Victoria's experience and the role of modelling in its responses to COVID-19

Dr Michael Lydeamore

Department of Health and Human Services, Government of Victoria, Australia

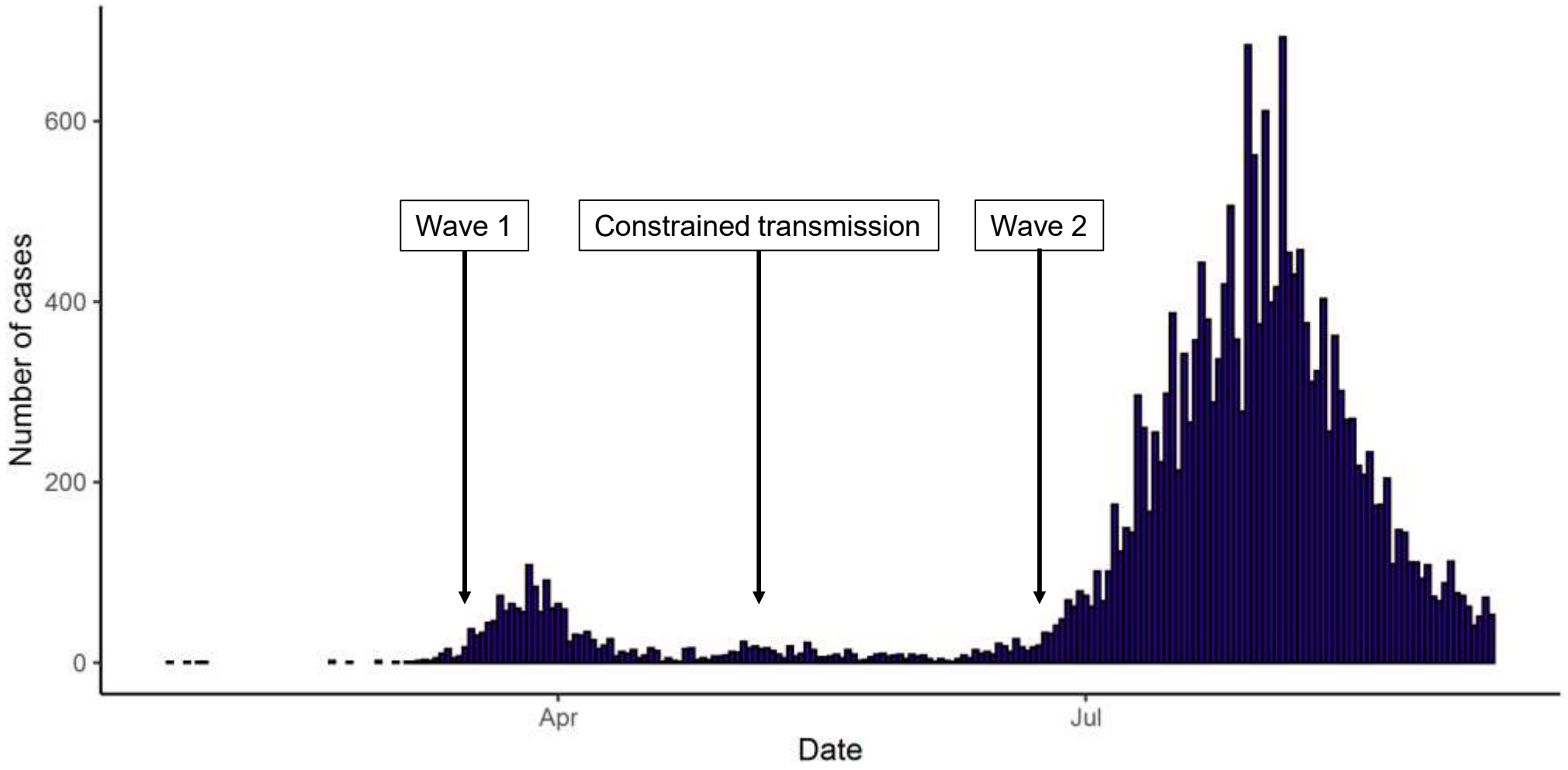
Department of Infectious Diseases, The Alfred and Central Clinical School, Monash University, Melbourne, Australia


@MikeLydeamore

My personal roadmap

- Bachelor of Mathematical Sciences at the University of Adelaide (completed 2012)
- Masters of Philosophy at the University of Adelaide (completed 2015)
- PhD at the University of Melbourne (completed 2019)
- Joined Monash University in mid-2019
  - Including honorary position at the SaferCare Victoria, Department of Health & Human Services
- Recruited into the COVID-19 response in late February/early March
- Appointed “Modelling & Forecasting Lead” in late March

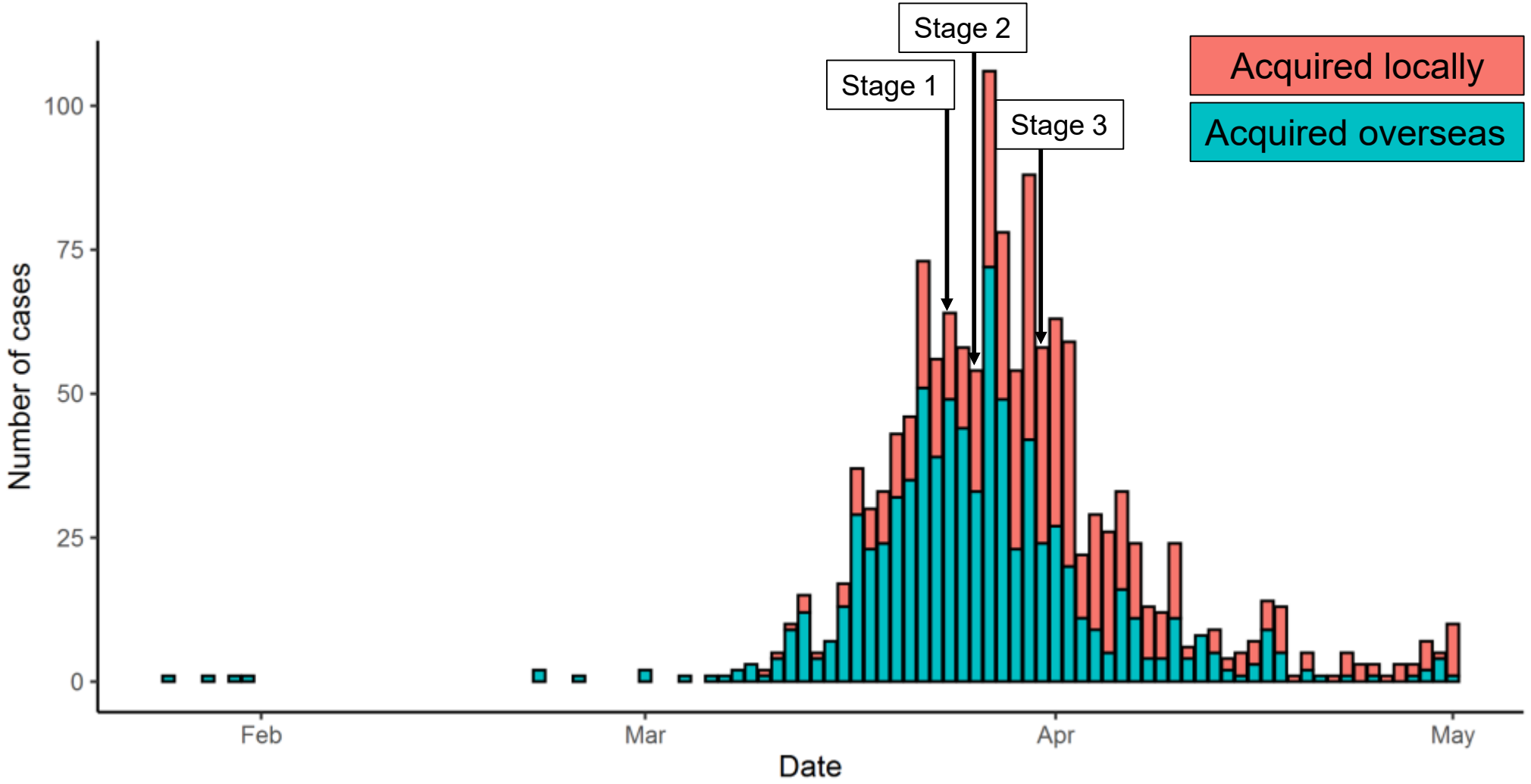
Victoria’s experience has been different to most



