Transitions in Combinations of Device and Liquid Characteristics Among Frequent Electronic Nicotine Delivery System Users over 3 Timepoints, 2020-2021

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Disclosures & Funding Sources

Background

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- The US ENDS market is characterized by an array of diverse ENDS devices and liquids.

- ENDS can differ on features of device (i.e., disposable, reusable) and liquid storage container (i.e., disposable pod/cartridge, refillable pod/cartridge, tank).

- Features may be associated with different user experiences, use patterns, flavor preferences, nicotine content and delivery, and user characteristics.

- Little is known about what ENDS devices and liquids people use in recent years, and particularly whether they stably use the same products or whether they change over time.

Research Questions

- Do frequent ENDS users change their most used ENDS device over time?

- Are there any differences in liquid nicotine concentration between frequent ENDS users who stably use the same device and users who transition to another device?
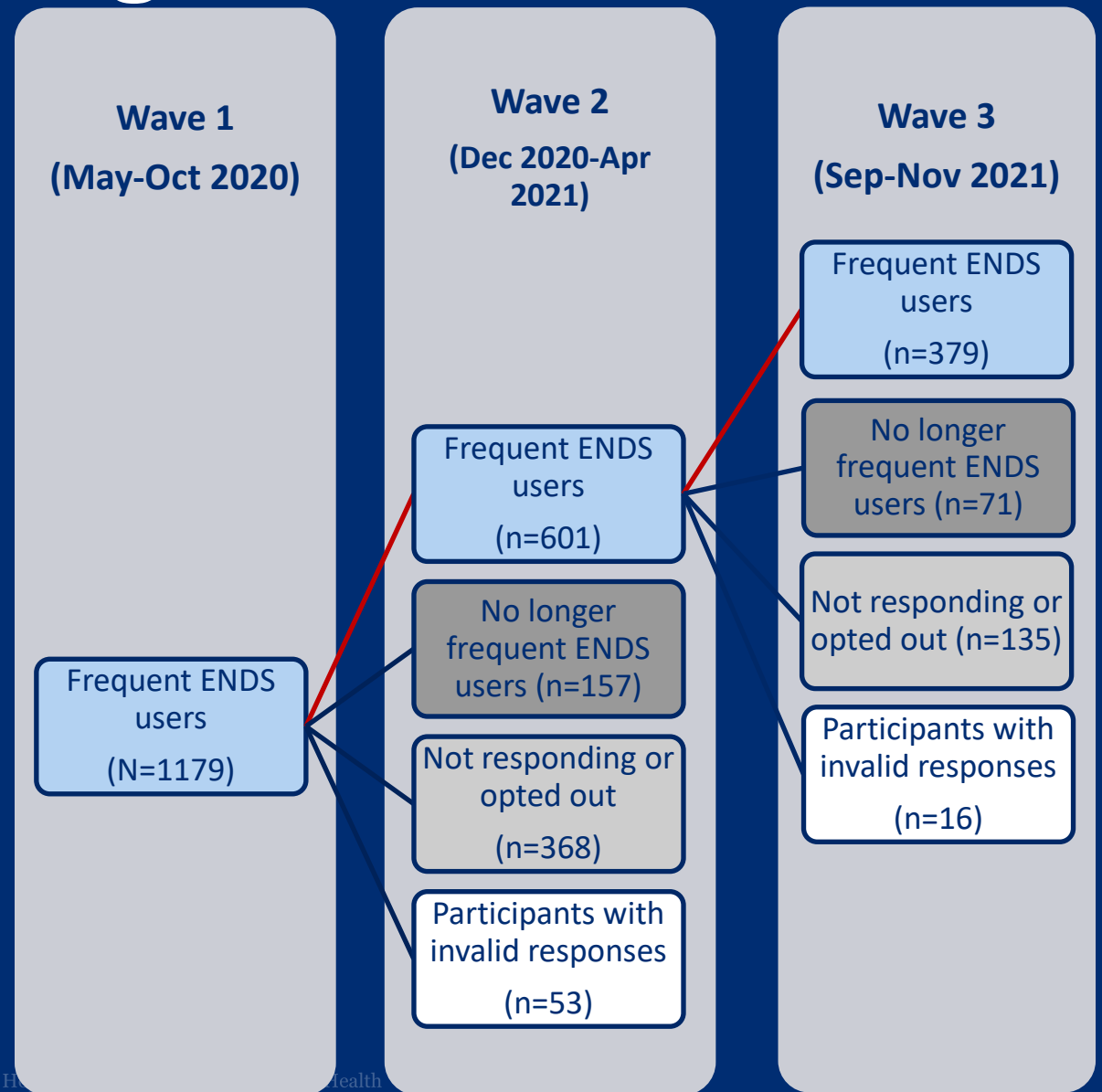
Methods

