NIHR | Health Protection Research Unit in Modelling and Health Economics at Imperial College London

UKRI MRC Centre for Global Infectious Disease Analysis

IMPERIAL

Blantyre, Malawi

Petropolis, Brazil

Serrakunda, Gambia

Enhancing teaching with wodin: A web-based approach to modelling

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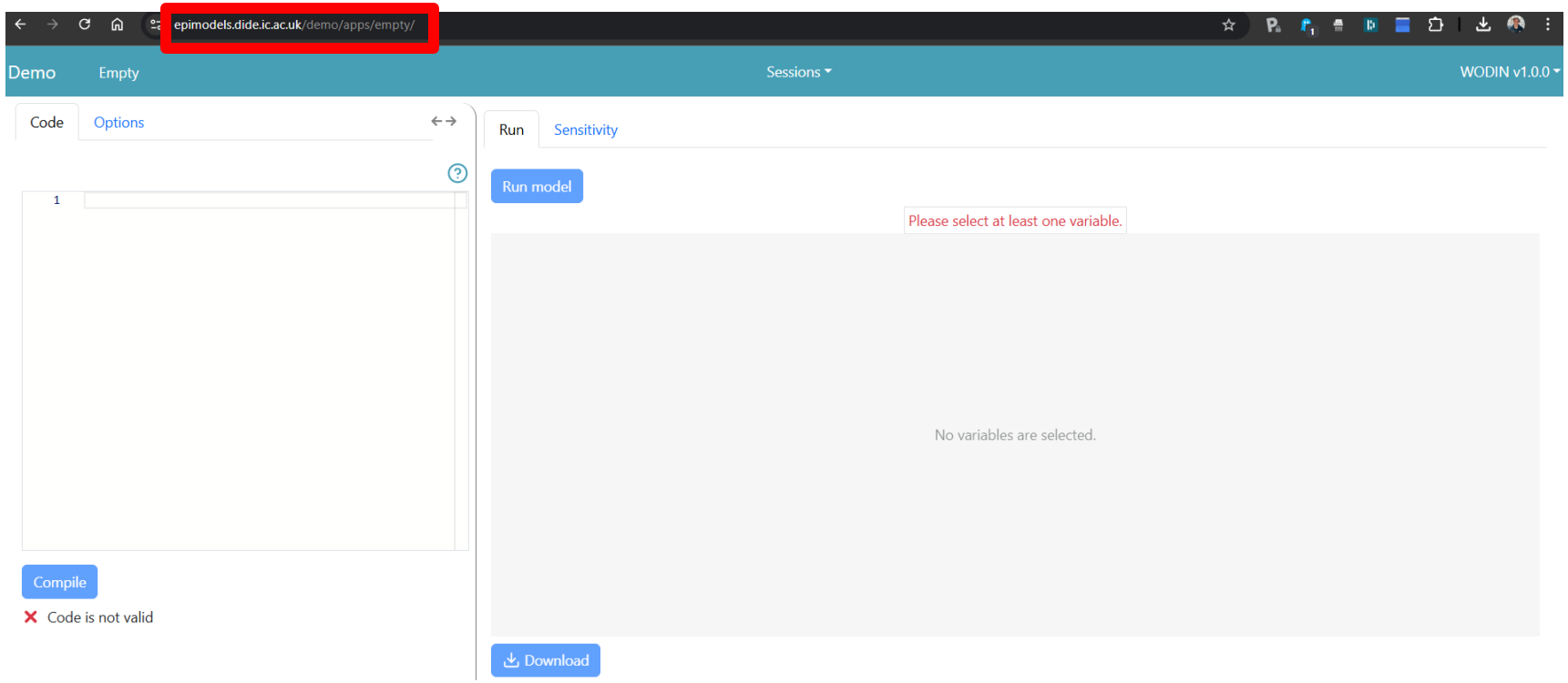
The Wodin Interface



- WODIN is a web application allowing students to author and run model code using *odin*. All online and happens in user's internet brower.
- Can be deployed with custom configuration to create teaching courses providing functionality for range of model usage E.g. basic model construction, sensitivity analyses, model fitting, stochastic modelling etc.

