Some practical uses of models

Top model seminar 2012-09-24

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What we want….

What we usually have...
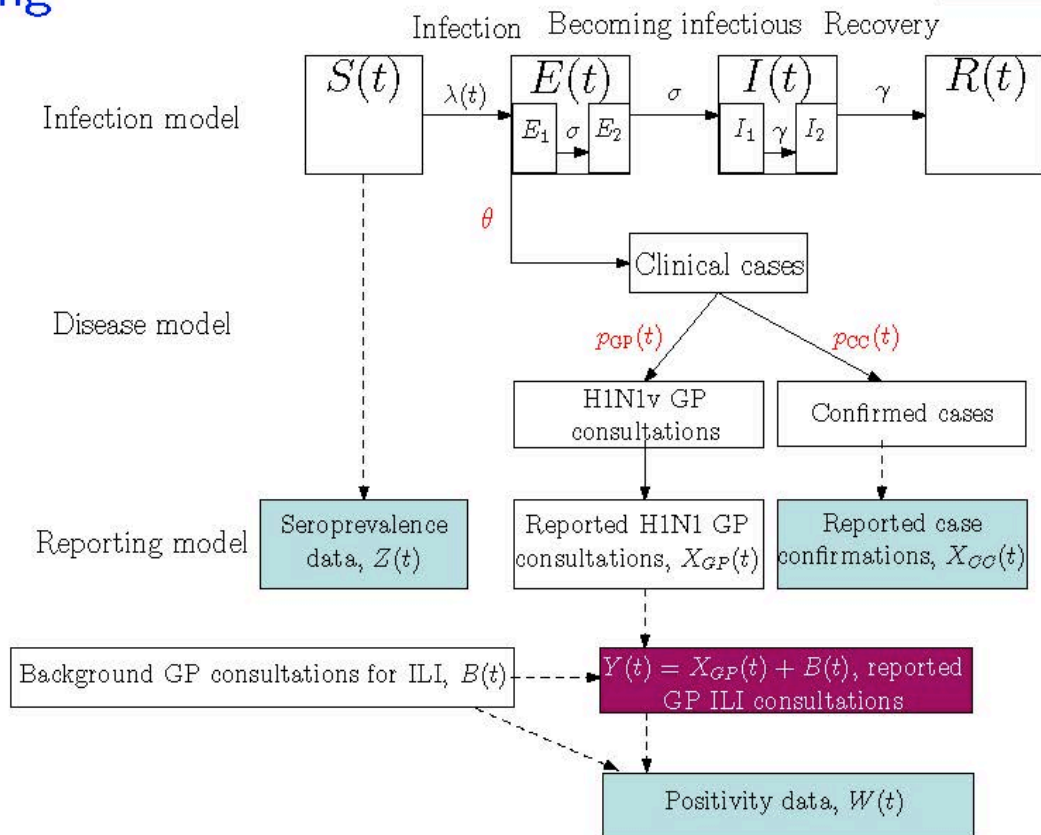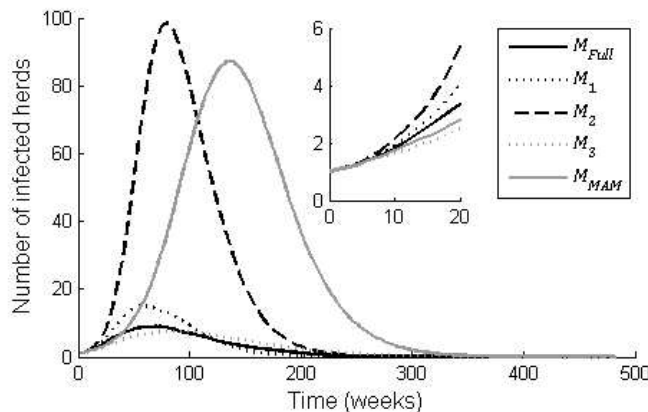
Modelling in an outbreak

