

Exercise 5: Sensitivity analysis (SA) of R_0 formulations for SIP, SIPD, SIFP, and SIPDF models

Learning objective: The learning goal of this exercise is to analyze the sensitivity of R_0 for SIP, SIPD, SIFP and SIPDF models using the normalized sensitivity index.

For this, the learner will try to find the sensitivity index for a range of parameter values as in Lesson 6. An excel file can be used for this exercise. For each model, the exercise requires to plot a figure where the sensitivity index is showed in a bar for each parameter. The student will need to spend 8 hours to construct the excel file and obtain the plots.

The exercise

The student will try to analyze the sensitivity of R_0 formulations for particle-based transmission models (SIP, SIPD, SIFP, and SIPDF). For this, the student will applied the methodology described in Lesson 6 for analyzing the sensitivity of R_0 for SI and SID models. The local sensitivity of R_0 for each model will be presented by ‘Sensitivity Index vs. Parameters’ plots as in Lesson 6, where the sensitivity index will represent the unit R_0 change per unit change in the given parameter. The analysis for each parameter can be computed at a 0-1 parameter range for all parameters except for b (0-10000), and N (0-200), while the rest of the parameters can be held constant with these baseline values: $\beta = 0.001$, $m = 0.1$, $d = 0.1$, $c = 0.1$, $b = 10000$, $r = 0.1$, $a = 0.1$, $f = 0.001$, $N = 100$.