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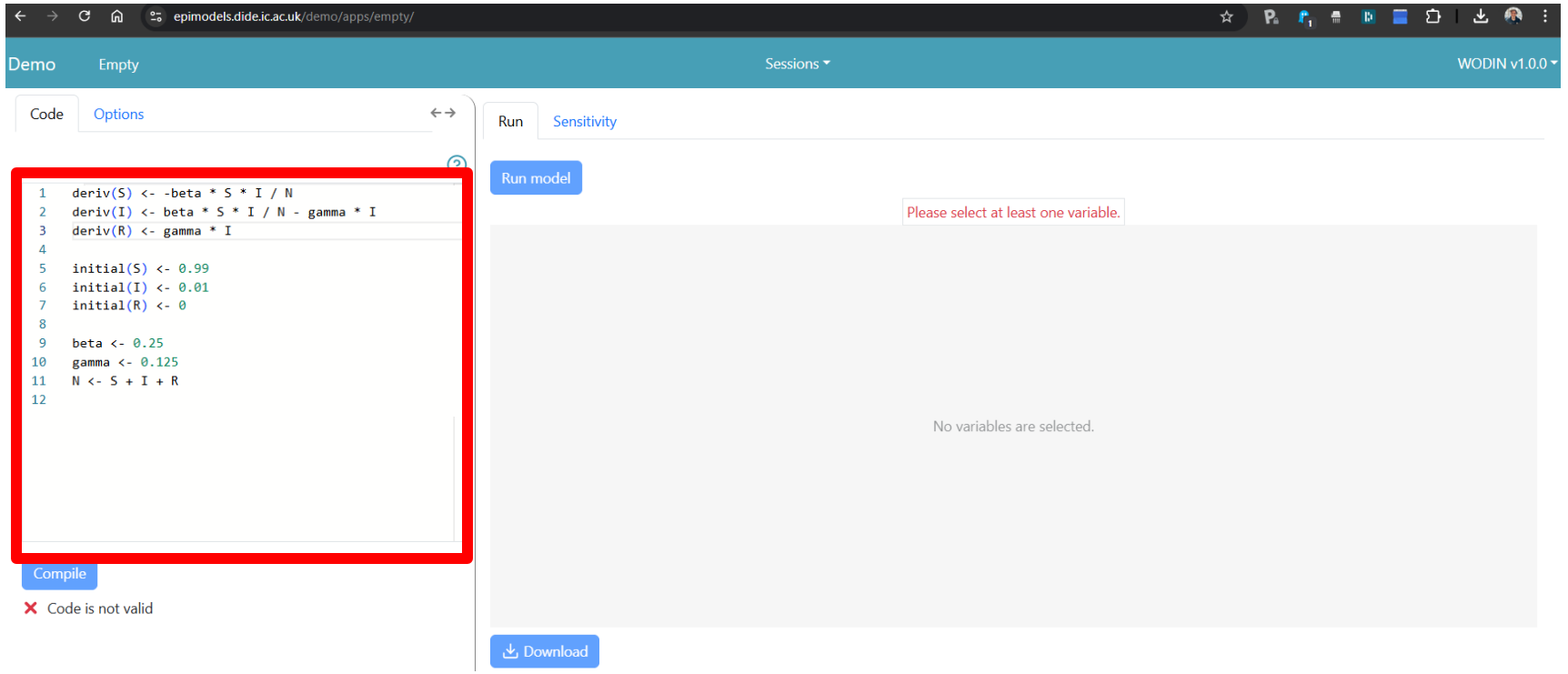

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Examples of courses where WODIN has been used:

Blantyre, Malawi
Focus: Malaria Modelling
Duration: 1 week
Experience Level: Mixture
Attendees: Academics, MoH

Petropolis, Brazil
Focus: Yellow Fever & VBD Modelling
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Serrakunda, Gambia
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Additionally:

- Workshops in Tanzania, Singapore and Cameroon
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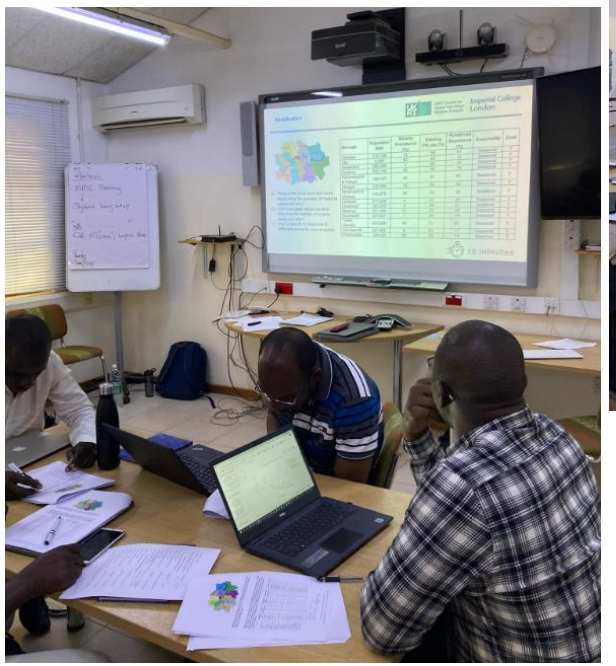
Malaria Modelling Workshop, MRC Unit The Gambia, 2022

Goal: Developing participant mathematical modelling skills, particular focus on malaria modelling.

Duration: 5 days of instruction, 9am-4pm each day.

Participants: ~25, from Gambia Ministry of Health and academics from MRC Unit and 8 countries across West Africa.

Experience: Limited – majority had no coding or modelling experience but were aware of what it was.



Activities:

- Building simple models in Wodin (SIR, Ronald-Ross style malaria models).
- Pen+paper exercises to develop intuition around R0 for malaria/VBD (and intervention impact).
- Simulated malaria intervention stratification exercises, using modelling for support.
- Journal club – review and critique of a modelling paper.
- Follow up course in 2024: Focused on participants extending models to include vaccination.

Some challenges with courses like this…

- **Setup issues:** Varying operating systems, R installations, and package management complexities.

- **Diverse attendee backgrounds:** Wide variety of skill sets. Wide range of familiarity with mathematics, programming, and epidemiological concepts.

- **Simultaneous learning demands:** Concurrent grasp of mathematical theory, programming techniques, and infectious disease modelling principles.

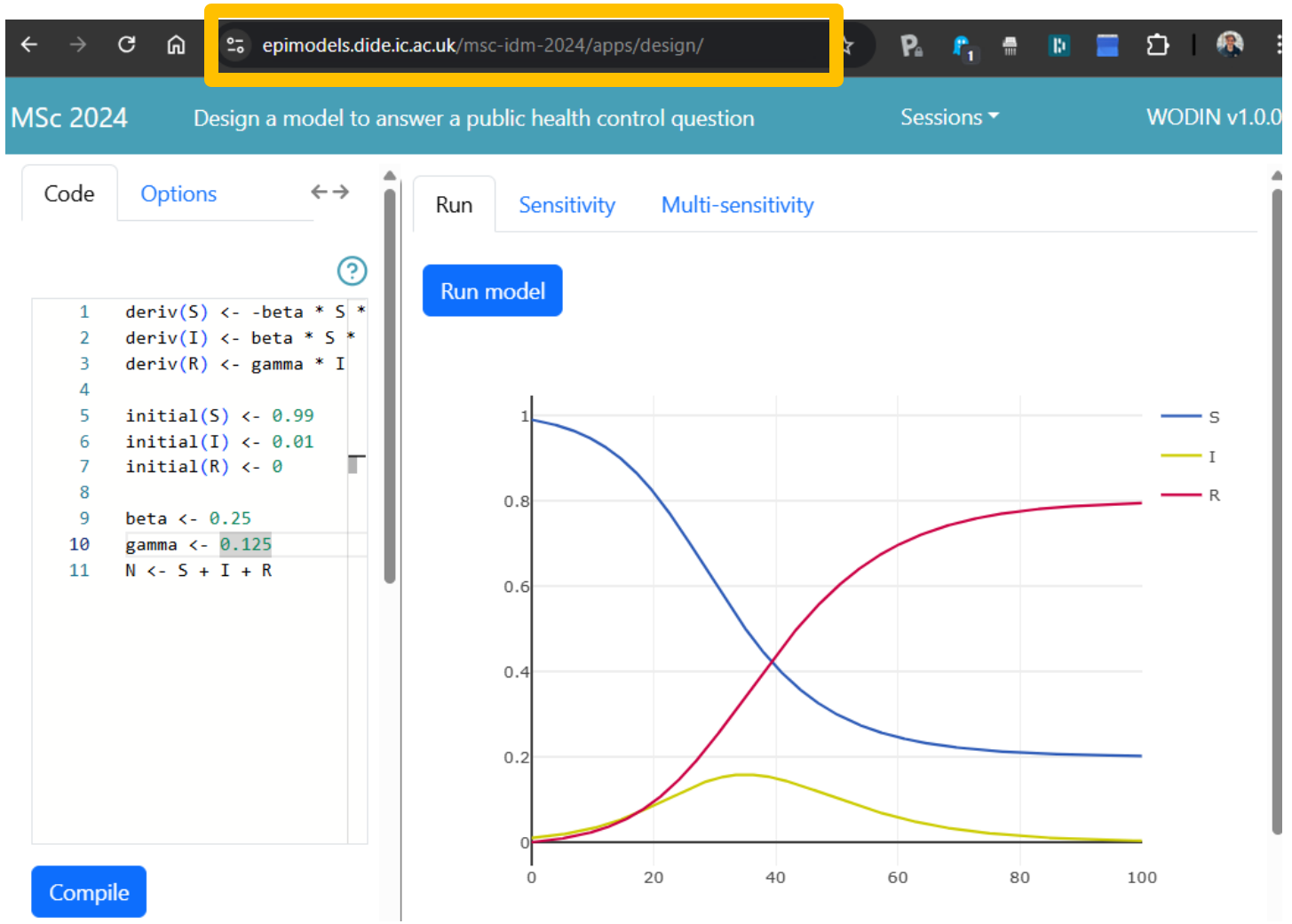
- **Short time-frame:** Courses typically only last a week. Limited teaching time. Every second counts, delays are very consequential.

