

Coupled SIS Models

For some diseases, there is a time period between the time the patient becomes infected and when they can infect others. This latent period can have effects on the dynamics of the infection. In this project, you will develop a SIS-type model that incorporates a latent period and compare it to a SIS model without a latent period. A SIS-type model is similar to a SIR model except that there is no acquired immunity after recovering from the infection.

Some Model Requirements

- The model without a latent period is a SIS-type model, which is similar to an SIR-type model except that there is no immunity.
- A SIS model with Latency divides the population into three groups: Susceptible (S), Latent (L), and Infected (I). The latent group are infected by the illness but are not showing symptoms. There is no recovered group so recovered infected members become susceptible again.
- Susceptible members are infected, becoming a member of the Latent population, at a rate proportional to their population size and the size of the Infected population.
- The members of the Latent population become infected at a rate proportional to the size of the Latent population.
- Infected members recover to become Susceptible members at a rate proportional to the size of the Infected population.
- Susceptible members can become infected by members of the Latent population at a rate proportional to their population size and the size of the Latent population, becoming members of the Latent population.

Some Questions to Answer

- What are the dynamics of SIS-type model without a latent period? Under what conditions would the infection be endemic?
- Consider the SIS model with a latent period where the Latent population cannot infect the Susceptible population. Under what conditions would the infection be endemic? How do the conditions compare with the SIS model without a latent period?
- Consider the SIS model with a latent period where the Latent population can infect the Susceptible population. Under what conditions would the infection be endemic? How do the conditions compare with the previous two models?
- If we are able to prevent a Latent member from becoming Infected, would it be possible to make an endemic infection cease to be endemic? Under what conditions could this occur?