TCORS 2.0
University of Michigan & Georgetown University

Center for the Assessment of Tobacco Regulations [CAsToR]

SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF MICHIGAN

GEORGETOWN UNIVERSITY
School of Medicine

Latent Transition Analysis of Tobacco Use Frequencies for Multiple Products in US Adults

Ritesh Mistry[1], Irina Bondarenko[2], Rafael Meza[3], Andrew F. Brouwer[3], Jihyoun Jeon[3], David T. Levy[4], Michael R. Elliott[2], Jeremy M. G. Taylor[2], Jana Hirschtick[3], Nancy L. Fleischer[3]

[1] University of Michigan, Department of Health Behavior and Health Education
[2] University of Michigan, Department of Biostatistics
[3] University of Michigan, Department of Epidemiology
[4] Georgetown University, School of Medicine

Tobacco Regulatory Science Meeting
October 18, 2021

Disclosures and Funding

- Authors do not have any disclosures.

- This work was supported by funding from the National Institutes of Health and Food and Drug Administration (U54CA229974). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

Background

- In the context of multi-tobacco products, there are practical and computational challenges in characterizing the complexity and dynamism in tobacco use behaviors over time.

- There is particular interest in transitions between tobacco use products and behaviors.
  - transitions between single, dual and poly tobacco use
  - transitions in frequency and intensity of use, product switching, cessation and relapse.

Objectives

- Use Latent Transition Analysis (LTA) to identify latent states of tobacco use characterized by the tobacco product(s) used and the frequencies of use over time.

- Estimate transition probabilities between latent states of tobacco use
  - To higher/lower frequency of use
  - To more/less harmful tobacco product use

- Identify demographic factors associated with transitions

Methods

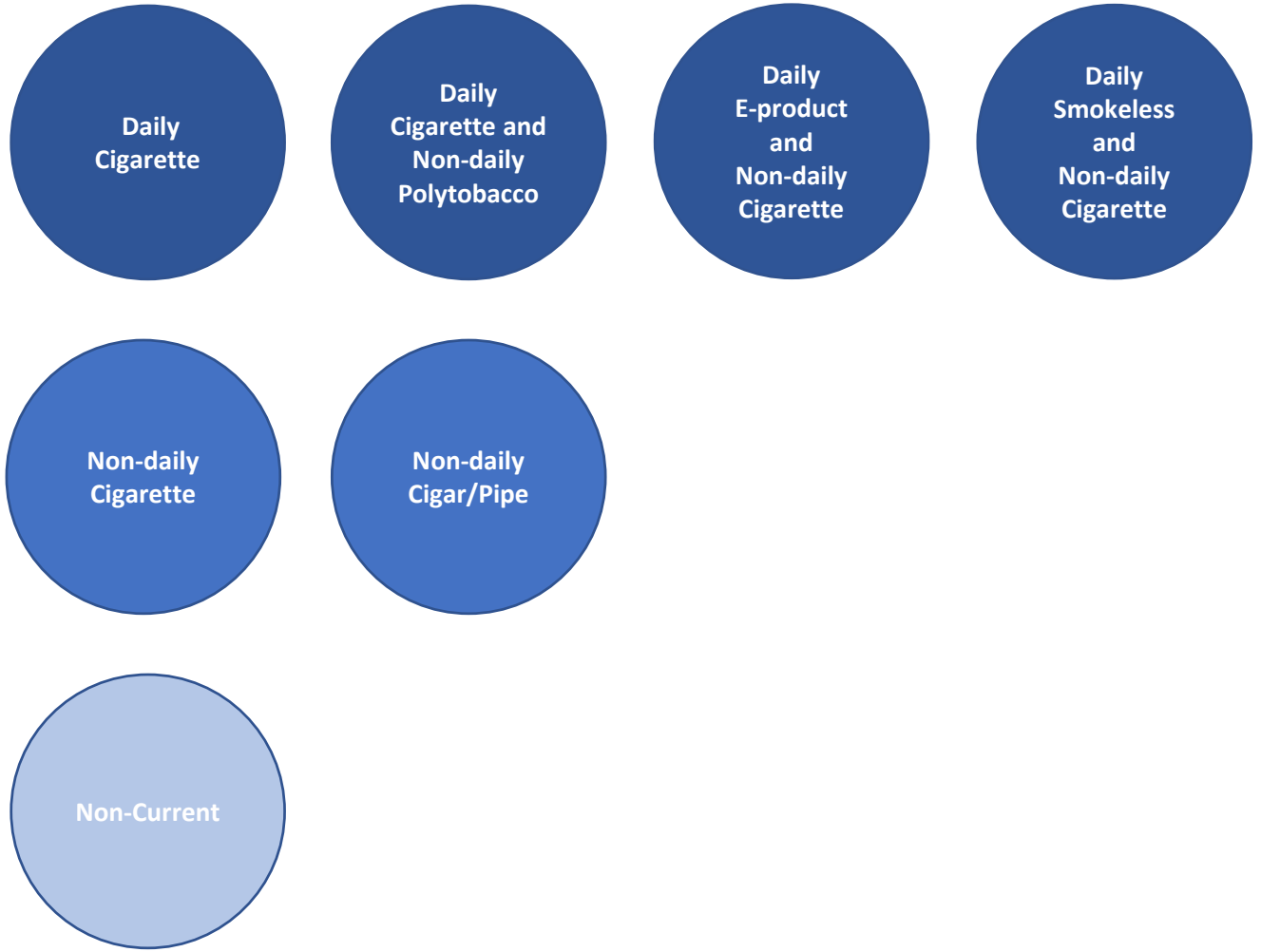
- PATH Waves 1-4 (2013-2018) Adult PUF (n=21284)
  - Analytic sample: Ever established tobacco users with no missing data (n=12036)

