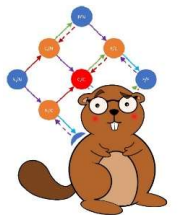


# MODELING A MENTHOL BAN USING THE MENTHOL SAVM (SMOKING AND VAPING MODEL)

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# Goals

- Build a model of a menthol cigarette ban to examine the public health impact using recent data on smoking patterns using the SAVM model
- Incorporate the potential role of nicotine vaping product (NVP, aka e-cigarette) use in a menthol ban, not previously considered
- Incorporate recent studies on the impact of a menthol cigarette ban
  - Review in BMC public Health
  - Expert Elicitation (just published in NTR)

*Results today are based on work done as part of the CAsToR TCORS*

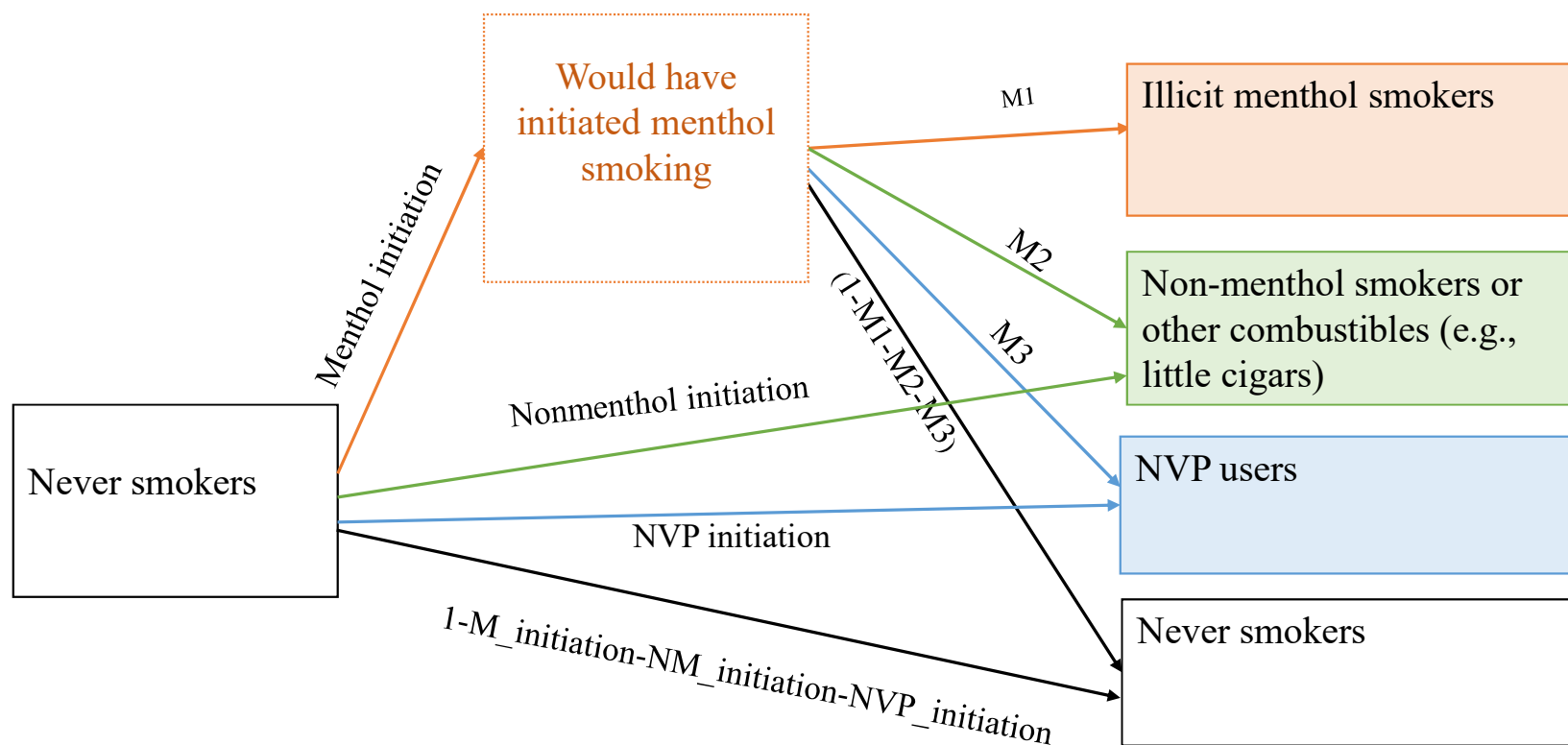
# Menthol Ban Scenario

- We consider the impact of a menthol ban that is applied to both cigarettes and little cigars, so that substitution from menthol cigarettes to menthol cigars, especially little cigars, is not a major unintended consequence.
- For the design of the menthol ban scenario in Menthol SAVM, we modeled the allocation of would-be menthol smokers in the initiation process from never smokers and the switching and cessation processes from menthol and non-menthol smokers. For these parameters, we rely on the expert elicitation (EE), but also consider a review by Cadham et al. We apply mean net transitions from the EE.

