



Dual Users Decoded: Exploring the Mosaic of Behaviors and Unique Journeys

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October 21, 2025



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Outline

Introduction

Characterization of Adult Dual User Subgroups

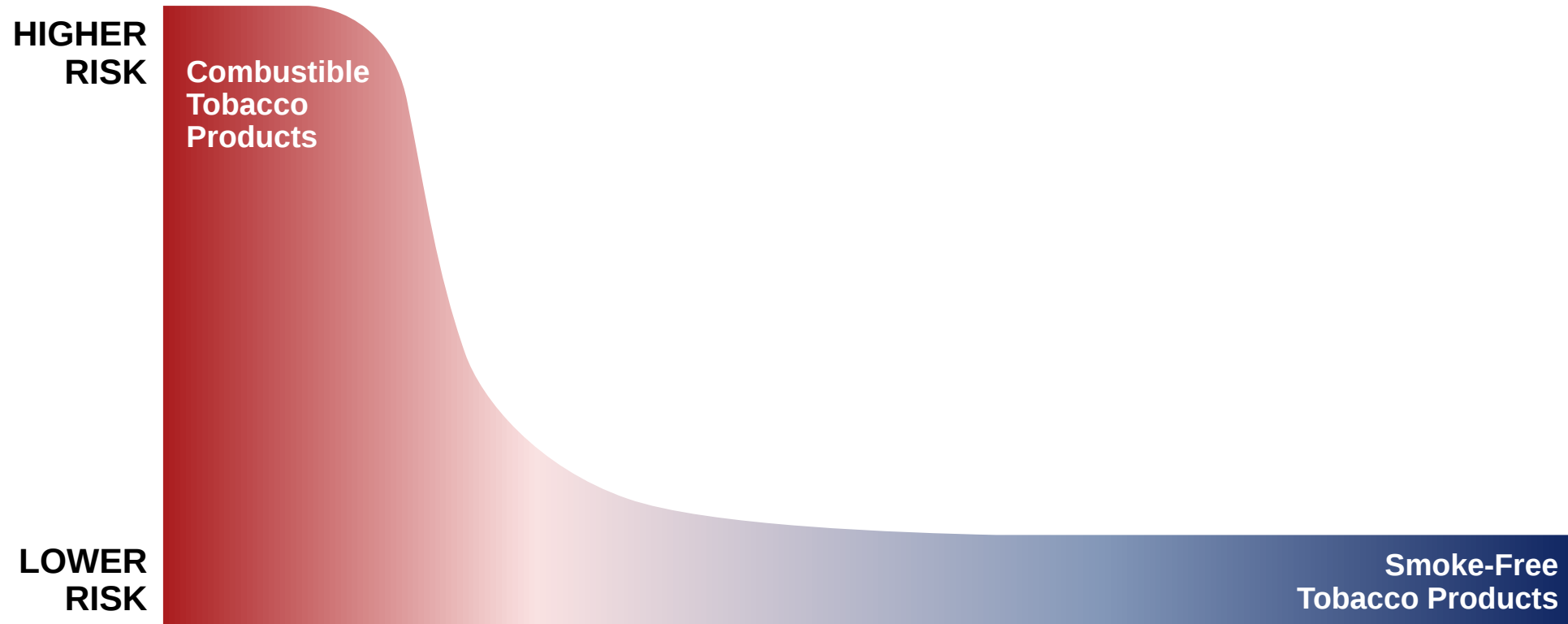
- Cross-sectional Assessment of Biomarkers of Exposure Based on Frequency of Smoking
- Longitudinal Assessment of Biomarkers of Exposure Based on Cigarette Consumption

