

The impact of current tobacco product use definitions on estimates of transitions between cigarette and e-cigarette use

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TCORS 2.0

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**Assessment of Tobacco
Regulations**
[CA_sTO_R]

Background

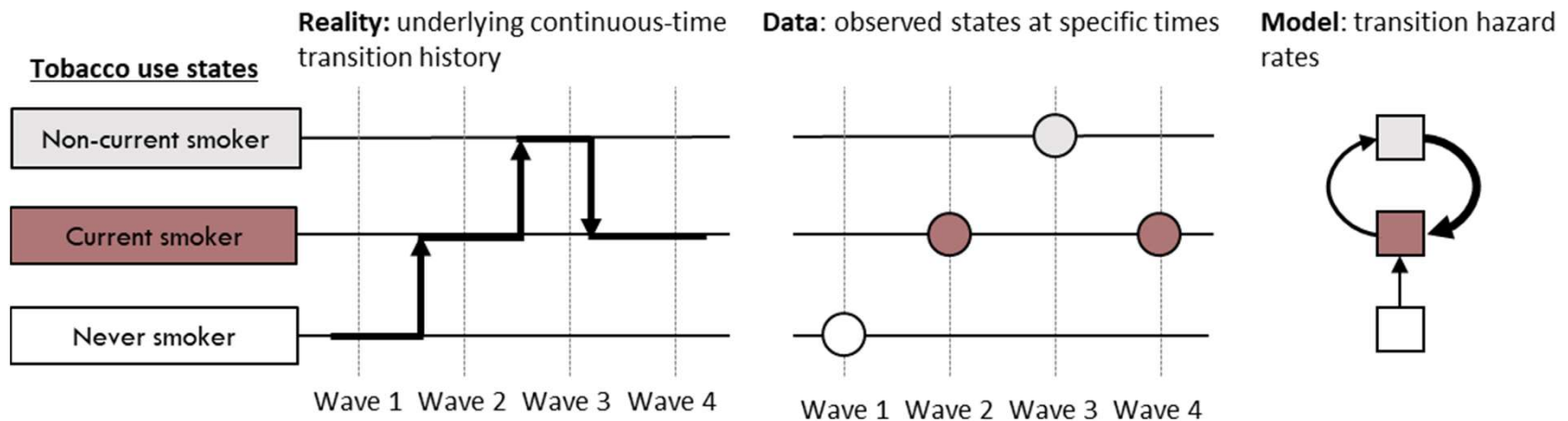
- Definitions of **current tobacco product** use vary and depend on frequency of use, established use criteria, and the product type.
 - Established use: Do not-yet-established users count as “current” users?
 - Threshold of use: How frequently does an individual have to use to be a “current” user?
 - Product type: do the answers above differ for e-cigarettes vs cigarettes?
- It is not known how and to what extent estimates of **transition rates** between different tobacco products depend on the choice of current use definition.

Data

- PATH is a longitudinal study of tobacco use
- Waves 1–4 (2013–17)
- Include 24,309 adult participants (in at least two waves and no relevant missing data)
- Our variables are derived from questions about:
 - Established use of cigarettes or e-cigarettes/e-products
 - Number of days of use in the past 30 days of cigarettes and e-cigarettes/e-products

Methods – Multistate transition model

- Continuous time stochastic model tracking a person's tobacco-use state through time estimates underlying transition hazard rates



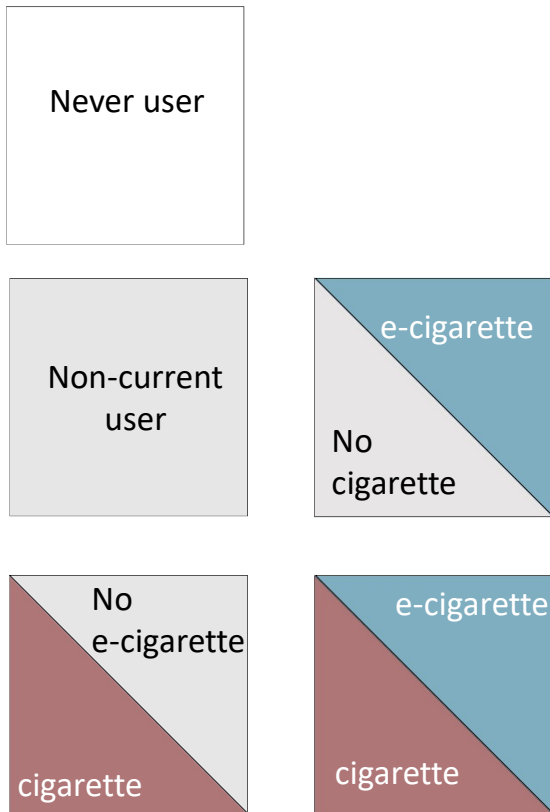
Brouwer et al. (2020). *Tobacco Control*.
Example code is accessible at tcors.umich.edu

