Online Course Evaluations

Your course evaluations are critical to future course development and instructor assessment processes.

Course Evaluations for 2013 Fall Term 1

Open: Wednesday November 20, 2013 at 10:00 a.m.*
Close: Wednesday December 4, 2013 at 4:00 p.m.

* *Faculties of ENG, HUM, SOCSCI, SCI, and DSB*

- Log in with your MAC ID to evaluate your courses.
- Each evaluation will take approximately 5 to 15 minutes to complete.
- Your responses are completely anonymous.
- Evaluation results are not made available to instructors until ***after*** final marks have been submitted to the Office of the Registrar.

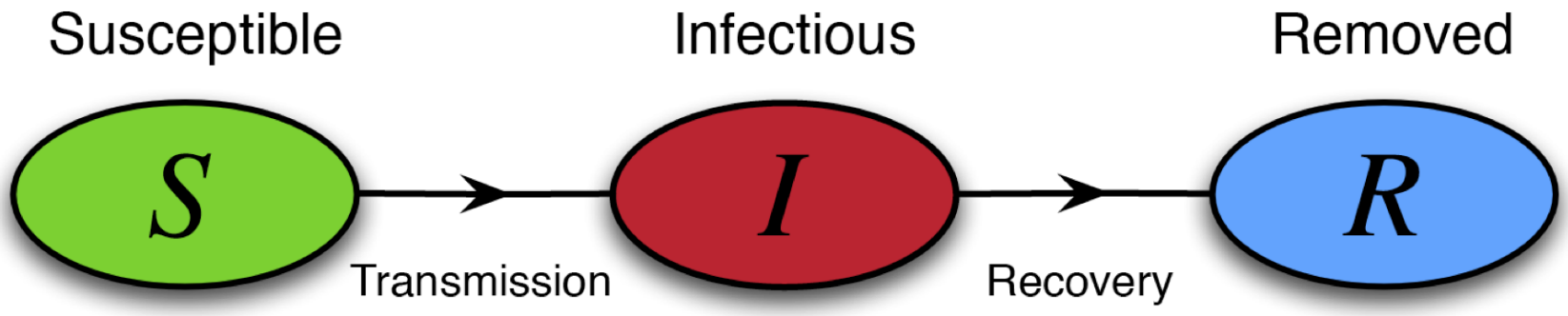
https://evals.mcmaster.ca

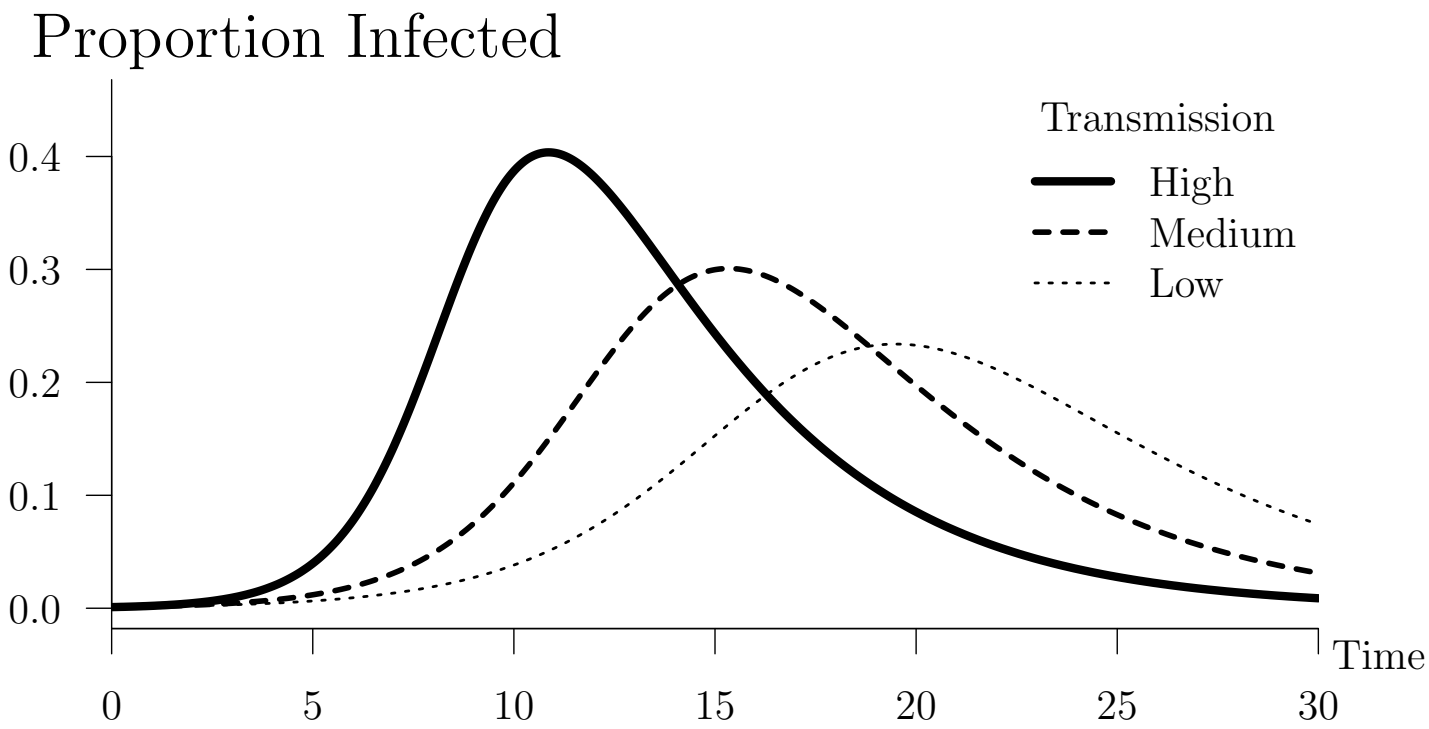
McMaster University

Model

A mathematical model
of infectious disease transmission

The SIR model





The SIR model

$$\frac{dS}{dt} = -\beta SI$$

$$\frac{dI}{dt} = \beta SI - \gamma I$$

$$\frac{dR}{dt} = \gamma I$$

- **Parameters:**
  - Transmission rate β
  - Recovery rate γ

The SIR model

$$\frac{dS}{dt} = -\beta SI$$

$$\frac{dI}{dt} = \beta SI - \gamma I$$

$$\frac{dR}{dt} = \gamma I$$