Key Takeaways



Risk Differential – Combustible vs. Smoke-free Products

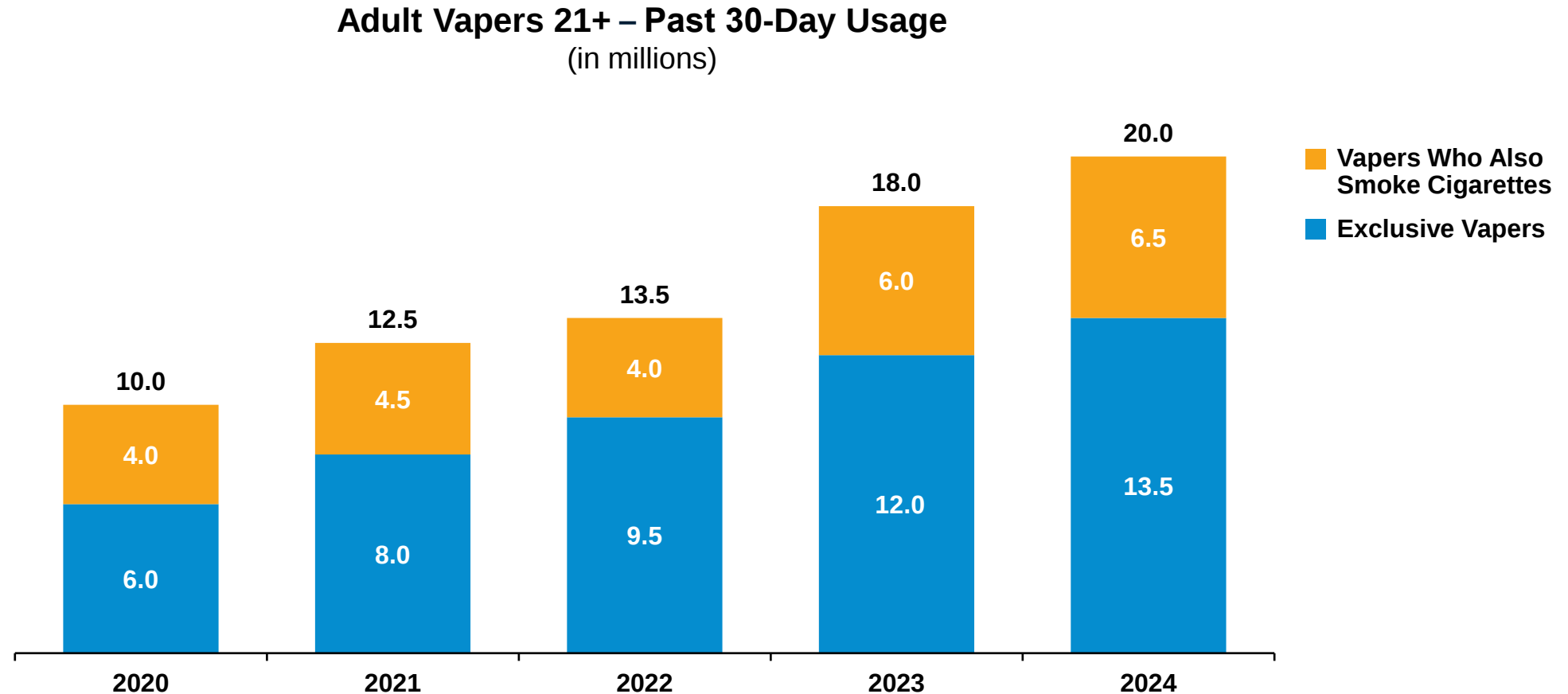
Risk Cliff Between Combustible & Smoke-Free Tobacco¹



¹Adapted from Nutt, et. al Estimating the Harms of Nicotine-Containing Products Using the MCDA Approach. *Eur. Addict Res* 2014; 20:218-225.



