

# Modelling COVID-19 incidence in Low-Middle Income Countries and moving back to biodiversity & landscapes

IBAHCM seminar

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- 2020 to present - PhD via MVLS DTP Scholarship funding
  - Oct 2020 to Sept 2021 - project rotations
  - leave/extension to work on COVID-19 response for some months
  - Sept 2021 - start of main project

# Some academic keywords about me

Biodiversity response to landscape changes

Extinction debts and colonization credits

R programming

Statistics + JAGS/STAN/INLA

Spatio-temporal analyses

GIS and r-spatial

# Slides structure

1. Modelling COVID-19 incidence in Dhaka, Bangladesh
2. Intro to my PhD project

# Modelling COVID-19 incidence in Dhaka, Bangladesh

University of Glasgow COVID-19 LMIC modelling response team

- Fergus J Chadwick @ UoG, IBAHCM
- Yacob Haddou @ UoG, IBAHCM
- Jess Clark @ UoG, IBAHCM
- Jess Enright @ UoG, SCS
- Elaine Ferguson @ UoG, IBAHCM
- Katie Hampson @ UoG, IBAHCM
- Davina Hill @ UoG, IBAHCM
- Jason Matthiopoulos @ UoG, IBAHCM
- Janine Illian @ UoG, SMS
- Mikolaj E Kundegorski @ UoG, IBAHCM
- Luca Nelli @ UoG, IBAHCM
- Ben Swallow @ UoG, SMS
- Craig Wilkie @ UoG, SMS

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[https://github.com/boydorr/BGD\\_Covid-19](https://github.com/boydorr/BGD_Covid-19)

[https://github.com/valiriel/DHAKA\\_COVID19\\_INLA](https://github.com/valiriel/DHAKA_COVID19_INLA)

# Modelling COVID-19 incidence in Dhaka, Bangladesh

## Why?

- Analyze the spatio-temporal trends of COVID-19 within one of the most densely populated megacities in the world
- Identify hotspots areas and worrying trends to inform the Bangladesh Institute of Epidemiology
- Feel useful during lockdown and provide statistical and data analysis help for on-the-ground interventions
- To learn Integrated Nested Laplace Approximation (INLA) modelling