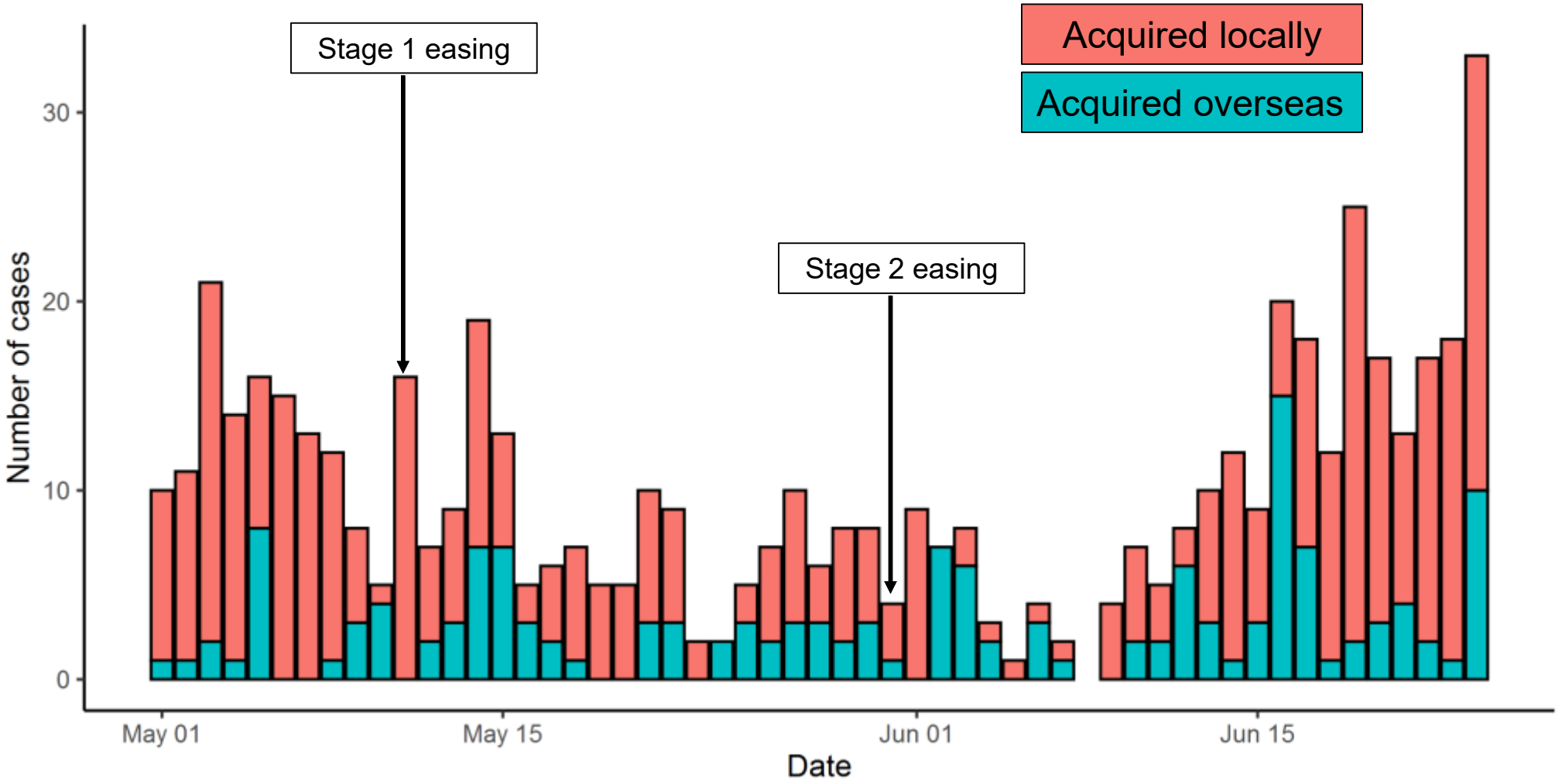
The Victorian Restriction Timeline

Date		
23 March	Stage 1 restrictions	Cease non-essential businesses
25 March	Stage 2 restrictions	Recreation facilities, entertainment facilities, restaurants move to take-away only
30 March	Stage 3 restrictions	Gatherings reduced to no more than two people, and only four reasons to leave home
11 May	Stage 1 release	Allow for larger gatherings and movements
31 May	Stage 2 release	Return to stage 2 + restaurants return to seated customers
1 July	Stage 3 restrictions in 10 suburbs	
4 July	Stage 3 restrictions in +2 suburbs	
9 July	Stage 3 restrictions in metro Melbourne	
2 August	Stage 4 restrictions	Curfew, single person trips out of households only, restricted exercise times

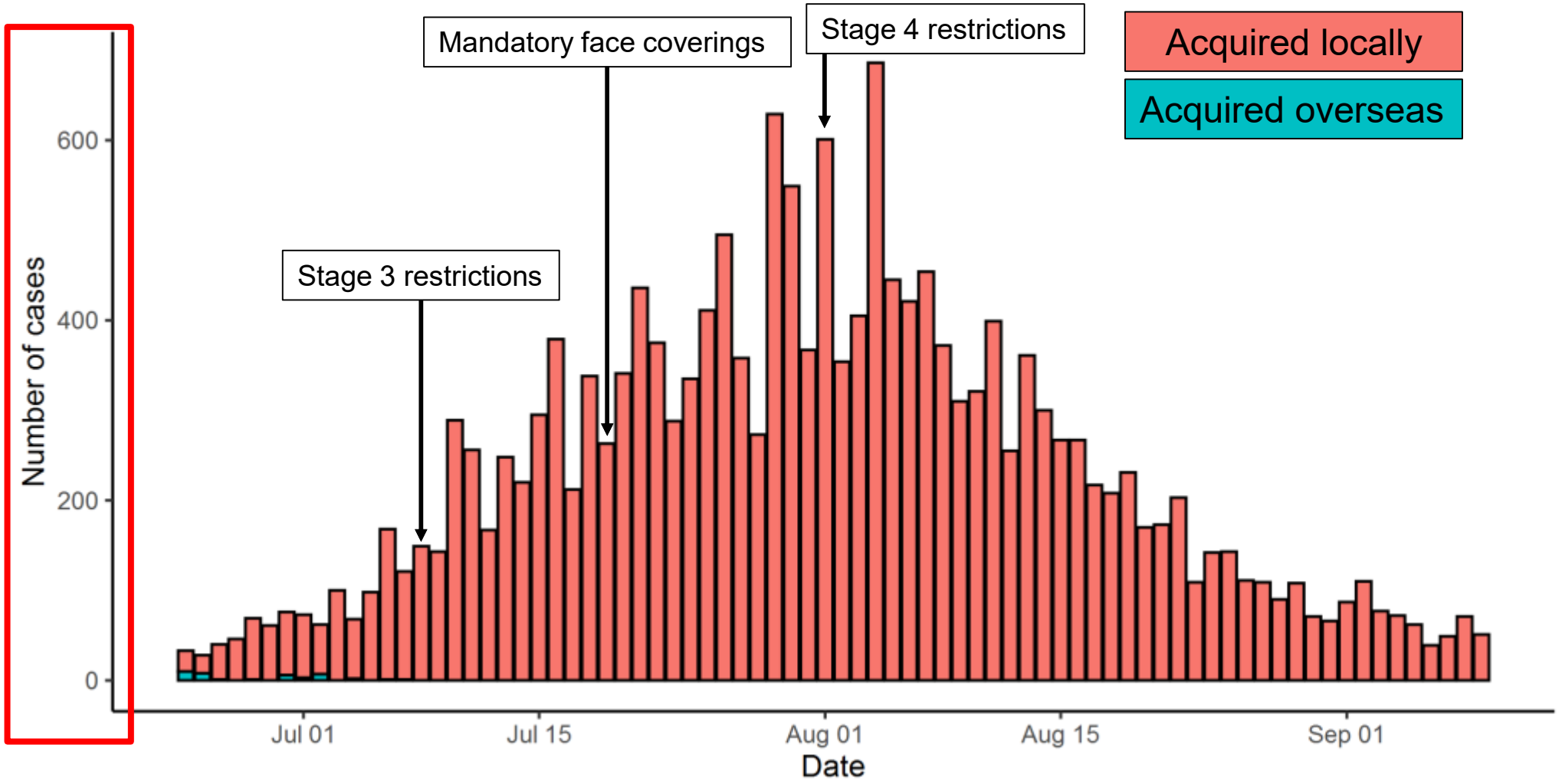
The first wave was primarily overseas cases



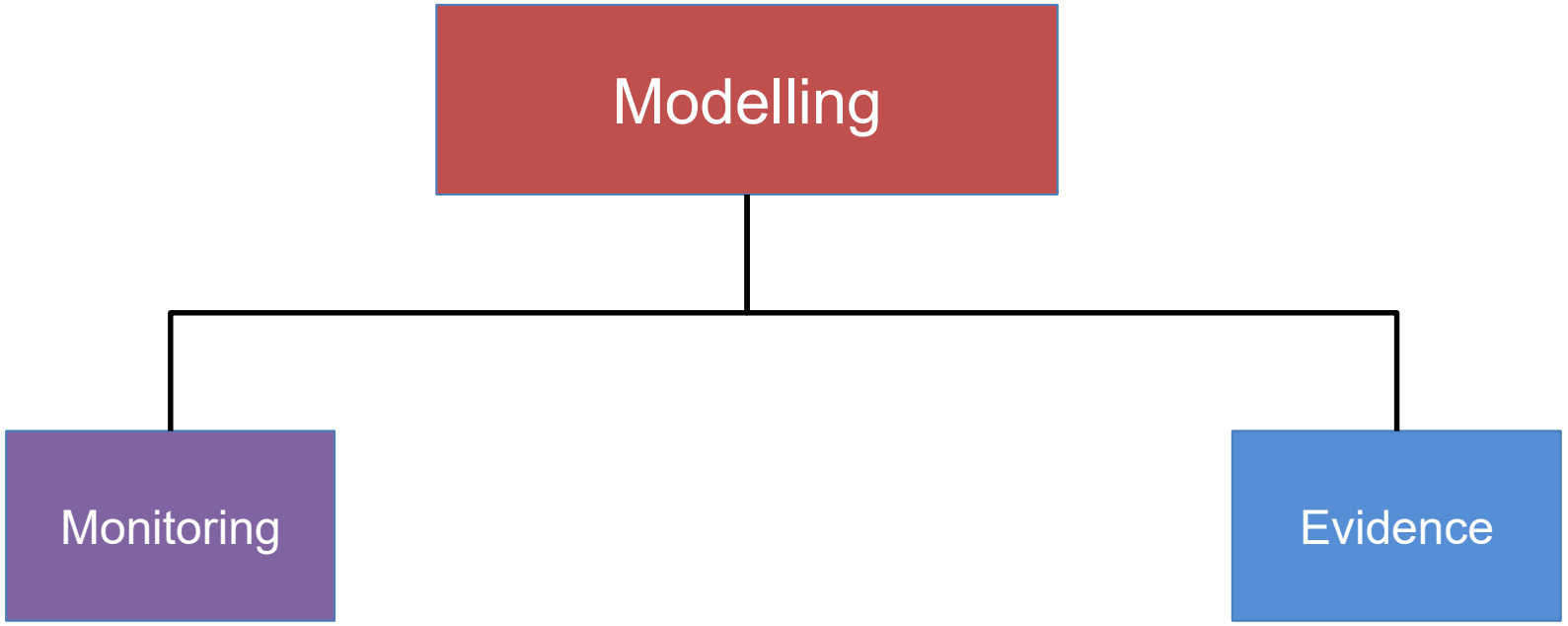
Followed by a time of small, localised outbreaks that were contained



Followed by a second wave, entirely locally driven.