E-Vapor Has Been the Most Successful Category Transitioning Smokers

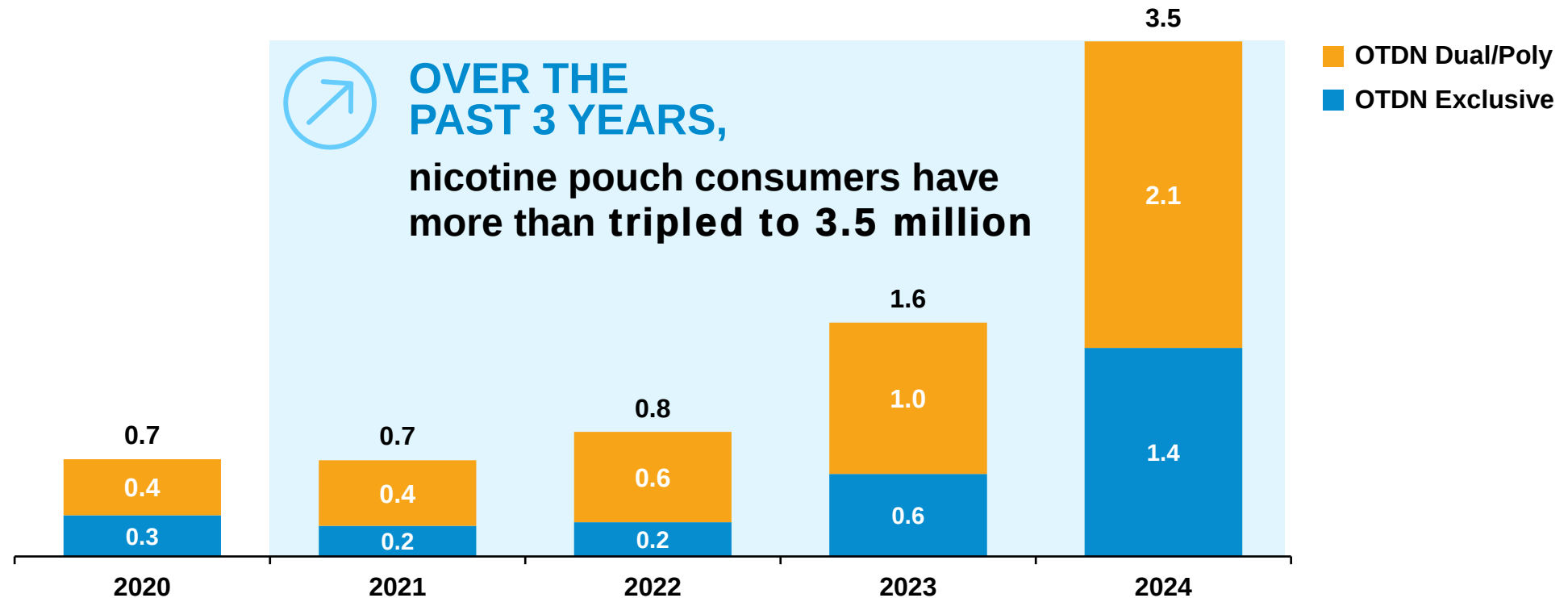


Note: Estimates are based on self-reported use of E-Vapor in the past 30 days. Self-reported product use trends may not correspond with changes in sales or shipment volume.
E-Vapor Exclusive: Using e-vapor exclusive of any other tobacco products. E-Vapor Dual/poly: Using e-vapor and at least one or more tobacco products.*Age 21 or older.
Source: Altria Client Services LLC Adult Tobacco Consumer Tracker (ALCS ATCT) 2020 to 2024 Data.



Oral Tobacco Derived Nicotine Pouch is Rapidly Growing

Adult OTDN Users Past 30-Day Usage
(in millions)



Note: Estimates are based on self-reported any use of OTDN in the past 30 days. Self-reported product use trends may not correspond with changes in sales or shipment volume.

OTDN Exclusive: Using OTDN exclusive of any other tobacco products (q1_onic=1 and q1_tot_tobc=1). OTDN Dual/poly: Using OTDN and at least one or more tobacco products (q1_onic=1 and q1_tot_tobc>1).

*Age 21 or older. Results are based on population weights. Numbers may not foot due to rounding.

OTDN=Oral Tobacco-Derived Nicotine.

Source: Altria Client Services LLC Adult Tobacco Consumer Tracker (ALCS ATCT) 2020 to 2024 Data.

