

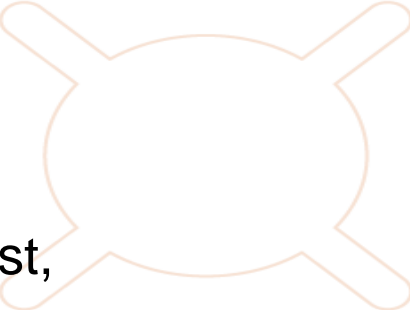


Contribution of environmental contamination to hospital ward MRSA incidence

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CENTRE OF RESEARCH EXCELLENCE
REDUCING HEALTHCARE
ASSOCIATED INFECTIONS

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Environmental contamination

- Pathogens survive for extended periods of times + frequently contaminate hospital surfaces
- Contamination from colonised patients similar to infected patients
- Threshold of ward environmental contamination?

MRSA in the environment

- Survives for extended time period
- Associated with MRSA acquisition
- Increased cleaning associated with decreased environmental contamination
 - not always with MRSA patient incidence

How can we **quantify contribution** to observed MRSA incidence?

Aims

- Evaluate **relative importance** of environmental contamination
- Re-use data to provide **further insight** into problem

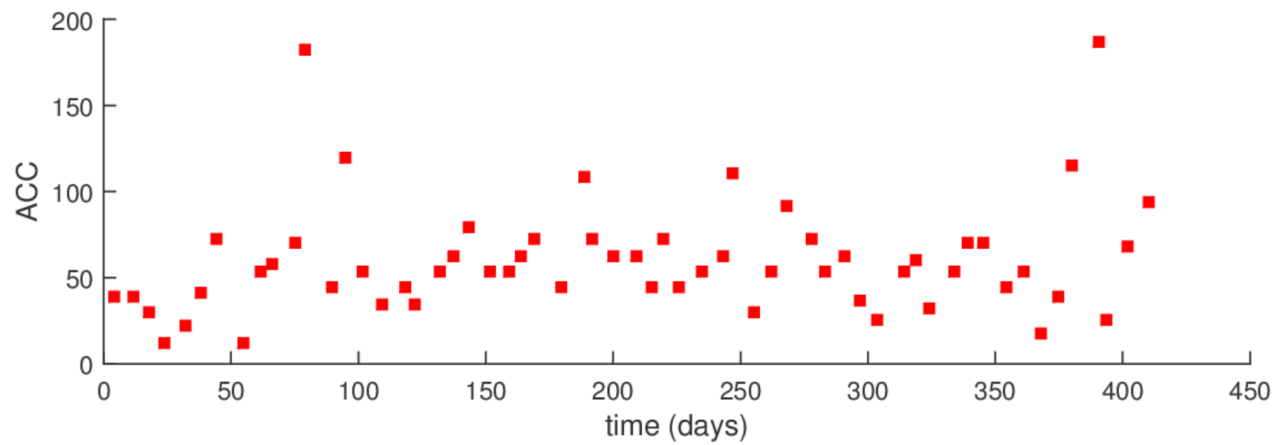
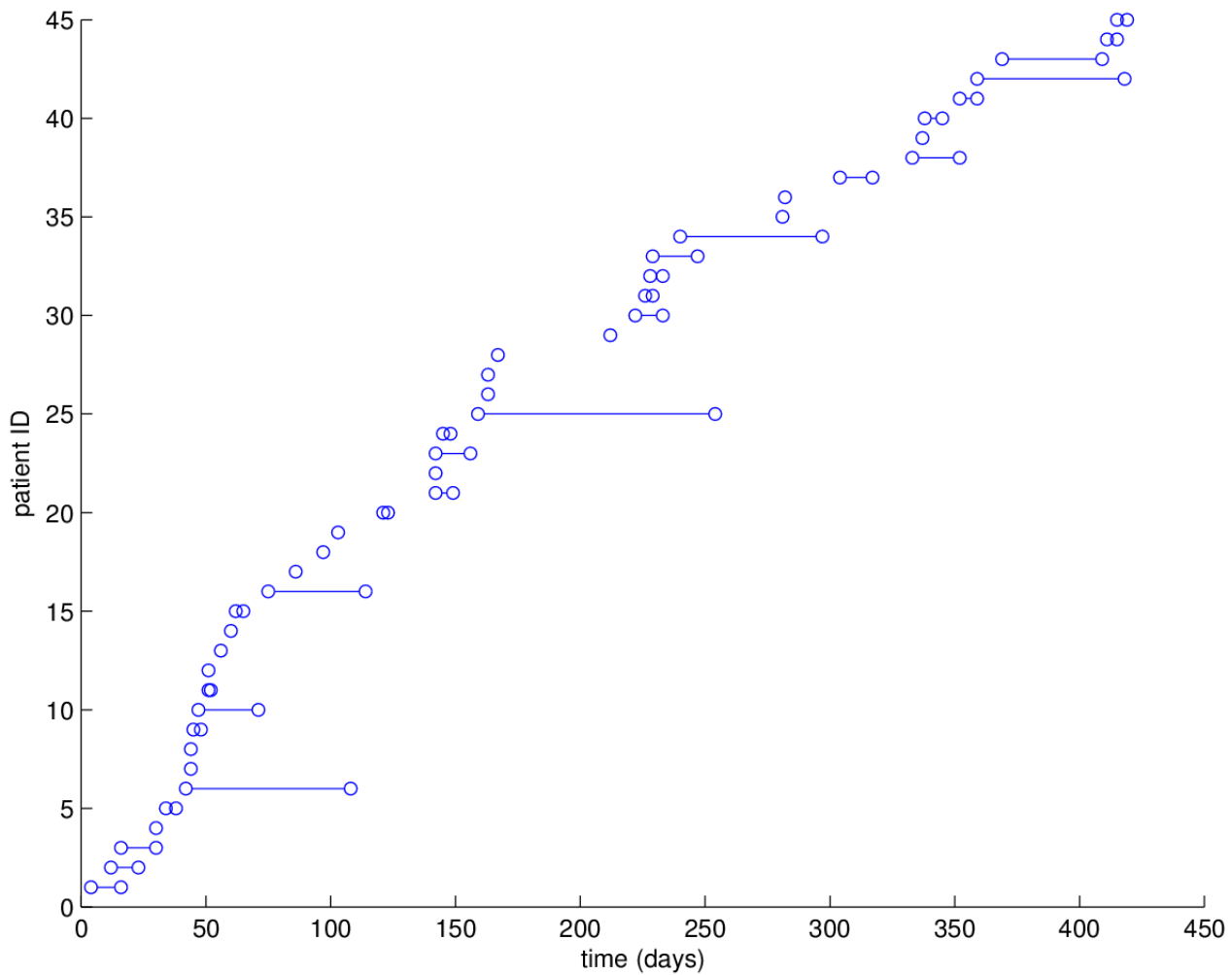
Setting