- Latent Transition Analysis
  - Tobacco products: Cigarettes, traditional cigars, cigarillos, filtered cigars, hookah, e-products, traditional smokeless tobacco, snus pouches
  - Past 30-day frequency of use: 0 (non-current), 1-25 (non-daily), and 26-30 days (daily)
  - Covariates: age, sex, sexual orientation, race/ethnicity, education, income

- Multivariate multinomial logistic regression identified demographics factors associated with transitions

- Accounted for survey design and longitudinal weights

Tobacco Use Latent States



Latent State Prevalence Rates

Latent States of Tobacco Use	Wave 1	Wave 2	Wave 3	Wave 4
1. Daily cigarette	29.7	28.9	28.8	29.0
2. Daily cigarette and polytobacco	7.4	6.0	4.8	3.8
3. Non-daily cigarette	9.8	9.5	8.4	8.0
4. Daily e-product and non-daily cigarette	2.4	3.3	3.6	3.6
5. Daily smokeless tobacco	4.9	4.8	4.7	4.8
6. Non-daily cigar	3.2	2.9	2.6	2.6
7. Non-current	42.5	44.7	46.9	48.2

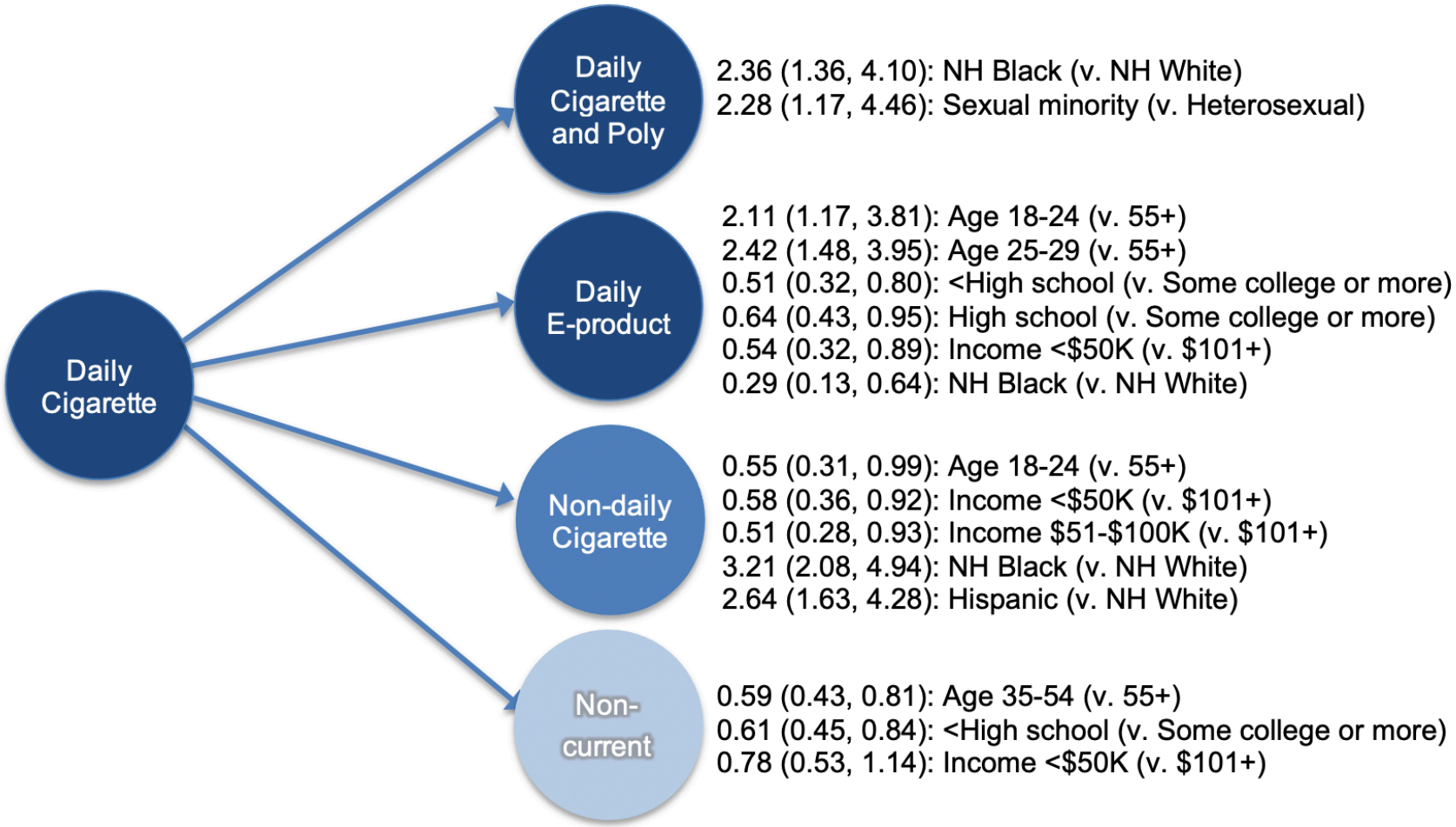
One-wave Transition Probabilities

Previous wave state	Later wave state						
	1	2	3	4	5	6	7
1. Daily cigarette	92.9	1.0	2.2	1.7	0.0	0.0	2.2
2. Daily cigarette and polytobacco	15.7	75.6	3.4	3.5	0.9	0.6	0.3
3. Non-daily cigarette	4.8	0.7	82.4	0.4	0.2	0.2	10.8
4. Daily e-product and non-daily cigarette	7.3	0.5	0.8	87.3	0.1	0.0	3.9
5. Daily smokeless tobacco	0.3	0.2	0.0	0.2	96.2	0.4	2.8
6. Non-daily cigar	0.1	0.7	0.5	0.9	0.0	90.1	7.8
7. Non-current	0.1	0.0	0.8	0.1	0.0	0.0	98.8