(i) Removing Setup & Installation Barriers

- **Immediate access:** Students can begin modeling instantly without lengthy software installations or configuration.

- **Cross-platform compatibility:** Works directly through a web browser, ensuring uniform accessibility across devices and operating systems.

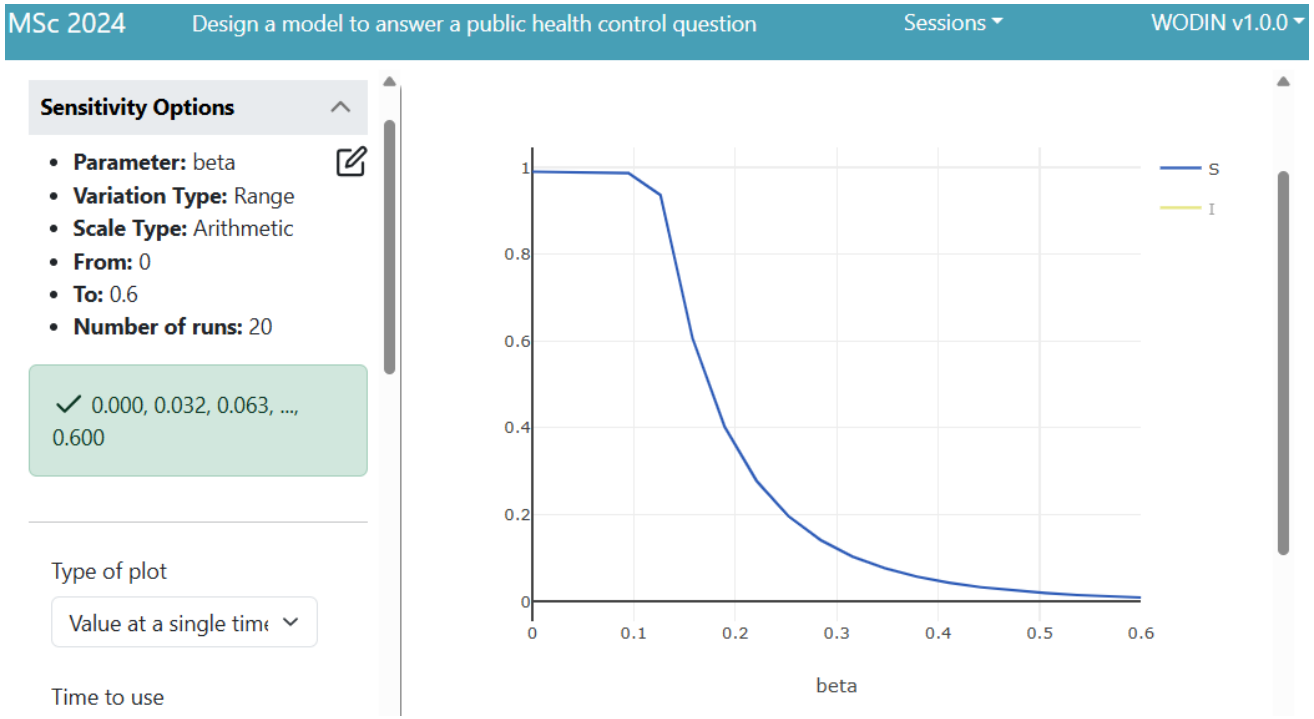
- **Reduced complexity:** Eliminates the need for managing dependencies and troubleshooting environment-related issues.