- UK surgical ward
- Weekly screening+
- Detected MRSA patients
 - topical clearance regimen
 - appropriate antibiotic treatment
 - cohort/isolate
- Nearby patients screened

Cleaning intervention

- One additional dedicated ward cleaner for 6 months
- Normal cleaning staff for 6 months+ after
- Microbiological environmental contamination surveillance
 - Aerobic colony counts (ACC)
- Reduced ACC and MRSA infections

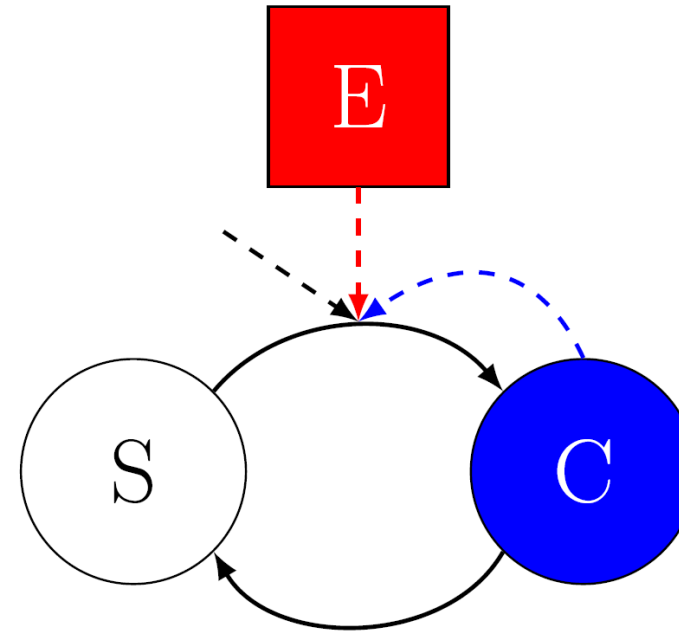
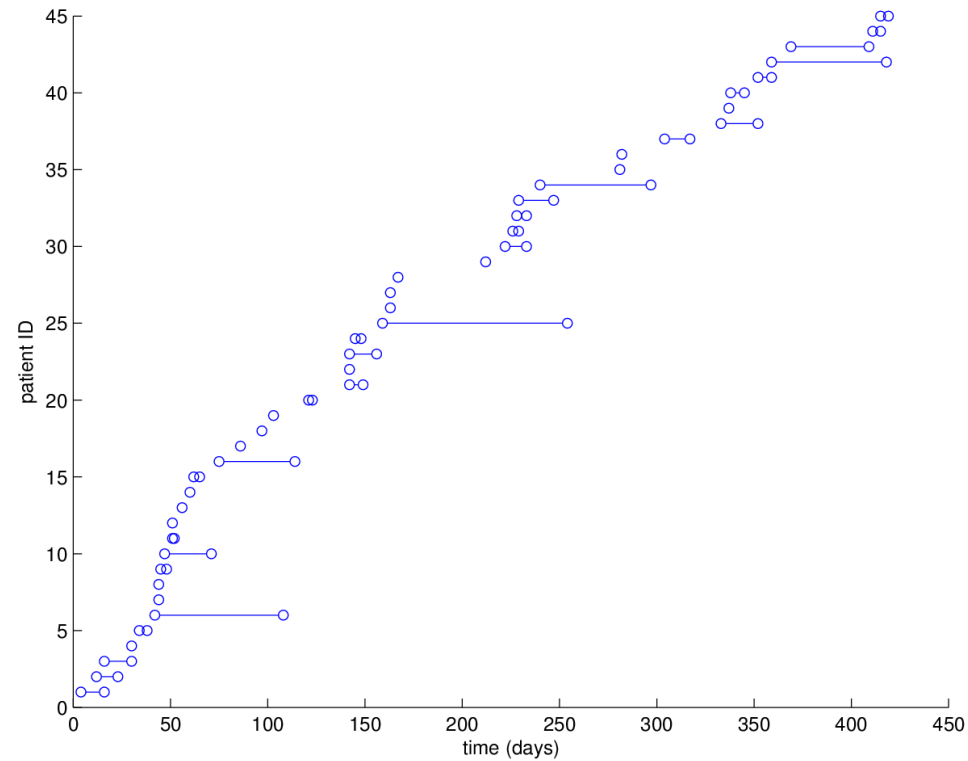
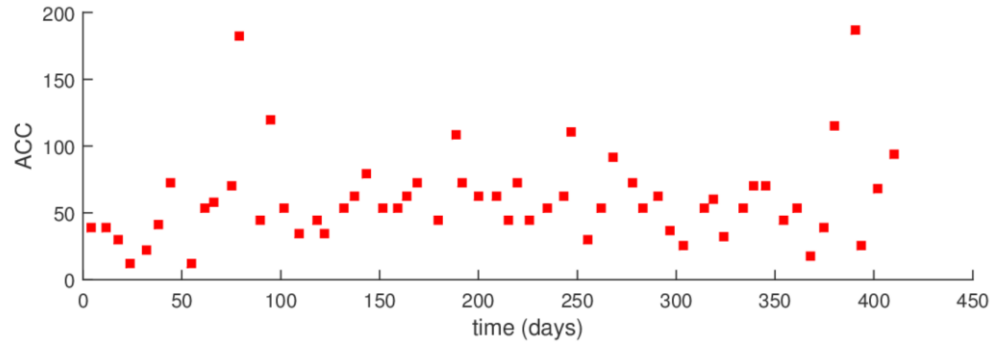
Data



Scope

- Number of MRSA-positive patients
- Limited patient information for this data set
- No HCW information
- ACC proxy measure of environmental contamination for MRSA colonisations

From data to model



- E** Environmental contamination (ACC)
- S** Susceptible patients
- C** MRSA-positive patients (colonised & infected)