Number of Transitions (n=33,996)

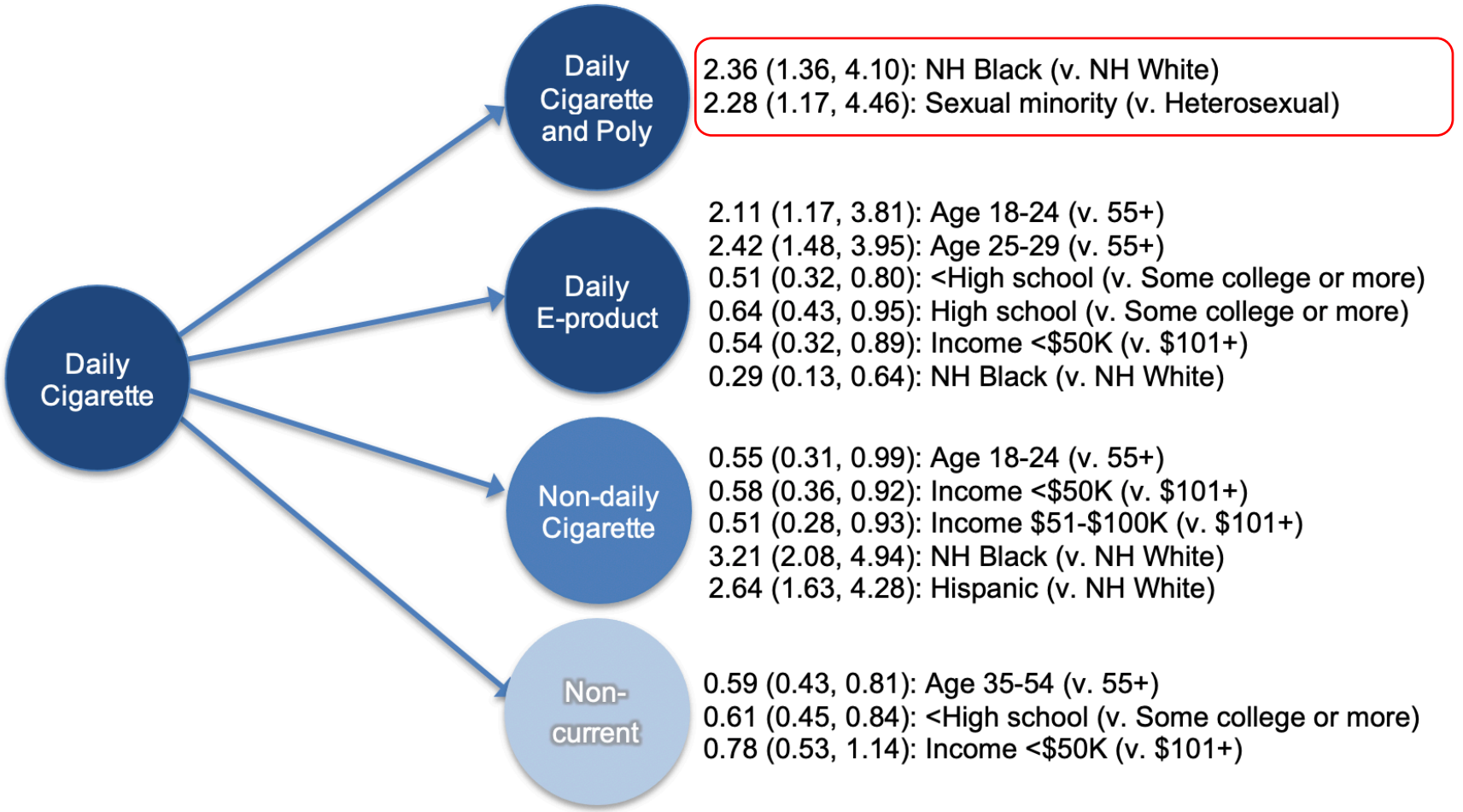
Previous wave state	Later wave state						
	1	2	3	4	5	6	7
1. Daily cigarette	12826	110	227	203	0	2	441
2. Daily cigarette and polytobacco	503	2356	106	98	23	15	9
3. Non-daily cigarette	263	30	3542	13	10	7	486
4. Daily e-product and non-daily cigarette	102	5	9	1167	1	1	76
5. Daily smokeless tobacco	3	2	0	5	1883	6	42
6. Non-daily cigar	1	6	7	11	0	1085	87
7. Non-current	15	2	61	17	1	2	8159

