MODELLING TRANSMISSION PARAMETERS FOR *SALMONELLA* TYPHIMURIUM IN SWINE USING A BAYESIAN APPROACH

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BACKGROUND & OBJECTIVE

Salmonella Typhimurium is a current major food-borne pathogen in humans and mainly associated with pork and pork products. At herd level testing is a part of the control programs for this agent. Modeling the transmission of this agent in the herd is one way of understanding the factors that influence the dynamic of transmission and may contribute to improve the efficiency of *S*. Typhimurium control programs.

AIM: to estimate transmission parameters (α, δ and β) for *S.* Typhimurium in swine herds using field data from a cohort study of infection using a three state (SIR) transition model.

MODELLING APPROACH

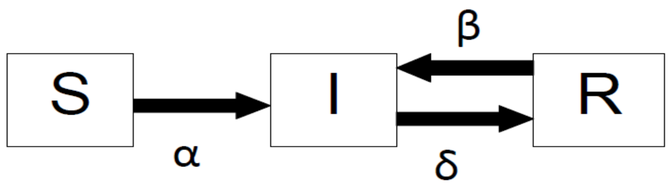
DATA:

- 6 cohorts of 30 pigs (2 cohort per herd) followed since 4 weeks old until the slaughter age.
- The herds were known to be infected with *S.* Typhimurium.
- The pigs were tested with intervals of 3 to 4 weeks for presence of Salmonella in feces and sera.
- Pigs were classified as infected (I), susceptible (S) or resistant (R) according to the results of the tests (interpretation as parallel testing).

ASSUMPTIONS:

A) An infected pig would shed at least 4 weeks;
B) Intermittent shedding (R->I);
C) No transition of R to S;
D) Markovian transitions;
E) Specificity for both tests of 100%;
F) All cohorts have infected animals in the beginning.;
G) Time interval of 2 weeks.

EPIDEMIC MODEL:



S – susceptible
I – infected shedding
R – infected not shedding

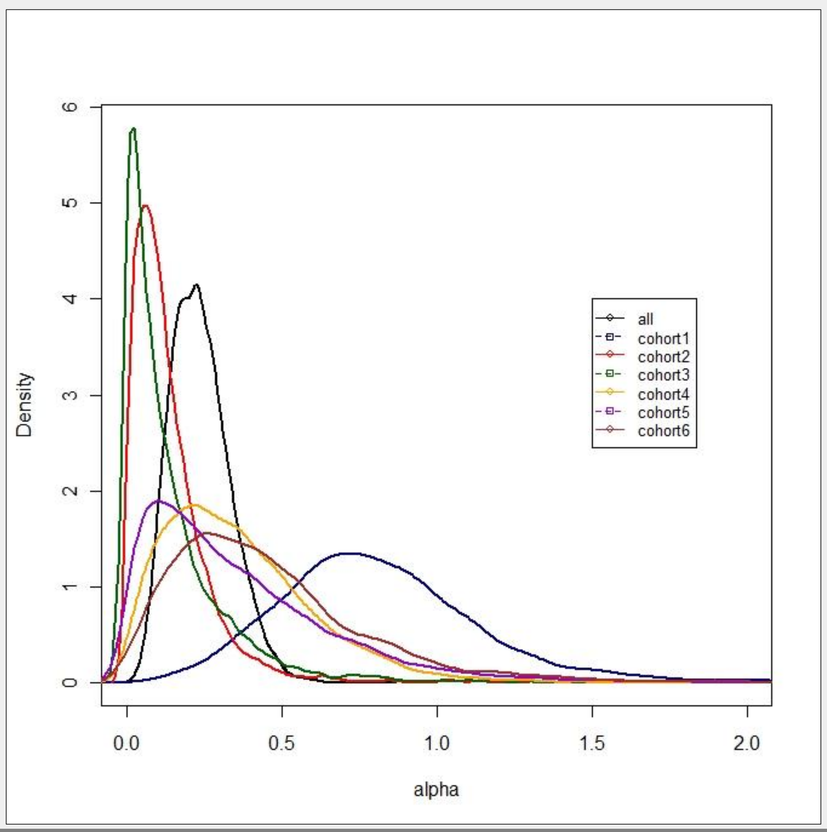
BAYESIAN FRAMEWORK:

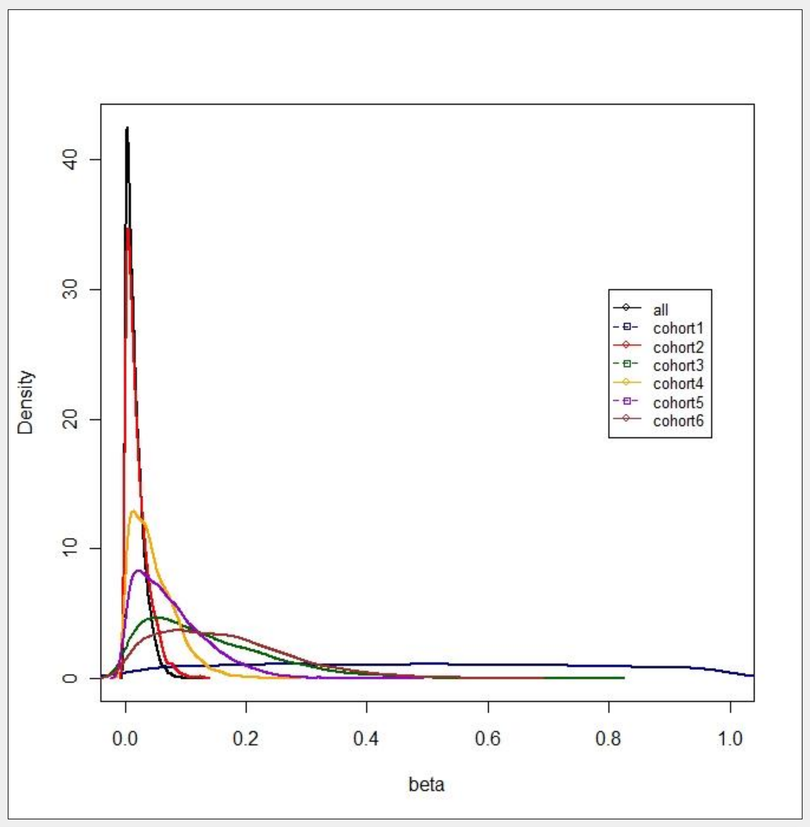
Poisson distribution for states.
Modelling temporal dynamic of observed status of pigs in cohorts.
Real health state of I depends of parallel Sensitivity of the tests.
Inference on transition parameters between states.

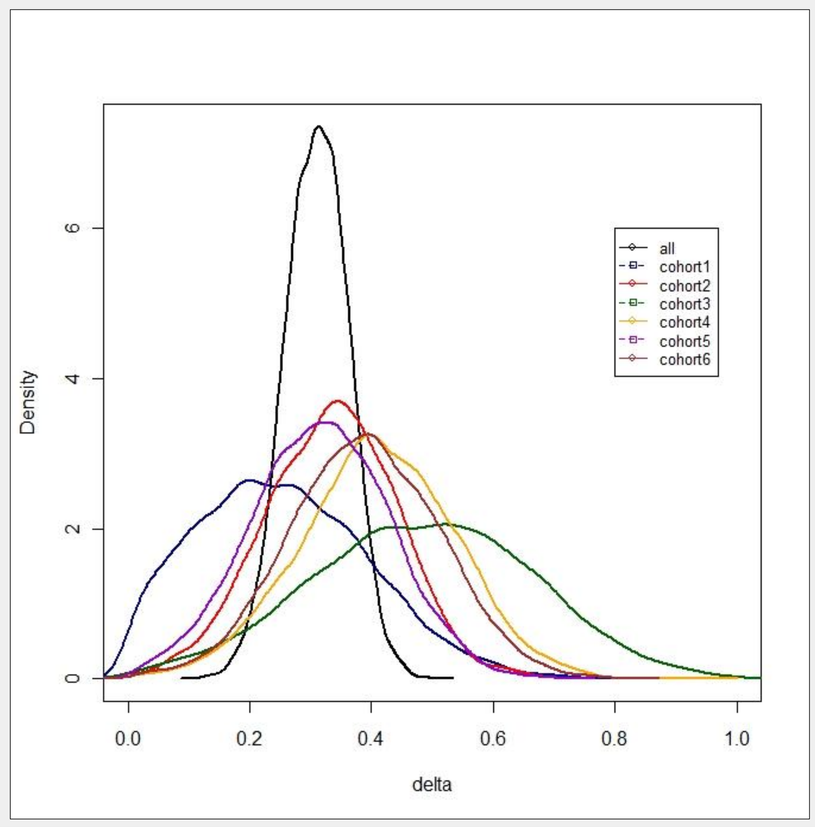
PRIOR DISTRIBUTIONS:

Minimally informative priors for transmission parameters.
Informative priors for sensitivity of both tests.

RESULTS & DISCUSSION







Alpha: Transition rate from S to I for all data and for each cohort	Beta: Transition rate from R to I for all data and for each cohort	Delta: Transition rate from I to R for all data and for each cohort

- Transmission rate parameter alpha differs between cohorts, cohort 1 reach the highest values. Two groups (cohort 2 and 3) and (cohort 4,5,6 and 1) seem to be present.
- Transition between R to I (intermittent shedding) seems to be low and is quite similar for all cohorts except for cohort 1.
- Transition between I to R (stop shedding) is high and very similar between cohorts with the mode values around 0.3 for each 2 weeks.

CONCLUSIONS

This study provides valuable information for future simulation studies such as:

- As the tests are not perfect for detection of Salmonella the sensitivity information should be incorporated in the models which use field data to assess better the real number of animals infected;
- As expected the dynamic of infection of this agent differs between cohorts of the same herds, so when simulating this aspect should be incorporated in the model;
- This information could be used for assessment of effectiveness of different control measures.

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SVEPM contribution to the delegate conference attendance Danish Agriculture and Food Council for the data