Creating a model world to address a research question

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Clinic on Dynamical Approaches to Infectious Disease Data
ICI3D Program

Step 0 (done):

- Focus on a clear, concise research question.

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  - Examples:
    - What is the most efficient way to reduce the number of human and dog cases of Dynamical Fever?
    - Can Eastern red fox populations maintain rabies virus transmission?
    - How would the existence of asymptomatic infections affect the trajectory of the current Ebola epidemic in West Africa?

Step 1:

- *Identify the key outcome of interest for addressing your question.*

Step 2:

- *Identify the processes that may affect the outcome of interest.*

Step 3:

- *Identify relevant characteristics of individuals in your study system.*

Step 4:

- *Identify what you think are the **most important** processes and characteristics among those identified above **for addressing your research question**.*

Step 5:

- *Reconcile your process and characteristic lists by identifying how the most important processes relate to the most important characteristics.*

Step 6:

- *Construct a diagram that represents all of the individual characteristics and processes of interest.*

Step 7:

- *Hand draw or print a clean, clearly labeled version of your model diagram and bring it with you to* ***tomorrow's 2pm session***.

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- *Hand draw or print a clean, clearly labeled version of your model diagram and bring it with you to* ***tomorrow's 2pm session***.
  - Use **labeled**, **solid** arrows to represent the transitions from one category or state to another.
  - Use **dashed** arrows from a category's box to a transition arrow to indicate the influence of a state variable on a transition rate.
  - Include a **key** for symbols/abbreviations.

Step 0 (this morning):

- Focus on a clear, concise research question.

Step 1:

- *Identify the key outcome of interest for addressing your question.*

  There may be multiple outcomes that you are interested in, but for now pick one primary outcome. For example:

  - the number of deaths per year
  - the incidence of infection
  - the presence or absence of the disease

Step 2:

- *Identify the processes that may affect the outcome of interest.*

  This is a brainstorming step, and you should not worry about how important these processes are nor should you wrack your brain to make sure you identify every possible process that might be involved.

Step 3:

- *Identify relevant characteristics of individuals in your study system.*

- May be categorical
  - male/female
- May be continuous
  - age
- You should use your study question as a guide to the best way to describe continuous characteristics
  - exact age vs categories such as child/adult.
- This step is also a brainstorming step - write down whatever comes to mind.

Step 4:

- *Identify what you think are the **most important** processes and characteristics among those identified above **for addressing your research question**.*
- If you are unable to select only a subset of the processes and characteristics identified, you are probably trying to understand too much all at once.
  - Identify a smaller research question that will help inform the answer to your broad research question.
  - For example, instead of asking *how* something occurs, you may pick a particular component that may be part of how something occurs and ask whether (and when) it can ever sufficiently explain the phenomenon of interest on its own.

Step 5:

- *Reconcile your process and characteristic lists by identifying how the most important processes relate to the most important characteristics.*
- If you are missing any categories of individuals necessary to complete the important processes, or have categories that aren't related to others through any of the listed processes, adjust your lists.

Step 6:

- *Construct a diagram that represents all of the individual characteristics and processes of interest.*
  - For your own purposes, you can use whatever graphical conventions work best for how you think about the system.

Step 7:

- *Hand draw or print a clean, clearly labeled version of your model diagram and bring it with you to the **Wednesday afternoon** session.*
  - Use **labeled** arrows to represent the transitions from one category or state to another.
  - Use **dashed arrows** from a category's box to a transition arrow to indicate the influence of a state variable on a transition rate.
  - Include a **key** for symbols/abbreviations.

Step 7:

- *Hand draw or print a clean, clearly labeled version of your model diagram and bring it with you to* ***tomorrow's 2pm session***.