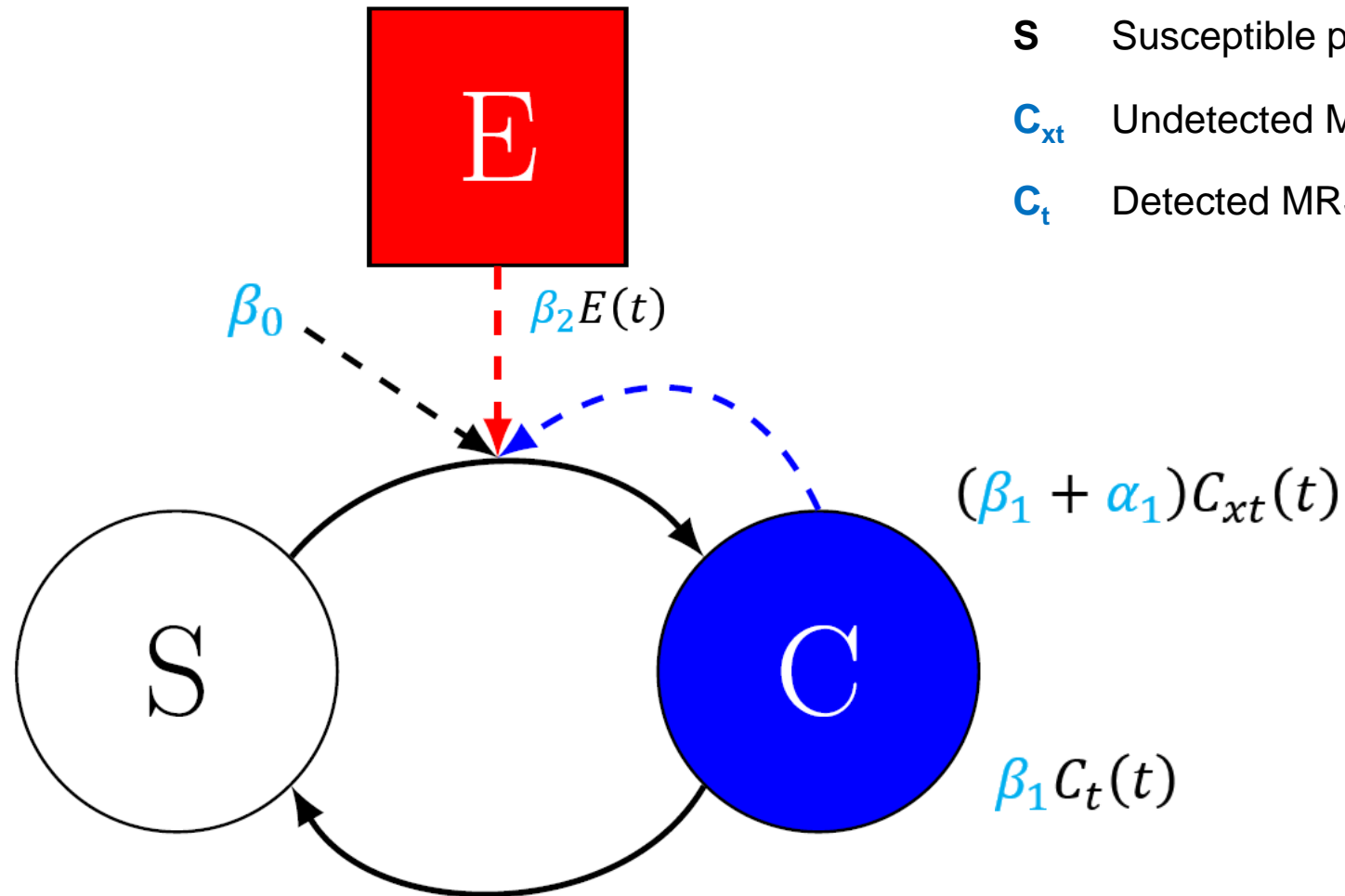
MRSA acquisition model

E Environmental contamination (ACC)