Analysis

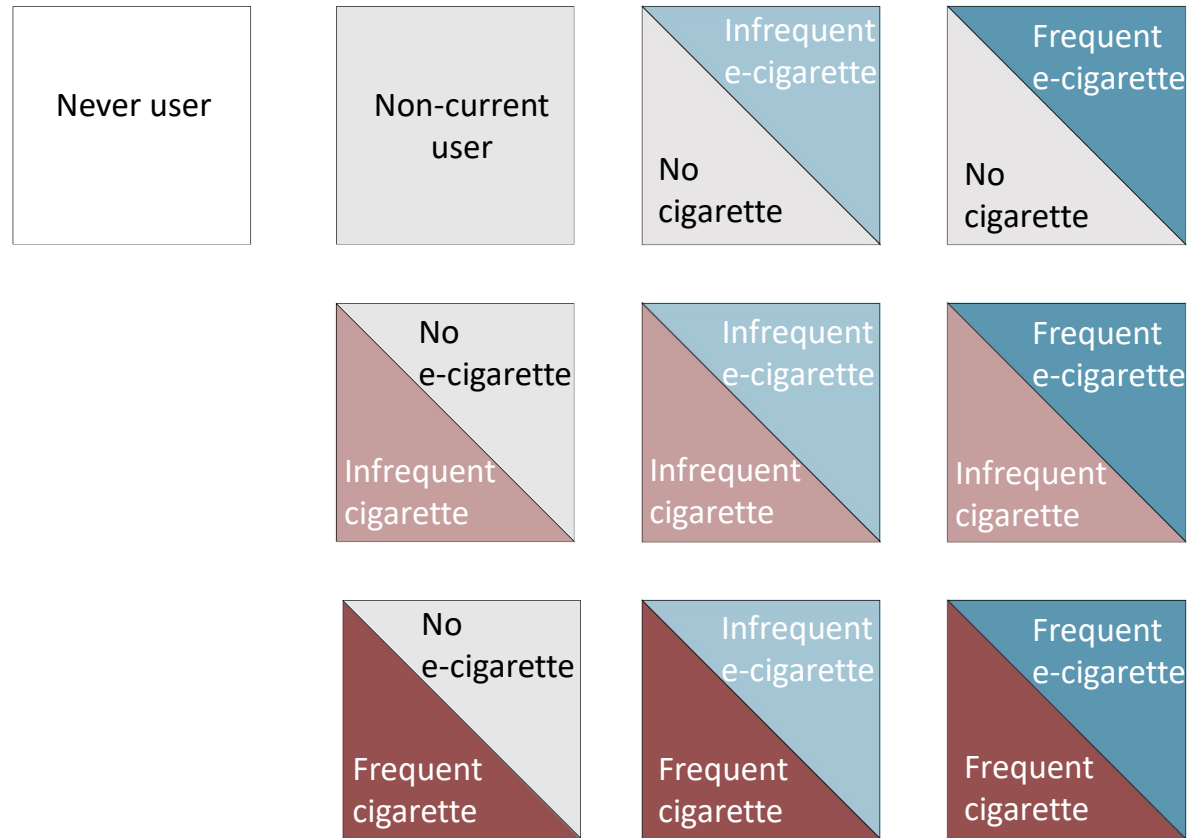
- Estimate hazard rates for transitions between never, non-current, cigarette, e-cigarette, and dual user states
 - For different thresholds for current use
 - 1+, 10+, 20+, and 30 days of the past 30 days
 - With and without established use criteria
 - Cigarettes: has smoked at least 100 cigarettes
 - E-cigarettes: ever a fairly regular user of e-cigarettes
- Two classes of models
 - Infrequent (below threshold) users are classified as non-current users
 - Infrequent users are distinct from both non-current and frequent (above threshold) users

