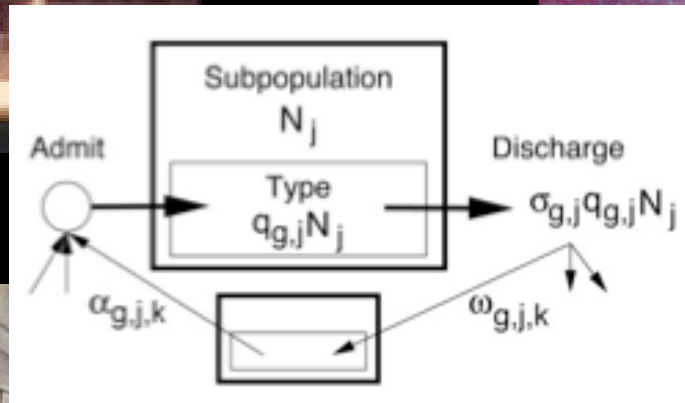
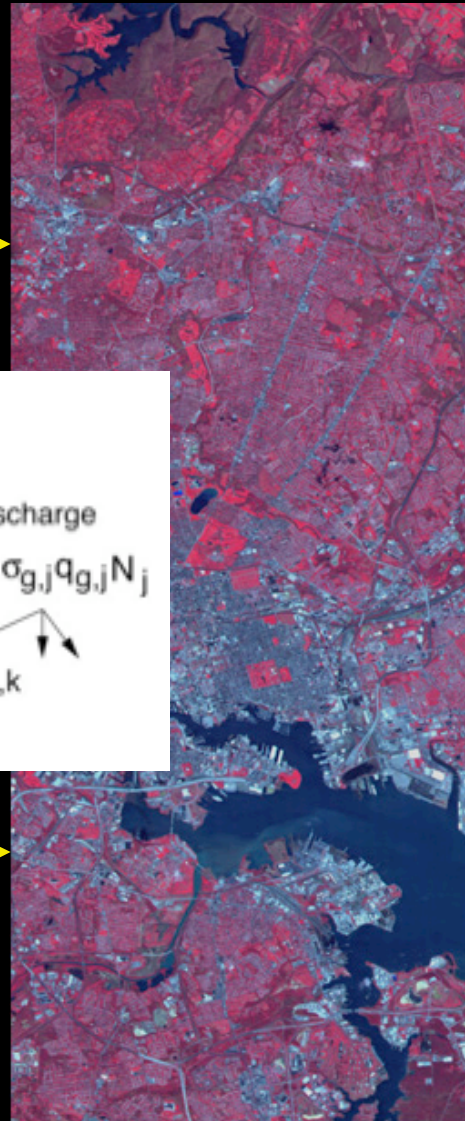


Antibiotic resistance in nosocomial pathogens: The hospital as a structured population

David L. Smith

**Currently employed by the Fogarty International Center, NIH, but presenting today as a private citizen.*





Baltimore

HCWs as Vectors

m	Work load	#HCWs / #Patients
a	Patient contact rate	#Patient Contacts / HCW / day
g	Decolonization rate	Hand Washing Rate
c	Transmission efficiency	Patient \rightarrow HCW
b	Transmission efficiency	HCW \rightarrow Patient
P	Proportion of colonized patients	
ϕ	Stability index	ac/g
β	Transmission capacity	$mab\phi$
$B(P)$	Colonization Pressure	$\frac{\beta P}{1 + \phi P} \approx \beta P$

