European project FLUMODCONT

MODelling the spread of pandemic in**FLU**enza and strategies for its **CONT**ainment and mitigation

financed under

FP7 Cooperation Work Programme: Theme 1 - Health

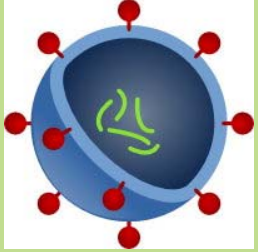
10 partners, 6 countries

Steering Committee, with experts from ECDC, WHO and member states

Started: **June 2008**. End: **May 2011**

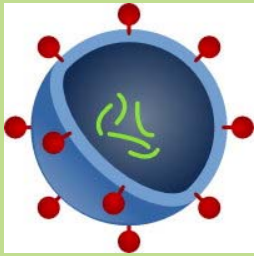
Web page: www.flumodcont.eu

Partners:



- **Università di Trento**,
- **Imperial College**,
- **FBK**, Trento
- **UPMC**, Paris
- **HPA** Porton Down
- **RIVM**, Netherlands
- **National Institute Health**, Finland
- **Università Bocconi**, Milano
- **National Health Institute**, Italy
- **National Health Institute**, Romania

Partners:



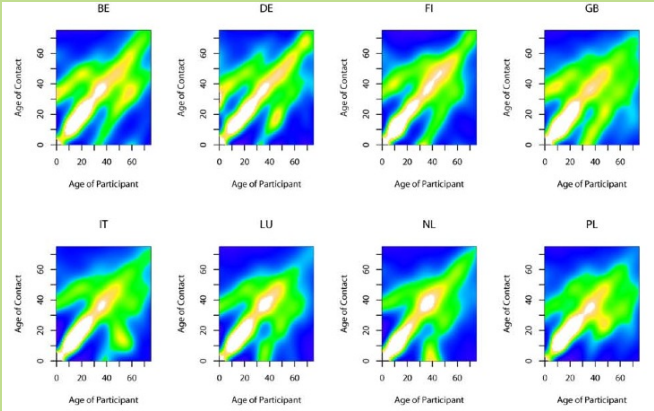
- **Università di Trento**, Italy (*Andrea Pugliese*), coordinator
- **Imperial College**, London (*Neil Ferguson*)
- **Fondazione Bruno Kessler**, Trento (*Stefano Merler*)
- **Université Pierre et Marie Curie**, Paris (*Guy Thomas*)
- **Health Protection Agency** Porton Down, UK (*Steve Leach*)
- **National Institute for Public Health** and the Environment, Bilthoven, Netherlands (*Jacco Wallinga*)
- **National Public Health Institute**, Helsinki (*Kari Auranen*)
- **Università Bocconi**, Milano (*Francesco Billari*)
- **Istituto Superiore di Sanità**, Roma (*Caterina Rizzo*)
- **Institutul de Sanatate Publica**, Bucharest (*Florin Popovici*)
- *[organizing entrance of **Clalit Health Services**, Israel (Ran Balicer)]*

Main objectives (WP)

- **population contact and travel patterns**;
- evaluating **behavioural responses** and social acceptance of restriction measures (**survey**);
- developing and testing **models** for spatiotemporal spread;
- **parameter estimation:** improving real-time methods, and analysing seasonal influenza;
- evaluating the **impact of intervention** options;
- developing **efficient** and easy-to-use **computational environment.**

Contact and movement patterns

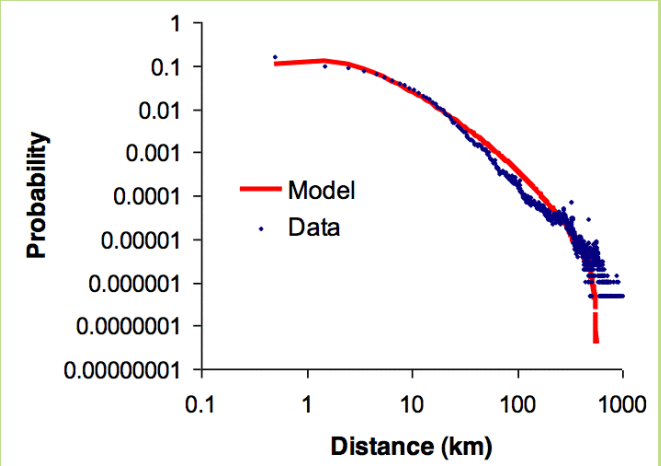
- Age structure of contacts:
  - ➢ Information from POLYMOD project, and from data analysis of infection data



from Mossong *et al.* (2008)

- Movement data:
  - ➢ Data exist but collected at national level;
  - ➢ Difficult to access/aggregate data to the European level.

- Work within FLUMODCONT:
  - ➢ Collection and organization of existing datasets
  - ➢ Use of data-driven models for population movement;
  - ➢ Comparison of models vs. selected data (e.g. seasonal influenza) of spatial spread



Behavioural responses

- A key uncertainty in modelling the spread of a pandemic, and the effect of possible interventions is predicting people's behaviours.
  - Analysis of 1918 US data in cities with different policies shows effect of public interventions
  - Behavioural studies in FluModCont:
    - literature review on absenteeism data during previous epidemics;
    - a survey was planned for May-June 2009 in 4 EU countries (Finland, Italy, Romania, UK) on expected behaviour during a future influenza pandemic:
      - to investigate spontaneous behavioural changes
      - to assess likely compliance with medical and non-medical recommendations of health authorities
  - Develop methods for incorporating behavioural responses in models

Survey

Big shift in focus after pandemic start:

Survey on **behavioural responses to a pandemic and acceptance of restriction measures,** was carried out between June 15 and July 15 in **Finland, Italy, Romania, UK.**

Scenario was that of the current H1N1 pandemic; questions were divided in 3 sections:

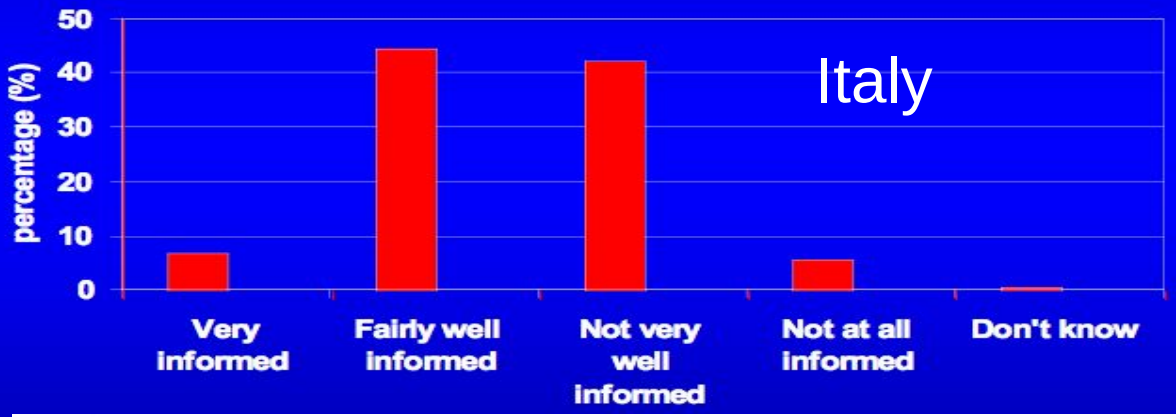
- **previous influenza;**
- **beliefs and knowledge about H1N1;**
- **willingness to pharmaceutical interventions (vaccination, antivirals)**
- **compliance to social distancing measuress**

It will be **repeated in the autumn**, depending on the epidemic course.

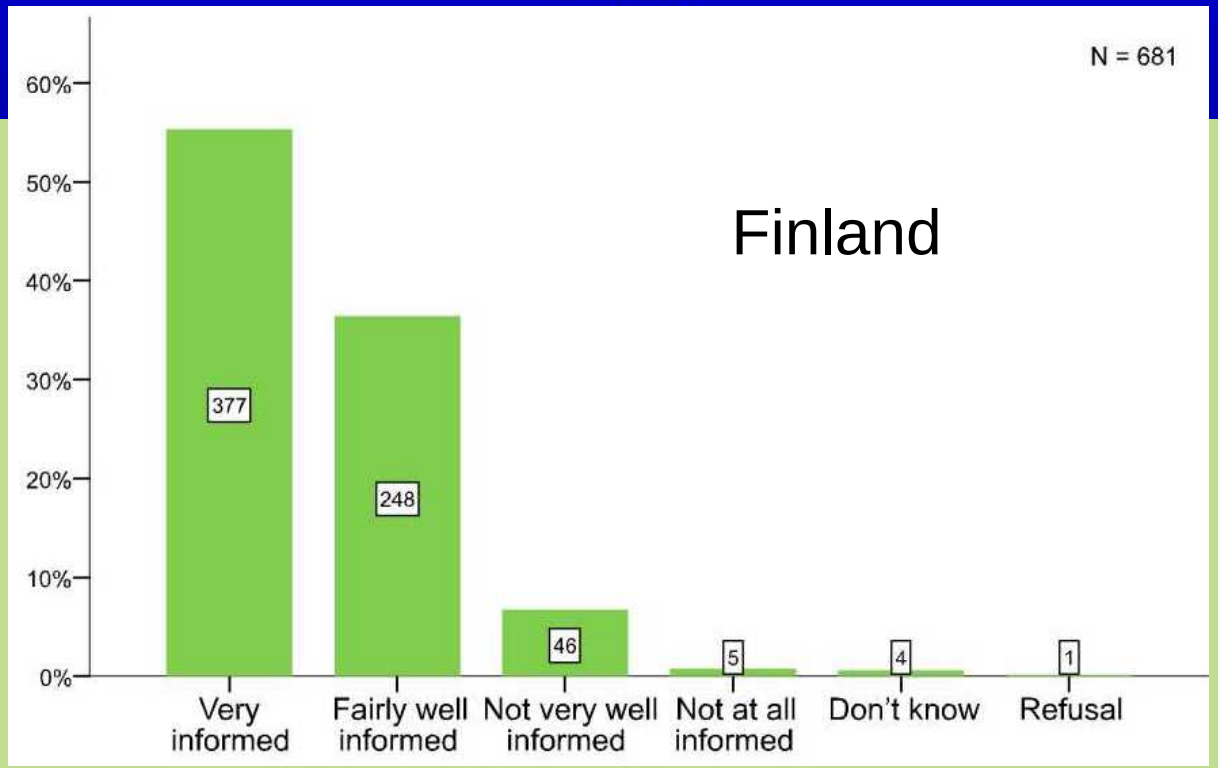
Results are being analysed. Some **preliminary results from Finland and Italy**, thanks to **Kari Auranen, Massimo Fabiani and Caterina Rizzo**.

