

Rates of Switching Away from Smoking Using JUUL over Two Years in Populations of Special Interest

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Introduction

- ENDS very significantly reduce exposures to Harmful and Potentially Harmful Chemicals in cigarette smoke¹⁻³
- For adult smokers, switching to ENDS is likely to significantly reduce risk⁴⁻⁶
- Strong evidence that smokers can and do switch completely away from smoking using ENDS⁷⁻¹⁰
- Multiple models find that ENDS will benefit the population as a whole, with benefits to adult smokers outweighing adverse effects (e.g., among youth)¹¹⁻¹³

Do Adult Smokers Switch Completely Away from Smoking Using JUUL ENDS?

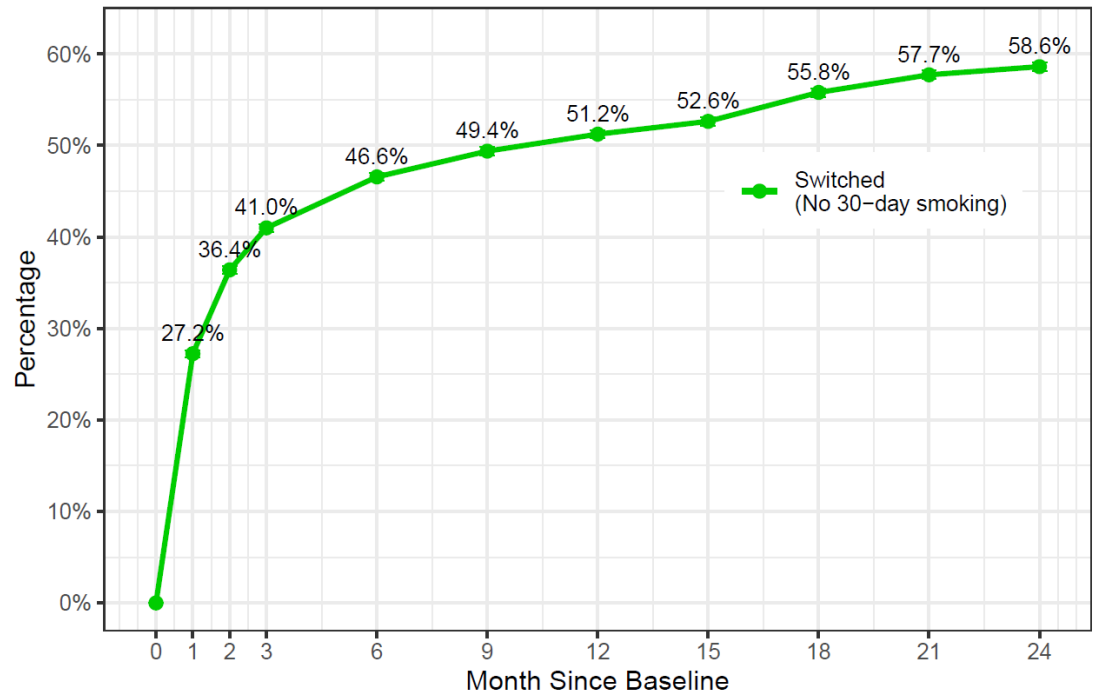
- The Adult JUUL Users Smoking & Switching Trajectories (ADJUSST) Study¹⁴
- Sample: Adult (21+) US smokers who made a first purchase of a JUUL Starter Kit in 2018
- Followed for up to 2 years at 1, 2, 3, 6, 9, 12, **15, 18, 21, 24** months
 - Online surveys
 - Multiple publications on Year 1 data¹⁵⁻¹⁷
 - Year 2 data newly analyzed
- Observational study: No dictated behavior change, no intervention, no behavioral directions, no free product
- N=18,420 established smokers with data at follow-ups
- Key outcome: Switching = no smoking (“not even a puff”) for past 30 days

