

Changing patterns of cigarette and ENDS transitions in the PATH study

A multistate transition model analysis of adults in 2017–19 (Waves 4–5) vs 2019–21 (Waves 5–6)

Andrew F. Brouwer, Jihyoun Jeon, Evelyn Jimenez-Mendoza, Stephanie R Land, Theodore R. Holford, Abigail S. Friedman, Jamie Tam, Ritesh Mistry, David T. Levy, Rafael Meza

*Department of Epidemiology,
University of Michigan
brouweaf@umich.edu*

TCORS

Center for the
**Assessment of Tobacco
Regulations**
[**CAStoR**]

Funding

- Support for this work was provided by grant U54CA229974 from the National Institutes of Health, National Cancer Institute and Food and Drug Administration (FDA).
- The opinions expressed in this article are the authors' own and do not reflect the views of the National Institutes of Health, the Department of Health and Human Services or the US government.

Disclosures

Tobacco Industry

E-cigarette & nicotine
product industry

Pharma Industry

The work being presented has received funding or other means of support from any of the following sources:

NO

NO

NO

Any of the authors have received funding (including consultancy) from any of the following sources in the past 5 years:

NO

NO

NO

Changes in the marketplace, new regulations, and public health events may have impacted transitions to and from ENDS and cigarette use.

ENDS sales

Increased initiation
and persistence of
ENDS?

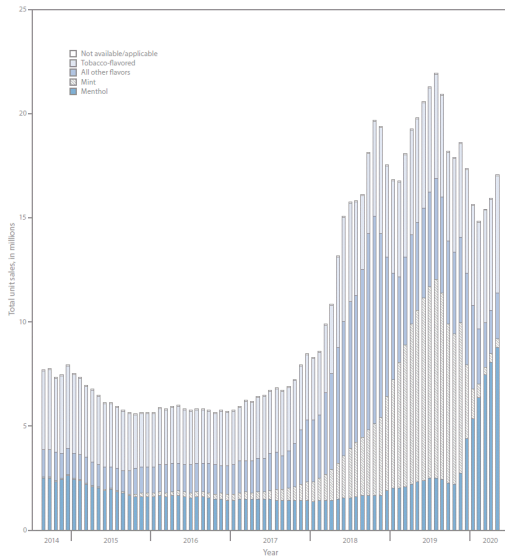
Youth vaping epidemic

Surgeon General's Advisory on E-cigarette
Use Among Youth

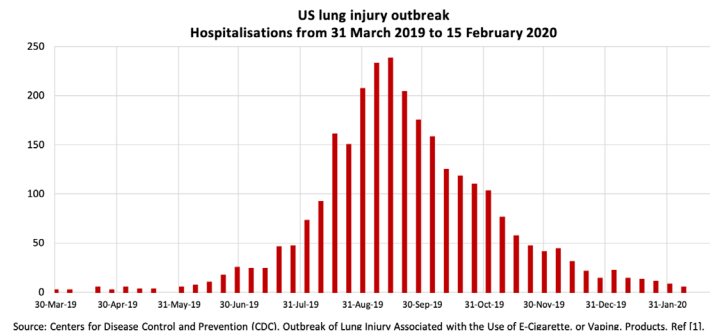


Changes in the marketplace, new regulations, and public health events may have impacted transitions to and from ENDS and cigarette use.

ENDS sales



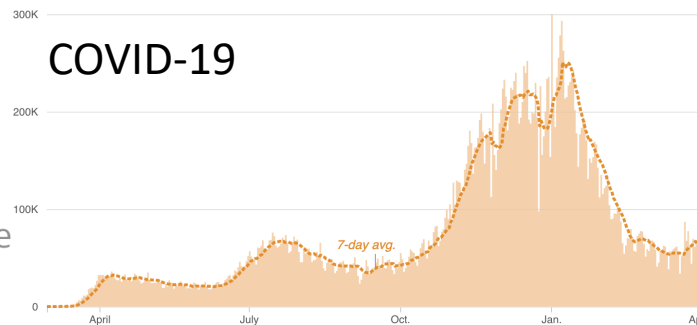
Lung injury outbreak



Increased ENDS cessation?

Youth vaping epidemic

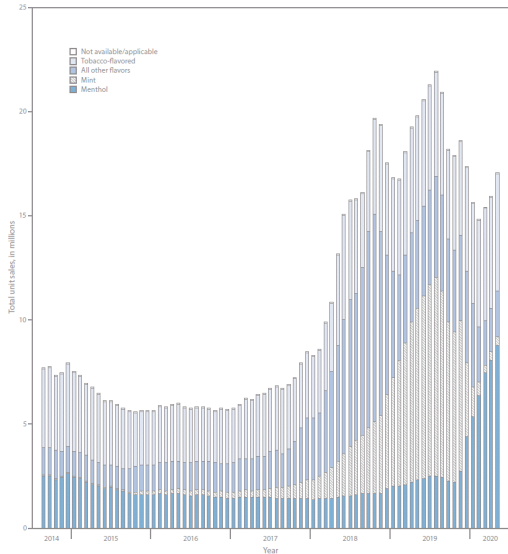
Surgeon General's Advisory on E-cigarette Use Among Youth



Increased cigarette cessation and relapse?

Changes in the marketplace, new regulations, and public health events may have impacted transitions to and from ENDS and cigarette use.

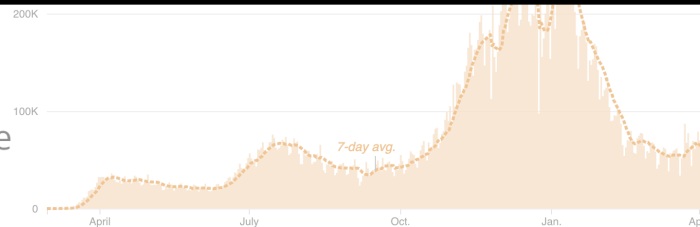
ENDS sales



Lung injury outbreak

US lung injury outbreak

Reduced ENDS and cigarette initiation?
Increased ENDS cessation?



ENDS flavor restrictions



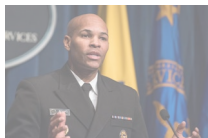
Tobacco 21



The Sale of Tobacco Products or Electronic Smoking Devices to Persons Under 21 is Prohibited

Youth vaping epidemic

Surgeon General's Advisory on E-cigarette Use Among Youth



FDA enforcement priorities

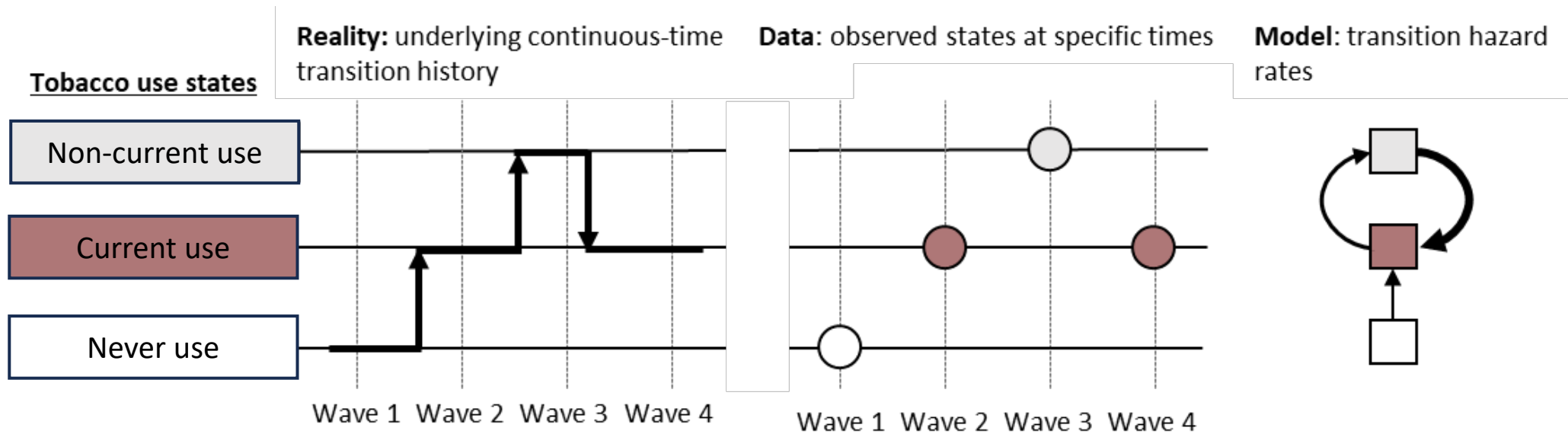
FDA'S ENFORCEMENT PRIORITIES FOR E-CIGARETTES AND OTHER ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS)

