

# SIR\_model

## sir\_1.R-hez ábrák

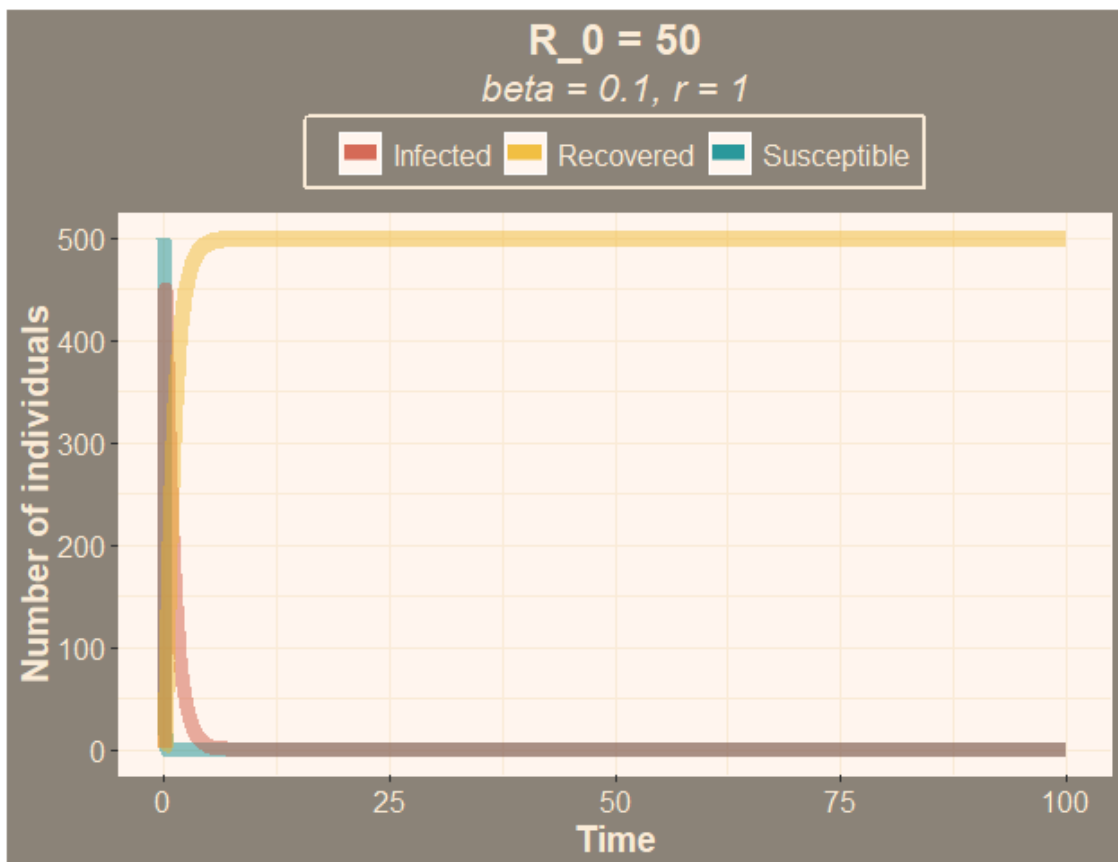
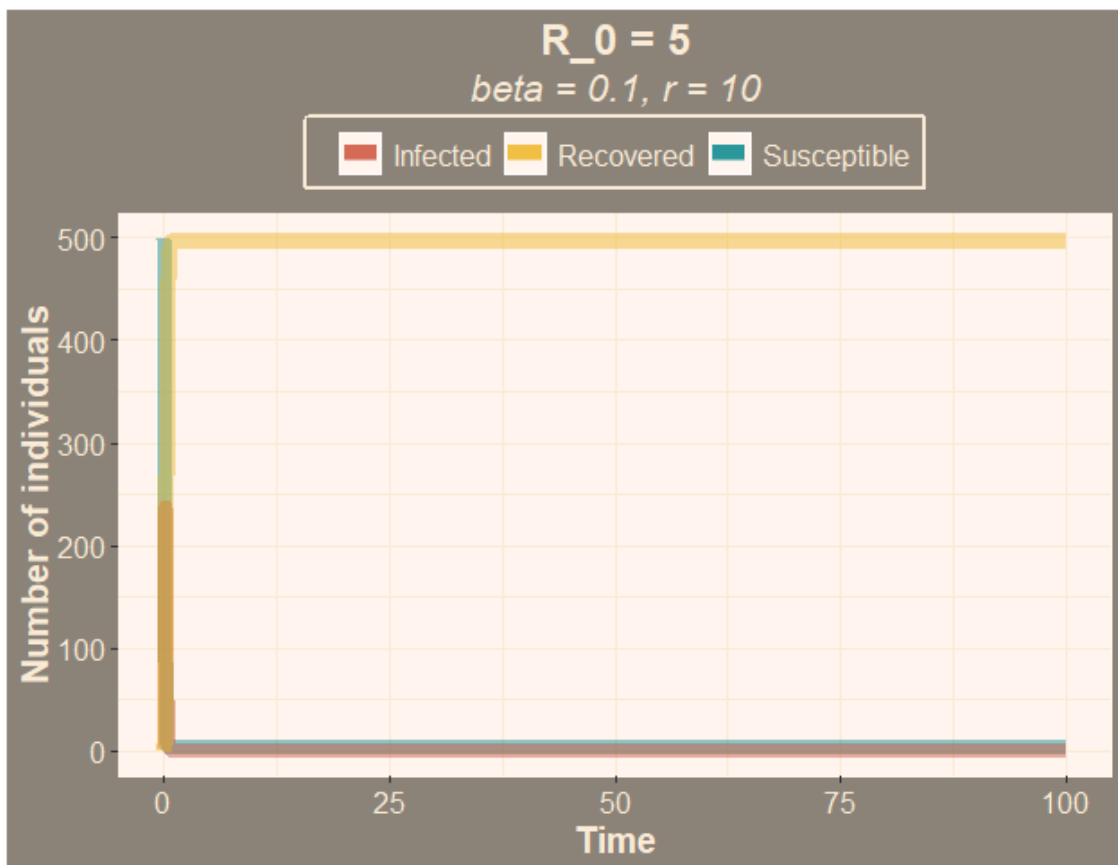
BZsofi 2019 március 22