Limitations & Strengths

- Limitations
 - Smoking status by self-report, not biochemically verified, no imputation
 - Typical of naturalistic observational survey studies (e.g., PATH, ITC)^{9,10,18}
 - Substantial amounts of missing data
 - Due to intermittent non-response, not drop-out¹⁴
 - Analyses indicate little likelihood of bias¹⁴
 - Not the full range of JUUL users
 - Represents users who adopted JUUL, not those who merely sampled (past-30-day users)
- Strengths
 - Large sample
 - Long, detailed follow-up
 - Confirmed brand purchase

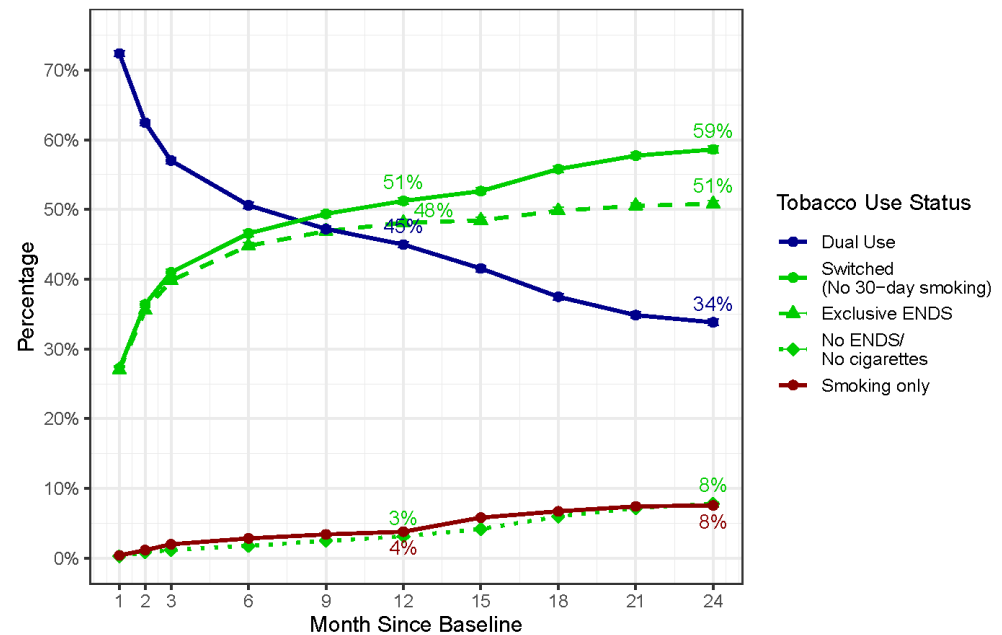
Substantial Rates of Switching With Continual Increase into Year 2

- Majority switched at month 12
- Continued increase to Month 24



The two-Year Trajectory of Smokers Using JUUL (and/or Other ENDS)

- Dual use initially dominant
- Dual use declines and is increasingly displaced by switching
- Continues into year 2
 - (Switching to other ENDS brands increases from 3% to 10%)
- In Year 2, more disposition into
 - Discontinuation of both smoking and ENDS use
 - Smoking



Smokers Switch with JUUL... But in which Populations?

- Need to attend to diversity in the smoking population, and to addressing disparities
- Important variations in smoking prevalence, difficulty stopping smoking, and smoking-related disease

Disparities in Smoking are of Concern

“Cigarette smoking rates in the U.S. have declined considerably... [but] progress hasn't been experienced equitably”

“Smoking disproportionately affects ... certain racial and ethnic populations, low-income populations, people living with mental health conditions”

“We ... have a tremendous opportunity to create meaningful change for populations ... disproportionately affected by tobacco use.”