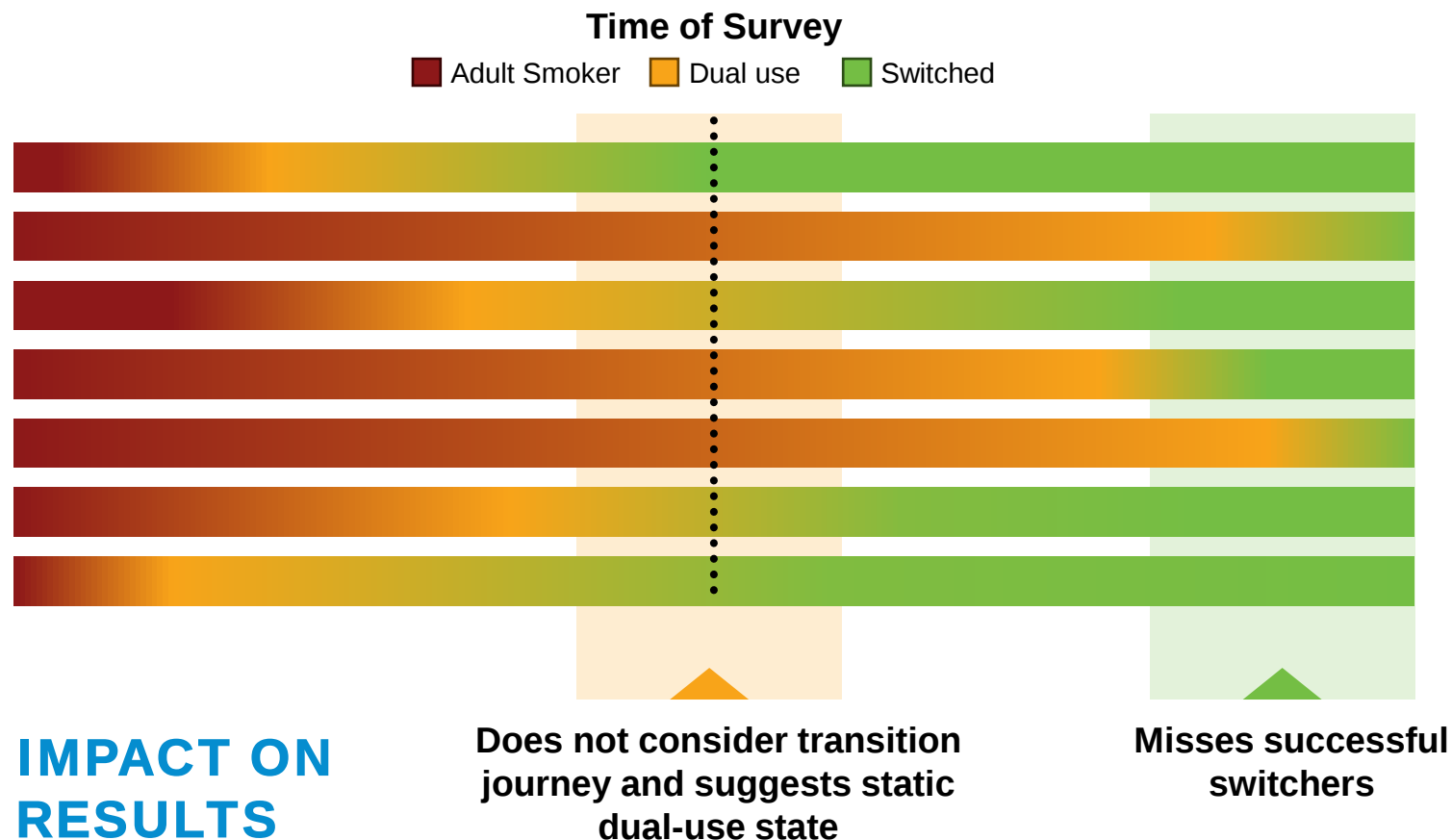


Selection Bias from Incomplete “Capture”

Defining “dual use” cross-sectionally

(i.e. based on what they were using at the time of the survey)

will categorize these people differently, even though many will eventually switch



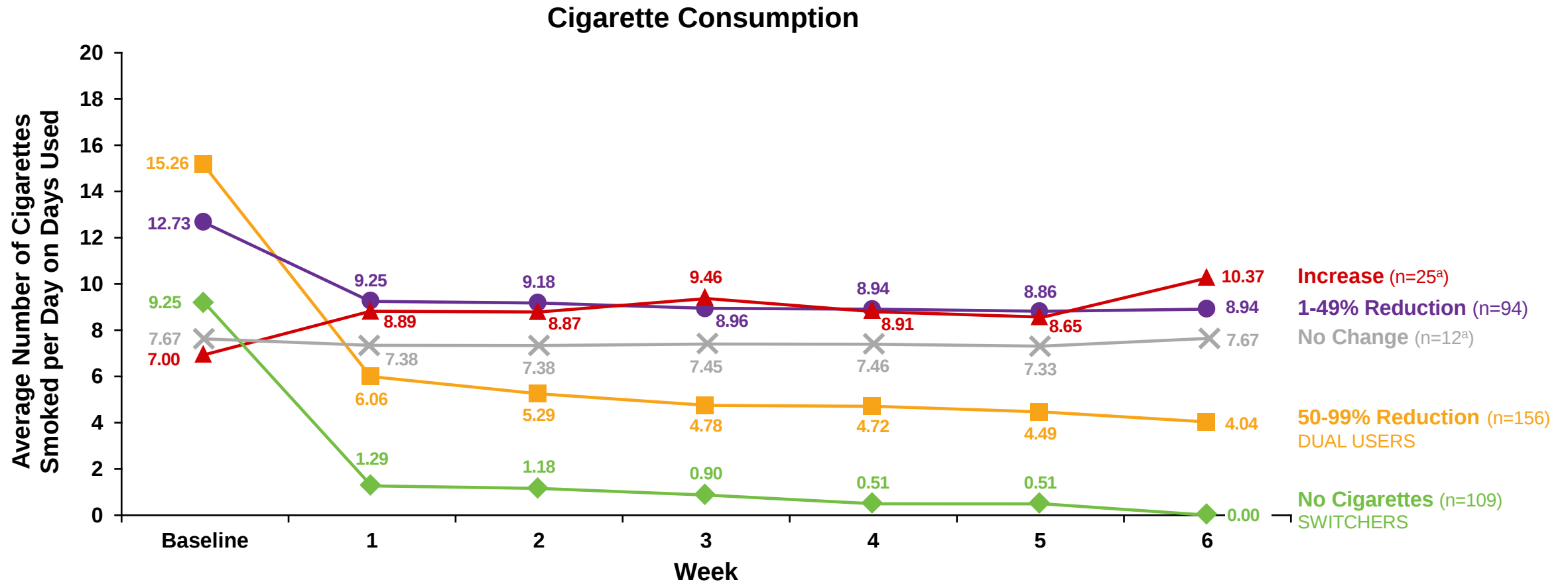
Slide adapted from Dr. Arielle Selya presentation at the Tobacco Research Science Conference, Knoxville, TN. Sept. 16, 2025



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Trajectory of Use Behavior Over Among Adults Who Smoke (AS) Transitioning to on!® Nicotine Pouches



^aCaution: small sample size.

Note: Cigarette consumption in this figure was calculated only among those participants who reported using on! nicotine pouches during Week 6.

