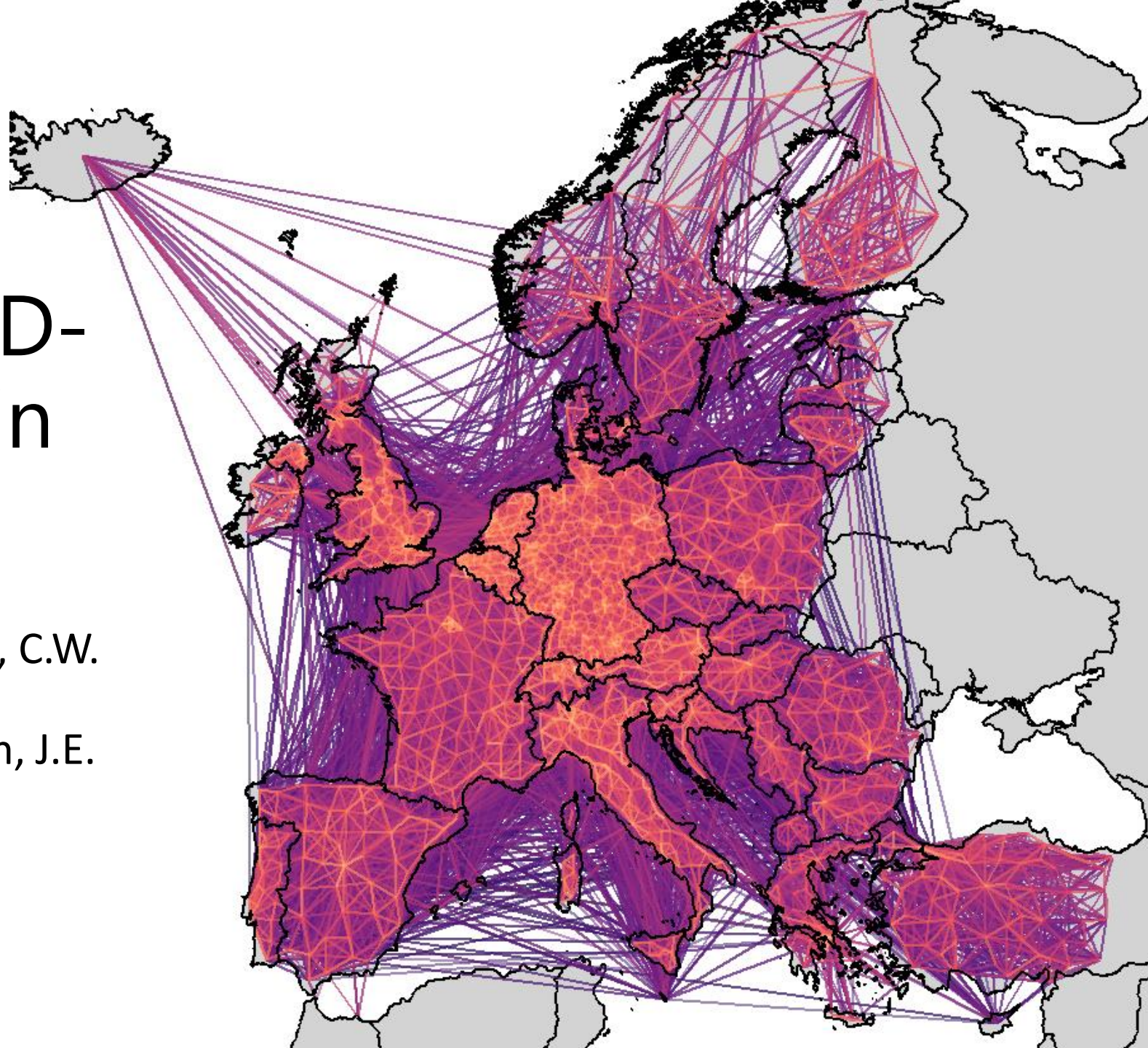
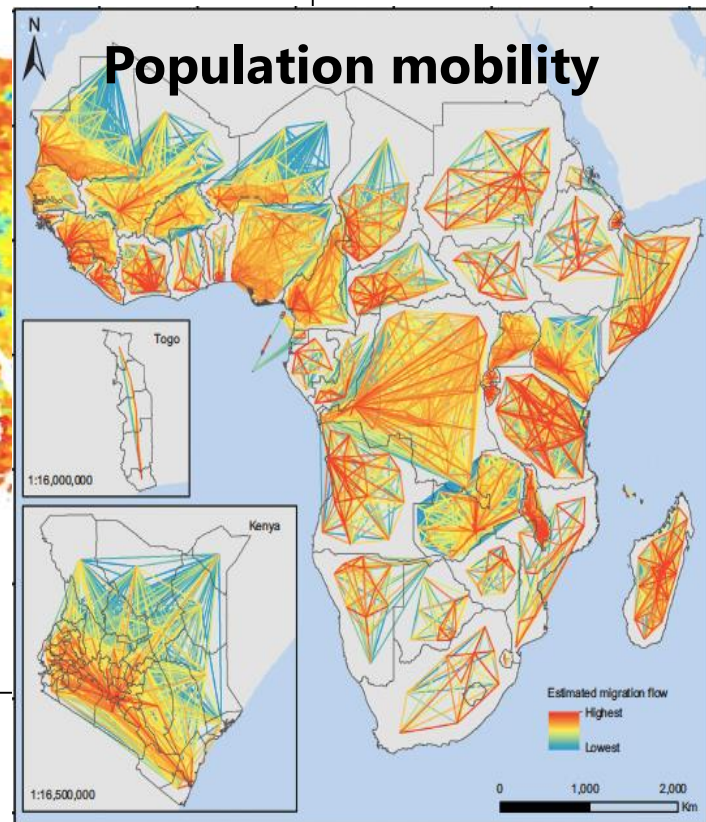
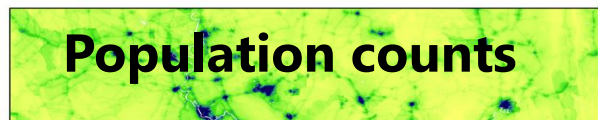