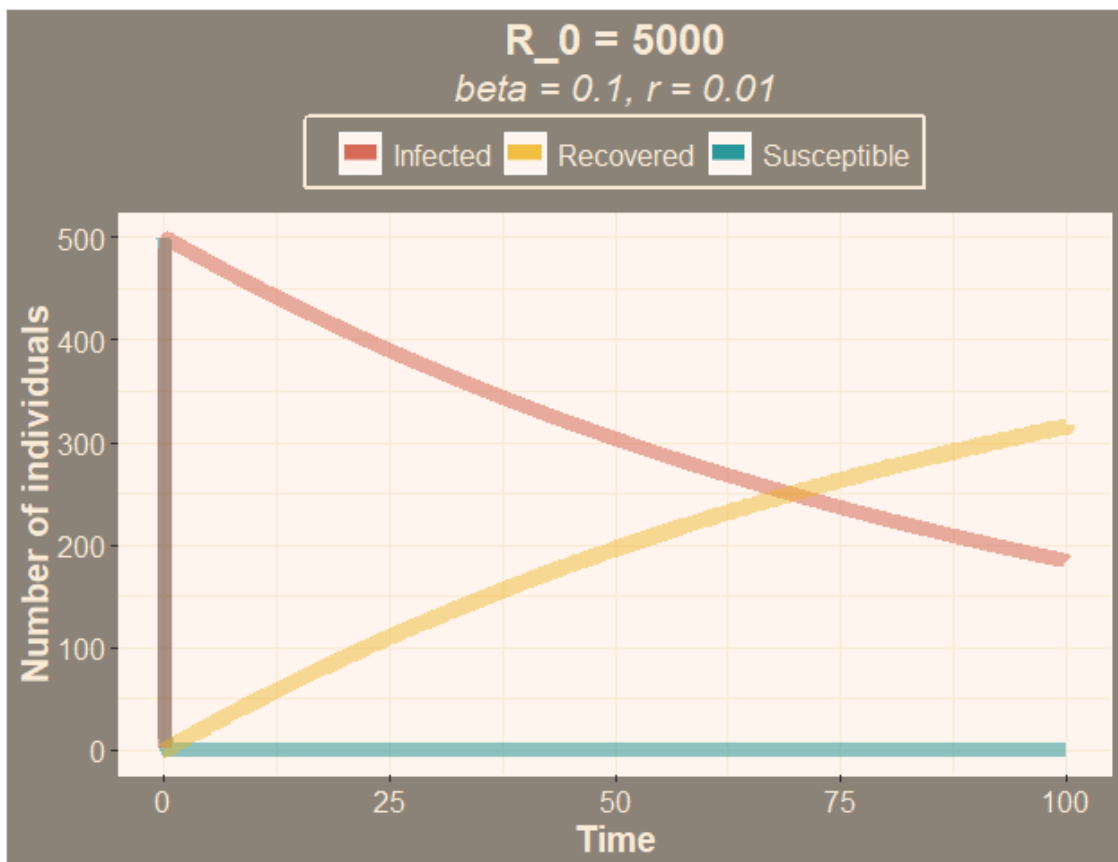
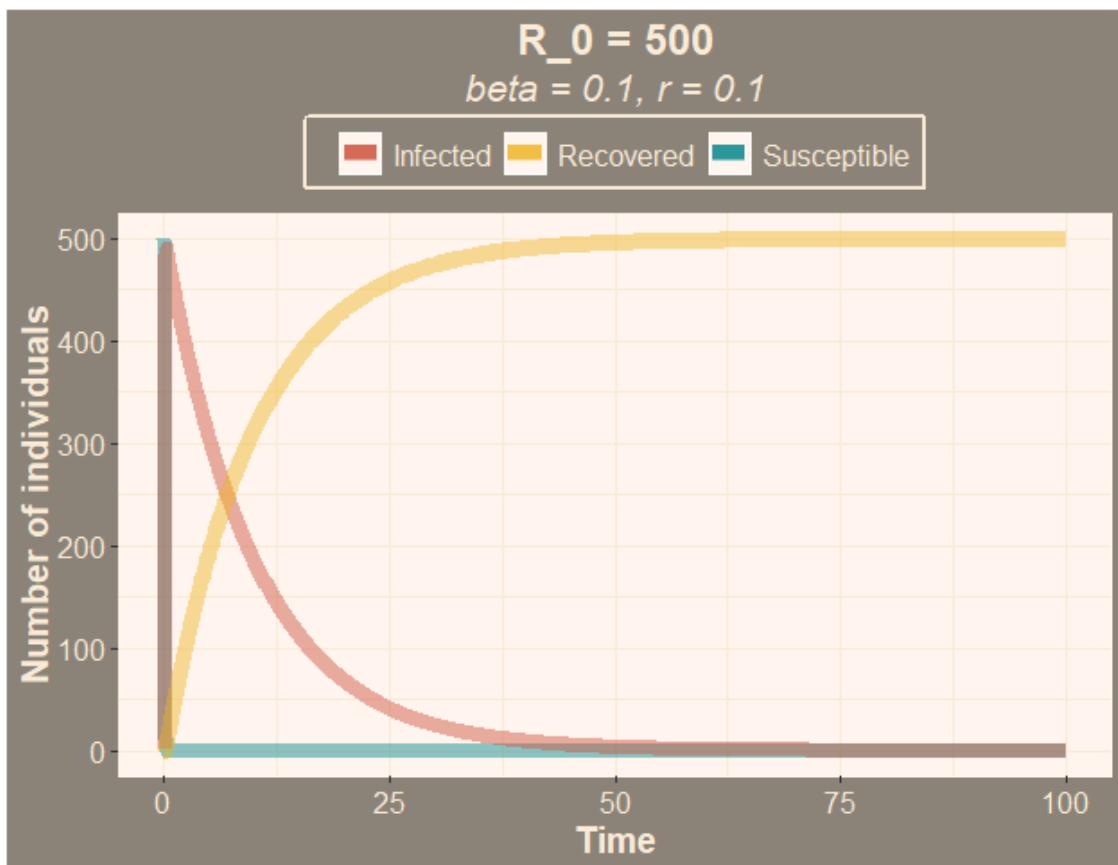
### FUNCTION DEFINITIONS

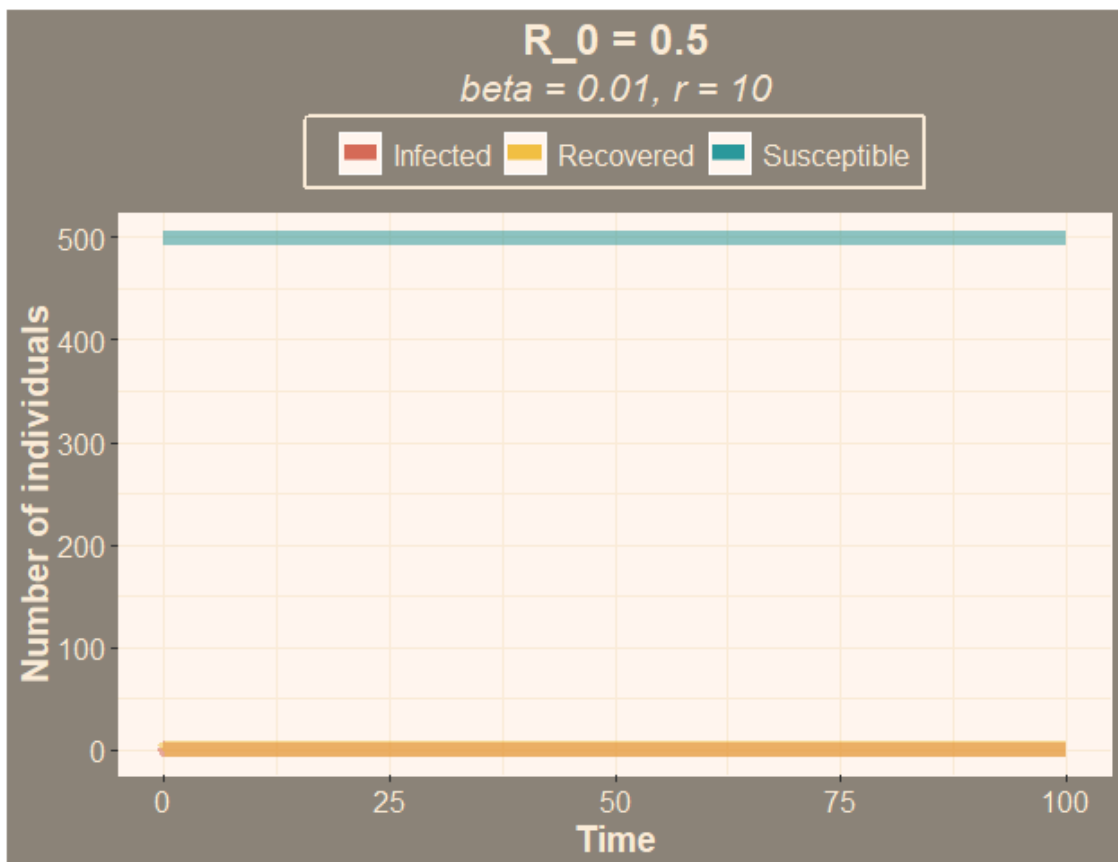
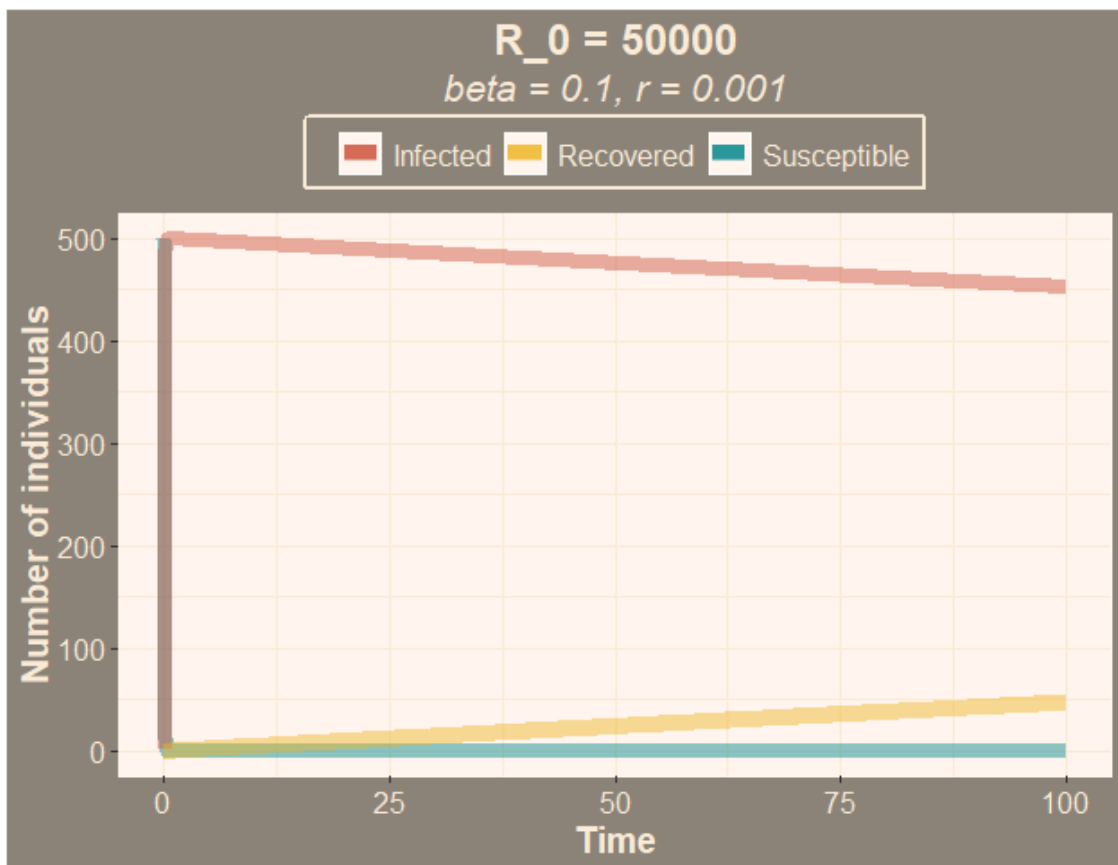
```
SIR <- function(t, x, parms){  
  with(as.list(c(parms,x)),{  
    dS <- - beta*S*I  
    dI <- + beta*S*I - r*I  
    dR <- r*I  
    der <- c(dS, dI,dR)  
    list(der)  
  })  
}
```

