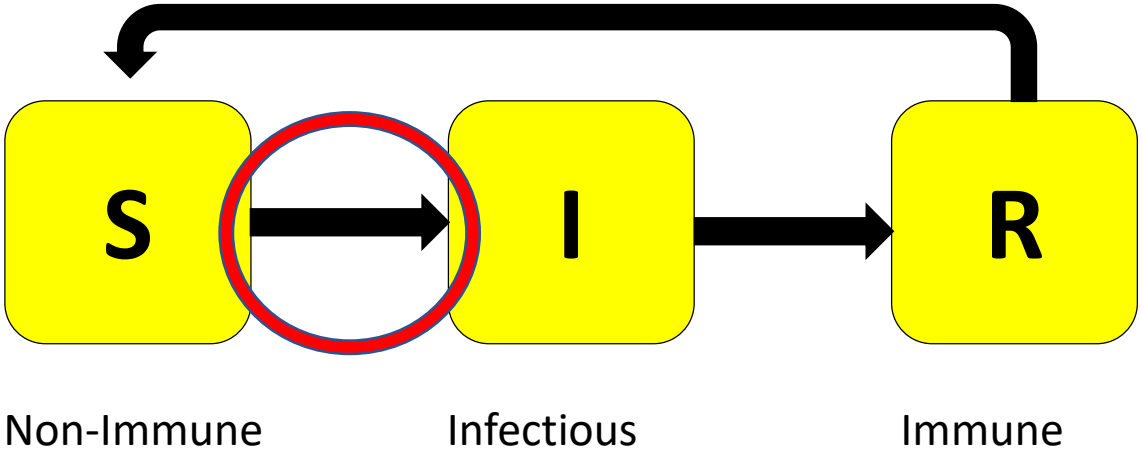
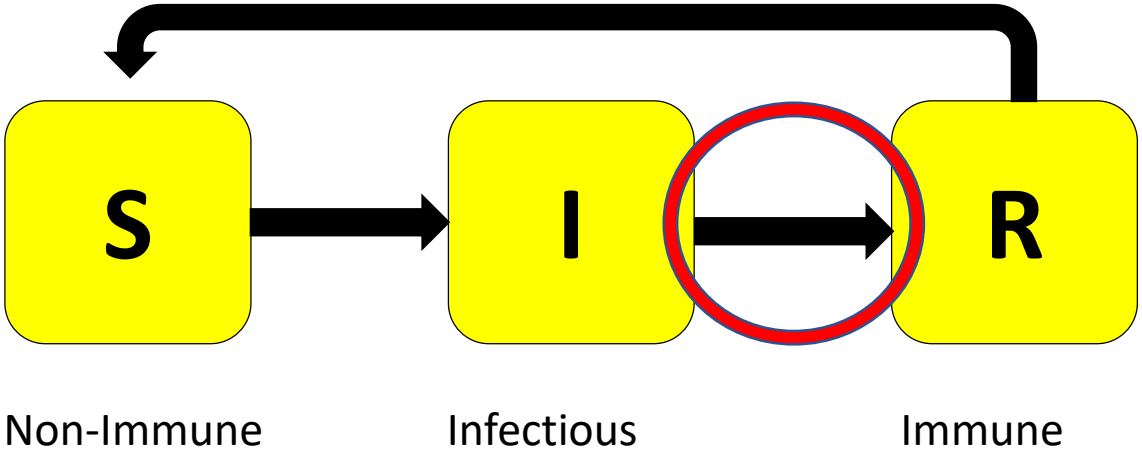
Building the SPPf model