Demographic Factors Associated with Transition from Daily Cigarette Use (ORs)*



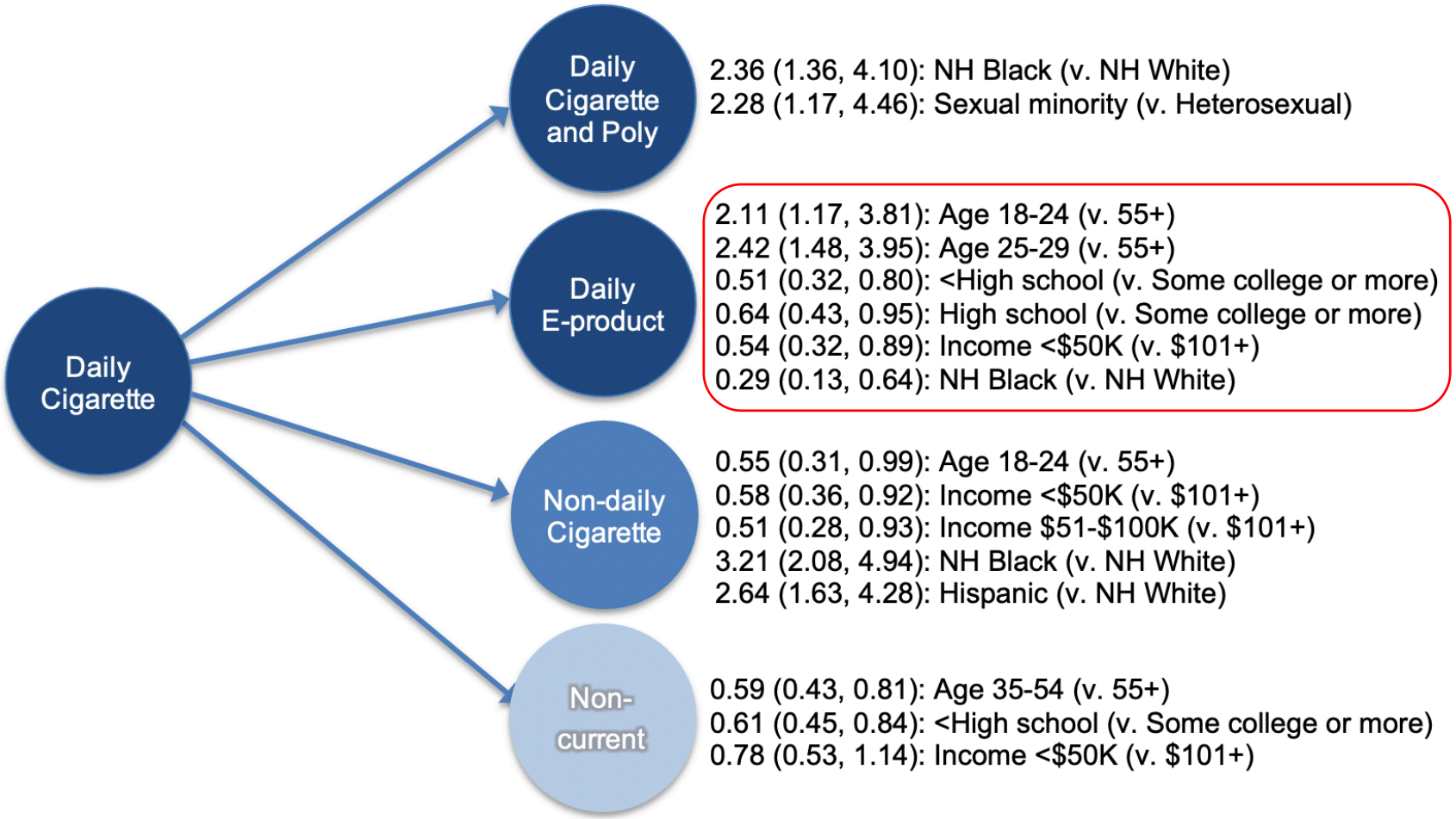
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transition from Daily Cigarette Use (ORs)*



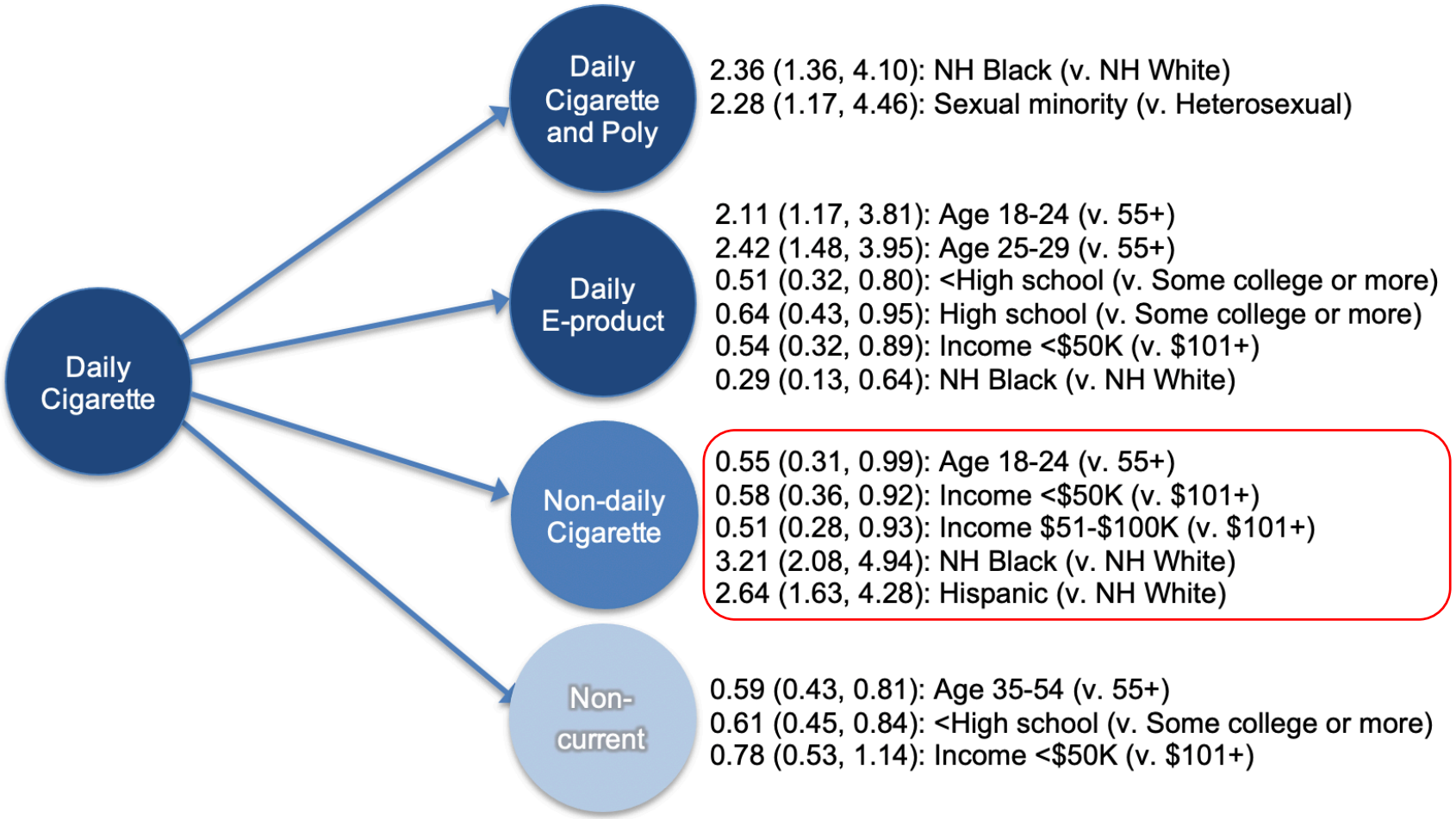
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transition from Daily Cigarette Use (ORs)*



