Final Review

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Agenda

1. Structure

2. R_0 : The reproductive number

3. Case fatality rate

4. Vaccinations

5. General tips

Structure of the final

Reproductive number

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Effective reproductive number, $R_e = R_0 x$ where x is the proportion of contacts that are susceptible.

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1. Directly fitting curve to epidemic trajectory
   - See Althaus Ebola paper where he used maximum likelihood to fit curves to the data
2. From equilibrium values
   - $R_0 = N/S_{eq}$ (See Lecture 3, Slide 16)
3. From model parameters
   - In a simple SIR,

$$R_0 = \frac{infection}{contact} \times \frac{contacts}{time} \times \frac{time}{infection} = \frac{\beta}{v} = \frac{bk}{v}$$

   - For more complex models, it is just the rate that people enter the infectious compartment over the rate people leave the infectious compartment (through death, recovery, or some other mechanism)
   - See Lecture 3, Slide 7
4. From age of first infection
   - For rectangular age structures, $R_0 = L/A$
   - For pyramidal age structures, $R_0 = 1 + L/A$
   - Where A is mean age of (first) infection) and L is average life span
   - See Lecture 3, Slide 19
5. (Also seroprevalence data, but don't use this for final)

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No.

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Know how to include it in your equations

Vaccinations and herd immunity

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Know how to incorporate vaccination in your model

See Lecture 5, Slide 25.

Tips

Review all lectures (but especially Lecture 3 and 5)

Know the basic models (SI, SIR, SIER) and when they are appropriate

For more complicated models (e.g., SIWR, Ross-MacDonald), you should at least know roughly what data you would need to estimate parameters, points of intervention, etc. Review Lecture 6.

Use the simplest model that you can justify (i.e., don't make age-specific compartments if mass action assumption holds)

Remember: heterogeneity is bad. Spatial heterogeneity, network structures, age effects, etc. Compartmental models assume mass action.

Probably useful to form groups and just spend an hour going over the quiz and comparing answers. Given how open-ended the quiz was, it is useful to know how other people would address the same question.

You're going to be fine