

# Final Remarks

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# Take Aways

In the last two days, we have covered a lot of ground. Here are some key takeaways:

- Infectious diseases are a major public health concern that can have devastating consequences.
- Mathematical models are essential tools for studying the dynamics of infectious diseases and informing public health decision-making.
- Models are simplifications of reality that help us understand complex systems.

- We have discussed several compartmental models, including the SIR, SEIR, and SEIRV models.
- The SIR model is a simple compartmental model that divides the population into three compartments: susceptible, infected, and recovered.
- The SEIR model extends the SIR model by adding an exposed compartment.
- We can model various pharmaceutical and non-pharmaceutical interventions (NPIs) by modifying the transmission rate or adding new compartments.

- We have discussed the basic reproduction number,  $R_0$ , which is a key parameter in infectious disease epidemiology.
- $R_0$  is the average number of secondary infections produced by a single infected individual in a completely susceptible population.
- If  $R_0 > 1$ , the disease will spread in the population; if  $R_0 < 1$ , the disease will die out.

- Deriving the basic reproduction number,  $R_0$ , is an essential step in understanding the dynamics of infectious diseases.
- Deriving  $R_0$  for the simple SIR model is simple as we just need to study the threshold phenomena.
- For more complex models, we can use the next-generation matrix approach to derive  $R_0$ .

- Often, homogeneous models are not sufficient to capture the complexity of infectious diseases.
- Incorporating heterogeneity into the models is essential for capturing the complexity of infectious diseases.
- Age structure is a common form of heterogeneity that can be incorporated into the models.
- Other forms of heterogeneity include spatial, temporal, and contact heterogeneity.

# How do we build models

**A**

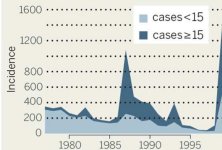
## Policy questions

Should rubella vaccination be introduced?  
If so, who should be targeted?  
When should large age-range campaigns be considered?

**B**

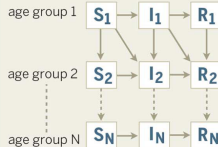
## Available data

Case/age surveillance following vaccine introduction



**C**

## Scientific understanding



**D**

## Policy advice

Introduce only when minimum coverage is achieved, which may depend on birth rate.  
Transfer from targeting only girls to including into routine vaccination if coverage sufficiently high.  
Consider vaccine heterogeneity

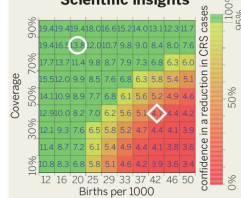
**E**

## Data collection

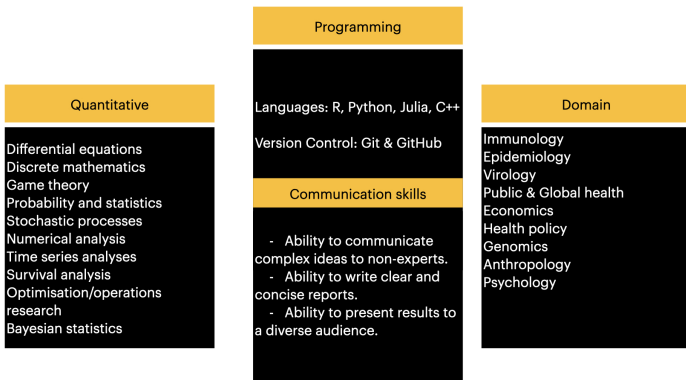


**F**

## Scientific insights



# What skills are needed to build and use infectious disease models?



**Figure 1:** A non-exhaustive list of skills needed for modelling.