# COVID-19 incidence across Dhaka

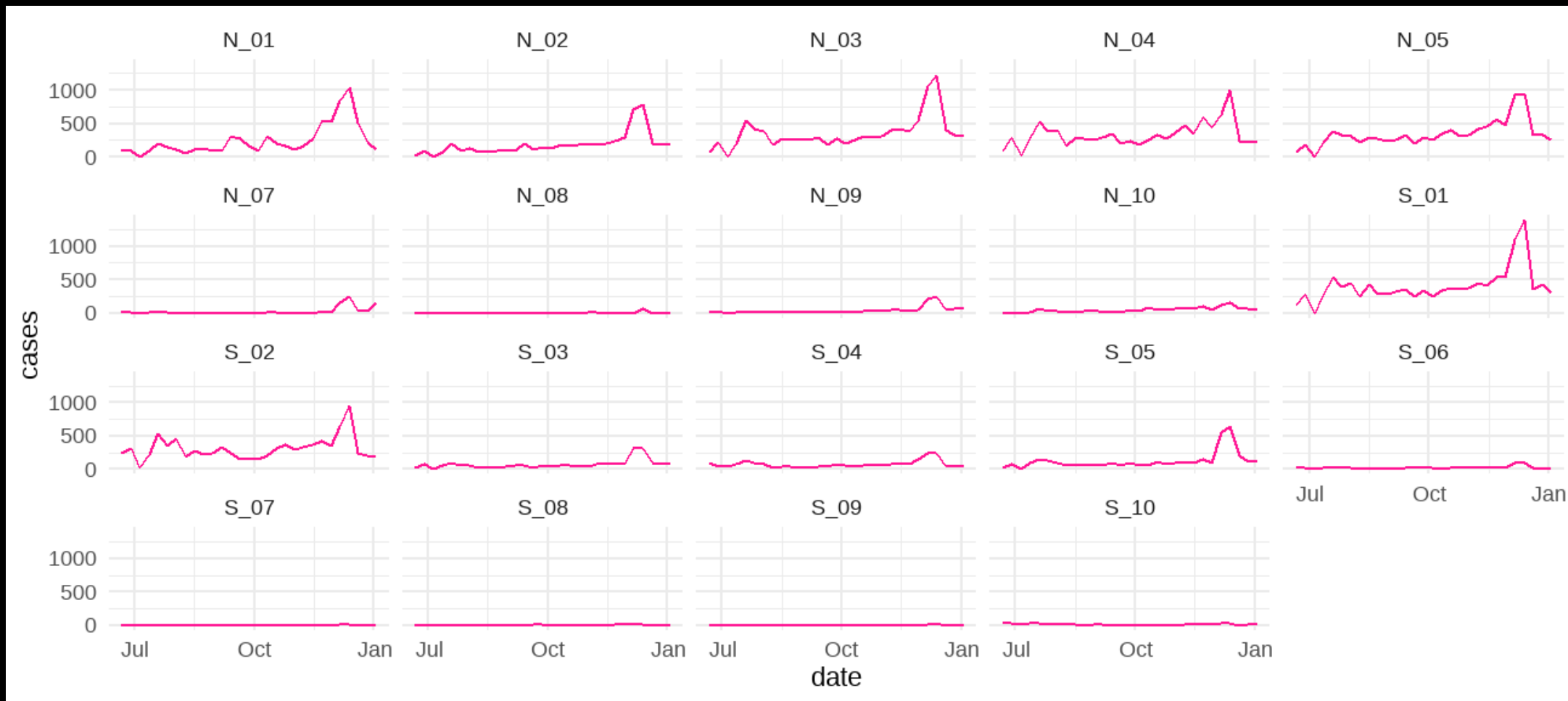


# COVID-19 SIR across Dhaka

Standardized Incidence Ratio (SIR) = observed cases / expected



# COVID-19 temporal trends across Dhaka wards





# Modelling COVID-19 incidence in Dhaka, Bangladesh

## INLA

A little to complex to explain in 5 minutes.

Imagine a linear model where you can define random effects, in INLA these random effects can be unstructured (your common glmer RE) or structured:

- **structured temporal RE** based on models such as ar1, rw, ar2
- **structured spatial RE** based for example on distance between polygons
- **spatiotemporal interactions** of the options above

**I can't really show results time and non-disclosure agreements for now**

# Modelling COVID-19 incidence in Dhaka, Bangladesh

## In the end it didn't even matter

### Take home messages

- Sometime the data is not good enough for the model
- Data collection needs to follow scientific protocols, especially during a pandemic
- Testing capacity was not up to standards
- I guess, at least I learned how to use INLA...

# Back to biodiversity and the main PhD

- Started 2 weeks ago so much of is still unsure
- I am currently focusing on shaping up a clear set of research questions
- The overall topic will focus on returning to the analysis of biodiversity response to landscape changes

- Haddou Y., Mancy R., Matthiopoulos J., Spatharis S., Dominoni D. (2020) Invisible biodiversity: extinction debts and colonization credits amongst US birds. Nature Ecology and Evolution. [in review]  
[<https://doi.org/10.21203/rs.3.rs-134174/v1>]
- Temporal lags in the response of biodiversity to changes in landscape composition
  - Compare taxa responses
  - Frequency of landscape changes and their speed
  - Incorporate more landscape components heterogeneity, climatic
  - Analyze differences across spatial and temporal, size at which these process manifest
  - Explore sensitivity of biodiversity metrics, functional diversity and niche occupancy

## PhD supervisors

Davide Dominoni

Rebecca Mancy

Jason Matthioupoulos

Sofie Spatharis

## Funders

College of Medicine, Veterinary and Life Sciences @ University of Glasgow

# Thank you for the attention.

## Any questions ?

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