The post-lockdown society: challenges of social and **mathematical** predictions

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Do you know who this is?

- Prof. Neil Ferguson
  - Mathematical epidemiologist at Imperial College London
  - Scientific Advisor to UK Government

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16 March 2020 *Imperial College COVID-19 Response Team*

Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand

Neil M Ferguson, Daniel Laydon, Gemma Nedjati-Gilani, Natsuko Imai, Kylie Ainslie, Marc Baguelin, Sangeeta Bhatia, Adhiratha Boonyasiri, Zulma Cucunubá, Gina Cuomo-Dannenburg, Amy Dighe, Ilaria Dorigatti, Han Fu, Katy Gaythorpe, Will Green, Arran Hamlet, Wes Hinsley, Lucy C Okell, Sabine van Elsland, Hayley Thompson, Robert Verity, Erik Volz, Haowei Wang, Yuanrong Wang, Patrick GT Walker, Caroline Walters, Peter Winskill, Charles Whittaker, Christl A Donnelly, Steven Riley, Azra C Ghani.

Prediction: based upon mathematical models

No action taken ⇨ 500.000 deaths in UK!

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MATHEMATICS

exponential growth

R_0

moving averages

flattening the curve

the R-number

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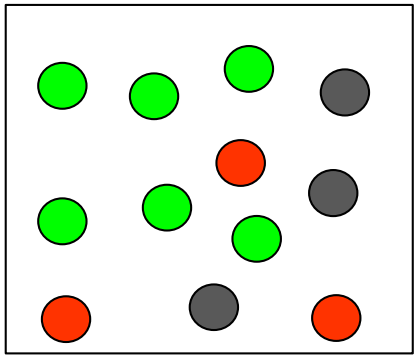
Underlying basic principles

- Two modelling approaches
  - Agent based



  - Equation based

$$\frac{dS}{dt} = -\beta SI$$
$$\frac{dI}{dt} = \beta SI - \gamma I$$
$$\frac{dR}{dt} = \gamma I$$