# Expert Elicitation (EE)

- Just published in Nicotine and Tobacco Research, worked with Dr. Sertkaya (our EE expert) and based on extensive discussion in our TCORS
- Involved 11 experts based on a our review of the literature on menthol bans and an H-index based on search of Scopus to identify individuals who were among the most published authors on the topic of menthol tobacco. Final panel based on these two criteria and attempts to have a panel with diverse views.
- Two rounds (Delphi method) conducted over the internet

# Transitions from Never Smokers under the Menthol Ban Scenario\*

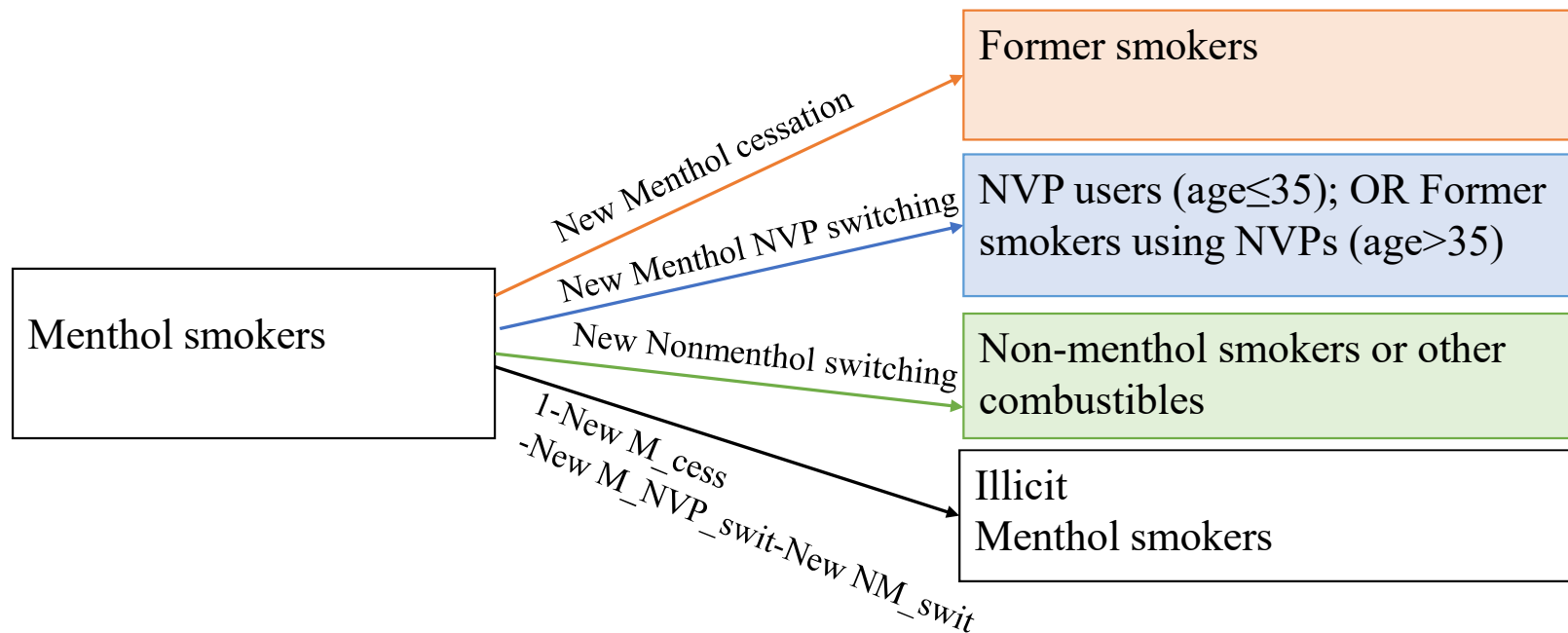


\* Based 100 youth and young adults who would have become menthol smokers by age 24 in the absence of ban