- Dr. Brian King¹⁹
Director, Center for Tobacco Products, Food and Drug Administration

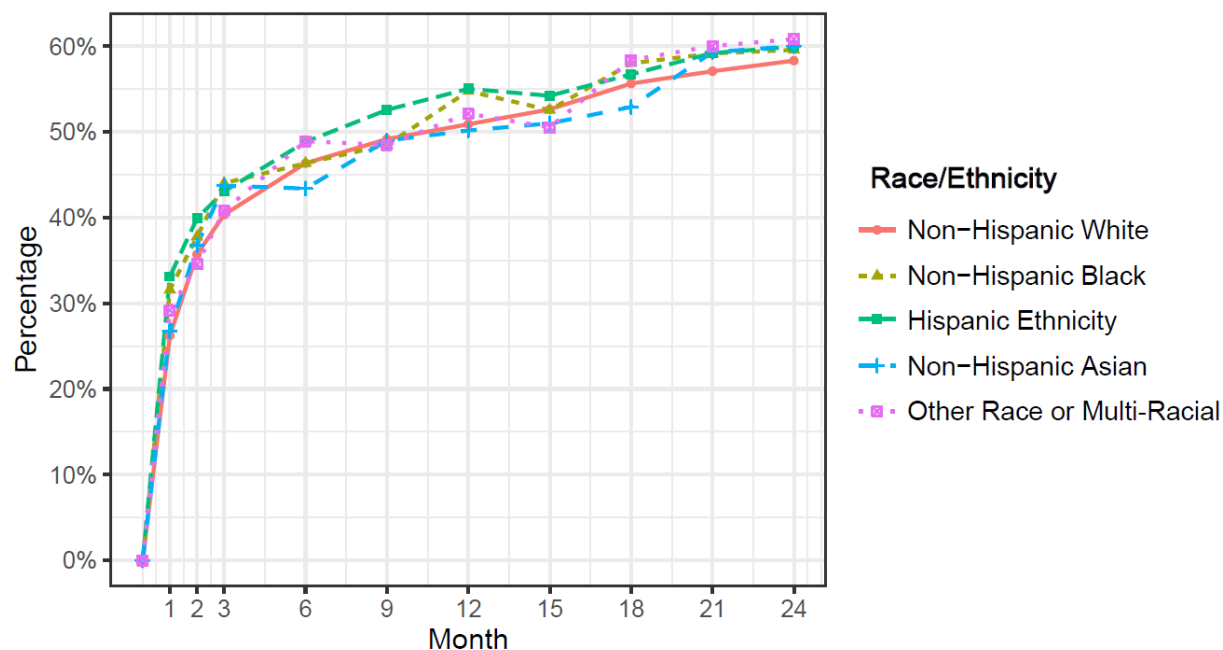
Switching Rate by Race/Ethnicity

Literature/background

- Some racial minorities bear a disproportionate burden of tobacco-related disease^{20,21}
- Some disparities in smoking cessation rates^{22,23}

Findings

- Very similar switch rates and switch trajectories for all groups examined



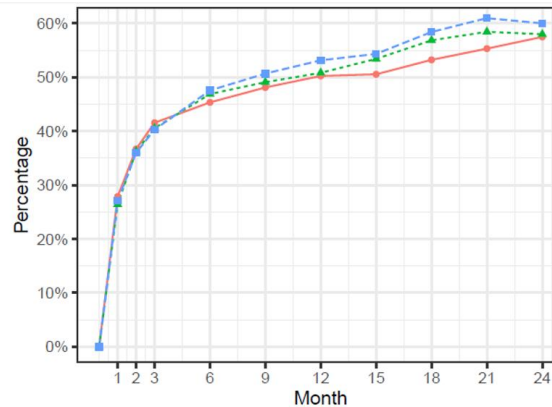
Switching By Socioeconomic Status: Income and Education

Literature/background

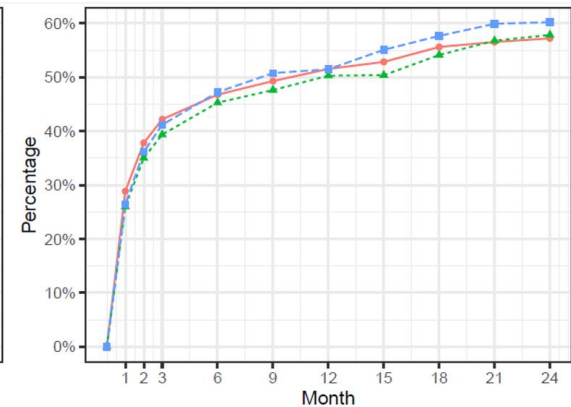
- Socioeconomic disparities in smoking prevalence²⁴
- Lower quit rates among smokers with lower-income, less education^{22,23}

Findings

- Similar switch rates across strata



Income levels
 —○— <150% FPL
 -▲- 150%-400% FPL
 -■- >400% FPL
 (Income classified by % of Federal Poverty Level, accounting for family size)



Education
 —○— HS or lower
 -▲- Associate
 -■- Bachelor or higher

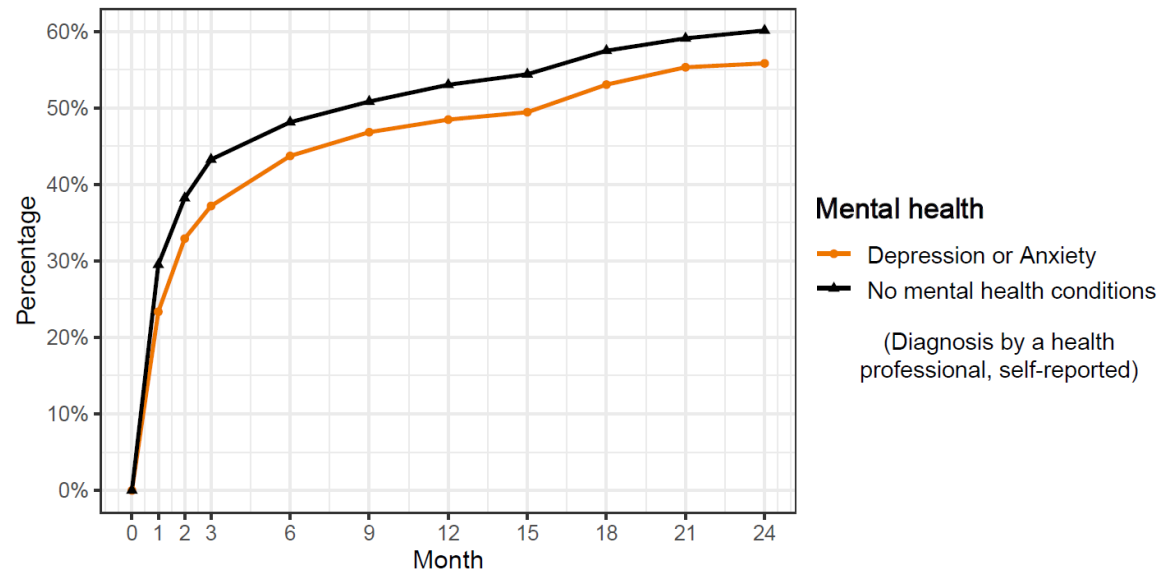
Switching Rate by History of Diagnosed Mental Health Conditions

Literature/background

- Higher prevalence of smoking in people with mental health conditions²⁴
- Lower quit rates in people with mental health conditions²⁵

Findings

- Based on reported professional diagnoses of anxiety and/or depression, the most common conditions
- Slightly lower switch rates for people with a history of mental health issues... still $\geq 55\%$