BELIEFS AND LEVEL OF KNOWLEDGE

Feeling informed about swine flu



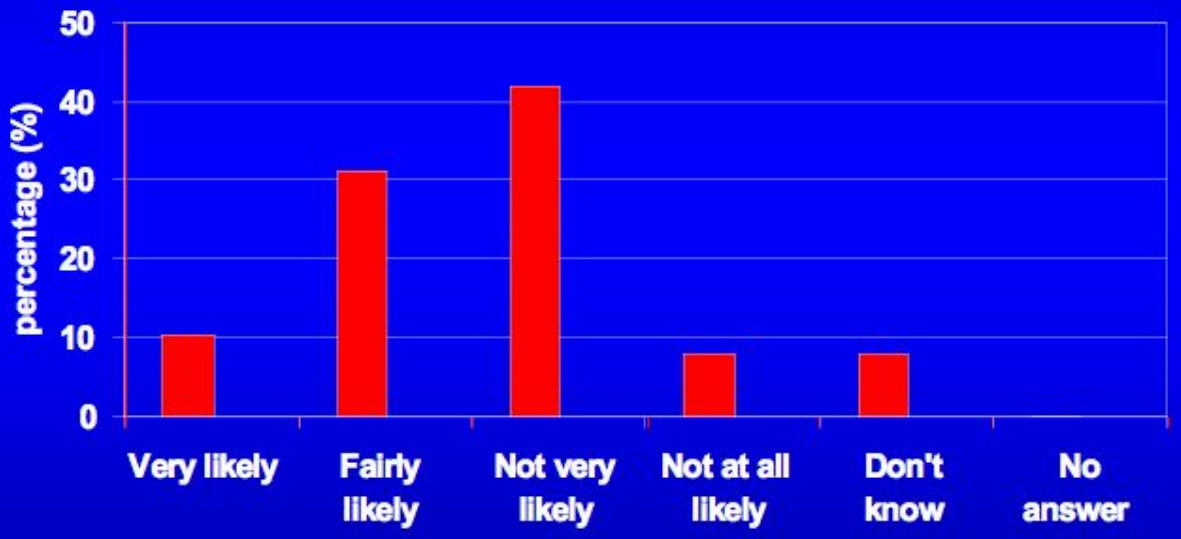
Italy



Finland

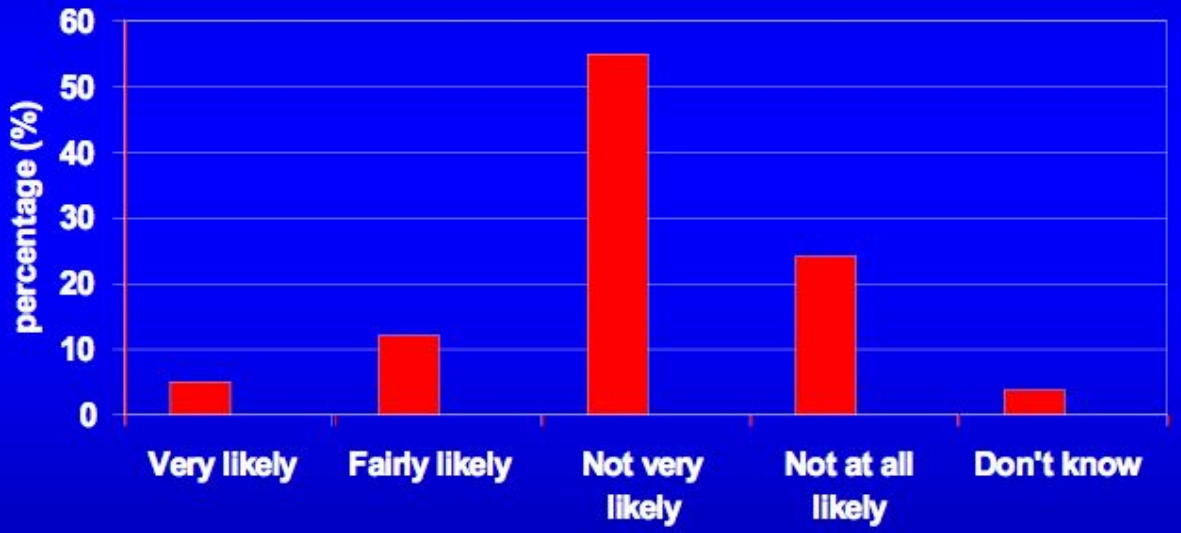
BELIEFS AND LEVEL OF KNOWLEDGE

Swine flu will become a serious problem in my country in the coming years



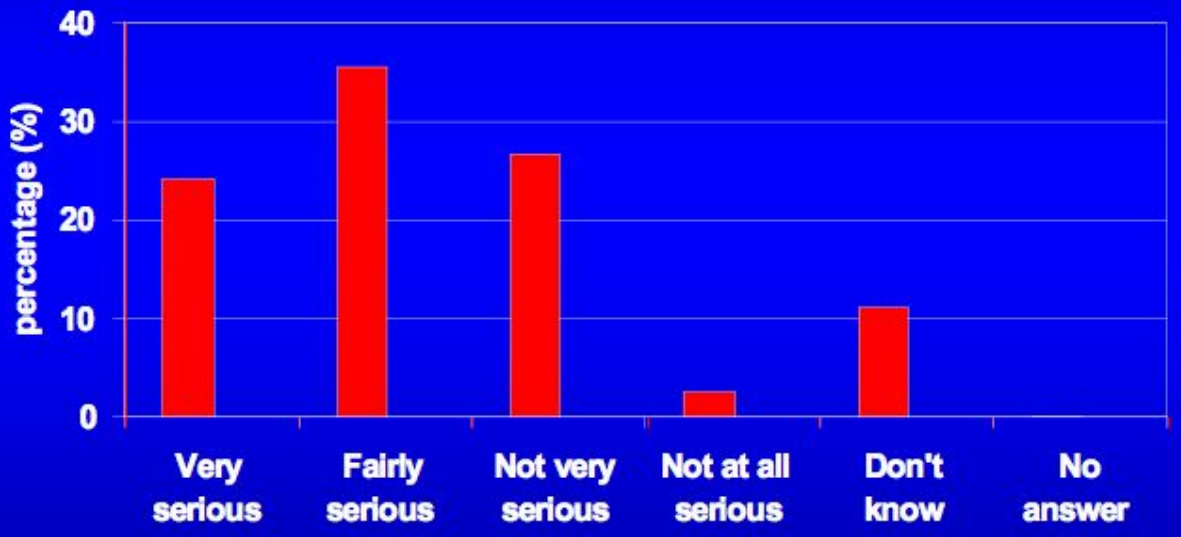
BELIEFS AND LEVEL OF KNOWLEDGE

