

Transitioning Dual Users Off Combustible Cigarettes: Maximizing Complete Switching

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Framing the Issue

- Combustible cigarette smoking remains the leading cause of preventable death
 - > 7 million deaths per year worldwide
 - >480,000 deaths per year in the U.S.
 - Comparison: COVID-19 to date (11/24/2020) has led to > 1,415,000 deaths worldwide; 262,000 in U.S.
- An unprecedented effort globally to combat the COVID-19
 - “All hands on deck” approach of all approaches – prevention, minimization of harm, and treatment
- Let's capture this sense of urgency with battling COVID-19 and apply to smoking.
 - If we were to similarly take a comprehensive, aggressive approach to end combustible smoking, we might be more open to considering e-cigarettes as an alternative for combustible smokers who have not been able to quit, despite availability of known options, or who are not yet ready to quit
- So, how can we best help smokers successfully switch completely from combustible cigarettes to e-cigarettes as a way off the combustible road?
 - Important to help DUAL users of both combustible and e-cigarettes to switch completely or to give up both completely
 - Need to understand how to maximize complete switching

Key Concept to Consider: Balance

What is the right “balance” for Dual Users?

- Uncertainty: How much do we hold out for until we have full certainty? Evidence consideration
- Hedonic Adaptation: What balance do we need to achieve for smokers to help them quit?



Framework for understanding dual use

- Pacek, Wiley, & McClernon (2018) introduced a conceptual framework for understanding factors that contribute to multiple product use. Framework integrates:
 - **Person** level factors (e.g., demographics; nicotine dependence)
 - **Situational** factors (e.g., smoking restrictions, craving/withdrawal, alcohol or other substance consumption, presence of other smokers)
 - **Product** factors (e.g., nicotine content, flavoring, availability)
 - **Interactions** among all person, situation/context, and product
- Ecological Momentary Assessments (EMA; “real time data capture”) provide an ideal opportunity to evaluate contributions of all levels (person, product, situation) within this framework to help understand choice and use of specific products

Choice of Product “in the Moment”

- Goal is to understand predictors of dual users’ “in the moment” choice of either a cigarette or e-cigarette
 - Identify factors that may help to tip the balance towards e-cigs or obstacles to their use
- Consider the combined influence of person level characteristics, product characteristics, and situational/contextual factors along with their interactions to predict product choice (Cigarette or e-cigarette) in real time among dual users.

Observational Study of Dual Users

- Observational study of adult “dual users” (N =410) who are primarily combustible cigarette smokers who are “early” in their uptake of e-cigarettes
 - No inclusion criteria for wanting to quit combustible
- Goals of the study are to examine the patterns and predictors of changes in tobacco use patterns (combustible/e-cigarette patterns), with an emphasis on subjective experience and contexts of use of products, over a 12 month time frame
 - Use of ecological momentary assessments (EMA) at multiple time points
 - Biweekly reports of cigarette and e-cigarette use over the 12 months
 - Extensive psychosocial and behavioral questionnaires at baseline and 12 months

Participant Characteristics

- 54% male; 46% female
- Race/Ethnicity: 31.1% White; 38.5% African-American; 14.9% Asian; 11.2% Hispanic; 4.3% Other
- Mean Age = 38.6 years (SD=12.4)
- Education: 19.1% no more than high school education
- Employment: 70% work full or part-time
- Baseline Daily Rate of combustible cigarettes: 8.9 (SD=7.84) cigs/day
- Baseline Daily Rate of e-cigarette use: 4.7 (SD=6.68) “sessions”/day

EMA Data Overview

- EMA protocol included both random prompts (5-7/day) and participant-initiated event recordings of both cigarette and e-cigarette use episodes
 - EMA interviews included objective contexts (location, presence of others, activities, including alcohol/marijuana use) and subjective experiences (mood pre and post use; urge; withdrawal; subjective ratings of satisfaction, pleasure of product)
- For inclusion in the current study analyses, participants needed to provide both cigarette and ENDS use EMA data – i.e., real time recording of use of both products – over two waves of EMA data collection

EMA Tobacco use (2 waves of 7-days each)

