# **OPTIMISING THE EFFICACY OF TIME-LIMITED INTERVENTIONS FOR EPIDEMIC CONTROL**

## **DISCUSSION**

* In all intervention scenarios its better to be too long than too short (apart from scenario 3 and 4 where there is some sort of ramping back down allowed)
* It is overwhelming better to have too strict of an intervention than one that is too mild
* For time limited interventions it is unclear whether it is better to be too early or too late when applying the interventions in the conext of allowing natura/herd-immunity to cause epidemic decline, and in the context of timie limited interventions.

Need to replace all text with NPI not SDMs

**Aim of Paper/Chapter – Questions to Explore w/ Modelling**

* How can we best implement time-limited social distancing measure strategies?
* Does an optimum exist for “controllable” parameters?
* How much room for error is there with the optimums?

**Take Home Messages from the Results**

* The way you implement social distancing measure strategies has a significant effect on the resulting epidemic curve – both for single and repeated interventions.
* There is an optimum intervention trigger timing which can minimise adverse outcome measures.
  + However, this timing is very narrow and likely not realistic or achievable – small room for error.
* There is an optimum for the intervention strength and duration.
  + Generally, if non-optimal parameters are selected, it is better to be too strong and to introduce the intervention for too long than to do the opposite.
* The interplay between these “controllable” parameter matters a lot – changing one parameter can shift the optimum for another.
  + For example, the longer an intervention is extended, the more you can make up for having a non-optimal trigger point (in terms of minimising adverse outcome measures).
* The interplay for parameters controlling repeated intervention is also very complex.
  + Generally, the parameters controlling the 1st intervention are much more important (timing, length, R0 strength)
  + i.e – it is much worse getting the 1st intervention wrong than it is getting the 2nd intervention wrong.

Show that depending on whether you want to ramp up or ramp down the outcomes and the optimal points are extremely different

Scenario 5 is analogous to a mitigation scenario

A supplementary materials analysis will also be mentioned here. We explore what is causing the “dip and increase” dynamics we observe here. This will explore only one outcome measure – the Height of the 1st and 2nd Peak and for the sensitivity analysis relating to the trigger date of the intervention. We will have 5 plots for each scenario. This will explain that the dip is due to the 1st and 2nd peak “exchanging” maximum I(t) as the trigger point changes, with both peaks being somewhat equal in the “dip” in the main figure text. With the increase on either side relating to where one peak becomes larger than the other.

**Points for discussion**

1. What are the differences between strategies (the resulting epidemic curve) for the RWC parameter set that we’ve chosen?
   1. Describe peak dynamics and the cumulative incidence differences.
   2. What happens when we start exploring the parameter space (the “best” one was due to (accidentally) hitting the epidemic at the right time) – Justifies the use of a sensitivity analysis (not just using one parameter set).
2. Maybe mention the concept of peak dynamics – often interventions are thought to push back the epidemic curve – but here we demonstrate that if it takes too long to ramp up the intervention, the 1st epidemic curve still occurs (earlier – Intervention 4) and the 2nd peak is supressed.
3. Describe the concept of being “wrong” for the timing, length or strength of an intervention – (the increases either side of the “dip and increase” dynamics).
4. Explain the concept of a small “optimum” and that in reality this will be much harder to achieve in practice.
5. It is much better to aim for an intervention which gives you a “wider” room for error – not a sharp decrease in Figure 2.
   1. What intervention is the best for this?
6. Describe the real-life parallels of the 5 strategies? Are they all actually viable in practice?

**Caveats**

1. Obviously a VERY simple model, does not describe age heterogeneity or super spreading or anything like that (Gomes paper).
2. If we don’t use a SEIR - talk about in real life there is a delay between the intervention and the effect on the epidemic curve
3. Very difficult to assign a quantitative number to the “magnitude of any intervention
4. Only considers lifelong immunity
5. Downsides to not “parameterising” the model with data
6. No deaths in the models
7. We do NOT aim to predict anything – this looks at the dynamics of social distancing measures. We do not consider that the effect of any other intervention (contact tracing) which may prevent an increase in cases after the cessation of social distancing measures.

**Additional Points**

Interesting to place this study in the context of not just deliberate differences in intervention strategies, but also the effect of human behaviour. An intervention such as lockdown might aim for a constant reduction in transmission. But human behaviour over time (lockdown fatigue) might cause a constant reduction to slowly creep and become less effective. You essentially transform one intervention scenario into another.

This analysis is probably applicable to any immunising human-to-human transmittable viral infection.

Things to Talk to Bram About

**Final Message of the Paper**

I’m not 100% sure about advertising the paper as an alternative to hit it hard and hit it fast because our approach relies on a number of caveats – so its only good to hit it hard and hit it fast in the context of the paper (time limited SDM) and no further intervention

Also for many of the scenarios the optimal parameter space is extremely narrow – you cannot really hope to optimise this since you don’t really know the true number of infections, exact strength of your intervention or anything – I guess my point is that this window is very narrow and the sweet spot is very difficult ot hit in practice

Maybe that there is an existence of a sweetspot? But its very difficult to hit and if you are not sure then maybe it might be better to just do it earlier

Also depends on your aim – if you rely on herd or natural immunity to cause the epidemic decline then