

Review of the manuscript

“*Bayesian investigation of SARS-CoV-2-related mortality in France*”

by Louis Duchemin, Philippe Veber, Bastien Boussau July 2, 2020

<https://www.medrxiv.org/content/10.1101/2020.06.09.20126862v2>

The manuscript “Bayesian investigation of SARS-CoV-2-related mortality in France” (version uploaded on July 2, 2020 to medRxiv) is a nice piece of work which analyses the French situation with respect to the current pandemic and the consequent effects of the relative confinement measures taken by the French government.

It builds on the Bayesian approach proposed by Seth Flaxman et al, recently published on Nature. The authors of this manuscript apply Flaxman approach for investigating the impact of the national confinement measures on the 12 mainland French regions and Corse. France held nation-wide municipal elections on March 15th, while different European countries were already taking restrictive measures, for instance Italian lockdown started on March 10th. Therefore the choice of holding elections has been an important debate in France and generally discussed on European news.

The authors calibrate the model on the data reporting the covid-related deaths in French hospitals. They estimate the temporal variation of the parameter R_t and analyse the impact of the lockdown, the election day and the week-ends on death numbers. Interestingly, their results indicate that elections did not have a noticeable impact on the virus-related deaths. On the other side, week-ends, characterised by fewer people at work, neither had a substantial impact on decreasing the epidemic.

In general, I think this work is interesting and it reads generally quite well. In the following, I leave some minor comments and questions for the authors.

1. On Section 2.1.1: As one can see from Flaxman et al, the reason why the *infection-to-death* is modelled as a sum of two gamma distributions is because *infection-to-death* is seen as *infection-to-onset* plus *onset-to-death*. However I think that this point should be stated in a clearer form.
2. Section 2.1.2: in the equations (1), (3), (5) μ_m should be $R_{t_0,m}$, with t_0 being the day at which lockdown is imposed. It would read better if the authors state this clearly.
3. Still on Section 2.1.2 (and also section 3.4): I think that, while the basic model is well introduced and one can easily refer to Flaxman’s work, mixture models are not well presented. I suggest the authors to explain them in a clearer way, maybe just expanding Section 2 of the Supplementary material. I would also suggest to add some references.
4. Section 3.1.1, sentence “*This likely results from under-reporting on week-end days, and is not handled explicitly in the model*”: why should hospital deaths be under-reported during week-ends? Please explain.
5. Caption of Figure 2: it might be clearer if the authors refer to the equation for $D_{t,m}$ at the end of page 4 when describing that dashed lines indicate the predicted number of

deaths.

6. Section 3.1.1, period *“For instance, the model estimates that in total there had been 6231 deaths in region “Ile de France” when all the data up to May 11 is used, 6502 deaths when the data stops one week before May 11, 6829 deaths when the data stops two weeks before May 11, and 5894 deaths when the data stops four weeks before May 11”*: initially it seems that the number of deaths increases as more data are excluded, meaning

deaths(all data) < deaths(last week excluded) < deaths(last 2 weeks excluded)

However when 4 weeks are excluded (and we are still under lockdown) this trend is broken and the number of deaths is smaller than the number of deaths using all the data. Can the authors provide a justification for this? Does this mean that in the last 4 weeks something did not work very well?

7. Still on Section 3.1.1, data points used in the estimation process are called prefix, but, for a better readability, I would suggest to initially introduce this term.
8. Still on Section 3.1.1, at the beginning of page 14 I do not find the text *“(9750 and 7300 deaths out of 9834 and 7824, respectively)”* very clear to me.
9. Section 3.2.1, sentence *“They reveal that a R_t fold change of 0.75 seems necessary for it to have a detectable impact on the number of deaths”*: try to expand and explain this concept in a clearer way.
10. Section 3.2.2, sentence *“Fig. 7 shows that the resulting posterior of R_t looks very similar to the posterior obtained without accounting for behavioural changes on week-ends”*: indeed the two graphs look very similar, but how do numbers change?
11. Section 3.3.2: a very important result is presented, but I think it should be supported by some ideas. For instance, masks were mandatory? Was safety distance applied? How was the voter turnout?
12. Section 3.4 parameters α_1, α_2 are elsewhere indicated as α^1, α^2
13. Some questions about the data:
 - Is it possible that different regional health systems have different reliability in reporting covid-related deaths?
 - In the discussion there is the sentence *“These mortality data are incomplete, as they only include the numbers of deaths in hospitals of patients positive for the virus”*: I was wondering how the testing was conducted, for instance, were all deaths in hospital tested against the virus?
14. I think it might be useful to show a map of France including all the regions, indicating the population density (for example as a heat map) and the estimated R_t . In addition, Ile-de-France is never mentioned to be Paris region, which I think it is important to remark.

15. Discussion section, sentence "*We find reproduction numbers in our results are virtually unchanged by this scaling of the IFR*": I would suggest to show this in the supplemental material.
16. Check hyperlinks, since these are not always working, especially when referring to figures in the supplemental material. As well check the References section.