# The impact of coordinated COVID-19 exit strategies in Europe

N.W. Ruktanonchai, J.R. Floyd, S. Lai, C.W. Ruktanonchai, A. Sadilek, P. Rente-Lourenco, X. Ben, A. Carioli, J. Gwinn, J.E. Steele, O. Prosper, A. Schneider, A. Oplinger, P. Eastham, A.J. Tatem







Applied research group

Open data, open peer-reviewed methods

Spatial demographic data for low and middle income countries

Key application areas in epidemiology, maternal/newborn health, childhood vaccination

# Managing COVID-19

- Exit strategies/non-pharmaceutical interventions (NPIs)
  - School/work/shop/hospitality closures, stay-at-home directives, self-isolation, social distancing...
- Can we relax without a second epidemic?



Italy



France

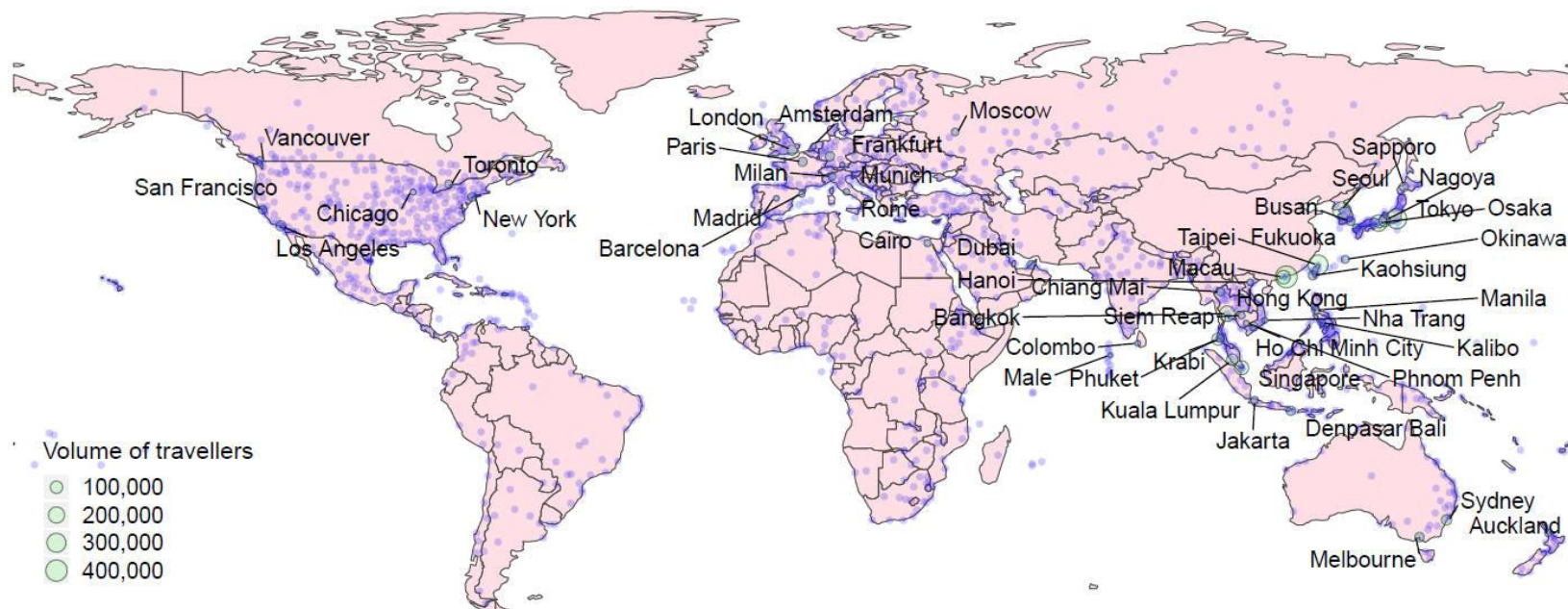


UK



# COVID-19 & international travel

- Reintroduction may occur after restrictions lifted
- International importation critical factor
  - Underscores importance of coordination: avoid COVID-19 whack-a-mole
- How much better are regional outcomes if exit strategies are coordinated?

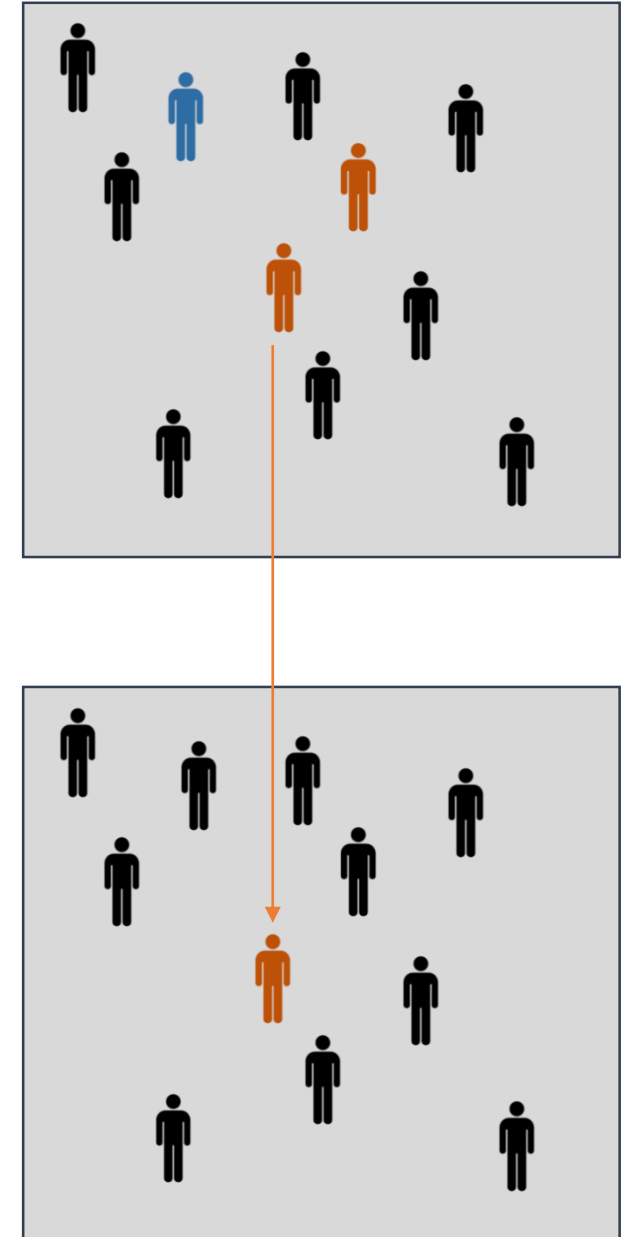


Travelers from high risk cities in China; <https://www.worldpop.org/events/china>