Hospital

Medical
ICU

Cancer
ICU

Surgical
ICU

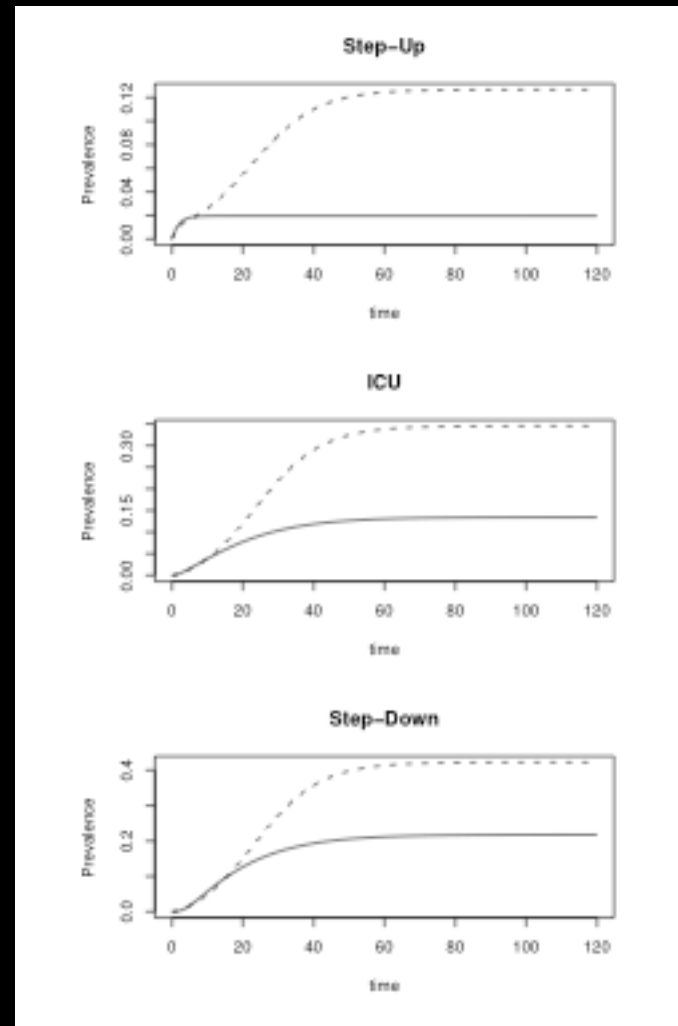
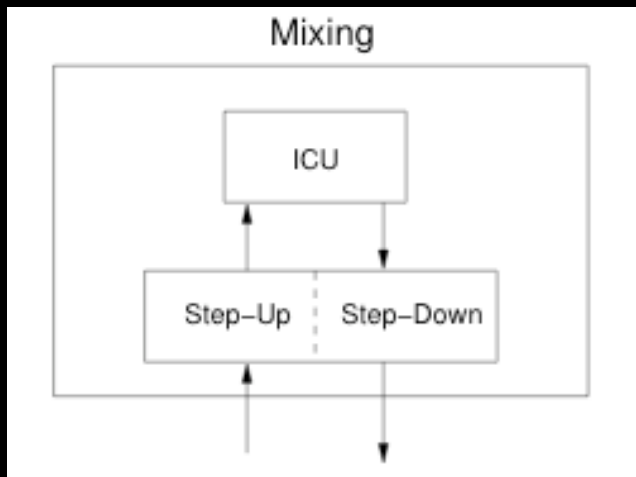
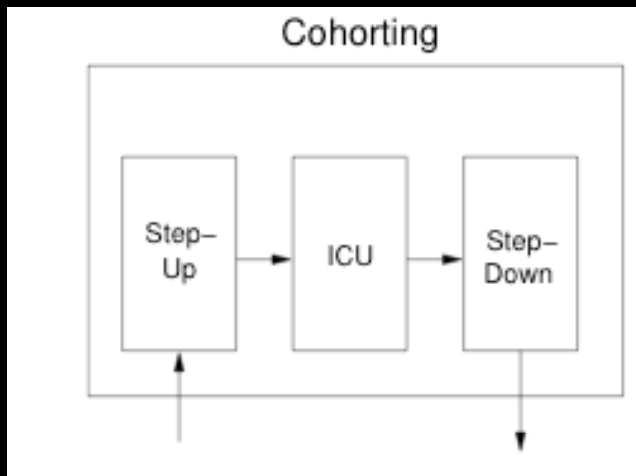
Burn Unit

etcetera

Hospital Structure

- Nurses transmit among patients within their administrative unit.
- Doctors, orderlies transmit among patients throughout the hospital.
- Patients are transferred, moved for procedures, etcetera.

Patient Mixing



Conclusions

- The spread of resistance has structure
 - Space: Movement within a unit
 - Heterogeneity: Long-stay patients should be isolated from others.