# Transition of would-be menthol smokers at age 12-24 in the Menthol Ban scenario from EE.

Population	Status Quo	Total Population with Menthol Ban			
Product Type	Mean/ Median	Mean	Median	Min	Max
Become non-menthol cigarette users (exclusively or with other products)	-	33.0	30.0	1.9	79.0
Become non-menthol cigar users (exclusively or with other products, but not cigarettes)	-	5.5	2.0	0.0	20.0
Become illicit menthol cigarette or cigar user	-	2.6	1.0	0.0	10.0
Total combustible use (status quo all menthol cigarettes)	100.0	41.1	46.0	3.5	83.0
Become exclusive smokeless tobacco or other oral tobacco product users	-	2.2	2.0	0.0	5.0
Become novel nicotine delivery product users (NNDP), such as e-cigarettes or heated tobacco products (exclusively or in combination with other products, but not cigarettes or cigars)	-	17.6	20.0	3.4	25.0
No tobacco or novel nicotine delivery product use	-	39.1	30.0	6.0	92.3

# Primary Transitions by Menthol Smokers in the Menthol Ban Scenario



Compared to cessation and switching transitions of menthol smokers in the absence of a menthol ban, i.e., the status quo

# Transition of menthol smokers at age 35-54 in the status quo and menthol ban scenario from EE

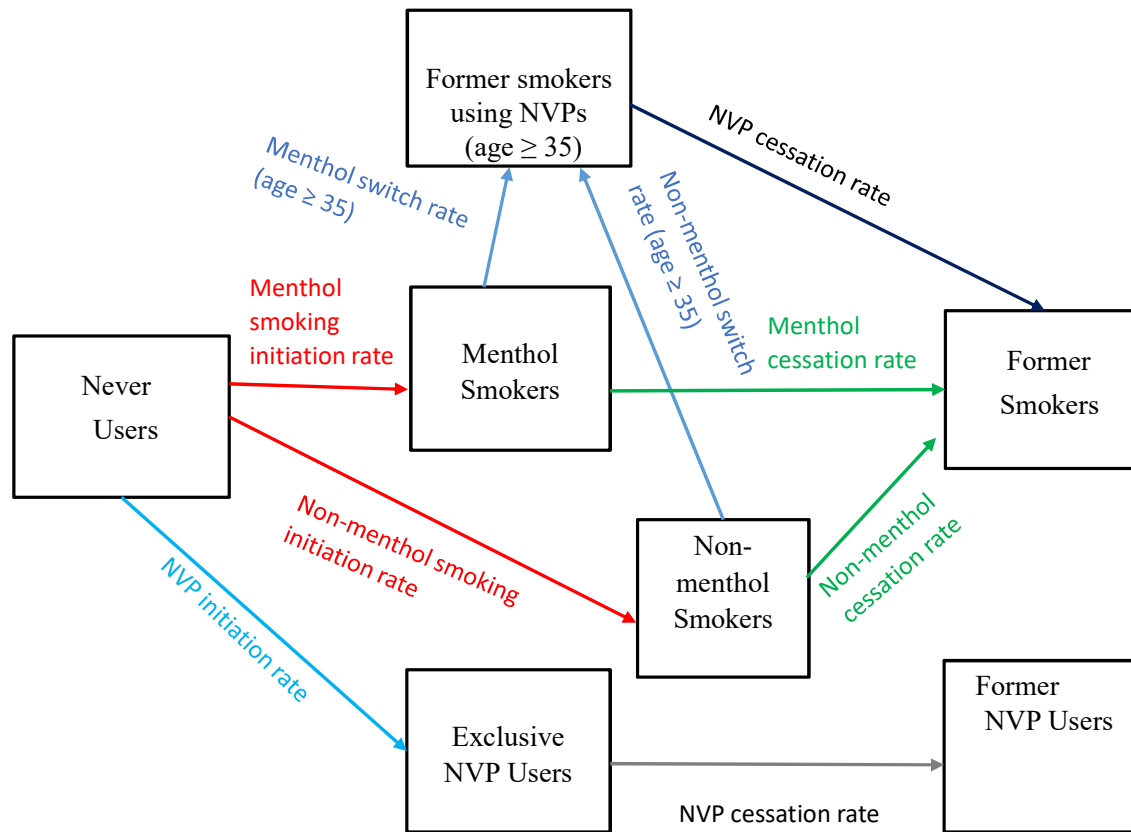
Product Type	No ban Mean	With ban Mean	Absolute difference	Percentage of the 67.9% menthol smokers in the Status Quo
Continue to be menthol cigarette smokers (exclusively or with other products)	67.9	0.0	-67.9	
Switch to non-menthol cigarettes (exclusively or with other products, except menthol cigarettes)	4.5	45.7	41.2	60.6%
Switch to cigars, especially little cigars, filtered cigars, or cigarillos (exclusively or with other products, but not cigarettes)	2.7			
Switch to non-menthol cigars, especially little cigars, filtered cigars or cigarillos (exclusively or with other products, but not cigarettes)		3.7	1.0	1.5%
Switch to illicit menthol cigarette or cigar use	0.0	5.7	5.7	8.4%
Total Combustible	75.2	55.2		
Switch to exclusive smokeless tobacco or other oral tobacco products	2.6	2.4	-0.2	-0.3%
Switch to novel nicotine delivery products (NNDP), such as e-cigarettes or heated tobacco products (exclusively or in combination with other products, but not cigarettes or cigars)	9.7	20.0	10.3	15.2%
Quit regular use of all tobacco or novel nicotine delivery products	12.5	22.5	10.0	14.7%