Modelling contributes in two ways



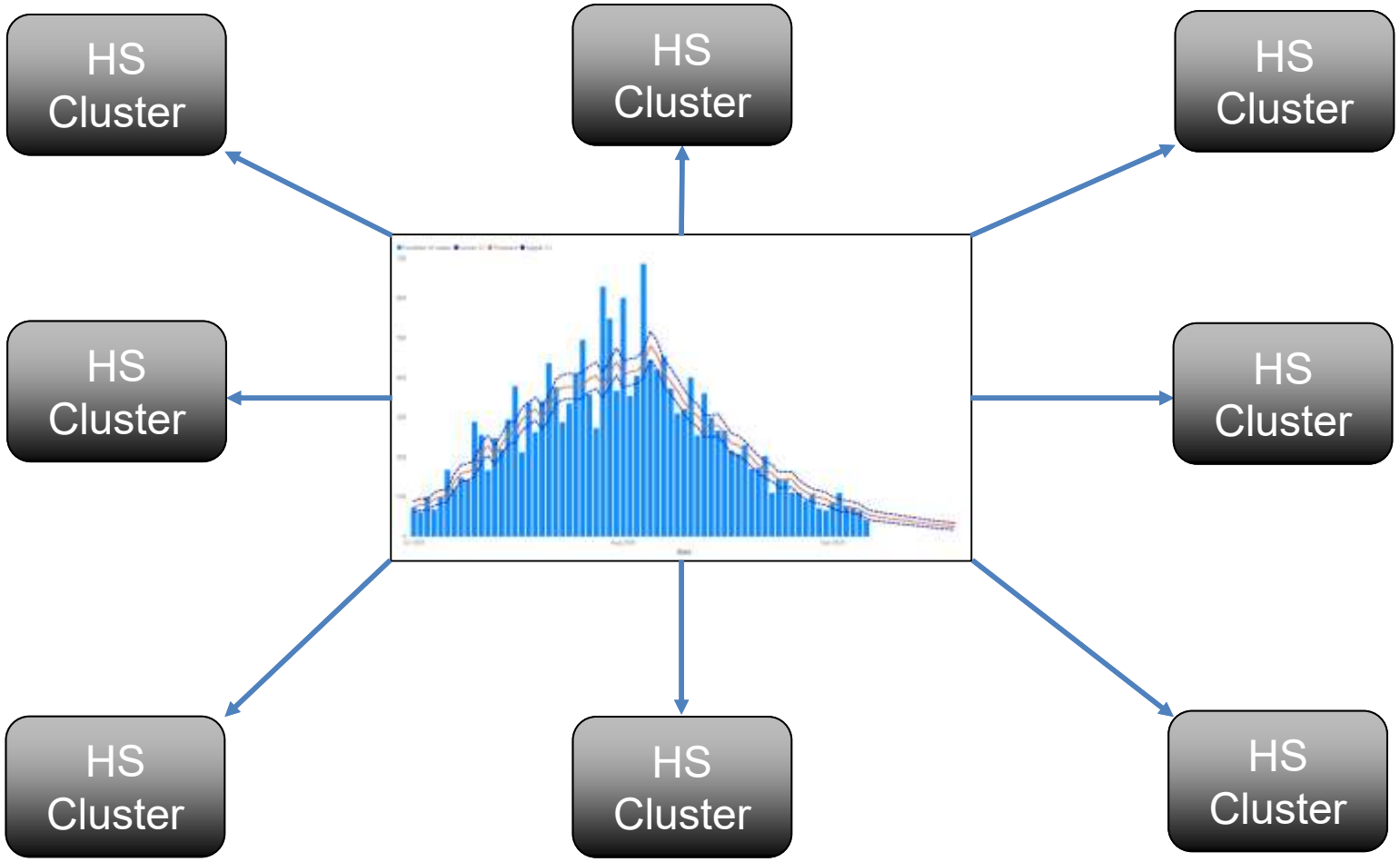
Modelling for monitoring

- **Operational needs change frequently and rapidly**
  - Hospital capacity
  - Elective surgery
  - Difficulties with workforce

- **Surveillance of key numbers to indicate ‘trouble’ or ‘success’**
  - R_{eff}
  - Geographic distribution of cases
  - Quantification of areas ‘at risk’

A case forecast is one thing…

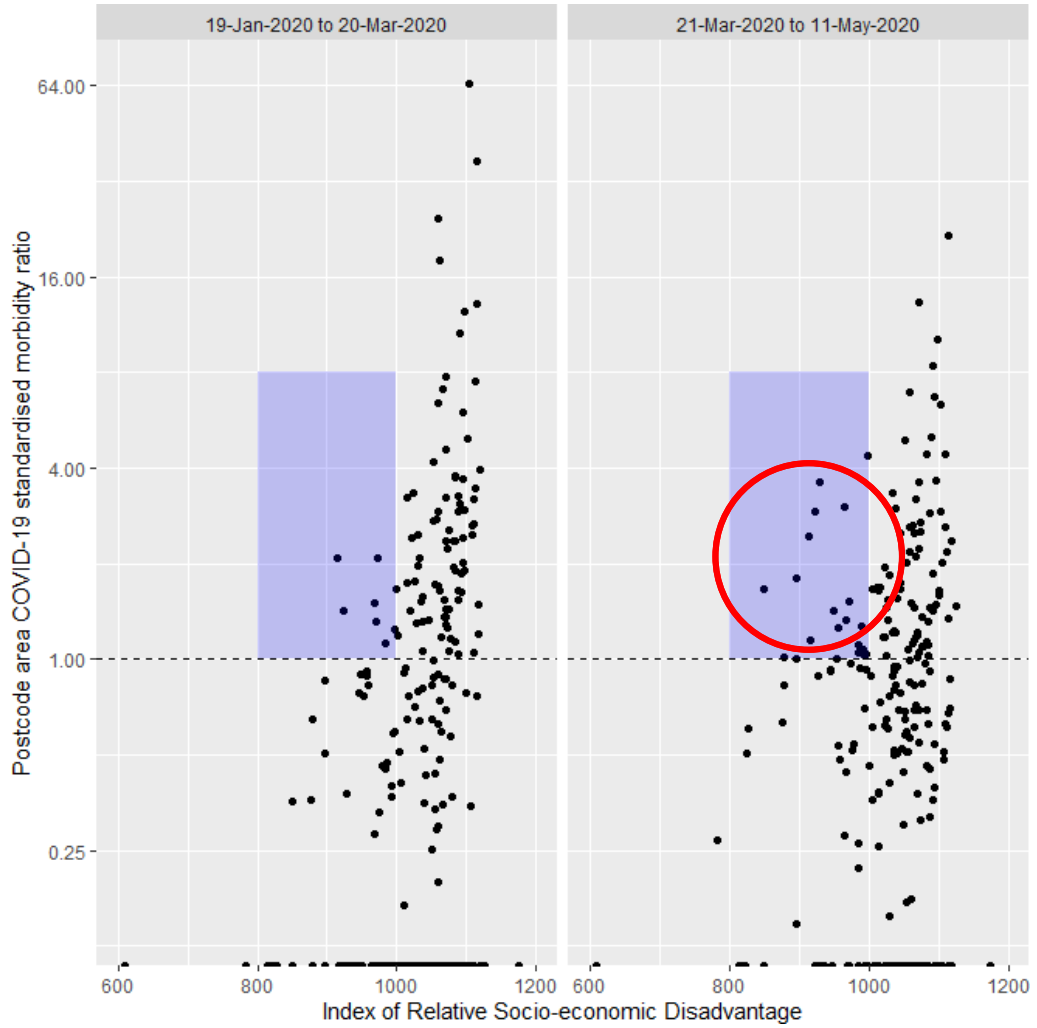
In Victoria, health services are not centrally managed



