COMORBUSS

A Bio-Social model for the design of Public Health Policies

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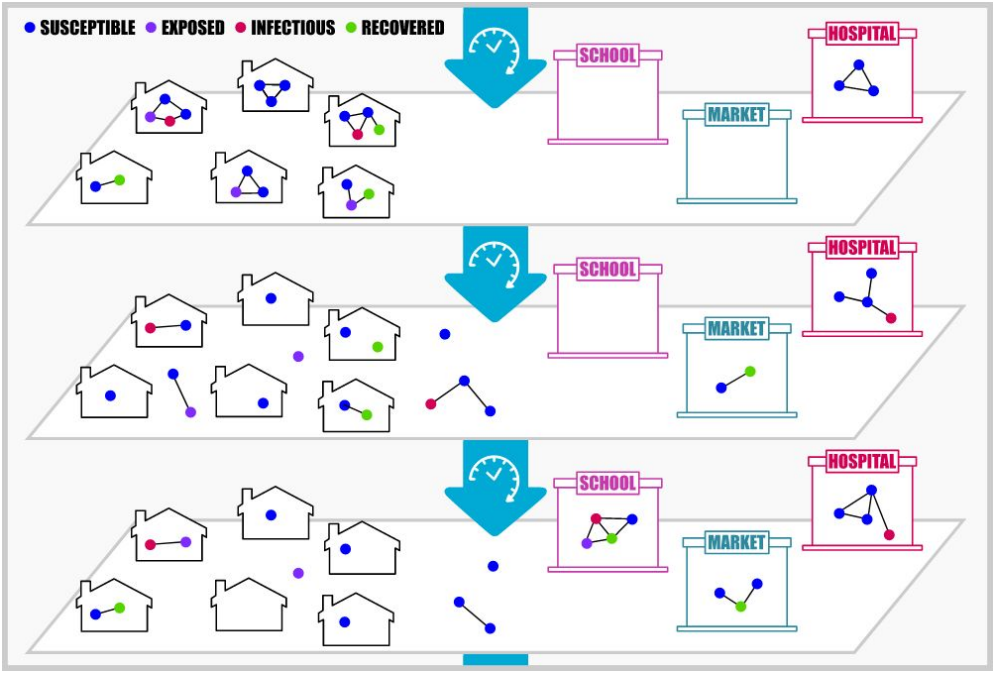
Modelling the COVID-19 pandemic: achievements and lessons
Royal Society & Isaac Newton Institute

COMORBUSS is a detailed agent-based model
WHAT SETS IT APART?

- Bottom-up model of social dynamics **based on description of city infrastructure** and average period of utilization by community;
- Encounters (and infection) happen organically as **agents live according to a stochastic model for behaviour**;
- **Contact networks** follow different architectures depending on locality, **respecting different social roles** of agents;
- Excellent **modularity**: we can easily add and mix features, e.g. different biological or infection models.

Can easily simulate other diseases and communities given necessary data!



We can simulate any type of Public Health Intervention

- Behavioral interventions;
  - Changes in pattern of utilization of services;
  - Changes in work relations;
  - Spontaneous events (shows, festivals etc.)
- Testing, contact tracing & quarantines;
  - Based on biological variables of agents and specifications of diagnostic tools;
- Changes in service infrastructure;
  - Restrictions or closures of services;
  - Changes in air-exchange rate;
- Non Pharmaceutical Interventions
  - Masks, based on aerosol transmission models
- Vaccine and drug testing and deployment

