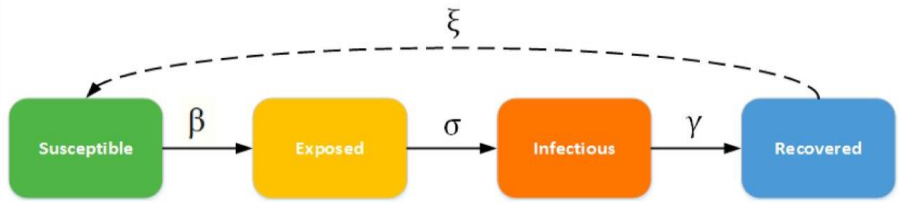
Report on SEIR Model

SEIR compartmental model is used in epidemiology to analyze the disease dynamics and to estimate the total number of infected people, the total number of recovered people.

The SEIR model consists of four compartments



1. S: The number of susceptible individuals. When a susceptible and an infectious individual come into infectious contact, the person becomes exposed to the disease and hence transitions to exposed compartment.
2. E: number of exposed people. A person who is infected but are not infectious (they undergo latency period). The rate of transition from this to infectious compartment is considered to be linear to E.
3. I: Number of infectious people. These are individuals who have been infected and are capable of infecting susceptible individuals. Again, the transition rate to recovered/removed compartment is considered linear to I.
4. R: the number of removed or deceased diseases. These are individuals who have been infected and have either recovered from the disease and entered the removed compartment, or died.

SEIR mathematical model comprises four ODEs to describe the dynamics and the parameters that affect them.

1. $\frac{dS}{dt} = -\frac{aSI}{N}$
2. $\frac{dE}{dt} = \frac{aSI}{N} - bE$
3. $\frac{dI}{dt} = bE - cI$
4. $\frac{dR}{dt} = cI$

We see that $\frac{dS}{dt} + \frac{dE}{dt} + \frac{dI}{dt} + \frac{dR}{dt} = 0$, implying that number of births and deaths are negligible compared to the current population.

Parameters:

1) a gives an idea about number of contacts per unit time
2) b is the inverse of average period of incubation
3) c is the inverse of average time taken an infected individual to recover.

Below is the graph of the above number of people v/s days in each compartment: