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Session 3 - Probabilistic Markov models
Exercise 2

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Exercise 2 – Adding a death state

In reality, models will have more than two states.

Go through the code and add in an extra state to represent death by:

a) Change number of states from 2 to 3 and naming the death state
b) Assume that there are 2 deaths in every 100 patients in the smoking state and 1 death in the non-smoking state, each represented by a beta distribution. **(See next slide for hint on implementation using two beta distributions)**
c) Define transitions from death so that it is an absorbing state that people cannot move back from.
d) Check that you have set up your transition matrix correctly using the code transition_matrices["SoC with website", 1, ,]
e) Assign a QALY of 0 and a cost of 0 to the death state
f) Rerun the simulation including the death state, assuming that no one starts in the death state
g) Analyse the results using BCEA. What impact does adding the death state have on the results?

Exercise 2 – Transitions using two beta distributions

```
# Assume that people have a 2/100 probability of dying in the smoking state
# and a 1/100 probability of dying in the non-smoking state.
probability_of_death_smoking <- rbeta(n_samples, 2, 98)
probability_of_death_not_smoking <- rbeta(n_samples, 1, 99)

# Transitions from smoking
temp <- rbeta(n_samples, 85, 15)
transition_matrices["SoC with website", , "Smoking", ] <-
matrix(c((1 - probability_of_death_smoking) * c(temp, 1 - temp),
probability_of_death_smoking), ncol = 3)
```

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Exercise 2 – Solution

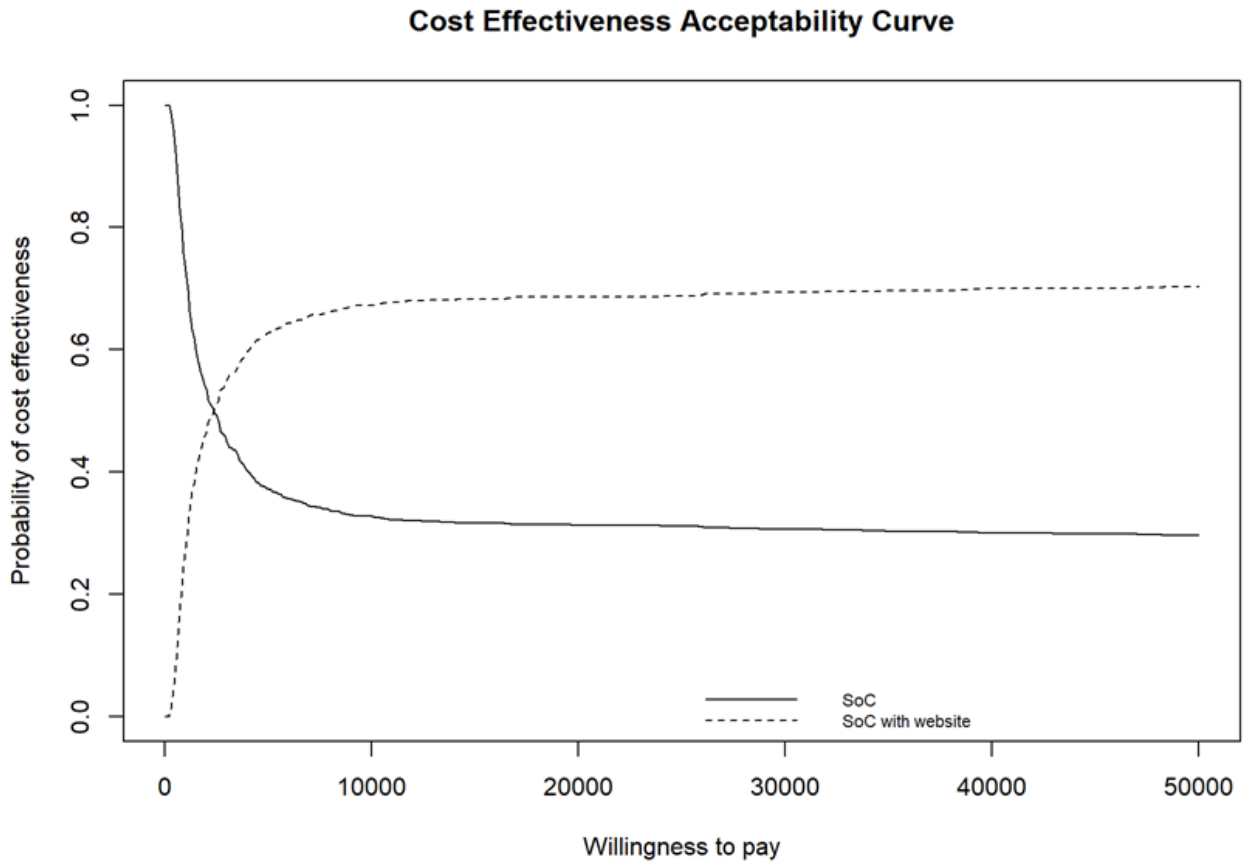
Using summary() of the new bcea object should give

	EIB	CEAC	ICER
SoC with website vs SoC	470.31	0.687	1921.9

The ICER is marginally reduced (from 2189.7) because the difference in effects is increased.

Uncertainty is marginally increased as CEAC has gone from 0.711 to 0.676, so closer to 0.50.

Code in session_3_exercise_2_solution.R



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Thank you!

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