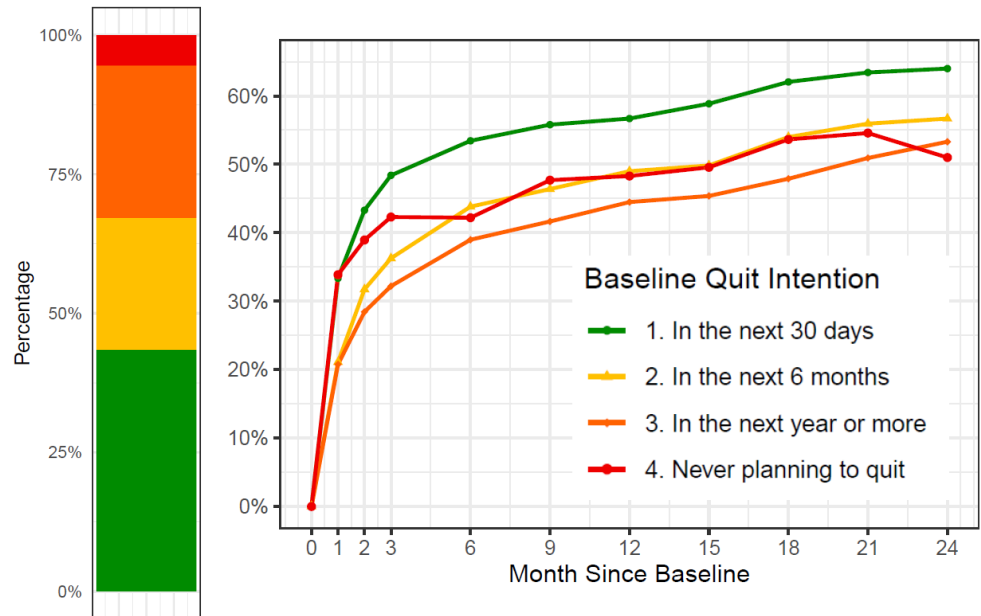


High Switch Rates at 24 Months Across a Range of Populations of Special Interest

- By race/ethnicity
 - By socioeconomics (income & education)
 - By mental health conditions
-
- But there are other sources of population diversity....

Heterogeneity in Smokers' Commitment to Stopping Smoking

- Unlike smoking cessation treatment, use of ENDS and entry into ADJUSST not based on commitment to quit smoking
- Stages of Change concept: Time horizon for quitting smoking
- Majority of JUUL purchasers were not ready to quit smoking (i.e., 30 days)
 - Some were NEVER planning to quit smoking ("hardcore smokers")
- All achieved at least 50% switching by month 24... Even the "never-quitters"
- Addressing smokers not addressed by cessation treatment



Another Source of Diversity: Preference for Menthol-Flavored ENDS

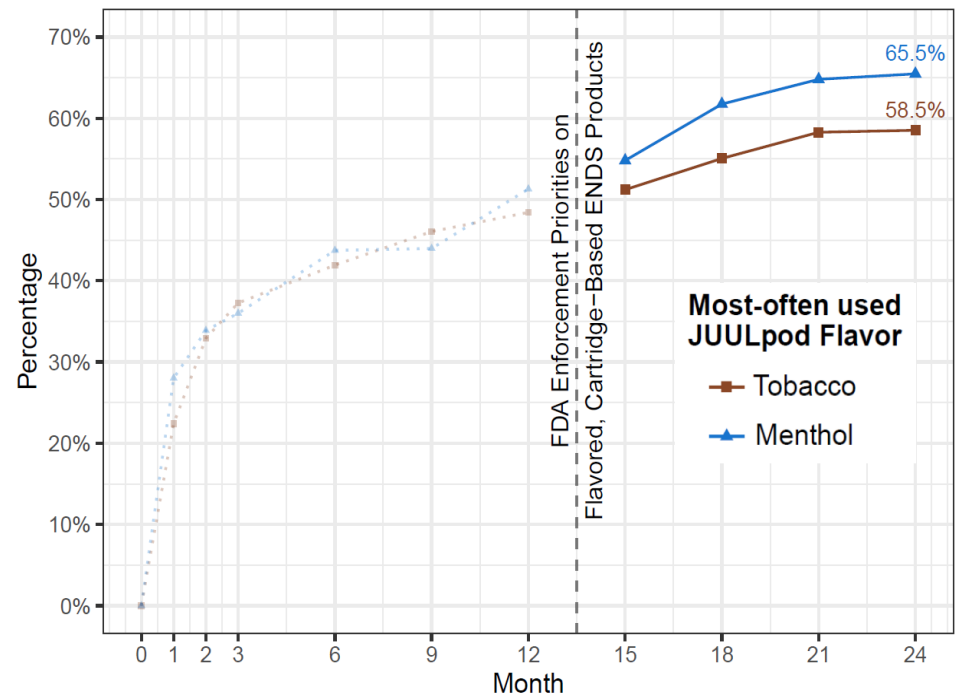
- Market indicates diversity in preference for flavors in ENDS²⁶
- FDA considers menthol flavor a risk for youth uptake, needs evidence of a benefit in adult smokers to balance this perceived risk^{27,28}
- Is use of menthol-flavored ENDS associated with improved switching among adult smokers?

