CBS 810

R0 for endemic diseases and seroepidemiology

1. Why is SIRS a better model for influenza than SIR?

Immunity for influenza is temporary, lasting only a couple of years, so immunity is temporary and recovered individuals become susceptible again.

1. Define force of infection

The per capita rate at which susceptible individuals contract infection (Keeling & Rohani book)

1. How do we estimate the average force of infection from cross-sectional serological data?

Fit a catalytic model (nls, non-linear least squares regression) to the data, which iterates over different values of lambda (FOI) in order to converge on an average value.

1. Why are measles and mumps are called “childhood diseases”?

The average age at which infection is contracted occurs during early childhood. In the example data set we looked at the average age was ~ 5 years

1. The force of infection between children and adults is often different. What factors may contribute to this difference?

Exposure, susceptibility, genetics

1. What is a WAIFW matrix?

The “Who acquires infection from whom” matrices capture the mixing between groups with different risk structures, e.g. different age groups, high risk vs. low risk.

7. The dataset RubellaBangladesh.csv contains data on the number of individuals who tested negative for rubella in a study conducted in 2008 in Bangladesh.

1. Estimate the average force of infection, assuming that it is not age dependent.
2. Estimate the basic reproduction number for rubella (Assume a life expectancy of 68 years)
3. Evaluate whether the force of infection is age-dependent