Data

- PATH is a nationally representative longitudinal study of tobacco use
- Wave 4 Cohort, Waves 4–5 (2017–19) vs Waves 5–6 (2019–2021)
 - 2017–19: 28,061 adults
 - 2019–21: 24,751 adults
- Our tobacco use state variables are derived from questions about:
 - Established use of cigarettes or ENDS
 - Past-30-day use of cigarettes and ENDS
- Incorporate longitudinal participant weights

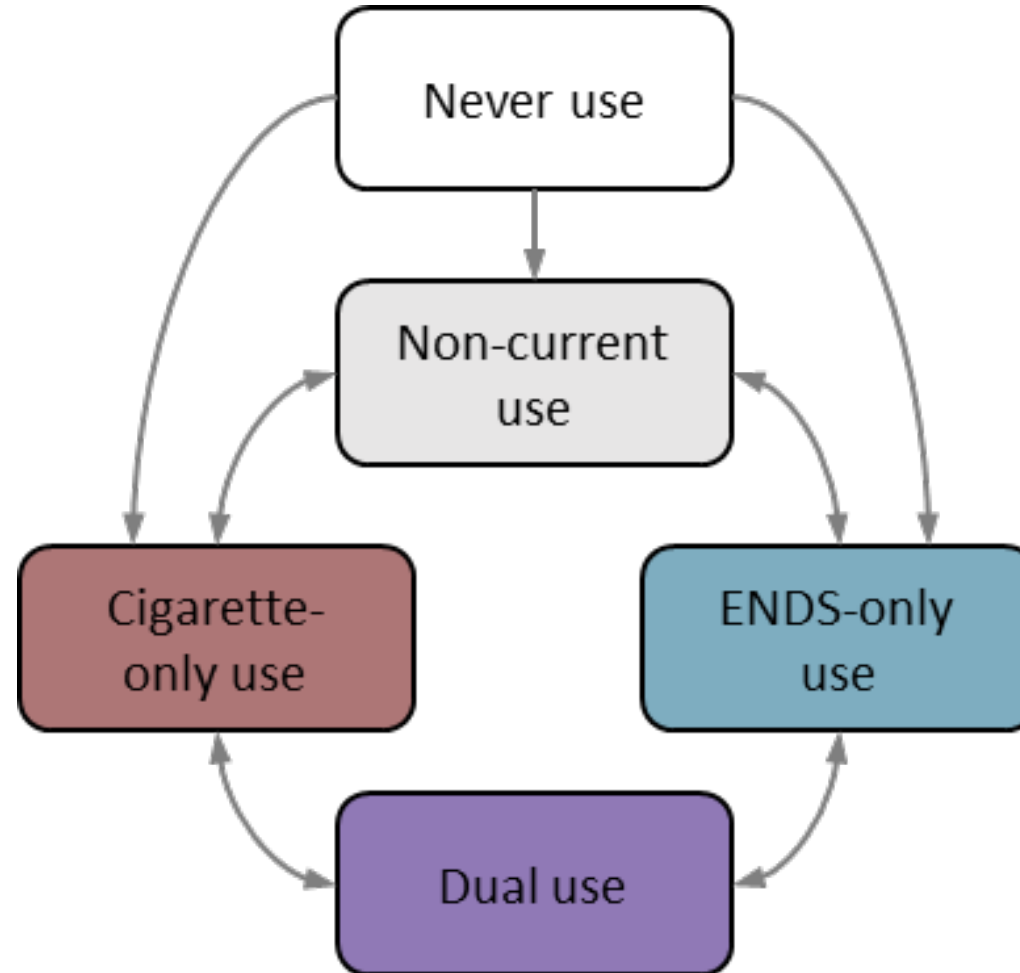
Methods – Multistate transition model

Estimates underlying transition hazards (rates) assuming that a person's tobacco-use state over time can be approximated by a continuous-time, stochastic model.

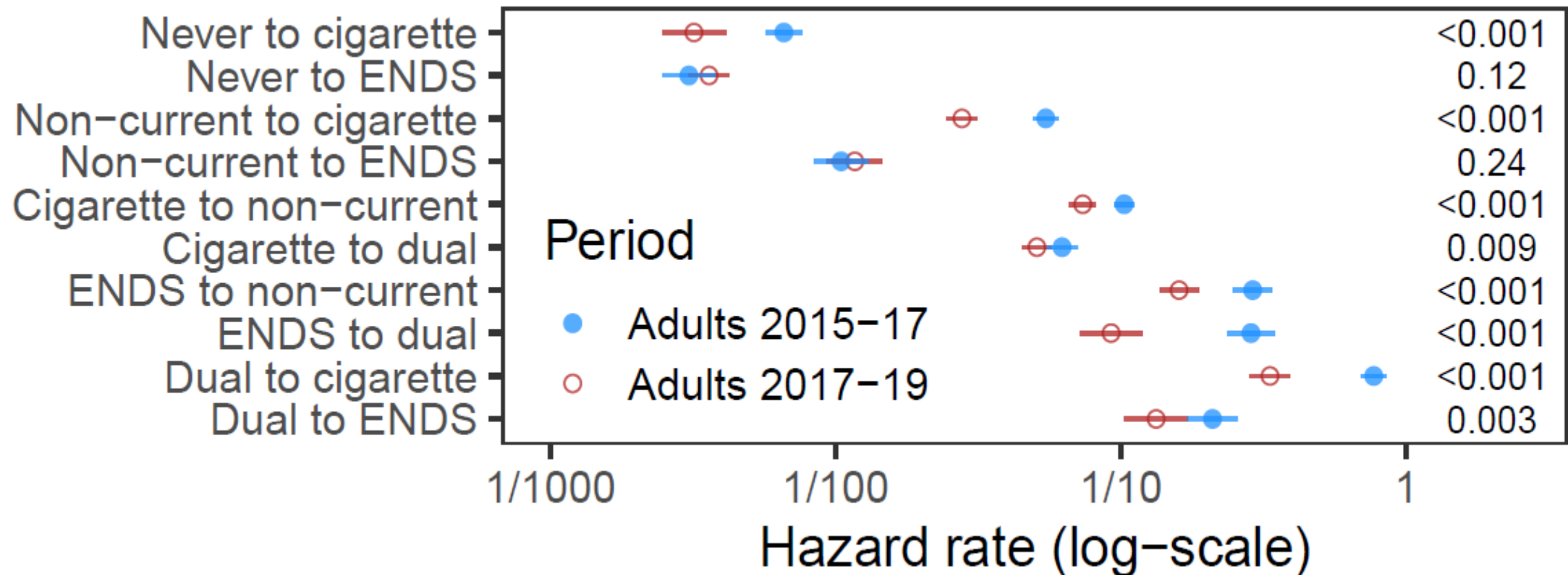


Brouwer et al. (2020). *Tobacco Control*.
Example code using PATH weights is
available at tcors.umich.edu