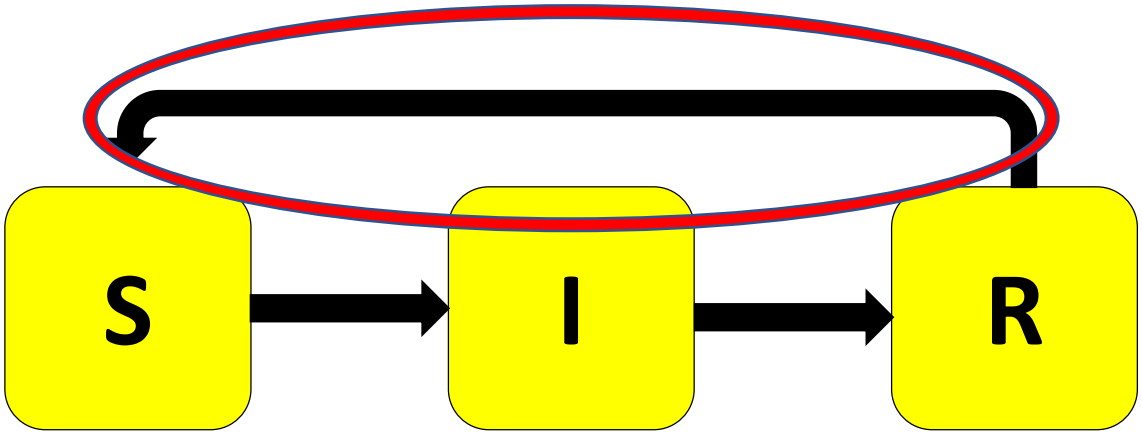
The SPPf model is an extension of the basic SIRS disease model



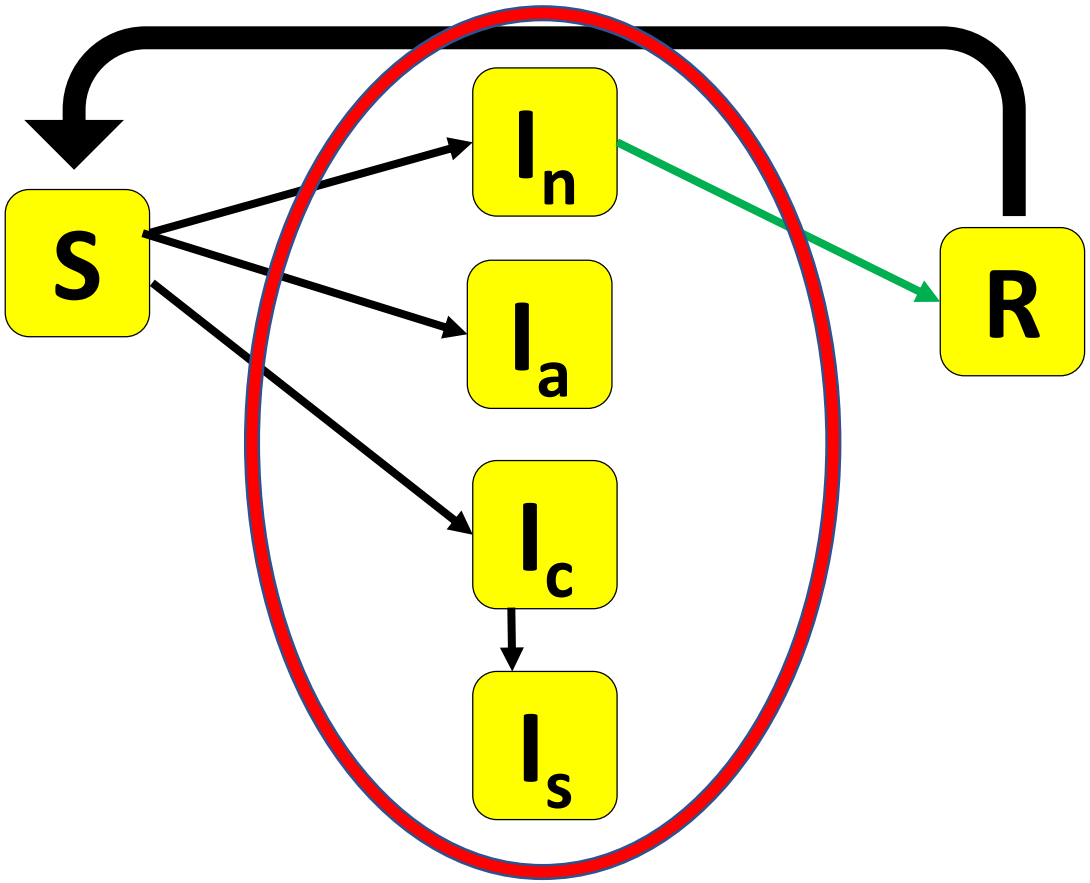
The non-immune may become infected with malaria



