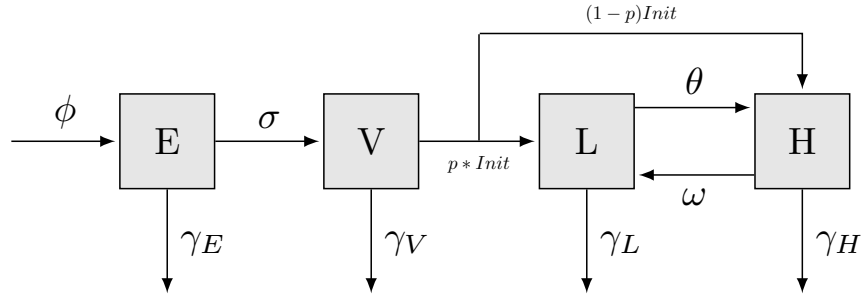


# Three Stage Model (SLH)

Charles Marks



$$\frac{dE}{dt} = \phi - \sigma - \gamma_E E$$

$$\frac{dV}{dt} = \sigma - \underbrace{c\beta V \left( \frac{L + \eta H}{L + H + V + E} \right)}_{\text{initiation}} - \underbrace{\gamma_V V}_{\text{death}}$$

$$\frac{dL}{dt} = \underbrace{p c \beta V \left( \frac{L + \eta H}{L + H + V + E} \right)}_{\text{initiation}} - \theta + \omega - \gamma_L L$$

$$\frac{dH}{dt} = \underbrace{(1 - p) c \beta V \left( \frac{L + \eta H}{L + H + V + E} \right)}_{\text{initiation}} + \theta - \omega - \gamma_H H$$

Symbol	Parameter Description	Units
$E$	Everybody (Full Population for Give Environment)	Persons
$V$	Vulnerable Population	Persons
$L$	Low-Rate Initiator Population	Persons
$H$	High-Rate Initiator Population	Persons
$\phi$	births, inflow to $E$	Persons
$\sigma$	function representing transitions from $E$ to $V$	Persons
$c$	contacts per time unit	Persons
$\beta$	infection rate	$\in [0, 1]$
$\eta$	high-initiator effect	$\in [0, \infty)$
$p$	Initiation Into L or H Probability	$\in [0, 1]$
$\theta$	$L$ to $H$ transition function	Persons
$\omega$	$H$ to $L$ transition function	Persons
$\gamma_E$	Death Rate of $E$	$\in [0, 1]$
$\gamma_V$	Death Rate of $V$	$\in [0, 1]$
$\gamma_L$	Death Rate of $L$	$\in [0, 1]$
$\gamma_H$	Death Rate of $H$	$\in [0, 1]$