	Mean Episodes/Person	Total Episodes
Cigarettes	43.0 (range 2-162)	6912
E-cigarettes	18.2 (range 2-127)	2940
TOTAL TOBACCO USE EVENTS		9852

Reasons for E-Cigarette use “In the moment” (N = 3185 events)

Reason	Frequency Endorsed
Using as a substitute for cigarettes	70.8%
Trying to cut down on smoking	42.1%
Less harmful than cigarettes	36.8%
Trying to quit smoking	33.8%
Like it more than cigarettes	30.9%
Cheaper than cigarettes	26.5%
Smoking not allowed in this location	22.7%
Because others dislike cigarettes	15.1%

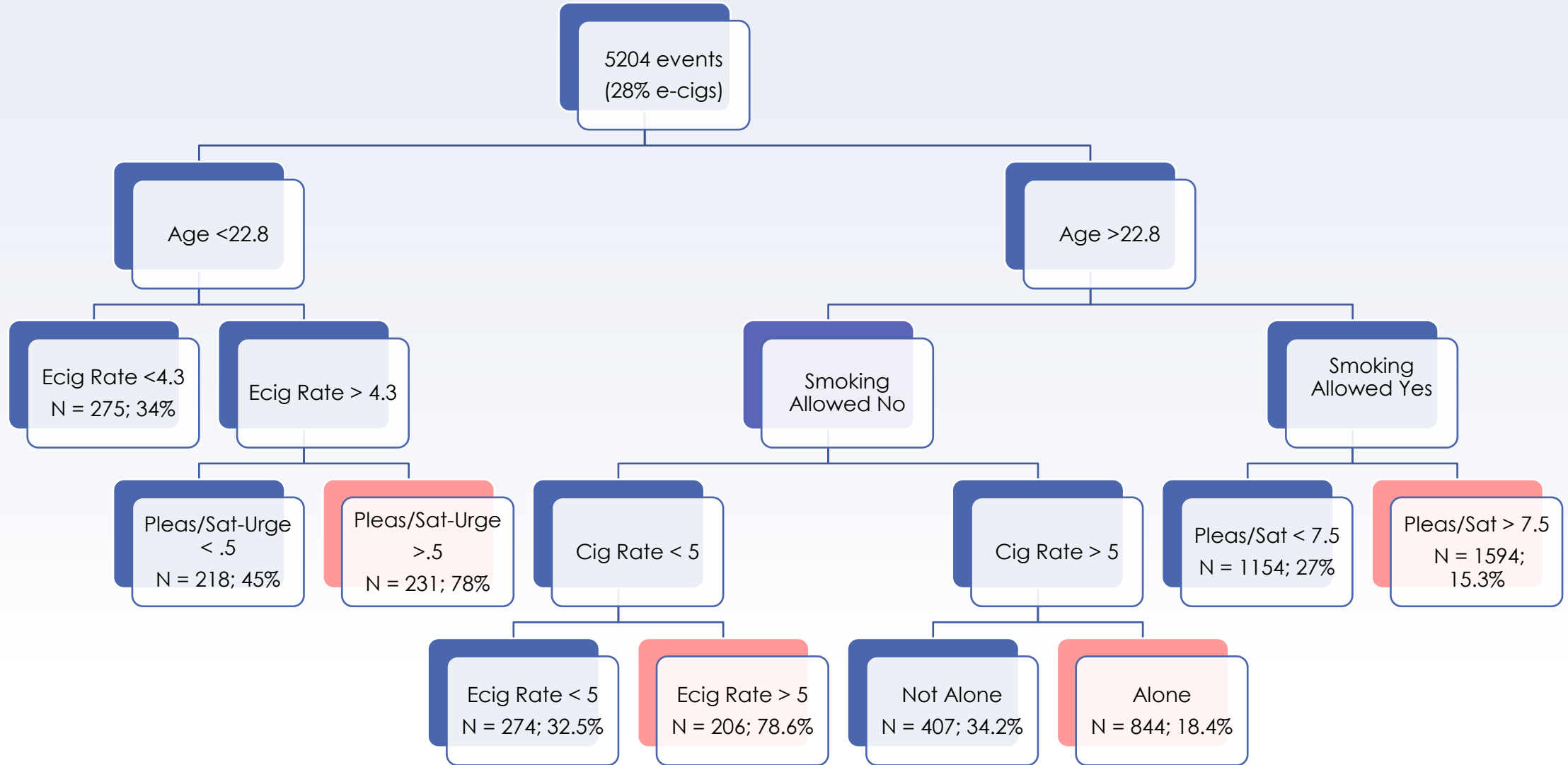
Choice of product may reflect interactions among multiple factors: Use of Conditional Classification Tree Analysis