Tobacco use states

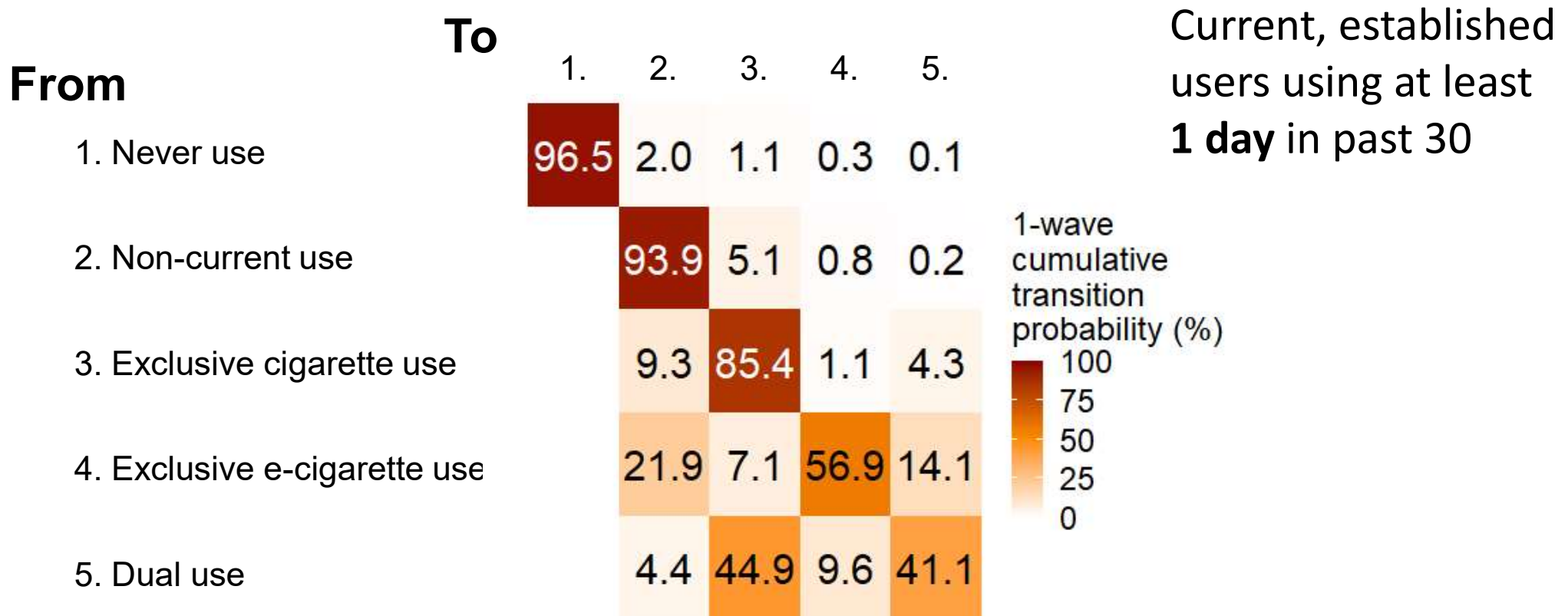
Infrequent users are non-current users



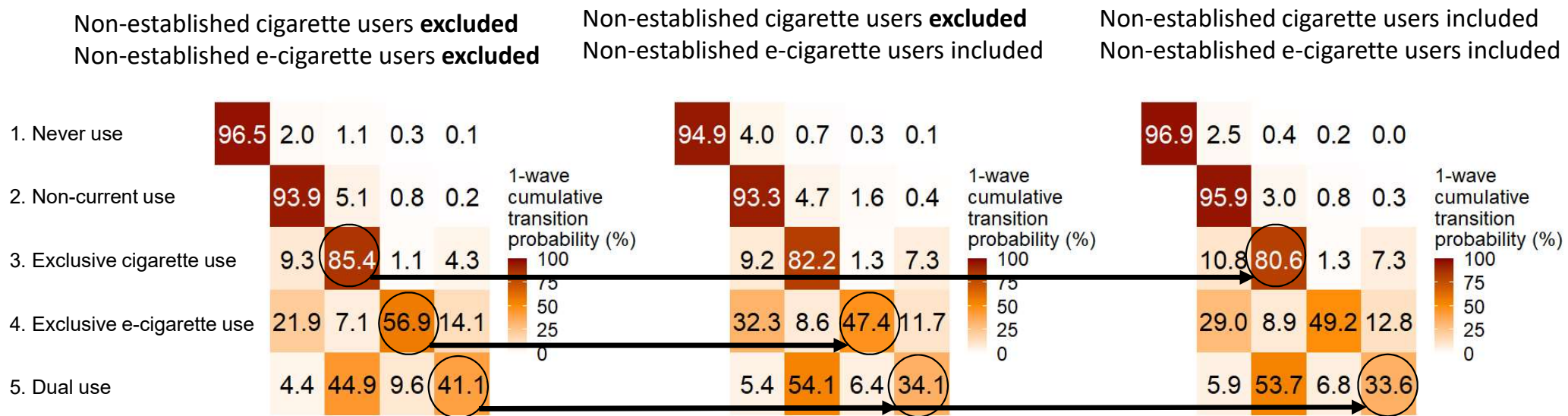
Infrequent users are distinct

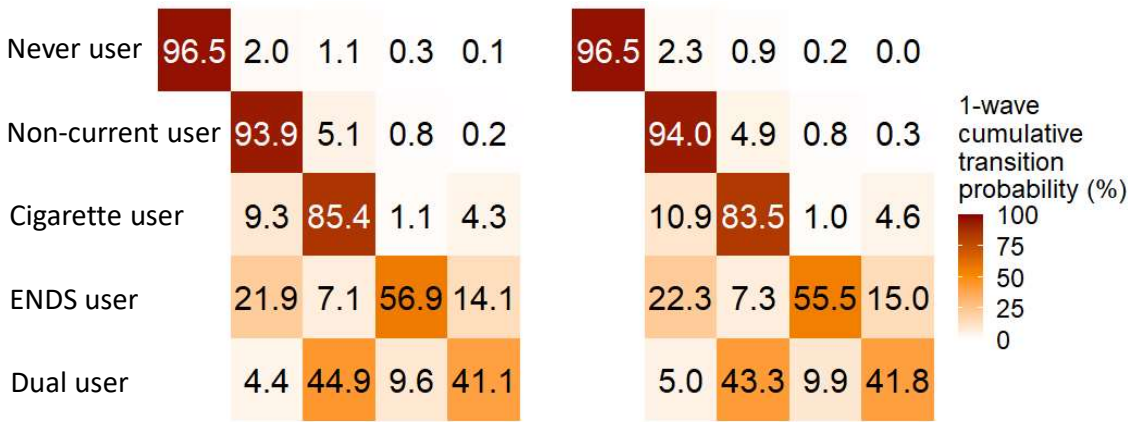


Results – infrequent users are non-current

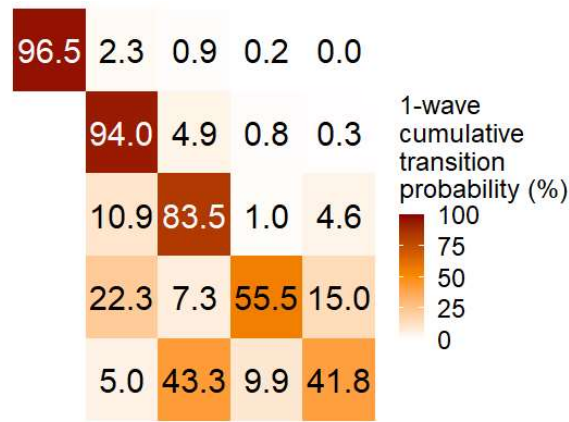


Including non-established users reduces persistence, especially for e-cigarette and dual use