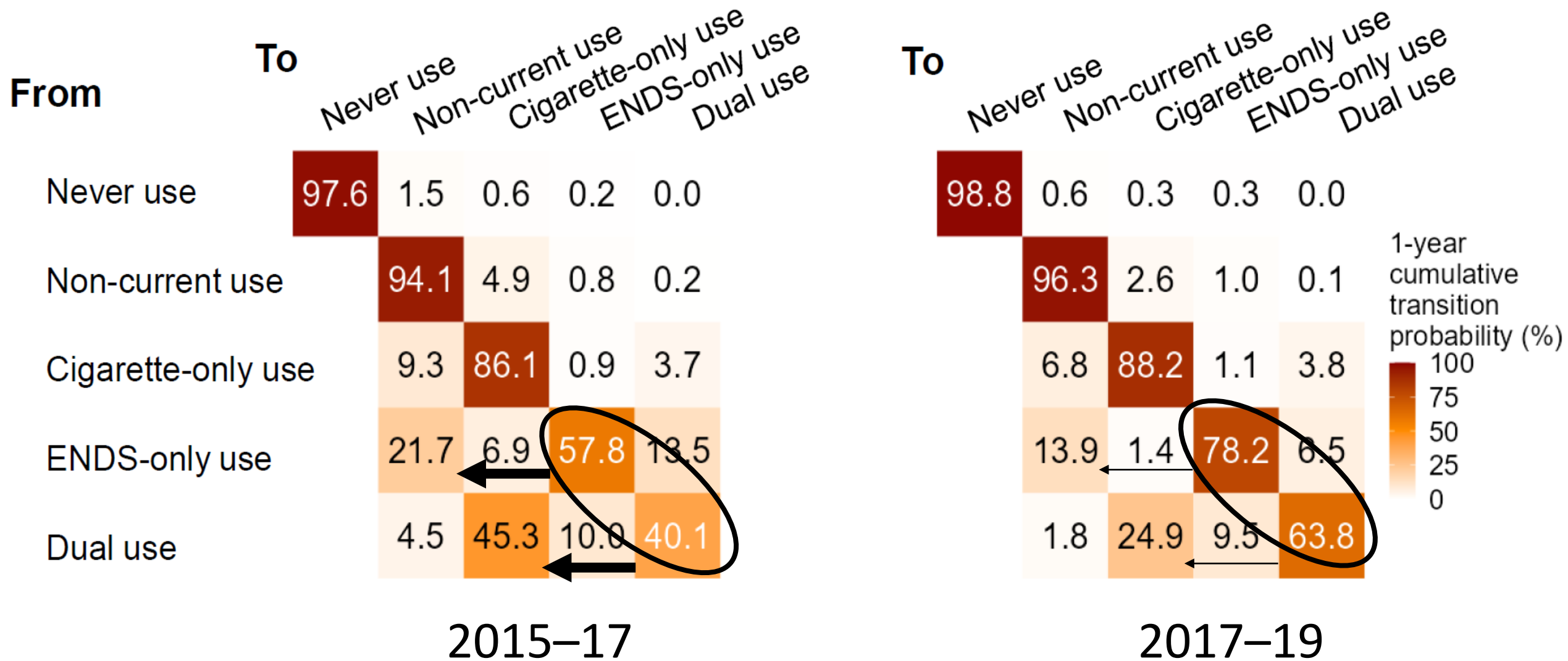
Methods – Product use transitions



Previously, between 2015–17 and 2017–19, we saw multiple changes...

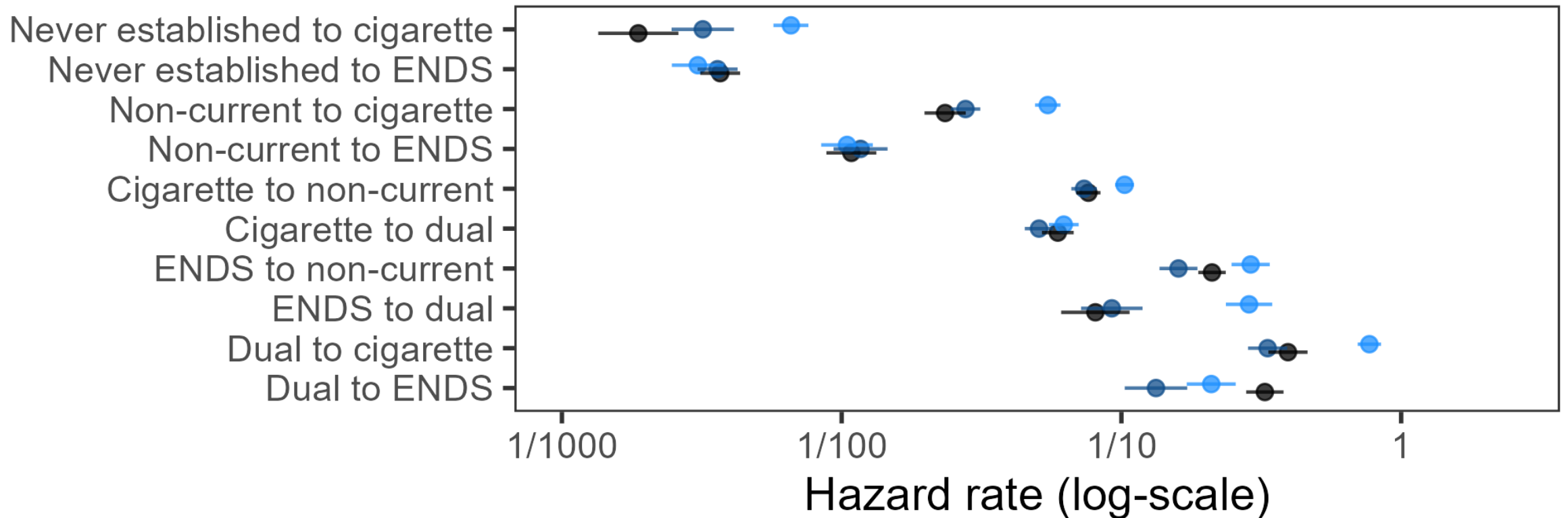


... especially an increasing persistence of ENDS and dual use.