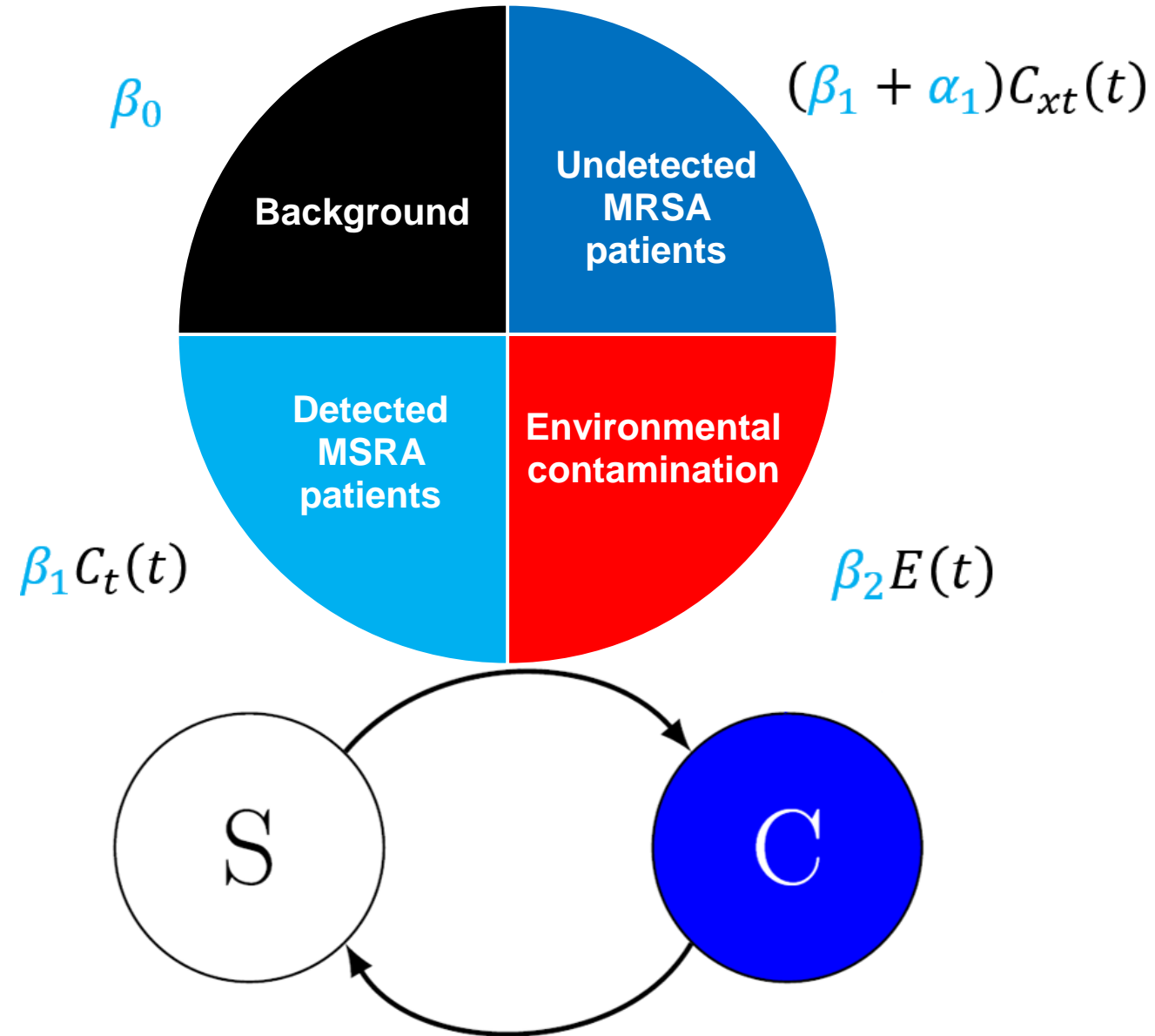
S Susceptible patients

C_{xt} Undetected MRSA-positive patients

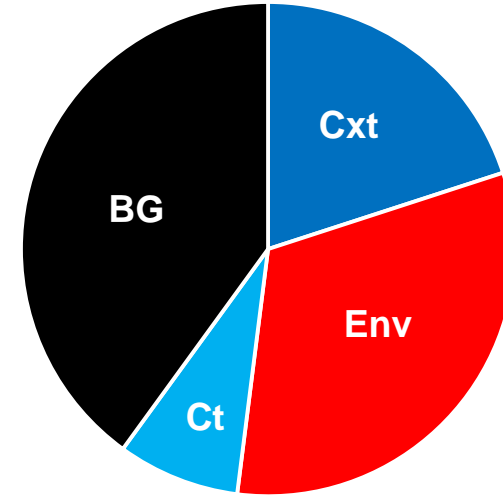
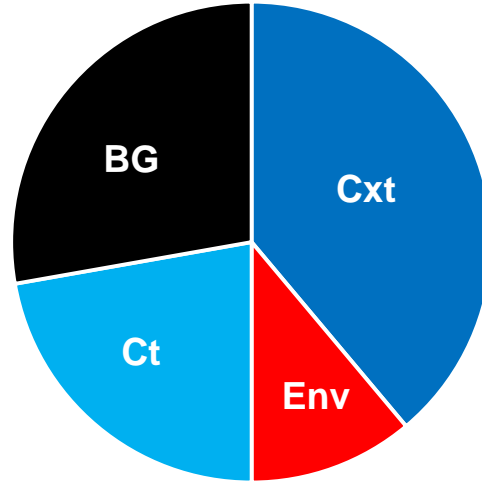
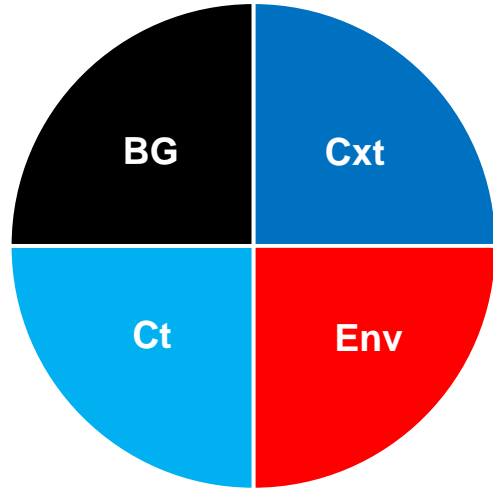
C_t Detected MRSA-positive patients



MRSA acquisition model