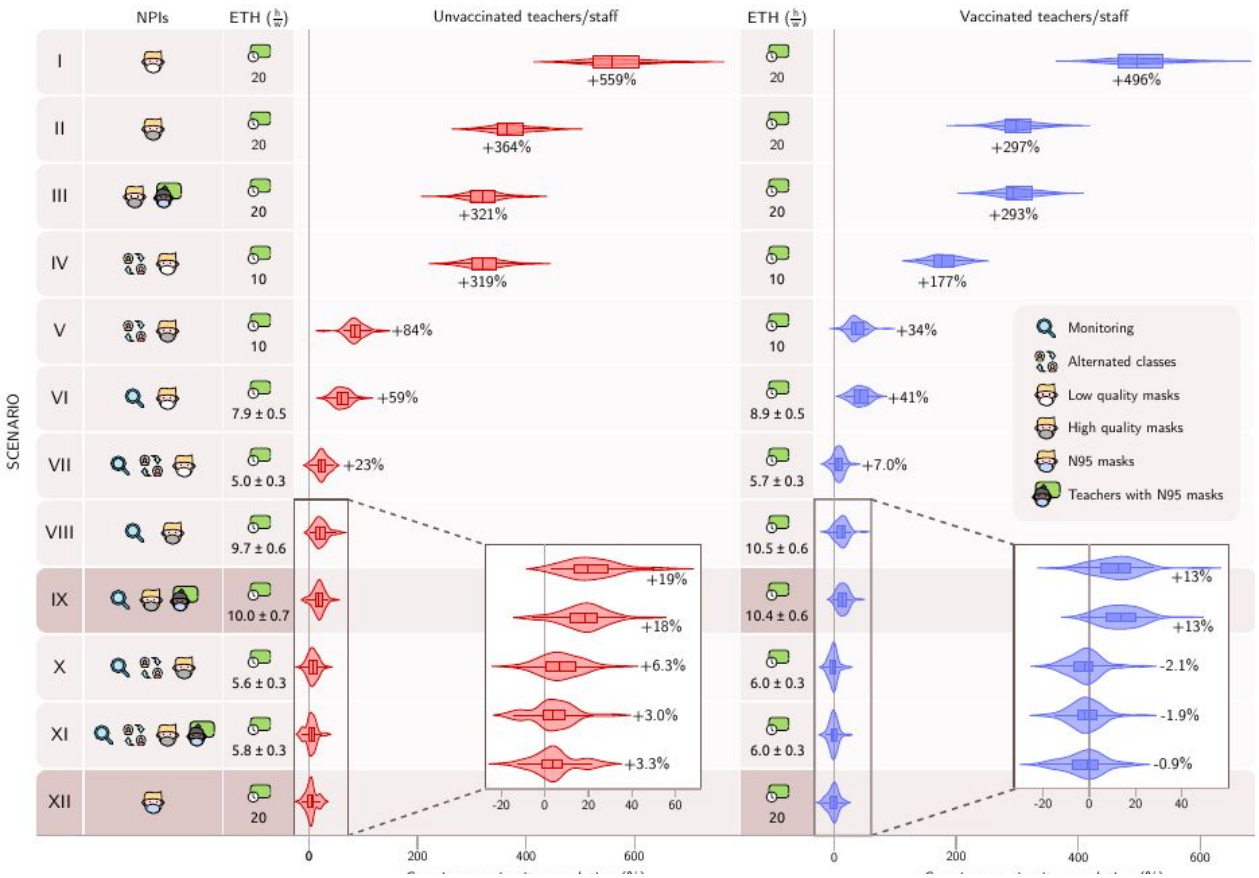
All interventions can be dynamic based on observable criteria!

NPI	Description
Reduced Workload	Schools function with shifts of two hours instead of four hours.
Alternating Groups	Schools function with reduced class sizes, and in particular classes are separated into 2 groups having in-person activities on alternate days.
Use of Mask	Low quality: $p_m = 0.5$ N95 or PFF2: $p_m = 0.05$ Good quality: $p_m = 0.3$ Teachers and staff with N95.
Active Monitoring	Schools function under the following measures: • Symptomatic people are tested; • If a case is found in a classroom, their activies are suspended for 14 days; • Students are tested and isolated (14 days) when they are symptomatic or a family member is confirmed positive; • Teachers which had contact with a classroom in which there were confirmed cases are tested and suspended for 14 days in the case of positive result; • School is closed for one week if there are two cases in distinct classes within a week.

We measure how much infections increase in the whole city using a specific scenario, compared to the case of keeping the schools closed.

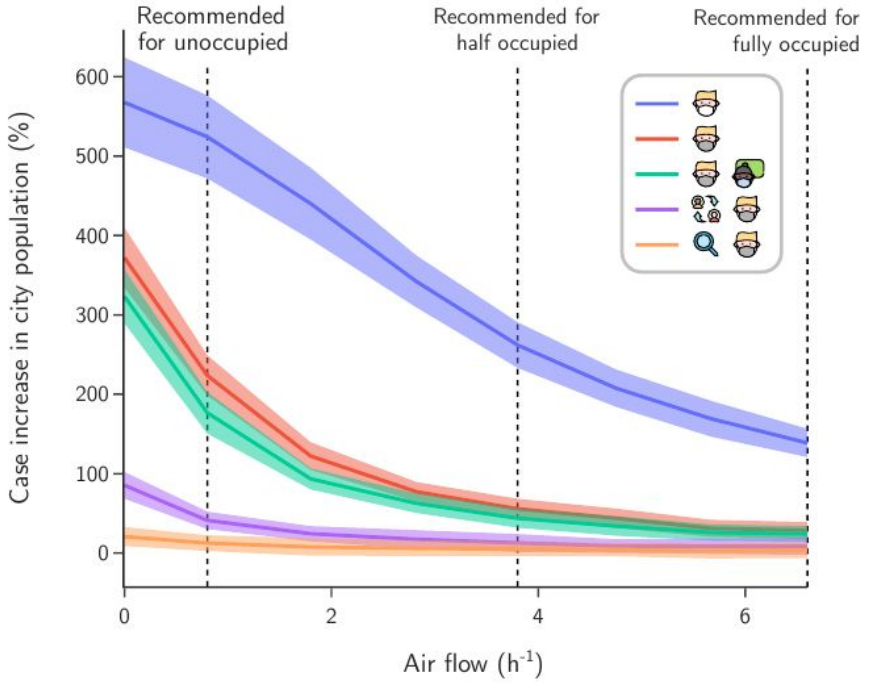
We also account the weekly Effective Teaching Hours in each scenario.

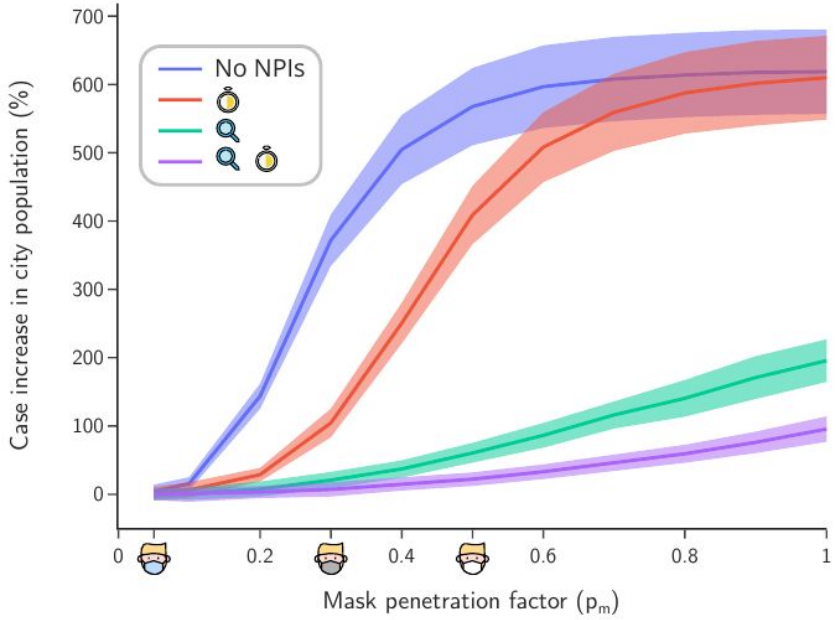
Safe activities are possible, provided the correct protocols are followed!



