Dengue

Dengue virus transmits between humans via mosquito vectors. While some infections are asymptomatic, others lead to dengue fever, of which a proportion go on to develop very severe Dengue Hemorrhagic fever (DHF), which can result in death. There are four subtypes of the Dengue virus. Recovering from one subtype generates complete immunity to that subtype (i.e. prevents re-infection) and some immunity to other subtypes (usually termed imperfect cross-immunity). It is also known that second or third Dengue infections have a higher chance of DHF due to something called 'antibody-dependent enhancement'. The degree of cross-immunity and increased severity of subsequent infections are highly uncertain, which makes it difficult to understand the impact of intervention strategies. You are the modeller in a large clinical trial team that is evaluating the use of a dengue vaccine candidate in country Y. Your role is to use a model that will help elucidate the results of the clinical trial which measures the incidence of dengue infection and DHF. However, first, you need to build a model that captures the dynamics of dengue prior to vaccine introduction.

Design a model of dengue transmission that captures the dynamics described above. For instance, you may wish to include the following:

- a compartment diagram of the disease including demographic states that you wish your model to track (showing arrows between your compartments denoting flows).
- Any further information on the model set-up (e.g. whether you wish to use a stochastic model and if so what type)
- A short list of information or parameters that you need to run your model
- Any values of these parameters needed (you may find googling helpful here - remember to state your source)
- A short list of where any uncertainty is in your assumptions or parameter values.