Becker E, McCaffrey S, Lewis J, Vansickel A, Larson E, Sarkar M. Characterization of *Ad Libitum* Use Behavior of *On!* Nicotine Pouches. *Am J Health Behav.* 2023;47(3):428-449.



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Lack of Standardization in Dual Use Characterization

Any use of both products	• Current cigarette and ever e-cigarette use^{1,2} • Everyday or some days use of both^{3,4,5,6,7,8} • Weekly use of both products⁹
Daily and non-daily use of both products	• Daily cigarette use and everyday or some days e-cigarette use¹⁰ • Daily e-cigarette use with cigarette smoking¹¹ • Daily and non-daily use of both products¹²
Frequent and infrequent use of both products	• Light, predominant, and heavy use of both products¹³ • Frequent and infrequent use of both products¹⁴
Consumption	• Reducers, maintainers, increasers¹⁵ • Low and High CPD¹⁶ • Reductions in CPD¹⁷

1. Christensen 2014; 2. Cheng 2022; 3. Simonavicius 2017; 4. Goniewicz 2018; 5. Coleman 2019; 6. Chang 2021; 7. Strong 2022; 8. Chen 2024; 9. Levy 2016; 10. Rostron 2019; 11. Biener 2015; 12. Smith 2021; 13. Buu 2022; 14. Lizhnyak 2022; 15. Anic 2022; 16. Xue 2025; 17. *Forthcoming* Lizhnyak 2025.



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Cross-Sectional Assessment of Adult Dual User Subgroups

The Population Assessment of Tobacco and Health (PATH) Study

Wave 1 Adult Questionnaire Restricted-Use Files and Biomarker Restricted-Use Files (2013-2014)

STUDY GROUPS:

- Four Dual User Subgroups
- Exclusive Daily Cigarette Smokers
- Exclusive Daily E-Cigarette Users
- Never Tobacco Users

POPULATION:

Adults aged 18 or older¹

OUTCOMES

Biomarkers of exposure (BOE)

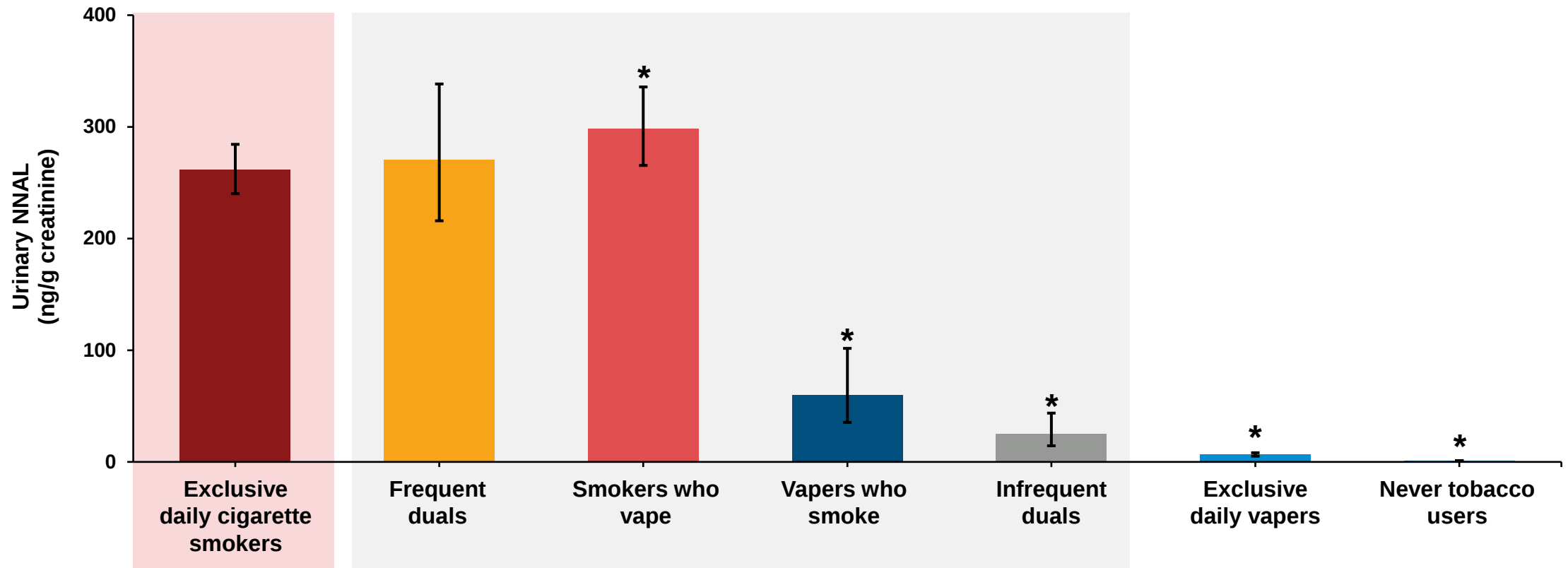
		CIGARETTE USE BEHAVIOR	
		Frequency	
E-VAPOR USE BEHAVIOR	≥20 days	≥20 days	<20 days
	<20 days	≥20 days	<20 days
	≥20 days	Frequent Duals	Vapers Who Smoke
	<20 days	Smokers Who Vape	Infrequent Duals

¹The analysis was not restricted to 21+ because, at the time data were collected, the federal minimum legal age to purchase tobacco products was 18.



