Switching Away from Combustible Cigarettes across a 12-Month Period Among Adult Smokers who Purchased the JUUL® System

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Introduction

- The adverse health effects of smoking are primarily caused by exposure to the byproducts of tobacco combustion[1]

- Electronic nicotine delivery systems (ENDS) expose users to lower levels of smoking-related carcinogens and toxicants than cigarettes[2]

- Evaluating switching away from combustible cigarettes among adult smokers who use electronic nicotine delivery systems (ENDS) is a key component of assessing the population health effects of ENDS

Methods

- Adult smokers (age ≥21 years) who purchased the JUUL System ("JUUL"; Juul Labs, Inc.) were recruited into a prospective cohort study in 2018

- Sample - Current Established Smokers (smoked within the past 30 days at baseline, smoked ≥100 cigarettes in their lifetime and currently smoke 'some days' or 'every day')

- Primary Outcome, Switching – No past 30-day smoking, "not even a puff"

- Point prevalence of switching was calculated at 1-, 2-, 3-, 6-, 9- and 12-month follow-up assessments via online surveys

- Repeated-measure logistic regression models assessed associations of baseline sociodemographic factors and smoking characteristics and time-varying JUUL use characteristics with switching across the 12-month period

References

1. U.S. Department of Health and Human Services. Reports of the Surgeon General. In: The Health Consequences of Smoking-50 Years of Progress: A Report of the Surgeon General. Atlanta (GA): Centers for Disease Control and Prevention (US); 2014.
2. National Academies of Sciences, Engineering, Medicine, Health. Public Health Consequences of E-Cigarettes. Washington (DC): National Academies Press (US); 2018.

Results

Table 1. Sociodemographic, and Smoking Characteristics of Sample

Sociodemographic Characteristics	N (%) or Mean (SD)
Age, yr, Mean (SD)	32.65 (10.81)
Sex	
Male	9,820 (55.0)
Female	7,943 (44.5)
Transgender	95 (0.5)
Race/Ethnicity	
Non-Hispanic White	13,183 (78.3)
Non-Hispanic African-American	496 (3.0)
Non-Hispanic Asian	950 (5.6)
Non-Hispanic Other Race	766 (4.6)
Hispanic Ethnicity	1,435 (8.5)
Marital Status	
Married	4,956 (28.0)
Divorced, Separated or Widowed	2,592 (14.6)
Never Married	10,163 (57.4)
Highest Level of Education Completed	
High school graduate or less education	4,689 (27.8)
Some college or associate degree	7,274 (43.2)
Bachelor's degree or more education	4,889 (29.0)
Annual Household Income	
Less than $50,000	8,304 (53.2)
$50,000-$100,000	4,618 (29.6)
Greater than $100,000	2,702 (17.3)
Smoking Characteristics at Baseline	
No. Days Smoked in Past 30 Days, Mean (SD)	23.31 (9.47)
No. Cigarettes Smoked per Day, Mean (SD)	11.10 (8.16)
Duration of regular smoking, yr, Mean (SD)	12.41 (10.66)
Cigarette Dependence (PATH Tobacco Dependence Index: Range 1-5), Mean (SD)	3.04 (1.08)
Plan to Quit Smoking in Next 30 Days	7,356 (43.3)

