26 June 2023

Dear Epidemics: Special Issue Editors,

We are happy to share our article, “Characterising information loss due to aggregating epidemic model outputs”. We investigate different methods of collecting output from epidemic models in order to compare projections from multiple models, with respect to the potential for information loss. Specifically we explore the effect of collecting simulated trajectories from each model, compared to individual models’ probabilistic quantile intervals. We identified information losses in terms of key epidemic quantities, uncertainty in an ensemble, and evaluating performance over time.

We found that by collecting individual simulated trajectories, as opposed to collecting quantiles at each time point, we were able to show key epidemic characteristics, such as trajectory shapes, peaks, and cumulative total burden. We also observed that the sample of trajectories contained a right-skewed distribution which was poorly summarised by an ensemble of quantile intervals. Further, we evaluated the performance of each trajectory against observed data over time, observing wide variation in each trajectory’s predictive performance. An ensemble of simulated trajectories weighted by past predictive performance substantially narrowed the range of plausible future incidence with increasing amounts of data, excluding some epidemic shapes altogether.

We suggest that understanding the potential sources of information loss in collecting multiple model projections may support improving the accuracy, reliability, and communication of collaborative infectious disease modelling efforts. The importance of different types of information losses may vary depending on the aims of the collaboration, with less impact on absolute short term predictions compared to assessing threshold risks and longer term relative uncertainty.

We believe this article falls within scope for the Epidemics special issue covering the US Scenario Modelling Hub. We use projections from the European Scenario Modelling Hub, with co-authors including all who contributed projections to the results analysed here. This makes the comparison of data collection from multiple models directly comparable to the US Scenario Hub, and our broader findings are likely to be of interest to all involved in developing and evaluating multi-model collaborations.

Yours sincerely,

Katharine Sherratt, Sebastian Funk, on behalf of all authors