If carry daily life as normal, how likely to catch swine flu in case of outbreak



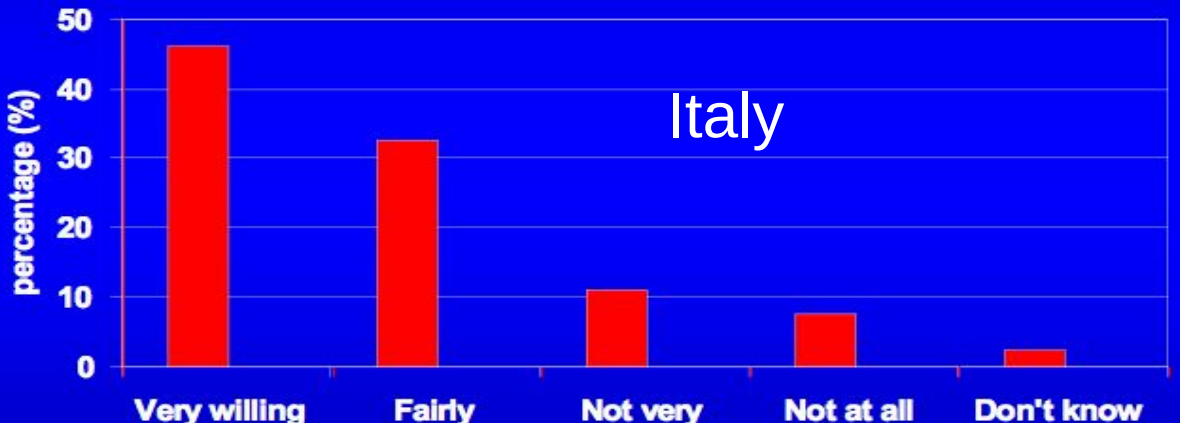
BELIEFS AND LEVEL OF KNOWLEDGE

If catch swine flu, how serious to own health

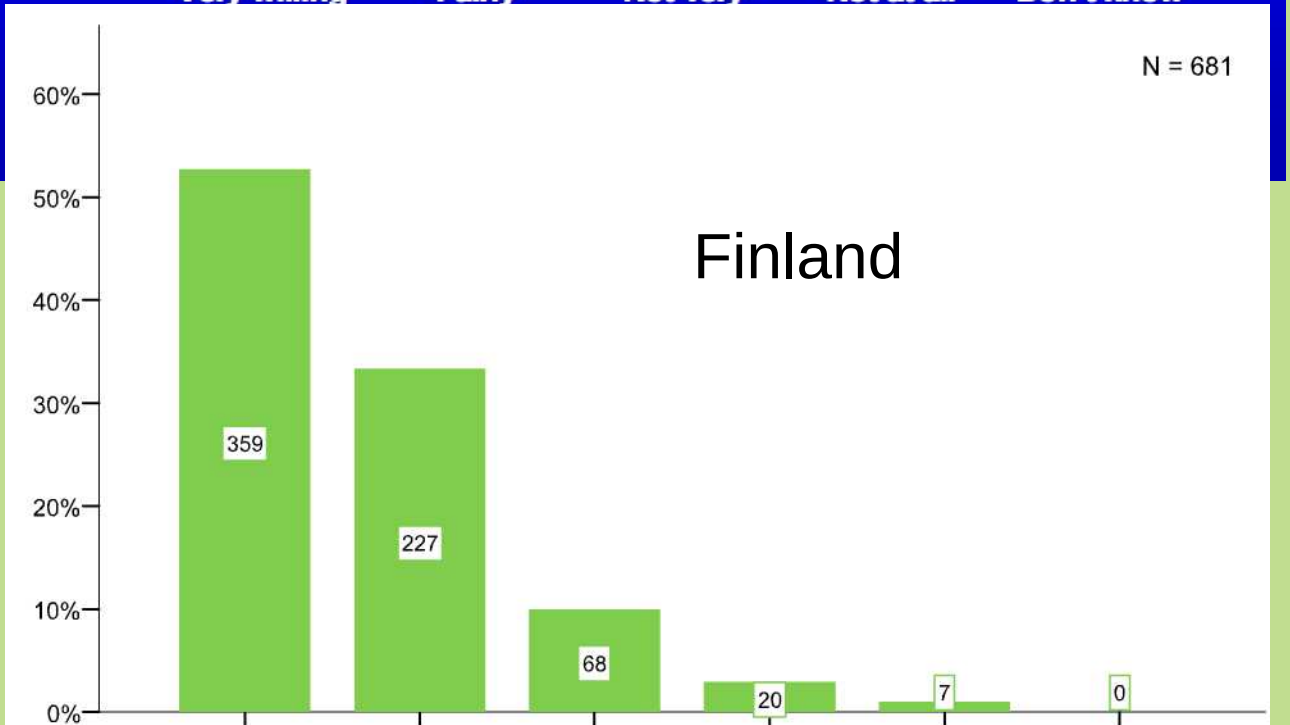


PREVENTING ACTIONS

How willing to get vaccinated against swine flu if it would be free of charge



