A mechanistic understanding of yellow fever outbreak potential under seasonal variation

Angélica Mata*, Lívia Abdalla, Eduardo Krempser, Douglas Augusto and Márcia Chame

*angelica.mata@ufla.br

2025-03-20

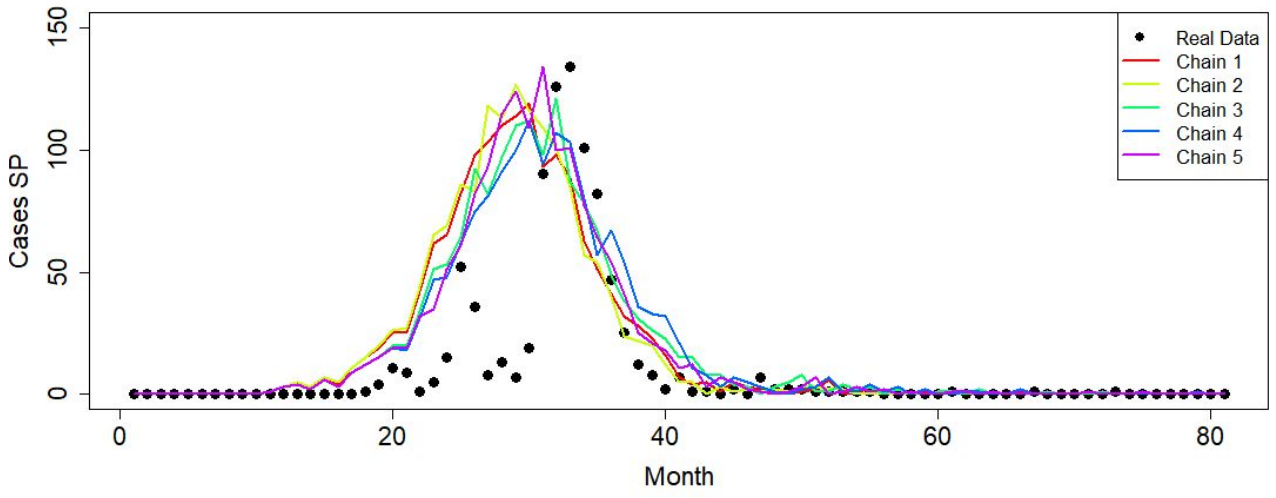
FIOCRUZ SUS MINISTÉRIO DA SAÚDE

Objectives

- Research project with Fiocruz (Brazil) and VIMC (Imperial College).
- Develop, refine and estimate a mechanistic seasonality model for YF in NHP in Brazil.
- Prepare suitable data to quantify seasonal relationships between YF occurrence and environmental conditions.
- Extend the model to examine climate change and extreme events.
- Use the model to explore the timing of interventions such as vaccination.
- Explore data needs and assumptions to expand the model beyond Brazil.
- How surveillance of human outbreaks affects the underreporting of cases.

Mechanistic Model

- Temporal series dataset of yellow fever incidence in NHP across different Brazilian states.
- Stochastic SIR model using Bayesian inference to estimate the infection rate (β) and recovery rate (γ).
- Tools: newer packages odin2 and monty.




```
> posterior::summarise_draws(samples_df)
# A tibble: 2 × 10
  variable   mean median     sd    mad     q5    q95  rhat
  <chr>     <dbl>  <dbl>  <dbl>  <dbl>  <dbl>  <dbl> <dbl>
1 beta     0.432  0.428  0.0138 0.0149 0.413  0.449  2.00
2 gamma    0.0750 0.0734 0.0193 0.0125 0.0539 0.124  1.37
```