2023 Harvard/University of Global Health Equity
Mathematical Modeling for Infectious Disease Planning
Defining a basic SIR model for your project

Time: 1 hour 30 minutes

This activity sheet will serve as a guide to help you clearly define and use a basic compartmental model for your specific disease.

1) Define the terms "Susceptible", "Infectious" and "Recovered" as it relates to your disease of focus. At this stage, assume that each of the states has only one compartment.

	Susceptible	Infectious	Recovered
Definitions			

2) Draw a basic compartmental structure illustrating the movement of individuals in your population of focus across the three disease states as defined in step 1. Use boxes to illustrate compartments and arrows to illustrate the movement of individuals from one compartment to another. Names of the disease states should be clearly indicated in the corresponding boxes. At this stage, focus only on getting the compartments and arrow directions right. We will focus on parameters in the next question.

3) Define your model parameters. Here, we will define parameters of interest and choose symbols and initial values for these parameters. If estimates exist in the literature for these parameters, specify these values and the reference(s). Ensure to include any cited reference(s) in the reference list at the end of the sheet.

Parameter	**Interpretation/definition**	**Unit**	**Symbol**	**Value**	**Reference(s) if any**
Effective contact rate			β		
Recovery rate			γ		
Birth rate					
Death rate					
Population size			N		
…					

4) Now, write down differential equations to illustrate the movements described in step 5, incorporating the parameters defined in step 6.

5) BONUS: Assume that there are multiple groups for each compartment, "S", "I", and "R", briefly explain the model can account for the following:

a. Two or more susceptible groups
b. Two or more infectious groups
c. Two or more recovered groups

<u>References</u>