

# Decision Tree Example in R - No Spray, Spray, Test

The DARTH workgroup

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Please cite our publications when using this code:

- Alarid-Escudero F, Krijkamp EM, Enns EA, Yang A, Hunink MGM Pechlivanoglou P, Jalal H. An Introductory Tutorial on Cohort State-Transition Models in R Using a Cost-Effectiveness Analysis Example. *Medical Decision Making*, 2022 (Epub). <https://doi.org/10.1177/0272989X221103163>
- Alarid-Escudero F, Krijkamp EM, Enns EA, Yang A, Hunink MGM Pechlivanoglou P, Jalal H. A Tutorial on Time-Dependent Cohort State-Transition Models in R using a Cost-Effectiveness Analysis Example. *Medical Decision Making*, 2022 (Epub). <https://doi.org/10.1177/0272989X221121747>
- Jalal H, Pechlivanoglou P, Krijkamp E, Alarid-Escudero F, Enns E, Hunink MG. An Overview of R in Health Decision Sciences. *Med Decis Making*. 2017; 37(3): 735-746. <https://journals.sagepub.com/doi/abs/10.1177/0272989X16686559>
- Krijkamp EM, Alarid-Escudero F, Enns EA, Jalal HJ, Hunink MGM, Pechlivanoglou P. Microsimulation modeling for health decision sciences using R: A tutorial. *Med Decis Making*. 2018;38(3):400–22. <https://journals.sagepub.com/doi/abs/10.1177/0272989X18754513>
- Krijkamp EM, Alarid-Escudero F, Enns E, Pechlivanoglou P, Hunink MM, Jalal H. A Multidimensional Array Representation of State-Transition Model Dynamics. *Med Decis Mak*. 2020;40(2):242-248. <https://doi.org/10.1177/0272989X19893973>

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Change `eval` to `TRUE` if you want to knit this document.

```
rm(list = ls())      # clear memory (removes all the variables from the workspace)
```

## 01 Load packages

```
# no packages needed
```

## 02 Load functions

```
# no functions needed
```

## 03 Model input

```
### Strategies
v_names_strat      <- c("Do not spray",      # store the strategy names
                        "Spray")

# your turn #
# add a strategy name "Test"

n_strat            <- length(v_names_strat)    # number of strategies

### Branch probabilities
p_outbreak <- 0.20    # probability that there is an outbreak
p_die_tox  <- 0.001   # probability of dying due to exposure to spray
p_die_inf  <- 0.33    # probability of dying if infected

# probability of infection under each strategy
p_inf_outbreak_nospray <- 0.02 # probability of becoming infected if did not spray
p_inf_outbreak_spray  <- 0.003 # probability of becoming infected if did spray (right away)

# your turn #
# add parameter here: # probability of becoming infected if did spray after test

### Terminal node values
# Number of deaths
n_death_die <- 1      # terminal value if pathway results in death
n_death_survive <- 0  # terminal value if pathway does not result in death

# Costs
c_inf_survive <- 10000
c_inf_die    <- 20000
```

```

c_tox_die <- 5000
c_spray <- 1500

# your turn #
# add parameter here: Cost of test #

```

## 04 Construct and evaluate decision tree model equations

```

# Vector of expected values for each strategy
# One vector for deaths, the other for costs
v_EV_death <- v_EV_cost <- rep(NA,n_strat)
names(v_EV_death) <- v_names_strat # attach strategy name
names(v_EV_cost) <- v_names_strat # attach strategy name

# Do not spray
v_EV_death["Do not spray"] <- p_outbreak*p_inf_outbreak_nospray*p_die_inf*n_death_die

v_EV_cost["Do not spray"] <- p_outbreak*p_inf_outbreak_nospray*p_die_inf*c_inf_die +
  p_outbreak*p_inf_outbreak_nospray*(1-p_die_inf)*c_inf_survive

# Spray
v_EV_death["Spray"] <- p_die_tox*n_death_die +
  (1-p_die_tox)*p_outbreak*p_inf_outbreak_spray*p_die_inf*n_death_die

v_EV_cost["Spray"] <- c_spray +
  p_die_tox*c_tox_die +
  (1-p_die_tox)*p_outbreak*p_inf_outbreak_spray*p_die_inf*c_inf_die +
  (1-p_die_tox)*p_outbreak*p_inf_outbreak_spray*(1-p_die_inf)*c_inf_survive

# your turn #
# Test
# Fill in equation to calculate expected deaths and costs under test strategy

```

## 05 Summarize Output

```

# Gather outcomes by strategy into a single data frame
df_EV_outcomes <- data.frame("Strategy"=v_names_strat,
  "Deaths"= v_EV_death,
  "Costs"=v_EV_cost,
  row.names=NULL)

df_EV_outcomes

```

```

##      Strategy      Deaths      Costs
## 1 Do not spray 0.001320000    53.200
## 2      Spray 0.001197802 1512.972

```