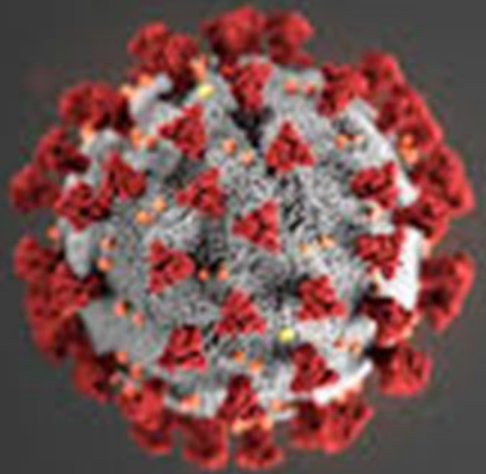
EpiPose project



Epidemic intelligence to minimize COVID-19's public health, societal and economical impact

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EpiPose project (non-exhaustive overview)

Data collection

Social contact patterns (in 20 European countries), health conditions, awareness, perceptions

Symptomatic surveillance (through InfluenzaNet), weekly reporting on symptoms and tests

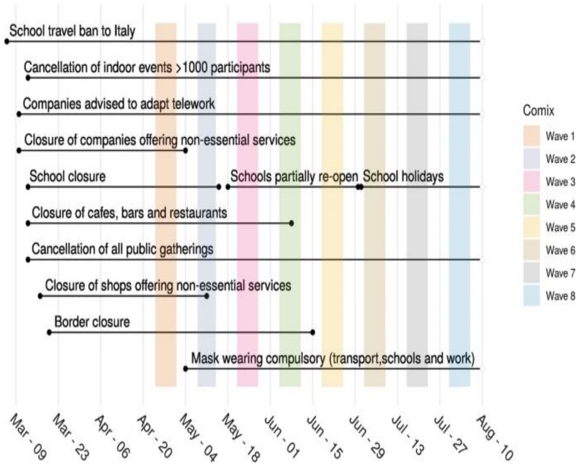
Epidemiological modelling

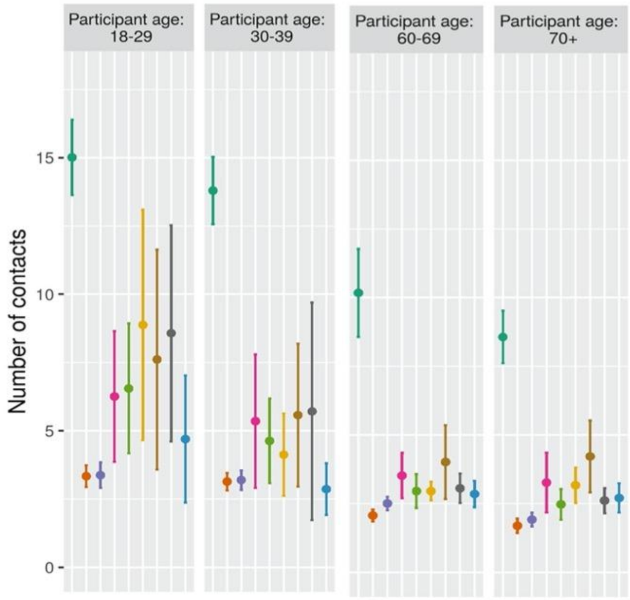
Epidemic nowcasting and forecasting to assess **key epidemiological parameters** in various countries and their change due to **intervention measures**