A few examples

Integrated model for transmission and reporting

From lab to computer and back again

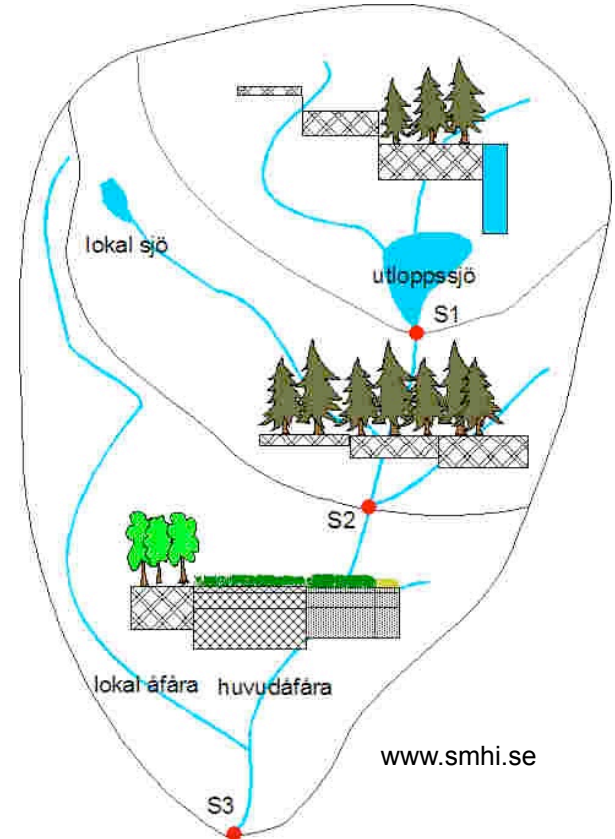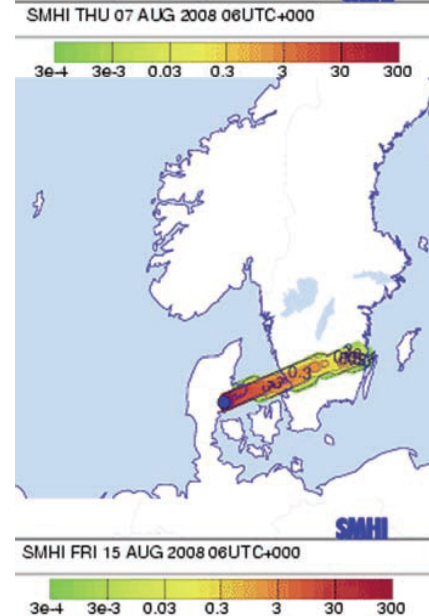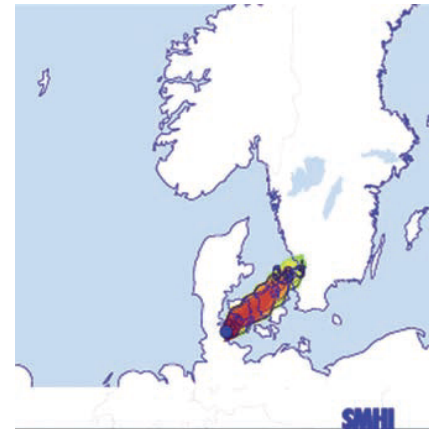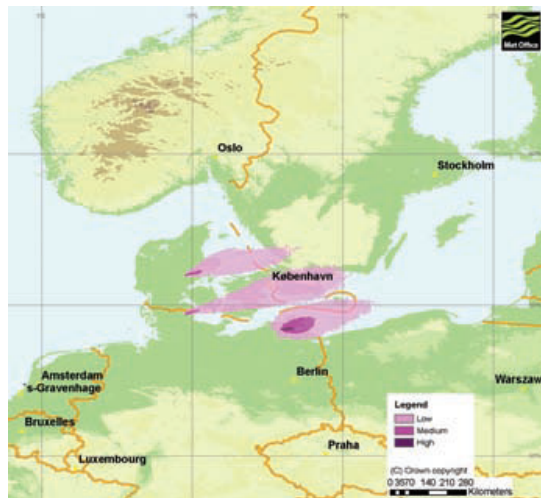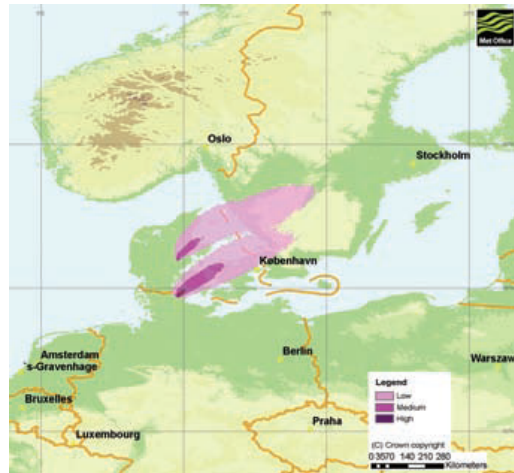- Not all experiments are practically feasible

- Some complex systems may need separate studies as well as comprehensive studies

- Maybe all of life's aspects can be described mathematically – and maybe not….

$P(\boldsymbol{v}|\boldsymbol{h}, \boldsymbol{U}, \boldsymbol{R}, \boldsymbol{e}, \boldsymbol{s})$

$$\propto \prod_{t=1}^{T} \prod_{I=1}^{K} \prod_{J=1}^{K} (P(e_t, s_t|\boldsymbol{v}, \boldsymbol{R}, I_t, J_t) P(I_t, J_t|\boldsymbol{v}, \boldsymbol{h}, \boldsymbol{R}))^{U_{IJt}} P(\boldsymbol{v})$$

