PHILIPPINES

COVID-19 MODELING:

Technical Discussion and Knowledge Exchange Session

Meeting Summary Report

November 28th and 29th 2022

Health Intervention and Technology Assessment Program

Contents

List of Abbreviations

ADP	Access and Delivery Partnership
CEA	Cost-effectiveness analysis
COVID-19	Coronavirus disease
DALY	Disability-adjusted life year
DOH PH	Department of Health, Philippines
HITAP	Health Intervention and Technology Assessment Program
HTA	Health technology assessment
iDSI	International Decision Support Initiative
LSHTM	London School of Hygiene and Tropical Medicine
NPI	Non-pharmaceutical intervention
QALY	Quality-adjusted life year
SIR	Susceptible, Infected, Recovered
SSHSPH NUS	Saw Swee Hock School of Public Health, National University of Singapore
UP NIH	University of the Philippines, National Institutes of Health

Acknowledgements

This report summarizes the discussion during two meetings held on 28th and 29th November 2022 to discuss the technical components of the COVID-19 epidemiological and economic models developed for the Philippines, and to discuss the lessons learned from respective modeling projects for the Philippine and Thailand settings. These meetings were organized by colleagues from the University of Philippines, National Institutes of Health (UP NIH), the Department of Health Philippines (DOH PH), the Saw Swee Hock School of Public Health National University of Singapore (SSHSPH NUS), the London School of Hygiene and Tropical Medicine, and the Health Intervention and Technology Assessment Program (HITAP). The report was prepared by Madison Silzle with inputs from Prof. Mark Jit, Saudamini Dabak, and Kinanti Khansa Chavarina.

The support from SSHSPH NUS and HITAP for the study in the Philippines was under the aegis of the International Decision Support Initiative (iDSI). The study in Thailand, which was a collaboration between LSHTM and HITAP, was supported by the Access and Delivery Partnership (ADP) and the Rockefeller Foundation. The findings, interpretations and conclusions expressed in this report do not necessarily reflect the views of the funding or participating agencies.

Background

Since late 2021, the University of Philippines National Institute of Health (UP NIH) has been collaborating with the Saw Swee Hock School of Public Health National University of Singapore (SSHSPH NUS) and the Health Intervention and Technology Assessment Program (HITAP) to develop a dynamic COVID-19 transmission model for the Philippine COVID-19 setting, with the support of the Department of Health (DOH), the Philippines. The overall objective of the model is to examine both the epidemiological and economic impact of different vaccines, vaccination rates, and non-pharmaceutical interventions (NPIs). These model outputs aim to address specific policy decisions around vaccination strategies in the Philippines, such as vaccine prioritization and mix and match vaccination strategies. The Philippines team aims to build internal technical capacity for epidemiological and economic modeling, alongside many other countries during the COVID-19 pandemic, such as Thailand. With support from NUS, the UP NIH research team has been adapting existing models to address questions in the Philippines COVID-19 context and support the government vaccination policy. In addition to answering COVID-19 policy questions, the technical skills developed will be valuable for future pandemic response. In addition, in Thailand, HITAP has been working with the London School of Hygiene and Tropical Medicine (LSHTM), United Kingdom (UK) to adapt a COVID-19 model from to the UK to the Thai context. To this end, a meeting was organized prior to the 10th HTAsiaLink Conference in November 2022 in Pattaya, Thailand to provide an opportunity to build capacity and share knowledge between partnering organizations in the Philippines, Singapore, UK and Thailand.

The first day focused on a technical discussion of the COVID-19 dynamic transmission model, led by colleagues from SSHSPH NUS on both, the epidemiological and economic components of the model in the Philippines. The second day was a knowledge exchange opportunity between Filipino and Thai research teams to identify key lessons learned from their experience developing a model during the COVID-19 pandemic.

Technical Discussion

The objective of this meeting was to review the technical aspects of the modeling work led by colleagues at SSHSPH NUS for the COVID-19 setting in the Philippines. Prof. Hannah Clapham led an activity to demonstrate the basic concepts of infectious disease transmission modeling. Participants were split into two groups and asked to create a model flow diagram for their disease of choice, COVID-19 and monkeypox (now, mpox), using the SIR model as a foundation.

An SIR model describes the basic three states of disease in a population: Susceptible (S), Infected (I), and Recovered (R). Additional states may be added to the model depending on the type of disease to describe differences in states of disease severity, vaccination, immunity, and others. For example, a model of COVID-19 infection may differentiate between infected individuals who are asymptomatic and symptomatic in order to capture individuals who are quarantined versus not. As COVID-19 and mpox infections have vaccines that can prevent infection, both groups included additional states in their models for vaccinated individuals. In the case of the COVID-19 model, they added even further distinctions between individuals with different number of doses.

Models are further developed with parameters, which define the rate at which individuals move between states. For example, the infectivity of a disease will influence how quickly people move from susceptible to infected. As previously mentioned, distinctions may be needed between vaccinated and unvaccinated individuals, because their susceptibility and infectivity are different. Thus, the rate at which these individuals move between states is different. Many factors influence the movement of individuals between states, and it is important to understand what the model assumes, and whether these assumptions are acceptable or not. For example, for the mpox model, it was assumed that all infected individuals with severe symptoms would be quarantined. This may not be true, but the assumption may be adequate for the purpose of modeling.

Once groups had completed their model flow diagrams and identified parameters, each group had to consider what data would need to be collected to input into the model. Not all data may be available to input into the model, in which case assumptions can be made using alternative data or with simplifications. For example, the effectiveness of COVID-19 vaccines may be unclear in the case of mixing and matching doses of COVID-19 vaccines. One solution is to assume all COVID-19 vaccine brands have the same efficacy.

Ultimately, models cannot capture all the intricacies of human behavior and infectious diseases. Models require simplifications and assumptions to be made to produce outputs that are useful and timely. It is important that the assumptions are understood and clearly communicated so that interpretations of the outputs are accurate, particularly in the case of informing policy.

Next, Dr. Wang Yi presented on the economic evaluation of COVID-19 vaccines in the Philippines, which uses outputs from the dynamic transmission model. The economic model requires collecting additional data on direct medical costs, direct non-medical costs, and indirect costs. This may include direct costs such as cost of treatment, vaccination, or quarantine. Some of this data can be assumed from literature, while others may be gathered from government sources. For example, the UP team gathered data on direct medical cost from both PhilHealth, the national insurance program manager, and patient interviews. Model outputs may vary depending on the factor of interest, such as life-year loss, Quality Adjusted Life Years (QALY), Disability Adjusted Life Years (DALY), or death.

After conceptualizing the economic model, Dr. Wang Yi walked through the data input and analysis in the R program. As the economic analysis uses output from the infectious disease model, no additional model simulation is needed for the economic analysis. Input of data, such as COVID-19 cases by disease severity and age group, can be entered directly into R or read using external files. As often the raw data collected may not be formatted for analysis, additional steps must be taken to convert the data into the desired format in R. For example, in the Philippines, reported cases by age groups of 4 years (e.g., 0-4, 5-9, 10-14, etc.), whereas data on direct medical cost used larger age groups (e.g., 0-4, 5-14, 15-39, etc.).

As these age groups are different, the data needs to be regrouped in R to be matched. Once the data is formatted, a cost matrix with cost categories is set up for different scenarios, such as vaccines versus no vaccines in 2021. Cost can then be calculated for each category using the data already input into R. For example, the total cost of adverse events due to vaccination can be calculated by multiplying the number of vaccinated individuals by the incidence of adverse events by the average cost of an adverse event. Depending on the data available and assumptions made, the cost categories may vary due to context. The Philippines model assumed total cost from direct medical costs, cost of adverse events due to vaccination, cost of masks and hygiene, and cost of contact tracing and quarantine. Cost of NPIs was not included because the model only compared scenarios of vaccination versus no vaccination, and thus the use of NPIs would be the same in each scenario.[1]

[1] Dr. Wang Yi's presentation slides, "Economic Evaluation of COVID-19 Vaccine in Philippines Training"

Knowledge Exchange Session

The Knowledge Exchange Session opened with brief presentations on the background and scope of the projects, 1) Philippines COVID-19 modeling presented by Dr. Hilton Lam and 2) 'COVID-M,' presented by Dr. Pritaporn Kingkaew and Siobhan Botwright.

The modeling project for the Philippines was commissioned by the Department of Health (DOH), Philippines with the primary goal of addressing key policy questions at the time, such as how COVID-19 vaccine allocation should be prioritized. Per the national HTA guidelines, the use of modeling is key to informing procurement of vaccines in the Philippines. Near the start of the pandemic, the DOH Philippines reached out to Dr. Hilton Lam from UP and, together with modeling experts from SSHSP NUS and HITAP, worked to develop a COVID-19 dynamic disease model for the Philippines COVID-19 pandemic. Due to the rapidly changing nature of the pandemic, the specific policy questions the project aimed to answer changed over time to also address issues around NPIs, booster doses, and value-for-money of vaccines. One of the difficulties that the Philippines modeling team has faced is the lack of availability or accessibility of local data. Subsequently, the model relies heavily on assumptions which results in greater uncertainty in model outcomes. The DOH has sought to expand its capacity in HTA and this project has been integral to building local modeling capacity. The outcome of this project and meeting will hopefully help inform future infectious disease modeling collaborations in the Philippines.

The COVID-M project is a collaboration between LSHTM and HITAP to build a COVID-19 dynamic disease model for the Thai context. In Thailand, there are many researchers who are experts in mathematical modeling, but their work is fragmented and there is limited inter-organizational communication. Additionally, there is a lack of agreement between organizations on how to address emerging policy issues, which has resulted in different policy recommendations. With this in mind, HITAP has collaborated with modelers from the LSHTM to build capacity in infectious disease modeling through the development of a COVID-19 model for Thailand. The key objectives of this project are to build a COVID-19 model that can be adapted to address policy questions, and to make the model publicly available and accessible to relevant stakeholders not experts in modeling. As capacity building is central to the COVID-M project, the team has focused on learning requirements for members at HITAP, such as training on infectious disease modeling, differential equations, and R programing.

As one of the objectives of this meeting was to identify lessons learned to inform future infectious disease modeling collaborations, each team took time to reflect on the successes and areas of improvement of their respective projects. Teams were asked to consider the impact of their project, what support was valuable, what additional support was needed, how the organization of team members facilitated the project or not, and whether the project objectives have been achieved. The Philippines COVID-19 modeling and COVID-M teams shared out the results of their discussions and were given the opportunity to ask questions. Next, individuals were split into three groups to participate in a World Café style session to discuss possible solutions to the common areas for improvement previously identified. Each group rotated through three facilitated discussions on solutions to challenges in the areas of capacity building, project management, and achieving project objectives. At the end of all rotations, facilitators presented on the outcomes. The discussion that took place is summarized below.

Although the objectives and context of each project are different, the Philippines COVID-19 Modeling and the COVID-M teams faced similar challenges to address questions of policy interest in the rapidly evolving pandemic. Flexibility is essential for adapting a project to changing situation and priorities. For example, the Philippines COVID-19 modeling team found the need to change and simplify model scenarios over time to address new policy questions and changing internal capacity. Setting clear expectations at the beginning amongst all team members, funders, policymakers, and other stakeholders may allow for greater ease of flexibility throughout the project timeline. Consistent and participatory communication and amongst all stakeholders could also facilitate this flexibility while ensuring that the impact of the work is not lost.

The need for flexibility should not prevent establishing a well-defined, over-arching objective. While the specific deliverables and timeline of the project may need flexibility, the overall objective and impact of work should be clearly identified and drive project management decisions. For example, one of the key objectives of the COVID-M project is to build internal capacity for infectious disease modeling, which has influenced the organization of the project. Time for internal trainings was prioritized and regular meetings were held to ensure all members were up to speed.

Often, a primary aim of infectious disease modeling is to influence policy and decision making. However, there are often obstacles to ensuring that this work is policy relevant. Involvement or support from government organizations may be advantageous to help set priorities and ensure the final outputs are impactful.

Modeling requires a lot of time and capacity for both data collection and model development, especially to build more complex models with many scenarios. This is often in conjunction with the need for rapid results to inform policy decisions, such as COVID-19 vaccination and NPI policies. The need for quick model outputs was less of an obstacle for COVID-M team, given that the aims were not to inform immediate policy decisions in Thailand. However, both modeling teams found it was difficult to manage limited time of team members. It is perhaps necessary to both clearly identify organizational capacity at project start to develop a suitable plan and allow for flexibility over time to address changing capacity needs.

Both the Philippines COVID-19 Modeling and COVID-M teams relied on international networks for collaboration, which was key for success. However, it can also be challenging to collaborate remotely. This is particularly true for building technical capacity, where face-to-face learning is more beneficial. It was noted that effort to strengthen capacity and international collaborations should be emphasized and prioritized between times of crisis, as these resources can then be accessed more readily during times of crisis. For example, during the COVID-19, the need for quick results may impede the ability to structure effective organizational capacity building. It should be clearly identified at the start of the project, if and how capacity building will be embedded in the project.

One solution discussed to address capacity needs for infectious disease modeling is to develop a network and standardization of training via certifications. Various types or levels of certification could support both the short- and long-term capacity needs. Additionally, it would be beneficial to consider capacity building across disciplines and ensuring that stakeholders, such as policy makers or the public, can understand the basic concepts of modeling would help increase the impact of modeling work.

Appendices

Appendix 1: Agenda

Philippines COVID-19 Modeling:
Technical Discussion and Knowledge Exchange
Concept Note

Background:

Since late 2021, the University of Philippines National Institute of Health (UP NIH) has been collaborating with the National University of Singapore (NUS) and the Health Intervention and Technology Assessment Program (HITAP) to develop a dynamic COVID-19 transmission model for the Philippine COVID-19 setting. The overall objective of the model is to examine both the epidemiological and economic impact of different vaccines, vaccination rates, and non-pharmaceutical interventions (NPIs). These model outputs aim to address specific policy decisions around vaccination strategies in the Philippines, such as vaccine prioritization and mix and match vaccination strategies. The Philippines team aims to build internal technical capacity for epidemiological and economic modeling, alongside many other countries during the COVID-19 pandemic, such as Thailand. With support from NUS, the UP NIH research team has been adapting existing models to address the Philippines COVID-19 context and support government vaccination policy. In addition to answering COVID-19 policy questions, the technical skills developed will be valuable for future pandemic response. To this end, a meeting is being organized prior to the HTAsiaLink Conference in November 2022 in Pattaya, Thailand to provide an opportunity to build capacity and share knowledge between partnering organizations.

The first day will include a technical discussion of the COVID-19 dynamic transmission model. Representatives from NUS will review both the epidemiological and economic components of the model. The second day will be a knowledge exchange opportunity between Filipino and Thai research teams to identify key lessons learned from their experience developing a model during the COVID-19 pandemic.

Technical Discussion Agenda:

Date and time: Monday November 28th, 2022 0900 – 1600 BKK time

Objective: To review technical components of the epidemiological and economic models developed for the Philippines COIVD-19 setting.

Participants: This will be a closed meeting between representatives of the University of Philippines National Institute of Health (UP NIH), the National University of Singapore (NUS), and the Health Intervention and Technology Assessment Program (HITAP).

Time	**Particular**	**Description**	**Facilitator(s)**
0900 – 0930	Introduction	• Introductions & Ice breaker • Identify session objectives	Madison Silzle
0930 – 1230	Epidemiological model	• Written exercise • Discussion on epi modeling work in the Philippines	Prof. Hannah Clapham
1230 – 1330	Lunch break		
1330 – 1530	Economic model	• Walk through CEA modeling process • Q&A on R code	Dr. Wang Yi
1530 – 1600	Closing	• Review outputs and next steps • Prepare for next day	Madison Silzle and All

Knowledge Exchange Agenda:

Date and time: Tuesday, 29th November, 0900 – 1200 BKK time

Objective: To share experiences and lessons learned developing a COVID-19 dynamic transmission model between Filipino and Thai research teams.

Participants: This will be a closed meeting between representatives of the University of Philippines National Institute of Health (UP NIH), the National University of Singapore (NUS), the Health Intervention and Technology Assessment Program (HITAP), the Department of Health, Philippines (DOH PH), and the London School of Hygiene and Tropical Medicine (LSHTM).