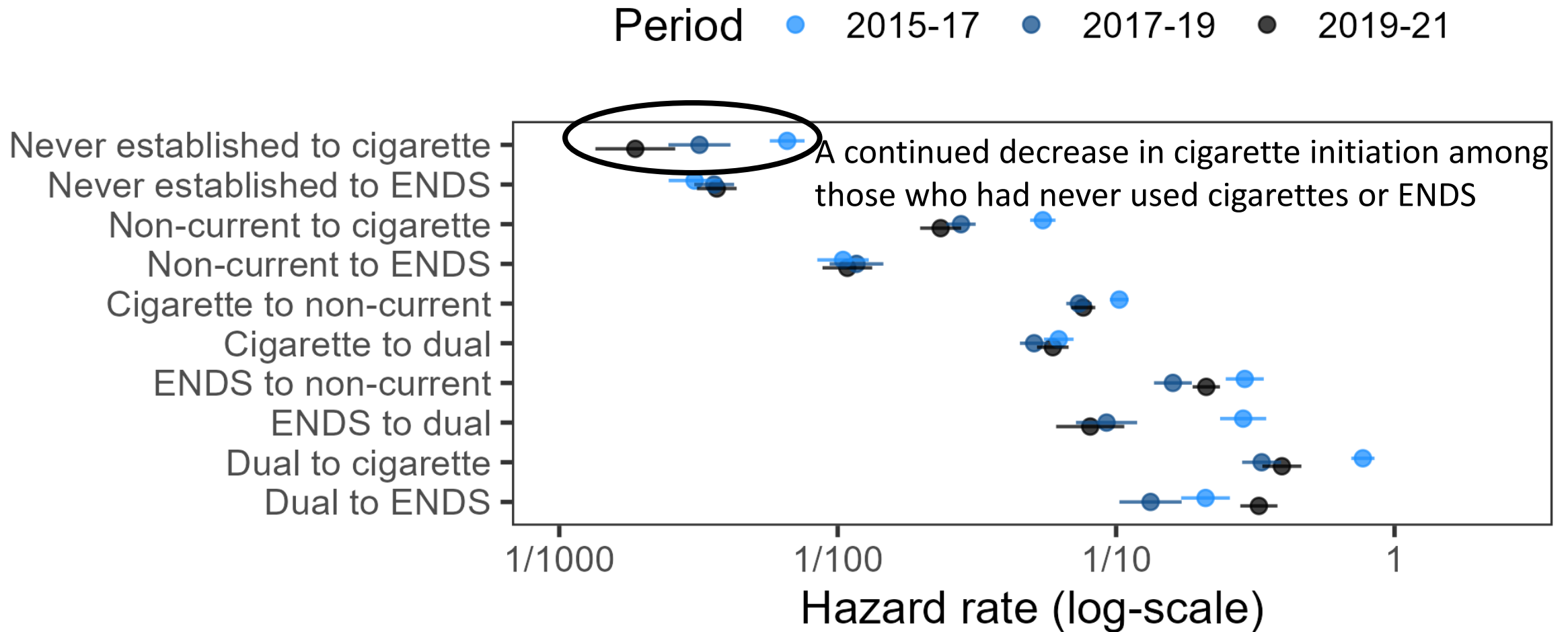


We see fewer changes from 2017–19 to 2019–21.

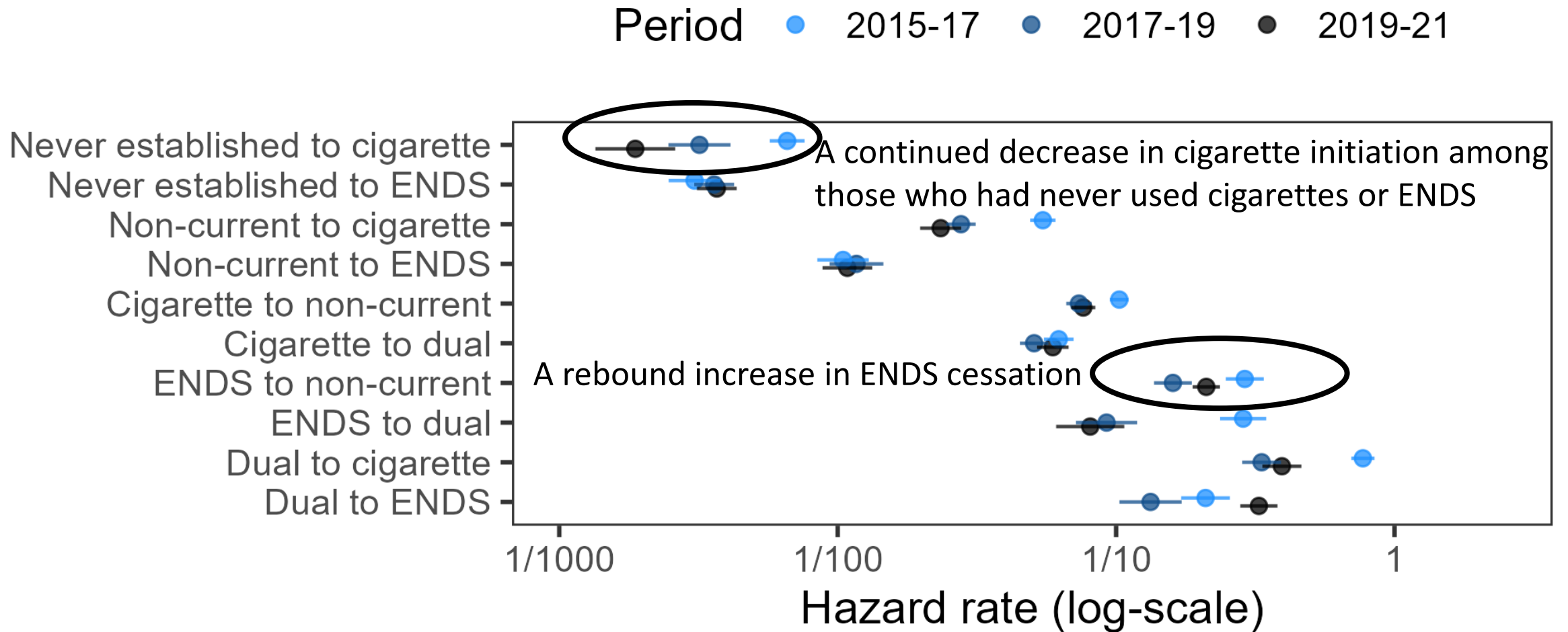
Period ● 2015-17 ● 2017-19 ● 2019-21



We see fewer changes from 2017–19 to 2019–21.

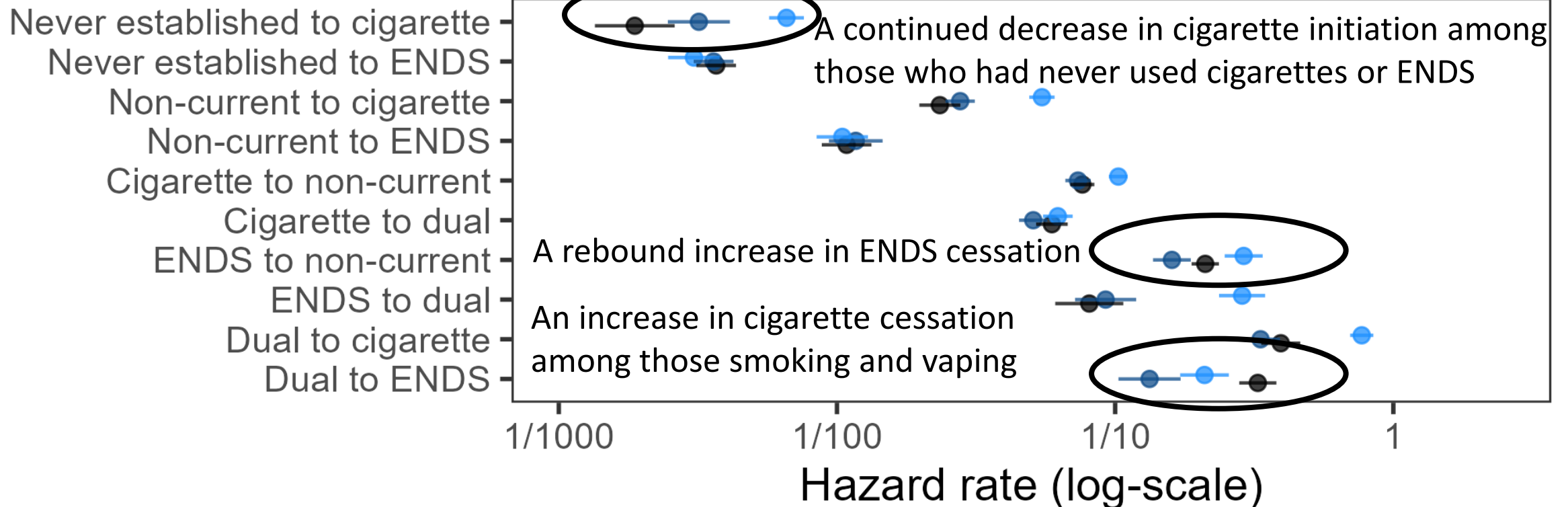


We see fewer changes from 2017–19 to 2019–21.

