

CBS810 Modeling in infectious disease

Assignment 1: Building a conceptual model

- This assignment is due on Monday 8/31. You can bring the assignment to class or send me a copy by email to clanzas@ncsu.edu

Choose an infectious disease that interest you and

- 1) Write a short paragraph on the key aspects of the epidemiology of the disease. If you are working on the disease for your thesis, please include the research question you are working on.
- 2) Draw a flowchart that depicts the important variables and transitions.

Building and drawing conceptual models

The most important step in modeling is to clearly formulate the purpose of the model. The art of model building is knowing what to cut out, and a clear defined research question acts as the logical knife. It provides the criteria to decide what can be ignored so that only the features necessary to fulfill the purpose are left.

It is good idea to organize your model conceptually with the aid of a diagram. We often use flow diagrams. A flow diagram depicts how each variable affects its own dynamics and those of other variables. Variables of a model are the entities that change overtime in the model. For microparasites, we follow the host population, so the model variables are the number (or proportion) of susceptible individuals (S), number of infectious individuals (I), and so on..... For macroparasites, we follow the parasite population, so the model variables are, for example, the mean number of sexually mature worms or infective larvae in the environment.

For this course, we will follow this approach to draw flow diagram:

- (1) Draw a separate square to represent each variable in the model.
- (2) Use a solid arrow to indicate when a process removes an amount of the variable (arrow exits the square) or contributes an amount to the variable (arrow enters circle).
- (3) Use an arrow that comes from nowhere but that enters a square to indicate when there is an external source for one of the variables or a variable can generate more of itself (e.g. births).
- (4) Use an arrow that comes from a square and goes to nowhere to indicate when a variable exits the system (e.g. deaths).
- (5) Use a dashed arrow to indicate when a variable influences the flow into another variable (square), but does not represent a decline in the variable from which the arrow begins. We often use this to indicate the source of transmission.

Example of a flowchart for SIRS with indirect transmission (through free living stages) with no births or deaths