Italy

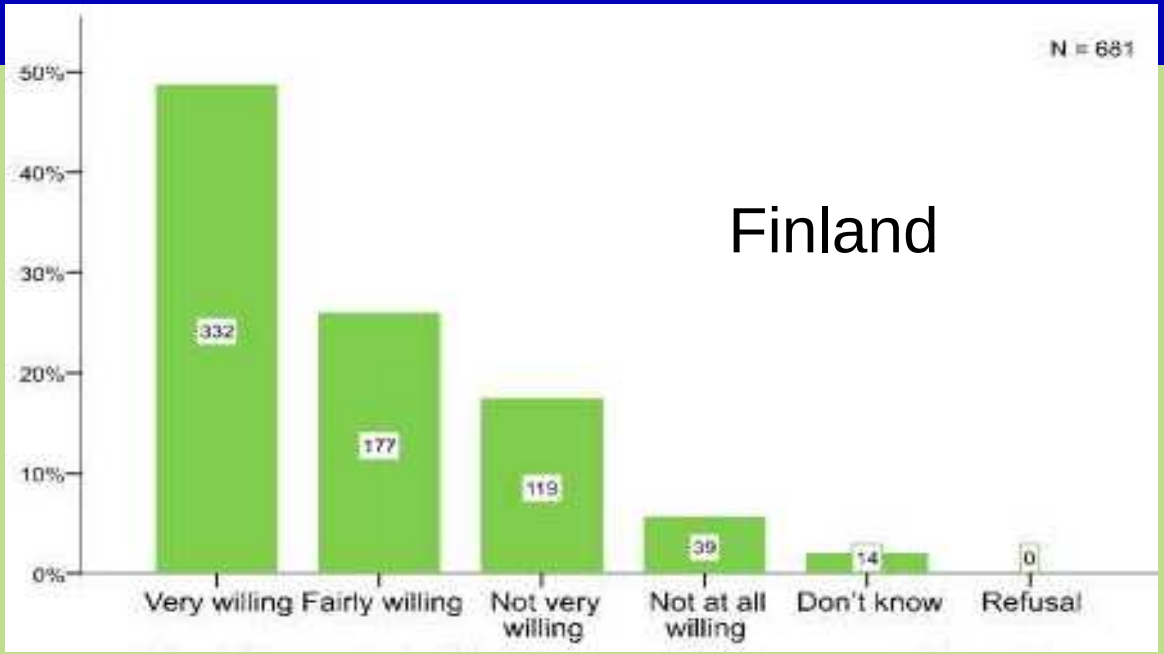


Finland

PREVENTING ACTIONS

How willing to take antivirals as a precutionary measure if free of charge

Italy

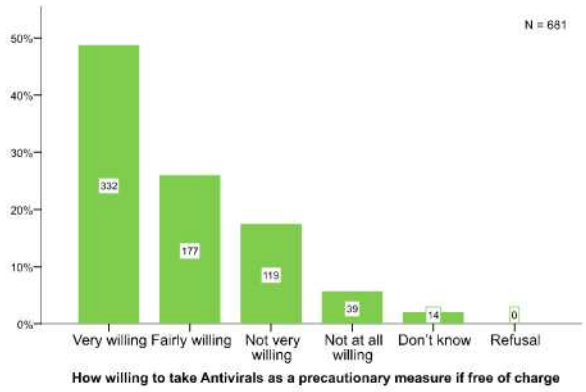


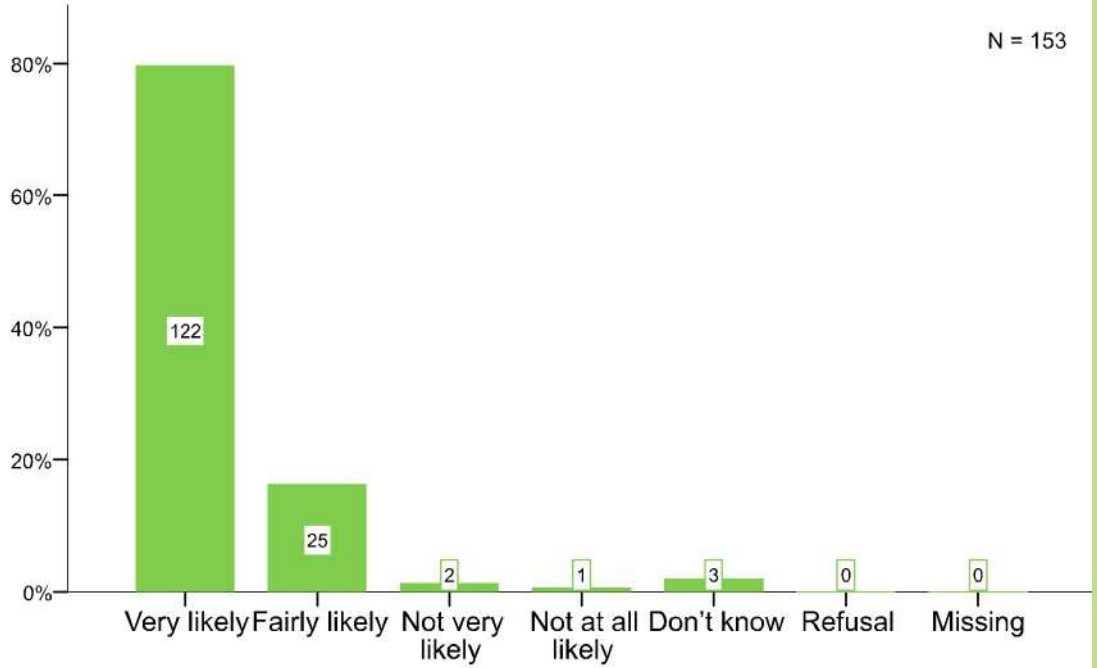
Finland

Antiviral acceptance as a precautionary measure (Finland)