Impact of Dual Use Should Consider Subgroups

Exposure to NNK (NNAL) Among Exclusive Daily Cigarette Smokers, Dual User Subgroups, Exclusive Daily E-cigarette Users, and Never Tobacco Users



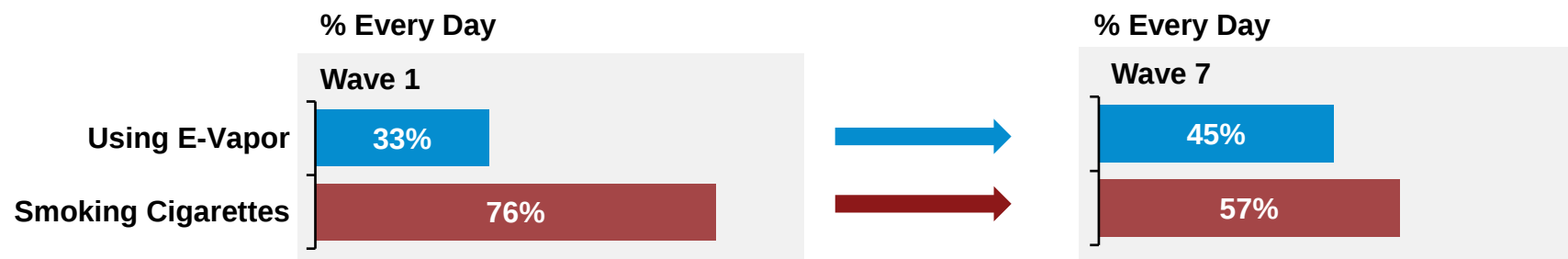
Abbreviation: NNAL: 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol; NNK: 4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone
Note: * - denotes statistically significant difference ($p < 0.05$) when compared to exclusive cigarette smokers.



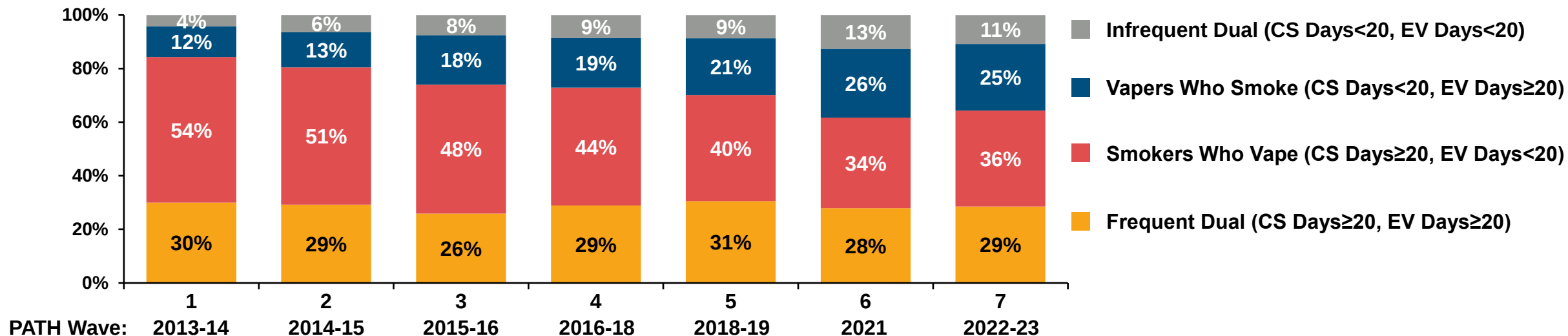
Changes in Cigarette and E-Vapor Dual Use Pattern

Cross-Sectional Analysis of PATH Wave 1 to Wave 7 Data

Cigarette and E-Vapor Dual Use Group



Proportion of Dual User Segment (Cigarette and E-Vapor Dual Group)



ALCS Cross-Sectional Analysis of PATH Wave 1 to Wave 7 Adult (18+) Data.

Dual User Group Sample Sizes: Wave 1 n=680; Wave 2 n=802; Wave 3 n=687; Wave 4 n=784; Wave 5 n=915; Wave 6 n=639; Wave 7 n=719.



