# Modern Techniques in Modelling

LONDON SCHOOL of HYGIENE & TROPICAL MEDICINE

# Who we are

**Course organisers**

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- Oli Brady, PhD Oliver.Brady@lshtm.ac.uk

**Course administration**

- Francesco Grisolia Francesco.Grisolia@lshtm.ac.uk

**Lecturers and Demonstrators**

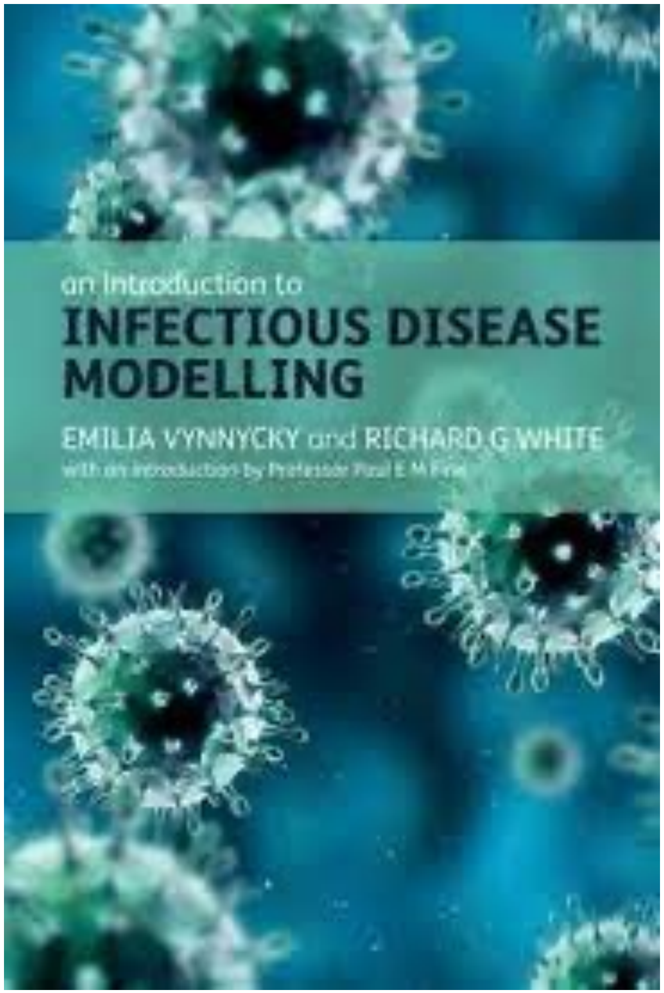
- Billy Quilty, Kath O'Reilly, Seb Funk, Johnny Filipe, Alexis Robert, Alex Richards, Kaja Abbas (All LSHTM / CMMID-based)

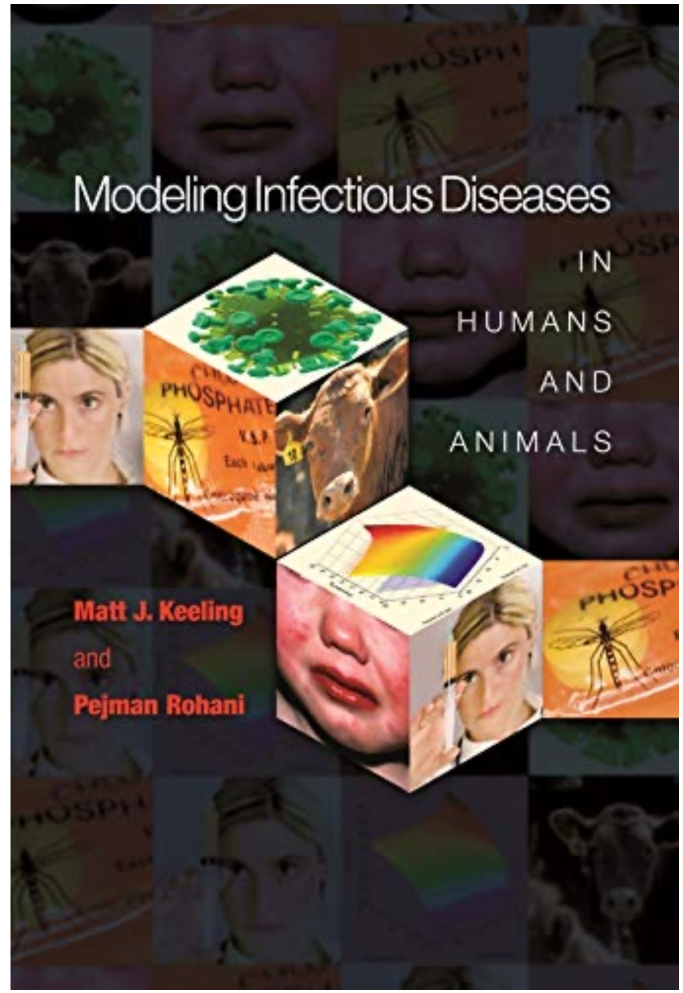
# Feedback

Your feedback is important to us!

Please complete the feedback form on Moodle after the course — tell us what we did well and what we could improve.

# Further resources



# Additional resources

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# Model Fitting and Inference for Infectious Disease Dynamics

**Overview** Course objectives How to apply

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## Overview

Course dates: Feb 2025

The course will take place in London, UK.

A short course taught by members of the Centre for the Mathematical Modelling of Infectious Diseases.

There is a growing demand for mathematical modellers in public health to explain observed disease trends and predict the outcome of interventions, often by synthesising information from different data sources. At the same time, increasing computational power and methodological advances are providing exciting opportunities to fit ever more complex mechanistic models to data. In light of the speed of methodological advances and the broad nature of the field, the task of choosing from the available methods and packages, as well as putting them into practice, can be daunting.

### Admissions status

Applications open

Apply now

### Course organisers

Sebastian Funk

# Which models will we see in the course?

**Difference equations**

Tracks the number of individuals in each epidemiological “compartment” (e.g. Infected or Susceptible) at each e.g. day or week timestep

**Ordinary Differential Equations (ODEs)**

Same as ‘difference equations’ but instead of calculating at each timestep, we move to continuous time

**Metapopulation**

Add in structure to ODE model by creating multiple subpopulations that can transmit infections within and between each subpopulation

**Individual-based model**

Tracks each individual, each with their own epidemiological characteristics; this model class also introduces the idea of randomness

**Network model**

Adds structure to the individual-based model, where each individual is constrained by who they can transmit to

**Stochastic compartment model**

A stochastic implementation of our compartment ODE model but there is randomness in events happening

# What type of mathematical models should we build?

*Main Question: how do we choose a model type and a model structure?*

*Key principle: build with parsimony ("as simple as necessary")*

- What is the research question?
- How big is the population?
- Are there stochastic fluctuations in the data that cannot be mechanistically accounted for?
- Do we need to track every individual?
- What type of events are we modelling and how do we parameterise them?
- What type of data do we have?

# Wrapping up

Any final questions?

# Photo time!

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