Longitudinal Survey Design

- Longitudinal Survey Design: Participants who responded to all three waves of VAPER (Vaping and Patterns of E-cigarette Use Research)

- Sample: 379 US adults (21+) who used ENDS frequently (5+ days/week) self-reported and uploaded photos of their most used ENDS device and liquid

Wave 1
(May-Oct 2020)

Wave 2
(Dec 2020-Apr 2021)

Wave 3
(Sep-Nov 2021)

Frequent ENDS users
(N=1179)

Frequent ENDS users
(n=601)

No longer frequent ENDS users (n=157)

Not responding or opted out
(n=368)

Participants with invalid responses
(n=53)

Frequent ENDS users
(n=379)

No longer frequent ENDS users (n=71)

Not responding or opted out (n=135)

Participants with invalid responses
(n=16)

Key Variables – Device/Liquid Grouping

- Device type (i.e., disposable device/reusable device with refillable tank/reusable device with refillable pod or cartridge/ reusable device with disposable pod or cartridge)

- Device settings (i.e., adjustable/not adjustable)

- Liquid formulation (i.e., nicotine salt/freebase)

Tank (freebase, adj settings)

Refillable pod/cart (salt, adj settings)

Disposable pod/cart (salt, no adj settings)

Disposable device (salt, no adj settings)

Other Key Variables & Statistical Methods

- Key Variables:
  - <u>Stable user</u>: using the same grouping across waves
  - <u>Unstable user</u>: using one grouping in wave 1 and transitioning to another grouping in wave 2 and/or 3
  - Nicotine concentration (mg/mL)