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Longitudinal Assessment of Adult Cigarette Smokers Who Transition to ENDS

DATA SOURCE

PATH Waves 1-5 RUF Biomarker Core

STUDY GROUPS

Adults 18+ Exclusive Established Cigarette Smokers who switched to ENDS, dual used, or quit smoking

OUTCOME MEASURES

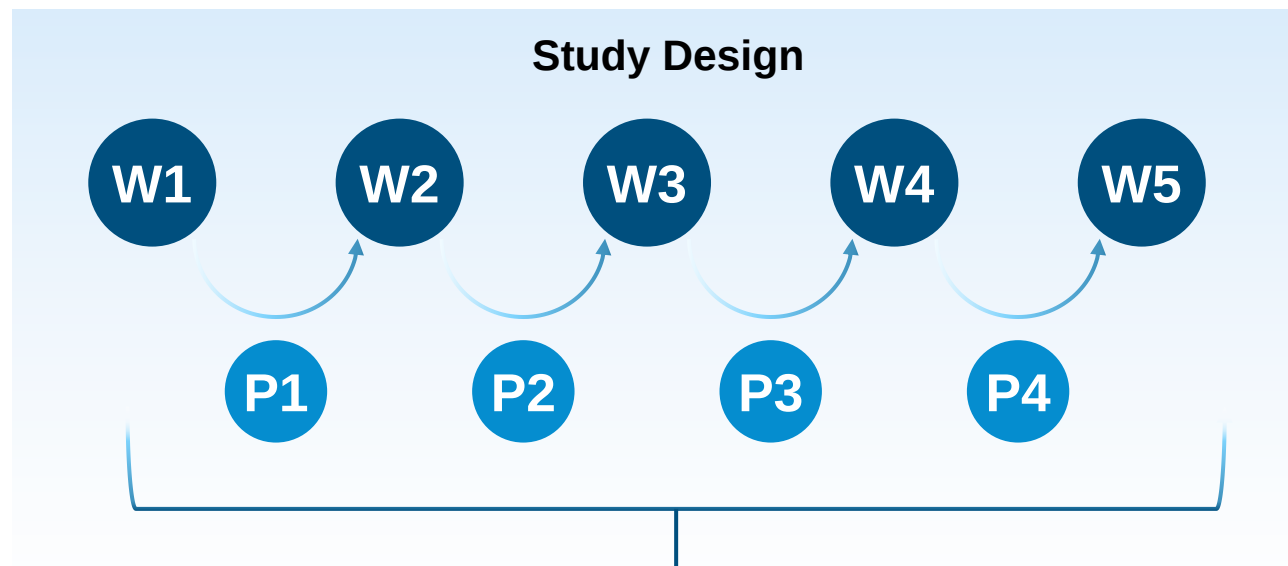
Biomarkers of Exposure (BOE)

MODEL

Generalized Estimating Equations (GEE)

COVARIATES

Age, sex, race and ethnicity, education, cigarettes per day, time (survey wave), and subject-specific correlations