Relative acquisition risk (RR)



BG Background

Cxt Undetected MRSA patients

Ct Detected MRSA patients

Env Environmental contamination

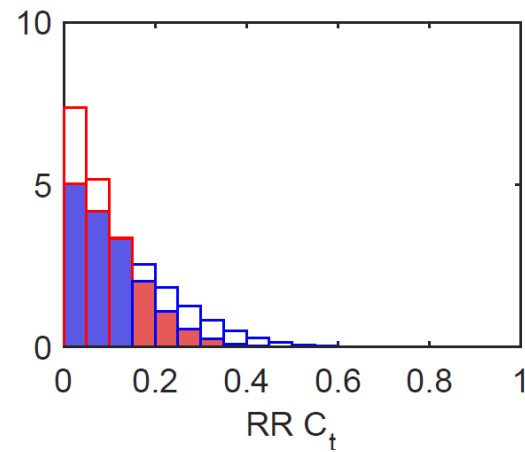
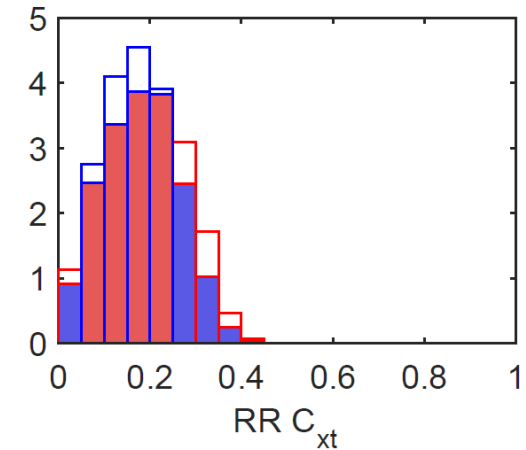
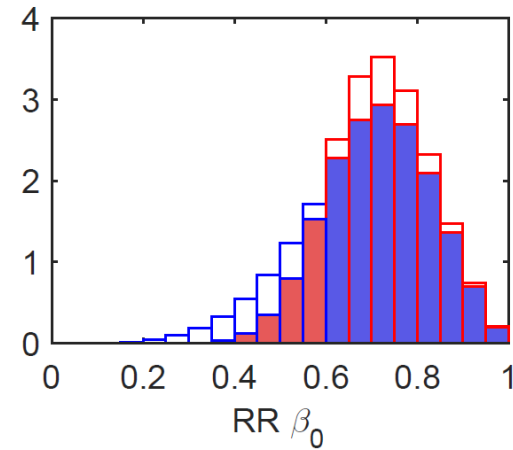
$$\beta_0$$