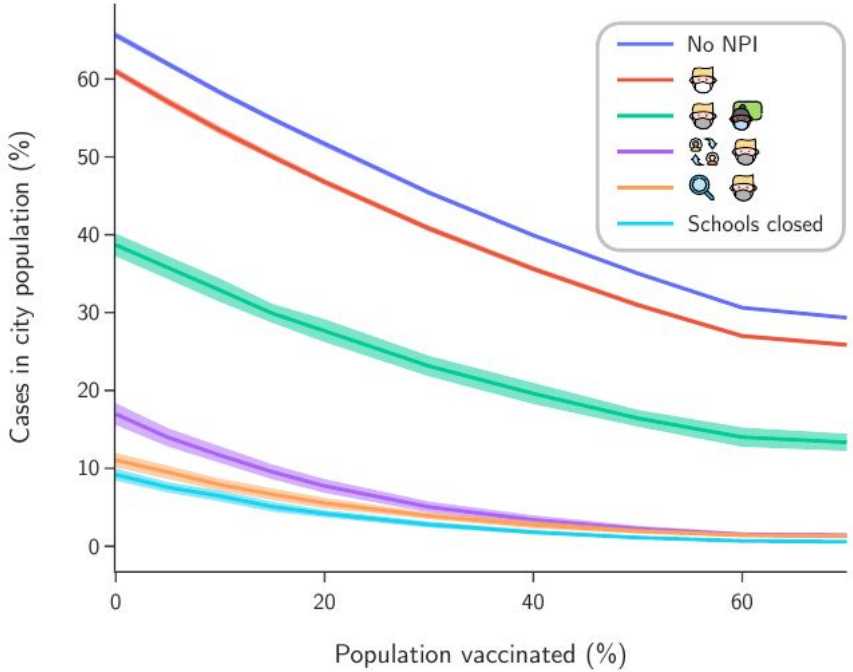
Application: Safe Protocols for School Activities

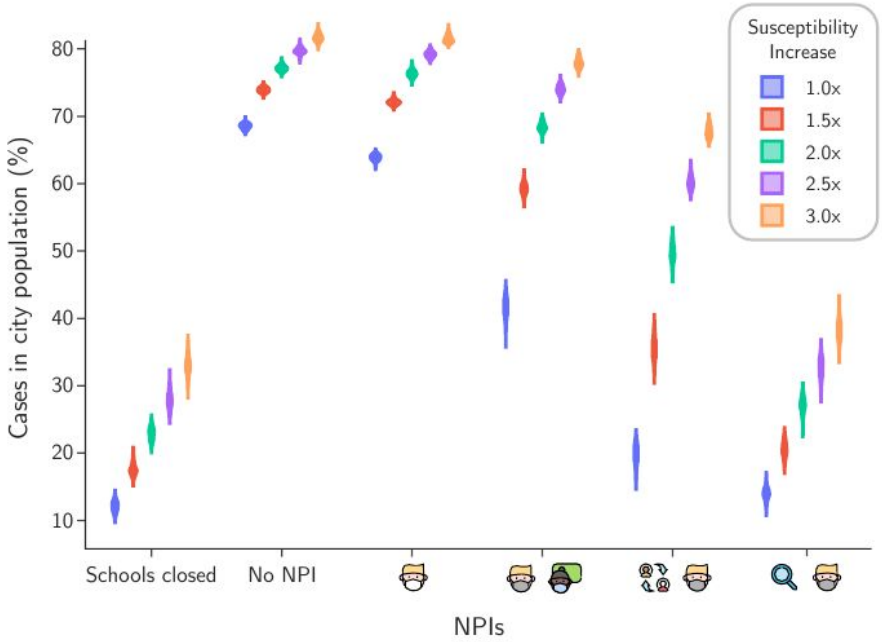
Robustness of Protocols with respect to changes in Classroom Airflow and Mask Quality





Robustness with respect to Vaccination Coverage and Susceptibility of population to Variants





Thank you!

GTG

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… and the rest of the ModCovid19 Team

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