SEACFMD National Coordinators Virtual Meeting

Modelling Spread and Control of FMD

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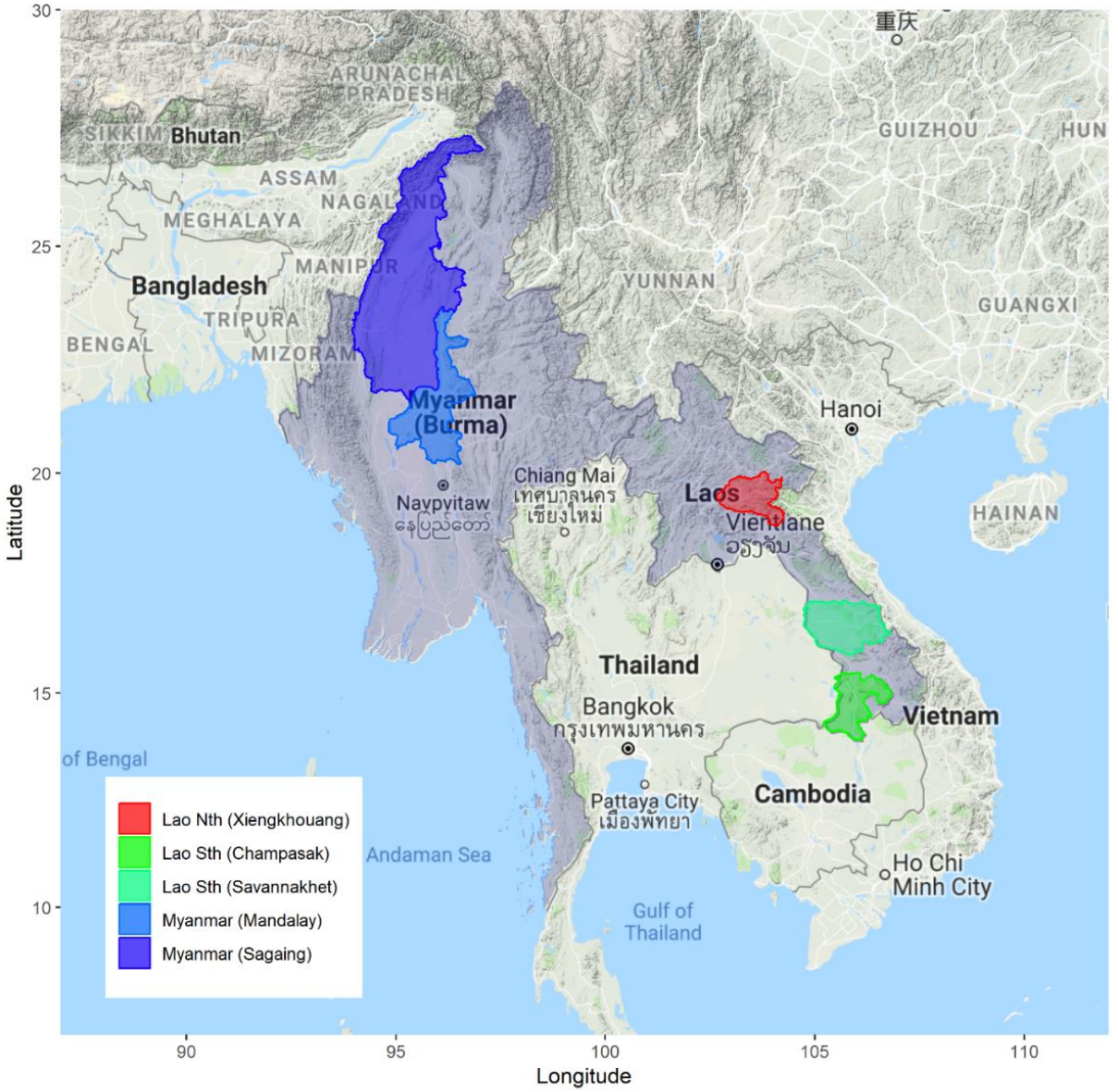
  - Dr Masako Wada, Dr Nelly Marquetoux, Dr Jun Han Hee

Expected Outputs

- Output 1: FMD risk assessments conducted in target areas
- Output 2: Control strategies developed and implemented for target areas
- Output 3: Training and technical assistance provided
- Output 4: Coordination workshops conducted and resource materials provided
- Output 5: **FMD** monitoring, evaluation, and **modelling** tools established



Purpose of modelling

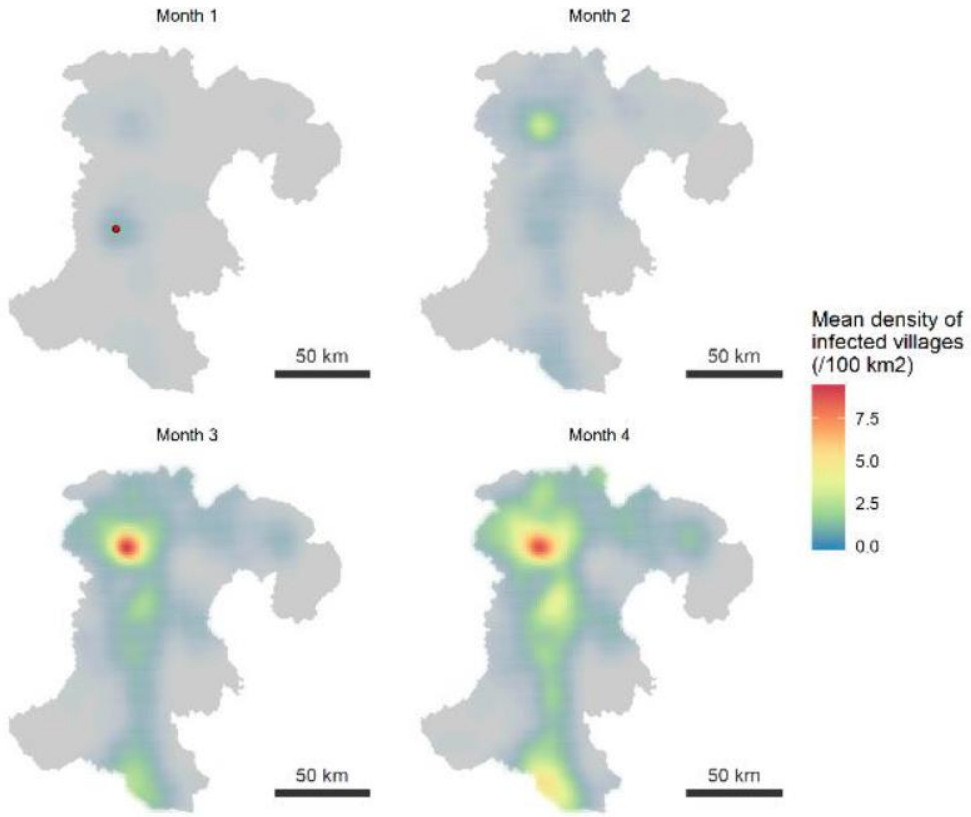
- Models = decision support tools
- Situation:
  - FMD is endemic: sporadic cases - - -> outbreaks
  - Risk based partial vaccination RBPV: ~40% villages vaccinated since 2017
- Questions to be addressed by modelling:
  - Can RBPV sustainably control FMD on the long run?
  - Can RBPV protect ruminants in non-vaccinated areas?
  - What coverage is required
  - What is the impact of long distance movements?
  - If so, where are additional measures required? Market control, awareness etc.