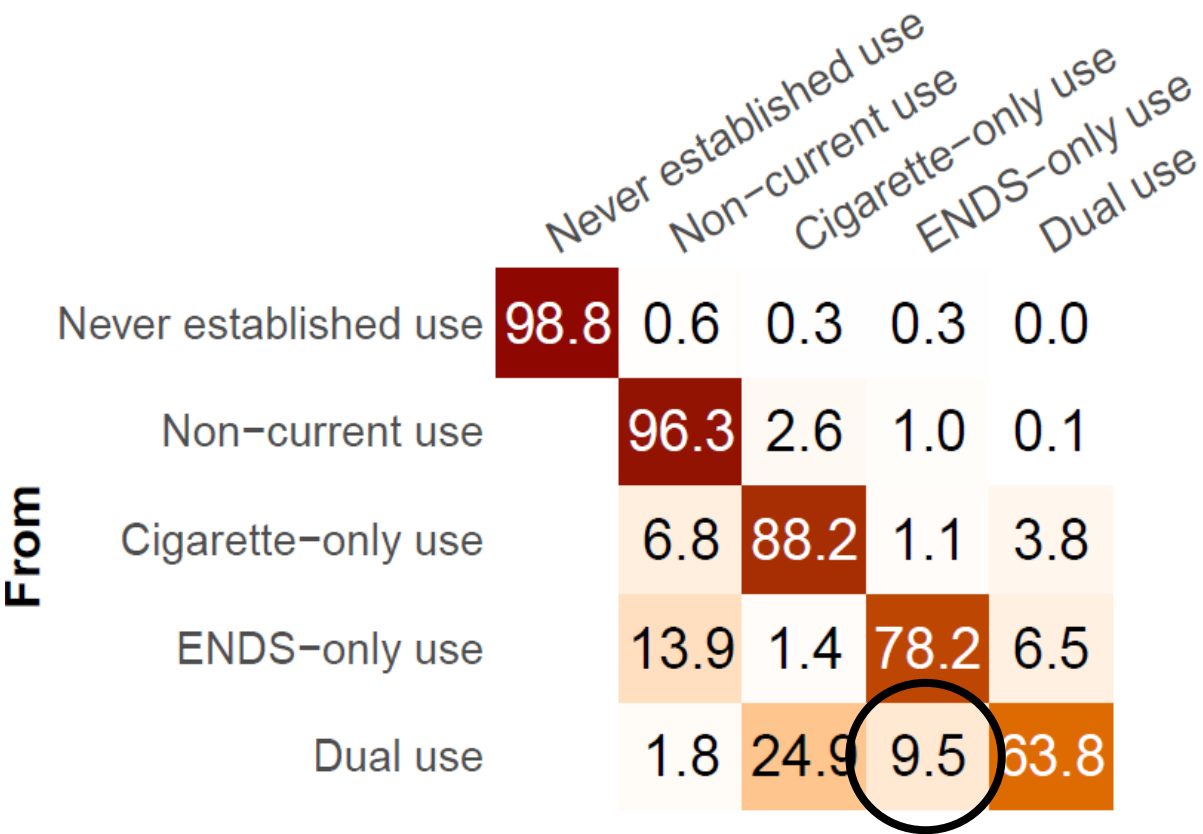


We see fewer changes from 2017–19 to 2019–21.

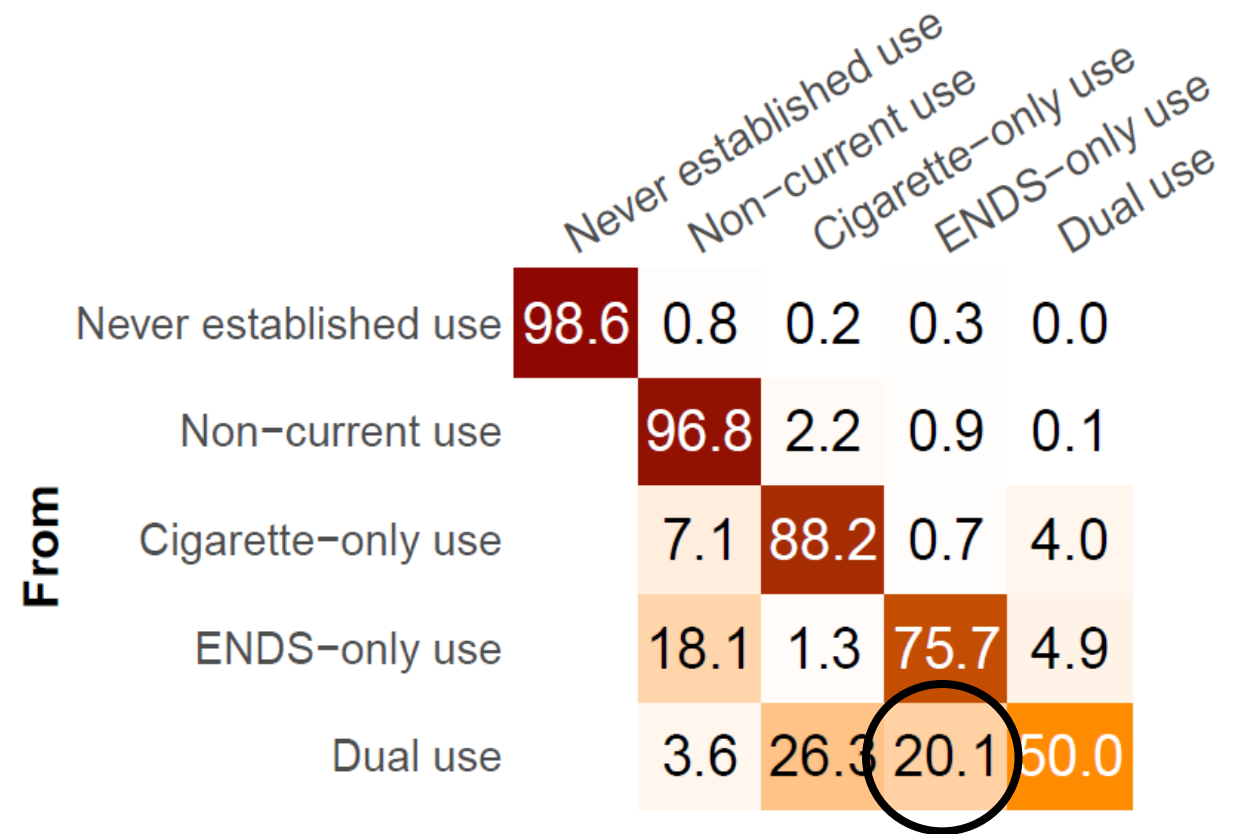
Period ● 2015-17 ● 2017-19 ● 2019-21



Dual use remains persistent, but there has been an increase in cigarette cessation among those who use both products.

