Exercise 6: Modelling vaccine coverage

A new vaccine has been developed for an endemic seasonal disease. Use the following parameters to develop an SIRS model to model the introduction of a new vaccine 10 years into the disease.

Basic Model parameters

beta=300, Average contact rate

beta1=0.4, Amplitude of seasonal effect

gamma=365/10, annual natural recovery rate

mu=365/100, annual birth/death rate

rho=365/30, annual loss of immunity rate

Start your model with 1 infectious case.

Part A:

a. Develop and run your model for 20 years with daily time steps

b. Introduce a vaccine at the 10 year mark using the parameters below.

propv=0.2, proportion vaccinated

v=365/7, annual rate of vaccination

c. Plot a graph that displays the level of infectious cases over 20 years for different coverage levels of the vaccine.

d. Compute the number of people who have received the vaccine under the scenarios in (c).

Part B:

The aim of this exercise is to assess the variability of the impact of a 20% vaccination policy for variable parameter values.

1. Load your SIR intervention model with vaccination
2. Select appropriate distributions for each parameter value
3. Simulate your model several times (e.g. 1000 times) drawing from your parameter distributions
4. Create confidence intervals and plot your findings