Do Switch Rates Vary Between Tobacco- and Menthol-Flavored JUUL?

- Flavor use varies between people... and over time (i.e., not a stable 'baseline' factor)
- Year 1 data complicated by diversity of flavors
- Year 2 is after withdrawal of other flavors

Findings

- Higher switch rate when using Menthol

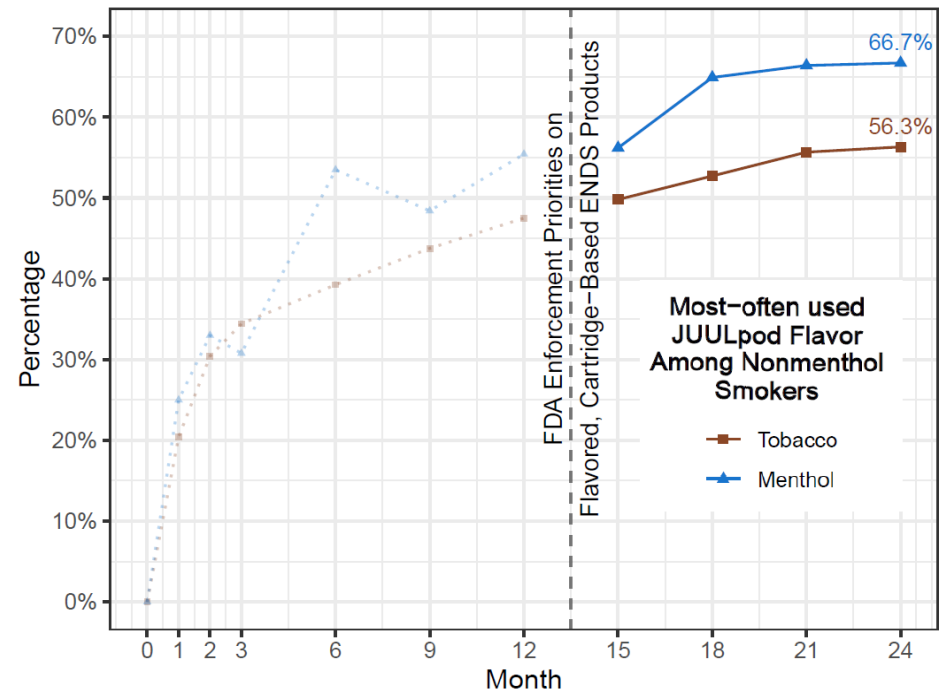


Are Higher Switch Rates with Menthol Due to Matching Cigarette Flavor Preference?

- Smokers of menthol cigarettes prefer menthol ENDS²⁹
- So, does using Menthol JUUL just benefit Menthol smokers?
- Might be time-limited benefit if menthol cigarettes are banned...
- Examine menthol effect in smokers of non-menthol cigarettes

Findings

- Using Menthol JUUL specifically benefits non-menthol smokers



Key Findings

- The majority of adult smokers who purchased JUUL report having switched completely away from smoking at 24 months
- Likelihood of switching continues to increase, and dual use continues to decrease in 2nd year of use: This is a long-term process / journey
- Similar trajectories and similarly high switch rates in subgroups of special interest and concern, by ethnicity, socioeconomic status, mental health conditions
- Smokers take up JUUL/ENDS even without being ready to quit, and can nevertheless achieve high switch rates
- Use of menthol JUUL associated with significantly higher switch rates among smokers of non-menthol cigarettes