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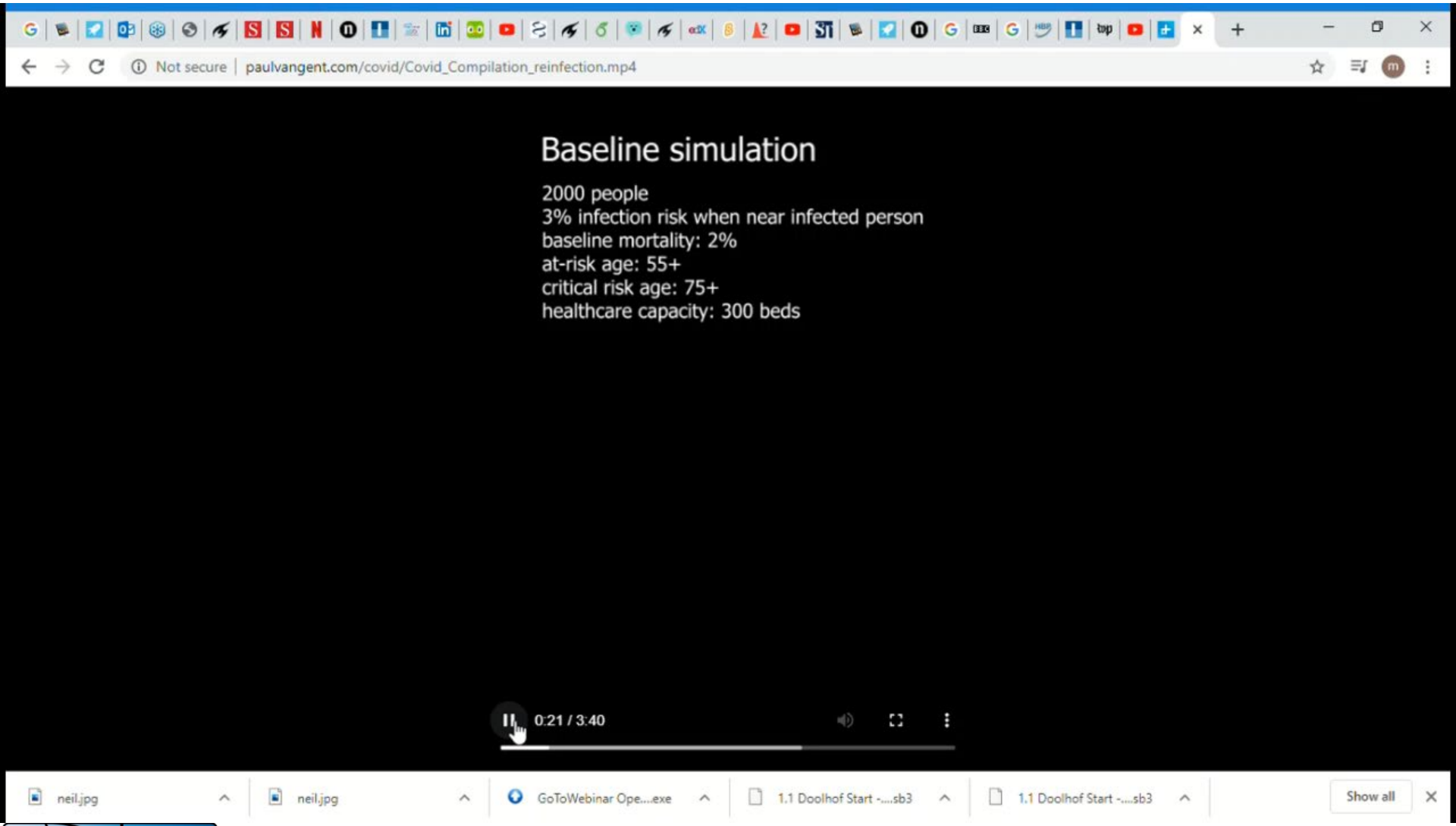
