

Cohort State-Transition Models in R: A Tutorial

Appendix

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Cohort tutorial model components

Table I

This table contains an overview of the key model components used in the code for the Sick-Sicker example from the DARTH manuscript: “Implementation of cohort state-transition models in R”. The first column gives the mathematical notation for some of the model components that are used in the equations in the manuscript. The second column gives a description of the model component with the R name in the third column. The forth gives the data structure, e.g. scalar, list, vector, matrix etc, with the according dimensions of this data structure in the fifth column. The final column indicated the type of data that is stored in the data structure, e.g. numeric (5,2,6,3,7,4), category (A,B,C), integer (5,6,7), logical (TRUE, FALSE).

Element	Description	R name	Data structure	Dimensions	Data type
n_t	Time horizon	<code>n_t</code>	scalar		numeric
v_s	Names of the health states	<code>v_n</code>	vector	<code>n_states</code> x 1	categoric
n_s	Number of health states	<code>n_states</code>	scalar		numeric
v_{str}	Names of the strategies	<code>v_names_str</code>	scalar		categoric

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Element	Description	R name	Data structure	Dimensions	Data type
n_{str}	Number of strategies	<code>n_str</code>	scalar		categoric
$\mathbf{d_c}$	Discount rate for costs	<code>d_c</code>	scalar		numeric
$\mathbf{d_e}$	Discount rate for effects	<code>d_e</code>	scalar		numeric
	Discount weights for costs	<code>v_dwc</code>	vector	$(\mathbf{n_t} \times 1) + 1$	numeric
	Discount weights for effects	<code>v_dwe</code>	vector	$(\mathbf{n_t} \times 1) + 1$	numeric
age_0	Age at baseline	<code>n_age_init</code>	scalar		numeric
age	Maximum age of follow up	<code>n_age_max</code>	scalar		numeric
M	Cohort trace	<code>m_M</code>	matrix	$(\mathbf{n_t} + 1) \times \mathbf{n_states}$	numeric
m_0	Initial state vector	<code>v_s_init</code>	vector	$1 \times \mathbf{n_states}$	numeric
m_t	State vector in cycle t	<code>v_mt</code>	vector	$1 \times \mathbf{n_states}$	numeric
Transition probabilities					
$p_{[H,S1]}$	From Healthy to Sick conditional on surviving	<code>p_HS1</code>	scalar		numeric
$p_{[S1,H]}$	From Sick to Healthy conditional on surviving	<code>p_S1H</code>	scalar		numeric
$p_{[S1,S2]}$	From Sick to Sicker conditional on surviving	<code>p_S1S2</code>	scalar		numeric
$r_{[H,D]}$	Constant rate of dying when Healthy (all-cause mortality rate)	<code>r_HD</code>	scalar		numeric
$hr_{[S1,H]}$	Hazard ratio of death in Sick vs Healthy	<code>hr_S1</code>	scalar		numeric
$hr_{[S2,H]}$	Hazard ratio of death in Sicker vs Healthy	<code>hr_S2</code>	scalar		numeric
$hr_{[S1,S2]_{trtB}}$	Hazard ratio of becoming Sicker when Sick under treatment B	<code>hr_S1S2_trtB</code>	scalar		numeric
P	Time-independent transition probability matrix	<code>m_P</code>	matrix	$\mathbf{n_states} \times \mathbf{n_states}$	numeric
Annual costs					
	Healthy individuals	<code>c_H</code>	scalar		numeric
	Sick individuals in S1	<code>c_S1</code>	scalar		numeric
	Sick individuals in S2	<code>c_S2</code>	scalar		numeric
	Dead individuals	<code>c_D</code>	scalar		numeric
	Additional costs treatment A	<code>c_trtA</code>	scalar		numeric
	Additional costs treatment B	<code>c_trtB</code>	scalar		numeric
Utility weights					
	Healthy individuals	<code>u_H</code>	scalar		numeric
	Sick individuals in S1	<code>u_S1</code>	scalar		numeric
	Sick individuals in S2	<code>u_S2</code>	scalar		numeric
	Dead individuals	<code>u_D</code>	scalar		numeric
	Treated with treatment A	<code>u_trtA</code>	scalar		numeric

Element	Description	R name	Data structure	Dimensions	Data type
A	Outcome structures				
	Transition dynamics array	a_A	array	n_states x n_states x (n_t + 1)	numeric
	Expected QALYs per cycle under a strategy	v_qaly	vector	1 x (n_t + 1)	numeric
	Expected costs per cycle under a strategy	v_cost	vector	1 x (n_t + 1)	numeric
	Total expected discounted QALYs for a strategy	n_tot_qaly	scalar		numeric
	Total expected discounted costs for a strategy	n_tot_cost	scalar		numeric
	Summary of the model outcomes	df_cea	data frame		
	Summary of the model outcomes	table_cea	table		