Research to increase preparedness for disease outbreaks

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What we want….

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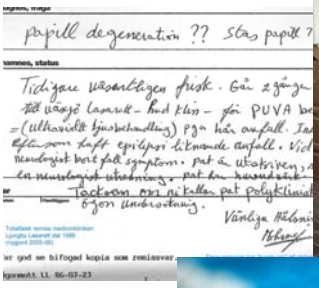
What we usually have...



Data/sample collection while fighting an outbreak

- Need to know/nice to know?
- Priorities at different stages of the outbreak?
- Some information must be available beforehand
- Resources needed?
- Data quality…

Full simulation models

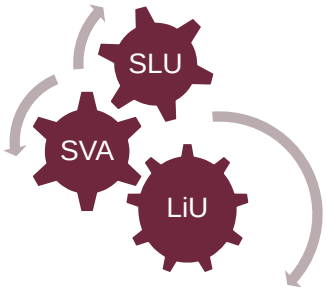
- Complex
- Non-obtainable data…
- Difficult to convey uncertainty
- Not enough data in outbreak situations?
- Most useful for testing strategies beforehand

Present and future work

- Disease modelling (simulation, hydrological and meteorological)
- Evaluation of eradication efforts
- Salmonella epidemiology (sampling strategies, risk factors etc)
- Biosecurity studies
- Application of microbial ecology

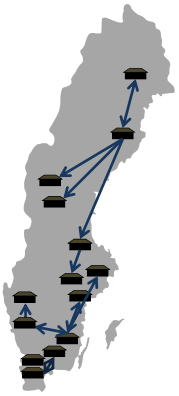
SLU-SVA-LiU: Strengthening the scientific basis for veterinary disease preparedness

- Between-farm contacts
- Mathematical models
- Farmers' attitudes



Between-farm contacts

- Animals
- Professionals (veterinarians, AI technicians, hoof-trimmers etc)

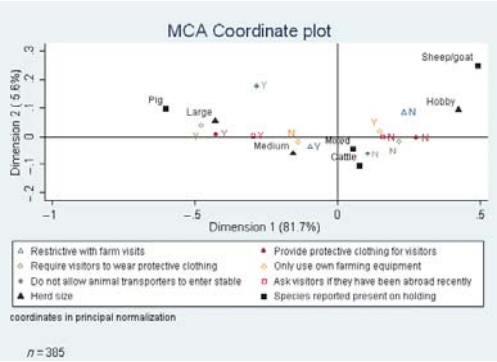


Data collection

- Frequency of contacts
- Type of contacts
- Biosecurity routines

Some results

- Frequency of animal contacts associated with size and type of herd
- Veterinarians and AI technicians better biosecurity than e.g. salespeople and machine technicians



Mathematical work

- Analysis of livestock networks – algorithm to estimate probabilities of future contacts
- Transport routes
- Frequency and weight of different contacts – simulation model
- Test intervention strategies in different situations

$$
\begin{aligned}
&P(\boldsymbol{v}|\boldsymbol{h},\boldsymbol{U},\boldsymbol{R},\boldsymbol{e},\boldsymbol{s}) \\
&\propto \prod_{t=1}^{T}\prod_{i=1}^{K}\prod_{j=1}^{K}\left(P(e_t,s_t|\boldsymbol{v},\boldsymbol{R},I_t,J_t)P(I_t,J_t|\boldsymbol{v},\boldsymbol{h},\boldsymbol{R})\right)^{U_{ijt}}P(\boldsymbol{v}) \\
&= \prod_{t=1}^{T}\prod_{i=1}^{K}\prod_{j=1}^{K}P(e_t,s_t|\boldsymbol{v},\boldsymbol{R},I_t,J_t)^{U_{ijt}}\prod_{t=1}^{T}\prod_{i=1}^{K}\prod_{j=1}^{K}P(I_t,J_t|\boldsymbol{v},\boldsymbol{h},\boldsymbol{R})^{U_{ijt}}P(\boldsymbol{v}) \qquad (1)
\end{aligned}
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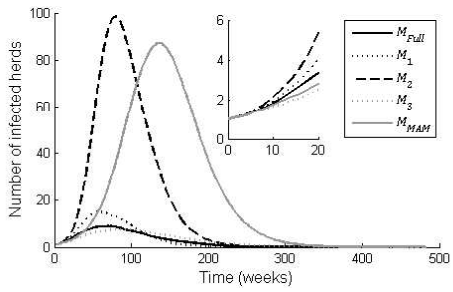
Some results

- Herd characteristics affect estimated probability of contact
- Some tools that allow for simulation
- Data quality is essential!



Farmers' attitudes

- Methods from social science
- Focus group study with livestock farmers
- Attitudes towards biosecurity, who do they listen to?

Expected usefulness

- Direct basis for preventive work
- Useful for information activities in outbreak situations
- Long-term contingency planning