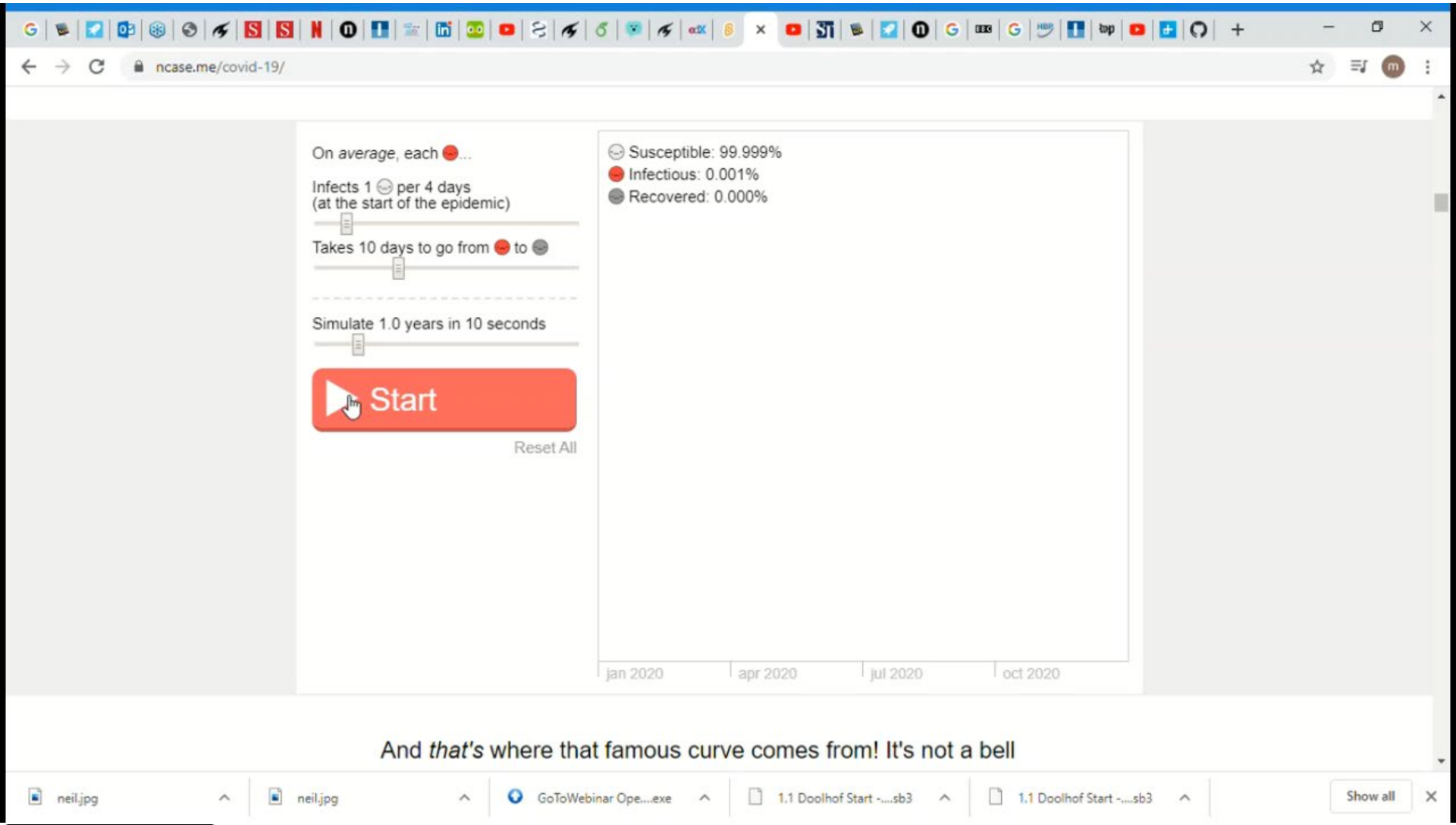
Some cool simulators: agent based