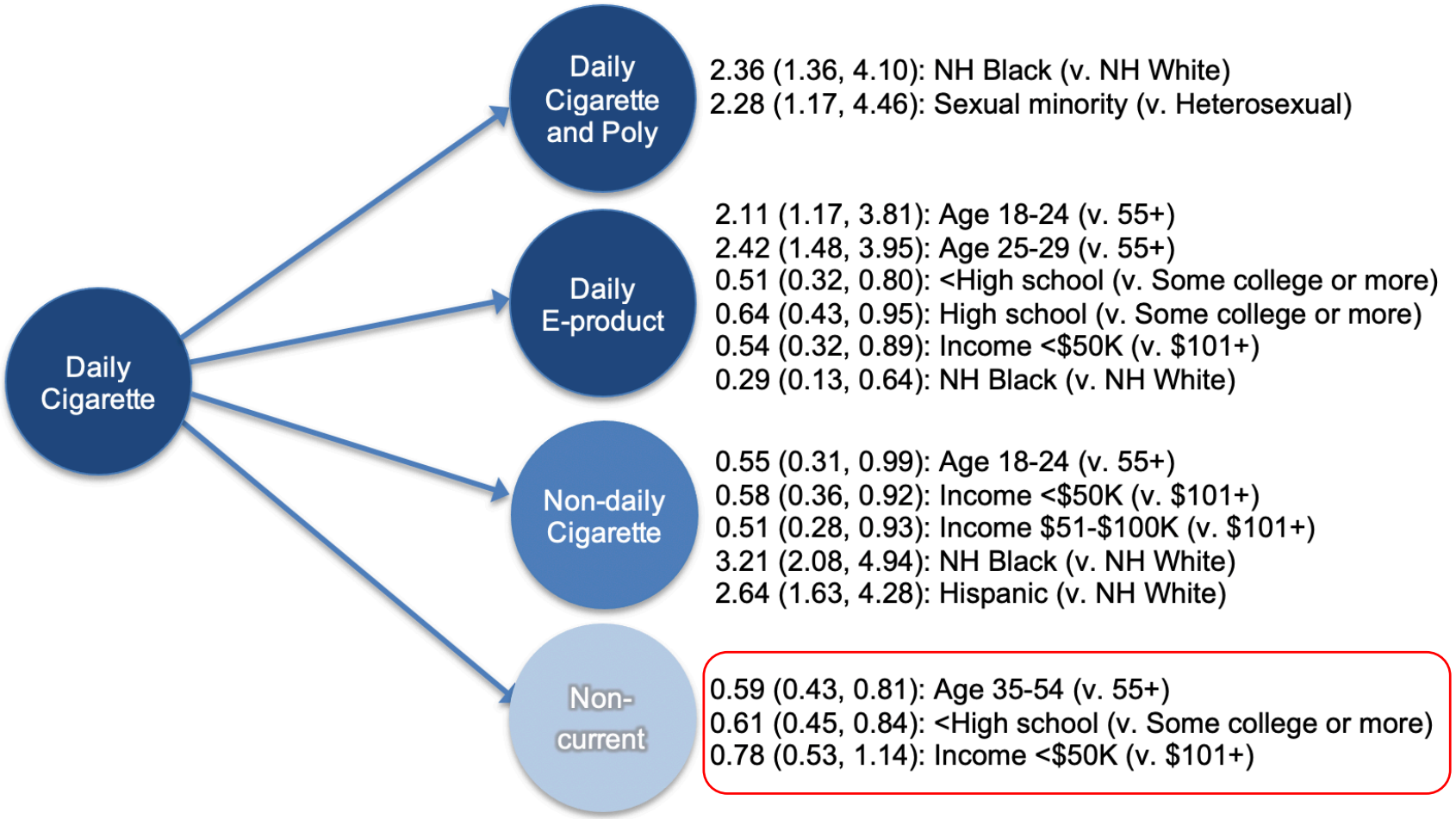
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transition from Daily Cigarette Use (ORs)*