Note. N=17,986

Figure 1. Proportion of Current Established Smokers Reporting Switching across 12-Month
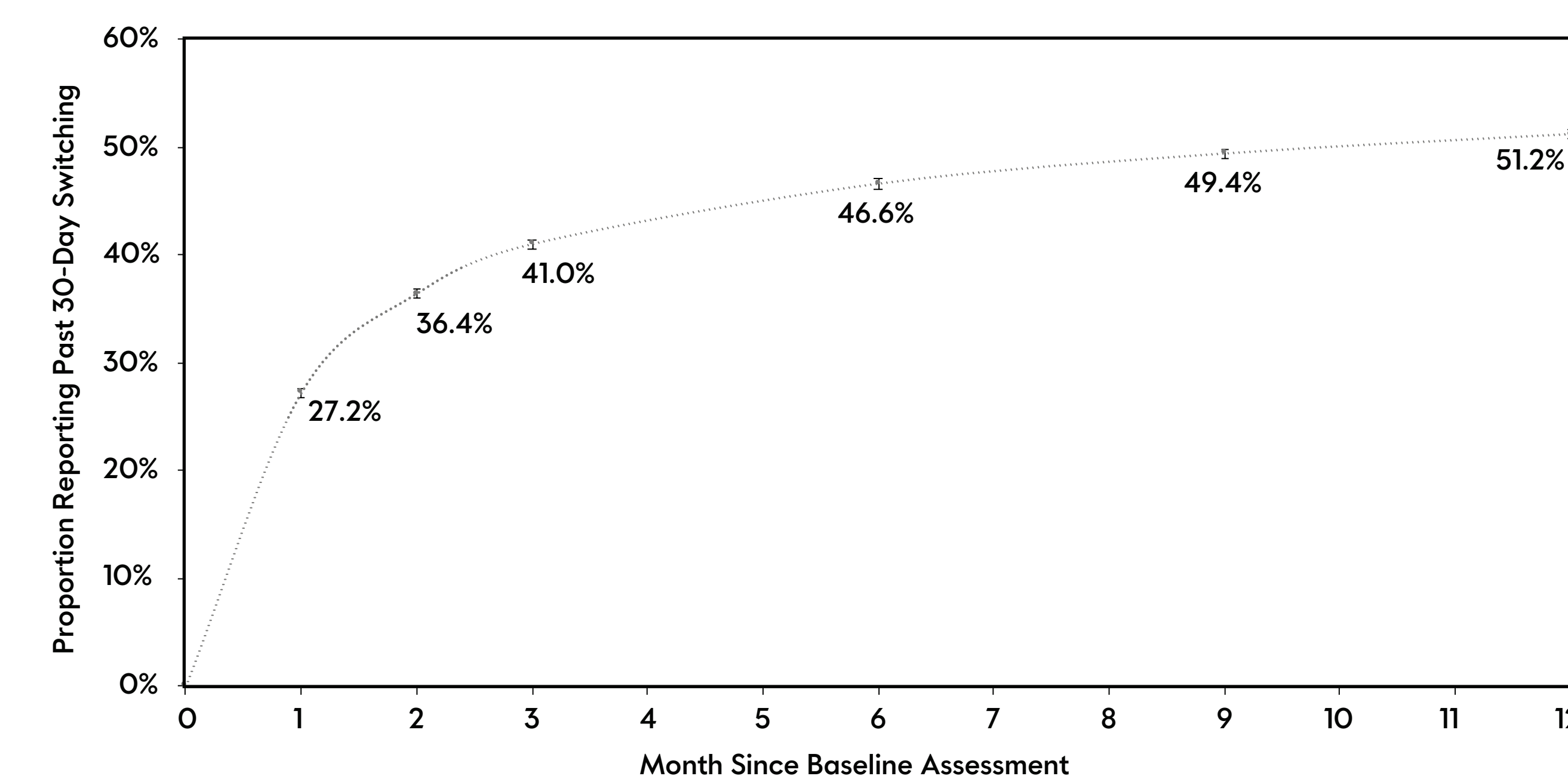
Based on a prior classification and regression tree (CART) analysis smokers were divided into six subgroups based on two variables:
1. Number of days they reported smoking in the past 30 days at baseline (1-19, 20-29, or 30 days)
2. Duration of regular smoking (≤5 years vs. >5 years)

Smoking Status Subgroup	Definition
Infrequent, Short-Term Smokers	Smoked 1-20 days in the past 30 days Lifetime smoking ≤5 years
Infrequent, Long-Term Smokers	Smoked 1-20 days in the past 30 days Lifetime smoking >5 years
Frequent, Short-Term Smokers	Smoked 20-29 days in the past 30 days Lifetime smoking ≤5 years
Frequent, Long-Term Smokers	Smoked 20-29 days Lifetime smoking >5 years
Daily, Short-Term Smokers	Smoked 30 days in the past 30 days Lifetime smoking ≤5 years
Daily, Long-Term Smokers	Smoked 30 days in the past 30 days Lifetime smoking > 5 years