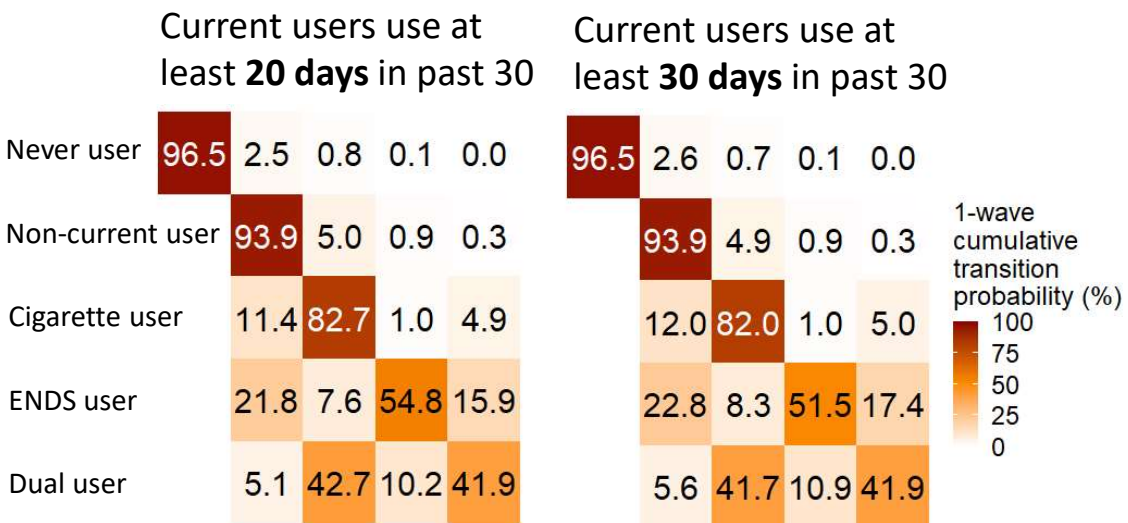




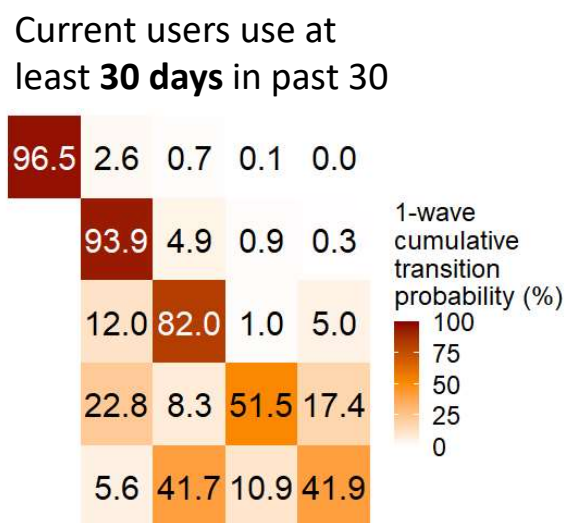
Current users use at least **1 day** in past 30



Current users use at least **10 days** in past 30



