

PMI 214 Notes

Sam Fleischer

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1 Entomological Inoculation Rate

- Rate at which a person is bitten by infectious vectors per day

$$EIR = ma\phi\theta \quad (1)$$

where

- m is the number of mosquitoes
- a is the number of bites per day
- ϕ is the fraction of bites which are on humans
- θ is the fraction of vectors which are transmitting the disease

2 What is “mathematical epidemiology?”

- based on theory of transmission process
- provides a conceptual representation of what is known about the mechanisms of a system
- helps identify knowledge gaps
- often used for hypothesis testing (tests scenarios that cannot be easily/safely tested in nature)

3 Vectorial Capacity

$$C = \frac{ma^2b}{-\ln p} p^n \quad (2)$$

C = number of infective vector bites that would arise from all the mosquitoes that bite a single host on a single day

- m , a same as before
- b is the vector competence
- n is the extrinsic incubation period for pathogen
- p is the daily mosquito survival probability

4 Basic Reproductive Rate

$$R_0 = \frac{C}{r} \quad (3)$$

R_0 = the avg. number of future host infections that will arise following introduction of a single infectious host in a susceptible population

- r is the host recovery rate... unit: $1/(\text{infectious period})$

5 SIR/SEIR

For hosts, susceptible \rightarrow exposed \rightarrow infective \rightarrow removed. For vectors, no exposed period.