

Considerations for Statistical Modeling



RAI SERVICES COMPANY

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**Modeling is best suited for estimating trends and likelihoods...
it is the *direction* and *magnitude* of the model projection that
ultimately supports a population health perspective**

Considerations for Statistical Modeling

- Start with validated statistical model
- Include both harmful and beneficial behaviors
- Rely on empirical data (to extent possible)
- Use sensitivity testing to assess model projections

Start with validated statistical model

- validate by comparing model estimates against actual mortality rates

**Survivors by Age Interval: 2006 US Life Table versus Model Estimates
(starting with 1,000,000 13-year-old male never tobacco users)**

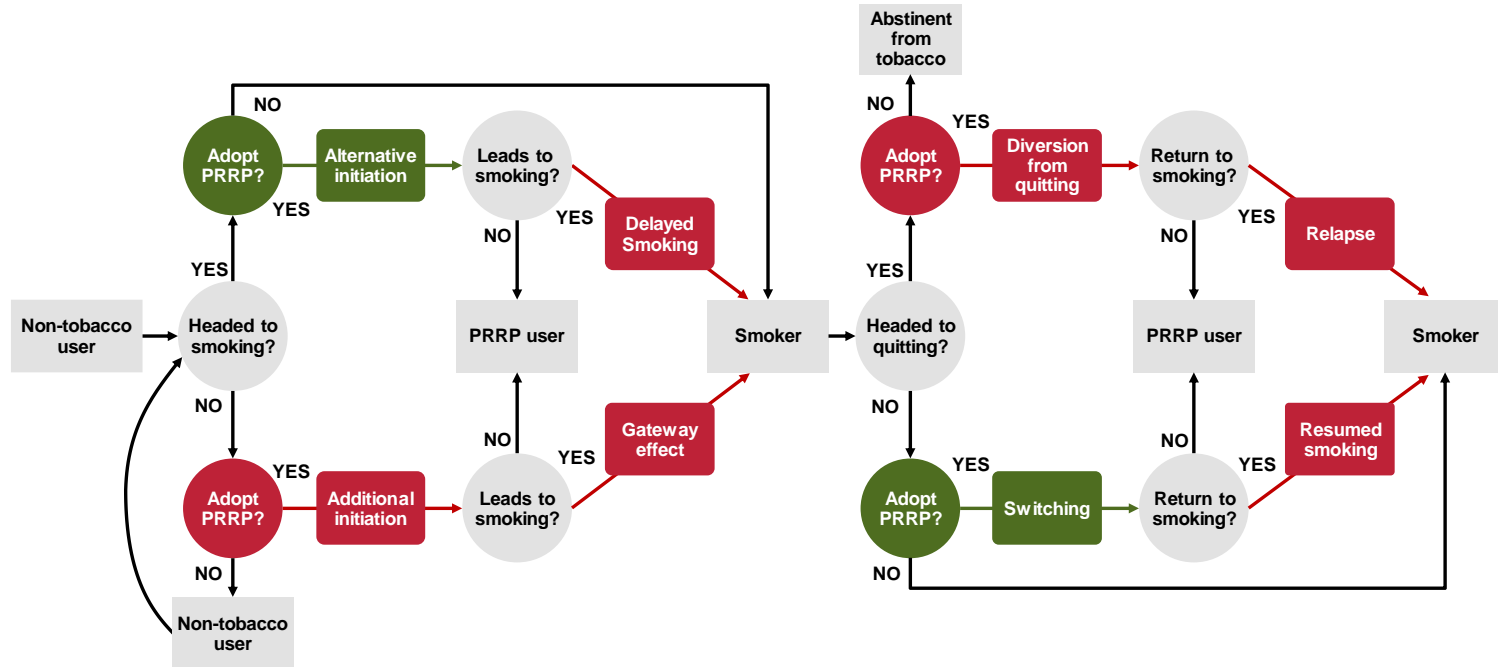
Age interval (years)	Survivors based on US life table	Survivors based on model estimate
38-42*	957,654	957,100
43-47	940,866	939,200
48-52	915,745	914,300
53-57	880,470	879,800
58-62	832,268	832,000
63-67	764,922	765,600
68-72	674,217	674,300

*Age interval 38-42 is the first age group where all possible tobacco use transitions have occurred.