Current users use at least **20 days** in past 30



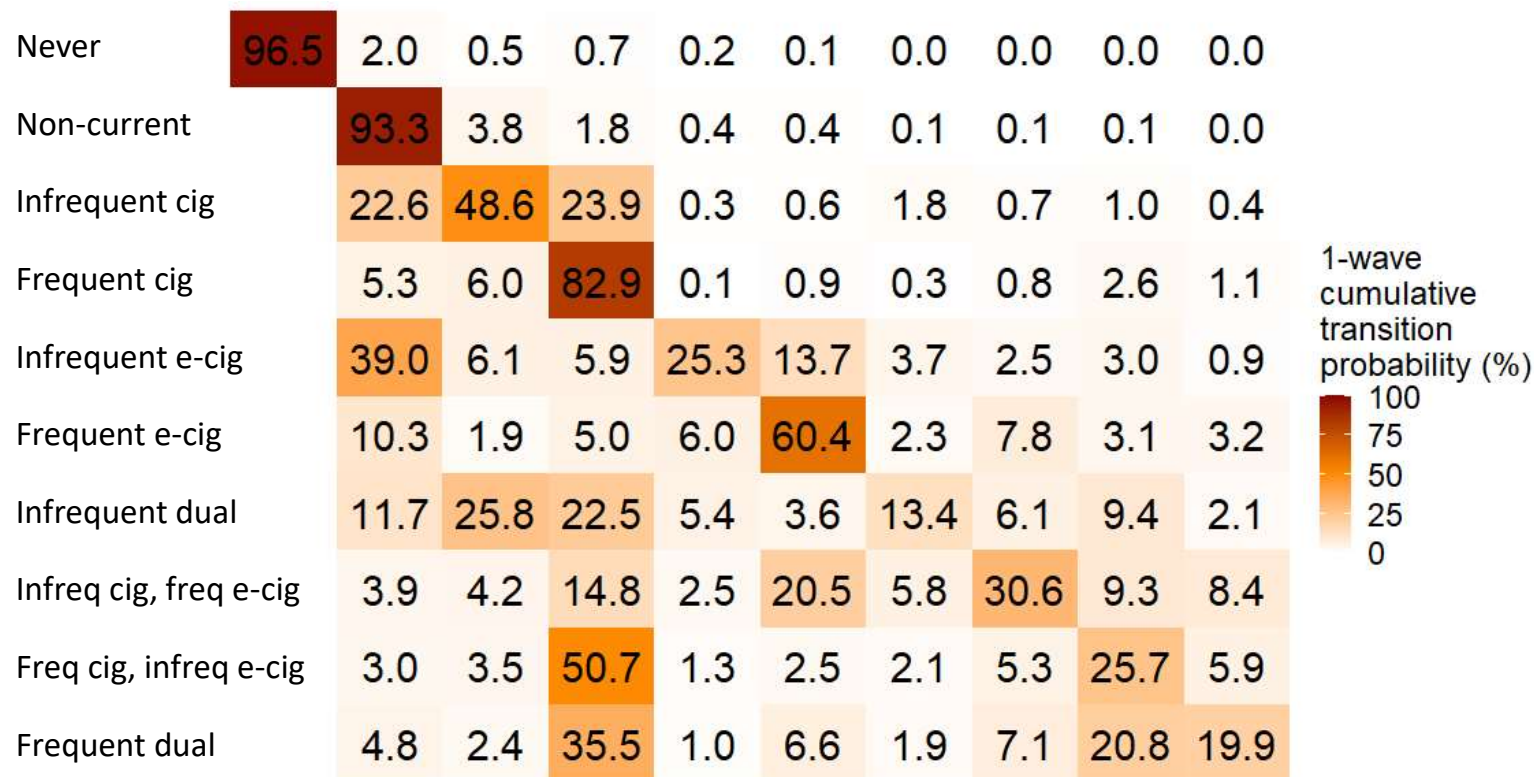
Current users use at least **30 days** in past 30

