WORLD VIEW

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How you can help with COVID-19 modelling

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Many physicists want to use their mathematical modelling skills to study the COVID-19 pandemic. Julia Gog, a mathematical epidemiologist, explains some ways to contribute.

Credit: Marisa Crimlis-Brown

While the COVID-19 pandemic continues its global devastation, the instinctive reaction from scientists is "how can we help?" I will try to answer this in general terms for colleagues with expertise in mathematics and modelling, but who may have little or no prior experience with infectious disease modelling.

Clearly, the set of things that would not help includes rediscovering results that disease modellers have known for decades — or for more than a century in the case of some things circulating now as if they are new ideas. Nor would it help to send your first attempts at running the classic susceptible–infectious–recovered (SIR) epidemic model to your local epidemiologist, who already has an e-mail folder full of 'my_first_epidemic.xls' from well-meaning friends and also a small outbreak of plots from correspondents who have just discovered the log-scale option. But, then, the question is how to usefully contribute. Here are some immediate options.

Signal to noise

Rather than adding noise, amplify the signal. The number of documents appearing on preprint servers is more than anyone can physically read, let alone the additional files being e-mailed and shared around. Perhaps you could contribute to sifting what is out there. For example, when different approaches give different results, you could attempt to identify exactly what is behind the divergence. When you see something particularly useful that has been overlooked, please help by distilling the key message and telling others about it — whether you do so by telling colleagues around you, sharing via social media or other routes. Alternatively, you could work with others to compile summaries and digests of what is out there with respect to some part of the data, models or results. If you have enough experience in the area, you could help address the need for more peer reviewers for COVID-19 work of all kinds. Research is being completed under immense time pressures, and preprints are being shared rapidly so they can be used by others and contribute quickly to policy decisions, but it remains as important as ever to maintain the quality and integrity of academic publishing, even during this unprecedented time.

Communicating to the public

The world wants to know what the science is behind the decisions, but there is great danger of misinformation when media interest is amplifying the voices of scientists, but not necessarily those most qualified to comment. You can learn the mathematical and scientific ideas from the broader literature, including some great textbooks. (Real-time papers are aimed at colleagues who know the literature already; reading only these will not be enough to get you up to speed.) If you have energy and time, share what you learn with people around you — and the wider public, if you have that gift. Communicate the ideas behind the models, the dynamics of epidemics, the explorations of control measures and the challenges of synthesizing data in real time. The mathematically literate community can identify and explain the dangers of overly simplistic readings of the raw data. For example, early in the epidemic many websites and media outlets reported the infection fatality ratio by dividing the current number of deaths by the current number of confirmed cases, even though it is known from previous epidemics that this naive approach is flawed. There will be other instances in the coming months for which the 'obvious' approaches are misleading, but their shortcomings might not be apparent to the general public. And, importantly, those with expertise in any modelling (in any area) can help communicate the limitations of modelling — it is not actually magic — and the ideas of uncertainties in predictions.

Contributing to research

Although your instinct may be to start your own models from scratch, or even immediately replicate all results as they are published by others, doing so is unlikely to be a practically useful contribution unless you already have some knowledge and experience in disease modelling. Researchers with this background do not have capacity at the moment to train up others one-to-one, but perhaps as the need for training and the will to help becomes clearer, new resources will appear in coming weeks. In addition, keep your eyes open for consortia starting to coordinate available expertise (such as RAMP), and join in anything you can.

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My hope is that the epidemic modelling community will learn to reach out to wider groups with questions and specific challenges, as we find the bandwidth to do so and when we know there are groups of people who are able to help.

Recommendations for further reading

These are not specific to this outbreak, but will help you navigate to the research front of the busy field of epidemic modelling.

In 2013 we held a landmark programme on infectious disease dynamics at the Isaac Newton Institute for Mathematical Sciences, Cambridge, UK. An outcome from the programme was a review on the state of disease modelling, and its interface to public health (H. Heesterbeek et al. *Science* **347**, aaa4339; 2015), written by a world-class group of researchers.

As part of the programme, we also set out key challenges in major areas of infectious disease dynamics, which are presented in a series of papers in a special issue of *Epidemics*.

The recent and ongoing work from my research team: the BBC pandemic project, which was part science communication via TV programme, but also a massive citizen science project, collecting detailed data on how people in the UK move and mix. The model behind the broadcast (P. Klepac, S. Kissler & J. Gog. *Epidemics* **24**, 49–59; 2018) was calibrated for a 'reasonable' set of parameters for pandemic influenza in the UK.

My colleagues and I are now working to process and share output from the BBC Pandemic project in forms useful for current needs (P. Klepac et al. Preprint at *medRxiv* https://doi.org/10.1101/2020.02.16.20023754; 2020), starting with the detailed mixing matrices. These characterize the number of interactions between people over a day, and who these people are (for example, by age) and in what context (for example, at school); these results are already being used in COVID-19 modelling.

Competing interests
The author declares no competing interests.