Australian COVID-19 Modelling Initiative (AUSCMI) submission to the Australian COVID-19 Response Inquiry

We write on behalf of the Australian COVID-19 Modelling Initiative (AUSCMI) to contribute to the COVID-19 Response Inquiry. AUSCMI is a broad collective of expert researchers, epidemiologists, and modellers focused on modelling infectious diseases dynamics that is not formally constituted. We met throughout the pandemic to support coordination of Australian COVID-19 modelling for policy and disseminated our modelling research through various modalities, including a series of educational seminars to improve community understanding of infectious disease modelling. Our submission focuses on the role, impact and potential of modelling in policy, strategy and research. We provide related recommendations for improving Australia's preparedness for future pandemics. We note that several very important modelling-related issues fall out of scope of the review terms of reference, including sub-national and international coordination and long Covid.

1, Modelling involvement, transparency and reproducibility

Disease modelling can be a powerful tool for ensuring responses to emerging infections are evidence-based.[1-5] However, transparency is key to public acceptance and impact.[6] Australia has a breadth of modelling groups located across many institutions that possess a broad range of expertise. Different methodologies can increase confidence in results where conclusions coincide, provide complementary insights or identify areas of genuine epidemiological uncertainty. Although there is a tension between responding rapidly to a crisis and undertaking comprehensive analyses, there is scope to improve the collaborative involvement, scientific review, transparency and reproducibility of pandemic modelling for policy.[6]

Recommendation: Australia should adopt a collaborative approach to modelling at the national level, with at least three independent groups contributing to modelling for public health decision-making bodies. Where time constraints render it impossible for several groups to undertake independent analyses, such groups can still collaborate in the identification of questions to be addressed, interpretation of the implications of modelling results for policy and peer review. The UK's modelling consortium (SPI-M-O) provides one possible model to inform the construction of such a collaborative approach.[7] With the advent of the Australian Centre for Disease Control (ACDC) and regional cooperation built during COVID-19 period, there is the opportunity to extend modelling networks, which would facilitate collaboration and peer review.

2, National coordination

While acknowledging that the scope of this review pertains to the federal domain, Australia's response was characterised by key decisions being made across multiple jurisdictions. It is the federal responsibility to clearly articulate an overarching control strategy for all Australian governments to follow. Although national strategies were sometimes stated (e.g. aggressive suppression), in practice these were poorly defined and contributed to a lack of national coordination. A clear national strategy is critical to ensuring effective communication to the public of the rationale for implementing specific public health interventions.

Recommendation: Australia should clearly define the meaning of the terms used to define the possible strategies to be deployed in the event of a future pandemic. Each strategic option should be associated with a coherent epidemiological rationale and set of goals.

Implementation of the strategy should be supported by a national body of scientific advisors with broad representation.

3, Harmonisation of data sources for broader use

At the national level, comprehensive data were not widely available in useable formats to guide decision making. This was true for key epidemiological data (e.g. case numbers, tests, hospitalisations, vaccination distribution) and social mobility data (e.g. transportation usage) that supports modelling the epidemic trajectory. This made the development of models difficult and limited the capacity to model in real-time to only a few groups. Careful reassessment of disease surveillance activities and how these important data are collected, stored, aggregated and shared is needed. Whilst data privacy and the security of identifiable individual data are important, modelling studies (particularly those examining transmission at the population level) often require only aggregated, non-identifiable data. Ensuring data are consistently gathered and stored can facilitate later epidemiological data linkage studies, which are critical to accurately modelling emerging pathogens.

Recommendation: A national body, such as the ACDC, is essential to coordinate data collection, analysis, and publication. This body should ensure harmonisation of the fields for collection of data for all jurisdictions for central collation. Data should be made equally accessible to all reputable modelling groups seeking to undertake modelling for policy.

4, The importance of targeted and age-informed strategies

A critical feature of COVID-19, which modelling helped to identify, is its highly age-dependent severity[8] (also true of SARS) and the fact that children have lower transmissibility.[9] Public health strategies should have taken this into account from early in the pandemic, when this epidemiological phenomenon was first established. In particular, modelling highlighted the extreme risk to the elderly and the comparatively smaller benefit from interventions targeting children. Given these features, protection of the aged care sector should have been a major priority from the early in the pandemic. Although school closures may have been a necessary component of certain response strategies, public health and social measures that avoid concentrating harms in children should have been consistently preferred.

Recommendation: Pandemic policy responses should use modelling to inform an epidemiological understanding that can help to tailor strategic responses to the characteristics of the pathogen. This modelling-based understanding should be integrated with social, ethical and economic principles.

5, Social equity and cohesion

Multiple modelling groups identified social inequalities as a significant epidemiological factor in the epidemiology of COVID-19. In particular, risk factors for infection and severe outcomes often clustered with employment status that made it more difficult for individuals to protect themselves against infection.

Recommendation: Mitigation of pandemic risk should be one of several arguments considered in ensuring governments pursue policy that maximises social equity and cohesion.

6, Interpandemic preparedness and evaluation

Pandemic risk must be recognised as a standing threat. It is not a question of if but when the next pandemic will occur. As one component of broader pandemic preparedness, future investment in the systems, structures and frameworks that support the development of

modelling capacity in Australia is key. Modelling should be undertaken now to explore hypothetical pandemic analyses before new pathogens emerge, including the simulation of alternative response scenarios to future emerging pathogens. Many public health interventions were adopted simultaneously or in rapid sequence, making it difficult to define which interventions worked and which did not. Now is an appropriate time to undertake further work to quantify the effectiveness, harms and cost effectiveness of the interventions deployed in order to enhance our preparedness for future pandemics.

Recommendation: The Australian Government should invest in supporting modelling groups, communities of practice, platforms and linkage infrastructure. Standing frameworks of governance for the sharing of surveillance data should be considered during inter-pandemic periods to minimise the logistical burden during the crisis period. Research should be undertaken now to define the effectiveness of interventions for COVID-19, which will inform future pandemic responses.

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