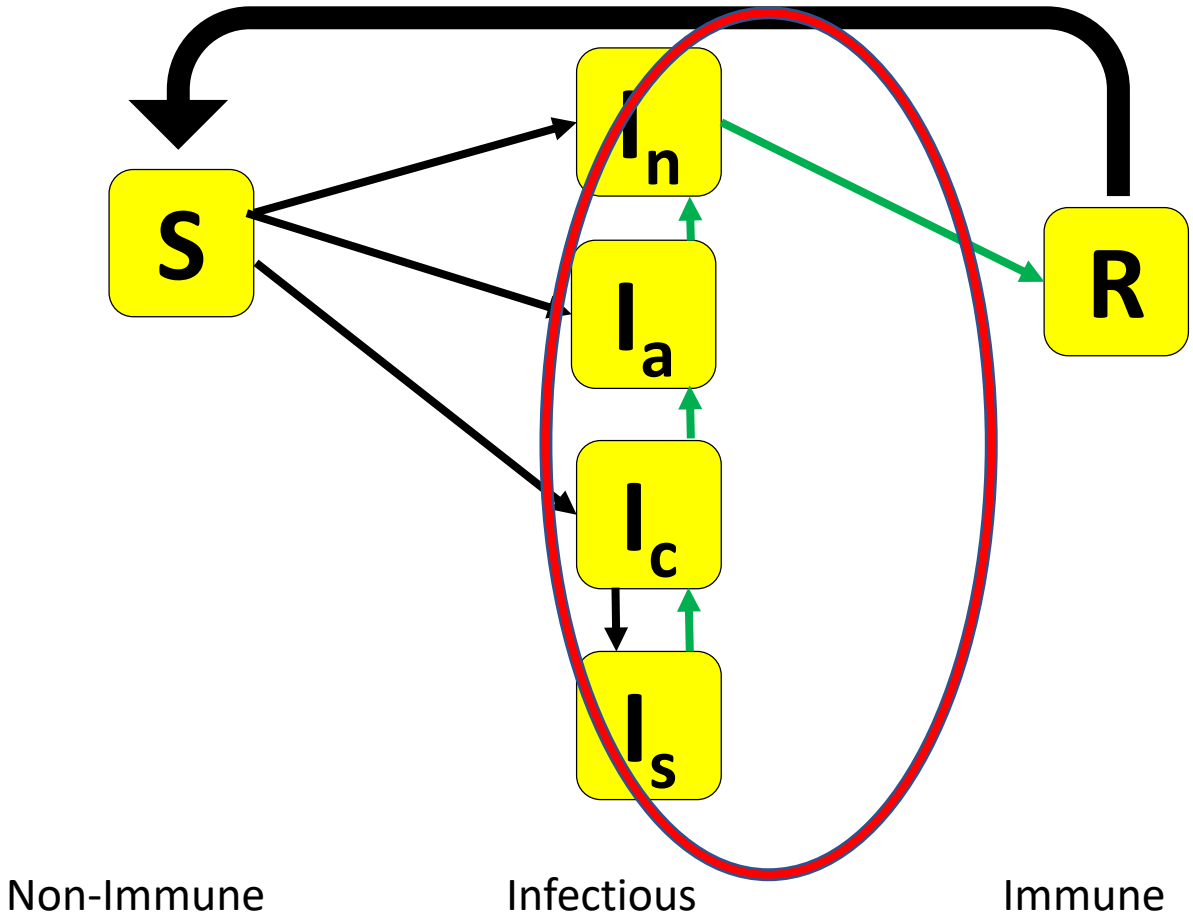
The infected may recover naturally and develop immunity to malaria