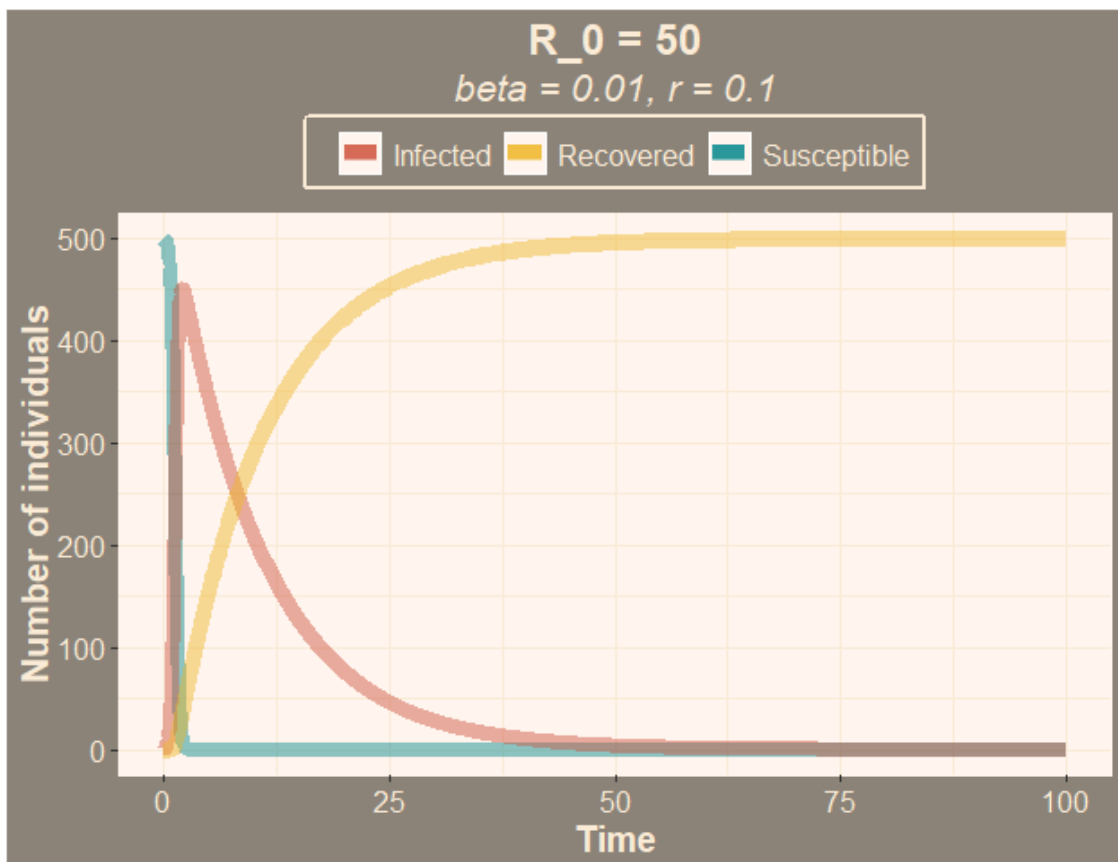
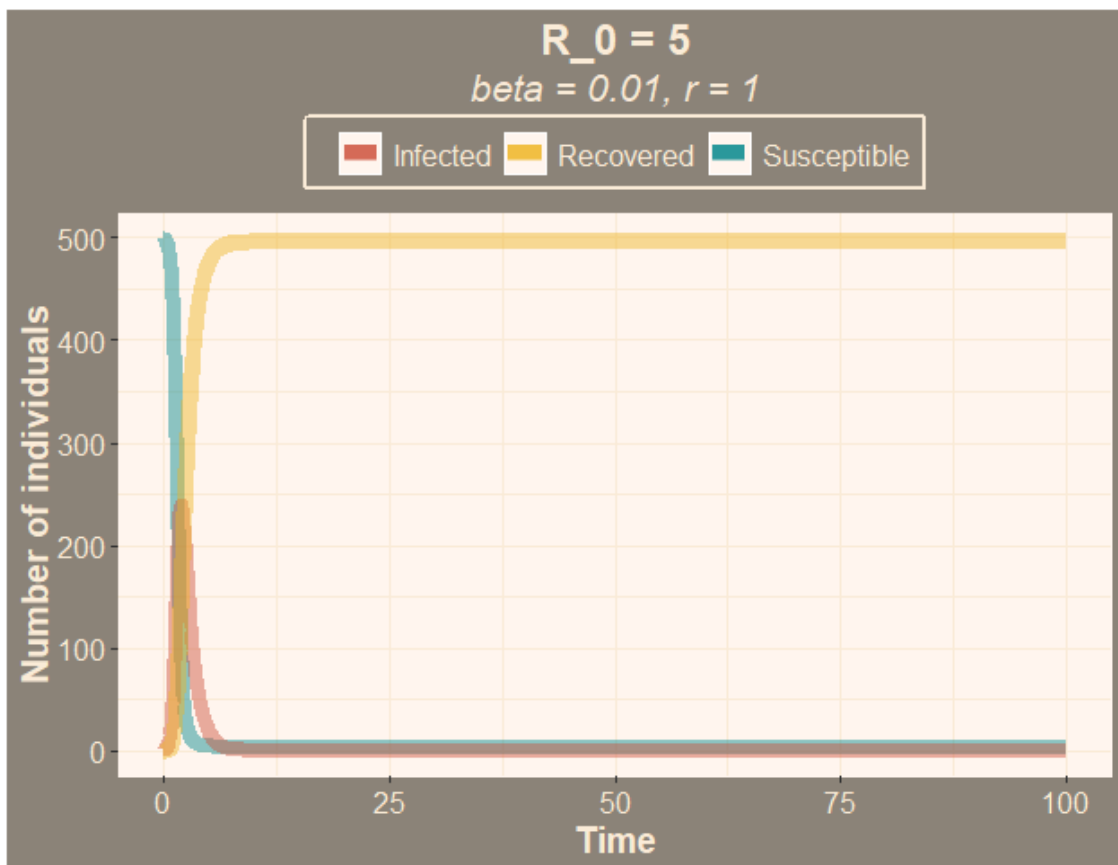
### MAIN PROGRAM - SIMULATION OF THE MODEL + PLOT