5.3: FMD Modelling

Time-space models developed for Myanmar and Lao PDR: InterSpread Plus

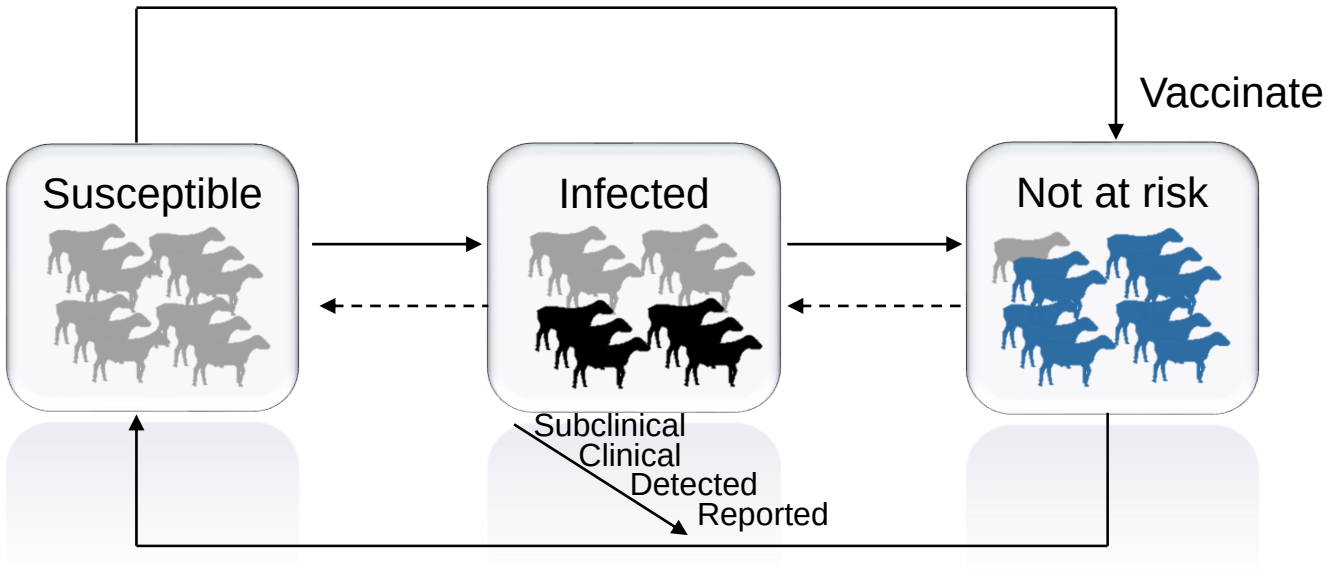
http://www.interspreadplus.com/

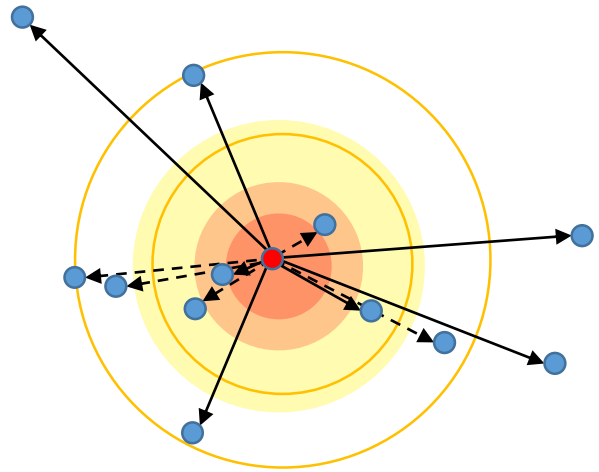
- 2018 base model: data requirement vs available information (Lao PDR, Myanmar)
- 2019: movement survey
- 2020: validate the model, assess its predictive accuracy and evaluate alternative scenarios



Model Features

- Design
  - Unit = village
  - Spatial parameters
  - Time parameters
  - Stochastic: uncertainties
- Transmission mechanisms
  - Livestock movement
  - Local spread
- Within-herd modelling features
  - to capture mixed states of infected, immune and susceptible animals within a village





Model parameters		Values	Data
Movement	Transmission probability	10%	OI
Traders	Distance	2 – 483 (8) km (pick-up) 3 – 161 (18) km (drop-off)	MS
	Frequency	Poisson λ = 0.27 /day (pick-up) Poisson λ = 0.18 /day (drop-off)	
Grazing	Distance	2 – 105 (3) km (out) 2 – 113 (6) km (in)	MS
	Frequency	Poisson λ = 0.03 (/day)	
Local spread	Transmission probability	8, 6, 4, 2 and 1 per 1000 susceptible village-day within 1, 2, 3, 4, 5 km	Other
Course of infection	Incubation period	2 - 21 (8) days	Lit
	Max time of infection	22 – 130 (38) days	OI
Partial immunity	% villages with immunity	30%	BS
	% animals with immunity	30%	SS
	% reduction in infectivity	50%	BS
Villagers report	Probability of detection	70%	BS
	Probability of report	30%	BS
	Delay to report	Poisson λ = 18 days	OI

OI: Outbreak investigation

MS: Movement survey

BS: Baseline survey

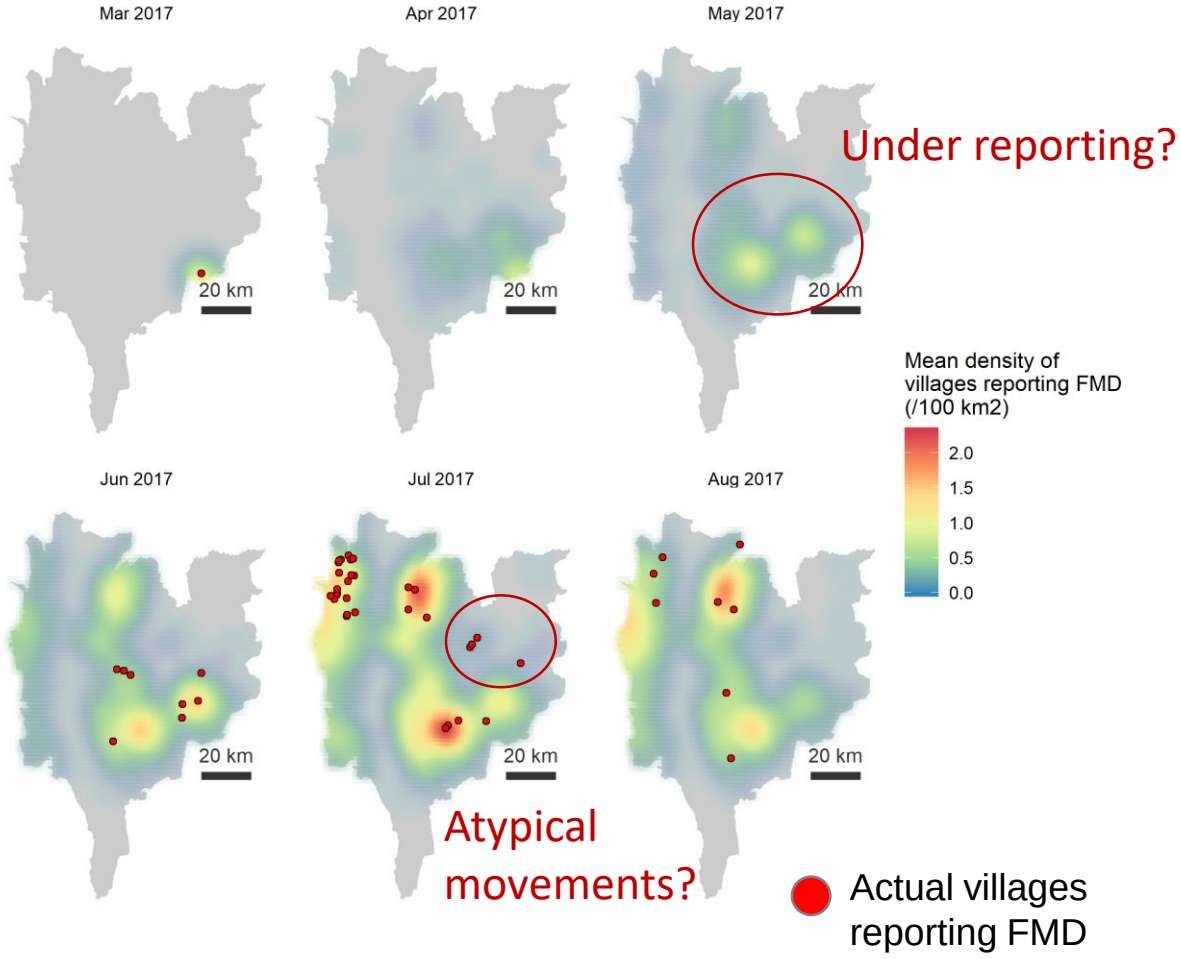
SS: Serological survey

Lit: Literature

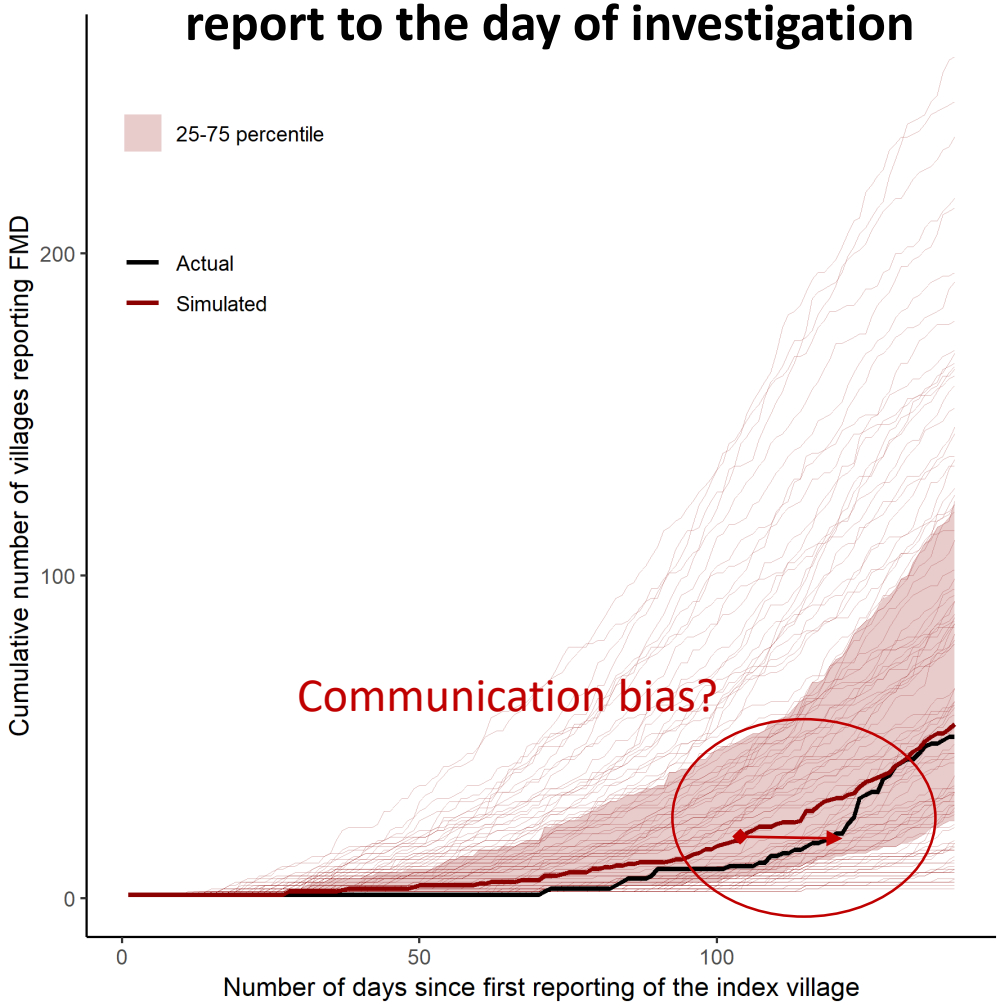
Validation – ‘outbreak investigation vs simulation’

