

Supplementary Material

8.1 Cohort tutorial model components

8.1.1 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: “An Introductory Tutorial on Cohort State-Transition Models in R Using a Cost-Effectiveness Analysis Example”. 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 fourth 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).

Parameter	Description	R name	Data structure	Dimensions	Data type
n_t	Time horizon	<code>n_cycles</code>	scalar		numeric
	Cycle length	<code>cycle_length</code>	scalar		numeric
v_s	Names of the health states	<code>v_names_states</code>	vector	$n_states \times 1$	character
n_s	Number of health states	<code>n_states</code>	scalar		numeric
v_{str}	Names of the strategies	<code>v_names_str</code>	scalar		character
n_{str}	Number of strategies	<code>n_str</code>	scalar		character
d_c	Discount rate for costs	<code>d_c</code>	scalar		numeric
d_e	Discount rate for effects	<code>d_e</code>	scalar		numeric
\mathbf{d}_c	Discount weights vector for costs	<code>v_dwc</code>	vector	$(n_t \times 1) + 1$	numeric
\mathbf{d}_e	Discount weights vector for effects	<code>v_dwe</code>	vector	$(n_t \times 1) + 1$	numeric
	Sequence of cycle numbers	<code>v_cycles</code>	vector	$(n_t \times 1) + 1$	numeric
\mathbf{wcc}	Within-cycle correction weights	<code>v_wcc</code>	vector	$(n_t \times 1) + 1$	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	$(n_t + 1) \times n_states$	numeric
m_0	Initial state vector	<code>v_m_init</code>	vector	$1 \times n_states$	numeric
m_t	State vector in cycle t	<code>v_mt</code>	vector	$1 \times n_states$	numeric

Parameter	Description	R name	Data structure	Dimensions	Data type
Transition rates and probabilities					
$r_{[H,S1]}$	Constant rate of becoming Sick when Healthy	r_HS1	scalar		numeric
$r_{[S1,H]}$	Constant rate of getting Healthy when Sick	r_S1H	scalar		numeric
$r_{[S1,S2]}$	Constant rate of getting Sicker when Sick	r_S1S2	scalar		numeric
$r_{[S1,S2]_{trtB}}$	From Sicker to Sick under treatment B conditional on surviving	r_S1S2_trtB	scalar		numeric
$r_{[H,D]}$	Constant rate of dying when Healthy (all-cause mortality rate)	r_HD	scalar		numeric
$r_{[S1,S2]}$	Constant rate of becoming Sicker when Sick	r_S1S2	scalar		numeric
$r_{[S1,S2]_{trtB}}$	Constant rate of becoming Sicker when Sick for treatment B	r_S1S2_trtB	scalar		numeric
$p_{[H,S1]}$	Probability from Healthy to Sick conditional on surviving	p_HS1	scalar		numeric
$p_{[S1,H]}$	Probability from Sick to Healthy conditional on surviving	p_S1H	scalar		numeric
$p_{[S1,S2]}$	Probability from Sick to Sicker conditional on surviving	p_S1S2	scalar		numeric
$p_{[S1,S2]_{trtB}}$	Probability from Sicker to Sick under treatment B conditional on surviving	p_S1S2_trtB	scalar		numeric
$hr_{[S1,H]}$	Hazard ratio of death in Sick vs Healthy	hr_S1	scalar		numeric
$hr_{[S2,H]}$	Hazard ratio of death in Sicker vs Healthy	hr_S2	scalar		numeric
$hr_{[S1,S2]_{trtB}}$	Hazard ratio of becoming Sicker when Sick under treatment B	hr_S1S2_trtB	scalar		numeric
P	Time-independent transition probability matrix*	m_P	matrix	n_states x n_states	numeric
	* _trtX is used to specify for which strategy the transition probability matrix is				

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Annual costs

Parameter	Description	R name	Data structure	Dimensions	Data type
	Healthy individuals	<code>c_H</code>	scalar		numeric
	Sick individuals in Sick	<code>c_S1</code>	scalar		numeric
	Sick individuals in Sicker	<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
	Vector of state costs for a strategy	<code>v_c_str</code>	vector	$1 \times n_states$	numeric
	list that stores the vectors of state costs for each strategy	<code>l_c</code>	list		numeric
	Utility weights				
	Healthy individuals	<code>u_H</code>	scalar		numeric
	Sick individuals in Sick	<code>u_S1</code>	scalar		numeric
	Sick individuals in Sicker	<code>u_S2</code>	scalar		numeric
	Dead individuals	<code>u_D</code>	scalar		numeric
	Treated with treatment A	<code>u_trtA</code>	scalar		numeric
	Vector of state utilities for a strategy	<code>v_u_str</code>	vector	$1 \times n_states$	numeric
	List that stores the vectors of state utilities for each strategy	<code>l_u</code>	list		numeric
	Outcome structures				
	Expected QALYs per cycle under a strategy	<code>v_qaly_str</code>	vector	$1 \times (n_t + 1)$	numeric
	Expected costs per cycle under a strategy	<code>v_cost_str</code>	vector	$1 \times (n_t + 1)$	numeric
	Vector of expected discounted QALYs for each strategy	<code>v_tot_qaly</code>	vector	$1 \times n_states$	numeric
	Vector of expected discounted costs for each strategy	<code>v_tot_cost</code>	vector	$1 \times n_states$	numeric
	Summary matrix with costs and QALYS per strategy	<code>m_outcomes</code>	table	$n_states \times 2$	
	Summary of the model outcomes	<code>df_cea</code>	data frame		

Parameter	Description	R name	Data structure	Dimensions	Data type
	Summary of the model outcomes	<code>table_cea</code>	table		
	Probabilistic analysis structures				
	Number of PSA iterations	<code>n_sim</code>	scalar		numeric
	List that stores all the values of the input parameters	<code>l_params_all</code>	list		numeric
	Data frame with the parameter values for each PSA iteration	<code>df_psa_input</code>	data frame		numeric
	Vector with the names of all the input parameters	<code>v_names_params</code>	vector		character
	List with the model outcomes of the PSA for all strategies	<code>l_psa</code>	list		numeric
	Vector with a sequence of relevant willingness-to-pay values	<code>v_wtp</code>	vector		numeric
	Data frame to store expected costs and effects for each strategy from the PSA	<code>df_out_ce_psa</code>	data frame		numeric
	Data frame to store incremental cost-effectiveness ratios (ICERs) from the PSA	<code>df_cea_psa</code>	data frame		numeric
	For more details about the PSA structures read <code>dampack</code> 's vignettes				