# Menthol SAVM Model

- Based on a simplified model of smoking and vaping (Population Metrics 2021). Focuses on regular use, does not explicitly consider dual use.
- Starts in 2013, about the time that nicotine vaping products (NVP) became more prevalent. We calibrated/validated the model over the period 2013-2020
- We assume that the menthol ban takes place in 2021 and compare the smoking and vaping rates and associated deaths with those under a status quo of no menthol smoking ban
- Assumed same risks of menthol and non-menthol smoking but did sensitivity analysis of NVP risk.
- Did not explicitly model cigar (considered as combustibles) or smokeless tobacco use.

## Transitions between Smoking and Nicotine Vaping Products (NVPs) Use States in the Status Quo Scenario



# Calibration of Pre-menthol model

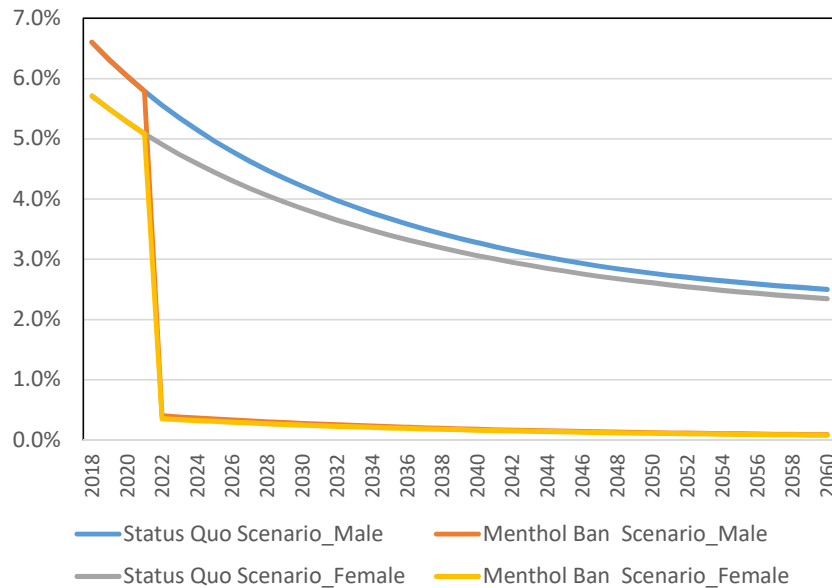
- Adjusted the rates of initiation and cessation to obtain better fit of the model for smoking and NVP prevalence, particularly at younger ages. The model showed an upward trend in menthol use pre-ban
- Tried a series of adjustments, the primary final adjustments involved reducing the % of smoking initiation and increasing the switching rate to NVPs at younger ages (e.g., through age 24) although reducing the cessation rate at older ages.
- We also adjusted the NVP switching rate for 2018 onward by reducing it by 10% annually starting in 2018 at all ages for both genders (otherwise the low smoking initiation led to drastic reductions in smoking prevalence).