Key Conclusions

- Adult smokers using JUUL can achieve high switch rates
- Transitions from dual use to switching over time; suggests switching is a journey, not an abrupt change
- Switch rates similar across groups; suggests benefit is widespread and may help address disparities across subpopulations
 - "We ... have a tremendous opportunity to create meaningful change for populations ... disproportionately affected by tobacco use." Dr. Brian King, CTP, FDA¹⁹
- ENDS adopted by smokers not ready to quit, and many do switch nevertheless; suggests ENDS reach beyond "smoking cessation" audience
- Menthol-flavored ENDS provide an incremental benefit in adult switching among smokers of non-menthol cigarettes; suggests may have population benefit

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Comments on “Rates of Switching Away from Smoking Using JUUL over Two Years in Populations of Special Interest” by Saul Shiffman PhD

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The content of this presentation is solely the responsibility of the author and does not necessarily represent the views of the NIH, FDA, or any other funding agency.

JF has done paid consulting for pharmaceutical companies involved in developing and marketing smoking cessation products (e.g. J&J in past year, Pfizer, GSK etc years ago).

JF has not done paid work of any sort for tobacco or e-cig manufacturers.

Very Impressive results, but a 30-day Smoking Cessation rate above 50% at 12 and 24 months seems almost too good to be true.

22,905 current someday/daily smokers who recently made a first Juul starter purchase completed the baseline assessment.

Approx 4,485 (around 20%) did not respond to any follow-up surveys. They are not included in the denominator for any of the subsequent analyses. If they had been recruited to the INTERVENTION arm of an RCT, they would have been included in the denominator in ITT Smoking Cessation rates.

Approx 11,919 completed the 12 m follow-up. That is around two thirds of the 18,420 who completed at least one follow-up, and 52% of all those who completed the baseline.

So the % who quit smoking is being calculated as a proportion of those who responded to each survey. e.g. At 12 months, $6105/11,919 = 51.2\%$.

If you were using ITT methods, it would be $6105/22,905 = \underline{26.7\%}$ had quit smoking.

However, this was not a randomized controlled trial, so it is not improper to report the switch rates the way they were reported by Dr Shiffman, so long as we keep in mind that these are responder quit rates.

We don't know how many of the non-responders also quit smoking. It is probably greater than zero and less than 100%. But there is a tendency for people who have not succeeded in quitting smoking to be less likely to respond.