Transitions are largely robust to changing the threshold of use.

Using stricter definitions of use increases the fraction of ENDS users that transition to dual use, that is *more frequent users of ENDS are more likely to pick up cigarettes*

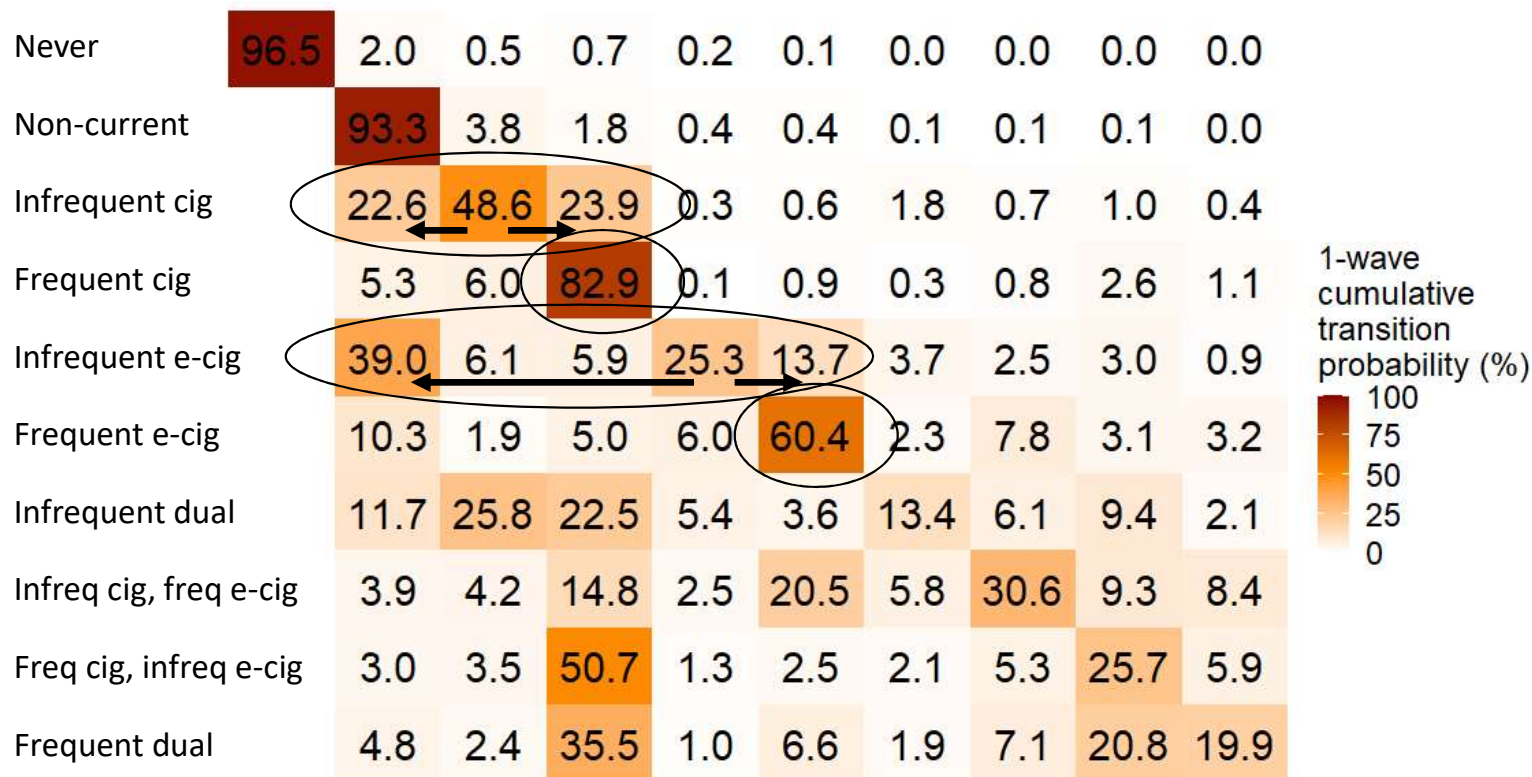
Results – infrequent users are distinct

Infrequent use is <30 days, frequent is 30 days



Results – infrequent users are distinct

Infrequent use is <30 days, frequent is 30 days



Infrequent cigarette users are equally likely to stop using or increase use frequency in the next wave.

Frequent cigarette users stay frequent cigarette users.

Infrequent e-cigarette users are more likely to not be using than they are to be using more in the next wave.

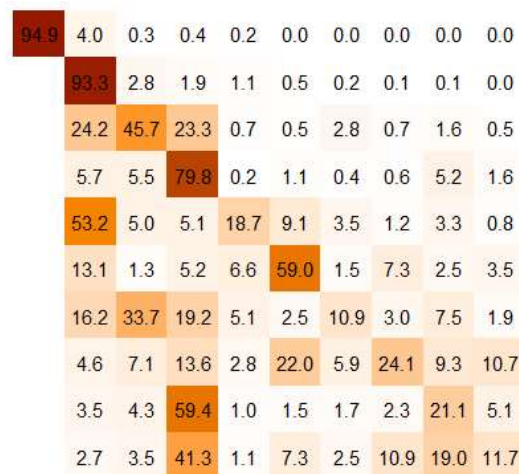
Frequent e-cigarette users mostly continue to be frequent e-cigarette users.

Unlike before, this class of models is robust to including non-established users.

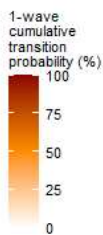
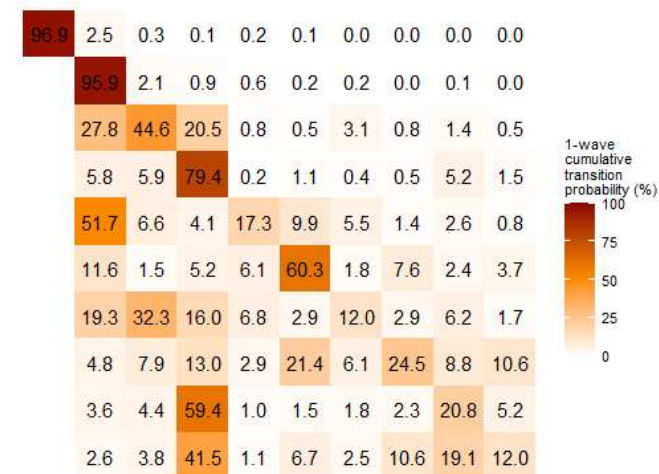
Non-established cigarette users **excluded**
Non-established e-cigarette users **excluded**