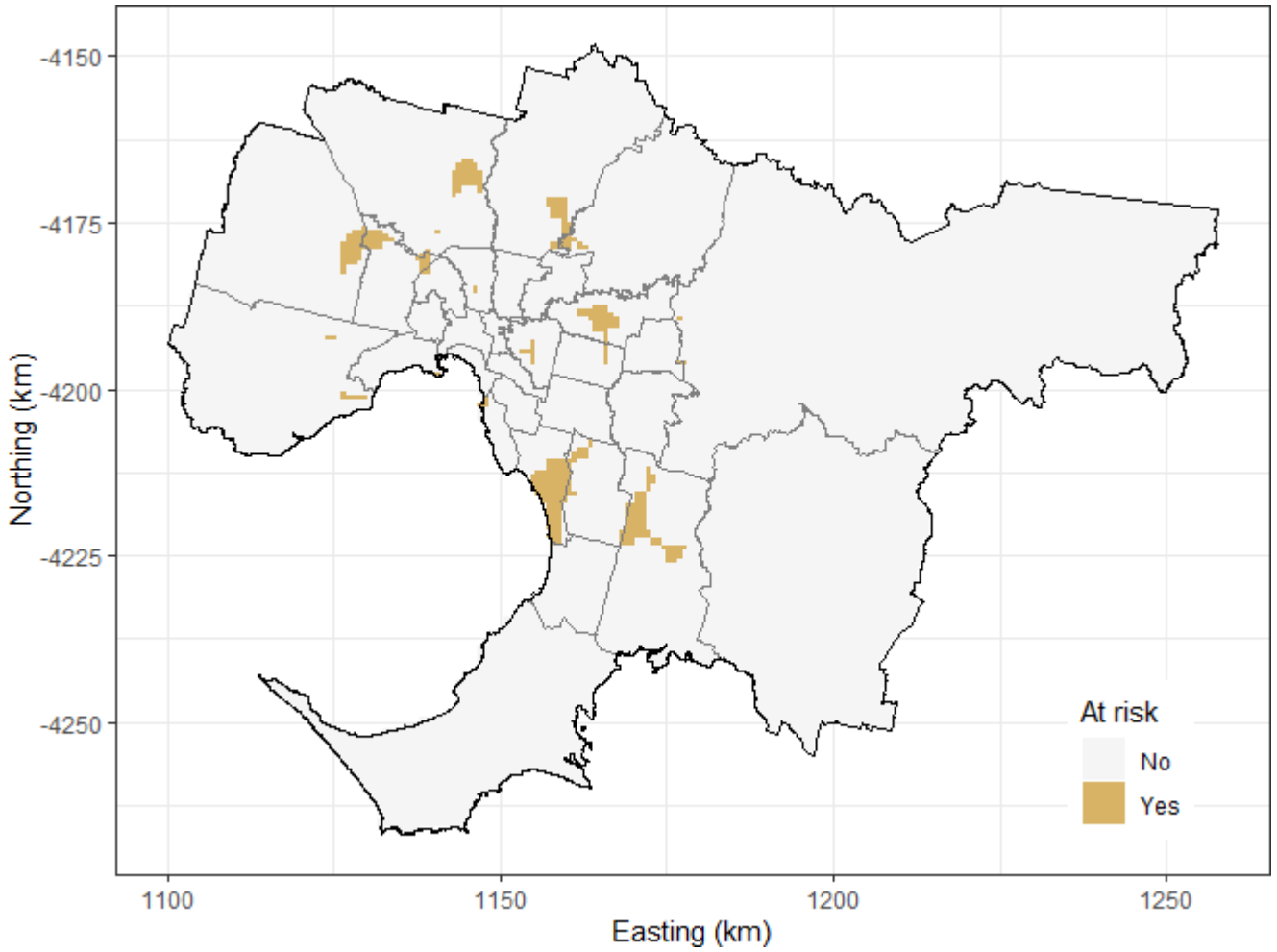
Changing geographic distribution of cases

Overseas experience demonstrates the public health challenges of this virus in areas of socio-economic disadvantage

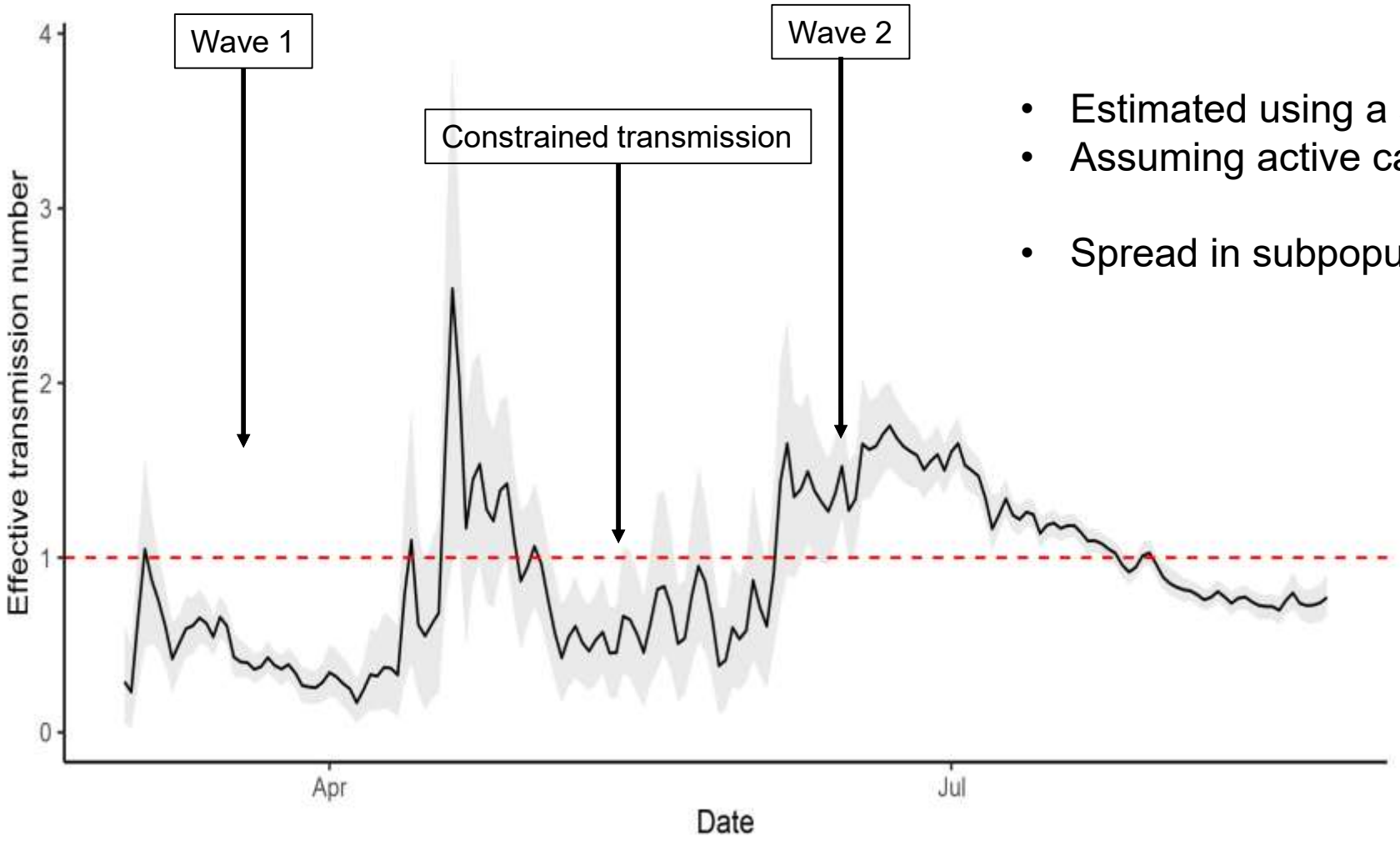
First signs that the demographics of disease had changed in Victoria occurred during relatively successful containment of transmission



Potential holes in testing coverage (that have since been plugged)



Effective transmission number



- Estimated using a statistical framework
- Assuming active cases represent ‘average’ behaviour

- Spread in subpopulations that may behave differently

Modelling as evidence

Modelling is frequently undertaken to:

- **Drive investment into key areas**

- **Understand the necessity of restrictions in Victoria**
- **Quantify if the scale of restrictions is appropriate**
- **Assess risks with easing of restrictions**

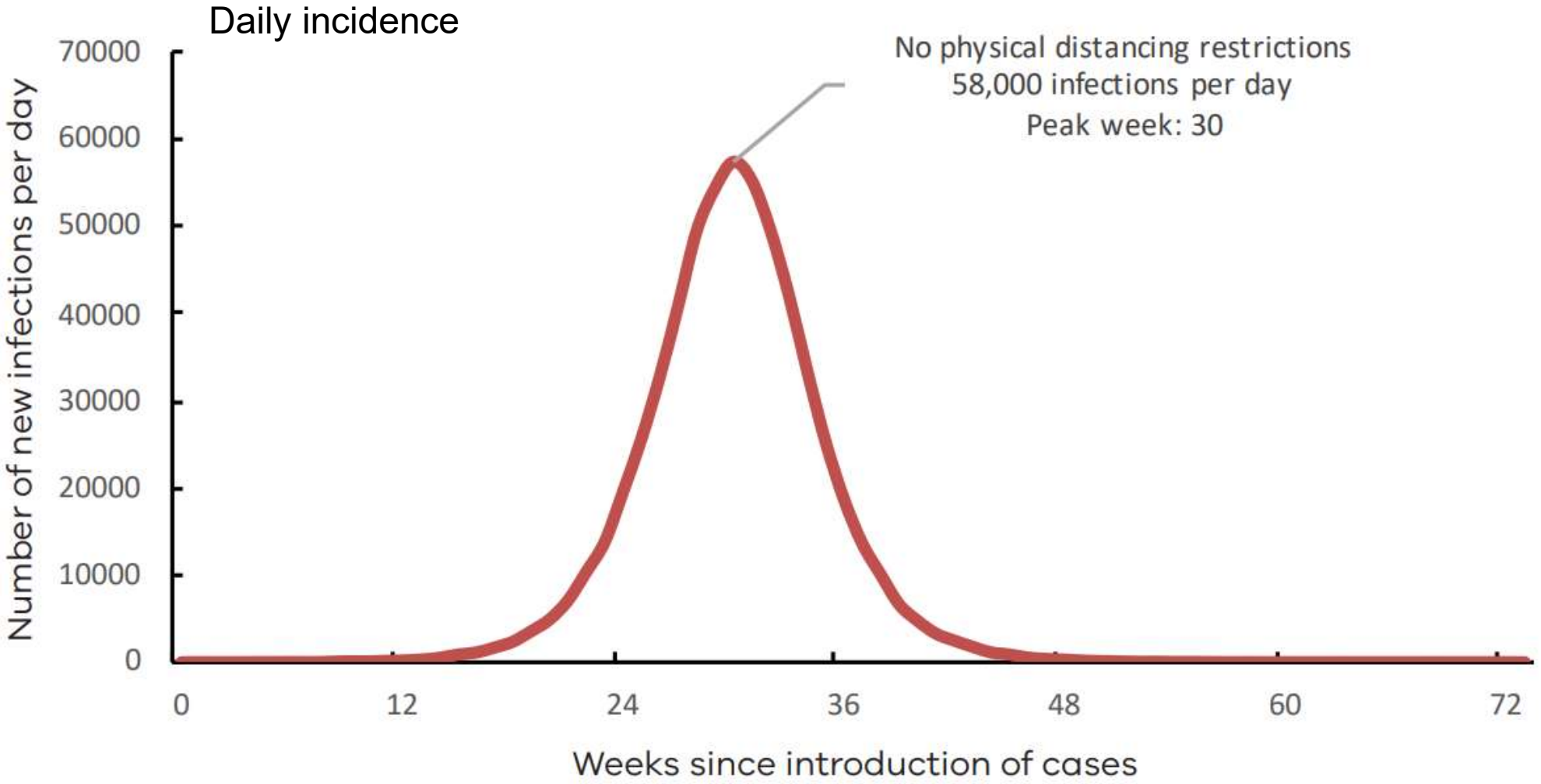
Model 1: Compartmental model

Developed throughout February and through to April, a compartmental SEEIIR model was utilised by Commonwealth and State Governments