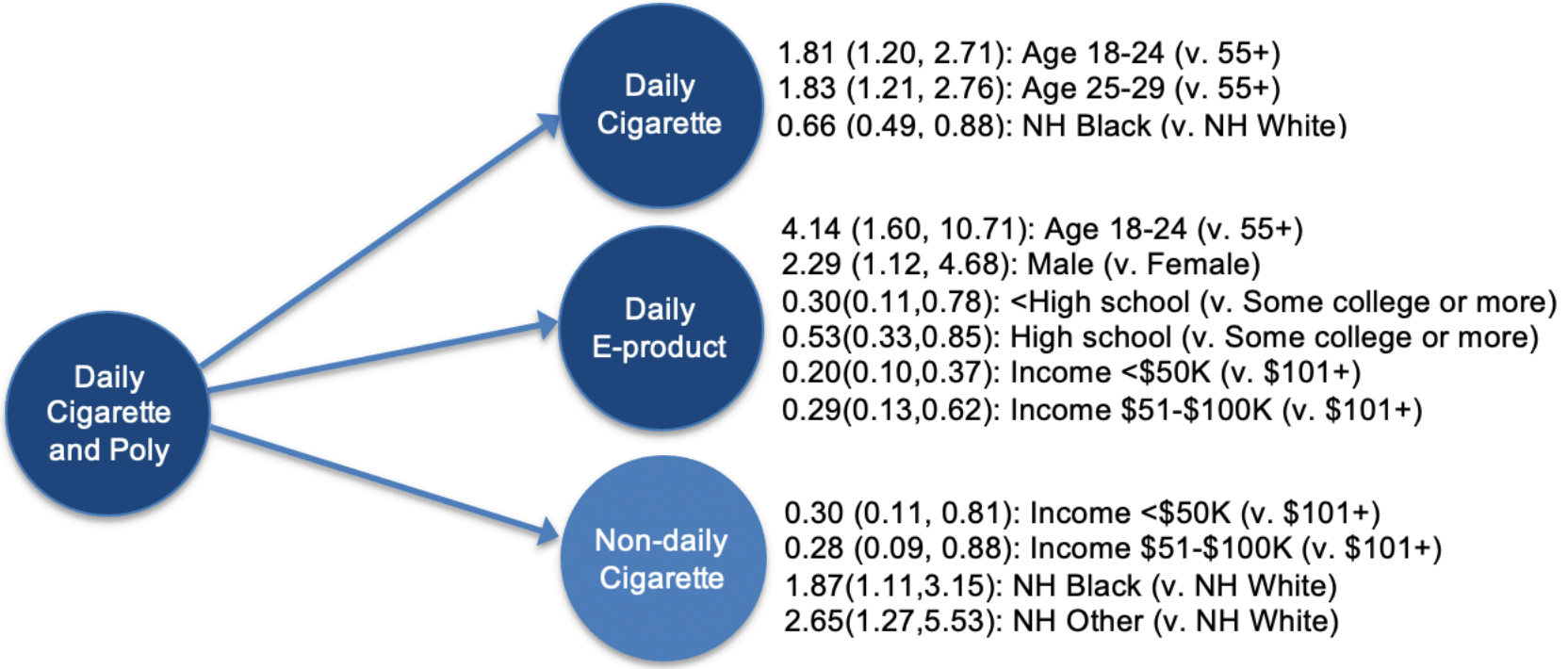
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transition from Daily Cigarette Use (ORs)*



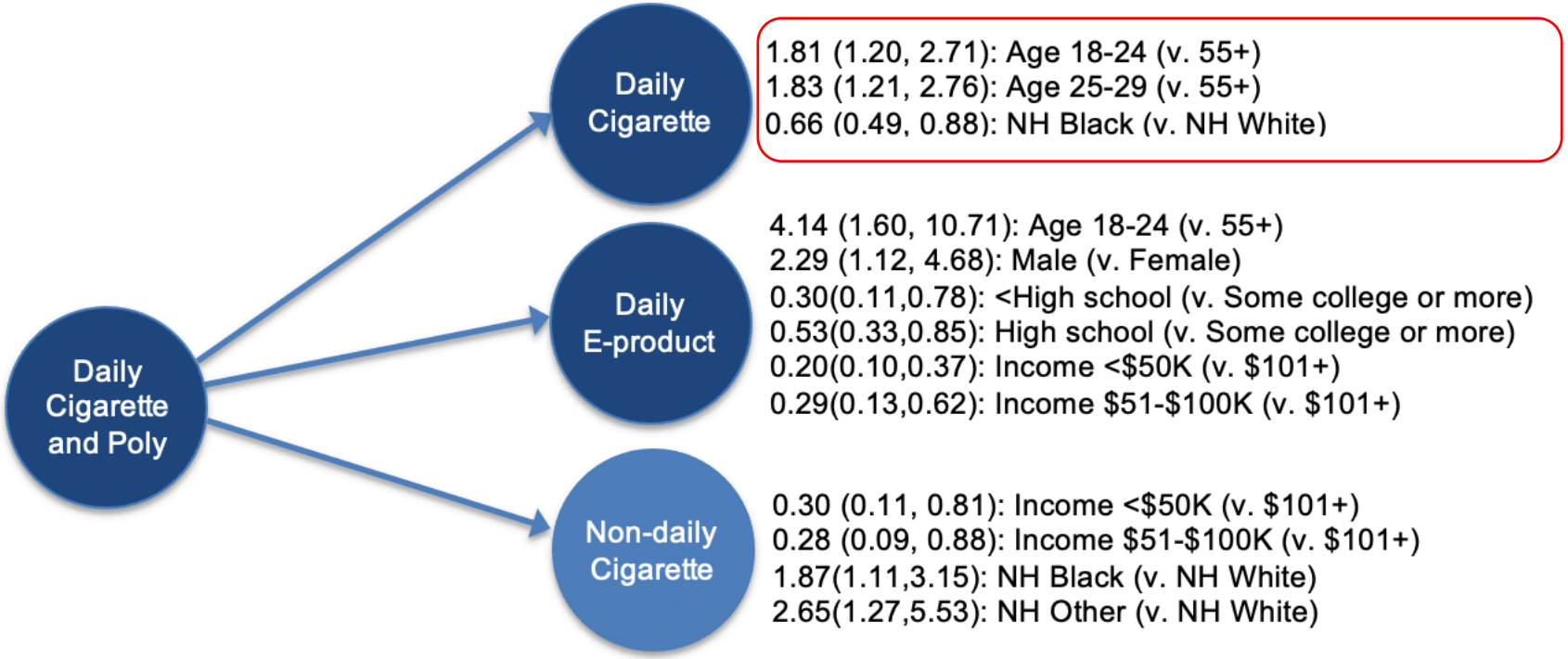
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transitions from Daily Cigarette and Polytobacco Use