Include both harmful and beneficial behaviors

- beneficial behaviors must be balanced against harmful behaviors

Overall Population Health Effect - PRRP





Rely on empirical data (to extent possible)

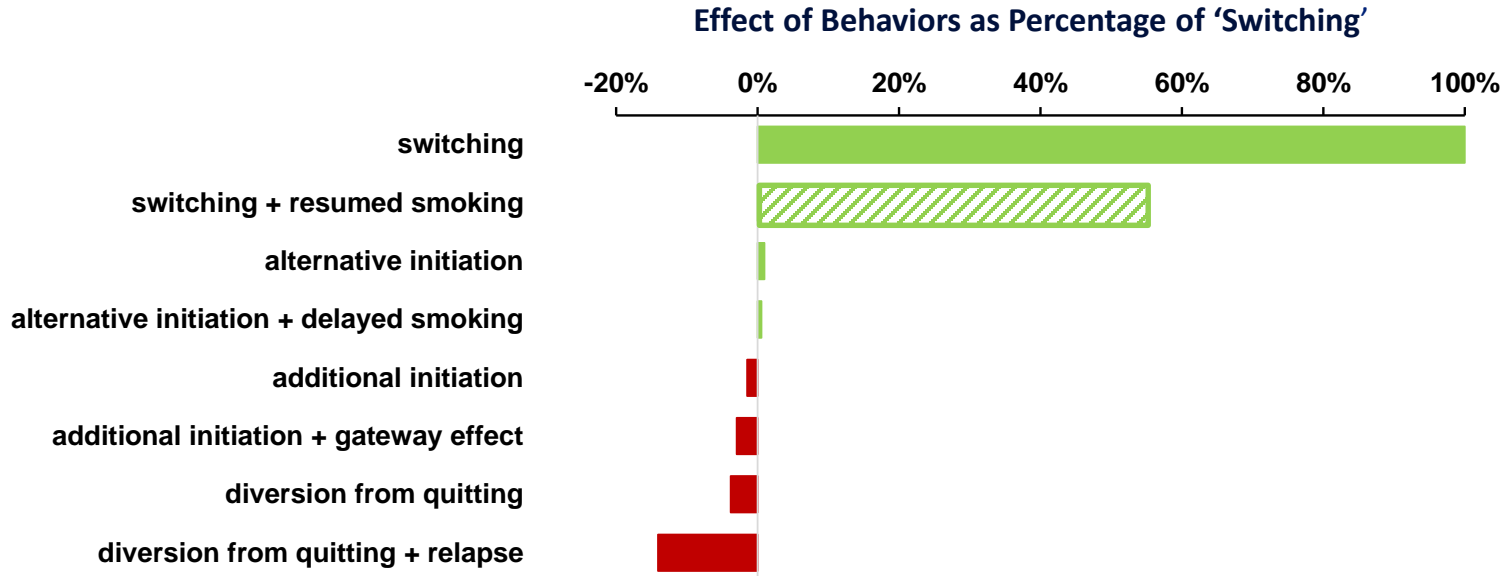
- use empirical data and conservative hypothetical estimates

Model Inputs Are Often Model-Specific

	Model Inputs	Supporting Source Data
Mortality rates -for each 5-year interval (current age, duration of tobacco use/quit)	Cigarette smoking	Kaiser-Permanente Cohort Study
	PRRP use (e.g., snus)	Levy et al. (2004) synthesis (89% and 92% risk reduction)
Transition probabilities -changes in tobacco use may occur at each 5-year interval	Cigarette smoking	US initiation/cessation rates (NSDUH)
	PRRP use	Age-interval-specific probabilities from <i>behavioral intentions</i> testing
	PRRP use to smoking	Hypothetical probabilities (50% of PRRP users)

