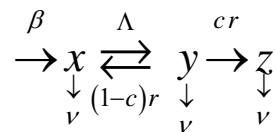


C. Snail population and transmission dynamics

Dynamic variables for the snail component of our model are population densities (per unit habitat) of x - susceptible snails; y - prepatent infected snails; and z -patent infected snails that are shedding *Schistosoma* cercariae; whereby $N=x+y+z$ - total snails. All variables in this scheme represent adult populations, and the relation among them is shown in following SEI diagram



We assume logistic population growth $\beta = \beta_0 (x + y)(1 - N / K)$, with maximal reproduction rate β_0 and carrying capacity K , and fixed snail mortality ν . Only susceptible and prepatent snails ($x + y$) can reproduce and contribute to growth. The transmission (SEI) part of the system has snail FOI, Λ , determined by the infective human population; prepatency rate r (period $1/r$), and patency conversion fraction c . The combined population growth-SEI dynamics is described by 3 differential equations

$$\begin{aligned}
 \frac{dx}{dt} &= \beta - \Lambda x - \nu x + r(1-c)y \\
 \frac{dy}{dt} &= \Lambda x - (r + \nu)y \\
 \frac{dz}{dt} &= cr y - \nu z
 \end{aligned}$$

Parameter values and ranges for the snail system are given in Table 2. The force of snail infection, Λ , is a nonlinear (saturated) function of the total egg release by the human host population per snail

$$\Lambda = \Lambda_0 \left(1 - \exp \left[-b \omega \frac{H E}{N} \right] \right) \quad (17)$$

H – host population size, E – mean per capita egg-release by hosts

$$E = E(\rho_0, k_0) = \sum_k \rho_k \phi_k h_k \quad (18)$$

The key inputs in Λ are sporocyst establishment rate Λ_0 , and transmission coefficient

$B = \alpha \beta_M$ (product of miracidium coefficient, β_M , times snail susceptibility, α).

In coupled human-snail systems, human FOI $\lambda = a \omega z$, is the product of exposure (contact) rate ω , patent snail density z , and transmission coefficient A that depends on cercarial production/mortality, and the probability of worm establishment in the human host.

Two transmission rates $A = a \omega$; $B = b \omega$ of the coupled system could be estimated from the known demographic and infection data for a given environment.