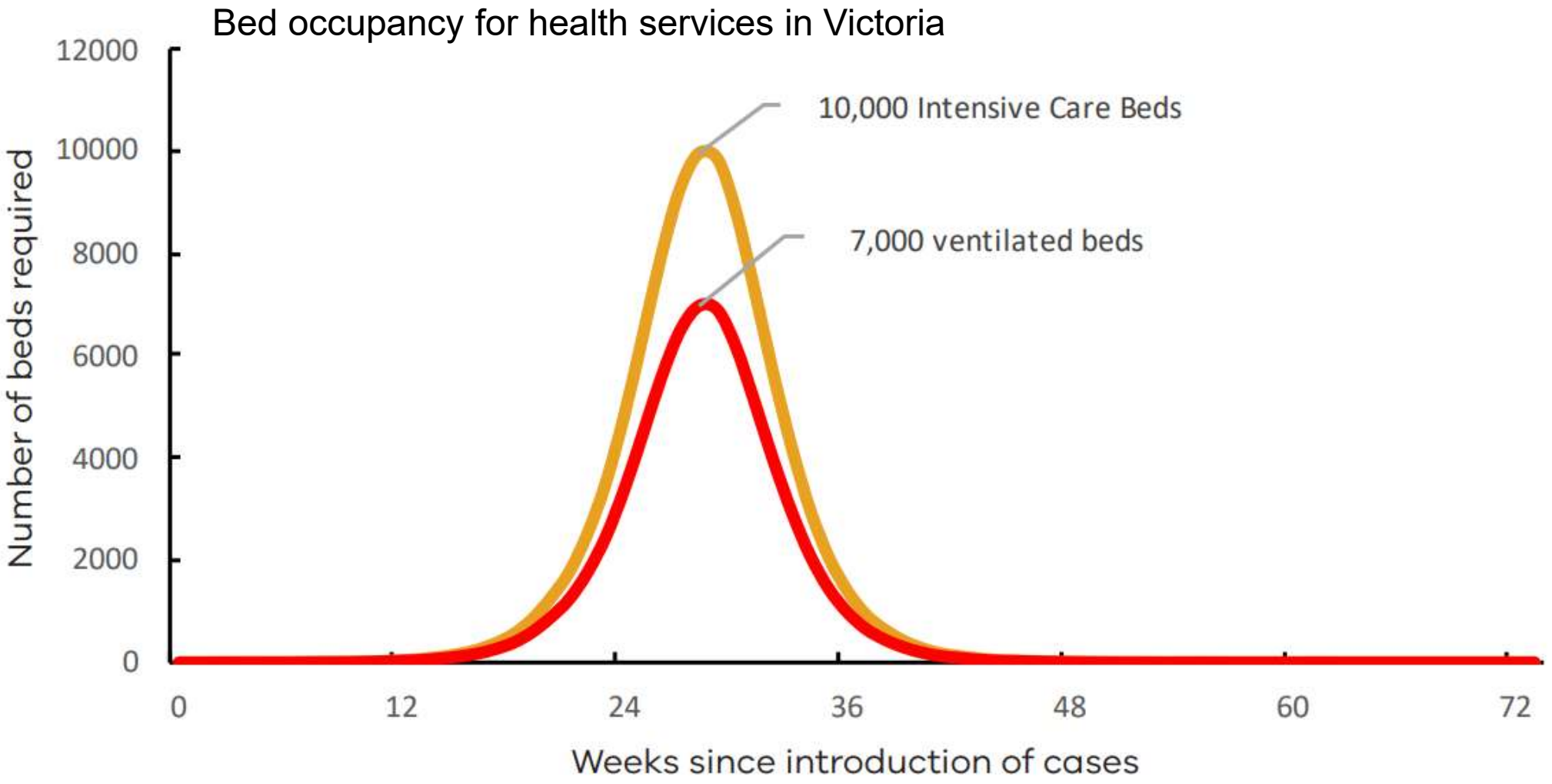
- Based largely on international knowledge
- Was consistent with the limited local experiences at that time

Model was used to justify strong public health action, and drive investment into the health sector to prepare for 'worst case scenario'