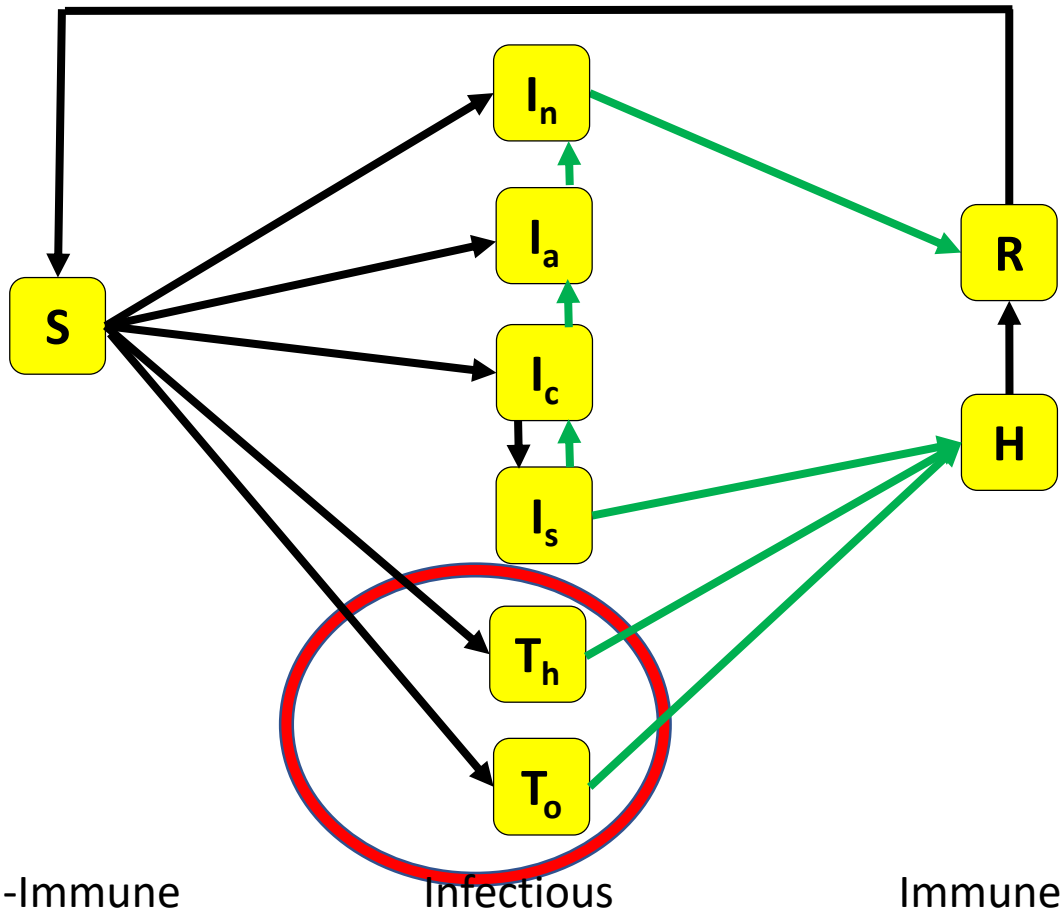
This immunity may be lost over time



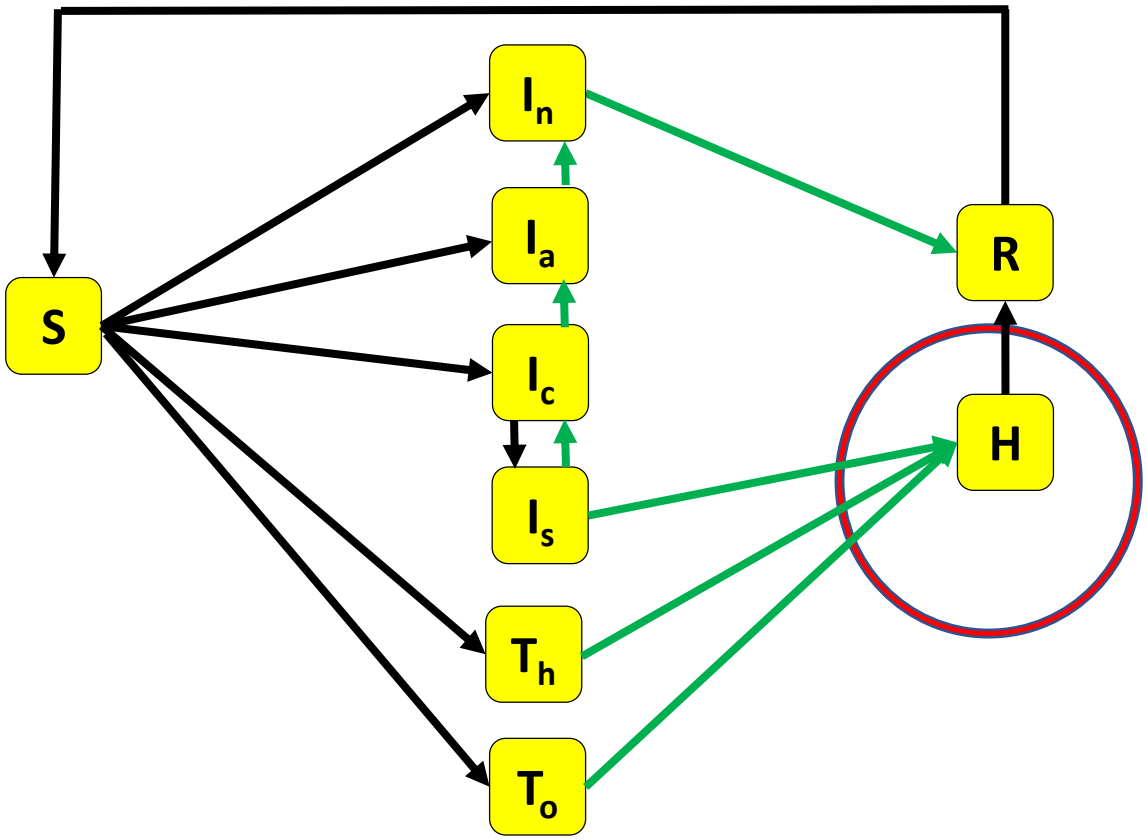
But infections can be sub-microscopic (I_n), asymptomatic (I_a) and clinical (I_c) with the potential to become severe (I_s)