**Smoking and NVP Prevalence, Smoking and Vaping Attributable Deaths, Life-Years Lost and Public Health Impact for Both Genders Combined, Ages 18 and Above, 2021-2060**

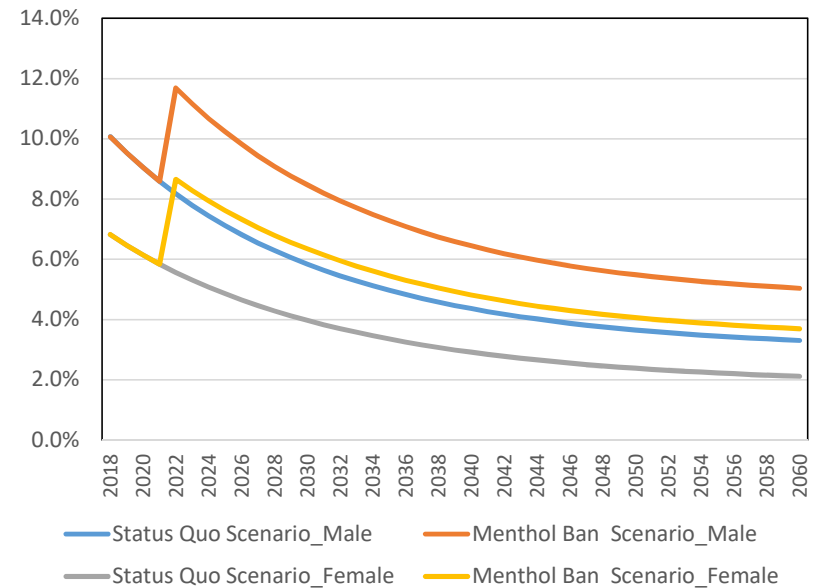
<b>Menthol Status Quo</b>				
<b>Category/Year</b>	<b>2021</b>	<b>2026</b>	<b>2060</b>	<b>Cumulative Impact *</b>
Menthol smoker	5.4%	4.5%	2.4%	-56%
Nonmenthol smoker	7.2%	5.7%	2.7%	-63%
All Smokers	12.6%	10.2%	5.1%	-60%
Former smoker	19.4%	18.4%	9.2%	-53%
Former NVP user	0.2%	0.6%	4.6%	1973%
Total SADs	380,525	377,046	282,457	14,217,294
Total LYL	4,694,635	4,425,092	2,401,706	143,238,275
<b>Menthol Ban Scenario</b>				
<b>Category/Year</b>	<b>2021</b>	<b>2026</b>	<b>2060</b>	<b>Cumulative Impact *</b>
Menthol smoker	5.4%	0.3%	0.1%	-98%
Nonmenthol smoker	7.2%	8.4%	4.2%	-41%
All Smokers	12.6%	8.7%	4.3%	-66%
Menthol smoker	<b>77,455</b>	<b>6,792</b>	<b>2,557</b>	<b>271,469</b>
Total	380,525	359,958	268,435	13,563,073
Total	4,694,635	4,113,651	2,182,890	131,927,198
<b>Public Health Impacts</b>				
Menthol Smoker	-	-92%	-97%	-
Nonmenthol Smoker	-	47%	58%	-
All Smokers	-	-15%	-15%	-
Overall NVP	-	23%	27%	-
Averted Deaths	-	17,088	14,022	654,221
Averted life-years lost	-	311,441	218,817	11,311,077