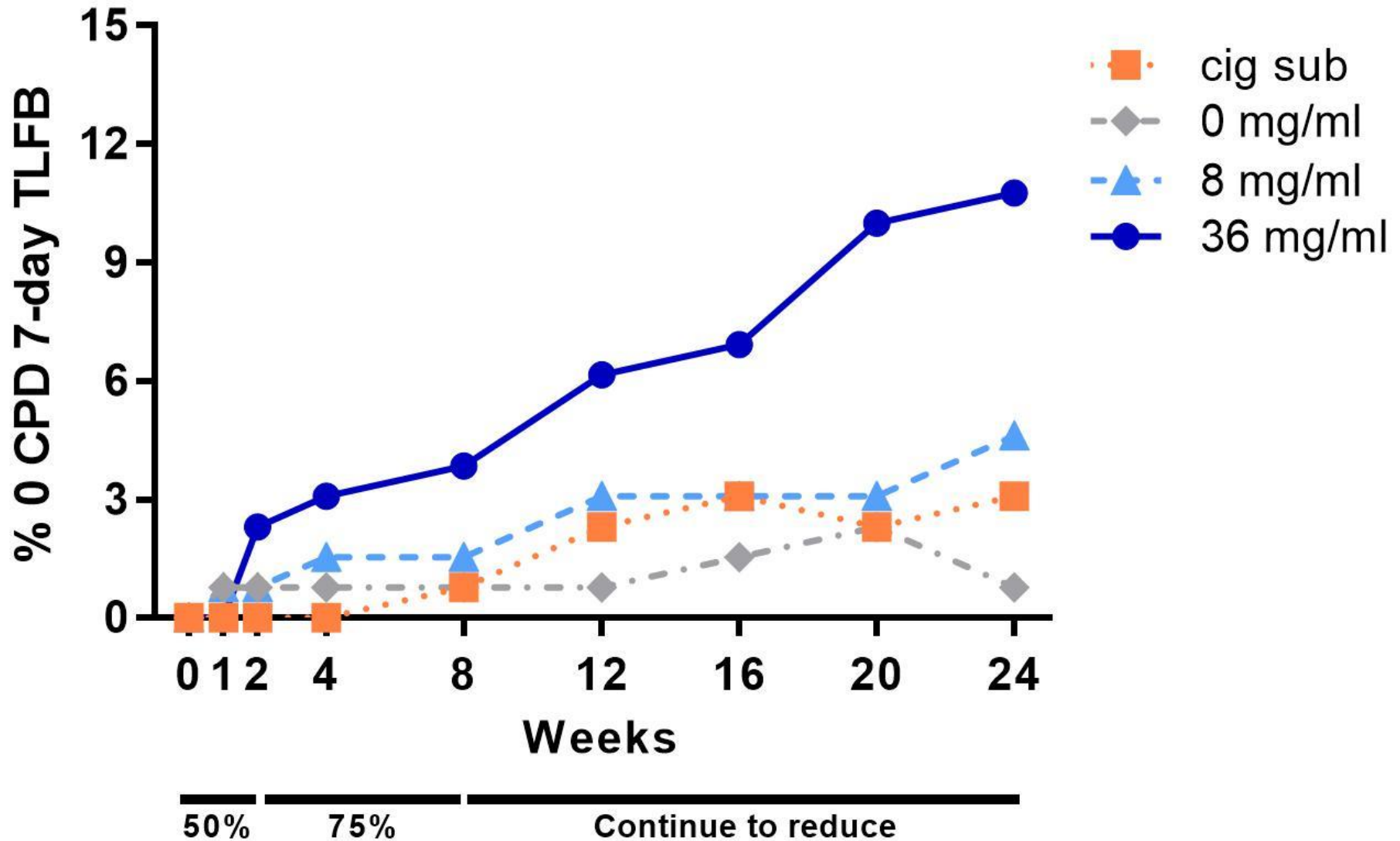
Even taking the most cautious approach, to have at least 26.7% of everyone purchasing a Juul starter kit and volunteering for a study having quit smoking a year later is still very impressive.

Another difference from RCTs is that survey studies do not require biochemical verification of self-reported smoking cessation (e.g. participants blowing an exhaled CO<10ppm).

Strengths of these results include:

- **Participants did not need to be planning to quit...many were not.**
- **Participants were not required to participate in counseling or any other supportive contacts.**
- **So these results provide “real world” evidence that a high proportion of smokers who purchase a Juul starter pack end up quitting smoking.**
- **Interestingly, unlike most medication RCTs, the proportion (and absolute number) quitting smoking increased over time.**

Cigarette Abstinence (CO-verified) - ITT



Foulds et al. Effect of an electronic nicotine delivery systems on cigarette abstinence in smokers with no plans to quit: Exploratory analysis of a randomized placebo-controlled trial. *Nicotine Tob Res* 2022, 24 (7): 955–961.

When we see similarities in the patterns of results from RCTs and real-world cohort studies, this increases confidence in the results.

The RCTs are not the same as the real world....

Products are usually given out for free, participants receive regular encouragement etc.

But RCTs can tell us, for sure, if ECIGS delivering a moderate amount of nicotine, increase the smoking cessation rate versus placebo or no ECIG, or versus NRT. They do.

Real-world cohort studies can tell us what actually happens in the real world when smokers purchase a product, without additional support. Dr Shiffman's study tells us that when smokers purchase Juul, a high (and increasing) proportion switch from cigarettes to Juul over time. This almost certainly produces a sizeable reduction in health risks for those who switched.