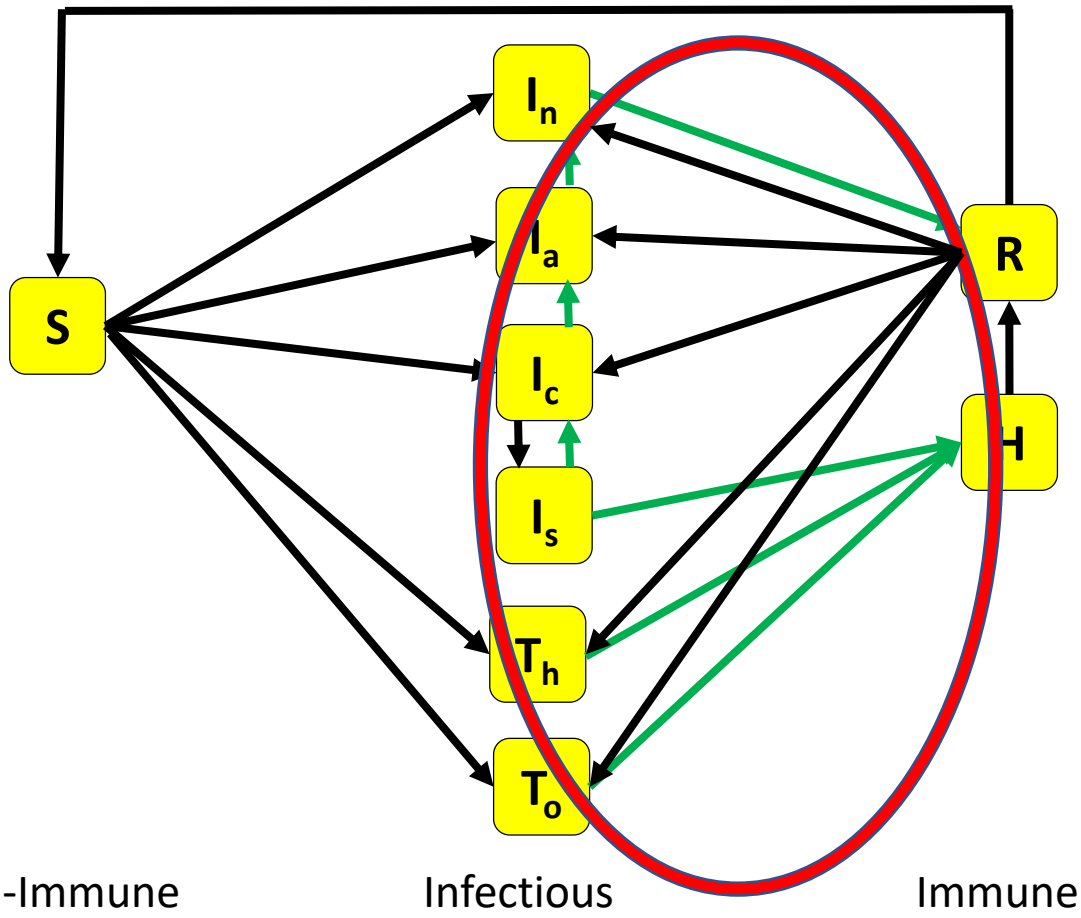
Natural recovery can occur with symptomatic infections becoming asymptomatic and eventually curing entirely (green arrows)