Victoria's evidence modelling



Victoria's evidence modelling



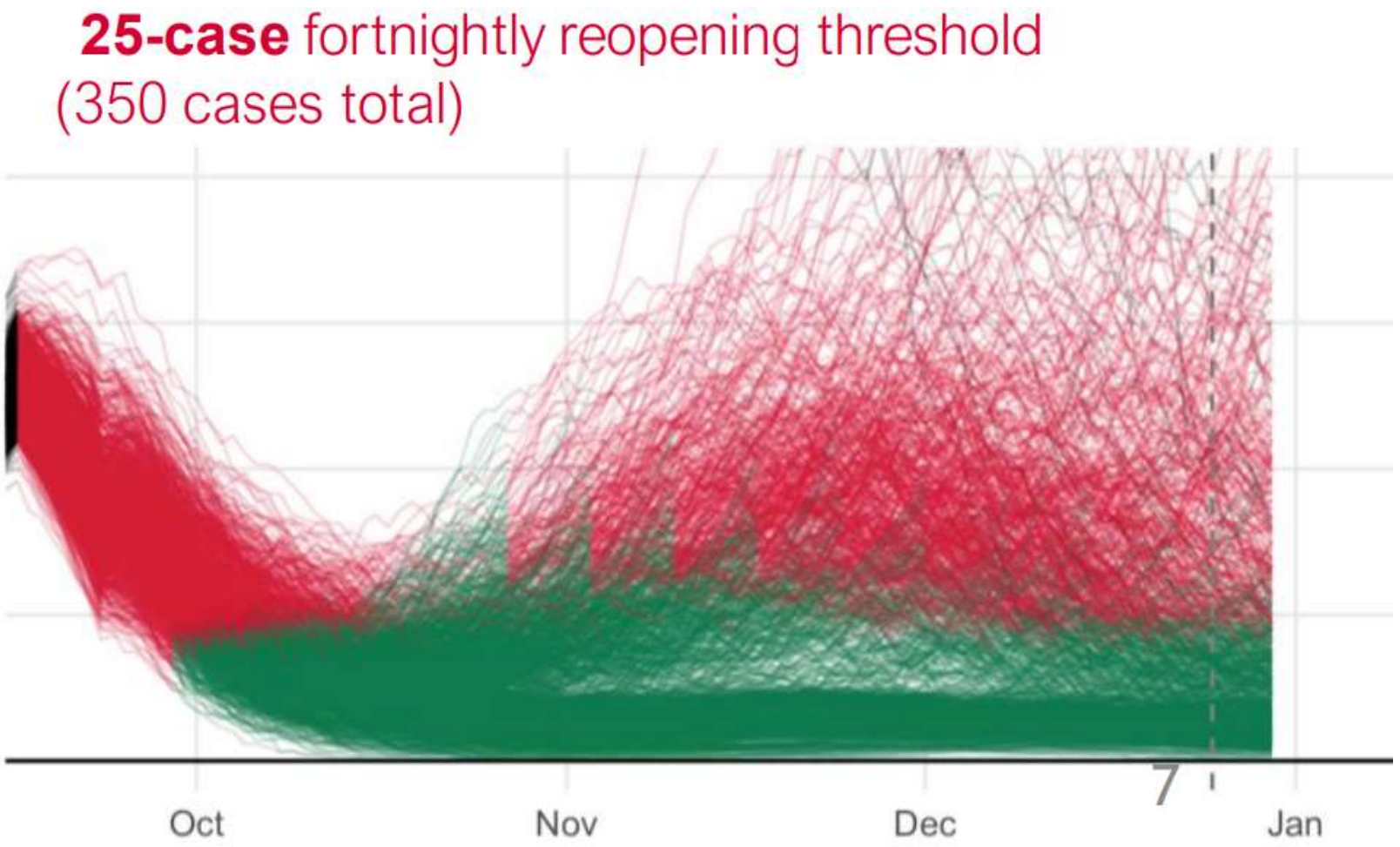
Model 2: Stochastic Agent Based Model

Developed by the University of Melbourne in collaboration with the Department

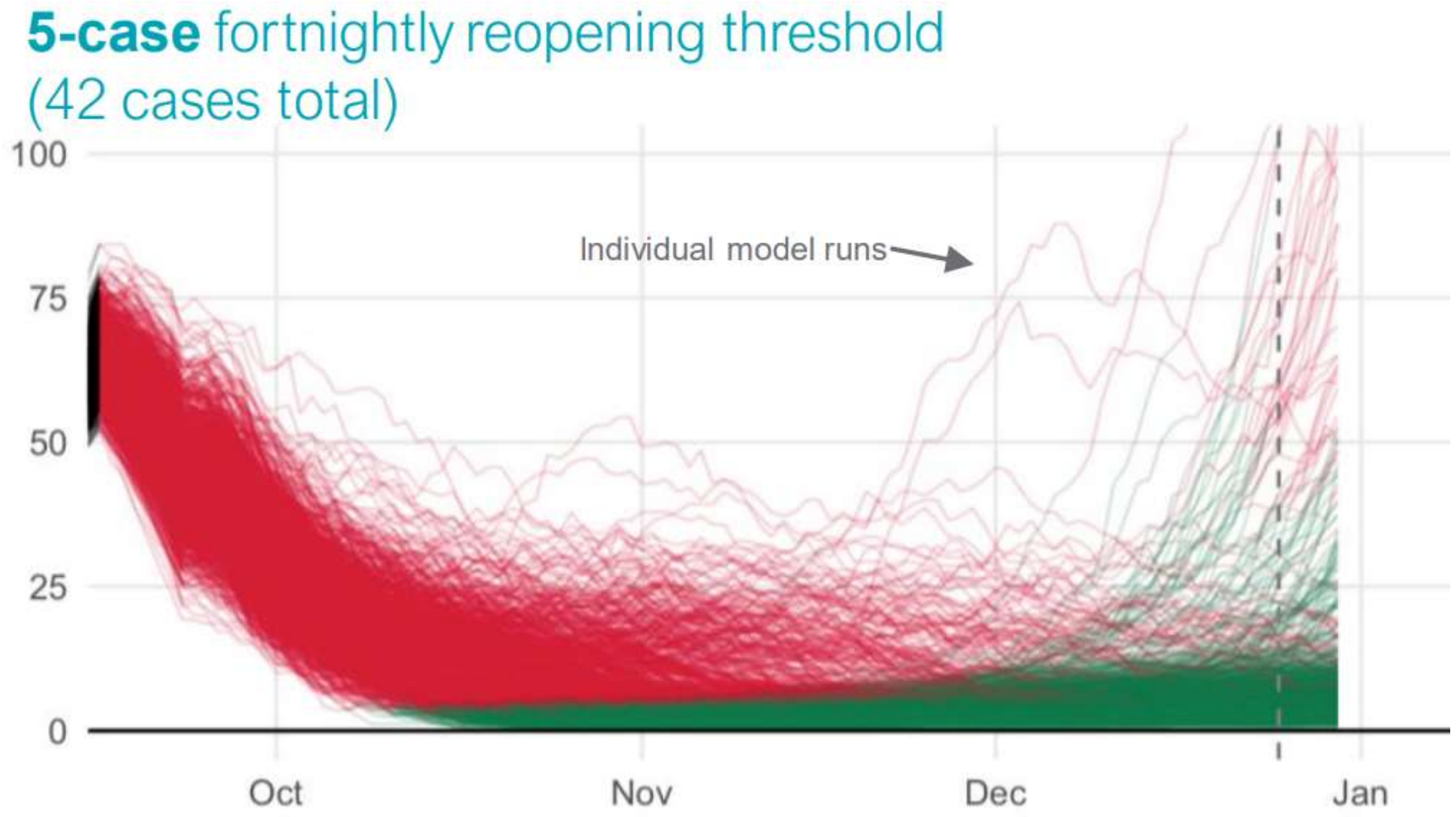
- Based on local observations
- Cannot be fully calibrated to all available data

Model used to explore ‘endgame’ scenarios for COVID-19 in Victoria

Victoria's evidence modelling – roadmap out of restrictions



Victoria's evidence modelling – roadmap out of restrictions



Modelling walks the line

- **Modelling has driven key parts of Victoria's response and continues to do so**
  - But is one piece of evidence used in decision making
  - Observations of reality always take precedence over model predictions
  - Communication of modelling results to policy makers is key: models are a quantitative tool for qualitative insights

- **Modelling strikes a balance between investigation and policy driven work**
  - Rather than asking "what are the findings", we ask "how does this change our response"?