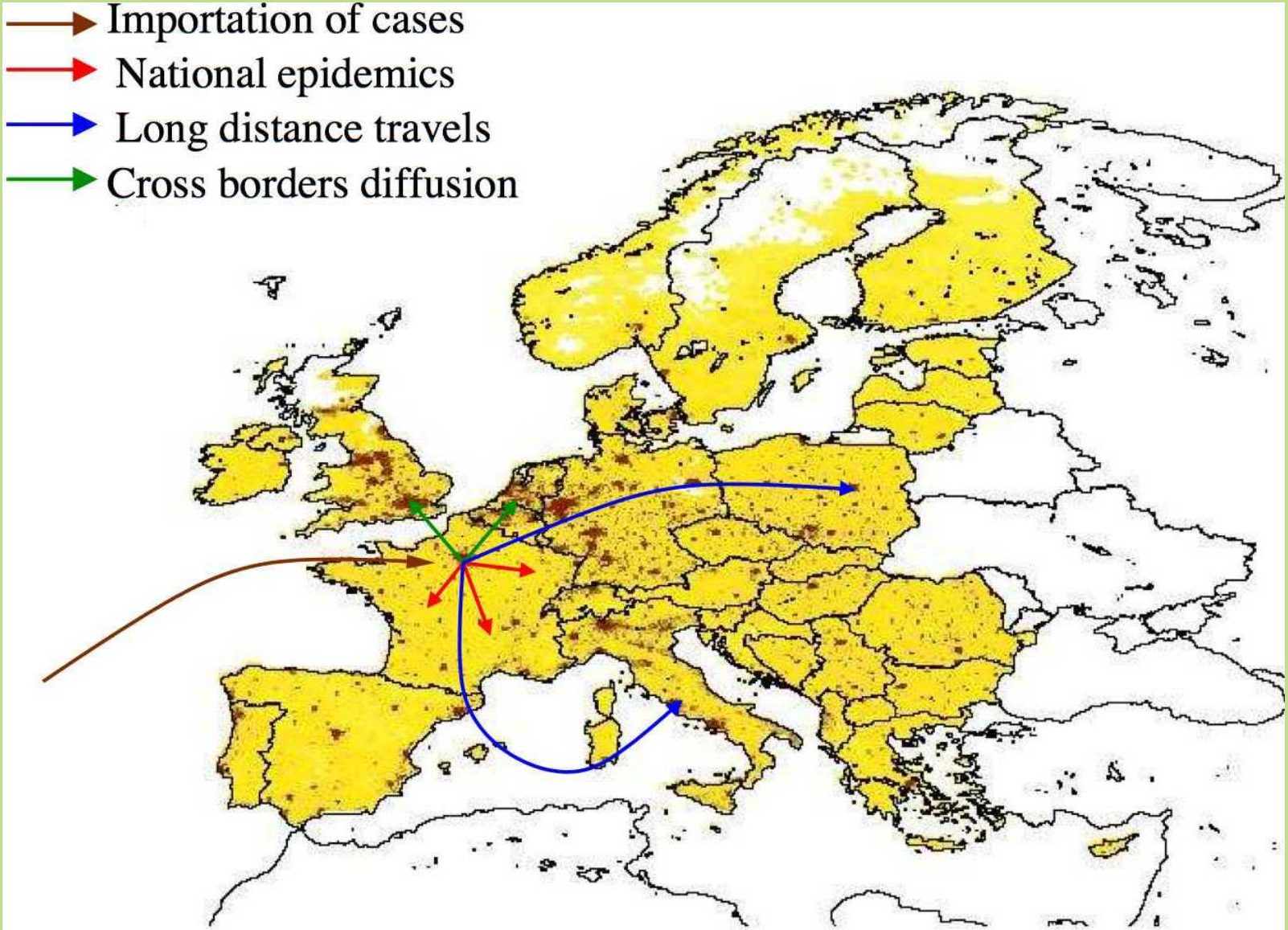
for self

for child



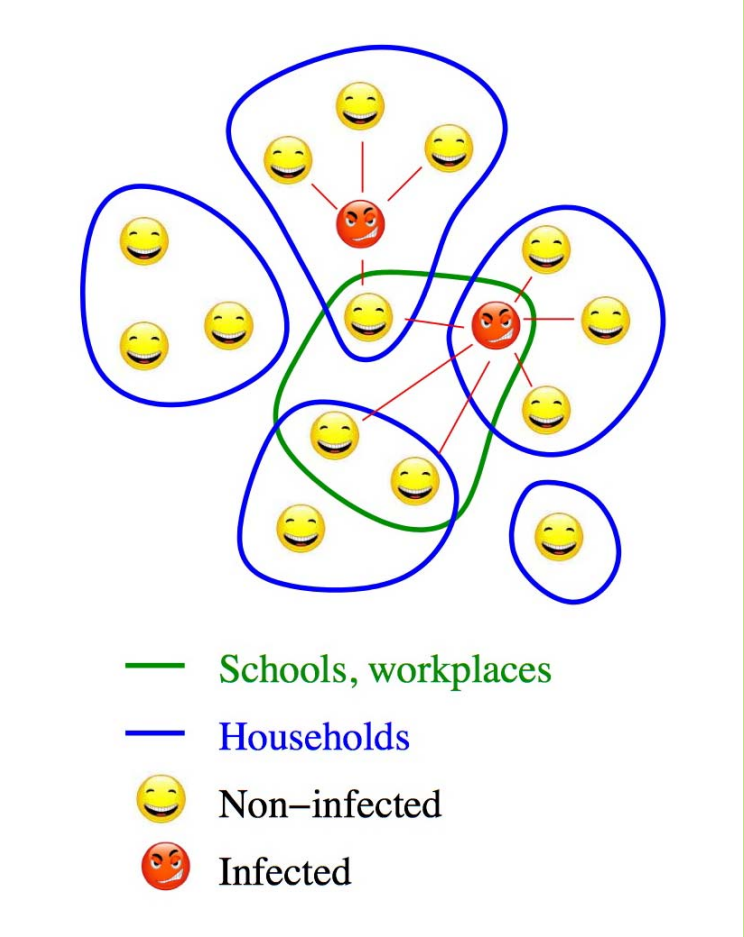


European-wide modelling

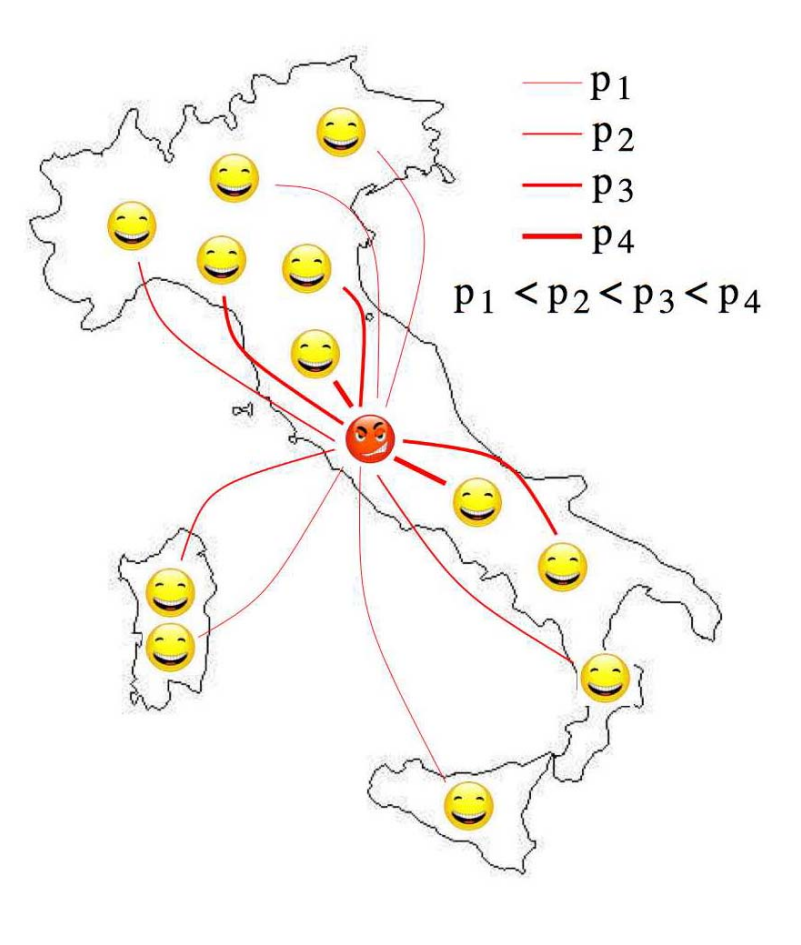


Structure of model

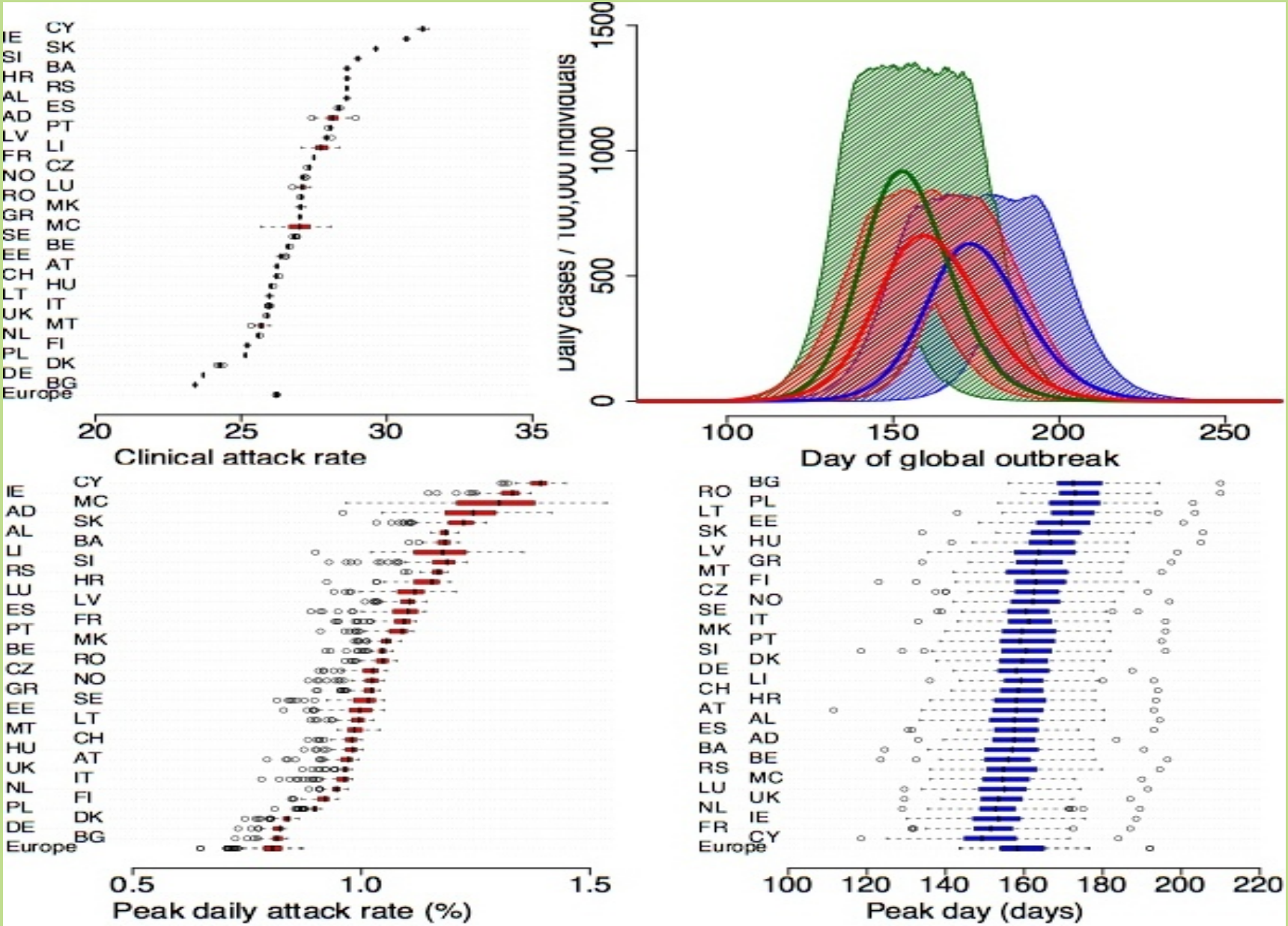
Household, school/workplace contacts



Community and travel contacts



Some results with R0=1.6

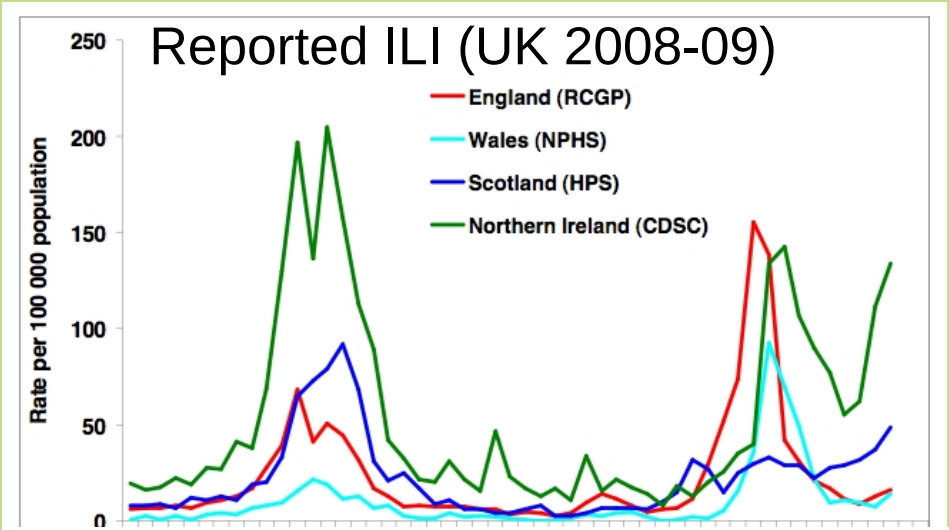


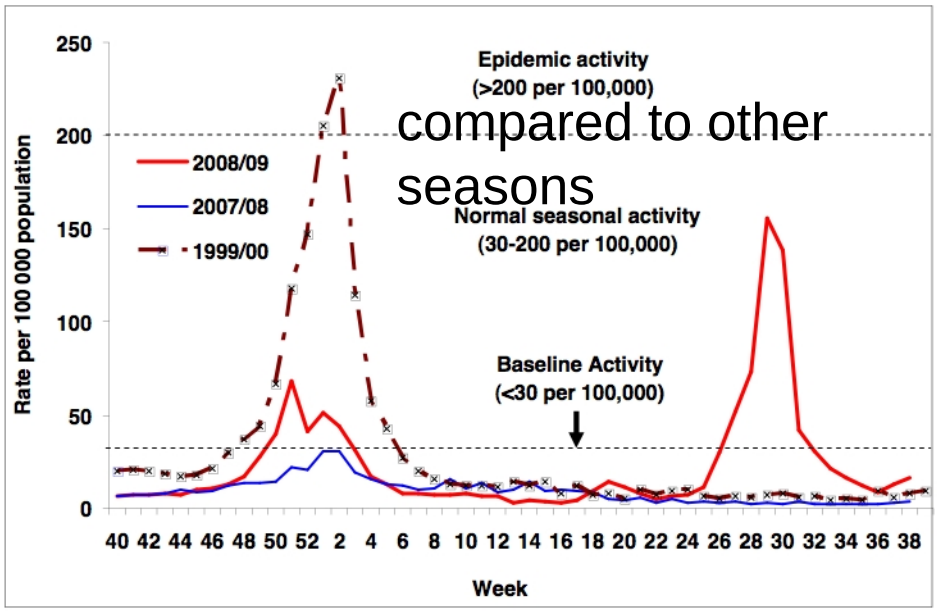
Main current activities

Big shift in focus after pandemic start:

- analysis of **early epidemic** in UK and NL;
- analysis of **household transmission** in US: SAR strongly dependent on household size; susceptibility: children = 2* 19-50 = 2* 51-+;
- estimation of **transmission parameters for Southern Hemisphere** country epidemics;
- modelling **reactive and local school closure**;
- estimation of **seasonal forcing** from seasonal influenza data;