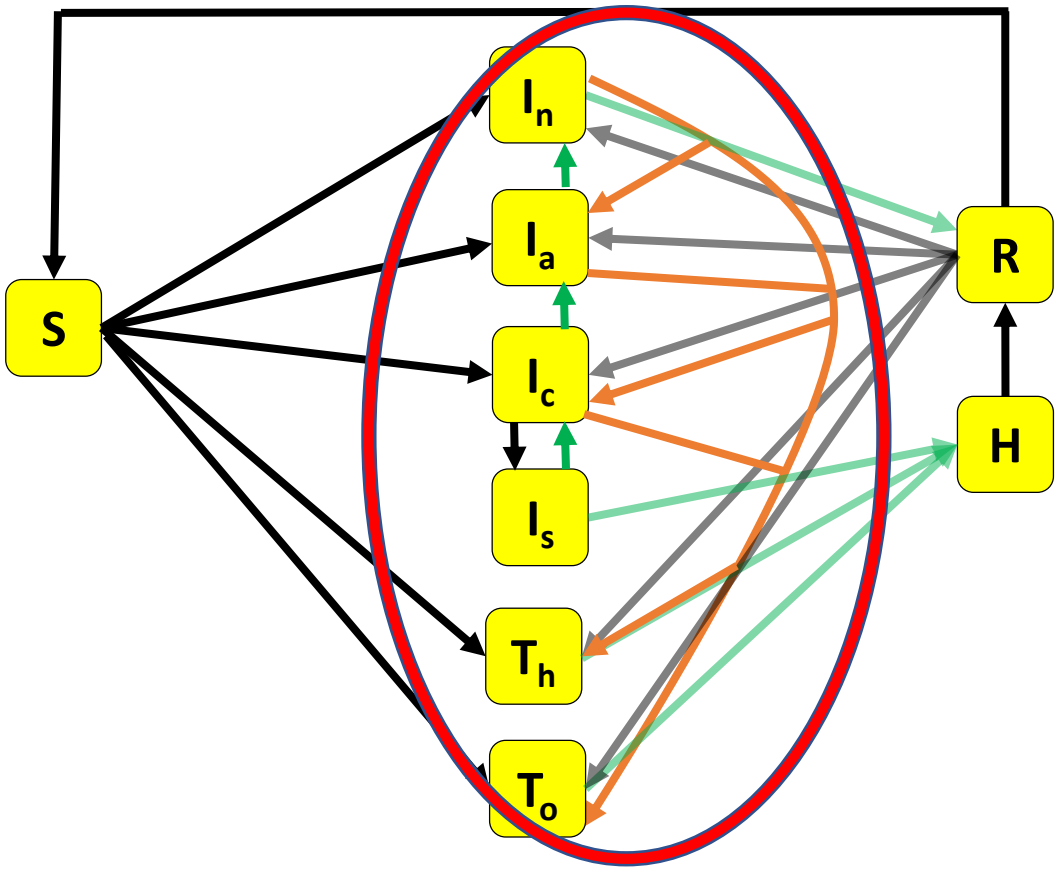
Some infections will be treated through the public health system (T_h) and others through the private sector (T_o)



Treated infections will cure to a state where false positive test results will temporarily be possible due to the presence of the HRP2 antigen.