Time	Particular	Description	Facilitator(s)
0900 – 0930	Welcome	• Introduction to the session • Team intros and activity	Madison Silzle, Annapoorna Prakesh, Dimple Butani
0930 – 0950	Background of modeling projects in Thailand and the Philippines	• Introduction to COVID-M project • Introduction to Philippines Modeling project • Q&A	Dr. Hilton Lam, Dr. Pritaporn Kingkaew, Siobhan Botwright
0950 - 1030	Breakout session 1	• Break into respective teams, COVID-M and Philippines Modeling Team, and discuss project successes and areas for improvement • Share out results	All
1030 – 1100	Break		
1100 – 1145	Breakout session 2, World Café	• World Café style small group discussion: brainstorm solutions to common areas for improvement for the following categories - impact of work, achieving project objectives, and building capacity • Share out results	All
1145 – 1200	Closing	• Review lessons learned and meeting outputs	Madison Silzle, All

Appendix 2: List of Participants

Technical Discussion, Monday, 28th November, 2022

No.	Name	Organization, Country
1	Dr. Hilton Lam	UP NIH, Philippines
2	Dr. Paul Pasco	UP NIH, Philippines
3	Haidee Valverde	UP NIH, Philippines
4	Dr. Clarence Yacapin	UP NIH, Philippines
5	Dr. John Robert Medina	UP NIH, Philippines
6	Dr. Hannah Clapham	SSHSPH NUS, Singapore
7	Dr. Wang Yi	SSHSPH NUS, Singapore
8	Dr. Keisha Prem	LSHTM, UK
9	Dr. Pritaporn Kingkaew	HITAP, Thailand
10	Siobhan Botwright	HITAP, Thailand
11	Annapoorna Prakash	HITAP, Thailand
12	Dimple Butani	HITAP, Thailand
13	Phornnaphat Chertchinnapa	HITAP, Thailand
14	Madison Silzle	HITAP, Thailand
15	Saudamini Dabak	HITAP, Thailand

Knowledge Exchange Session, Tuesday, 29th November, 2022

No.	Name	Organization, Country
1	Dr. Hilton Lam	UP NIH, Philippines
2	Dr. Paul Pasco	UP NIH, Philippines
3	Haidee Valverde	UP NIH, Philippines
4	Dr. Clarence Yacapin	UP NIH, Philippines
5	Dr. John Robert Medina	UP NIH, Philippines
6	Patrick Wincy Reyes	DOH HTAD, Philippines
7	Princess Allyza Mondala	DOH HTAD, Philippines
8	Sarah May Obmaña,	DOH HTAD, Philippines
9	Dr. Hannah Clapham	SSHSPH NUS, Singapore
10	Dr. Keisha Prem	LSHTM, UK
11	Prof. Mark Jit	LSHTM, UK
12	Dr. Yang Liu	LSHTM, UK
13	Dr. Pritaporn Kingkaew	HITAP, Thailand
14	Dr. Jarawee Sukmanee	HITAP, Thailand
15	Siobhan Botwright	HITAP, Thailand
16	Dimple Butani	HITAP, Thailand
17	Phornnaphat Chertchinnapa	HITAP, Thailand
18	Annapoorna Prakash	HITAP, Thailand
19	Kinanti Khansa Chavarina	HITAP, Thailand
20	Madison Silzle	HITAP, Thailand
21	Saudamini Dabak	HITAP, Thailand
22	Dr. Wanrudee Isaranuwatchai	HITAP, Thailand
23	Dr. Yot Teerawattananon	HITAP, Thailand

Appendix 3: Feedback

Surveys were sent to participants after the meeting to collect feedback on the sessions. Participants of the Technical Discussion found the session very useful and relevant to their work. However, several individuals expressed wanting more time to have a computer-based practical session on the CEA R code. Participants of Knowledge Exchange Session found the small group discussion useful and that it was helpful to learn from others' experience. All participants who provided feedback for this session mentioned wanting a longer meeting, as the time limitation restricted discussion.

Appendix 4: Photos

Figure 1&2. Technical discussion modeling exercise

Figure 3. Technical discussion group photo

Figure 4&5. Knowledge exchange world café