- Statistical Analysis:
  - Post-stratification survey weights: gender/age/race (weighted to 2019 TUS-CPS)
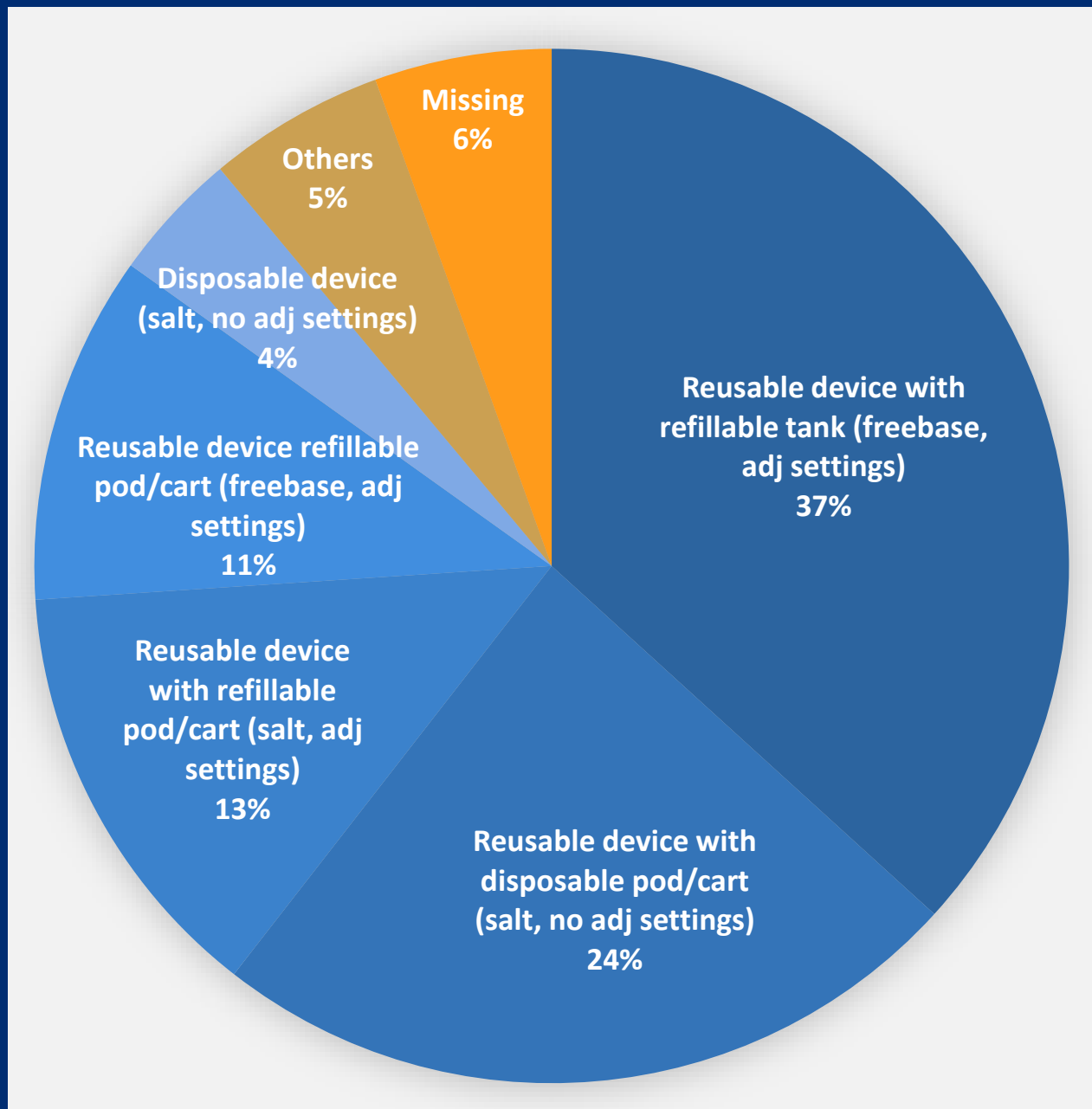 - Chi-square, independent t-test, ANOVA

Results

Sample Description

- A total of 379 ENDS frequent users

- Majority of the participants (76.5%) were less than 45 years old

- Approximately 90% of participants were White

- More than 40% of participants had an annual income less than $40,000

- Approximately 30% of participants reported that they had smoked a cigarette in the past 30 days