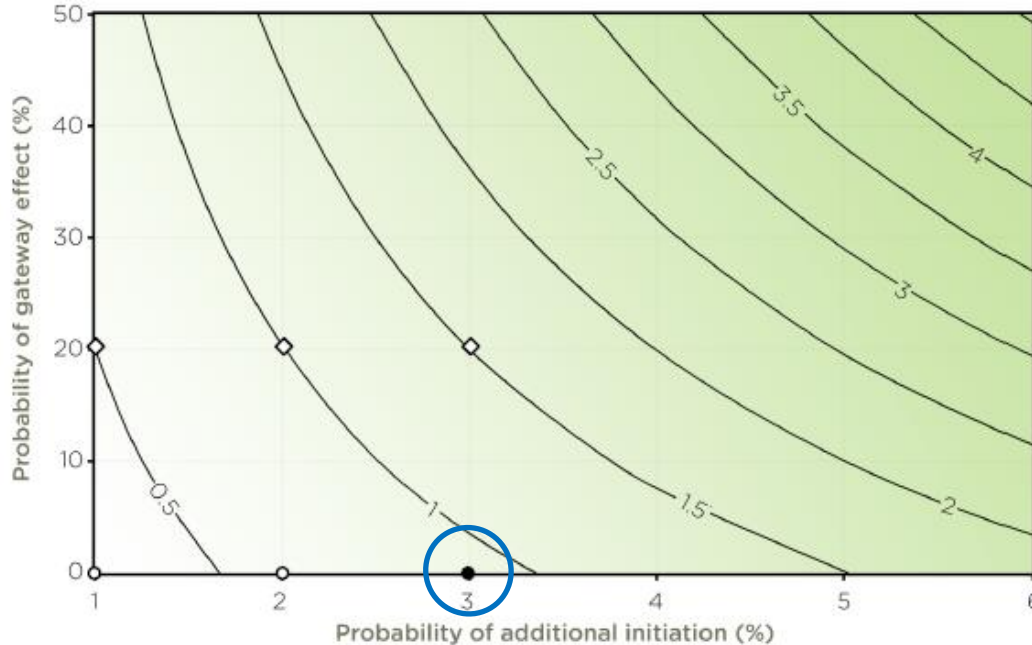
Use sensitivity testing to assess model projections

- best practice to first identify most influential behavior(s)



Use sensitivity testing to assess model projections

- assess projections by modifying inputs against most influential behavior(s)



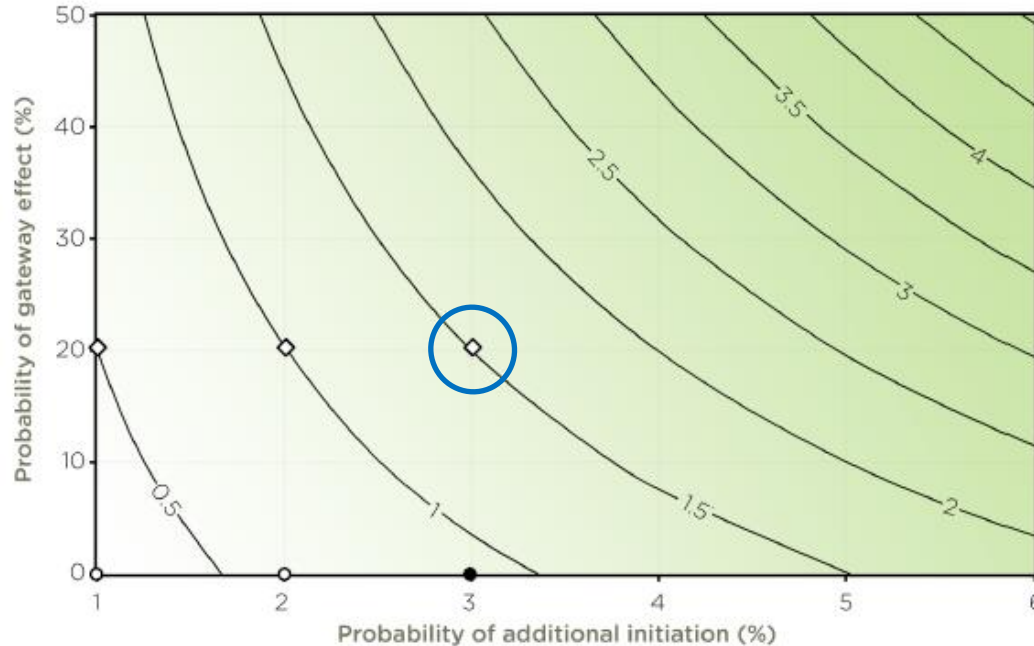
**Tipping-Point Analyses
(multi-dimensional)**

**0.9% switching offsets
3% additional initiation/
0% gateway effect**

[curved lines - % switching required for zero difference in survivors]

Use sensitivity testing to assess model projections

- assess projections by modifying inputs against most influential behavior(s)



Tipping-Point Analyses (multi-dimensional)

*1.5% switching offsets
3% additional initiation/
20% gateway effect*

[curved lines - % switching required for zero difference in survivors]

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Communication of Model Projections

- develop approach to apply model projections to full population

Birth cohorts - indexed by age when PRRP first available	'Stacked Cohort' Analyses	
	5-year intervals	ERR=0.11
13-17	126,963	137,034
18-22	113,964	122,647
23-27	90,857	97,402
28-32	56,773	60,638
33-37	28,994	30,925
38-42	15,584	16,548
43-47	7,979	8,433
48-52	3,836	4,055
53-57	1,523	1,606
58-62	530	549
63-67	106	106
Cumulative totals	447,109	479,943

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