Figure 2. Proportion of Smoker Subgroups Reporting Switching across 12-Month Follow-Up Period
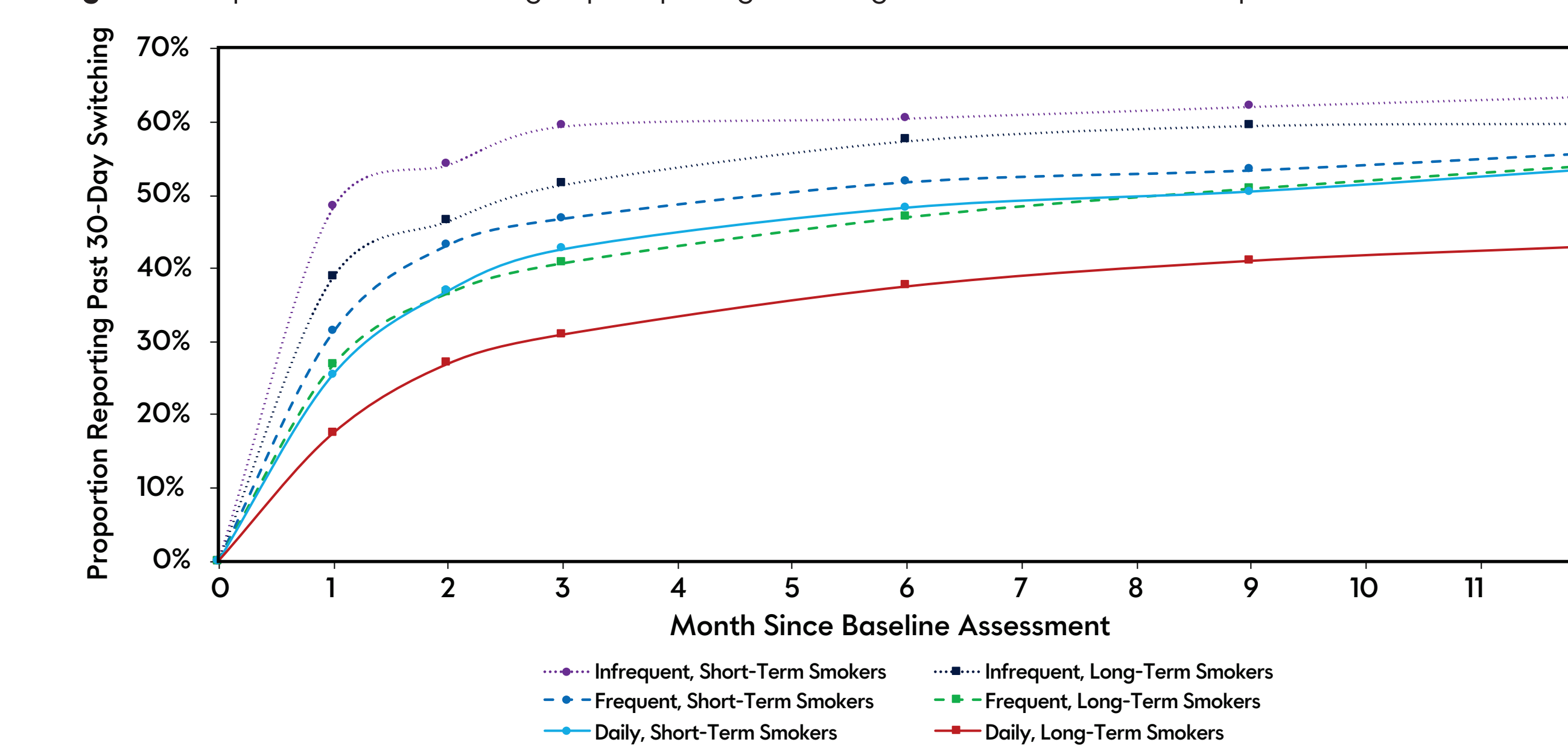