- **Derived Parameters:**
  - Mean infectious period $\frac{1}{\gamma}$
  - Initial growth rate $\beta - \gamma$
  - Basic Reproduction Number

$$\mathcal{R}_0 = \frac{\beta}{\gamma}$$

The basic reproduction number $\mathcal{R}_0$

$$\begin{aligned}\mathcal{R}_0 &= \beta \cdot \frac{1}{\gamma} \\ &= (\text{transmission rate}) \\ &\qquad \times (\text{mean infectious period})\end{aligned}$$

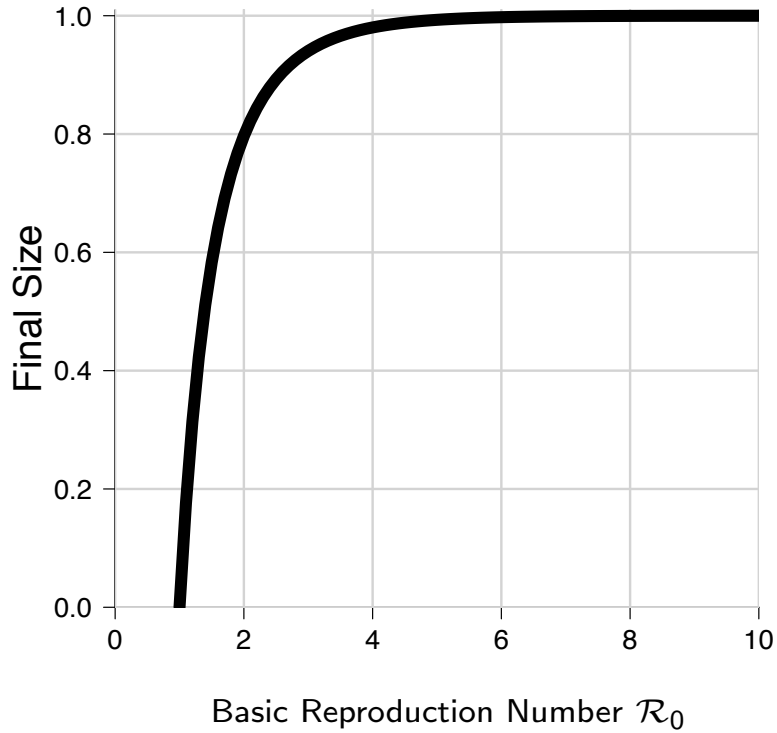
- $\mathcal{R}_0$ is the average number of secondary cases caused by a primary case (in a wholly susceptible population).
- $\mathcal{R}_0$ is dimensionless
- We must have $\mathcal{R}_0 > 1$ to have an epidemic.

The SIR model

Final Size Formula:

$$Z = 1 - e^{-\mathcal{R}_0 Z}$$

- Final size Z (final proportion infected) is determined entirely by $\mathcal{R}_0$
- Final size is never the whole population ($Z < 1$)
- Formula derived for SIR model (Kermack & McKendrick, 1927) is valid for much more realistic models (Ma & Earn, 2006)



- For 1918 flu: $1.5 \lesssim \mathcal{R}_0 \lesssim 2$
- Proportion of world population infected?
- $\sim$60–80%

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