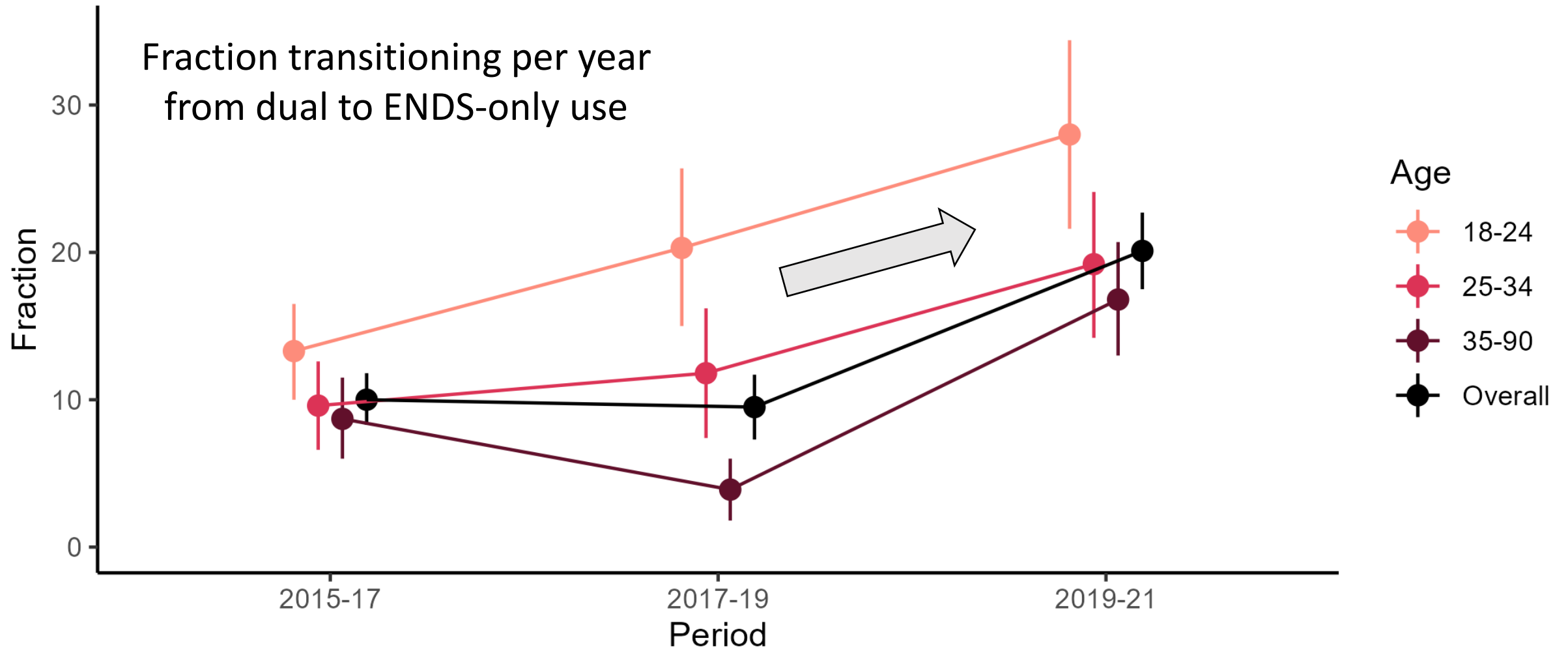


2017-19

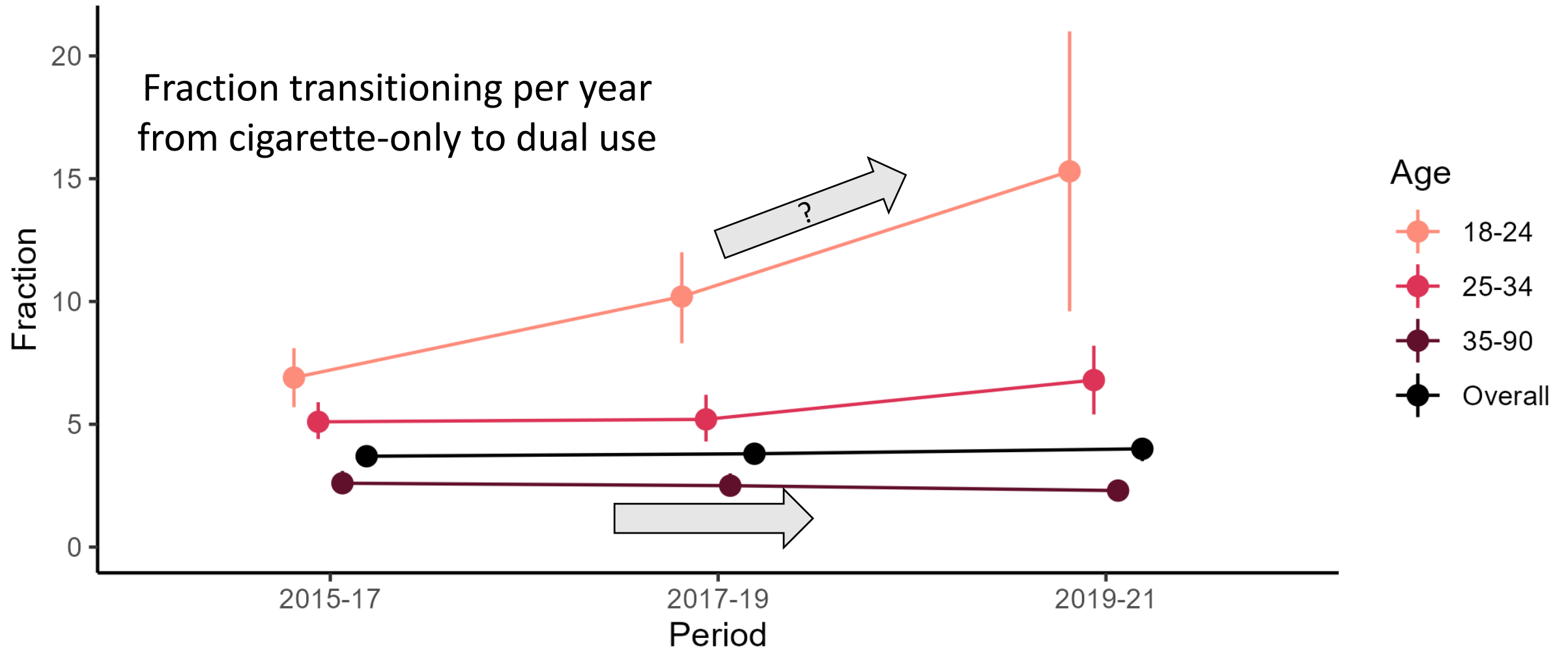


2019-21

We see the recent increase in the dual to ENDS-only use transition across adult age groups.



But, there is little adoption of ENDS among those currently smoking.