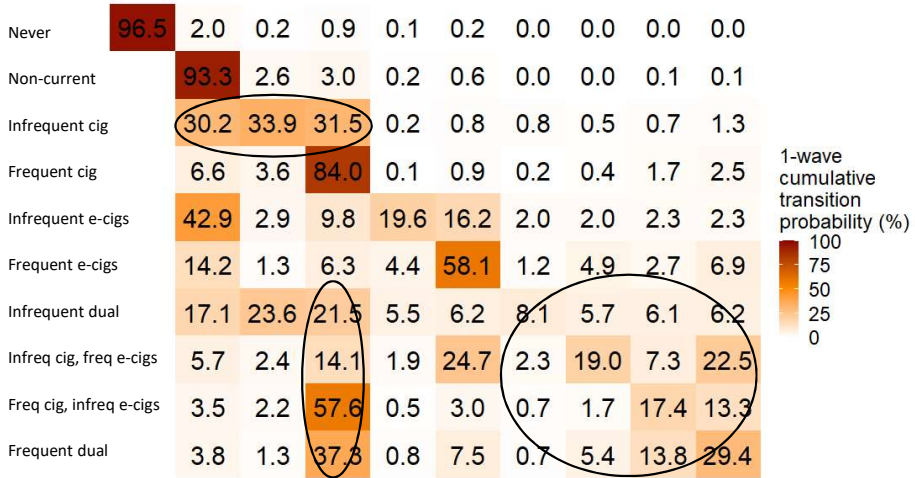


Non-established cigarette users **excluded**
Non-established e-cigarette users **included**



Non-established cigarette users **included**
Non-established e-cigarette users **included**



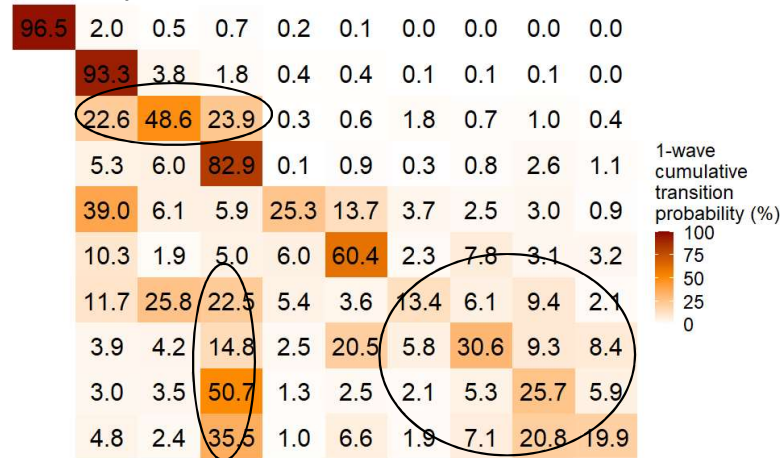
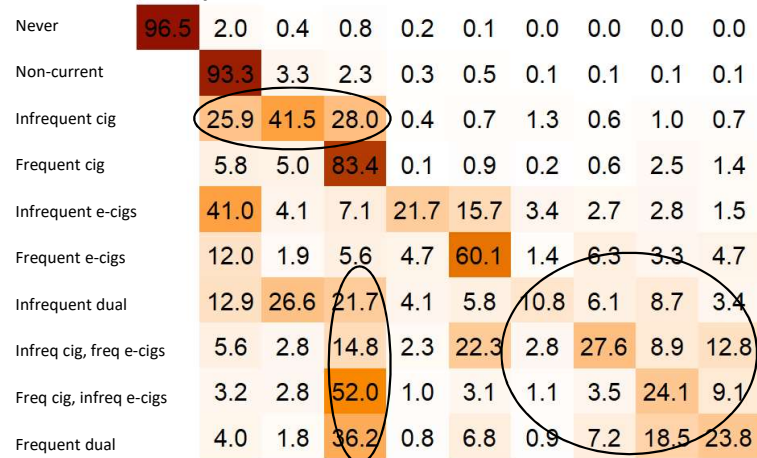


But, transitions involving infrequent use are not robust to changing the threshold of use.

Current users use at least **10 days** in past 30

Current users use at least **20 days** in past 30

Current users use at least **30 days** in past 30



Conclusions

- Product use definitions have important implications for assessing product use transitions and thus the public health implications of cigarette and e-cigarette control strategies.
- Transition models that treat infrequent users as non-current are more robust to thresholds of use and less robust to inclusion of non-established users
- Transition models that treat infrequent users as distinct are less robust to thresholds of use and more robust to inclusion of non-established users
- Greater attention needs to be placed on understanding patterns of infrequent use.

Acknowledgments

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