

Pharmacoeconomics and HTA:

Download and install R: <https://cran.r-project.org/bin/>

Download and install RStudio: <https://www.rstudio.com/products/rstudio/download/>

Download and install JAGS: <https://sourceforge.net/projects/mcmc-jags/>

Open RStudio and install the following packages (copy and paste commands in the RStudio command line):

```
install.packages(c("R2jags", "BCEA", "splancs", "ggplot2", "heemod", "diagram"))
```

```
install.packages("INLA", repos=c(getOption("repos"), INLA="https://inla.r-inla-download.org/R/stable"),  
dep=TRUE)
```

Download (from the BB page of Pharmaecoeconomics) and save (create a new folder called 'Lab sessions' on your pc) the R scripts: "Markov\_model.R", "LoadData.R", "Utils.R", "vaccine\_mod.R", "Statistical\_and\_Economic\_model\_Vaccine.R", from the Blackboard page of the course.

Run the following lines of code and check that no error messages appear. It is ok if you get some warnings, but you should see no error messages:

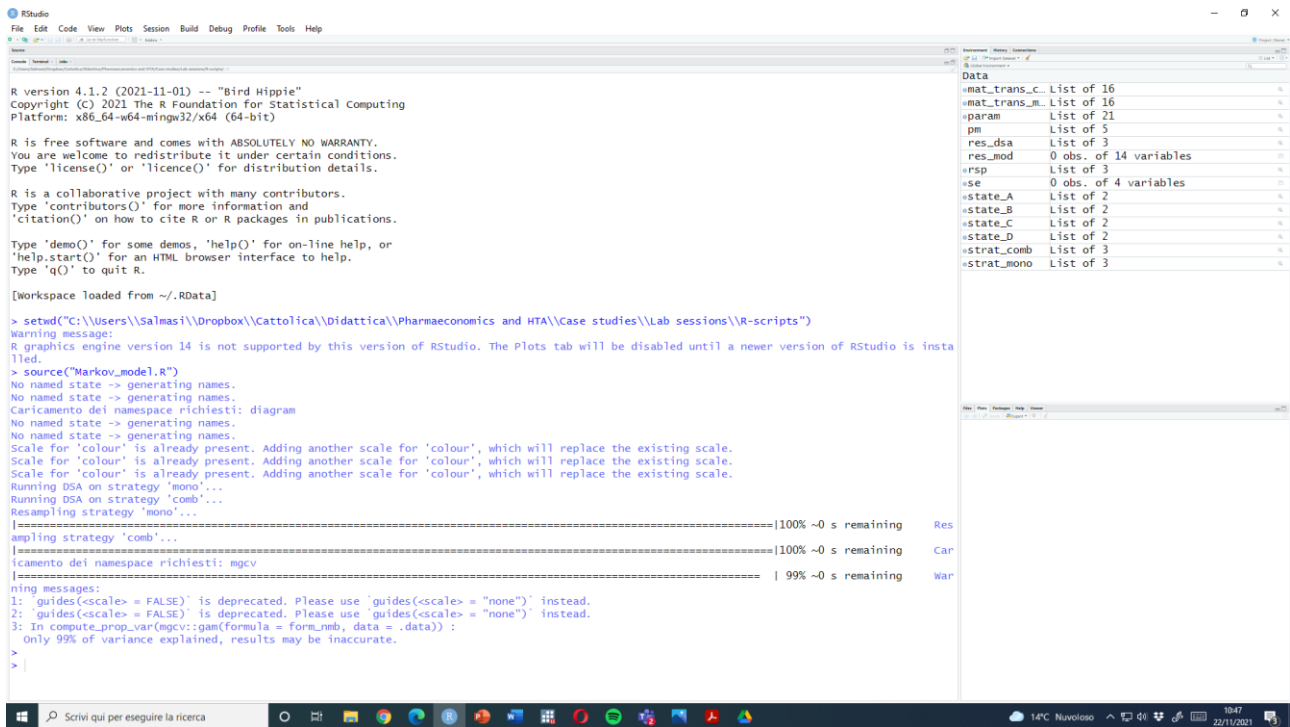
```
rm(list=ls())
```

```
setwd("C:\\Users\\...\\Lab sessions ") # substitute dots with the path to the Lab sessions folder created
```

```
# previously
```

```
source("Markov_model.R")
```