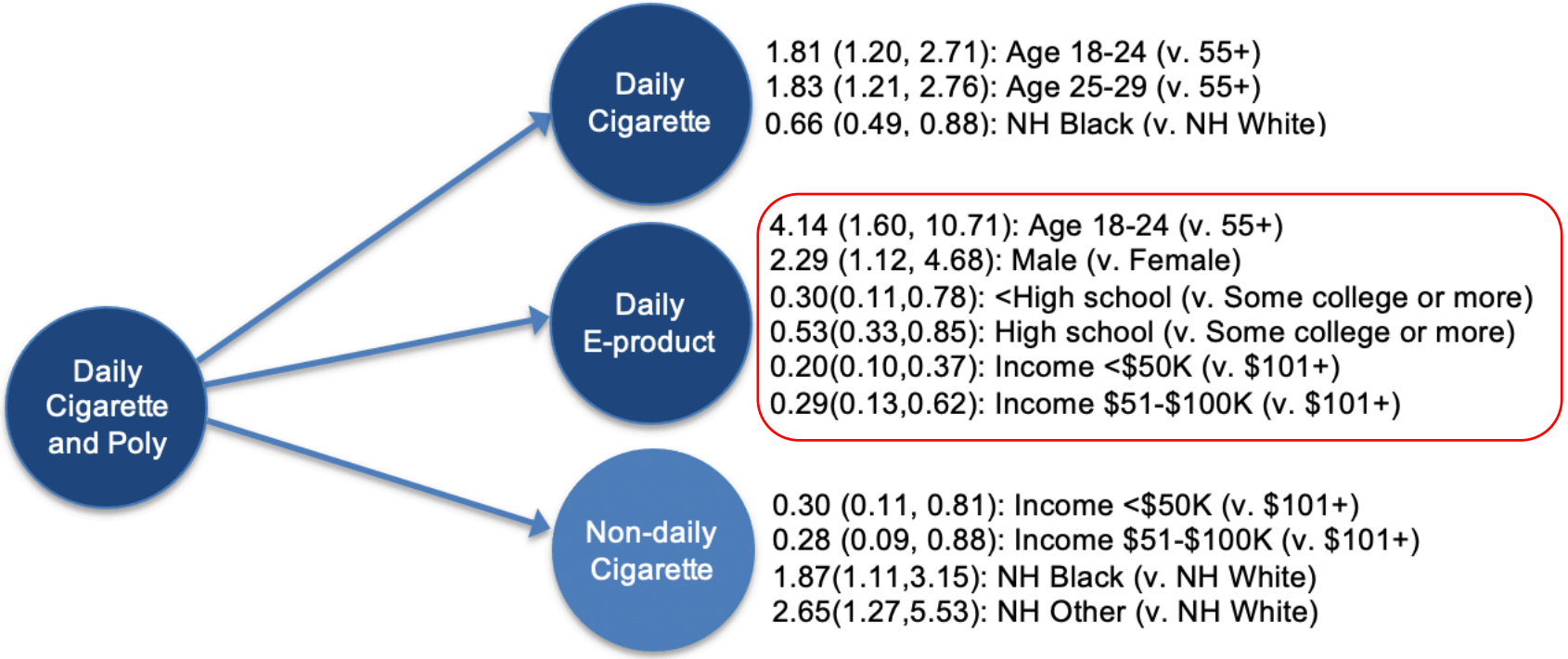
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transitions from Daily Cigarette and Polytobacco Use