(ii) Abstracting Programming to Emphasise Key Concepts & Support Progressive Instruction

- **Focus on concepts, not code:** Reduces barriers related to limited programming experience.
  - Ensures accessibility of the modelling, and enables attention to be directed toward modelling concepts, not coding.

- **Functional tools supporting scaffolded instruction:** Support for plotting, sensitivity analyses and data fitting enables progressive introduction of complexity with minimal friction.
  - Removes programming typically required for these, which enables faster conceptual progress.
  - Increases extent of learning possible during short workshops.

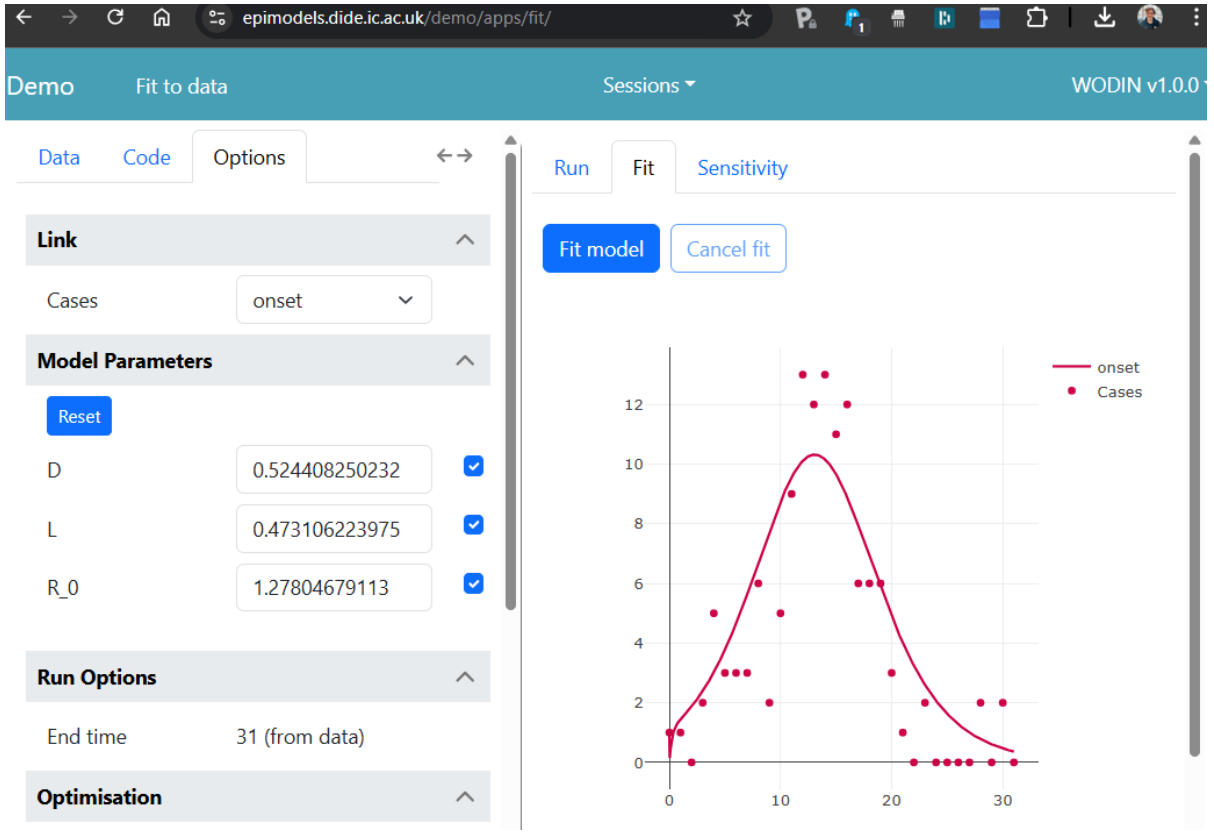


(iii) Flexible setup facilitates differentiation and tailored learning experiences

- **Adaptive instruction:** Flexible setup allows customisation of courses to suit different skill levels.
  - E.g. Pre-population of console with model code for complete novices.