- **Paul van Gent:** post-doc at Faculty of CiTG
  https://github.com/paulvangentcom/python_corona_simulation

Some cool simulators: equation based



https://ncase.me/covid-19/

Equation based approach on networks

4th May 2020 *Imperial College COVID-19 Response Team*

Report 20: Using mobility to estimate the transmission intensity of COVID-19 in Italy: A subnational analysis with future scenarios

occur, the number of deaths averted is likely to be considerably lower in both scenarios. It should be noted that in our model we do not account for cross-region movement, which, given increased mobility, is likely to increase infections and subsequently deaths, in regions not experiencing major epidemics.

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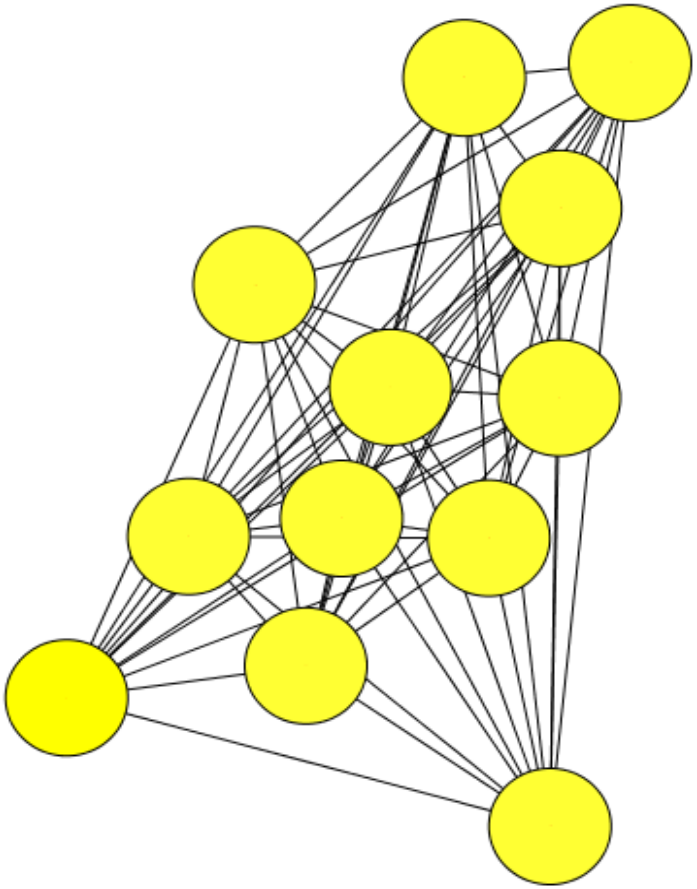
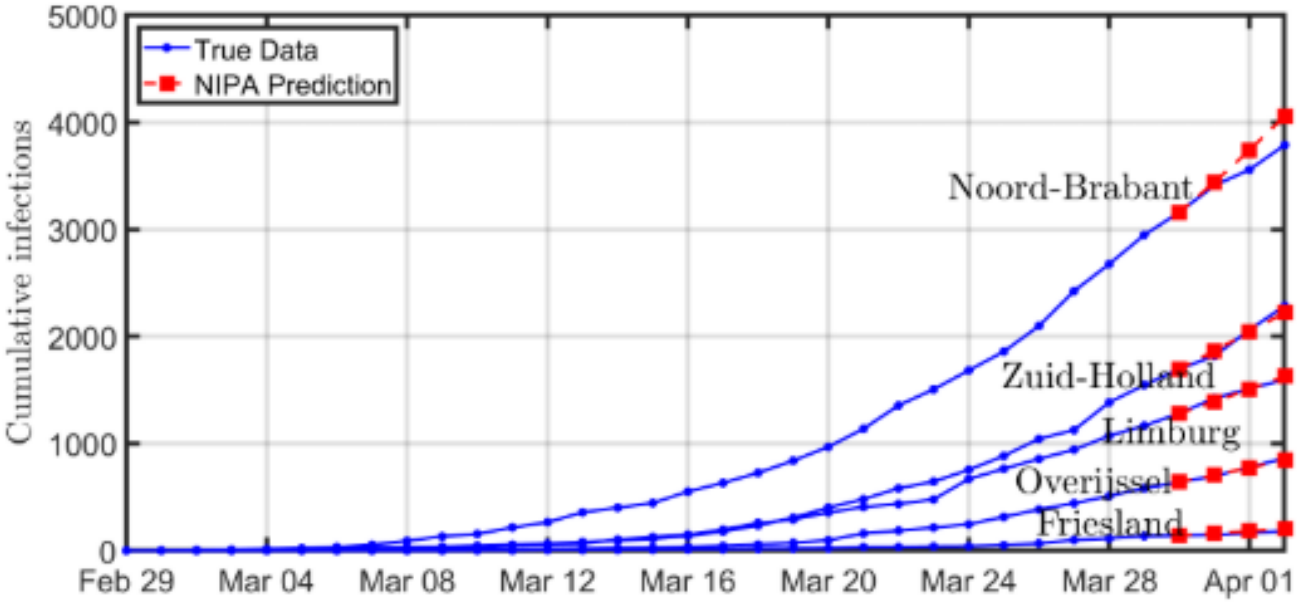
Equation based approach on networks



