Modelling Club: Week 2

Welcome to Modelling Club!

Modelling Club

- Practice model-building in teams

- Practice scenario: BF.7 subvariant in Bangladesh

Tasks from Week 1

- Think about a specific key questions related to our scenario

- Consider the different roles for a modelling team and how you could contribute

Modelling Club

- Practice model-building in teams

- Practice scenario: BF.7 subvariant in Bangladesh

- Today's goals:
  - listen to ideas for key questions
  - choose 2 or 3 key questions to build models
  - discuss modelling team roles
  - divide into teams (1 team per key question)

Modelling Scenario

- Scenario: BF.7 subvariant in Bangladesh

- Main purpose: estimate number of cases, number of hospitalizations, number of deaths caused by BF.7

Model Development

- Multi-step process to develop our models

- Remember:
  - "All models are wrong, but some are useful."
    - George Box

Identify the question

Identify existing knowledge

Choose model structure

Choose modeling method

Model quantification

Model validation

Prediction & optimization

Decision making

Model transfer

Identify the Question

Identify the question

- What is our key question?
  - prediction questions
  - model will produce estimates of cases, hospitalizations, and deaths
  - what else are we interested in knowing?

Practice Model

- Main purpose: estimate number of cases, number of hospitalizations, number of deaths caused by BF.7

- Possible key questions:

Economic impacts: if there was no vaccination, what would costs have been (compared to with vaccination)? Is vaccination cost-effective?

-costs associated with: cases, hospitalization, deaths, vaccination

-cases: lost productivity

-hospitalization: cost for bed, treatments, lost productivity

-deaths: YLL, cost for YLL

-run 2 models: one with vaccination, one without

-number of cases, number of hospitalizations, number of deaths

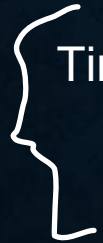-number of vaccinations

-ages of those who died

Practice Model

- Main purpose: estimate number of cases, number of hospitalizations, number of deaths caused by BF.7

- Possible key questions:

Impact of different types of interventions?
-masking, social distancing, vaccination

Timing of epidemic: how quickly will numbers of cases, hospitalizations, and deaths occur?
  -assess different values of R0 for this virus (i.e. the transmissibility of the variant)
      -best-case scenario vs worst-case scenario
      -find possible values for R0 to test
  -run models with different R0 for variant and compare timing of epidemic
      -compare epidemic curves for each
      -timing of peak number of cases/hospitalizations/deaths or timing of a set number for each

Modelling Teams

Modelling Teams

- Many tasks and decisions for each step
  - Gathering information about the disease
  - Finding data about the population
  - Researching options for model structure/method
  - Coding
    - model code
    - model results & visualization
  - Presenting and explaining the model

transmission, disease progression

cost estimates

number of people, age groups

SEIR?

Ideas:
- cost-effectiveness of vaccine
- timing of epidemic
- vaccine efficacy
- impact of other interventions

Modelling Teams

Team 1	Team 2	Team 3
Question: indirect costs	Question: direct costs	Question:
- Sohel	- Sharif	
	- Farzana	

Team 1: What is the impact of vaccination on indirect costs?

Team 2: What is the impact of vaccination on direct costs?

Types of costs:

Direct costs
- vaccine
- hospitalization
- treatments
- deaths

Indirect costs
- DALY
- YLL
- lost productivity

When we start the model, we don't have any data

-build the structure

-find parameter/input estimates (numbers to put in the model)

-run some trials for the model to see if results make sense

-make adjustments

-compare to real data

Existing Knowledge

Identify Existing Knowledge

✓ **Identify the question**

Identify existing knowledge

- What inputs do we know?
  - Demographics -# people, %age groups
  - Natural history parameters -transmission, severity (% hospitalized, % deaths)
  - Control options & impact -vaccine: % vaccinated, % efficacy

- Do other models exist?
  - Similar disease? -many COVID-19 models (structure, numbers)
  - Similar scenario?-cost analyses
  - Distributions/values for parameters?

    -see what numbers and sources other models have used

Many types of models exist
-we can consider other models to help us understand what we are studying
-terms used to describe our type of model:
        -mechanistic, compartmental, mathematical

Tasks for Next Guided Session

We'll let other club members decide which team to join

- Meet with your team!
    - discuss how to share the tasks
    - make a plan for communicating with each other

Possible sources
-WHO, UN
-published papers
-government ministries

- Find potential sources for existing knowledge
    - human demographics, natural history of virus, control impacts
    - similar models
    - make a list or copy the links and send them to me

I'll post on the Modeling Club website so we can share

Table/list of all the numbers you will need for your model
-notes on possible sources to use for these numbers