A mobile app-based digital solution for contact tracing and control of the COVID-19 epidemic

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COVID-19 impact on ICUs
(Imperial report, Ferguson et al)

In this scenario, interventions can limit transmission to the extent that little herd immunity is acquired—leading to the possibility that a second wave of infection is seen once interventions are lifted.

Figure 2: Mitigation strategy scenarios for GB showing critical care (ICU) bed requirements. The black line shows the unmitigated epidemic. The green line shows a mitigation strategy incorporating closure of schools and universities; orange line shows case isolation; yellow line shows case isolation and household quarantine; and the blue line shows case isolation, home quarantine and social distancing of those aged over 70. The blue shading shows the 3-month period in which these interventions are assumed to remain in place.

Table 3 shows the predicted relative impact on both deaths and ICU capacity of a range of single and combined NPI interventions applied nationally in GB for a 3-month period based on triggers of between 100 and 3000 critical care cases. Conditional on that duration, the most effective combination of interventions is predicted to be a combination of case isolation, home quarantine and social distancing of those most at risk (the over 70s). Whilst the latter has relatively less impact on transmission than other age groups, reducing morbidity and mortality in the highest risk groups reduces both demand on critical care and overall mortality. In combination, this intervention strategy is predicted to reduce peak critical care demand by two-thirds and halve the number of deaths. However, this "optimal" mitigation scenario would still result in an 8-fold higher peak demand on critical care beds over and above the available surge capacity in both GB and the US.

Stopping mass gatherings is predicted to have relatively little impact (results not shown) because the contact time at such events is relatively small compared to the time spent at home, in schools or workplaces and in other community locations such as bars and restaurants.

Overall, we find that the relative effectiveness of different policies is insensitive to the choice of local trigger (absolute numbers of cases compared to per-capita incidence), $R_0$ (in the range 2.0–2.6) and varying IFR in the 0.25%–1.0% range.
Why digital solutions?

Tools of classical epidemiology against COVID-19:

- **Physical distancing/isolation/quarantine**
  - Either insufficient or high social & economic costs
- **Mass screening/testing + contact tracing**
  - Hard to scale for a rapid response (HR, manufacturing)
- **Vaccination**
  - Development/trial phase + time to scale production

Alternative digital technologies are needed for a **fast, scalable** response
A mobile app for instant contact tracing

Subject A has COVID-19 infection. No symptoms

Day 1

Awakes with fever

Report symptoms
Request home test

Positive Covid-19

Automated test request
Self-isolate - 14 days

Advice on social distancing (lower risk contact)

Day 2

Instant signal

Decontaminate
Why instant contact tracing matters?

Pre-symptomatic transmission

Symptomatic transmission

About half of all transmissions are pre-symptomatic!

\[ R_0 = 2.0: \]

- \( R_p = 0.9 \) from pre-symptomatic
- \( R_s = 0.8 \) from symptomatic
- \( R_e = 0.2 \) from environmental
- \( R_a = 0.1 \) from asymptomatic
Why instant contact tracing matters?

*Isolation and contact tracing can stop the epidemic only with high efficiency and response times of < 24h*

Isolation and contact tracing can stop the epidemic only with high efficiency and response times of < 24h.
Useful at all phases of the epidemic

• Prevent initial spread

• “Smart lockdown” to keep to economy afloat

• “Smart exit” from lockdown to prevent a second peak

• Control residual spread
Challenges

• Limitations in smartphone coverage and contact technologies (low-power Bluetooth), possibly integration of multiple ones

• >50% uptake required

• Compliance with app recommendation to “stay at home” is key

• Scale-up of diagnostic testing across Europe is needed

• Some degree of physical distancing could still be required for the fast-growing European epidemic

• Iterative improvements of app back-end and front-end, as well as the science and technology behind the app
Ethical issues

- Building trust and confidence at every stage
- Privacy and data usage concerns at the forefront
- Adopting a transparent and auditable algorithm
- Careful consideration of digital deployment strategies to support specific groups, such as health care workers, the elderly and the young
- Deployed with individual consent
What can you do?

- This is not a single solution, must be part of an integrated strategy (with surveillance, geolocation, prediction etc)
- Widespread diagnostic testing is critical
- Physical distancing still important
- Please energise your government and partners to vocally support an app-based contact tracing strategy
Find out more here:

http://www.coronavirus-fraser-group.org