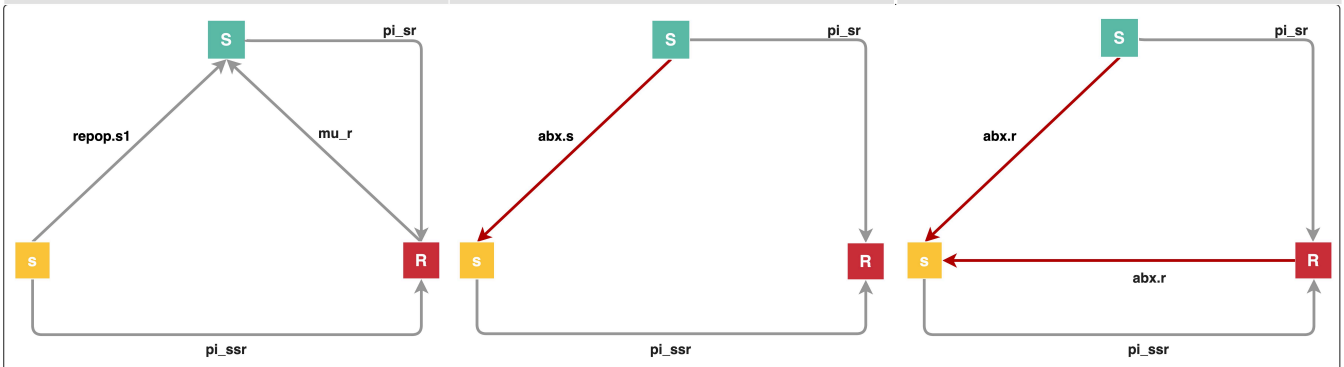
A. Model 1

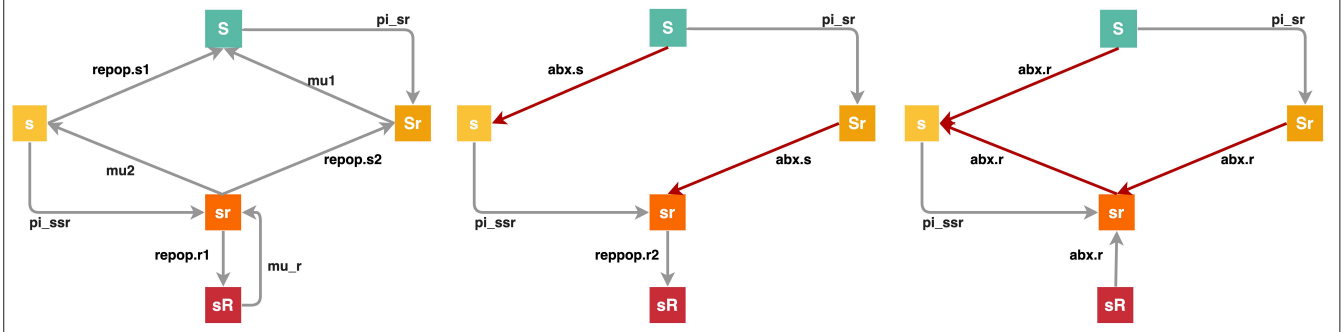


Legend

S: An individual carrying a high number of Enterobacteriaceae (S) susceptible to antibiotics, abx_s and abx_r
s: An individual carrying a low number of Enterobacteriaceae (s) susceptible to antibiotics, abx_s and abx_r
R: An individual carrying Enterobacteriaceae (R) susceptible to antibiotic, abx_r

pi_sr: Daily probability of transmitting Enterobacteriaceae R to individuals carrying Enterobactericeae S
pi_ssr: Daily probability of transmitting Enterobacteriaceae R to individuals carrying Enterobactericeae s
repop.s1: Daily probability of s Enterobacteriaceaes repopulating to S
mu_r: Daily probability of decolonization of R Enterobacteriaceae to S
abx.s: Daily probability of reducing S Enterobacteriacaeae to s by antibiotic, abxs
abx.r: Daily probability of killing R and S Enterobacteriacaeae by antibiotic, abx_r

B. Model 2



Legend

S: An individual carrying a high number of Enterobacteriaceae (S) susceptible to antibiotics, abxs and abx_r
Sr: An individual carrying a high number of Enterobacteriaceae (S) susceptible to antibiotics, abxs and abx_r *and* low number of Enterobacteriaceae (r) susceptible to antibiotic, abx_r
s: An individual carrying a low number of Enterobacteriaceae (s) susceptible to antibiotics, abxs and abx_r
sr: An individual carrying low numbers of Enterobacteriaceae (s) susceptible to antibiotics, abxs and abx_r *and* Enterobacteriaceae (r) susceptible to antibiotic, abx_r
sR: An individual carrying a low number of Enterobacteriaceae (s) susceptible to antibiotics, abxs and abx_r *and* Enterobacteriaceae (R) susceptible to antibiotic, abx_r

pi_sr: Daily probability of transmitting R to S individuals
pi_ssr: Daily probability of transmitting R to s individuals
mu1: Daily probability of decolonization of r Enterobacteriaceae from Sr to S
mu2: Daily probability of decolonization of r Enterobacteriaceae from sr to s
mu_r: Daily probability of reduction of R Enterobacteriaceae from sR to sr

repop.s1: Daily probability of s Enterobacteriaceae repopulating to S
repop.s2: Daily probability of sr Enterobacteriaceae repopulating to Sr
repop.r1: Daily probability of sR Enterobacteriaceae becoming to sr under no antibiotics
repop.r2: Daily probability of sR Enterobacteriaceae becoming to sr under antibiotic abxs
abx.s: Daily probability of reducing S Enterobacteriaceae to smaller numbers, s, by antibiotic abxs
abx.r: Daily probability of reducing S and R Enterobacteriaceae to smaller numbers, s, by antibiotic abx_r

C. Model 3

Rate of growth of Enterobacteriaceae (per time step),

$$\frac{dNs}{dt} = c \times Ns \times (1 - \frac{Ns + Nr}{K}) - \rho_{abx_s} - \rho_{abx_r}$$

$$\frac{dNr}{dt} = c \times Nr \times (1 - \frac{Ns + Nr}{K}) - \rho_{abx_r} + \rho_{tr}$$

where Ns is the number of Enterobacteriaceae susceptible to both antibiotics abx_S and abx_r,
Nr is the number of Enterobacteriaceae susceptible to antibiotic abxr,
c is the exponential growth rate constant,
K is the carrying capacity of the gut for Enterobacteriaceae,
ρ_{abx_s} is the rate of loss of Enterobacteriaceae due to antibiotic, abx_S,
ρ_{abx_r} is the rate of loss of Enterobacteriaceae due to antibiotic, abxr,
ρ_{tr} is the rate of gain of resistant Enterobacteriaceae from transmission.

For an individual, i, the probability of being transmitted resistant Enterobacteriaceae,

$$P_{tr.i} = 1 - (1 - pi_{ssr})^{n.bed_r}$$

where pi_{ssr} is the daily probability of a resistant Enterobacteriaceae carrier to transmit to others,
$n.bed_r$ is the number of number of resistant Enterobacteriaceae carriers in the ward.