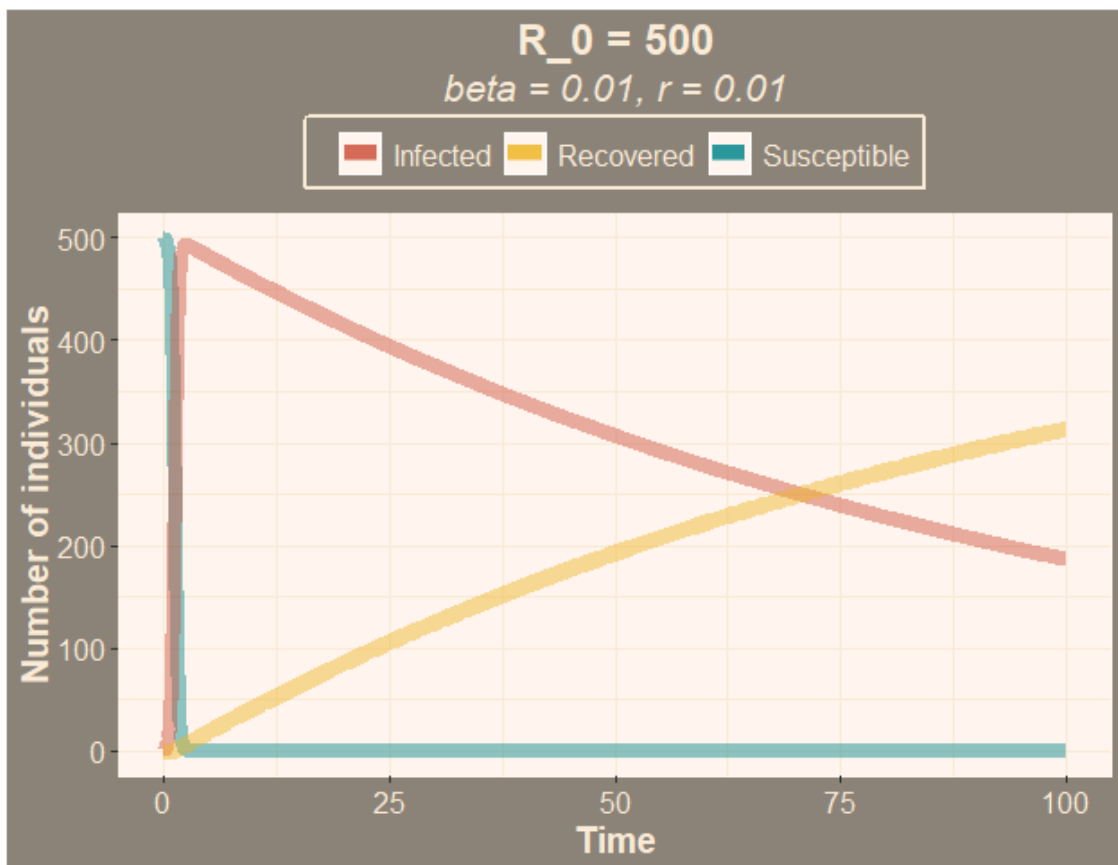
```
library(deSolve)  
library(ggplot2)  
  
for(i in 1:5) {  
  for(j in 1:5) {  
    parms <- c(beta=10^(-i), r=10^(-j+2))  
    inits <- c(S=499, I=1, R=0)  
    dt <- seq(0,100,0.1)  
  
    N <- sum(inits)  
    R_0 <- with(as.list(parms),{beta*N/r})  
    title = paste("R_0 = ",R_0, sep = "")  
    beta = parms[1]  
    r = parms[2]  
    beta2 = paste("beta = ",beta, sep = "")  
    r2 = paste("r = ",r,sep = "")  
    subtitle = paste(beta2,r2, sep = ", ")  
  
    simulation <- as.data.frame(lsoda(inits, dt, SIR, parms=parms))  
  
    plot = ggplot(simulation, aes(x = time)) +  
      geom_line(aes(v = S, colour = "Susceptible"), size=3, alpha=0.45) +  
      geom_line(aes(v = I, colour = "Infected"), size=3.1, alpha=0.45) +  
      geom_line(aes(v = R, colour = "Recovered"), size=3.2, alpha=0.45) +  
      vlab(label="Number of individuals") +  
      xlab("Time") +  
      ggtitle(title, subtitle = subtitle) +  
      scale_color_manual(name = "",  
        values = c("Susceptible" = "turquoise4", "Infected" = "tomato3", "Recovered" = "goldenrod2")) +  
      theme(plot.background = element_rect(fill = "antiquewhite4"),  
        legend.background = element_rect(fill = "antiquewhite4"),  
        plot.title = element_text(size = 18, lineheight=.8, hjust=0.5, face="bold", colour="antiquewhite"),  
        plot.subtitle = element_text(size = 16, lineheight=.8, hjust=0.5, face="italic", colour="antiquewhite"),  
        axis.title = element_text(size = 15, face="bold",colour="antiquewhite"),  
        axis.text = element_text(size = 12,colour="antiquewhite"),  
        legend.position="top",  
        legend.key = element_rect(fill = "seashell"),  
        legend.text = element_text(size = 12,colour="antiquewhite"),  
        legend.box.background = element_rect(colour = "antiquewhite", size=1.5),  
        panel.background = element_rect(fill = "seashell", colour = "seashell", size = 0.5, linetype = "solid"),  
        panel.grid.major = element_line(size = 0.5, linetype = 'solid', colour = "antiquewhite"),  
        panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "antiquewhite"))  
    print(plot)  
  }  
}
```

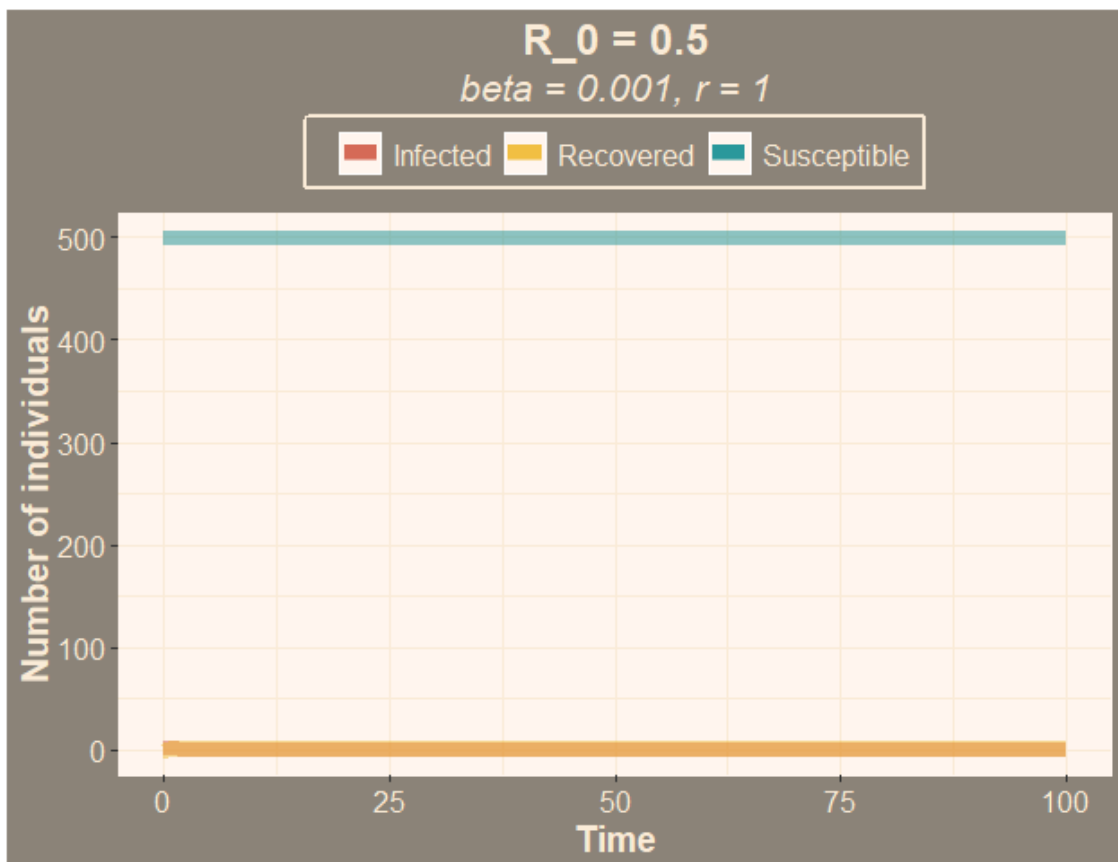
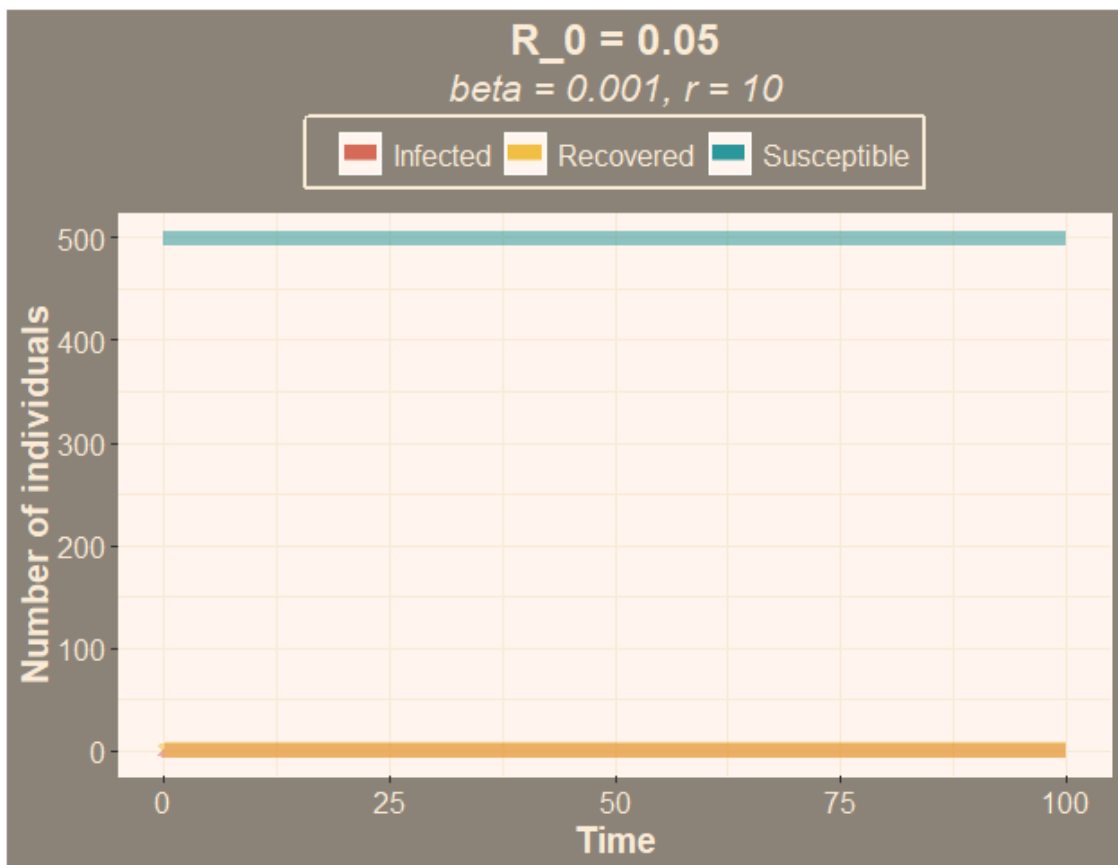


