

COVID-19 Multi-Model Comparison Collaboration (CMCC)

May 2020

Background

As the COVID-19 pandemic is evolving, a growing number of countries are making use of information derived from mathematical and computational simulation models in policy and public communication. Types of models employed by the countries vary but we witness primarily **planning (model) tools** for capacity and infrastructure preparation including test capacity, intensive care units, hospital beds, ventilators etc., and **impact models** that run different mitigation policies and scenarios in different settings.

All global health partners have been confronted with increased requests from countries for guidance on the selection and validation of the models, interpretation of the model results etc. Models employ a diverse range of model structures, assumptions, and fitting procedures and may result in different projections. We appreciate and recognize the need for multiple approaches at this stage, given the uncertainty and constant updating of the literature and state of knowledge around covid-19 as well as due to the varying purpose and questions the models are used to answer. However, some of those models may also produce conflicting results about, for instance, the impact of the outbreak and mitigating interventions. Significant time pressures and limited capacity to interpret those models in some settings may hinder the appropriate use of such models in policy making, and this is of concern in low- and middle-income countries (LMICs) where preparedness and strategic decisions will be crucial in mitigating the negative impacts of this outbreak. Moreover, models may not sufficiently address the evidence needs for LMICs to plan for their COVID-19 response. This Collaboration is being proposed to help enhance the use of mathematical and computational simulation models during the COVID-19 outbreak by ensuring their policy relevance, robustness, and usefulness.

This concept notes describes the overall objectives, target audience, multi-model comparison process and expected deliverables of this COVID-19 Multi-Model Comparison Collaboration (CMCC).

Objectives and target audience

The overall goal of the CMCC is to provide country governments and other model users with an overview of aims, strengths and caveats of the existing COVID-19 models and how their projections differ and what the key-assumptions and drivers are of their models. In other words, this exercise is to help the users to understand when they may use each model (i.e. mapping out their purpose), better to interpret the estimates from these tools for planning and strategic decisions. It is not to rank, appraise or approve the models or stating whether a model is “right or wrong”. In addition, the comparison study aims to improve the accuracy of existing COVID-19 models by having information exchange and encouraging discussions between different groups participating in the exercise.

An equally important goal for this exercise is to actively involve decision/policy makers to determine what their needs are and to provide feedback to the modeling results in order to improve the communication on existing models, and most importantly, future iterations (with policy scenarios and outcomes adapted to LMICs) and applications of the models.

Over and above this objective, the World Bank is engaged in discussions and strategic partners with modelling groups to provide a facility for developing countries to access modelling data that are frequently

updated with country data. The intent is for these models to be a tool for developing country decision makers to use as they outline and adapt their COVID-19 responses.

Policy questions

What are the differences in the estimates for the current COVID-19 pandemic by different models used to inform policy-decisions and outbreak response?

What is the purpose, objectives, characteristics, data, or key-assumptions driving potential differences in predictions of each model?

How can we better guide the selection and use of the model, and make the result presentation more meaningful to policy makers?

Are models addressing the policy needs of decision-makers in LMICs? What might they be missing?

Structure of the CMCC

The Collaboration will establish three groups to carry out this work:

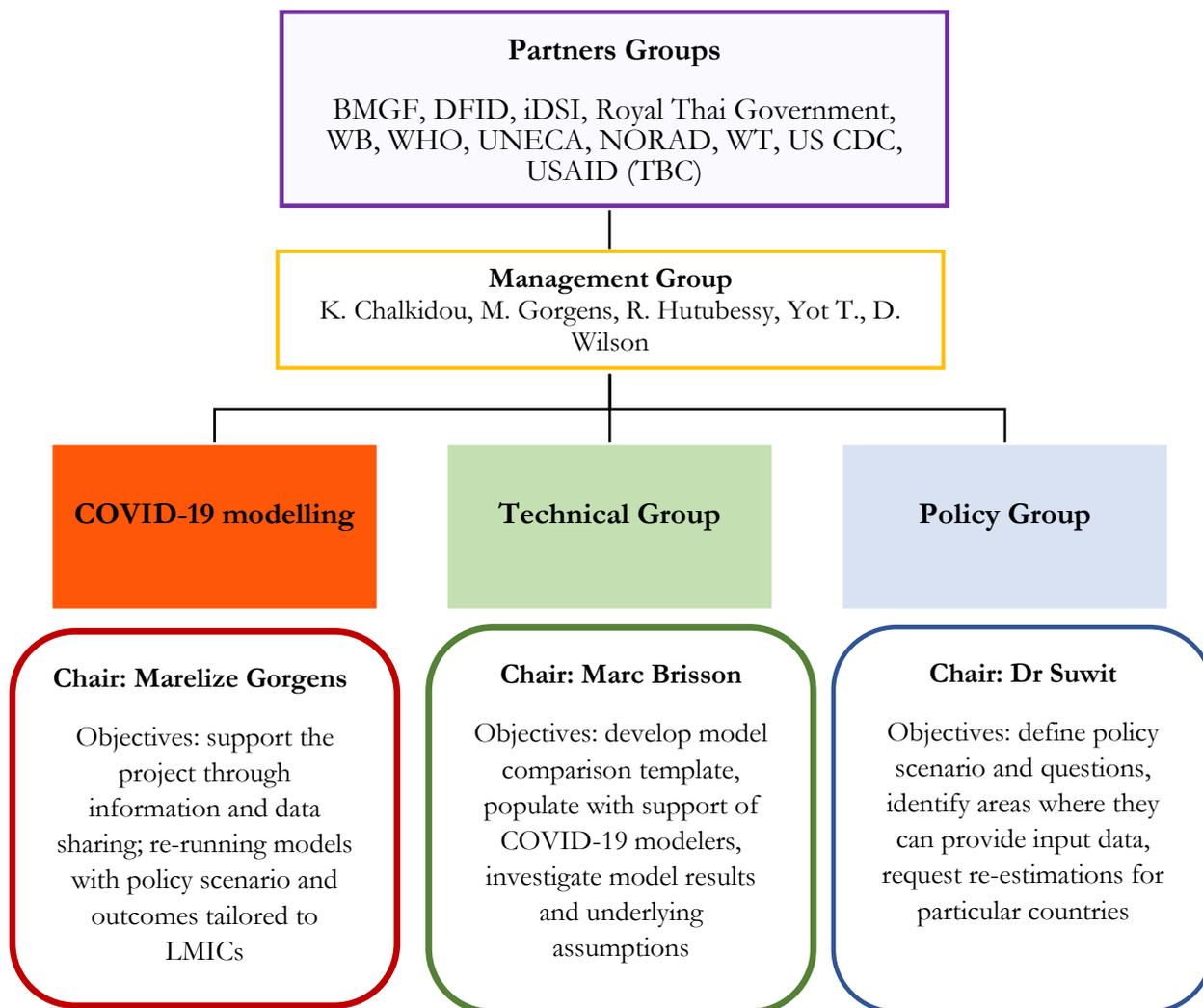
- A **technical group**, chaired by Marc Brisson, comprising eight modelling experts who will guide the assessment of models
- A **policy group**, chaired by global health expert and policy maker, Dr Suwit Wibulpolprasert, and comprising policymakers from LMICs
- A **COVID-19 modelling group**, chaired by Marelize Gorgens, comprising of one member of each modelling group included in the multi model comparison

Each groups will work directly with the management group, which will be in charge of running the groups, request information from each group, validate outputs and deliverables on a regular basis, and communicating internally with the groups and externally on the work of the CMCC.

The management group is composed of K. Chalkidou, M. Gorgens, R. Hutubessy, Yot T., D. Wilson (in alphabetical order). The management group will be in charge of day to day running of the CMCC work: they will invite members for all groups, validate the study protocols and any output produced under this initiative, and plan for the different phases of the work.

The management group will also work closely with the partners group (membership TBC, invitations sent out to organisations mentioned in the Figure). The role of the Partners Group is to provide overall and high-level guidance on the objectives of the CMCC, actively promote the collaboration's work and activities within their own organisations and beyond, help disseminating the products, and act as advocates for good modelling practice to support country level decision making related to COVID-19.

A summary of the CMCC structure is shown in the Figure below.



Work Phases

The work of the CMCC will be organised in two consecutive phases.

Phase 1: Comparison based on existing published results and initial policy engagement

The technical group, formed of independent model experts not involved in any of the COVID-19 models to be compared, will conduct the multi-model comparison study and will follow the principles and best practices of a recently developed WHO Guide on multi-model comparisons of the impact of infectious disease interventions¹.

Models in this first phase are selected based on the following criteria: i) they are dynamic models that inform the impact of different COVID-19 policy measures for multiple countries and have published their results in the public domain and ii) their developers willing to participate in the comparison study.

The groups are IDM, IHME, Imperial College, LSHTM, Oxford Consortium, and the University of Basel. Those groups will appoint members to join the covid-19 modelers groups. Each group will fill out a standardized table on their model purpose, outcome parameters, features, key-assumptions, intervention scenarios etc. An initial short report, containing populate templates documenting model features, as well as an initial comparative analysis, will be produced.

