Supplementary Appendix

A1: Derivation of Transition Rates between Tobacco Smoking States

Table 1 provides the current, former and never smoking rates by race and sex, per data from the National Health Interview Survey (NHIS).[1] The CDC estimates that 55.1% of persons who are currently smoking attempt to stop smoking in a given year.[2] This estimate implies that 44.9% of currently smoking persons do not attempt cessation in a given year. Considering each day to represent an independent opportunity to attempt cessation, we can estimate the daily probability p of attempting a quit using the binomial model:

$$(1-p)^{365} = 0.449.$$

We solve this equation to get $p = 0.00219$. Thus, the daily probability of cessation for all race and sex categories is $p = 0.00219$. We set up and solve the following balance equation to estimate the daily rate of return-to-use ("relapse") to maintain a constant proportion of currently smoking persons for each race and sex combination:

```
Relapse * Former = Cessation * Current
```

This equation posits that the number of persons returning to use (computed on the left-hand side) is equal, on average, the proportion of persons attempting to quit. For each race and sex, we then compute the relapse rate by implementing the R function below:

```
## Calculate transition rates to keep smoking rates stable
get_transition_rates <- function(dt, race, sex){
  rates <- get_smoke_proportions(dt, race, sex)
  former_rate <- rates[SMOKESTATUS2=="FORMER", V1]
  current_rate <- rates[SMOKESTATUS2=="CURRENT", V1]
```

```
    # Relapse * Former = Cessation * Current --> Relapse = (Cessation *
Current) / Former

    relapse = (cessation * current_rate) / former_rate

    print(paste(race, " ", sex, "Relapse:", relapse))

}
```

This computation gives us the following transition rates from former to current smoking for

each race and sex:

Table A1

Daily Transition Probabilities between Former to Current Smoking States

Population Subgroup	Daily Former-to-Current Transition Probability (i.e. relapse/return-to-use)	Population Subgroup	Daily Former-to-Current Transition Probability (i.e. relapse/return-to-use)
White Males	0.000986	Hispanic Males	0.000975
White Females	0.001092	Hispanic Females	0.001215
Black Males	0.001983	Asian Males	0.000988
Black Females	0.001779	Asian Females	0.000736

A2: Derivation of Transition Rates between Alcohol Use States

As described in the main body of the manuscript, alcohol use was classified in four

states: non-drinking, or categories defined on the basis of the daily consumed quantity of

alcohol, as defined by the WHO.[3] The distributions of these four states were defined on the

basis of a recent analysis of the National Epidemiologic Survey on Alcohol and Related

Conditions (NESARC-II).[4] This analysis found annual rates of transition between the four

categories defined above. As we did for smoking, we used the binomial formulation to compute

the daily transition probability p from the annual transition probabilities published in the analysis of NESARC-II data.[4] The daily transition probabilities found in our analysis are provided below.

Table A2

Daily Transition Probabilities between Alcohol States Computed using the Binomial Formula

	Non-Drinking[b]	Category I[b]	Category II[b]	Category III[b]
Non-Drinking[a]	0.9988398	0.0002604598	0.0006111654	0.0002886173
Category I[a]	0.0001665947	0.9997282	6.936145e-05	3.584933e-05
Category II[a]	3.307502e-05	0.001020066	0.9977292	0.001217685
Category III[a]	1.098082e-05	0.0004387222	0.9982205	0.998474

[a]Represents transitions from
[b]Represents transitions to

A3: References Cited in the Appendix

1. IPUMS NHIS. at <https://nhis.ipums.org/nhis/>

2. CDCTobaccoFree. Smoking Cessation: Fast Facts. *Centers for Disease Control and Prevention* (2023). at <https://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/smoking-cessation-fast-facts/index.html>

3. MacKillop, J., Agabio, R., Feldstein Ewing, S. W., Heilig, M., Kelly, J. F., Leggio, L., Lingford-Hughes, A., Palmer, A. A., Parry, C. D., Ray, L. & Rehm, J. Hazardous drinking and alcohol use disorders. *Nat Rev Dis Primers* **8,** 80 (2022).

4. Puka, K., Buckley, C., Mulia, N., Purshouse, R. C., Lasserre, A. M., Kerr, W., Rehm, J. & Probst, C. Behavioral stability of alcohol consumption and socio-demographic correlates of

change among a nationally representative cohort of US adults. *Addiction* **118,** 61–70

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