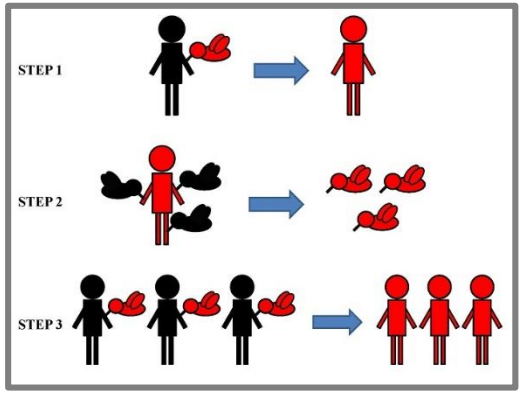


The immune are also susceptible to infection with a higher probability of developing an asymptomatic infection

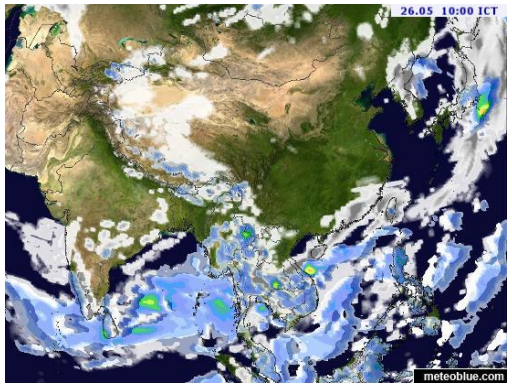


It is possible have more than one infection at the same time (superinfection - orange arrows)