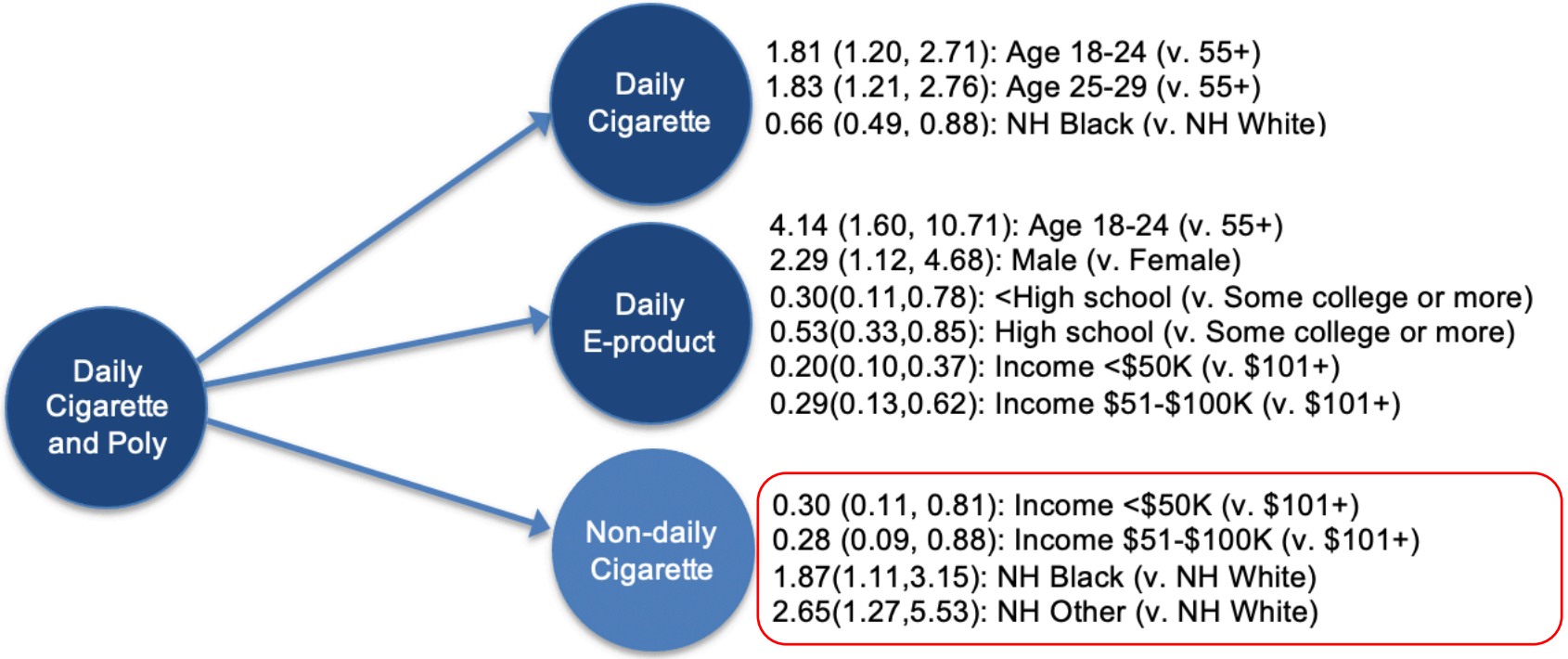
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transitions from Daily Cigarette and Polytobacco Use



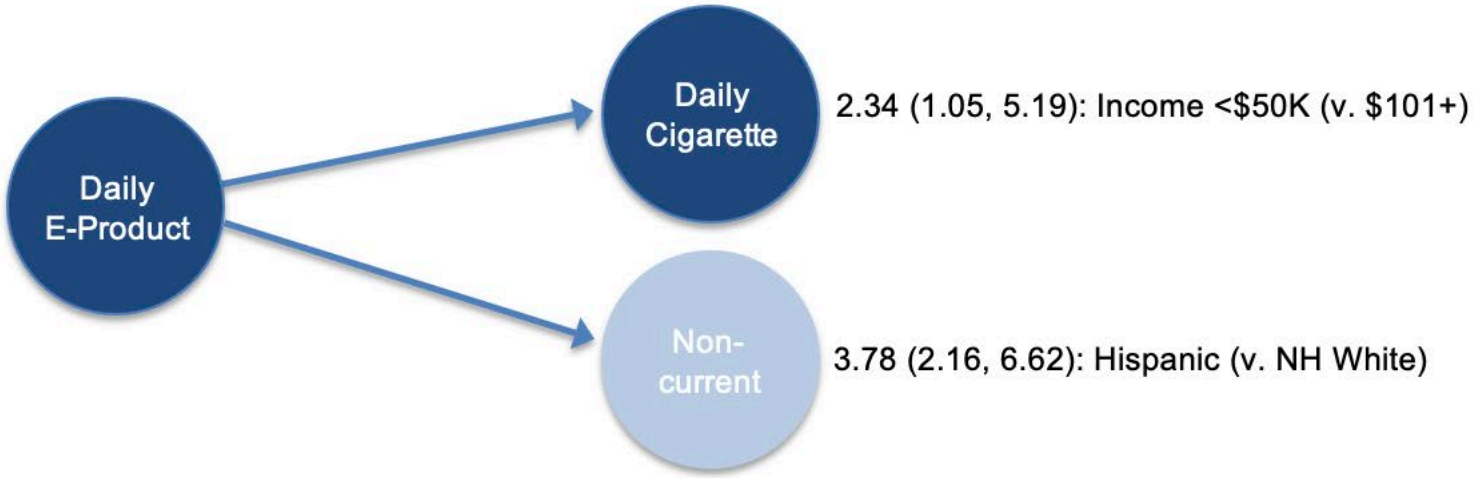
*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transitions from Daily Cigarette and Polytobacco Use



*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Demographic Factors Associated with Transitions from Daily E-product use



*Models adjusted for age, sex, sexual orientation, race/ethnicity, education and income

Conclusions and Implication

- There were distinct tobacco use latent states characterized by:
  - primary use of cigarettes, cigars, e-products and SLT
  - secondary use of cigarettes, and polytobacco use
- Latent states of tobacco use can inform measurement of *a priori* states.
- The ‘daily cigarette and poly tobacco’ use latent state may have the highest level of nicotine dependence among all states.
- Though about 4% of ‘daily e-product and non-daily cigarette use’ transition to non-current use (remission), almost twice as many transition to ‘daily cigarette use’.
- Demographic differences in transitions may influence tobacco-related health disparities.

Thank you!

Ritesh Mistry riteshm@umich.edu
Irina Bondarenko ibond@med.umich.edu