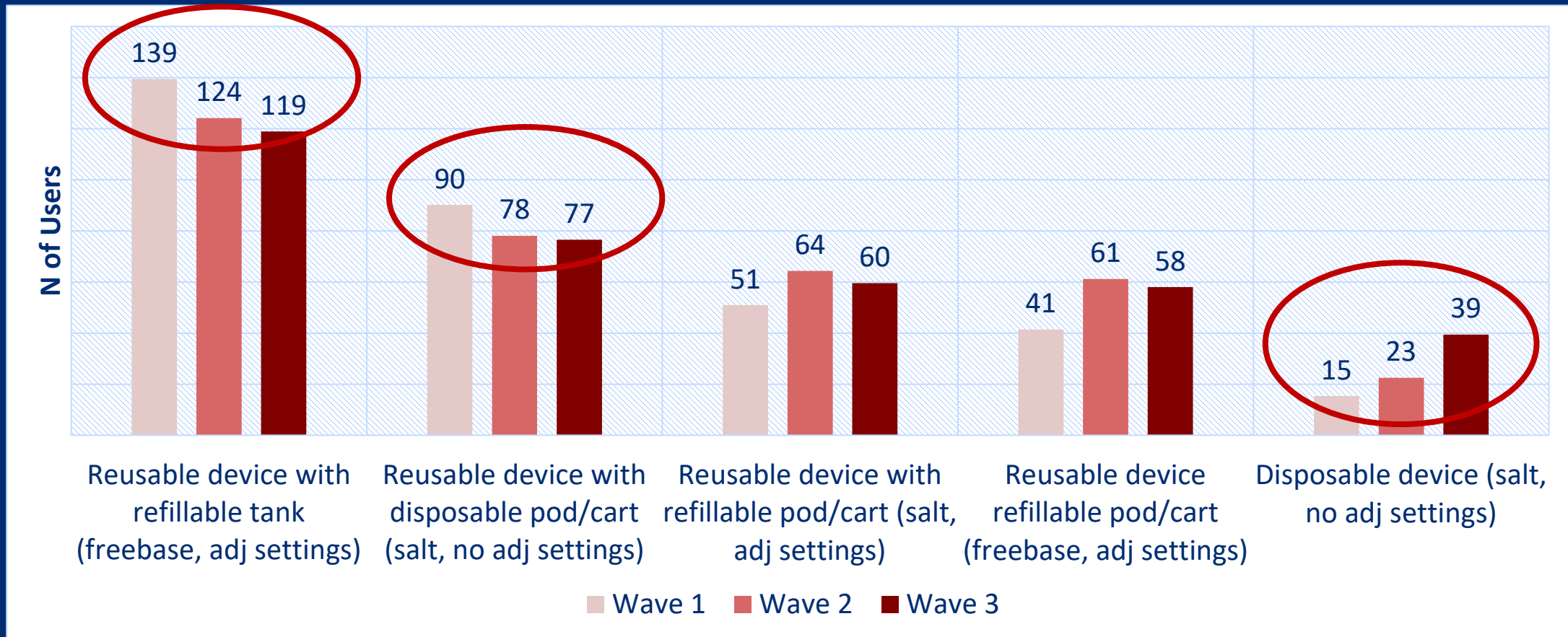|		n (%)
Geographic Location	Northeast	33 (8.8)
	Midwest	70 (18.5)
	South	165 (43.4)
	West	111 (29.3)
Age	21-29	84 (22.1)
	30-44	206 (54.4)
	45+	89 (23.5)
Gender	Male	191 (50.3)
	Female	185 (48.9)
	Other	2 (0.5)
	Prefer not to answer	1 (0.3)
Race	White	340 (89.7)
	Other or multi race	35 (9.2)
	Prefer not to answer	4 (1.0)
Annual Household Income	$0 - $39,999	158 (41.6)
	$40,000+	212 (56.2)
	Prefer not to answer	9 (2.2)
Have you smoked a cigarette in the past 30 days in wave 1?	No	266 (70.2)
	Yes	113 (29.8)

Users of Device/Liquid Grouping in Wave 1

- In total, 13 device/liquid groupings were observed. And 5 device/liquid groupings account for about 90% of participants

- Users of top 5 device/liquid groupings were significantly different by:
  - Age (<30): <10% refillable pod/cart device (freebase, adj settings) users; >40% disposable device (salt, no adj settings) users
  - Smoked in the past 30 days: ~20% tank (freebase, adj settings) and refillable pod/cart device (freebase, adj settings) users; >40% disposable device (salt, no adj settings) users

Pie chart labels:
- Reusable device with refillable tank (freebase, adj settings) 37%
- Reusable device with disposable pod/cart (salt, no adj settings) 24%
- Reusable device with refillable pod/cart (salt, adj settings) 13%
- Reusable device refillable pod/cart (freebase, adj settings) 11%
- Disposable device (salt, no adj settings) 4%
- Others 5%
- Missing 6%

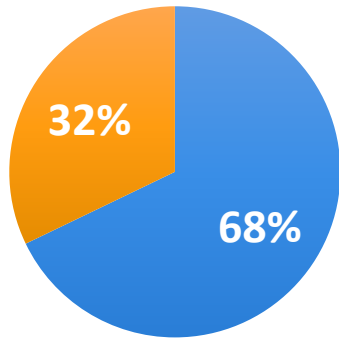# Number of ENDS Users by Device/Liquid Grouping across Waves