– Mingin Township –

<u>Space</u>: Simulated and actual villages reporting FMD



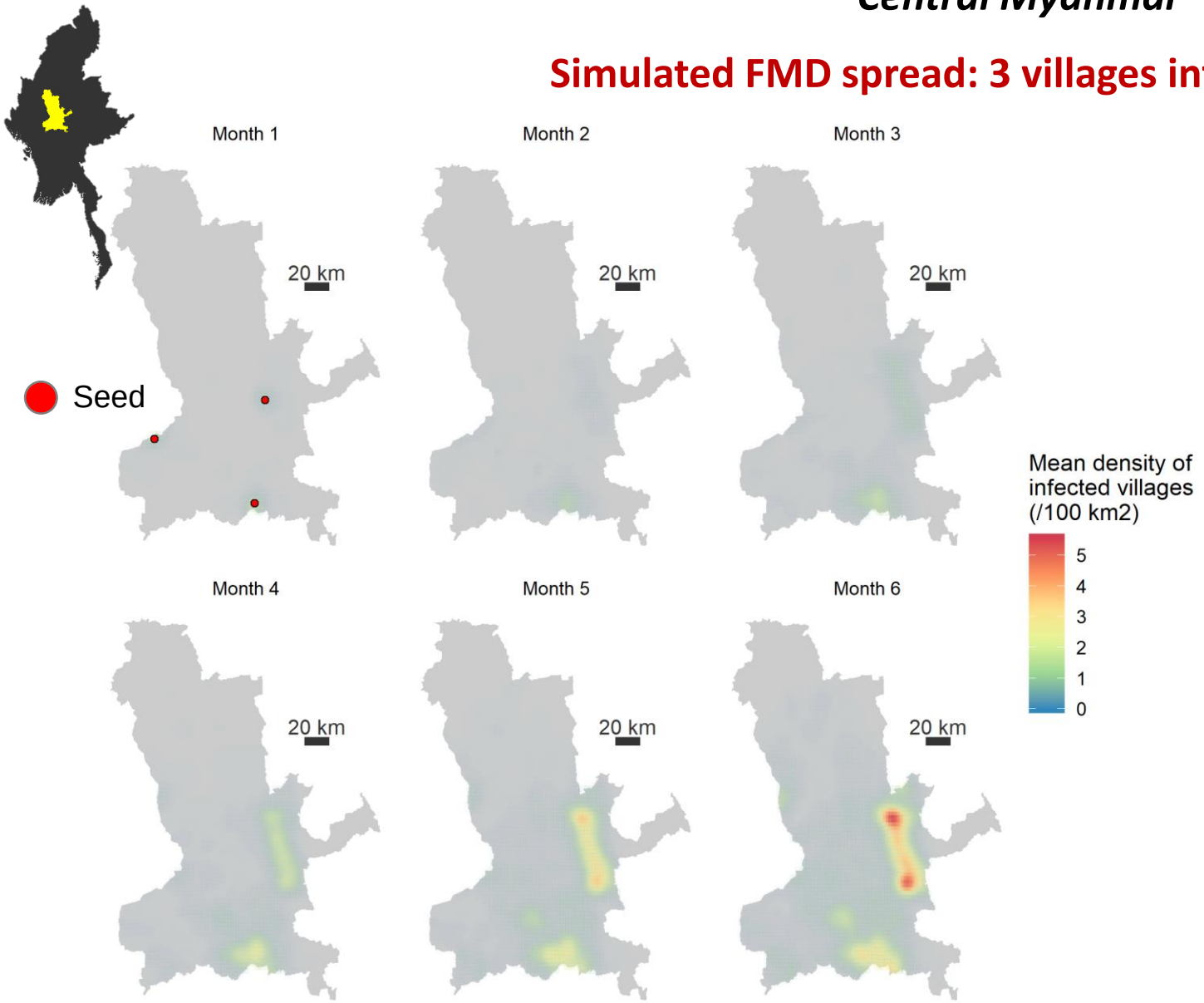
Time: Simulated and actual time from first report to the day of investigation