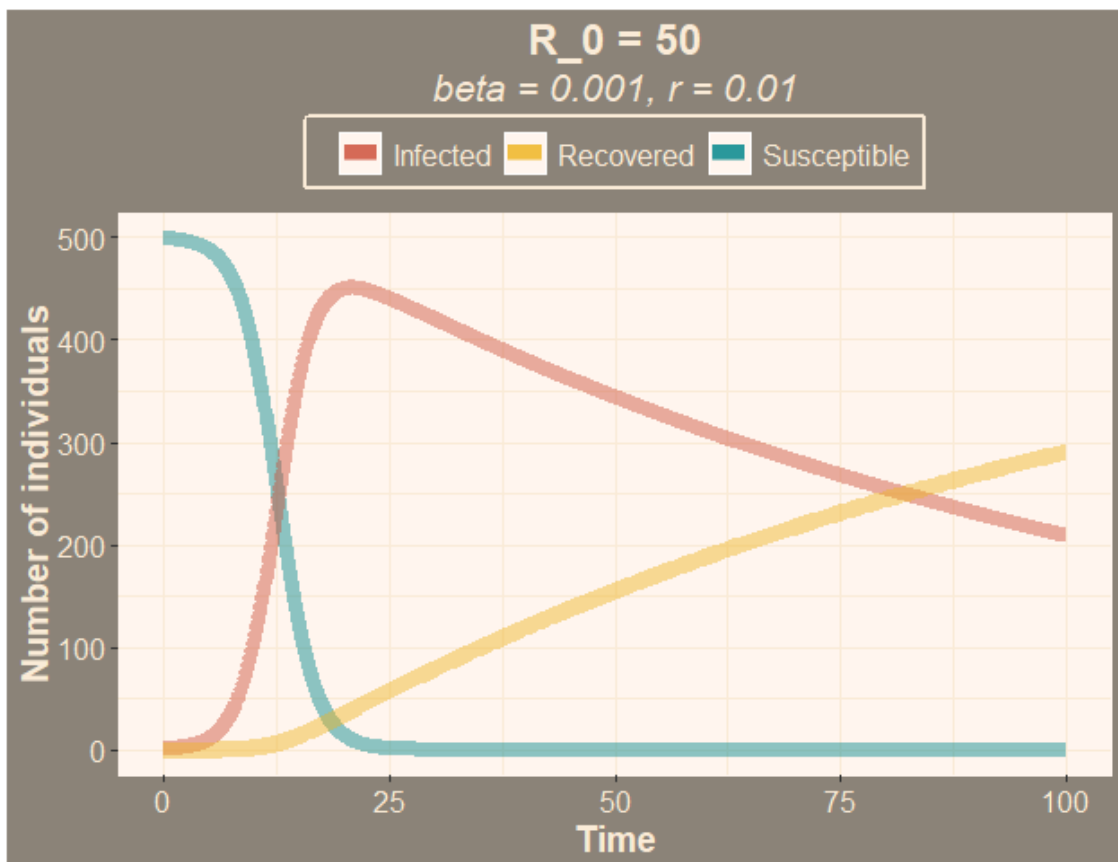
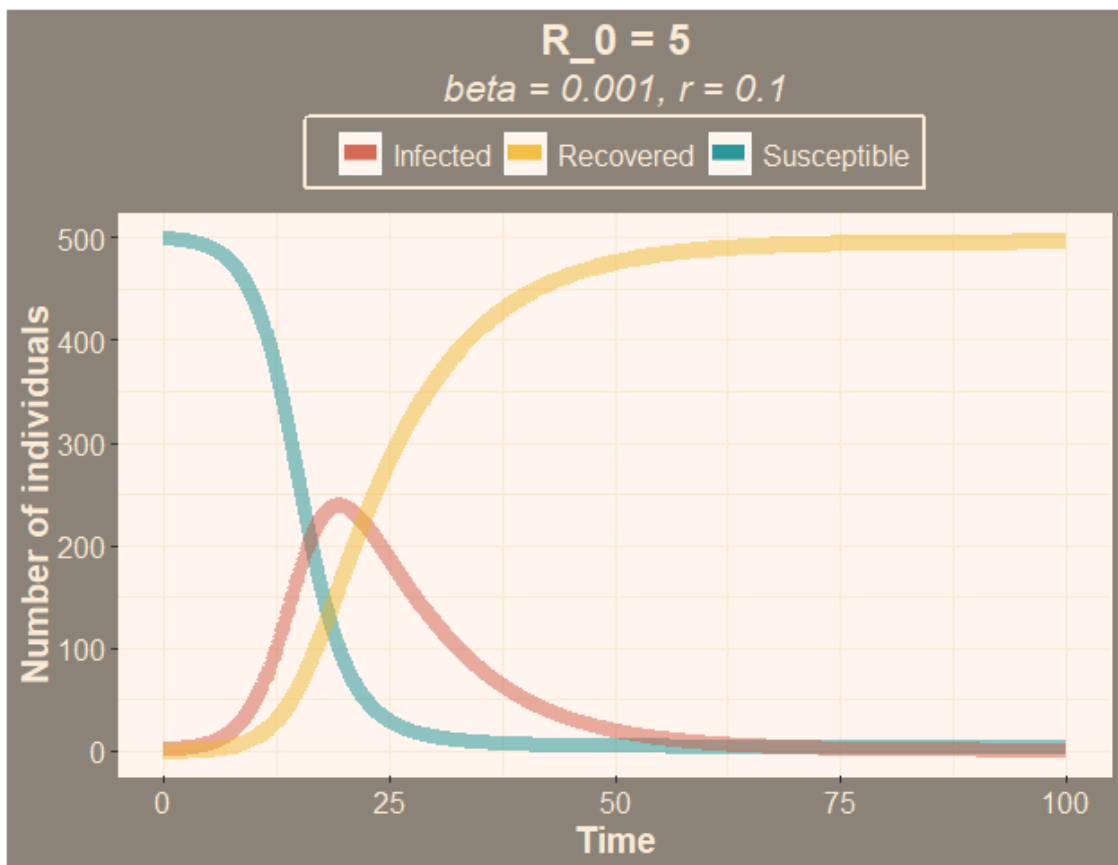




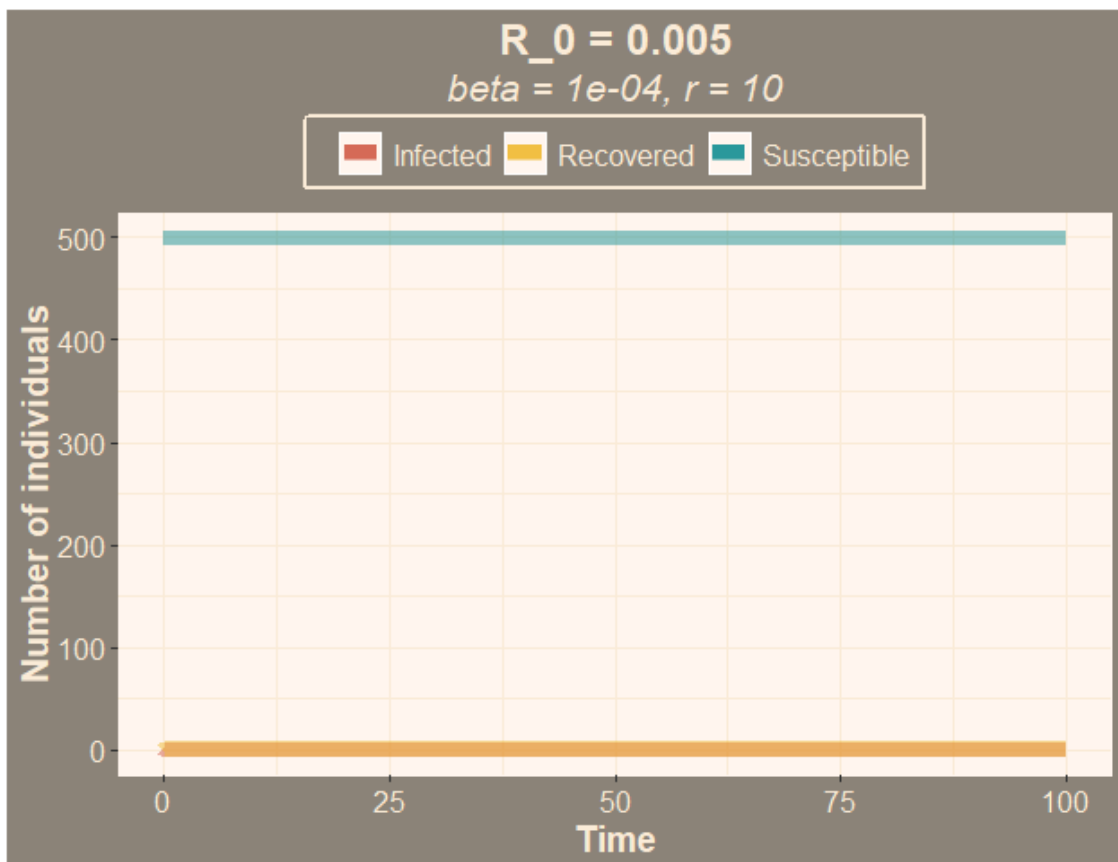
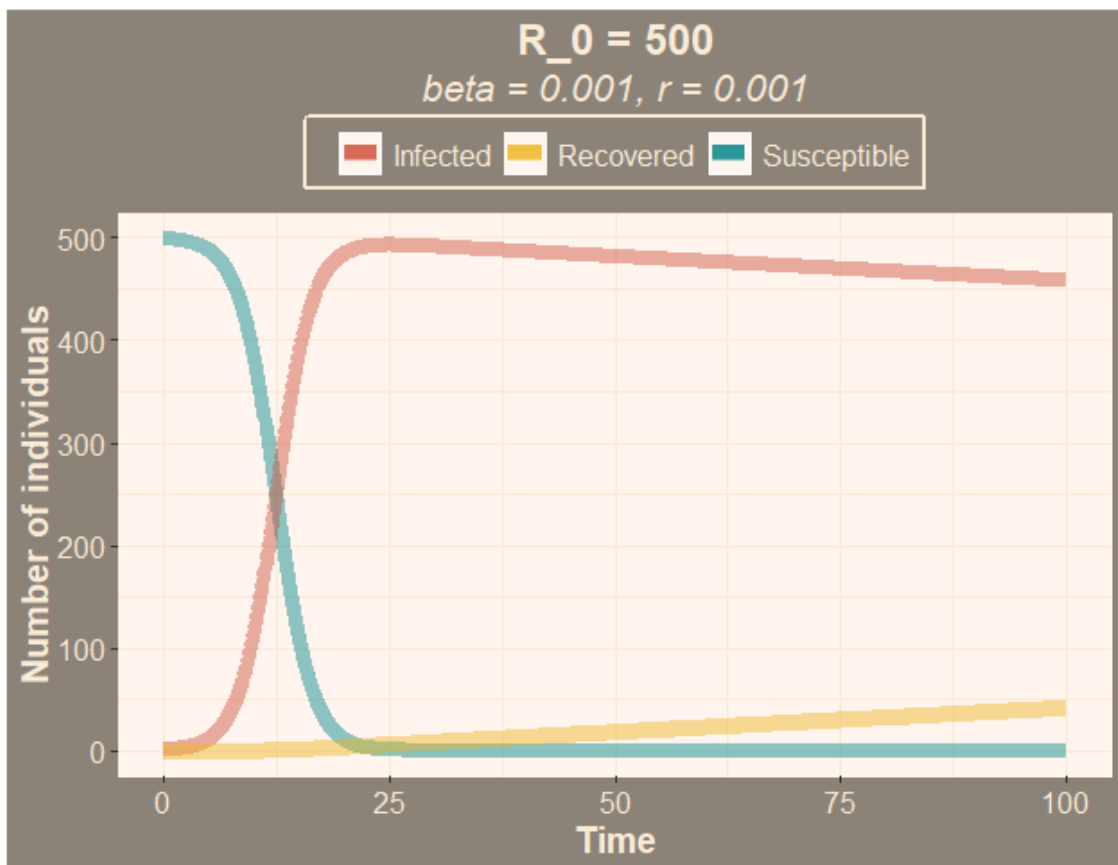