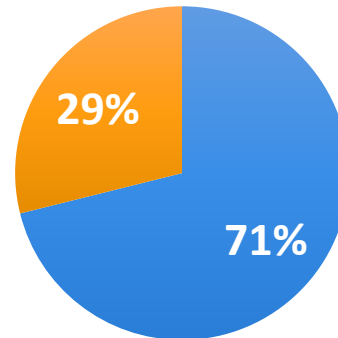# Stable Users vs Unstable Users by Device/Liquid Grouping in Wave 1

Stable users: using same grouping in 3 waves

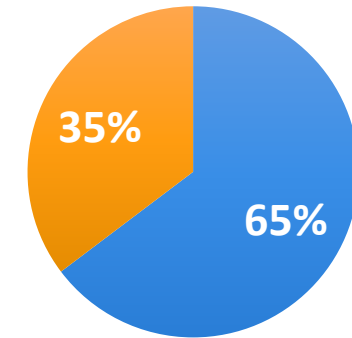**Unstable users:** using one grouping in wave 1 & moving in wave 2 and/or 3

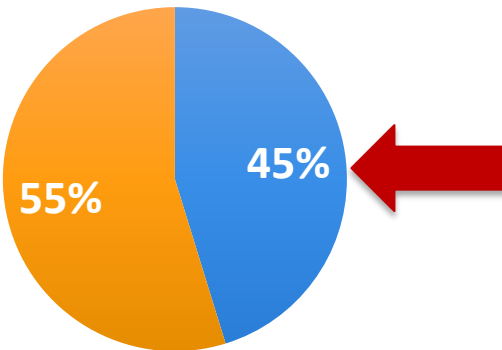### Reusable device with refillable tank (freebase, adj settings) (n=139)

- 32%
- 68%

Reusable device with disposable pod/cart (salt, no adj settings) (n=90)
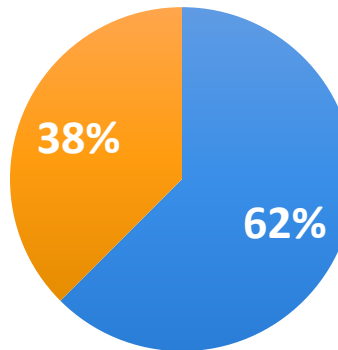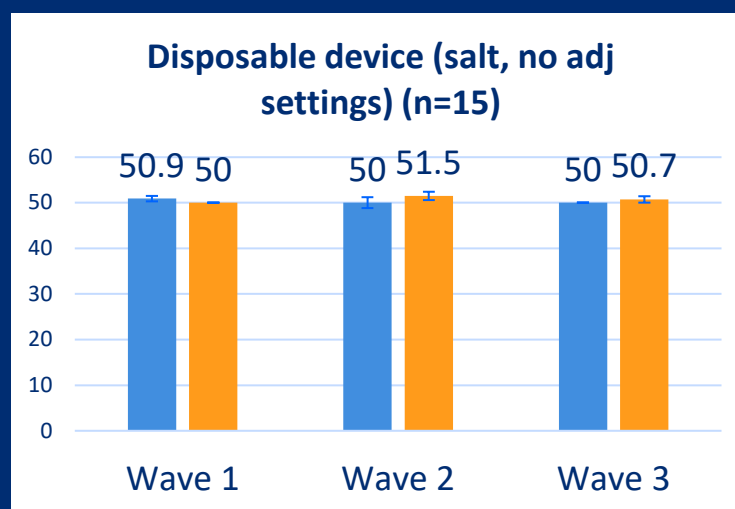
- 29%
- 71%

Reusable device with refillable pod/cart (salt, adj settings) (n=51)

- 35%
- 65%

Reusable device refillable pod/cart (freebase, adj settings) (n=41)