$$= \prod_{t=1}^{T} \prod_{I=1}^{K} \prod_{J=1}^{K} P(e_t, s_t|\boldsymbol{v}, \boldsymbol{R}, I_t, J_t)^{U_{IJt}} \prod_{t=1}^{T} \prod_{I=1}^{K} \prod_{J=1}^{K} P(I_t, J_t|\boldsymbol{v}, \boldsymbol{h}, \boldsymbol{R})^{U_{IJt}} P(\boldsymbol{v})$$
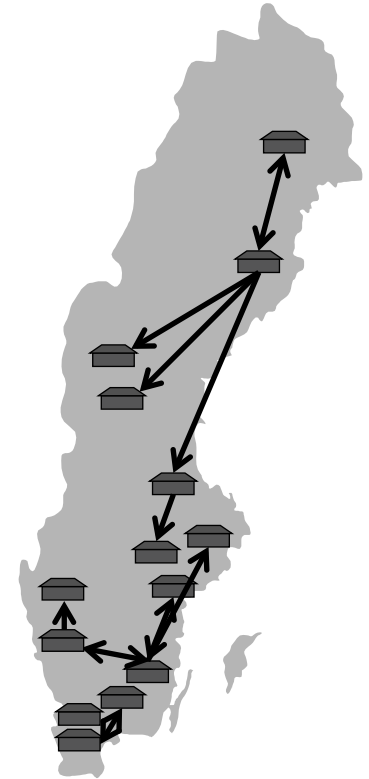
(1)

Lindström et al 2011

Meteorological, hydrological and spatial models

From Ågren et al 2010

www.smhi.se

Between-farm contacts

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

M Nöremark 2011
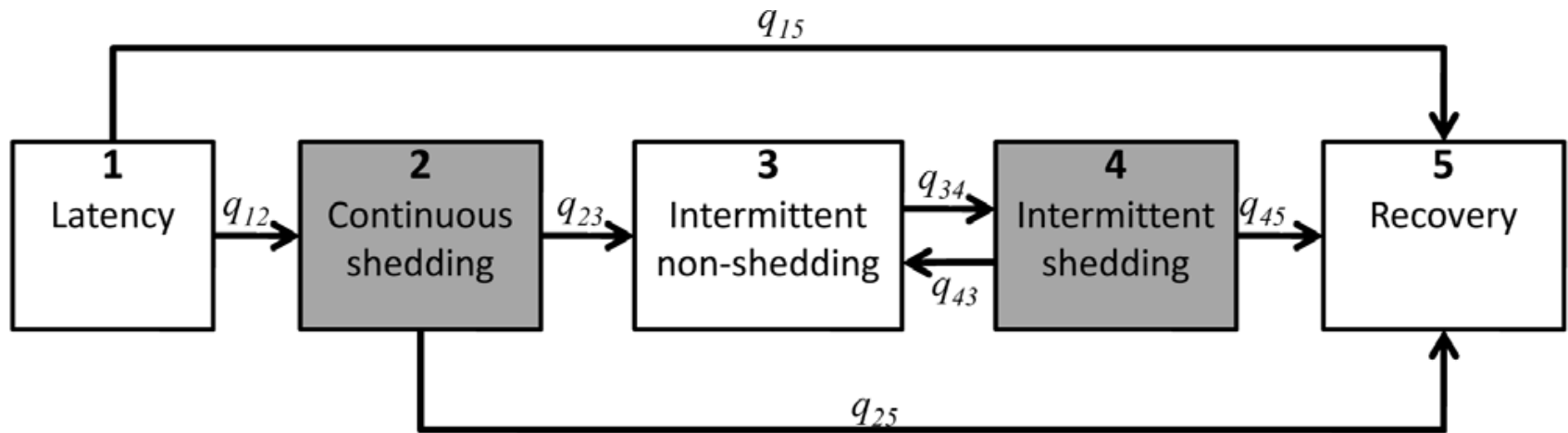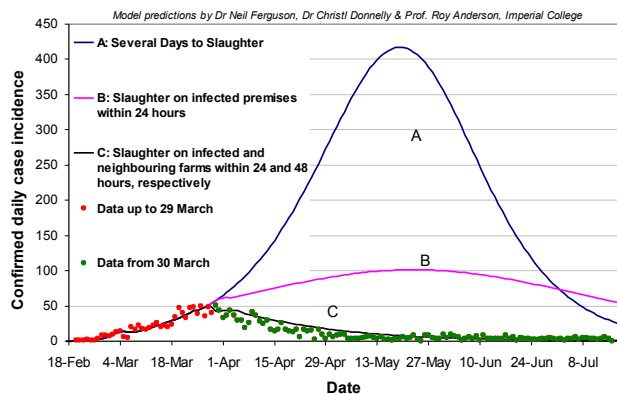
From experimental data to deeper understanding

Figure 1. A multistate model describing transition of pigs through the states of shedding following challenge.

From Ivanek et al 2012

Modelling infectious diseases

- Adds to and develops data from direct studies
- Different scenarios may be tested
- Different interventions may be tested
- Data needs may be identified
- Prognoses…

Model predictions by Dr Neil Ferguson, Dr Christl Donnelly & Prof. Roy Anderson, Imperial College

Telegraph April 2001