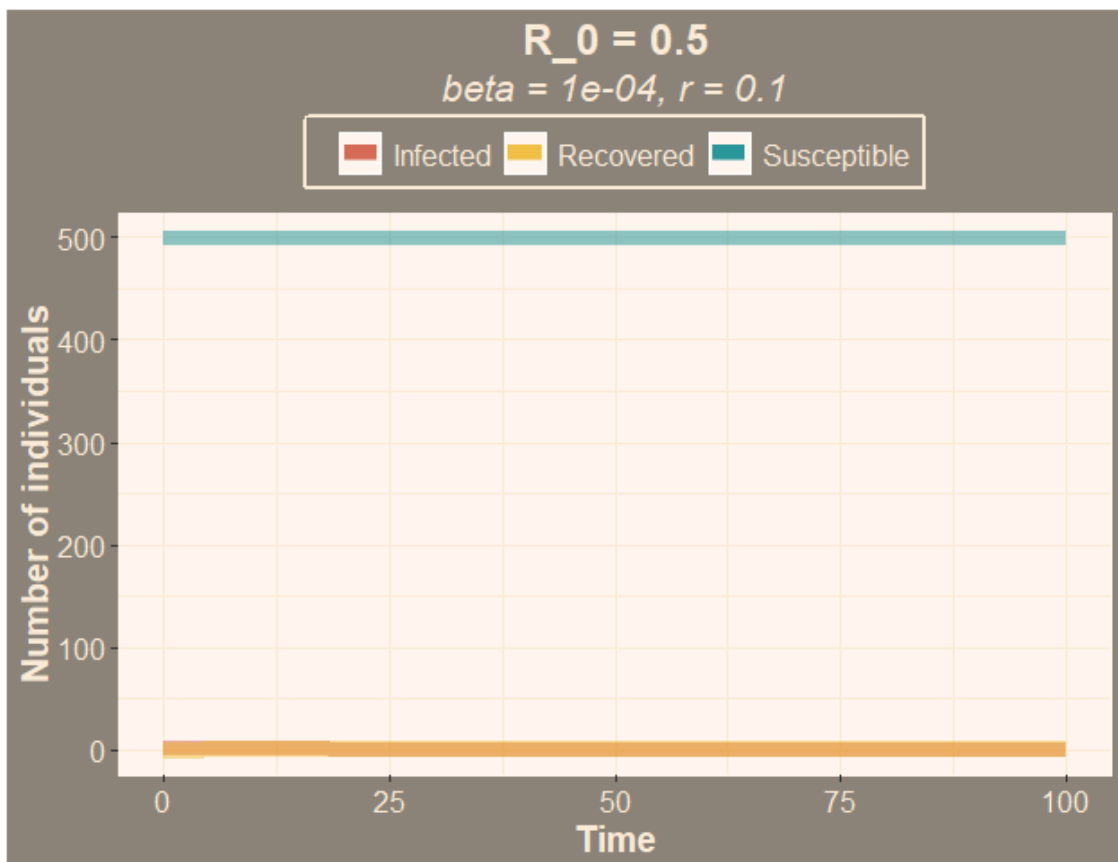
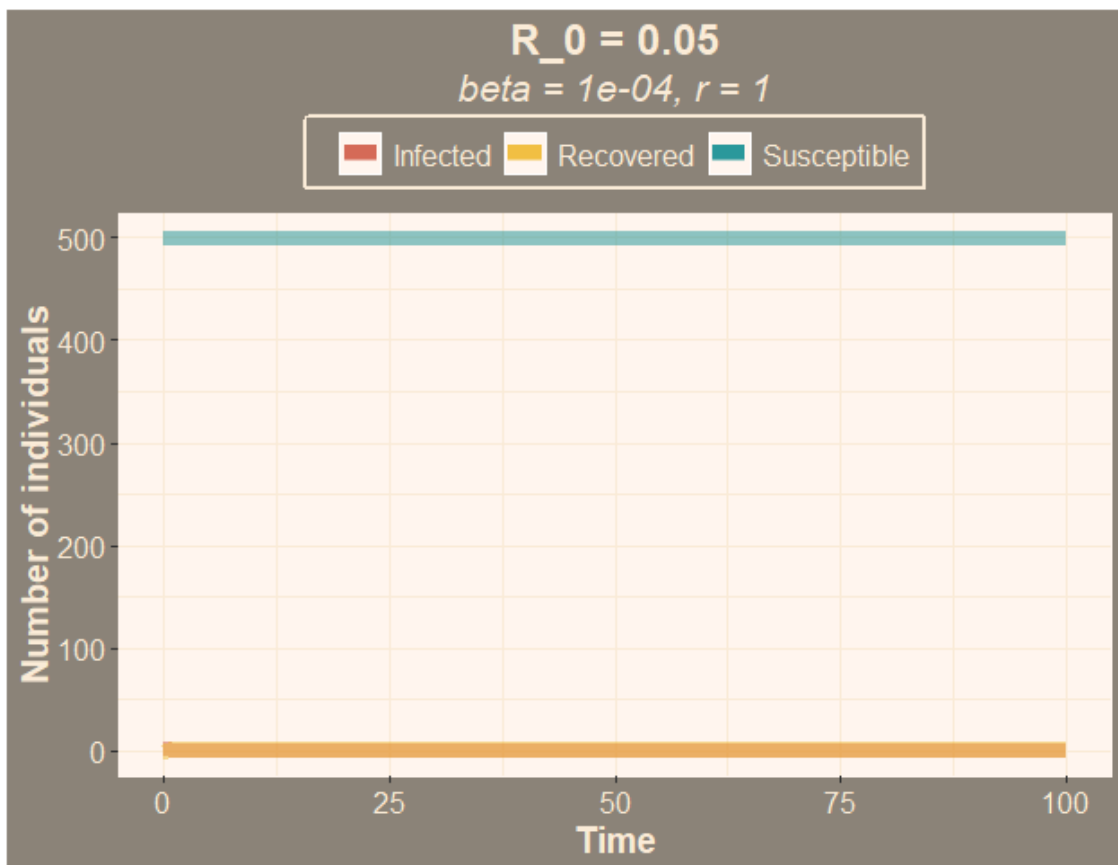


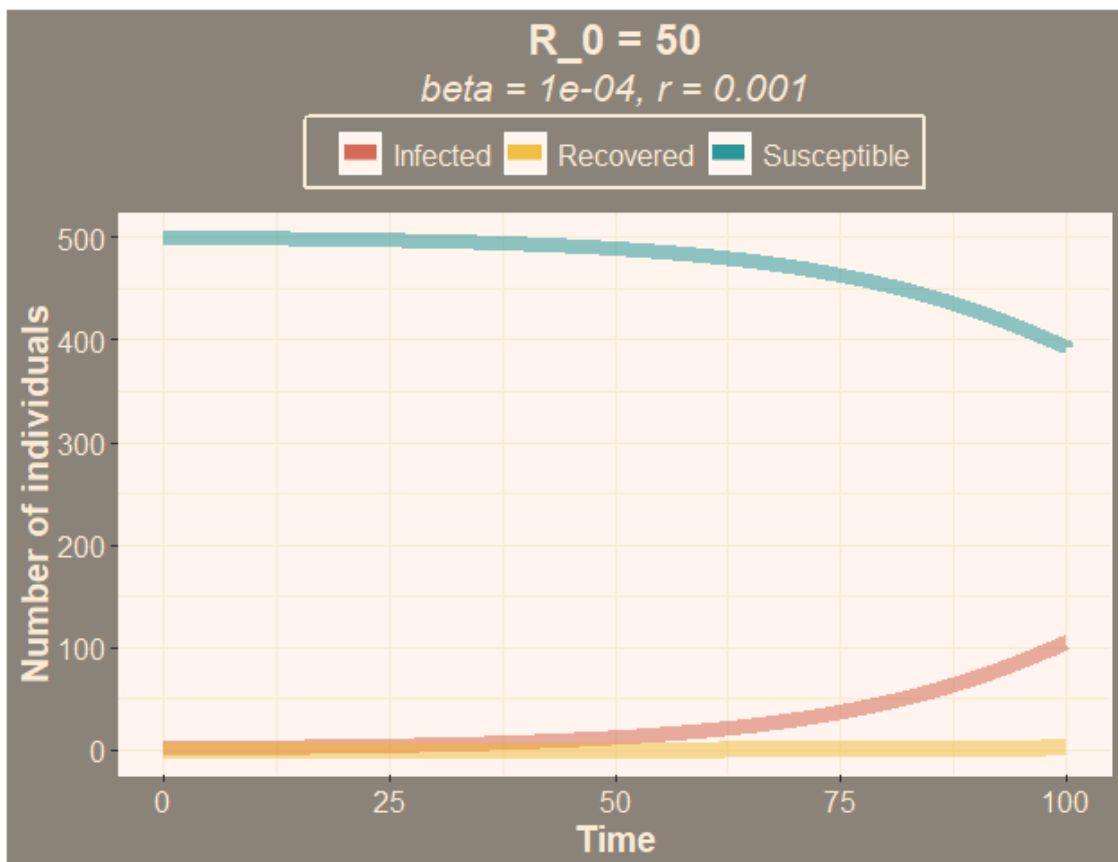
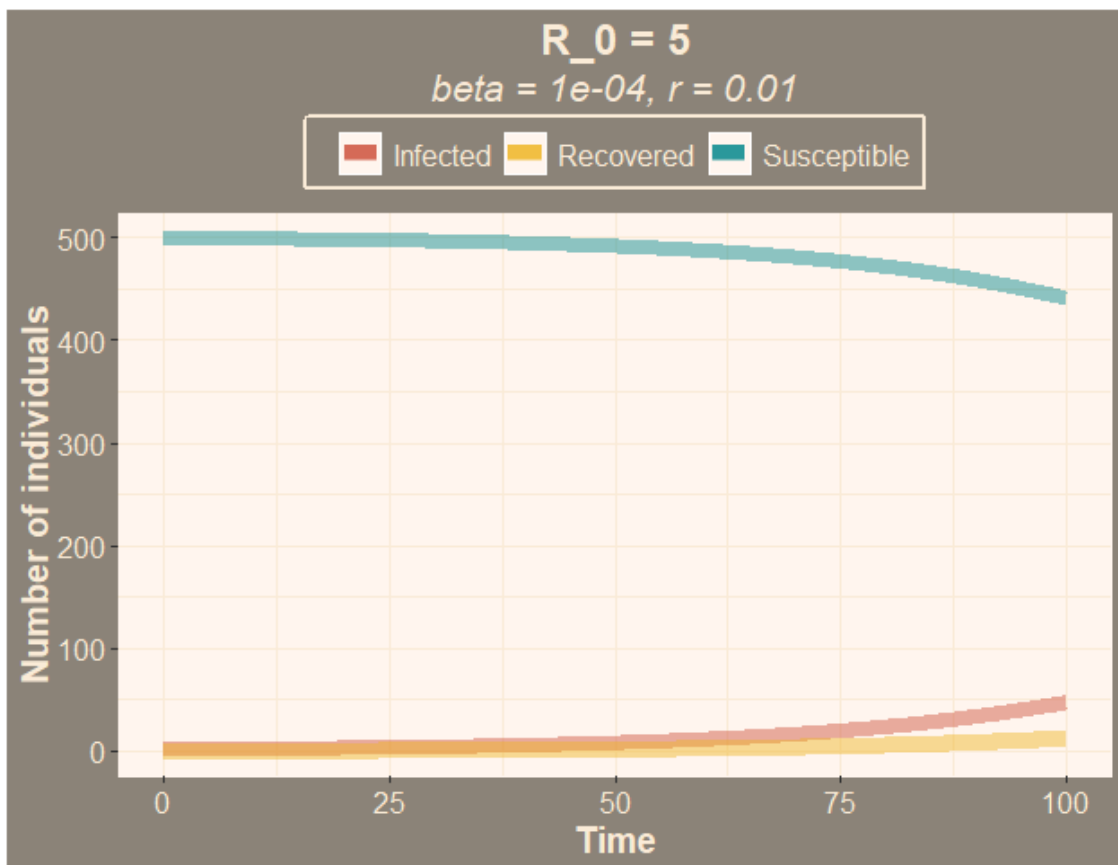


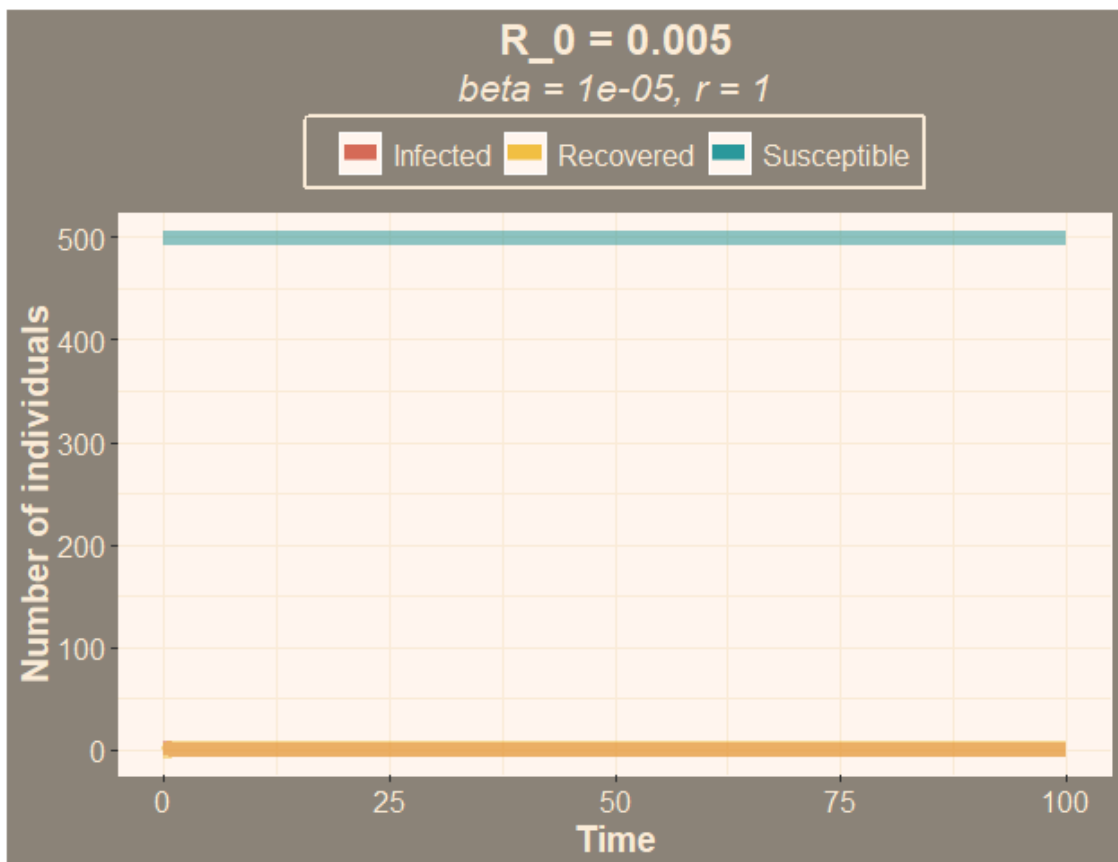
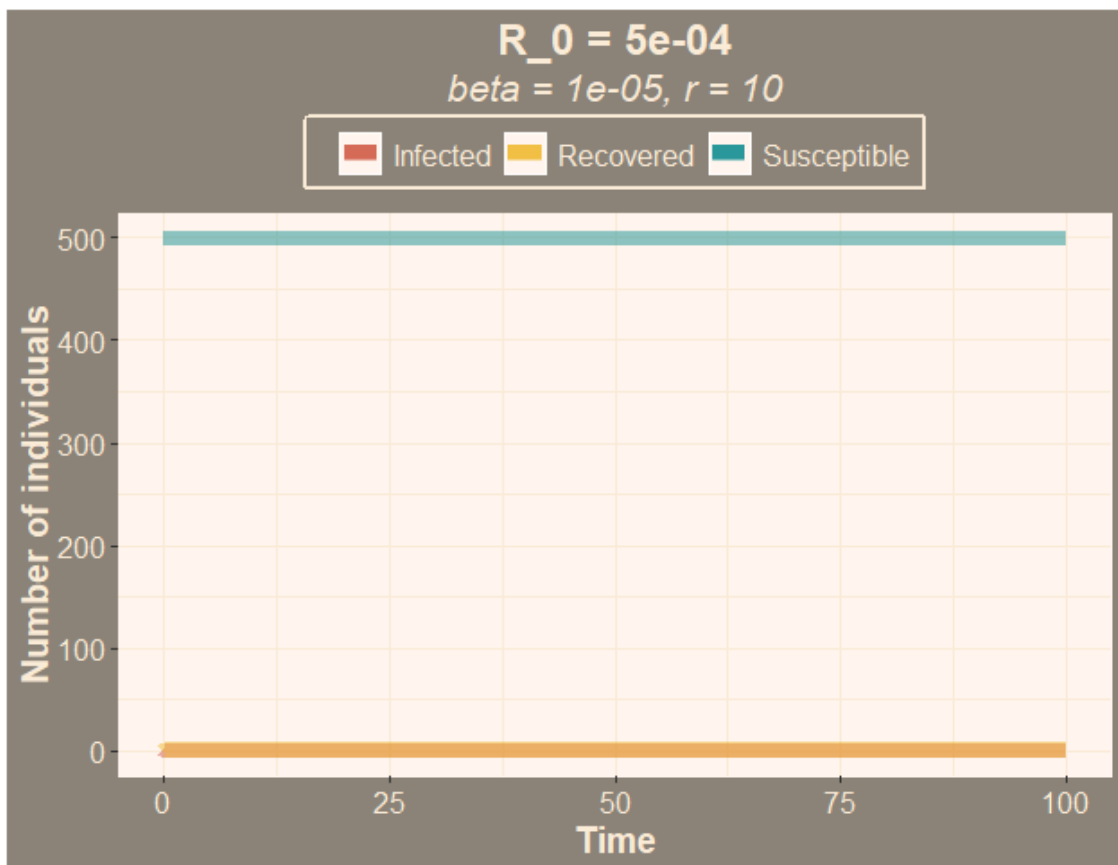