$$(\beta_1 + \alpha_1)C_{xt}(t)$$

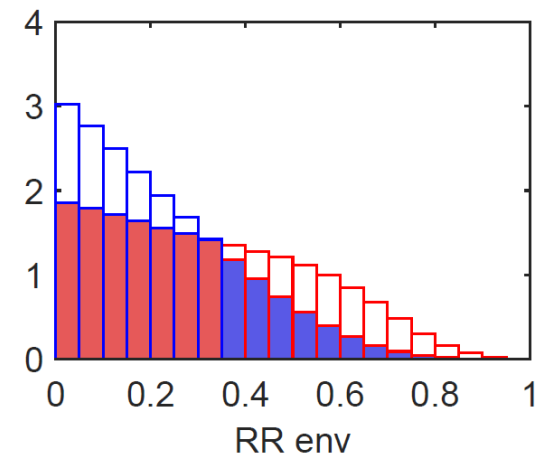
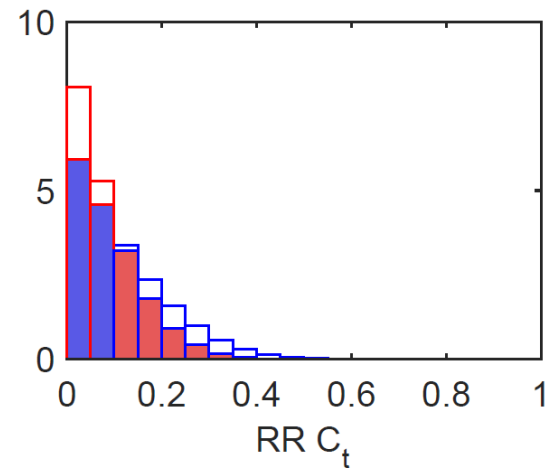
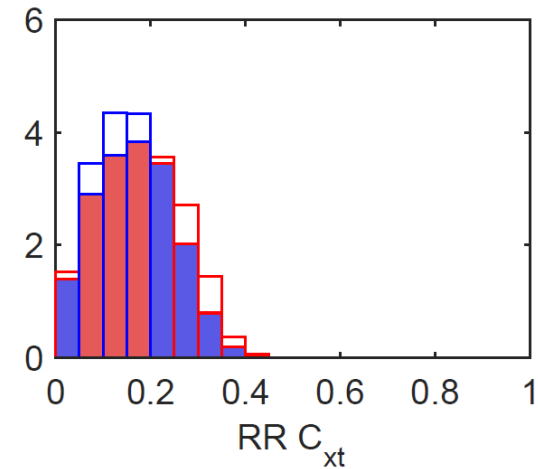
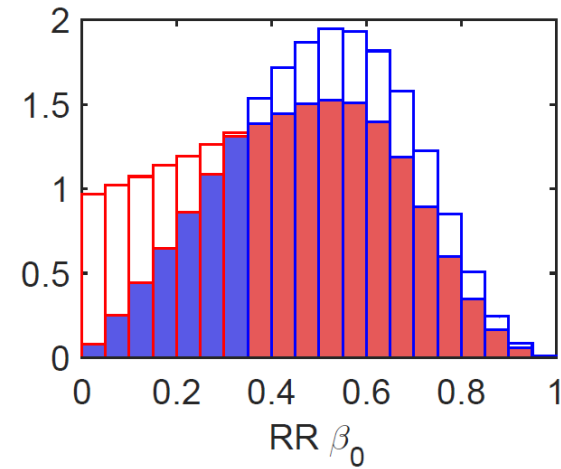
$$\beta_1 C_t(t)$$