Biology



Environment

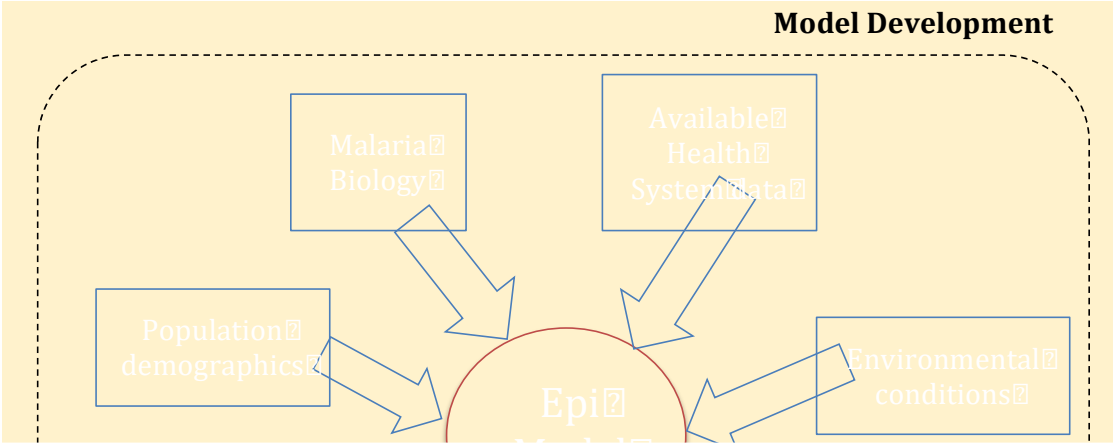


Demography

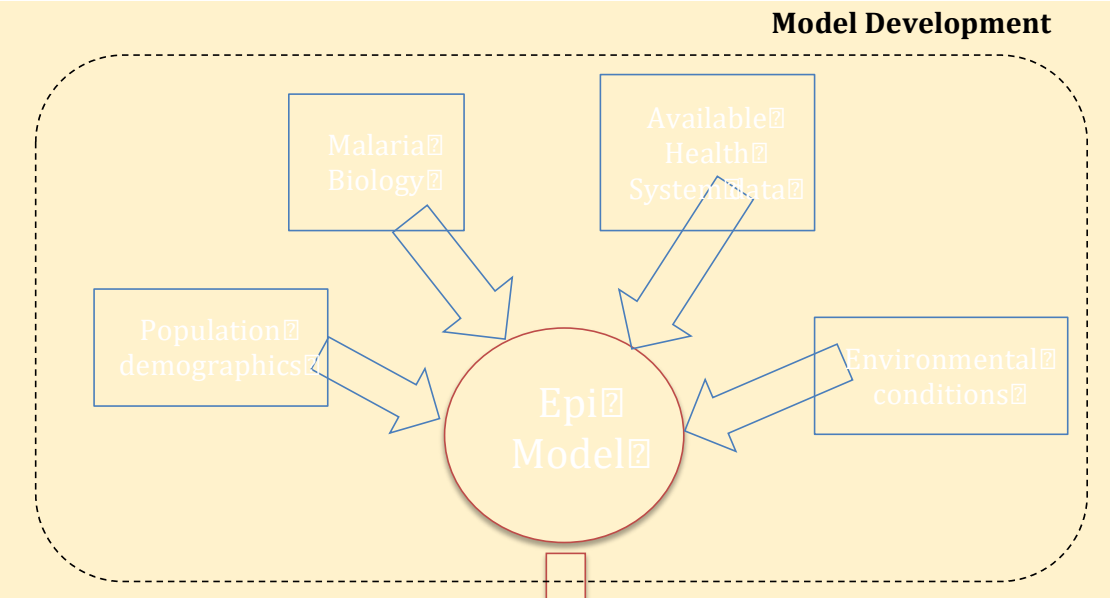
Health Systems Information

Geography

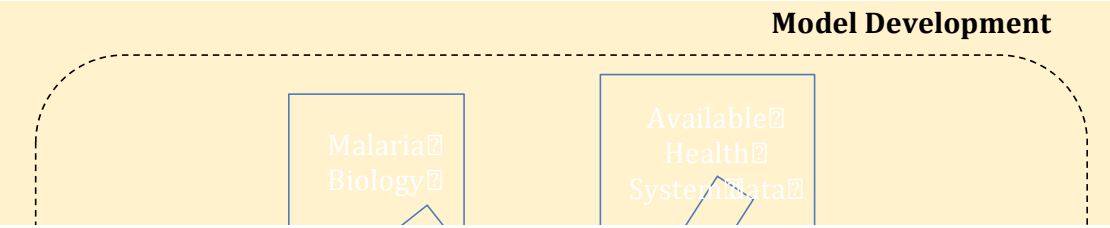
Economic Costs



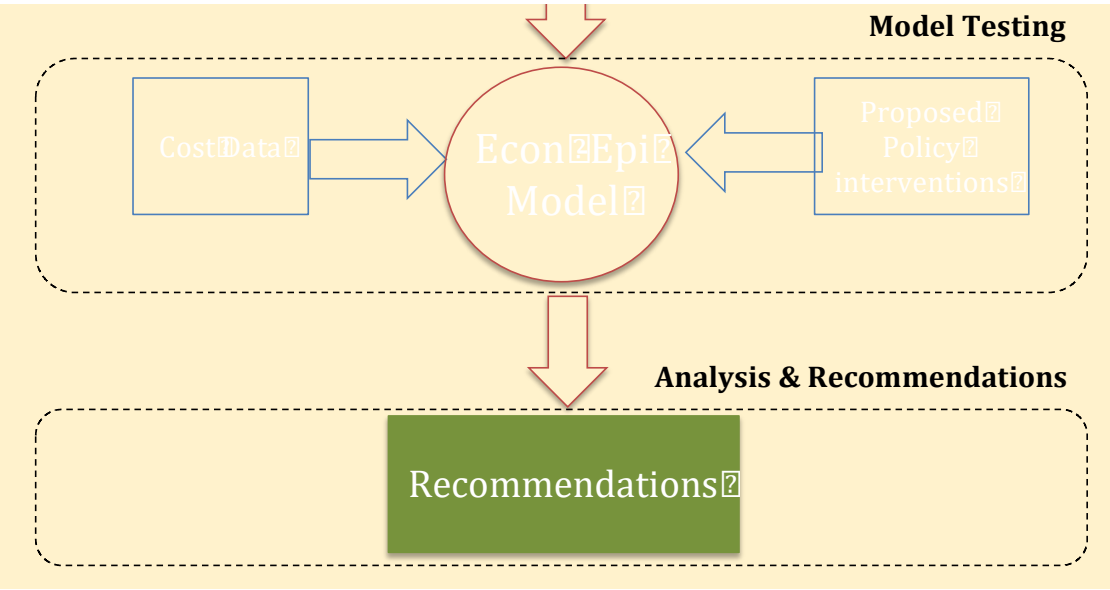
How to develop an epidemiological-economic model?



1. Write equations to describe biological behaviour of malaria
2. Calibrate the model to existing environmental conditions
3. Use population and health systems data to create synthetic populations *in silico* that have features similar to real populations



4. Test out proposed interventions on the model
5. Incorporate cost data for each intervention
6. Analyse model output to make recommendations



These elements are combined to project the costs for and rates of malaria in a geographic area of interest.

Model