- Conditional classification tree analysis is a hierarchical, exploratory analytic technique that allows for the simultaneous consideration of multiple variables to predict an outcome.
 - Decision trees are hierarchical; splits continue until no longer significantly different or limited sample size (set limit to 200 events)
 - Identifies a set of characteristics that best differentiates individuals along an outcome
 - Outcome here is predicting choice of e-cigarette over cigarette

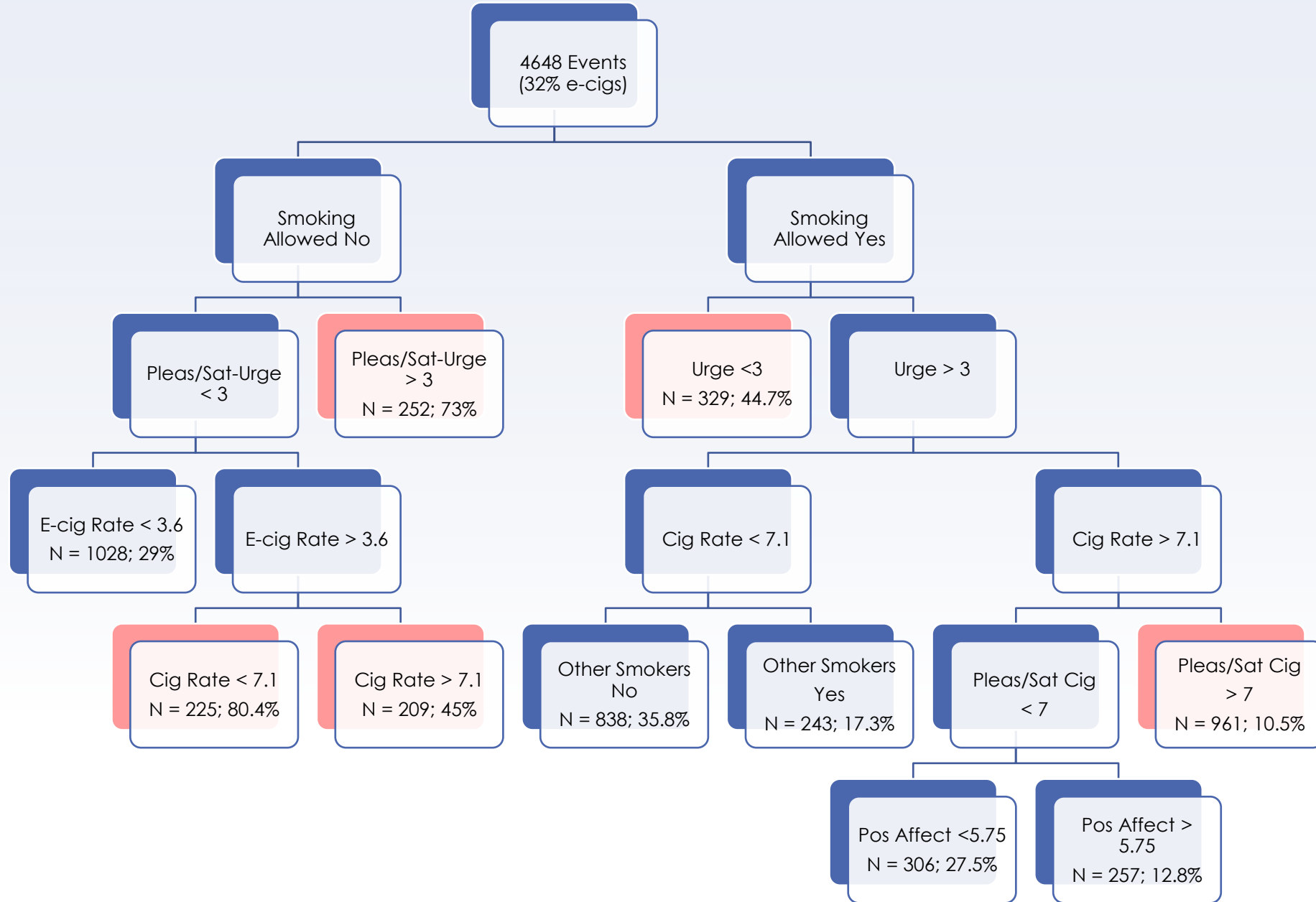
Variables considered in Classification Tree Analysis – Predicting in the Moment E-Cigarette Use