- 55%
- 45%

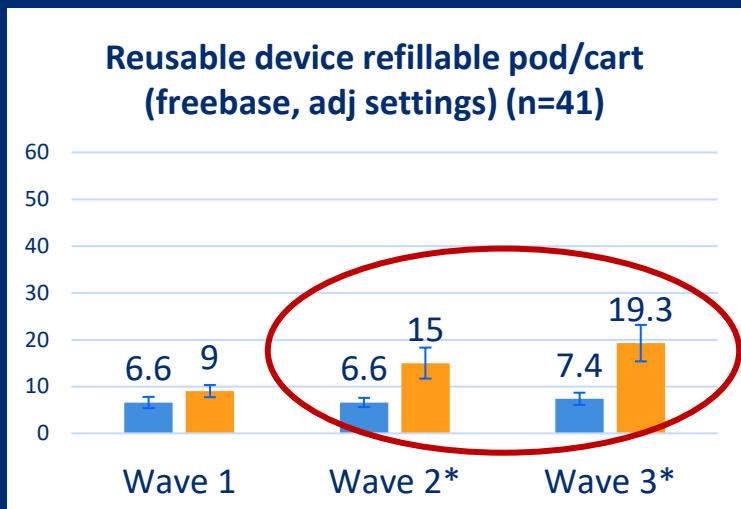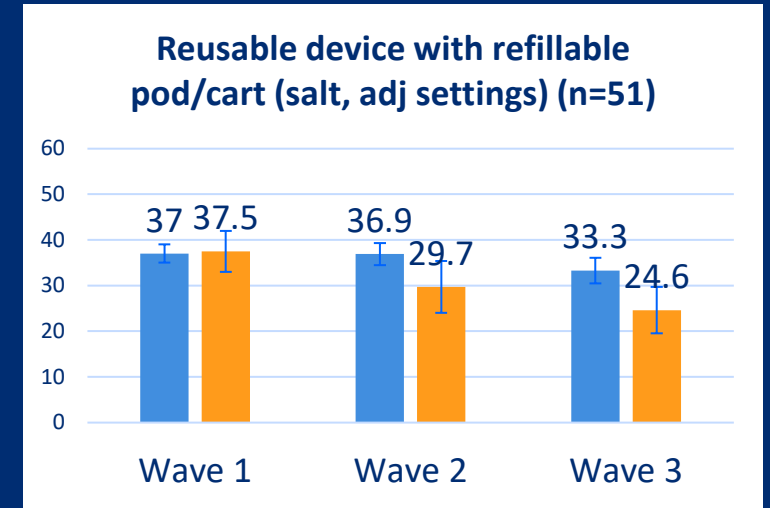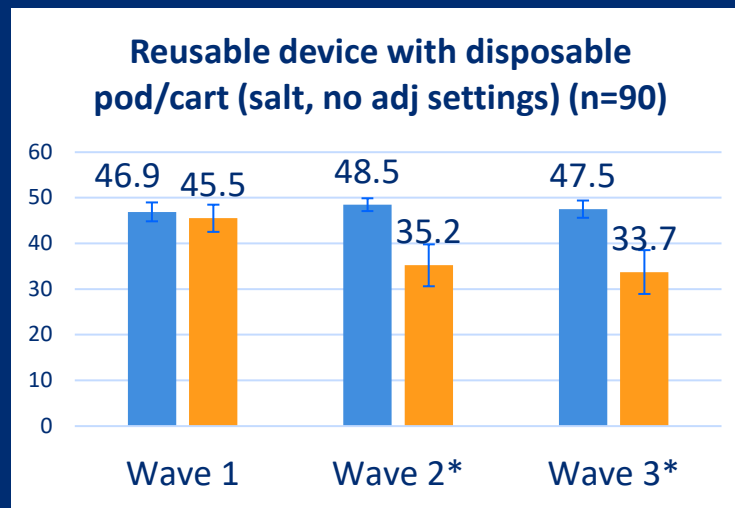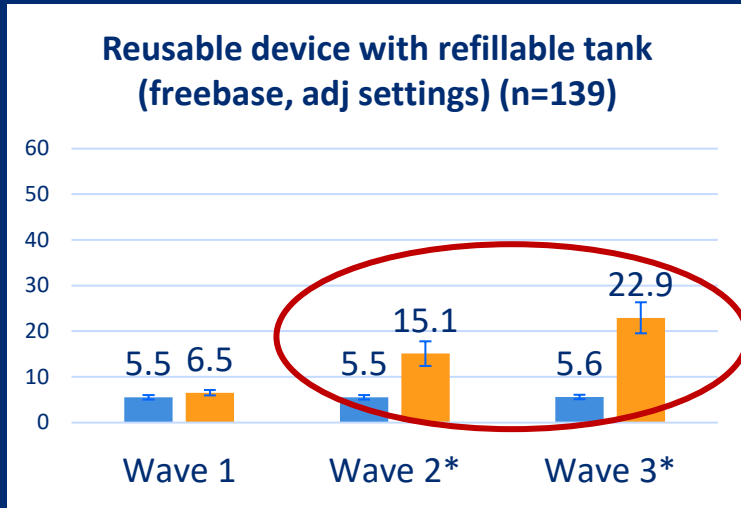### Disposable device (salt, no adj settings) (n=15)