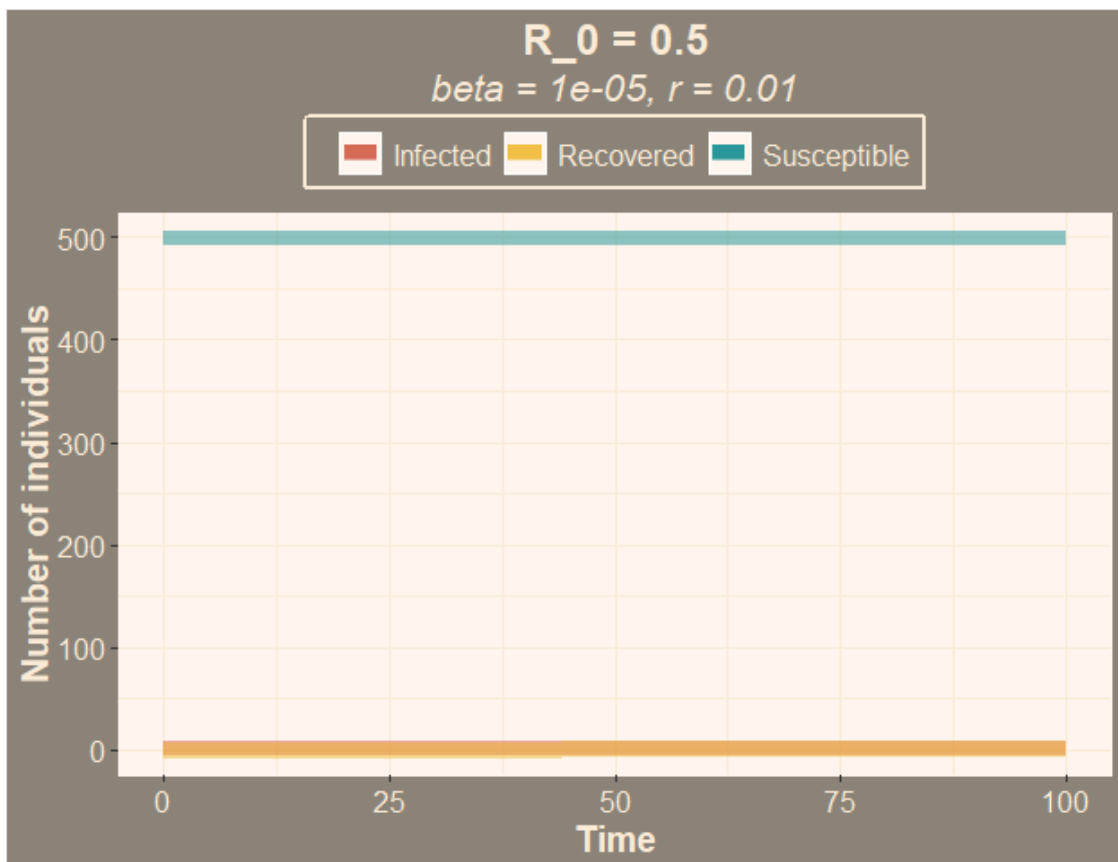
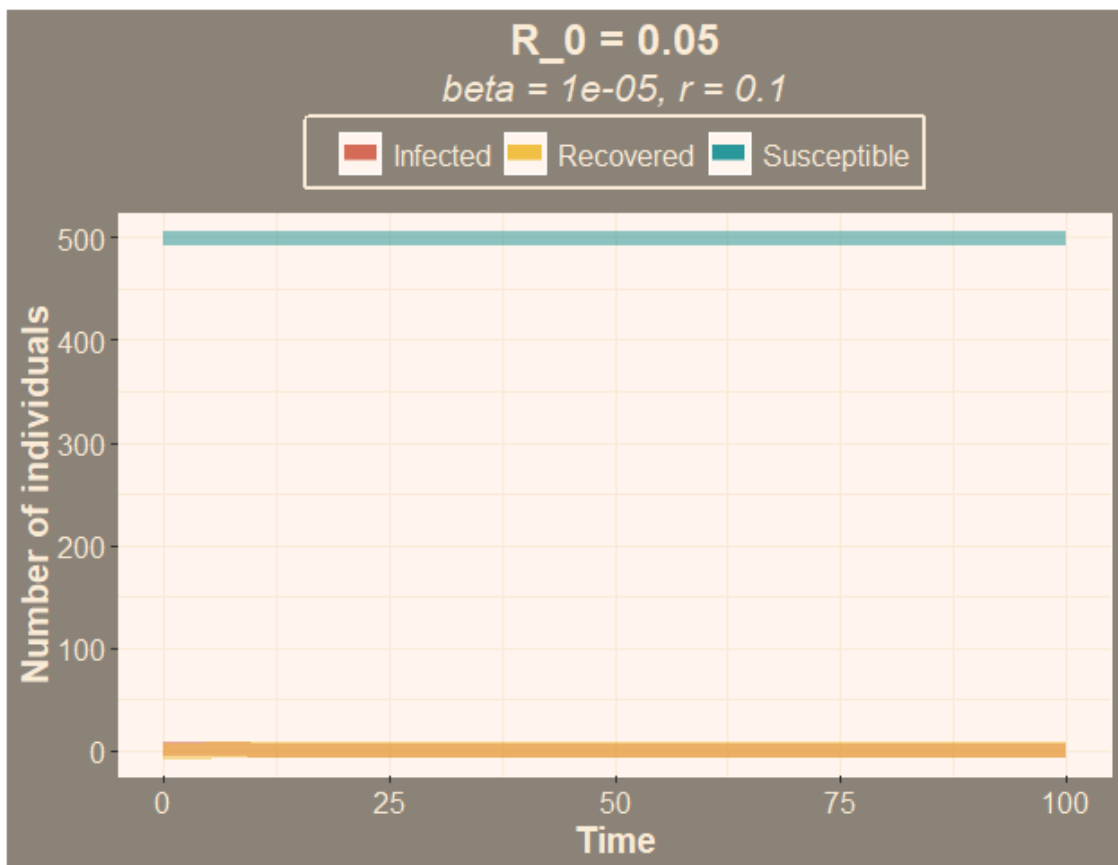












$R_0 = 5$

$\beta = 1e-05, r = 0.001$

