

1a. Host-environment interface

Mechanisms

- Landscape channelization
- Propensity of host to form mass gatherings
- Time spent in random search

Inferential methods from movement ecology

Host movement traits

- Duration & structure of movement bouts
- Step length/turning angle by environment
- Group size

Other host traits

- Overlooked here

1b. Pathogen-environment interface

Mechanisms

- Mode of transmission
- Resilience across environments
- Ability to alter host behavior and movement

Experimental methods from microbiology/virology

Pathogen traits

- Local shedding
- Local persistence potential
- Autonomous movement

2. Epidemiological landscape

Host density

Mobility

Contact

Density,
 N_i

Movement from site i to j ,
 ρ_{ij}

Instantaneous contact rate,
 κ

Pr[transmission | contact],
 c'

3. Spatial epidemiology

$$\lambda_i = \left(\sum_j Y_j \left(\frac{1}{N_i} \right) \rho_{ij} \right) (\kappa c')_i$$

Spatially explicit dynamic model

Spatial transmission traits

- Epidemic wave speed and structure
- Overdispersion in number of cases individuals produce
- Location and timing of transmission hotspots

Legend

Phenomenological entity

Mechanistic entity

Mechanistic/
Phenomenological choice

Inferred from mechanism using standard testing

Suggested from pattern