- 38%
- 62%

- More than 60% ENDS users reported using the same device/liquid grouping in three waves except users who began with refillable pod/cart device (freebase, adj settings).

Stable Users vs Unstable Users: Nicotine Concentration (mg/mL)

Stable users: using same grouping in 3 waves

Unstable users: using one grouping in wave 1 & moving in wave 2 and/or 3

Reusable device with refillable tank (freebase, adj settings) (n=139)

	Stable	Unstable
Wave 1	5.5	6.5
Wave 2*	5.5	15.1
Wave 3*	5.6	22.9

Reusable device with disposable pod/cart (salt, no adj settings) (n=90)

	Stable	Unstable
Wave 1	46.9	45.5
Wave 2*	48.5	35.2
Wave 3*	47.5	33.7

Reusable device with refillable pod/cart (salt, adj settings) (n=51)

	Stable	Unstable
Wave 1	37	37.5
Wave 2	36.9	29.7
Wave 3	33.3	24.6

Reusable device refillable pod/cart (freebase, adj settings) (n=41)

	Stable	Unstable
Wave 1	6.6	9
Wave 2*	6.6	15
Wave 3*	7.4	19.3

Disposable device (salt, no adj settings) (n=15)

	Stable	Unstable
Wave 1	50.9	50
Wave 2	50	51.5
Wave 3	50	50.7

- No significant difference in nicotine concentration between stable and unstable groups among all users of top 5 groupings in wave 1.
- Differences were found in wave 2 & 3 between stable and unstable groups among refillable tank (freebase, adj settings), disposable pod/cart (salt, no adj settings) and refillable pod/cart (freebase, adj settings) users.

* Significant at p<0.05.

Conclusions

Conclusion

- Approximately 90% of frequent ENDS users began with one of five device/liquid groupings in 2020.

- A rapid growth in disposable device (salt, no adj settings) users and a decrease in refillable tank (freebase, adj settings) and disposable pod/cart (salt, no adj settings) users were observed in 1.5-year period.

- Most frequent ENDS users continued using the same device/liquid groupings over a 1.5-year period except refillable pod/cart (freebase, adj settings) users.

- Users who transitioned from refillable tank (freebase, adj settings) to other groupings were more likely to increase the nicotine concentration of their liquid compared to the stable users.

Regulatory Implications

- The new disposable devices, such as Elf Bar, may trigger the migration away from tanks or disposable pods/cartridges. Significant increase in using disposable devices that contain nicotine salts and deliver higher levels of nicotine may lead to an increased dependence on ENDS.

- The movement of tank (freebase, adj settings) and refillable pod/cart (freebase, adj settings) users was associated with increases in nicotine concentration, while stable disposable device (salt, no adj settings) users used a similar nicotine concentration as unstable users.

- Future research can examine possible changes in health outcomes in response to device/liquid grouping transition to evaluate the public health implications of these behaviors and to better forecast the potential impacts of possible regulations on nicotine formulation and concentration.

Thank you!

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