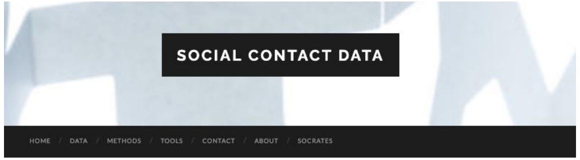
Health-economics and public health

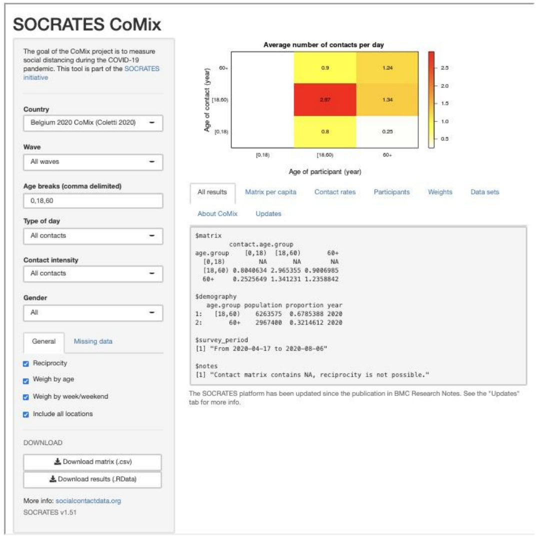
COVID-19 **disease burden** and health **costs**, **healthcare-pressure**, impact on financial markets and of cost-effectiveness of treatments when they become available.

CoMix: **comparing mixing patterns in the Belgian population during and after lockdown**









Transmission dynamics of SARS-COV-2 (Belgium)

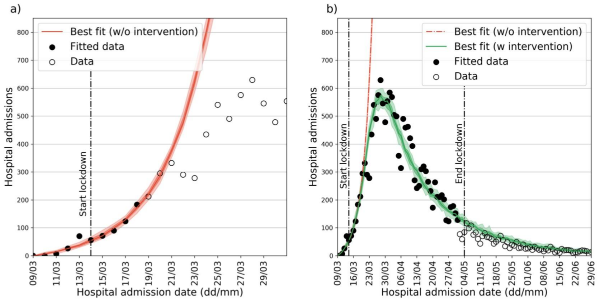


Figure 2: Parameter estimation and model fitting. (**a**): calibration of the pre-intervention phase. Data on hospital admissions is shown in comparison with the best-fit model. Black points are used to calibrate the model in the pre-intervention phase. (**b**): calibration for the intervention phase. Data on hospital admissions is shown in comparison with the best-fit model. Black points are used to calibrate the model in the lockdown phase. In both panels median curves are shown along with 50% confidence intervals (CIs; dark shade) and 95% CI (light shade).

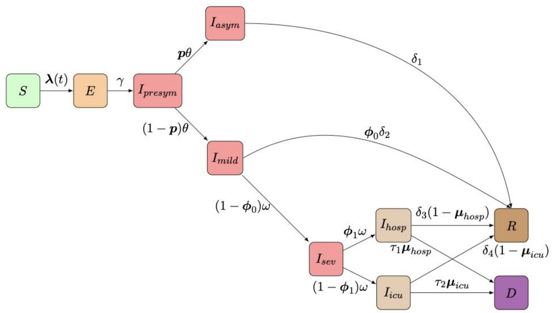


Figure 1: Schematic overview of the flows of individuals in the compartmental model: Following SARS-CoV-2/COVID-19 infection susceptible individuals (S) move to an exposed state (E) and after a latent period individuals further progress to a pre-symptomatic state (I_{presym}) in which they can infect others. Consequently, individuals stay either completely symptom-free (I_{asym}) or develop mild symptoms (I_{mild}). Asymptomatic individuals will recover over time. Upon having mild symptoms, persons either recover (R) or require hospitalization (going from I_{sev} to I_{hosp} or I_{icu}) prior to recovery (R) or death (D).

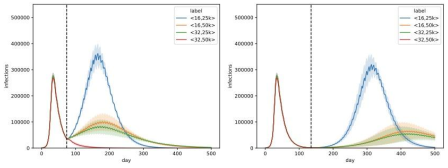


Figure 2: **Trends for pool isolation.** Trends for all combinations of parameters $\langle k, T_d \rangle$, for $\text{FNR}_{\text{PCR}} = 0.1$. Universal testing starts at the first of May (left panel) and the first of July (right panel). We follow the pool isolation strategy, where we isolate all individuals that are part of an infected pool. The curves show a line that depicts the average over the trajectories of the result aggregations and a shaded area that depicts the standard deviation.

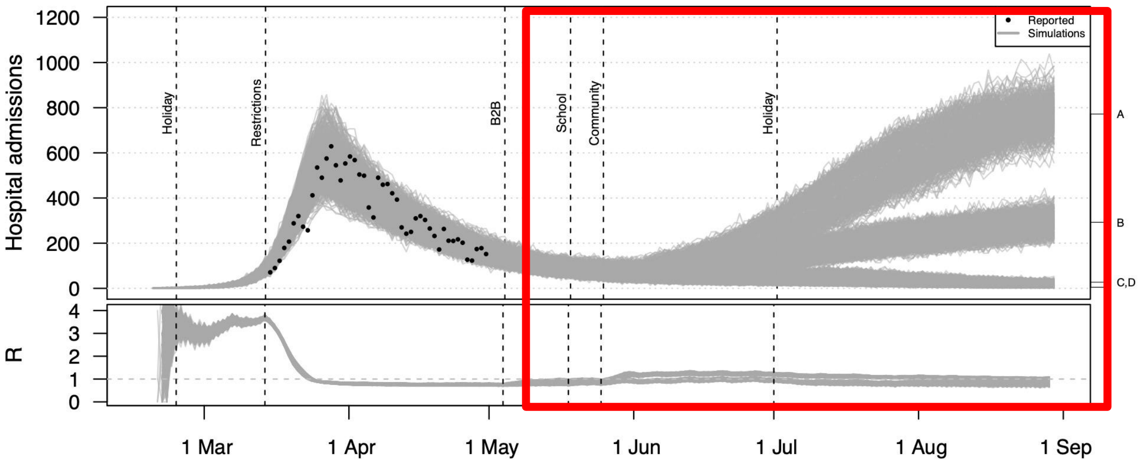
Meta-population model
⇒ social contacts, mobility, ...

Stochastic compartmental model
⇒ Serology, mortality, social contacts, (a)symptomatic, ICU, …

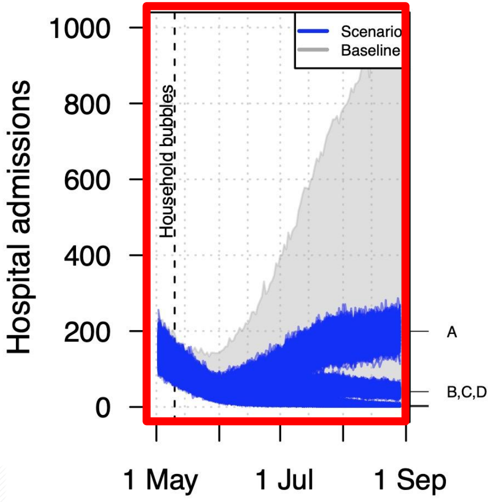
Individual-based model
⇒ universal testing, contact tracing, household bubbles, superspreading

Take home messages (non-exhaustive)

1. Model comparison and validation
2. Scenario analysis vs. prediction (w.r.t. transmission vs behaviour)
3. Network structure:



Deconfinement strategies with **open** contact networks



closed contact networks
(household bubbles)

References (this presentation)

- **Abrams, et al.** Modeling the early phase of the Belgian COVID-19 epidemic using a stochastic compartmental model and studying its implied future trajectories. medRxiv (2020)
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- **Coletti et al:** A data-driven metapopulation model for the Belgian COVID-19 epidemic: assessing the impact of lockdown and exit strategies. medRxiv (2020)
- **Libin et al.** Assessing the feasibility and effectiveness of household-pooled universal testing to control COVID-19 epidemics. Plos Computational Biology. (In press)
- **Willem, et al.** The impact of contact tracing and household bubbles on deconfinement strategies for COVID-19: an individual-based modelling study. medRxiv (2020)
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- ...

More info: EpiPose page at UHasselt website

www.simid.be www.socialcontactdata.org www.covid-hcpressure.org