- use of **serological data** to model seasonal flu;
- evaluating potential **impact of vaccination** strategies.

Analysis of early H1N1 epidemic





- computation of effective R over time;
- very strong effect of school closure;
- inference of age profile of susceptibility:

Potential effect of local and reactive school closure

- Spatial scales: school; UK district; region
- Length of closure: 1-2 weeks;
- Threshold for closure: 1-5-10% absenteeism.

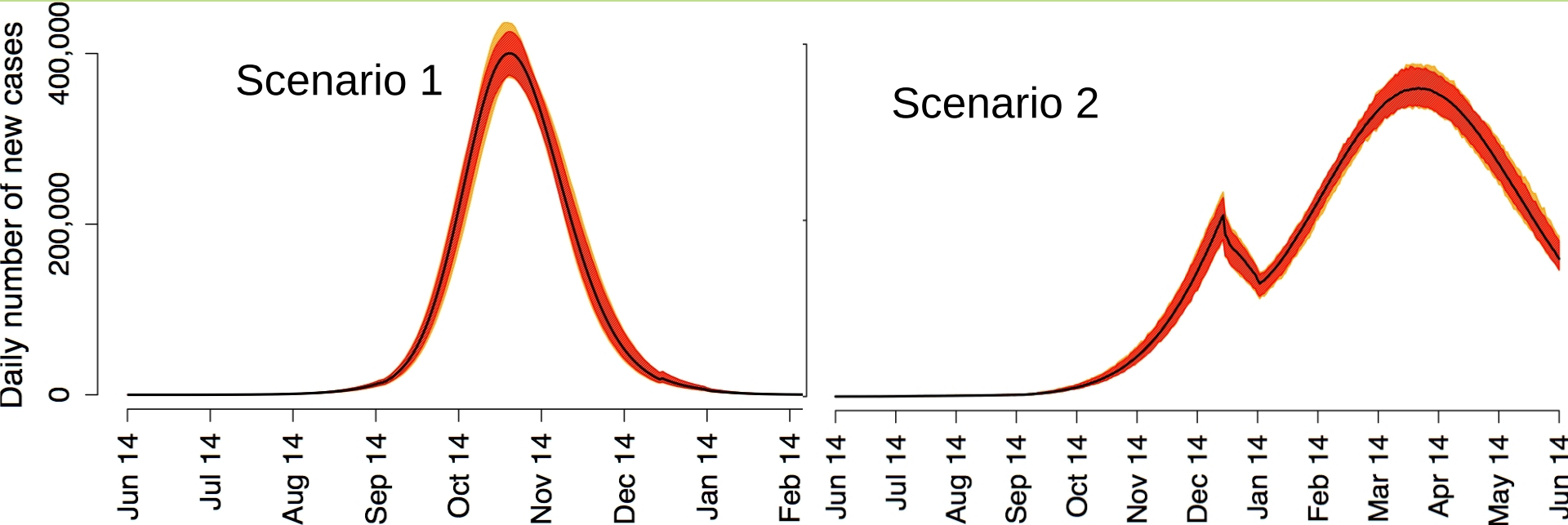
Closures of 1-2 weeks triggered at **district-level** when a proportion of schools exceeds a 1-5% threshold may work:
reduction of up to 30% in peak height, and **delay of the peak**.

Presumably, an unlikely option with a very mild pandemic.

Analysis of vaccination strategies

- Classes considered: essential workers; risk groups; age classes.
- Time of vaccine availability: October 15 - December 15;
- Time required for vaccine distribution;
- Number of doses available.

Results mainly depend on the assumed baseline



Conclusions

- FLUMODCONT project has provided a network of modellers and public health researchers, that has allowed exchange of information and ideas, has contributed to a first assessment of H1N! pandemic, and has given advice to policy makers.
  - Many of the partners are involved in the WHO informal modelling network, and in the ECDC modelling network.
- A quick assessment of the pandemic evolution is critical to update modelling plans. This will critically depend on a good collaboration with surveillance system, serological and virological studies, and with public health authorities.
- Post-pandemic analysis will definitely contribute to our understanding of the spread of infectious diseases, and to organize future plans.