Equation based approach on networks

- NIPA = Network Inference-based Prediction Algorithm



- Apply NIPA to evaluate Exit Strategies

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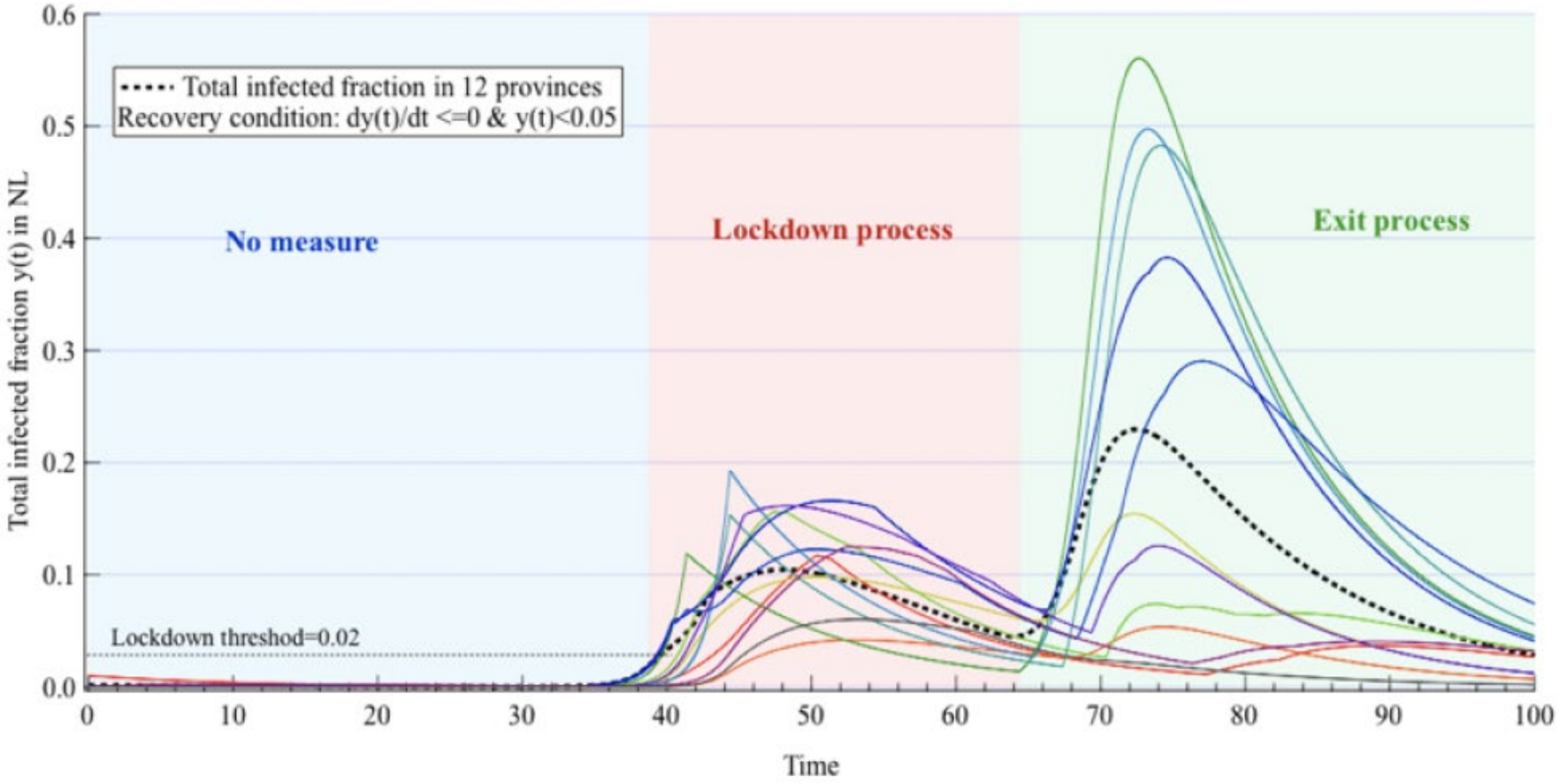
Equation based approach on networks



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Exit Strategies

- Relaxation of measures post-lockdown
  - public gatherings
  - school closures
  - social distancing
  - mobility restrictions
  - case-based measures

- Exit Strategy is combination of
  - Which measures?
  - When?
  - Where?
  - For whom?