Person Level Variables	Product Level Variables	Person X Product	Situational Variables	Person X Product X Situation
<ul style="list-style-type: none"> • Demographics (gender, age, race/ethnic) • Nicotine Dependence • Baseline rates of use of products 	<ul style="list-style-type: none"> • Flavoring (Tobacco; Menthol/Mint; Sweet; Other) 	<ul style="list-style-type: none"> • Pleasure/Satisfaction 	<ul style="list-style-type: none"> • Alone/with others • Presence of other smokers • Smoking restrictions • Urge prior to use • Negative Affect prior to use • Positive Affect prior to use • Alcohol or Marijuana Use 	<ul style="list-style-type: none"> • Pleasure/Satisfaction - Urge

Classification Tree Analysis Predicting Use of E-cigarettes (28% of events) "In the Moment" (Wave 1)



Classification Tree Analysis Predicting Use of E-cigarettes (32% of events) "In the Moment" (Wave 2)



Evaluating “Goodness of Fit” of Trees

- Classification trees are “exploratory” predictions and sensitive to specific data set
 - Replicated by splitting observations in half
- Accuracy – correct classification rate – proportion of observations for which the prediction and actual response agree
 - Wave 1: .77
 - Wave 2: .73
 - Excellent at classifying cigarette events (>.96 both waves), but less good at classifying e-cigarette events (.65)
- Positive predictive Value (precision) = .73, .73
- Negative predictive value = .77, .73

Key Factors that Drive Choice

- Reasonable concordance in terms of identifying set of variables that emerge from both analyses as most important – Person, Product, Situation, and Interaction
 - Age
 - Daily Cigarette Rate
 - Daily E-Cigarette Rate
 - Contextual – Smoking Allowed or not; Presence of others/Alone
 - Urge for cigarette
 - Level of pleasure/satisfaction –
 - Whether pleasure/satisfaction derived from e-cigarette greater than level of urge for cigarette

Summary Take Home Points to Consider

- Richard Klein, “Cigarettes are Sublime”
- What motivates people to smoke?
 - Not just relief of negative affect
 - Not just withdrawal relief
 - For many, the power of positive reinforcement and subjective pleasure is a driver
- Concept of Balance:



- Potential advantage of e-cigarettes is in their delivery of pleasure/satisfaction that may overcome urge

How to Maximize Complete Switching

- Pay attention to drive for pleasure/satisfaction – product characteristics matter
 - This can be a highly valued “commodity” – not just a “bridge”
 - Not everything is relief of negative affect
 - Need to do more than just de-value cigarettes, but “drive” smokers to an alternative (which may be aspirational – “health”; or may be product)
- For higher rate smokers, and older smokers, may take more “trial and error” to find the right e-cigarette and taste/flavor, voltage, etc.
- Context matters – usual messages about time around other smokers
 - Encourage “social spread” of nonsmoking even when switching
- Importance of pleasure during COVID-19 era and decisional balance

Back to Balance

- Is it a “dangerous” message to stress the importance of subjective pleasure in e-cigarettes?
 - Are we in danger of making them appealing to youth?
- Perhaps this is the point to take advantage of changes with current world context and COVID-19 pandemic
 - Has the balance shifted with youth use? What are trends?
Can we reposition e-cigarettes in a new light?
- Quitting combustible cigarettes remains the target goal!