Something about Epidemiology

- Epidemics involve exponential growth
- $R_0$: Basic reproduction number
  - nr of persons that an infected person infects, on average
- Corona $R_0$: about 2.5 (maybe even 4)
- Social Distancing: getting $R_0$ down below one
The Crucial Role of Uncertainty

Phase transitions
(thanks to Bert Zwart, Bernard Zweers):
• 75% social distancing may imply ‘IC (intensive care) wards don’t fill up’
• whereas 70% social distancing may imply ‘4000 people in NL need to but cannot go to IC’
  • this means they’ll die
• …if $R_0$ is 2.4. If $R_0 = 3$ it is completely different again.

Play around with

[gabgoh.github.io/COVID/index.html](gabgoh.github.io/COVID/index.html)
Feedback Problem

- effect of measures only visible after 12-14 days. In mean time, exponential growth may continue
- …and when you see a change 12-14 days after the fact, hard to trace back what actually caused it
Corona is totally not like the flu!

• If everybody gets the attention they need, then like with flu, corona, while still substantially worse, mostly kills people that already had a very short life expectancy anyway (very old/ill)

• Unlike flu, $R_0$ and hospitalization rates incomparably higher, and high exposure means higher risk (doctors die!)

• …and if you need to go to hospital but can’t, you’re quite likely to die.
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- Unlike flu, $R_0$ and hospitalization rates incomparably higher, and high exposure means higher risk (doctors die!)
- …and if you need to go to hospital but can’t, you’re quite likely to die.
- Without sufficient social distancing, Corona very roughly adds about a year’s ‘normal’ nr of deaths (David Spiegelhalter BLOG)...but these would have come to us in the course of about 1 month
What to do now?

- Those who want to save all lives at all economic costs and those who fear a repetition of the 1929 recession (which arguably caused World War II) do agree on one thing: **herd immunity is not an option**
herd immunity is not an option

Simple back-of-the-envelope calculation shows this:

- At least 60% of population needs to be infected
- We have 2000 IC (Intensive Care) beds in NL
- People stay at IC around 3 weeks (or, let’s say we kick them out after 2 weeks…)
- % of infected people that need to go to IC = 2%.
- …so if you want to do this without IC overload you need…

...5 years?
**herd immunity is not an option**

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    - **5 years?**

**Quality Press**: “this is too complex for back of the envelope (BotE) calculations” **My response**: “you may not use BotE to conclude that something complex is right, but you can still use it to conclude that something complex is wrong!”
What to do now?

- Yet, question remains: how far should distancing measures go?
  - Again, uncertainty about something that grows exponentially fast…
- We can’t keep up with current measures for very long
- “Natural” Experiment: Sweden
  - What they did was irresponsible!
  - Yet still they might be getting away with it
- Of course NL situation very hard to compare with Sweden
Initiatives CWI ML Group

• Assist UMC Utrecht with Clinical Trials
• BCG vaccin has been in use for 130 years as vaccination against tuberculosis
  • side effect: generic ‘boost’ immune system
  • 1st trial (already started): does BCG reduce days-missed-because-of-illness (corona and otherwise) for hospital workers?

• 2nd trial: does BCG reduce hospitalization rates for elderly?
Trial 1: CORONA-BCG

- Coordinating PI: Prof. Dr. Marc Bonten
- Trial Statistician: Henri van Werkhoven
- 750 hospital workers get BCG vaccin, 750 get placebo vaccine. 9 hospitals take part
- Our Role (originally): can we stop early if results very convincing? can we continue experiment with more (> 1500) subjects if results promising but inconclusive? (“Safe Testing”)
- Rosanne Turner, Alexander Ly, Judith ter Schure
Statistici slaan landelijk de (virtuele) handen ineen voor de kwaliteit van klinisch onderzoek naar covid-19

De Vereniging voor Statistiek en Operations Research (VVSOR) en biostatistici van alle Nederlandse universitair medische centra, het Nederlands Kankerinstituut, de vele medisch-ethische toetsingscommissies en het Centrum Wiskunde & Informatica starten een initiatief om gezamenlijk de methodologische kwaliteit van Nederlands covid-19 onderzoek naar een (nog) hoger plan te tillen.

really Judith ter Schure,
board member VVSOR
PhD student CWI ML group