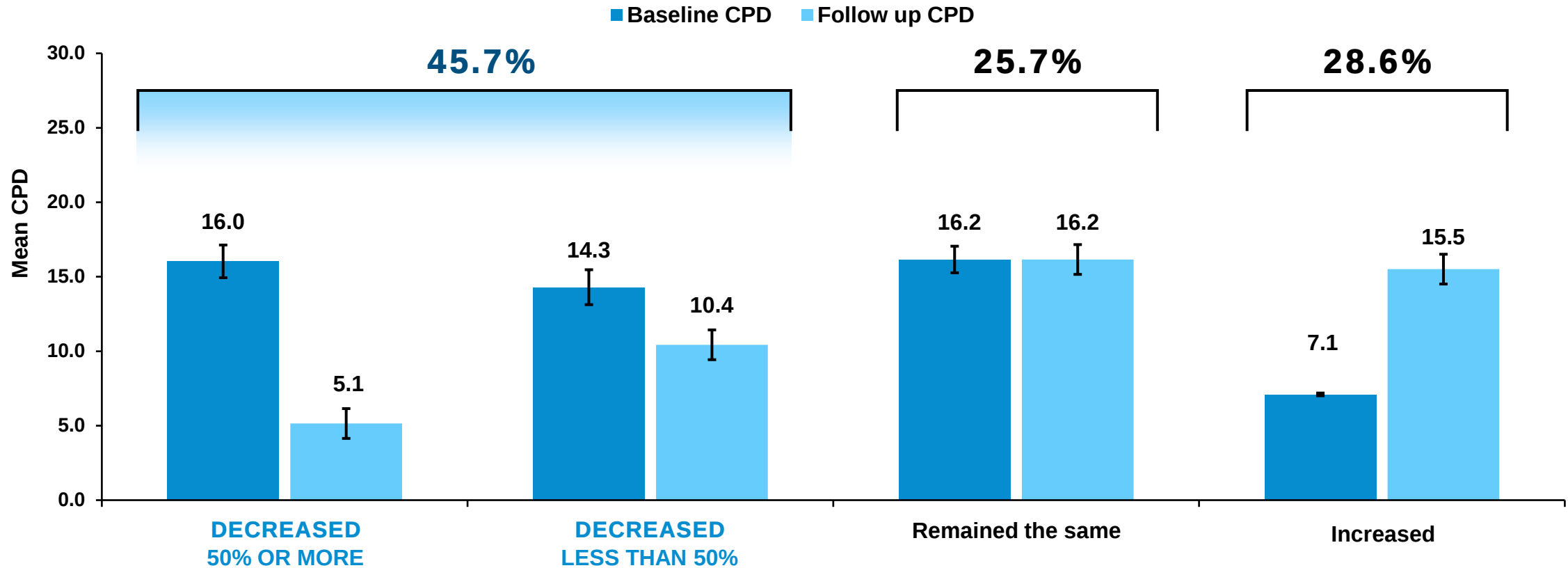


Tobacco User Group	Abbr.	Number of Observations
Exclusive Established Cigarette Smokers	CS	5,178
Exclusive Established ENDS Users	AE	79
Exclusive Established Dual Users	ADU	311
Former Smokers (no past 30-day tobacco use)	AQ	544



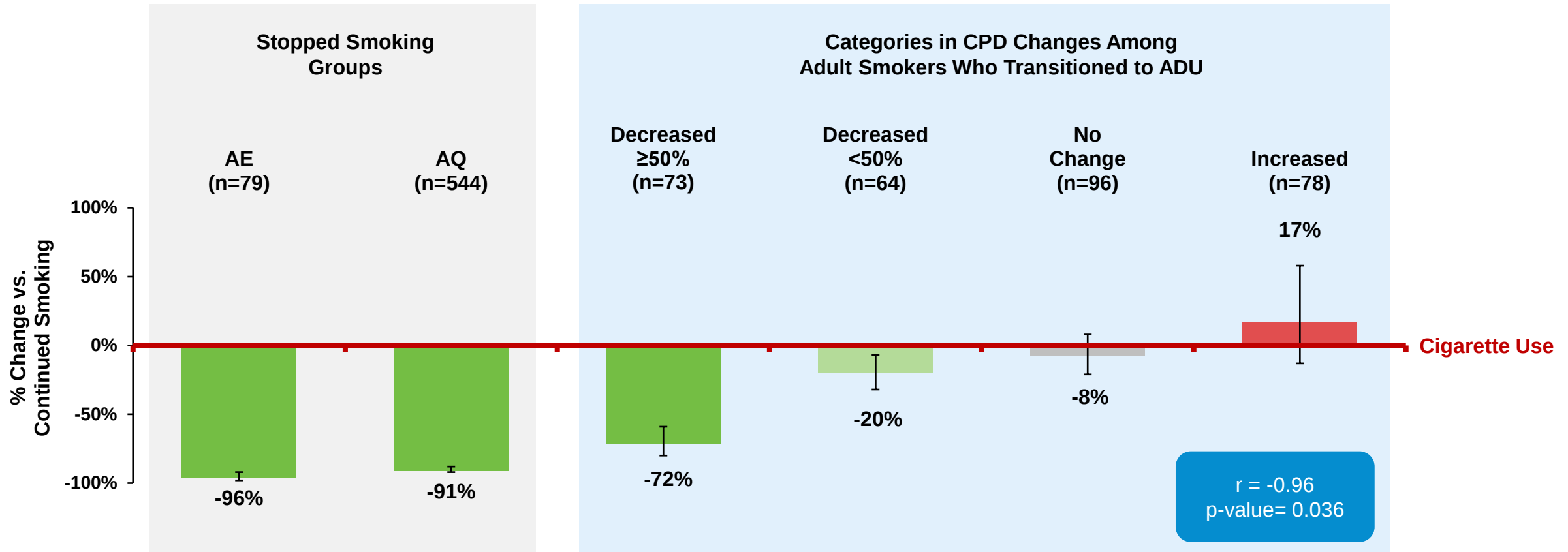
About Half of Adult Cigarette Smokers Who Transitioned to Dual Use Reduced Their Cigarette Consumption

Change in Cigarette Consumption from Baseline to Follow-up
Among Dual Users (ADU), Grouped by CPD Change



Using Cigarette Consumption Patterns to Differentiate Dual Use Subgroups

Changes in NNAL vs. Continuing Smoking



Abbreviations: **NNAL**: 4-(methylnitrosamino)-1-1(3-pyridyl)-1-butanol; **AE** – Exclusive Established ENDS Users; **AQ** – Former Smokers (no past 30-day tobacco use); **ADU** – Exclusive Established Cigarette Smoking and ENDS Users; **CPD** – Cigarettes Per Day



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Key Takeaways

- ✓ **Dual users are not a monolithic group**
transition from cigarettes to smoke-free products is unique for each individual
- ✓ **Segmenting dual users by frequency of cigarette use is key**
to accurately assess exposure and understand risk
- ✓ **Some subgroups will experience substantial reduction in exposure**
which can lead to reduced risk of smoking-related diseases





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