- **Individualized exploration:** Students can independently explore extensions or advanced scenarios without additional setup burdens.
  - E.g. No infrastructure required to go from model construction ➔ model fitting.

- **Student differentiation:** Minimal friction associated with progression to advanced tasks supports differentiated learning of diverse groups.



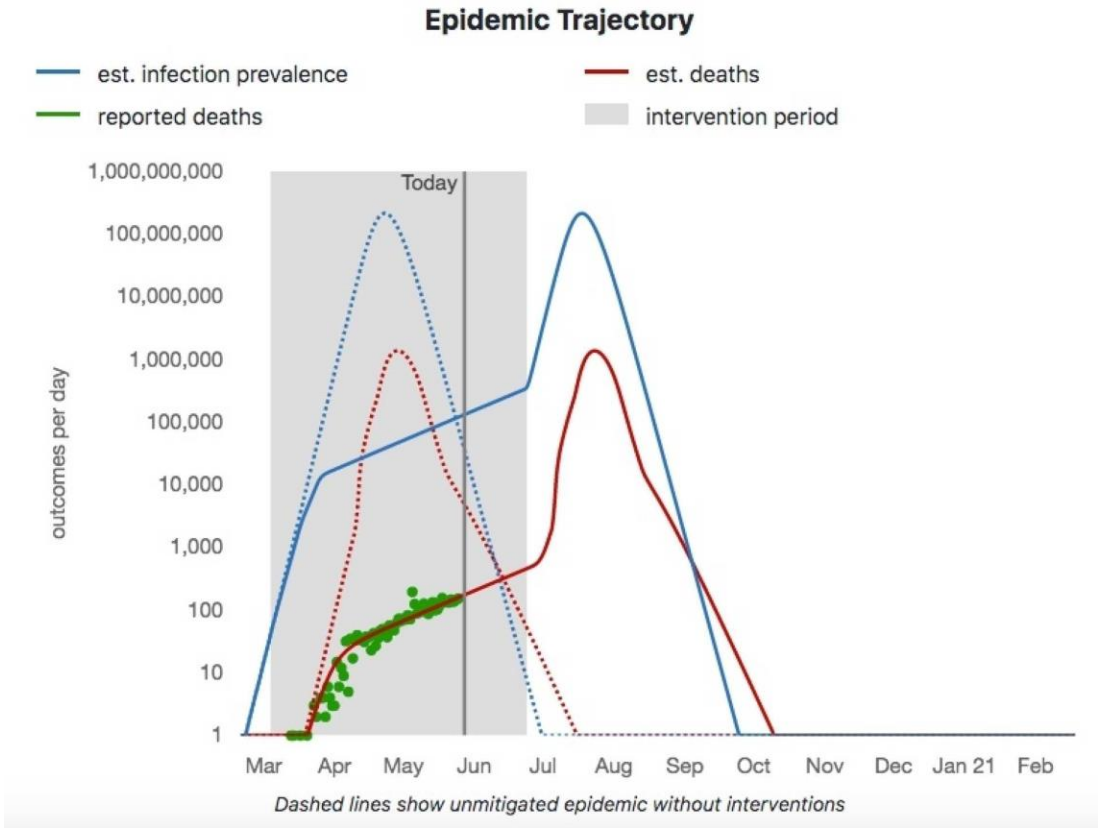
However…

- Intended audience **and** goal of engagement can be very different.
  - E.g. directly supporting policymakers and/or feeding into policymaking process.

- Web-interface tools can be a very effective way of supporting policy making process.
  - Rapid scenario ideation, comparison and feedback.
  - Allows proactive engagement and active co-creation rather than passive receipt of “modelling results”.

