotine concentrations ( $p<0.001$ )



# Wattage

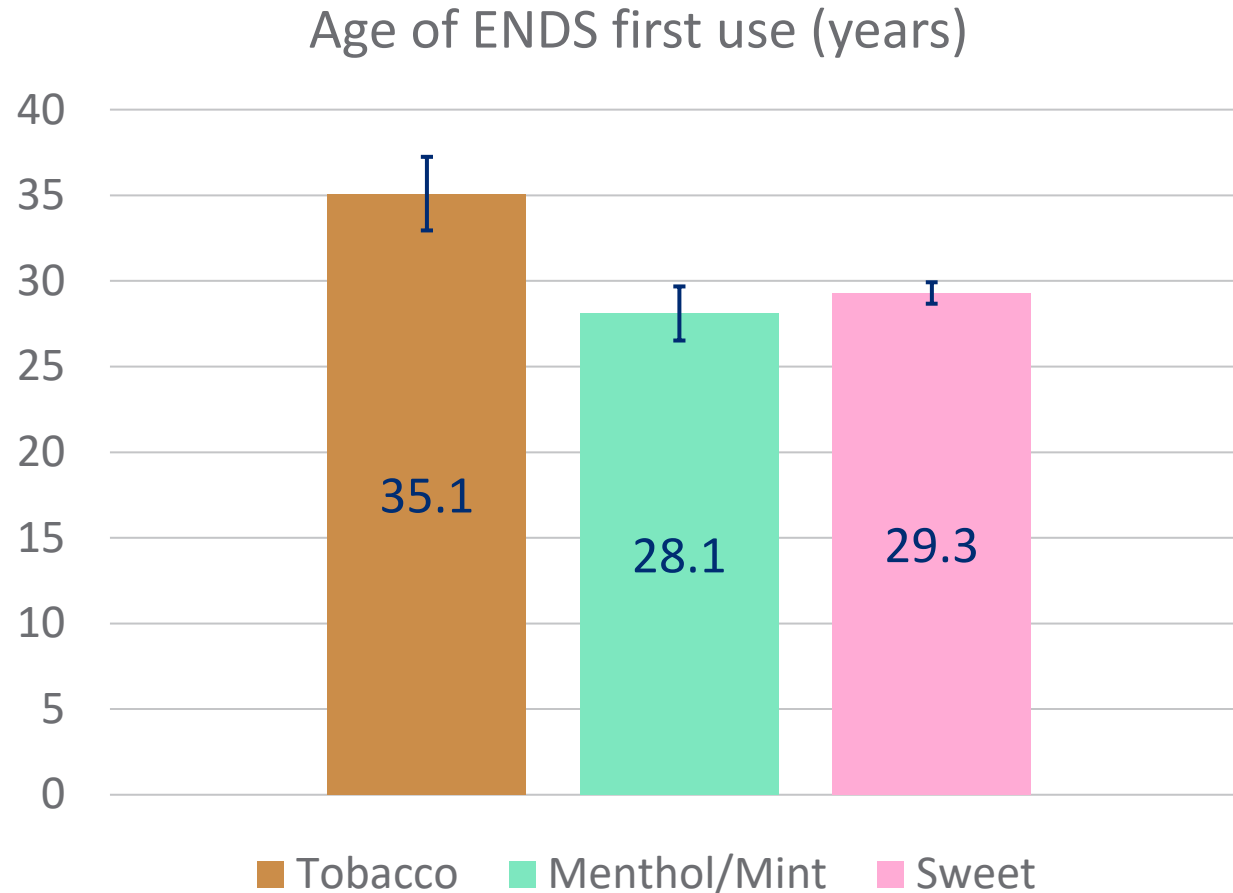


Compared to tobacco flavor users:

- **Sweet** flavor users use **higher** wattages ( $p < 0.001$ )



# Age of ENDS first use



Compared to tobacco flavor users:

- **Menthol/mint and sweet** flavor users first used ENDS at a **younger** age ( $p < 0.001$ )





# Conclusions

# Conclusions

Among our sample of adult frequent ENDS users, in comparison to tobacco flavors:

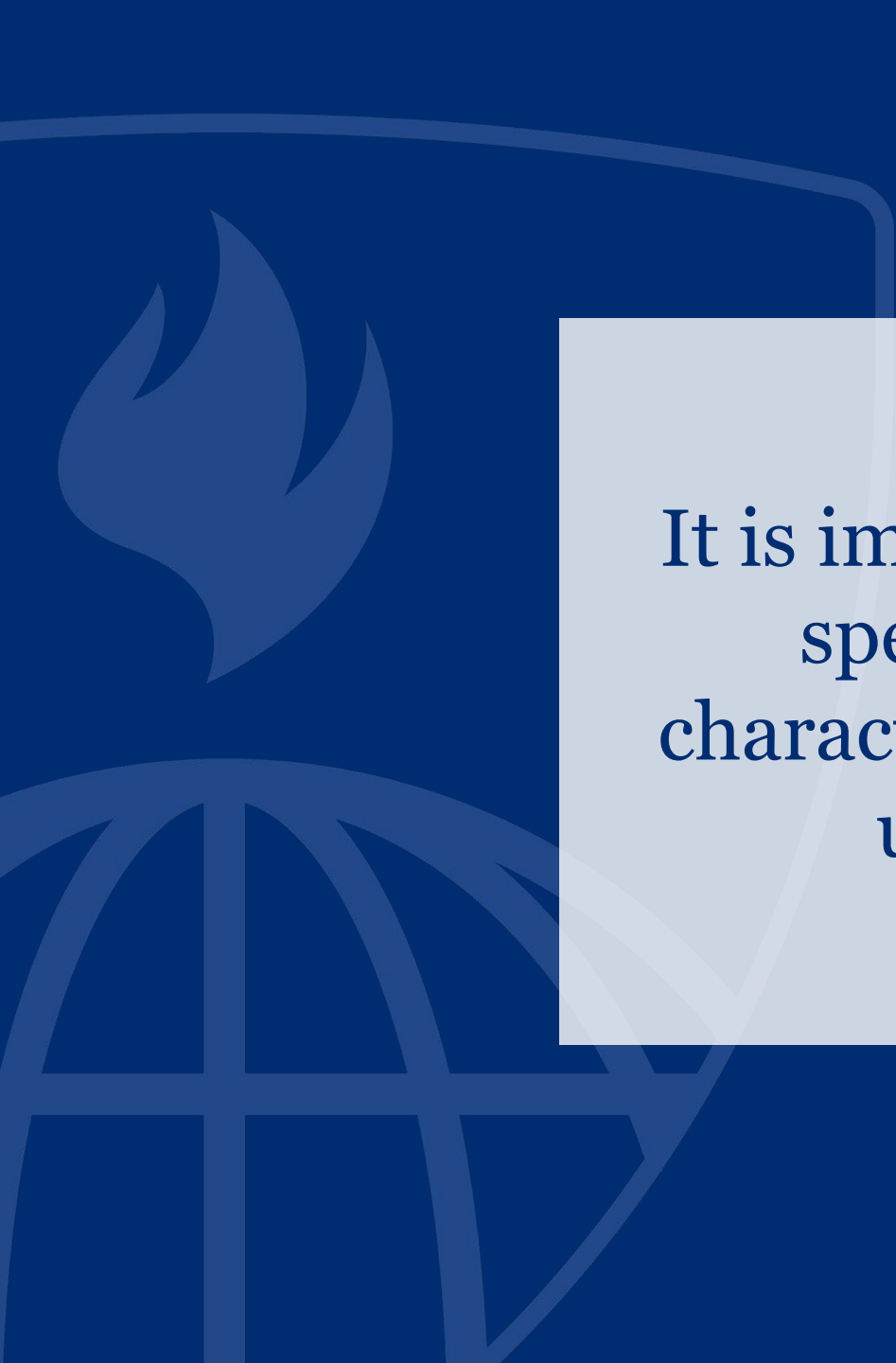
Sweet flavors were associated with:

- Lower nicotine concentrations and device voltages and resistances
- Higher device wattages
- Lower age of ENDS first use
- Reporting using ENDS because of the flavor

Menthol/mint flavors were associated with:

- Higher nicotine concentrations
- Lower age of ENDS first use



A stylized graphic on the left side of the slide. It features a blue flame-like shape at the top, with a blue grid pattern below it that resembles a globe or a network. The background is a solid dark blue.

It is important to understand the  
specific device and liquid  
characteristics and combinations  
used by ENDS users.

# Regulatory Implications

- Regulatory agencies must consider how regulations on these characteristics may affect user behavior, particularly regarding the other characteristics discussed here.
- For example:
  - Regulations limiting the availability of sweet flavors or limiting device wattages may create conditions that encourage use of menthol/mint or tobacco flavors, which are more often used with lower wattages and may have different health implications for the user.
  - Regulations limiting the nicotine concentration in liquids may create conditions that encourage use of sweet flavors, which are more often used with lower nicotine concentrations and higher wattages.



# Areas for future research



What are the **health implications of different device/liquid characteristic combinations** (e.g., sweet flavor with lower wattage vs. tobacco flavor with higher wattage)?



Why do **ENDS users use certain device/liquid characteristics in combination?**



How would **regulations** on each of these characteristics **affect user behavior and health?**