¹ Boon et al. BMC Medicine (2019) 17:163 <http://doi.org/10.1186/s12916-019-1403-9>

In parallel, the policy group will identify the high priority questions and how models can help address them through consultations and group discussions. The policy group will also discuss the experience, in their countries, with using models, and provide guidance on how to best present results and communicate to achieve evidence to policy translation.

Expected outputs from Phase 1:

1. Model comparison template adapted to COVID-19 and LMIC settings, inspired by existing frameworks (e.g. [Society of Medical Decision-Making repository](#); [iDSI/Gates Reference Case](#) or previous comparison exercises²).
2. Short report comparing modelling objectives, features attributes and key driving assumptions, in user friendly/lay language for policy makers, including a populated model comparison matrix
3. Short report from the engagement in the policy group containing recommendations on relevant policy scenarios and questions, and future data input available to modelers; adapted to LMICs
4. Guideline/recommendations for modellers on communicating model results, including on uncertainty, that is appropriate for on-going research and in the context of an emergency and for policy makers and research funders for enhancing the value and impact of the research to policy implementation.

Expected deadline: early June, 2020

Phase 2: Full comparison based on new simulations and new modelling proposed

Depending on the outcomes of Phase 1, we will invite modeling groups to run 2-3 standardised COVID policy scenarios for a hypothetical country(s) and compare their forecast estimates. Those scenarios will be determined by engaging both the technical and policy groups. To allow for direct comparison inputs and output data need to be standardized as well as the intervention scenarios (maximum of 4 models).

The results will be presented to the policy group members who will be able to deliberate with modelers and the technical group of neutral modeling experts who do not own the models. This deliberation process will allow policy-makers to better understand the models and their results in order to make recommendations on the selection and validation of the model, interpretation of the model results, and improvement of presentation and reporting of results. A clearing house of models and assumptions will also be created, alongside the production of a full length CMCC report on models.

Finally, during this phase, the CMCC will explore, with all three groups, the feasibility of future modelling efforts that may further address policy needs in LMICs (e.g. exit strategy models or models to capture trade-offs across the healthcare system -net health benefits-).

Expected output Phase 2:

1. A full report summarizing quantitative multi-model comparison analyses providing information on the robustness of the individual models as well as their usefulness in health policy to be published, if possible, in peer review journal.
2. A clearing house of COVID-19 models and assumptions
3. If possible, a website or online platform where countries can access estimates produced by different models that will enhance their use and comparison, to be updated regularly
4. Start of new model engagement to further address policy needs in LMICs.

Expected deadline: TBC (within months)

² Delva W, Wilson DP, Abu-Raddad L, Gorgens M, Wilson D, et al. (2012) <https://doi.org/10.1371/journal.pmed.1001239>

Summary of outputs

Phase 1 Early June

- Covid-19 comparison template
- Populated comparative model matrix
- Model comparison report
- Report on policy-engagement
- General guidelines communications for policy-makers and modellers

Phase 2 TBC

- Full CMCC report
- Clearing house for covid-19 models and assumptions
- TBC: online platform hosting country estimates from different models, engagement for future model efforts

List of experts (in alphabetical order)

Technical Group: Marc Brisson, Chair (Laval University, Canada)

Nigel Gay (independent consultant, UK), Jane Labadin (Universiti Malaysia Sarawak, Malaysia), Paula Luz (FIOCRUZ, Brazil), Wilfred Ndifon (African Institute of Mathematical Sciences, Rwanda), Brooke Nichols (Boston University, USA), Shankar Prinja (PIGMER, India), Akhona Tshangela (Africa CDC, Ethiopia), Josh Salomon (Stanford University, USA)

Policy Group: Suwit Wibulpolprasert, Chair (International Health Policy Program & Health Intervention and Technology Appraisal Program, Thailand)

Mark Blecher (Treasury, Republic of South Africa), Gabriel Leung (Hong Kong University), Claudia Lopez (Mayor of Bogota, Colombia), Sania Nishtar (Office of the Prime Minister of Pakistan, Pakistan), Mahlet Kifle Habtemariam (Africa CDC, Ethiopia), Dr Swarup Sarkar (ICMR, Government of India)

Covid-19 Modelling Group: Marelize Gorgens (World Bank Group, Chair)

Deborah Ashby (Imperial College London), Emmanuel Bakare (Oxford Consortium), Rosalind Eggo (LSHTM), Brittany Hagedorn (IDM), Mark Jit (LSHTM), Renato Mendes Coutinho (Oxford Consortium), Ali Mirzazadeh (Oxford Consortium), Richard Neher (University of Basel), Anna Vassall (LSHTM), Theo Vos (IHME), Lisa White (Oxford consortium)