Output on my pc:



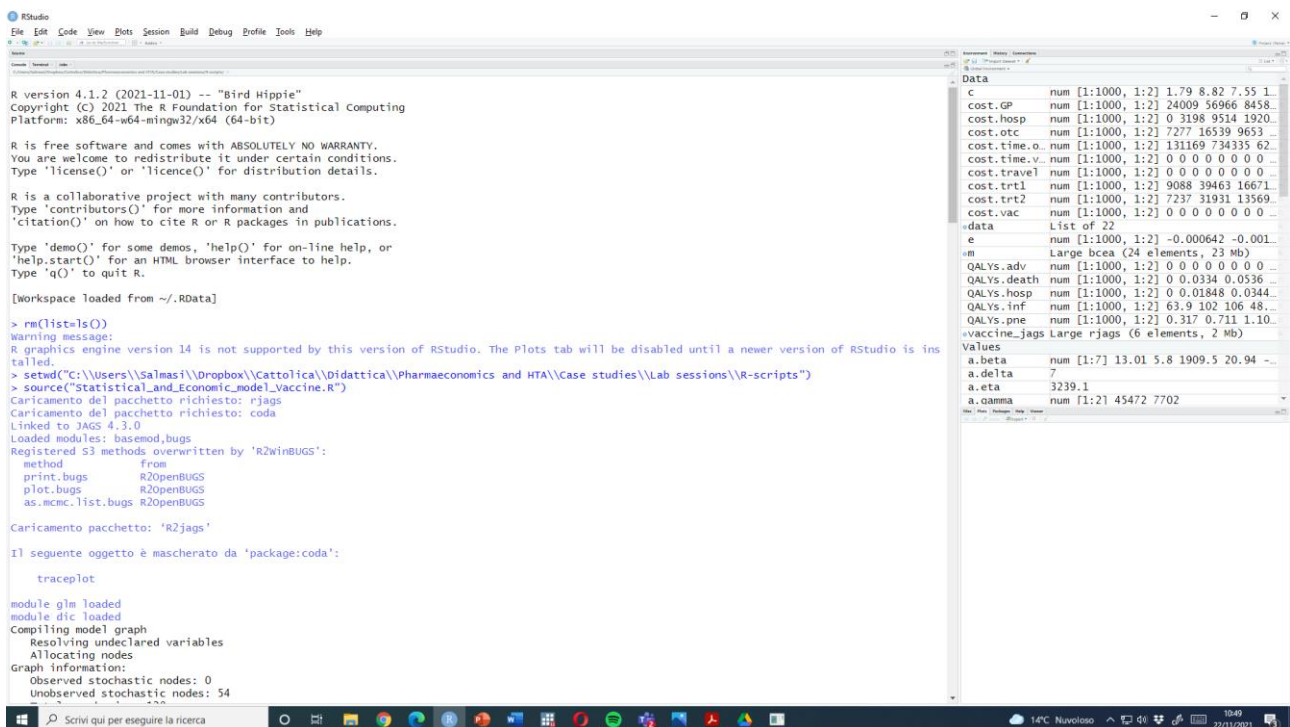
```
rm(list=ls())
```

```
setwd("C:\\Users\\...\\Lab sessions ") # substitute dots with the path to the Lab sessions folder created
```

```
# previously
```

```
source("Statistical_and_Economic_model_Vaccine.R")
```

Output on my pc:



Click 'Yes' if this message appears

The screenshot shows the RStudio interface. The main window displays a large table of parameters and their values. A dialog box titled 'Domanda' is open in the center, asking: 'The following objects in .GlobalEnv will mask objects in the attached database: phi. Remove these objects from .GlobalEnv?'. The dialog has 'SI' and 'No' buttons. The table contains parameters like Trt, beta, eta, gamma, lambda, n, omega, phi, psi, rho, and xi, with columns for parameter names and numerical values. Below the table, there is a note: 'For each parameter, n.eff is a crude measure of effective sample size, and Rhat is the potential scale reduction factor (at convergence, Rhat=1.0)'. The bottom status bar shows the system clock and date.

Parameter	Value
Trt[1,2,1]	489.588
Trt[2,2,1]	392.644
Trt[1,1,2]	0.000
Trt[2,1,2]	0.000
Trt[1,2,2]	116.862
Trt[2,2,2]	93.797
beta[1]	0.070
beta[2]	0.296
beta[3]	0.401
beta[4]	0.014
beta[5]	0.000
beta[6]	0.001
beta[7]	0.100
delta	7.030
eta	0.900
gamma[1]	0.420
gamma[2]	0.814
lambda	2.821
n[1,1]	100000.000
n[2,1]	56692.419
n[1,2]	0.000
n[2,2]	43307.581
omega[1]	4.326
omega[2]	0.000
omega[3]	0.000
omega[4]	6.399
omega[5]	6.343
omega[6]	15.241
omega[7]	0.545
phi	0.433
phi[1,1]	0.070
phi[2,1]	0.070
phi[1,2]	0.022
phi[2,2]	0.022
psi[1]	20.540
psi[2]	2640.858
psi[3]	7.259
psi[4]	10.031
psi[5]	45.703
psi[6]	3.812
psi[7]	1.605
psi[8]	0.817
rho[1]	0.000
rho[2]	0.691
xi	0.950

The screenshot shows the RStudio interface with a cost-effectiveness analysis summary and four diagnostic plots. The summary text is as follows:

intervention 2 vs intervention 1 -0.56414 0.387 28103

Optimal intervention (max expected utility) for k = 25000: intervention 1

EVPI 1.5929

Cost-effectiveness analysis summary

Reference intervention: intervention 2

Comparator intervention: intervention 1

Optimal decision: choose intervention 1 for k < 28200 and intervention 2 for k >= 28200

Analysis for willingness to pay parameter k = 10000

Intervention	Expected utility
intervention 1	-30.197
intervention 2	-30.761

intervention 2 vs intervention 1 -0.56414 0.387 28103

Optimal intervention (max expected utility) for k = 10000: intervention 1

EVPI 1.5929

Cost-effectiveness analysis summary

Reference intervention: intervention 2

Comparator intervention: intervention 1

Optimal decision: choose intervention 1 for k < 28200 and intervention 2 for k >= 28200

Analysis for willingness to pay parameter k = 30000

Intervention	Expected utility
intervention 1	-30.197
intervention 2	-30.761

intervention 2 vs intervention 1 -0.56414 0.387 28103

Optimal intervention (max expected utility) for k = 30000: intervention 2

EVPI 1.5929

The four diagnostic plots are:

- Cost-Effectiveness Plane Intervention 2 vs Intervention 1**: A scatter plot showing the relationship between effectiveness differential and cost differential. A red dot indicates the optimal intervention at k = 25000.
- Expected Incremental Benefit**: A line graph showing the expected incremental benefit (EIB) as a function of willingness to pay (k). The curve starts at 0 and increases linearly, reaching a plateau at k = 28200.
- Cost Effectiveness Acceptability Curve**: A line graph showing the probability of cost effectiveness as a function of willingness to pay (k). The curve starts at 0 and increases, reaching a plateau at k = 28200.
- Expected Value of Information**: A line graph showing the expected value of information (EVI) as a function of willingness to pay (k). The curve starts at 0, peaks at k = 28200, and then decreases.