$$\beta_2 E(t)$$

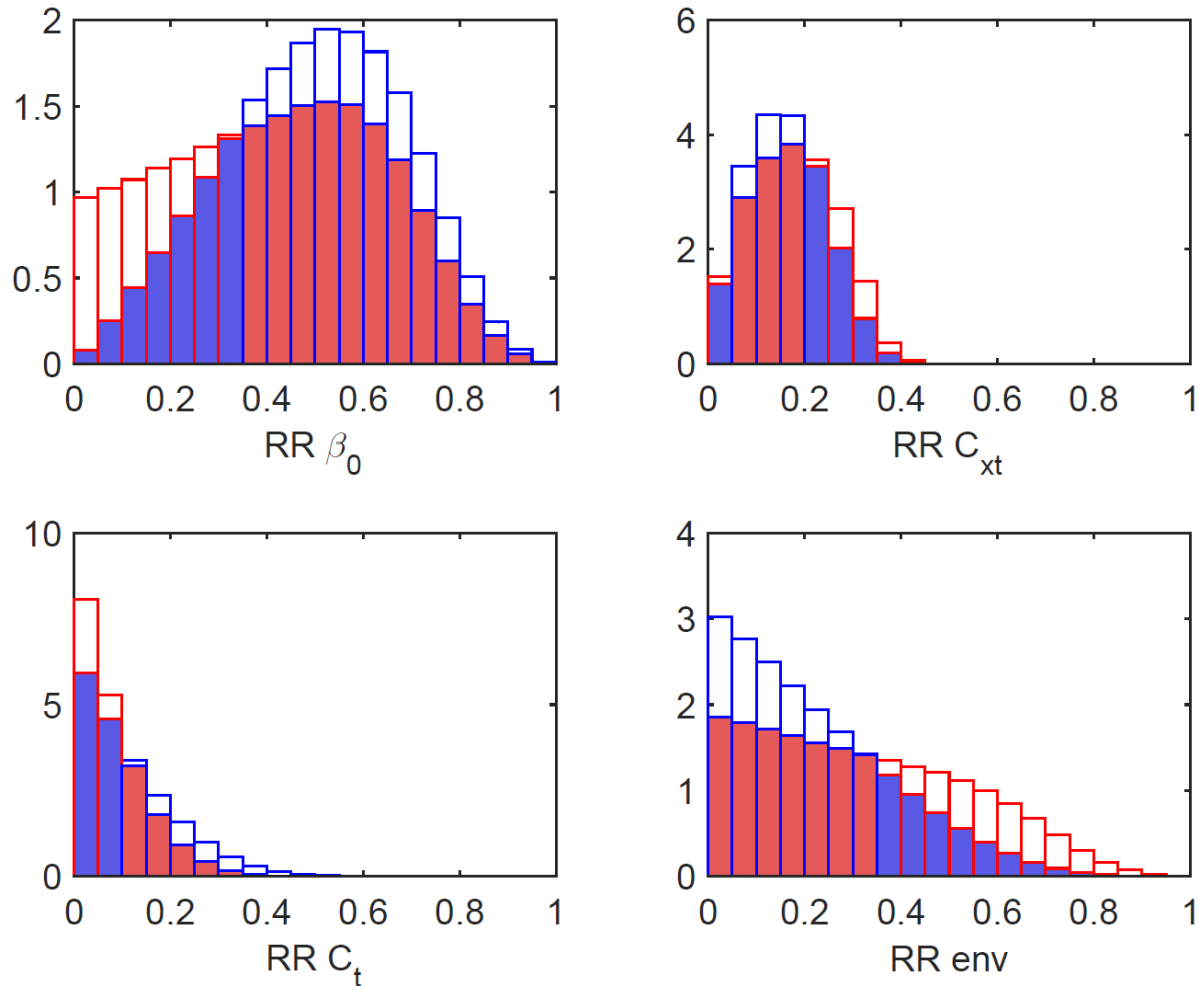
Acquisition model with no environmental contamination



Acquisition model with environmental contamination



Relative acquisition risks



RR	extra cleaning	normal cleaning
background	0.50	0.41
C_{xt}	0.16	0.18
C_t	0.12	0.08
environment	0.22	0.32

Acquisition model summary

- Environmental contamination has similar contribution as undetected colonised patients to MRSA acquisition
- **Non-negligible environment RR**
 - Supports increased focus on appropriate environmental cleaning

Research opportunities

- Larger, more complete data set
- Replicate model for other HAI organisms
- Incorporate more sophisticated data type (WGS)
- Other transmission pathways?

Recommendations

- **Hospital cleaning** should be part of infection control practices
 - REACH trial 2014-2017
- **Modelling tools** are a great way of synthesizing more and more varied data sources
 - small datasets too