***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/ 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/ 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 recover from plague to become immune, based on rate . All rats in the population experience background mortality with hazard *μ*, and infectious rats experience an additional disease-induced hazard of mortality, *α*.