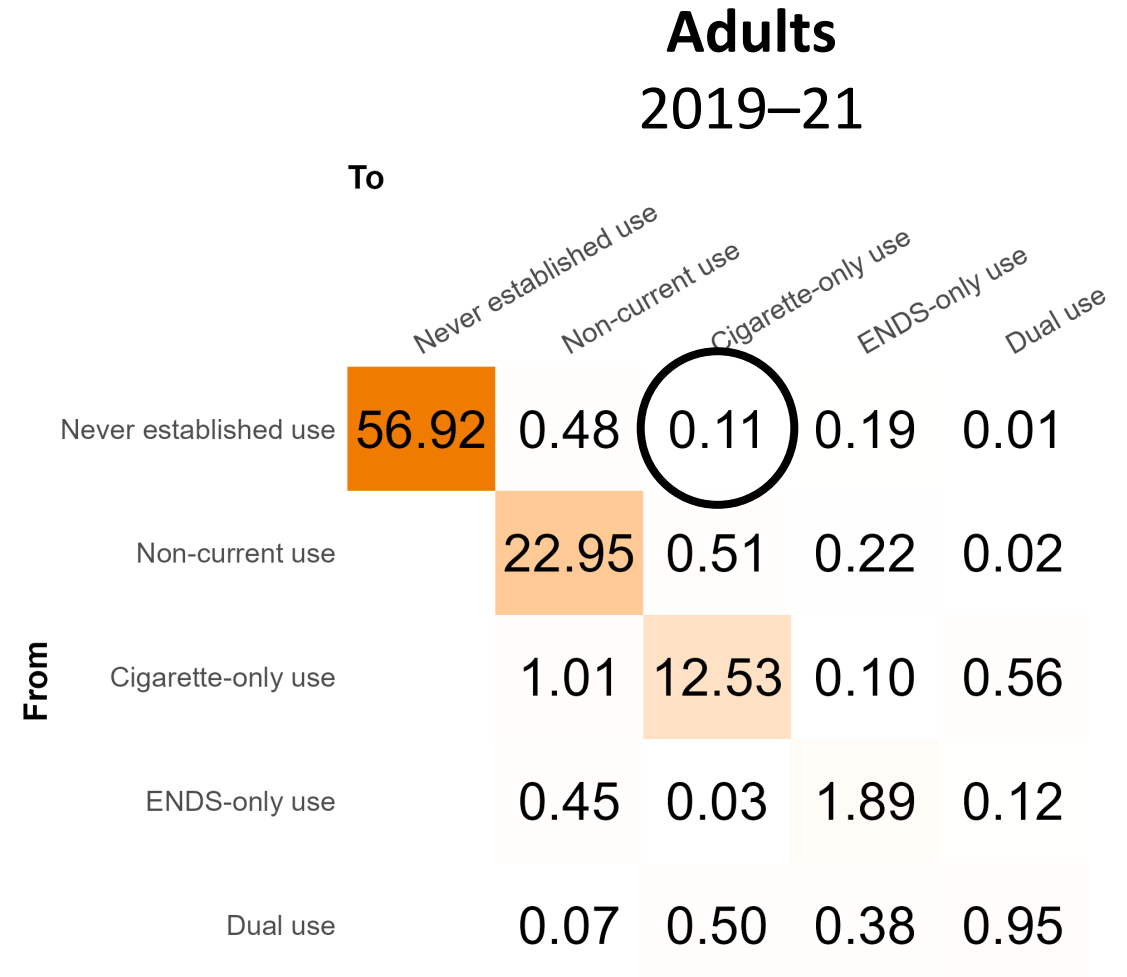
Viewing transitions as fractions of the population suggests that there has not been substantial benefit to public health.

Adults
2019–21

		To				
		Never established use	Non-current use	Cigarette-only use	ENDS-only use	Dual use
From	Never established use	56.92	0.48	0.11	0.19	0.01
	Non-current use	22.95	0.51	0.22	0.02	
	Cigarette-only use	1.01	12.53	0.10	0.56	
	ENDS-only use	0.45	0.03	1.89	0.12	
	Dual use	0.07	0.50	0.38	0.95	

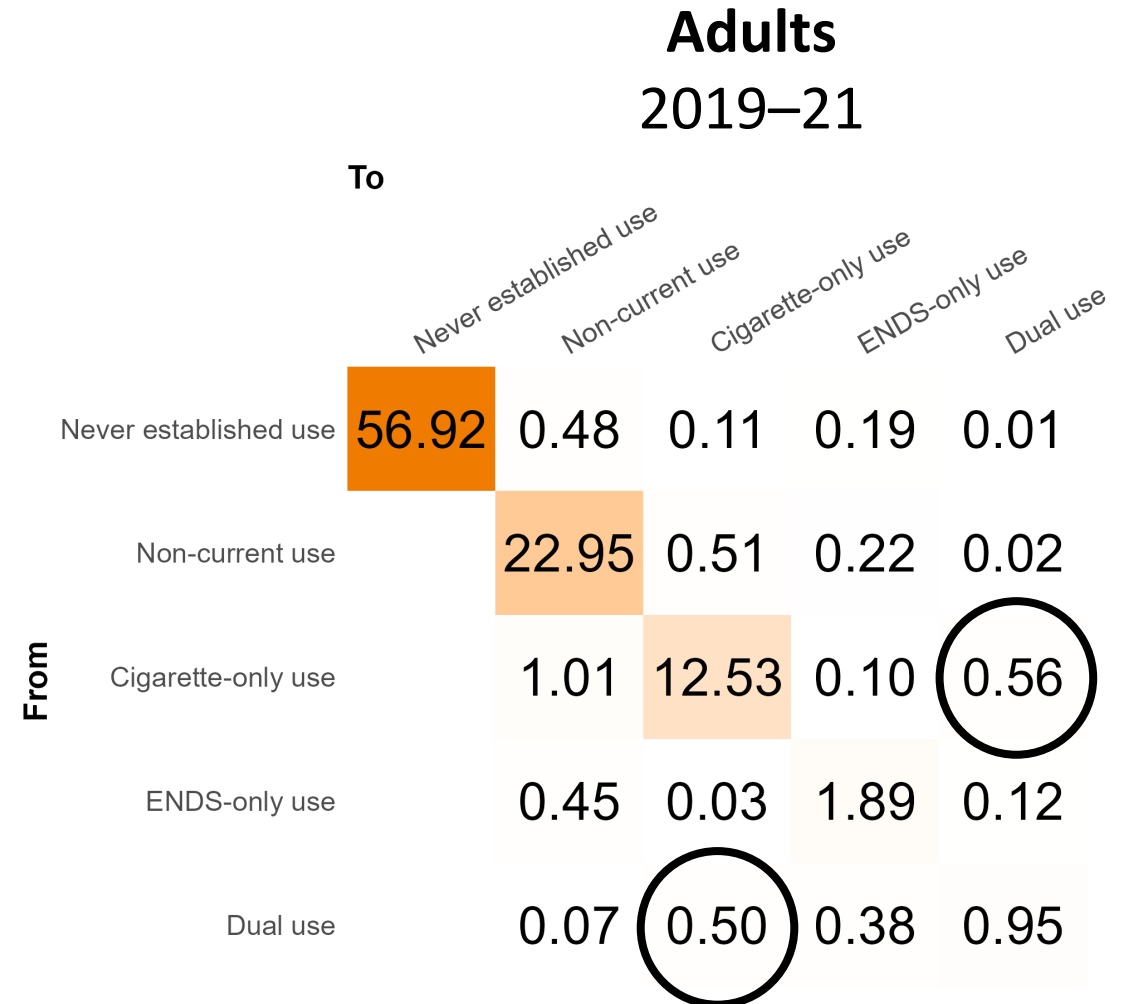
Viewing transitions as fractions of the population suggests that there has not been substantial benefit to public health.

- Adult cigarette initiation is already quite low, so further reduction has minimal impact