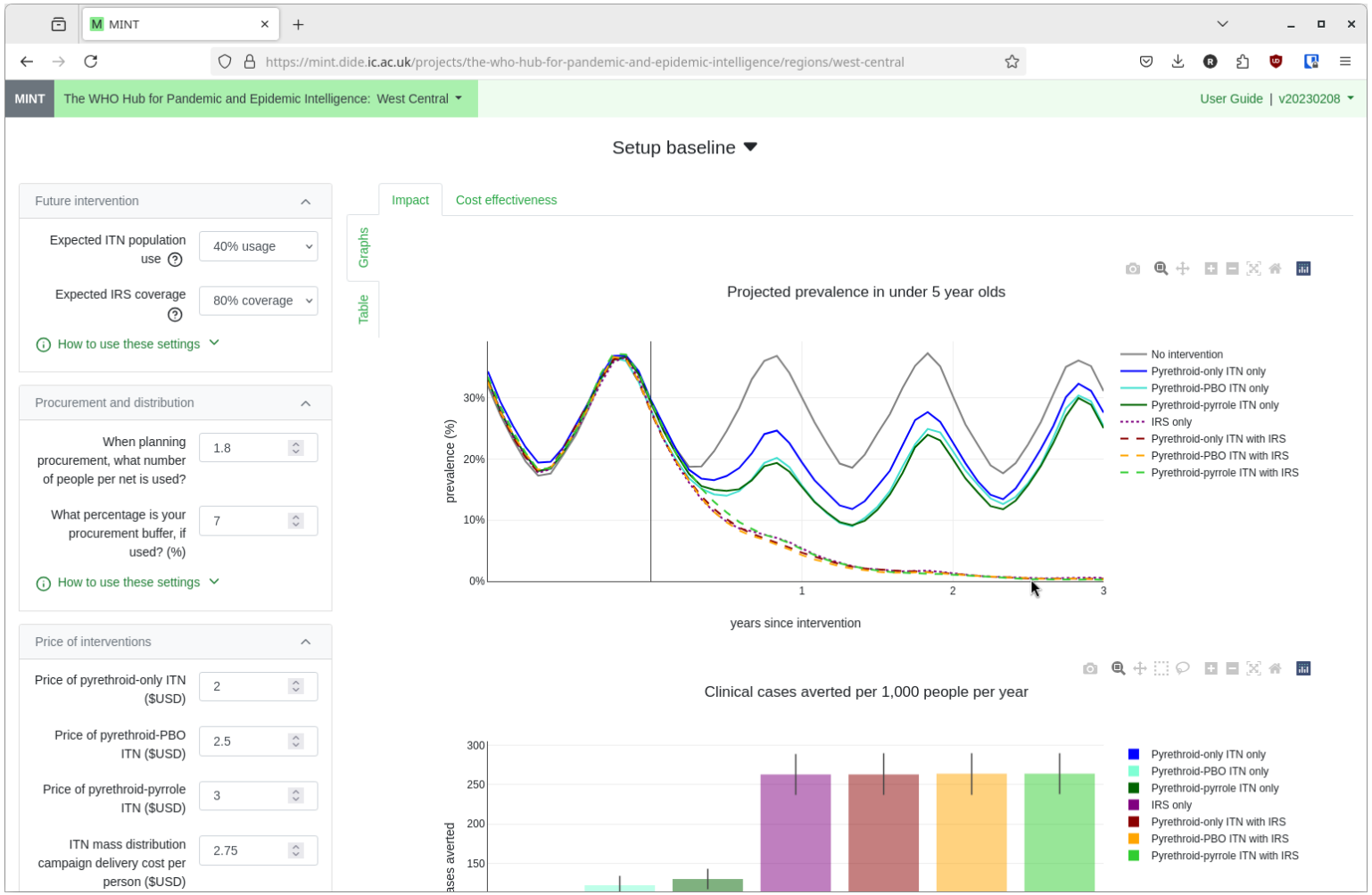
- However:
  - This typically requires complex models.
  - Improving modelling understanding isn’t the main objective.

- What does this mean for the tools required?



An Example: MINT (Malaria INtervention Tool)

- Tool designed to help National Malaria Control Programs explore most cost-effective options for WHO recommended mosquito net and IRS products.
  - Underpinned by complex malaria IBM offering more granularity and detail than possible with *wodin* (compartmental models).
- Aim is to support policymaker decision making rather than teaching mathematical modelling.
  - Higher level of both detail AND detail abstraction required.



Thoughts & Reflections from the Wider Group?