Figure 3. Proportion of Smoker Subgroups Reporting Switching across 12-Month Follow-Up Period
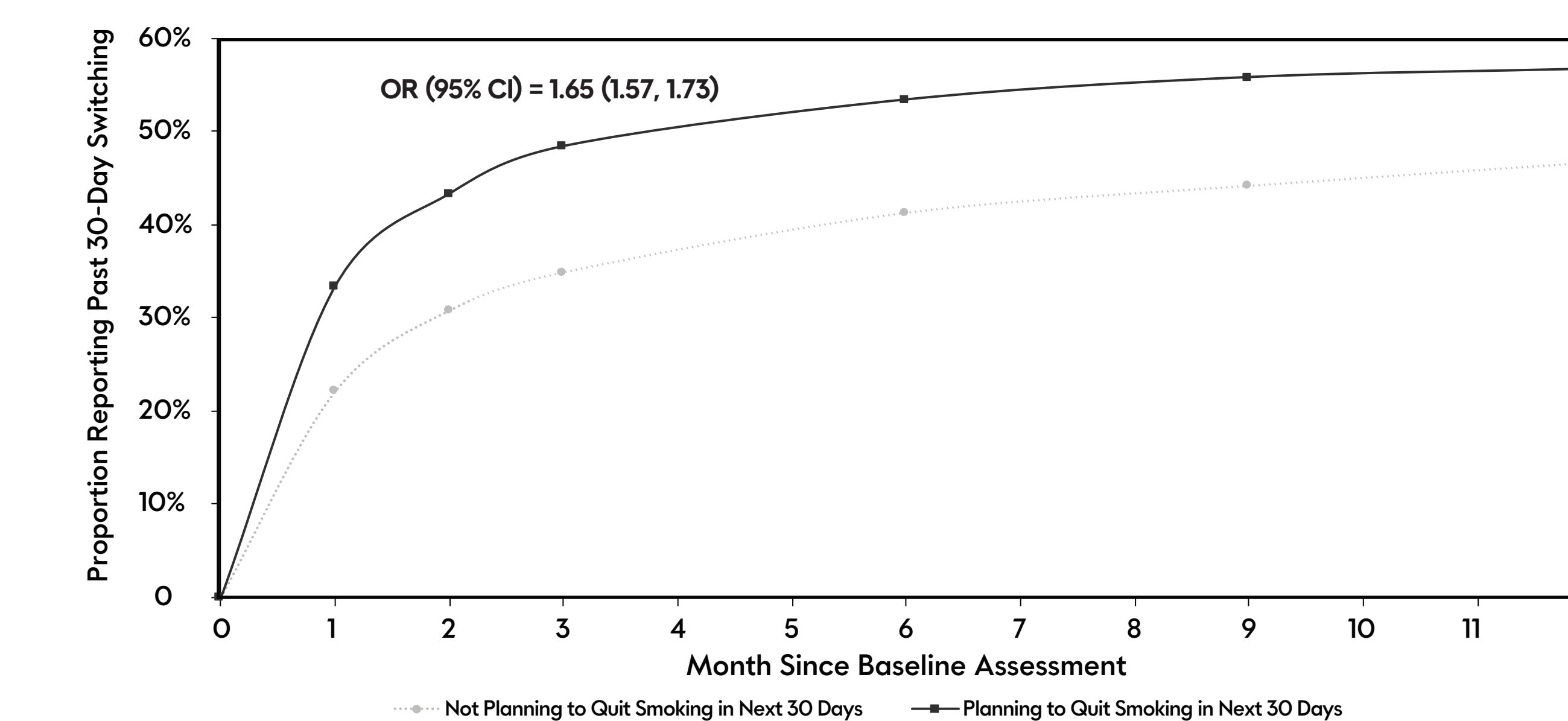

Table 2. Association of Smoking and JUUL Use Characteristics and Switching

Smoking Characteristics At Baseline	Univariate Models OR (95% CI)	Adjusted Model[a] OR (95% CI)
No. Days Smoked in Past 30 Days	0.96 (0.96, 0.96)	0.97 (0.97, 0.98)
No. Cigarettes Smoked per Day	0.96 (0.96, 0.97)	0.99 (0.99, 1.00)
Duration of regular smoking, yr	0.97 (0.97, 0.97)	0.98 (0.97, 0.99)
Cigarette Dependence (Range: 1-5)	0.77 (0.75, 0.78)	0.88 (0.85, 0.92)
Plan to Quit Smoking in Next 30 Days	1.65 (1.57, 1.73)	1.65 (1.54, 1.76)
JUUL Use Characteristics		
Satisfaction from Initial JUUL Use (Range: 1-7)	1.27 (1.24, 1.31)	1.17 (1.13, 1.21)
Time-Varying Effects		
Time effect, months (linear)	1.08 (1.08, 1.09)	1.10 (1.09, 1.11)
No. Days Used JUUL in Past 30 Days	1.03 (1.03, 1.03)	1.03 (1.02, 1.03)
No. Times Used JUUL per Day	1.01 (1.01, 1.01)	1.00 (1.00, 1.01)
JUUL Dependence	1.17 (1.14, 1.19)	1.08 (1.04, 1.11)

Note. N=13,534 participants, 57,401 observations. aAdjusted for all sociodemographic, smoking and JUUL use characteristics.

Conclusions

- Among adult established smokers who purchased the JUUL System and responded to surveys, switch rates increased across the 1-year follow-up period to 51.2% at the 12-month follow-up from 27.2% at 1-month.

- Rates of switching varied as a function of smoking frequency and duration: switching decreased with increasing frequency and duration of smoking—rates were high among all subgroups of smokers, over 40% at the 12-month follow-up, even among long-term daily smokers

- Frequency and quantity of JUUL System use and greater levels of JUUL dependence were positively associated with switching across the follow-up period

- Greater JUUL dependence and greater satisfaction from JUUL use at baseline were also positively associated with switching