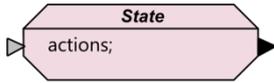
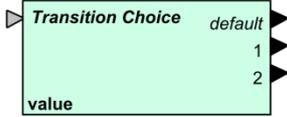
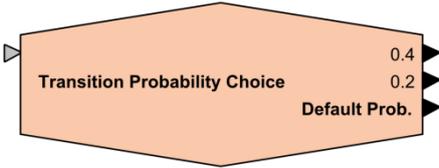
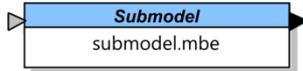
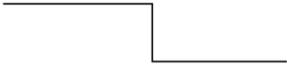


# Supplementary Material S2:

## EPISIM Graphical Cell Behavioral Model Elements

Model Element	Symbol	Description
State		In a state element a set of 'actions strings' can be defined which are sequentially executed at runtime. Action strings may be assignments of values to a certain cell property or calls of predefined functions for e.g. cell division, cell-cell communication, cell death or secretion /absorption of molecules. Each state has one input port and one output port.
Transition Choice		Transition Choices allow to branch to multiple paths in a model in dependence of a mathematical expression or a value. Output ports can be defined for all expected results or values. The path connected to the 'default output port' is followed if the value of the variable or the result of the mathematical expression matches none of the defined output ports.
Transition Probability Choice		Transition Probability Choices allow to branch to multiple paths based on given rates assigned to a particular output port. An unlimited number of output ports can be defined. A 'Default Prob.' port can be added as a default path to be followed if none of the other output ports was chosen by the random experiment underlying this model element. <i>*Please note the formula that is used to calculate probabilities based on given rates (below this table).</i>
Transition Condition		Transition Conditions allow to branch to two distinct paths in a model in dependence of a Boolean expression being either true or false.
Submodel		Submodels allow implementing a hierarchical structure in a cell behavioral model. The overall model is thereby physically distributed over different model files with unambiguous file names. Semantically, each file realizes a certain self-contained functional aspect of the overall model. The number of submodels is unlimited.
Connection Point		Each output port can be connected to only one input port and vice versa. In case multiple transitions shall lead to a single common model element, a connection point has to be used to join the incoming edges. Therefore, a connection point always has just one output port.
Edge		Edges connect two model elements using their input port and their output port respectively. Input ports and output ports are drawn as small triangles.
Comment		Textual descriptions or explanations of model semantics can be added as a comment anywhere in the model.

\*Formula for calculating probabilities  $P(r_i)$  for each output port of a Probability Transition Choice based on n given rates  $r_i$  ( $i = 1 \dots n$ ):

$$P(r_i) = \frac{r_i}{(\sum_{i=1}^n r_i) + p_{default}}$$

$$p_{default} = \begin{cases} 1 - \sum_{i=1}^n r_i & \text{for } \sum_{i=1}^n r_i < 1 \\ 0 & \text{for } \sum_{i=1}^n r_i \geq 1 \end{cases}$$

The default path is chosen with probability  $p_{default}$  if the corresponding output port was added. Otherwise,  $p_{default}$  is set to 0.