**3. Simulation Procedure**

A simulation study was conducted which allows changing parameters of interest (i.e. the number of target statistics and number of simulations). All simulations and analyses were conducted using R version 3.6.2 (2019-12-12)

1. **Simulation setup**

|  |  |  |
| --- | --- | --- |
|  | **Reference one** | **Reference two** |
| **Target features** | **Prevalence at times 50 & 75** | **Prevalence at times 50 & 75 + peak prevalence** |
| **Targets used** | **Prev. at 50 = 0.644 (644 out of 1000)**  **Prev. at 75 = 0.404 (404 out of 1000)** | **Prev. at 50 = 0.622 (622 out of 1000)**  **Prev. at 75 = 0.371 (371 out of 1000)**  **Peak prev. = 0.677 (677 out of 1000)** |
| **Number of simulations** | **1,000,000** | **1,000,000** |
| **Parameters used to generate targets** | **Beta = 0.2**  **Gamma = 0.02** | **Beta = 0.2**  **Gamma = 0.02** |
| **Beta prior** | **Uniform distribution (0.1, 0.3)** | **Uniform distribution (0.1, 0.3)** |
| **Gamma prior** | **Uniform distribution (0.01, 0.03)** | **Uniform distribution (0.01, 0.03)** |

|  |  |  |
| --- | --- | --- |
|  | **Scenario one** | **Scenario two** |
| **Target features** | **Prevalence at times 50 & 75** | **Prevalence at times 50 & 75 + peak prevalence** |
| **Targets used** | **Prev. at 50 = 0.644 (644 out of 1000)**  **Prev. at 75 = 0.404 (404 out of 1000)** | **Prev. at 50 = 0.622 (622 out of 1000)**  **Prev. at 75 = 0.371 (371 out of 1000)**  **Peak prev. = 0.677 (677 out of 1000)** |
| **Number of simulations** | **60,000** | **75,000** |
| **Parameters used to generate targets** | **Beta = 0.2**  **Gamma = 0.02** | **Beta = 0.2**  **Gamma = 0.02** |
| **Initial compartmental values** | **S = 990**  **I = 10**  **R = 0** | **S = 990**  **I = 10**  **R = 0** |
| **Time span** | **Sequence from 0 to75 incremented by 1** | **Sequence from 0 to75 incremented by 1** |
| **Beta prior** | **Uniform distribution (0,1)** | **Uniform distribution (0,1)** |
| **Gamma prior** | **Uniform distribution (0,0.5)** | **Uniform distribution (0,0.5)** |

1. **Obtaining targets**

As target statistics in this study, there were two scenarios. Scenario one (S1) considered two target features (prevalence at two-time points, 50 and 75) and scenario two (S2) looked at three target features (peak prevalence for each model run in addition to the two-time points in scenario one).

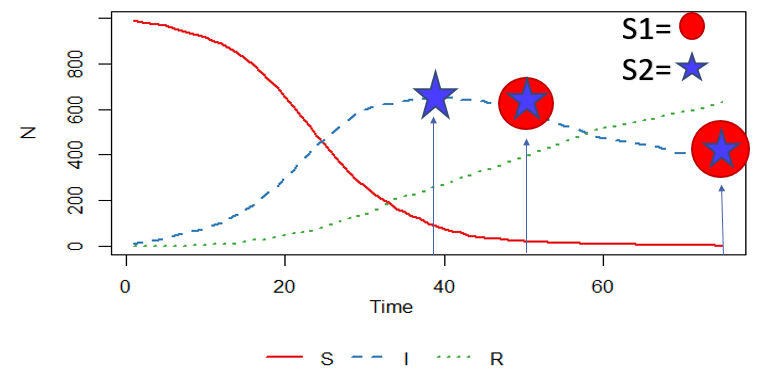


Figure 5: targets for scenarios 1 and 2. Scenario 1 considers only green points on the Infectious (I) curve while scenario 2 considers both red and green points on the (I) curve.

R version 3.6.2 (2019-12-12) was used to perform the statistical analyses and datasets were obtained from a stochastic SIR model using the SIR function in the SimInf library (siminfref). To obtain targets for scenario one, the SIR model was ran once with known parameter values () and the prevalence at times 50 and 75 were saved as target statistics. Similarly for scenario two, the SIR model was ran once with the same known parameter values and the prevalence at times 50 and 75, as well as the peak prevalence, were saved as targets.

1. **Running the methods**
2. **Obtaining a Reference (“true posterior”)**

At a sufficiently small tolerance, rejection ABC approximates the true posterior (ref: Sunnaker et al). For each scenario, we run a million simulations and saved all parameter combinations at tolerance = 1. We then chose the tolerance as low as possible in order to retain the same number of parameter combinations accepted by the methods compared.