

E2M2: Model Telephone with Model Diagrams

Friday, May 23, 2025

2:45-3:45pm

2:45-2:55pm: Intro activity and form groups of three (but don't tell them everything that is going to happen). Do not discuss, share, or show your model diagram at all yet! Keep it secret.

2:55-3:10pm: Pass your model diagram to the person to your right. Your diagram should have your question at the top and all parameters and state variables defined, but there should be no other text. Your partner will now write the model description (see example below) from your diagram. There should be no talking, even if this is frustrating!

3:10-3:25pm: Now take your model description and pass it to the next person to the right. This person should not have seen your model diagram or description yet. This person will now draw the diagram from the model description.

3:25-3:35pm: Now show the model description and second model diagram to the person who created the first. Everyone can talk! Discuss what was difficult to infer from the original diagram or the description and how this might be improved.

3:35-3:45pm: Come back together as a big group. The instructors (Santino + Angelo) will facilitate discussion. Ask students to share some way in which their partners helped improve their model constructions. Also ask what was most frustrating, useful, etc.

Example Model Description

Can the Malagasy black rat (*Rattus rattus*) population independently maintain transmission of the bacterium, *Yersinia pestis*, responsible for human plague?

Susceptible juvenile rats enter the population through birth, at rate b , which is influenced by the proportion of uninfected (susceptible) adult rats in the population at a given time. Juvenile rats age into the adult class, on average $1/\omega$ time units after they are born. Both juvenile and adult susceptible rats can be infected by contact with infectious rats of any age, based on a force of infection proportional to the prevalence of infectious rats in the population. Once infected, rats enter the exposed class. The incubation period is $1/\sigma$ time units (on average), after which the animals develop clinical plague, which is equivalent to transitioning from the exposed class to the infectious class. A subset of rats recovers from plague to become immune, based on rate γ . All rats in the population experience background mortality with hazard μ , and infectious rats experience an additional disease-induced hazard of mortality, α .