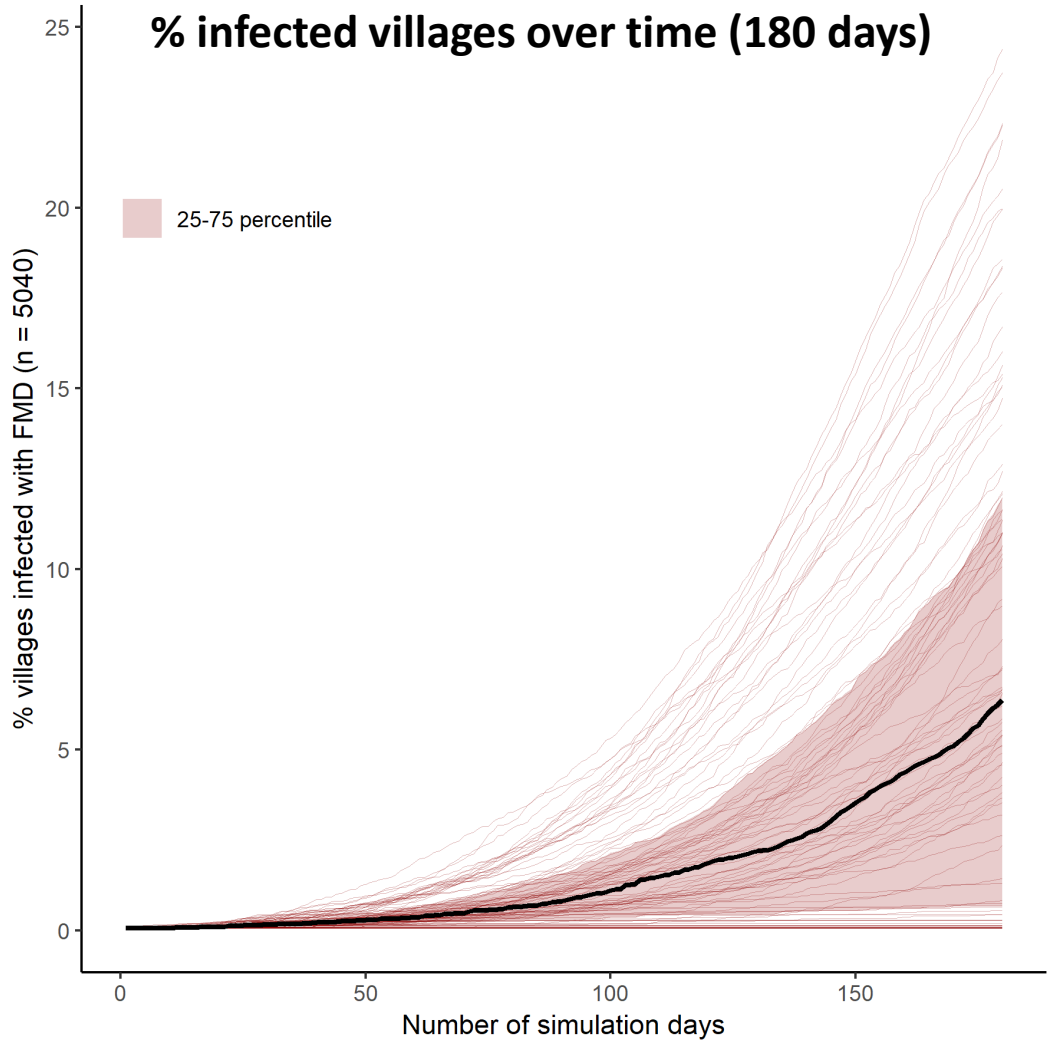


Evaluation control scenarios: *'do nothing'*

– Central Myanmar –

Simulated FMD spread: 3 villages infected in month 1

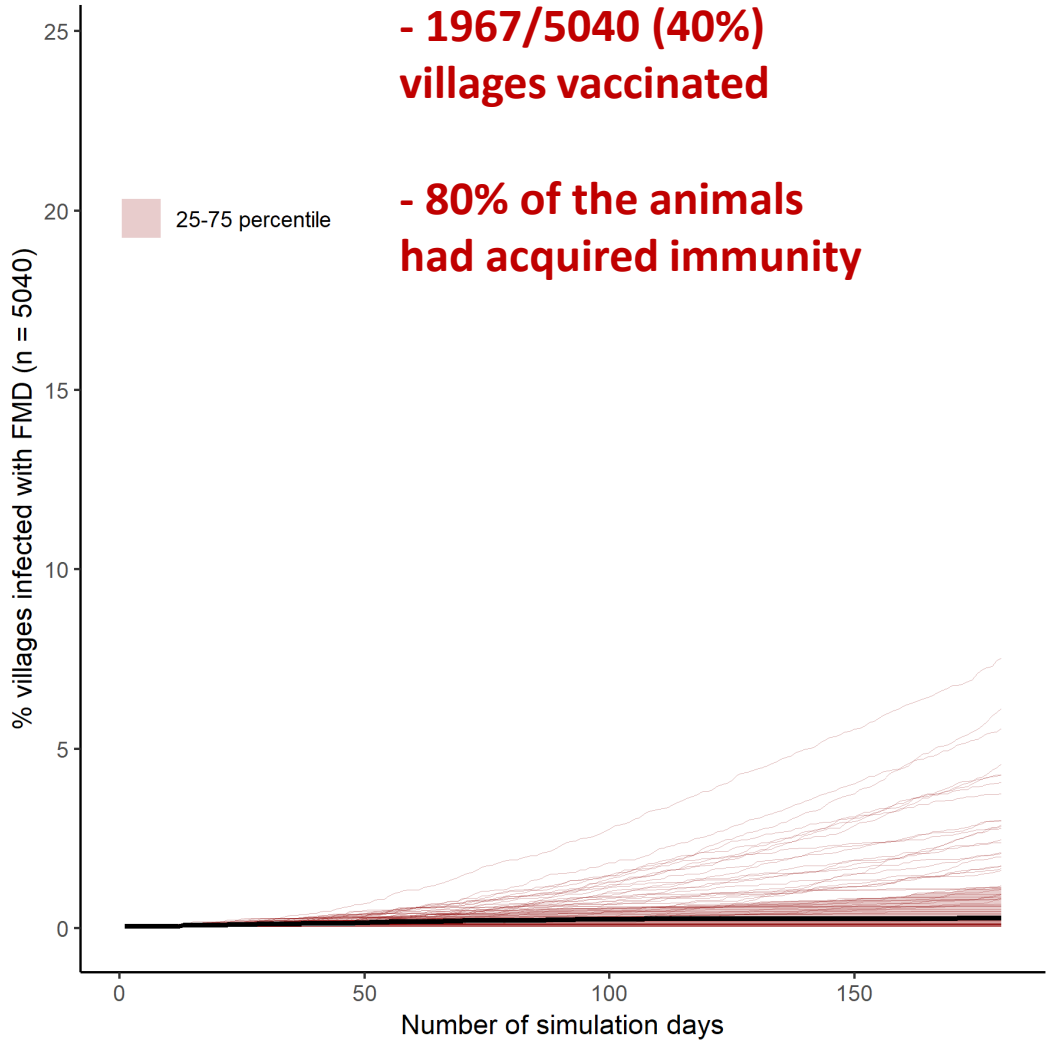




Evaluation control scenarios: *'risk based partial vaccination'*

– Central Myanmar –

Simulated FMD spread: 3 villages infected in month 1



- 1967/5040 (40%) villages vaccinated

- 80% of the animals had acquired immunity

Activities for 2020-2021

1. Post baseline survey/ analysis/ reporting
   early 2020: Lao PDR,
   early 2021: Myanmar
2. FMD impact on Myanmar dairy farm (collaborate with MDEP)
3. Training of trainers for outbreak investigation (August?)
4. Follow-up level 2 training for outbreak investigation in Lao PDR and Myanmar
5. GIS training (October?)
6. PVM for Lao PDR and Myanmar
7. **Finalise models for Lao PDR and Myanmar + In-country training**
8. Prepare manuscripts and submit (2 in 2020 + 6 in 2021)
9. In-country project summary workshop (Lao PDR and Myanmar)

Achievements from a Massey perspective

- Capability to generate information
- The data were key to inform model development
- Confident that by the end of the project, basic disease modelling will have been demonstrated and used by some individuals