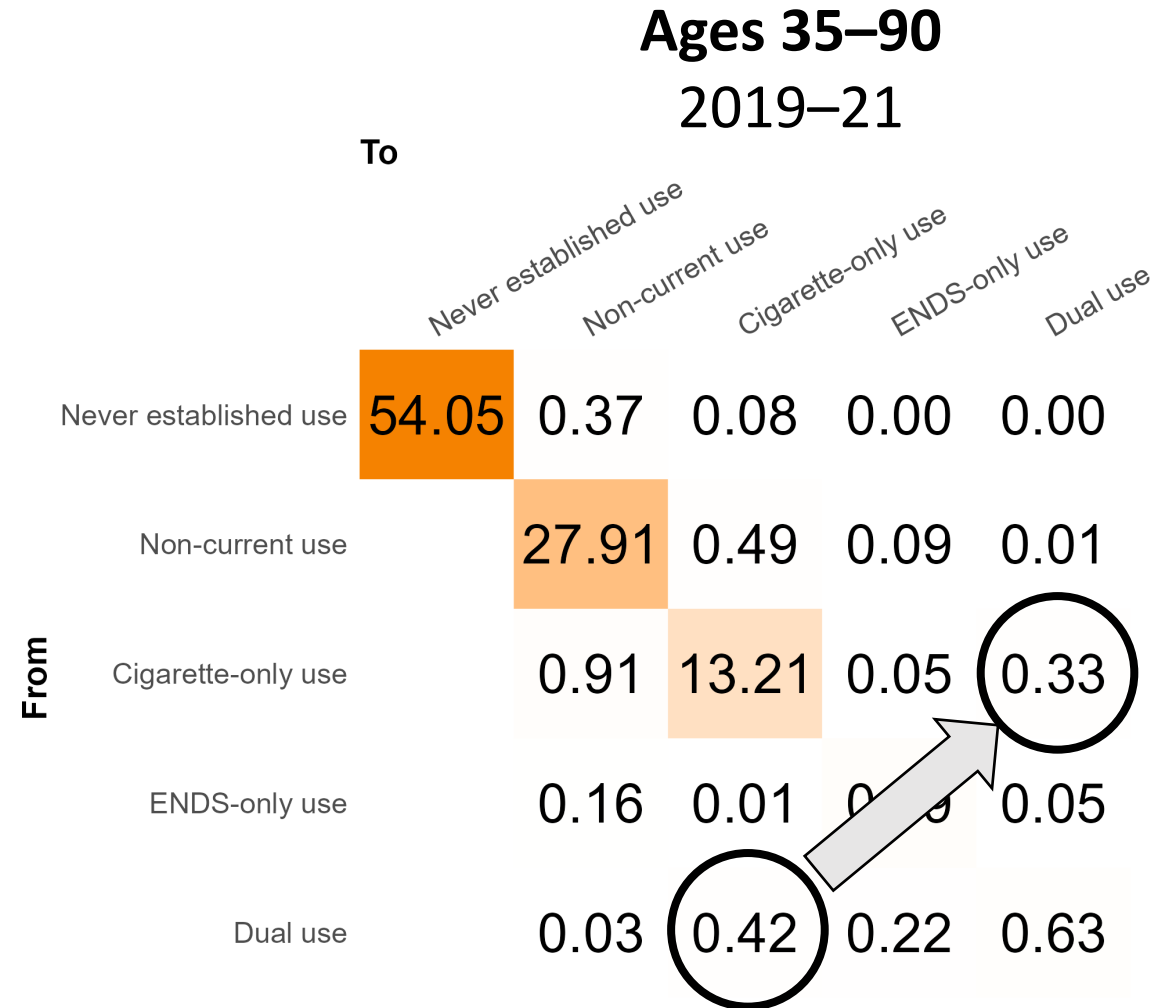
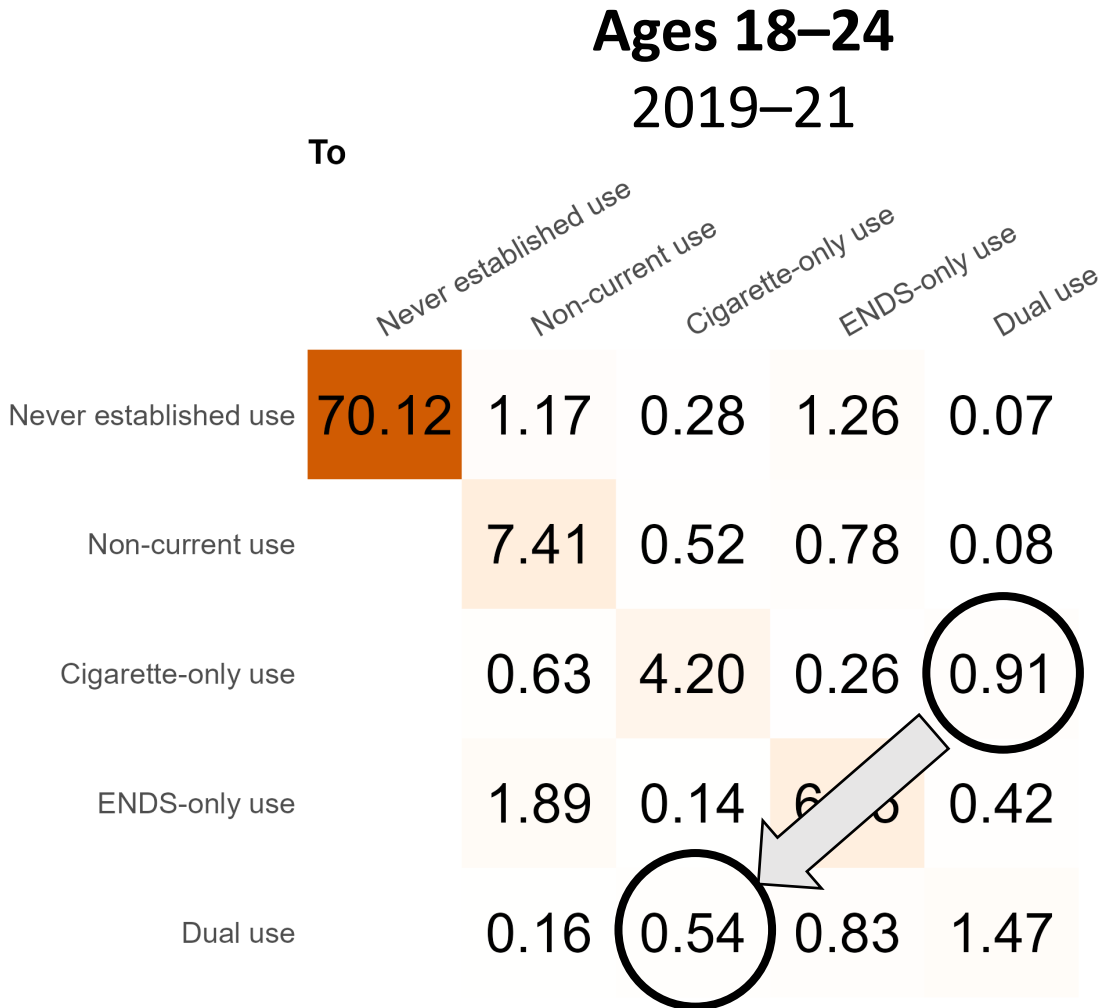


Viewing transitions as fractions of the population suggests that there has not been substantial benefit to public health.

- Adult cigarette initiation is already quite low, so further reduction has minimal impact
- The number of people transitioning from cigarette-only to dual use is approximately offset by the number of people transitioning from dual to cigarette-only use.



However, there maybe benefits for younger adults.



Take-aways

- We found 3 statistically significant changes in transitions rates from 2017–19 to 2019–21
 - Reduced cigarette initiation among never users
 - Increased ENDS cessation among ENDS-only users
 - Increased cigarette cessation among those smoking and vaping
- We expected larger changes in transitions rates because of the changes in the marketplace and regulatory context and several public health events.
 - Some changes in behavior may have already been accounted for in Wave 5 (2019)
 - Changes may have been short-lived
- The public health impact of these trends will likely be minimal.
 - Few people using cigarettes are switching to dual use, especially older adults.



Tobacco regulatory implications

- Adoption of ENDS among those currently smoking remains low, especially among older adults
 - *Regulatory goal*: Promotion of harm reduction among older adults
 - *Regulatory goal*: Prevention of ENDS initiation among those who would not have initiated smoking
- Even if cigarette cessation among those using cigarettes and ENDS is increasing, persistence of dual remains high
 - *Science question*: Is dual use increasing or reducing the likelihood of cigarette cessation after accounting for demographics and motivation to quit?
 - *Regulatory goal*: Promotion of transitions from dual use to non-current use or exclusive ENDS use

Questions?

TCORS

**Center for the
Assessment of Tobacco
Regulations
[CA_sToR]**