Analysis Exit Strategies: uncertainty

- Availability and quality of data
- Duration immunity
- Seasonal variation
- Undetected cases
- Human mobility
- Adherence to post-lockdown measures

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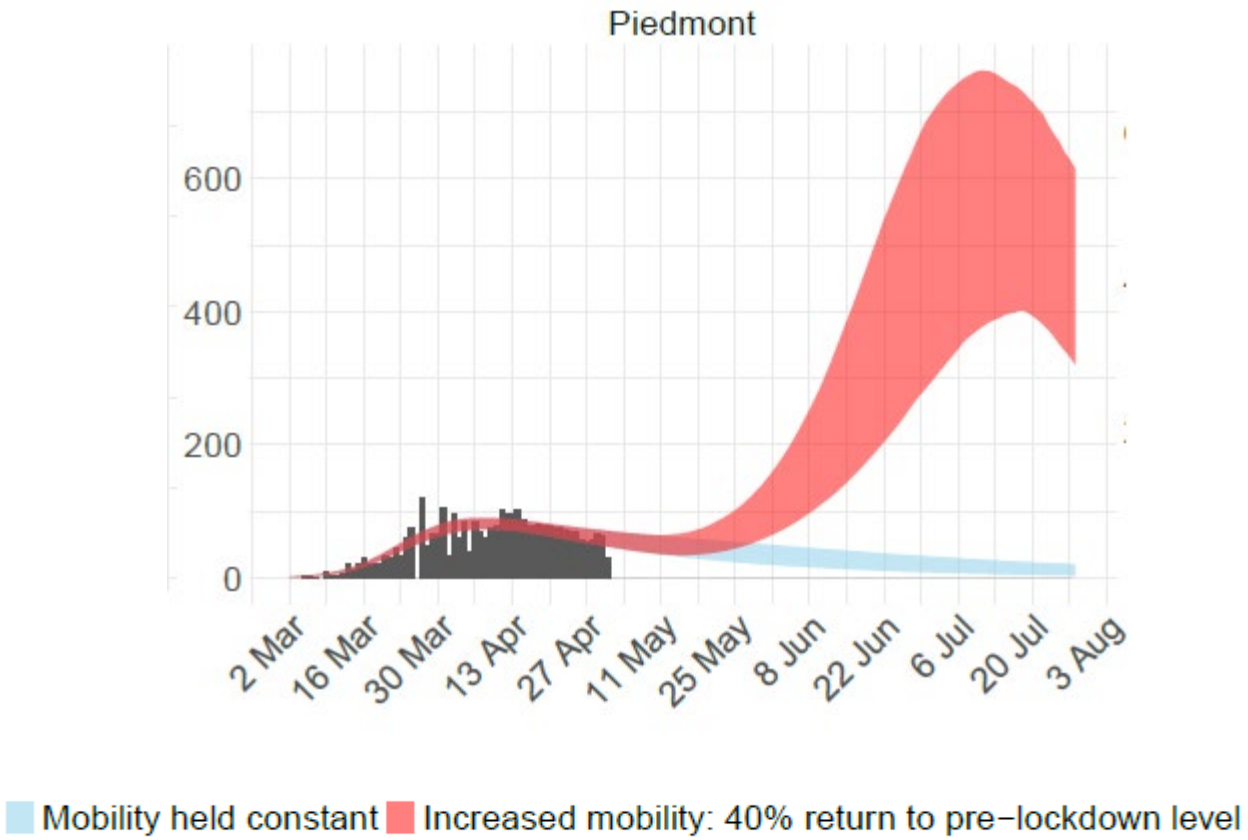
Analysis Exit Strategies: uncertainty

4 May 2020



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Analysis Exit Strategies: uncertainty

Virus spreading in public transport networks: the alarming consequences of the business as usual scenario

Published on April 30, 2020

Panchamy Krishnan
Postdoctoral Researcher at TU Delft

1 article ✓ Following

Panchamy Krishnakumari and Oded Cats, Dittlab | SmartPTLab, TU Delft

- Pre-corona demand:
  - 3 infectious travelers infect 55% of all travelers in 20 days

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Analysis Exit strategies

dr. Tina Comes

ESCAPE: **E**xit **S**trategies - **C**ombining **A**pproaches from **P**opulation behavior, mobility and **E**pidemiology

NIPA

DiTT Lab Data Analytics & Traffic Simulation

Lab Smart Public Transport

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