# Prevalence Rates: Pre- and Post-Menthol Ban

Menthol prevalence ages 18+

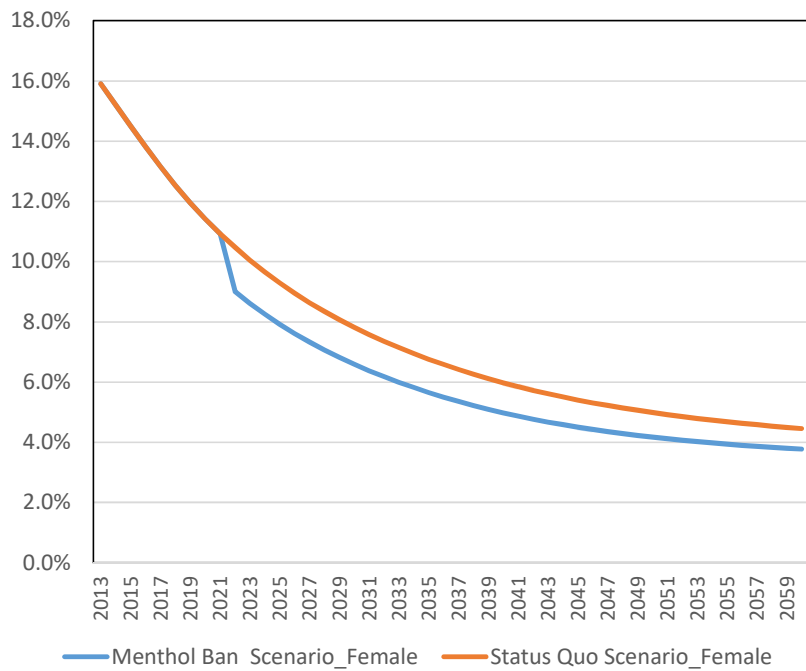


Non-menthol prevalence ages 18+

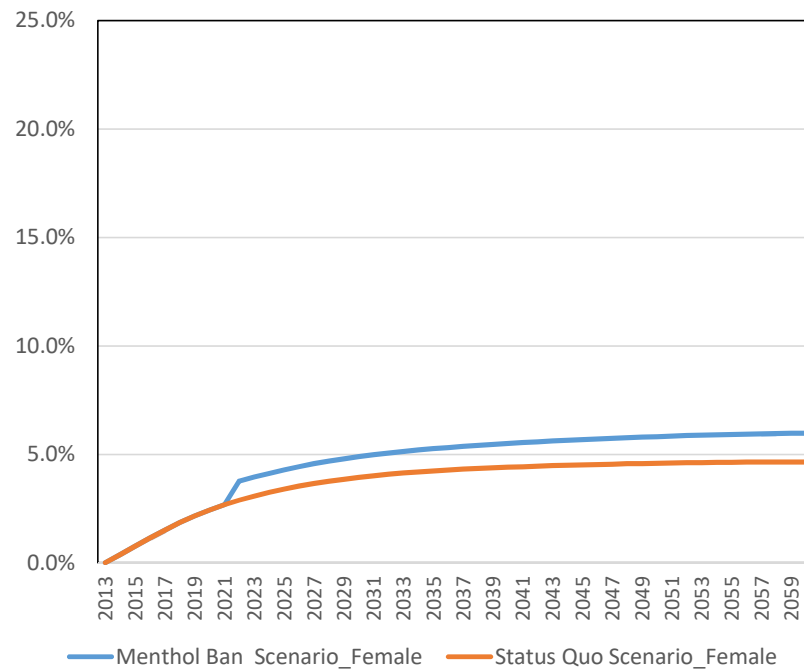


# Impact on Overall Smoking and NVP Prevalence

Overall female smoking prevalence ages 18+



Overall female NVP prevalence 18+



## Sensitivity Analysis of Averted Smoking- and Vaping-Attributable Deaths and Life-Years Lost to NVP Relative Risks and Individual Transition Parameters, Both Genders Combined, All Ages, 2021-2060

Case	Description	Both genders combined	% change*
<b>Smoking- and Vaping-Attributable Deaths Averted by Menthol Ban</b>			
1	Base Case	654,221	-
2	5% instead of 15% NVP risk	687,209	5%
3	25% instead of 15% NVP risk	622,425	-5%
4	Increase overall smoking cessation rates by 50%	459,759	-30%
5	Reduce overall smoking initiation rates by 50%	617,576	-6%
6	Increase non-menthol cessation rates annually by 10%	845,972	29%
7	Menthol cessation rate same as non-menthol rate	461,006	-30%
8	Increase NVP cessation rates by 50%	668,766	2%
9	Increase NVP initiation rates by 100%	652,116	-0.3%
10	Menthol switching rate same as non-menthol rate	636,897	-3%
11	Increase overall switching rate by 50%	581,294	-11%
12	Reduce the annual decline in switching rate from 10% to 0%	504,624	-23%

*Results are particularly sensitive to the NVP switching and smoking cessation rates*

# Issues in Modeling a Menthol Ban

- Definitions of regular dual and exclusive use
- Variations across different subpopulations (e.g., by age, SES, and especially race)
- Stability of transitions, especially as related to NVPs (e.g., due to major changes in technology or surrounding events, such as Covid).
- Broader sensitivity analysis over more variables
- Products to be considered- include smokeless tobacco/new oral products and heated tobacco products?



# Conclusions

- Menthol Ban leads to improvements in public health through reduced smoking to some extent offset by increased NVP use
- Results relatively insensitive to single parameter variations of individual transitions and NVP risks
- SAVM Model is available from the TCORS website with 100 page User Manual (in color)
- Planning on extending the model to examine how the ban will be influenced by a policy of restricted flavors in NVPs

Thanks!