# Modelling regional movements in COVID-19

- **What are the costs and benefits of international coordination?**
  1. Estimate baseline movement
  2. Quantify NPI effect on movement/contact
  3. Simulate scenarios of lifting NPIs
- **Scenarios tested:**
  - Coordinated vs uncoordinated lifting
    - What happens if one country doesn't follow the rules?
  - Synchronized cycles vs unsynchronized
    - Reinstating NPIs after threshold cases—what happens if not done in a regional manner?
- Initially in Europe due to data availability, but will expand

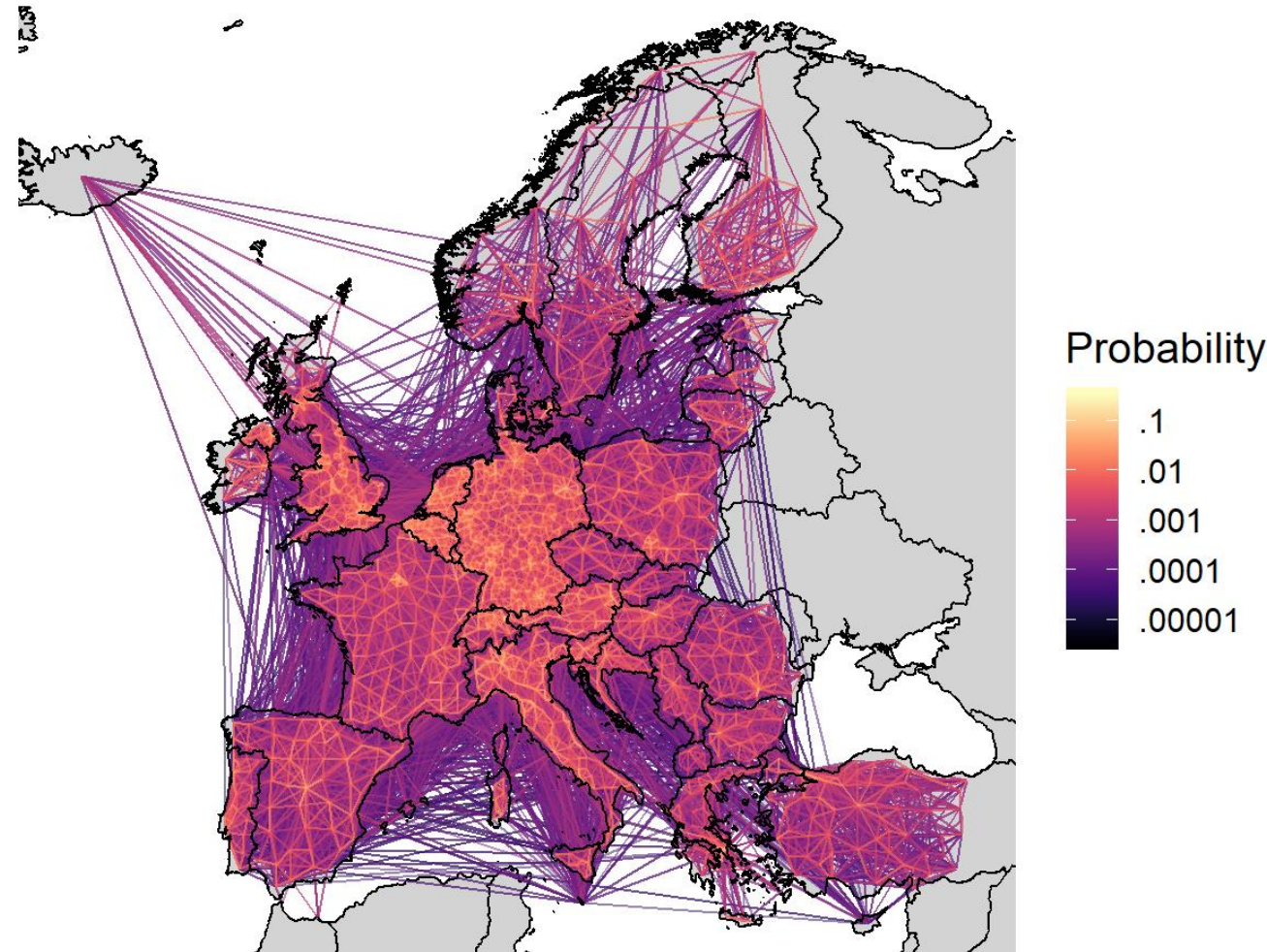


# 1. Estimate baseline movements

## 2 Mobile phone datasets:

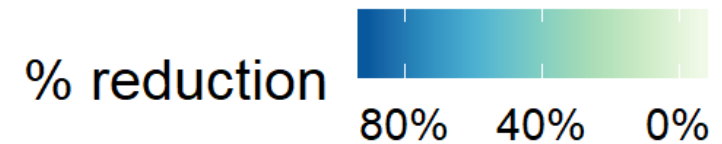
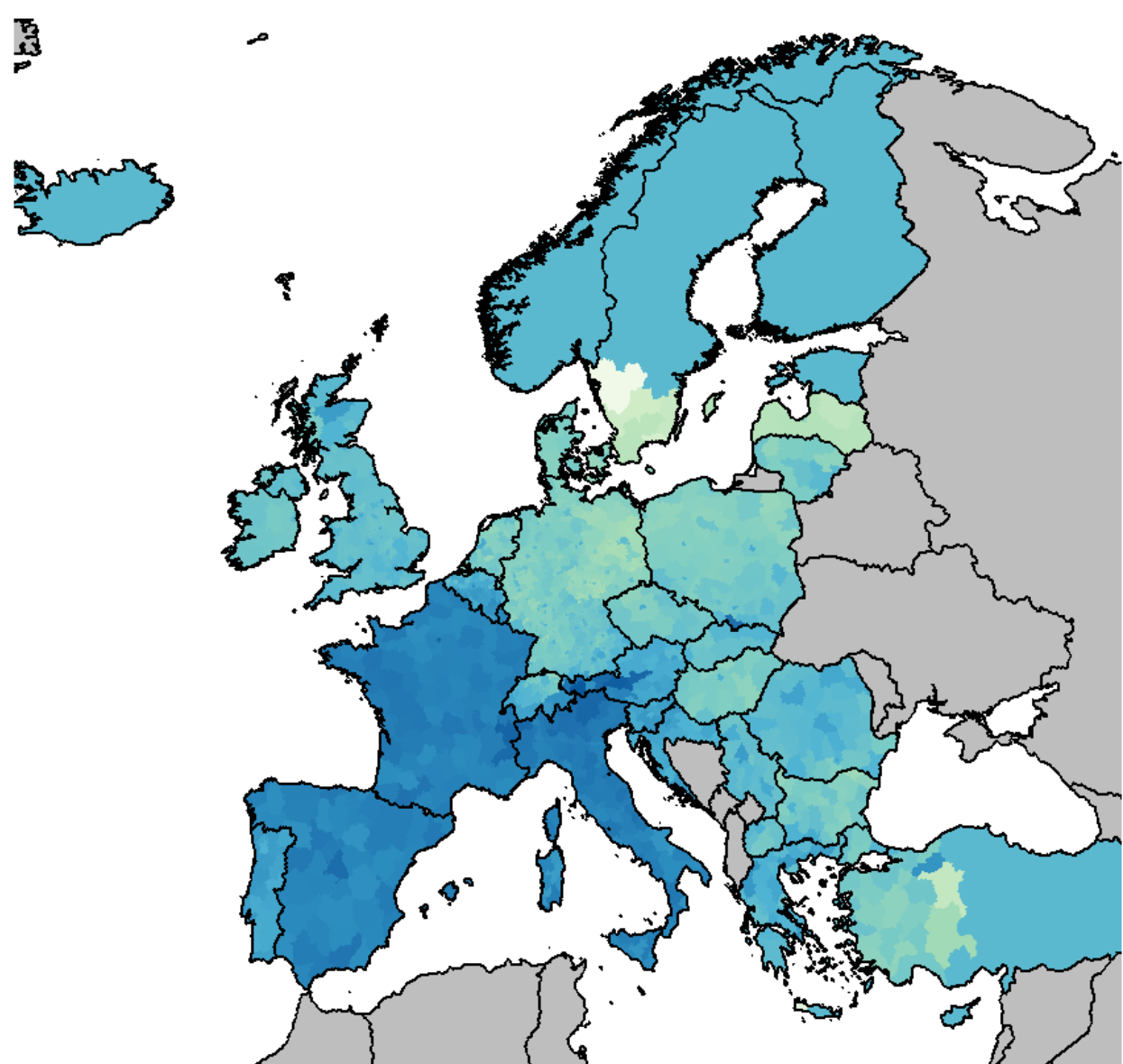
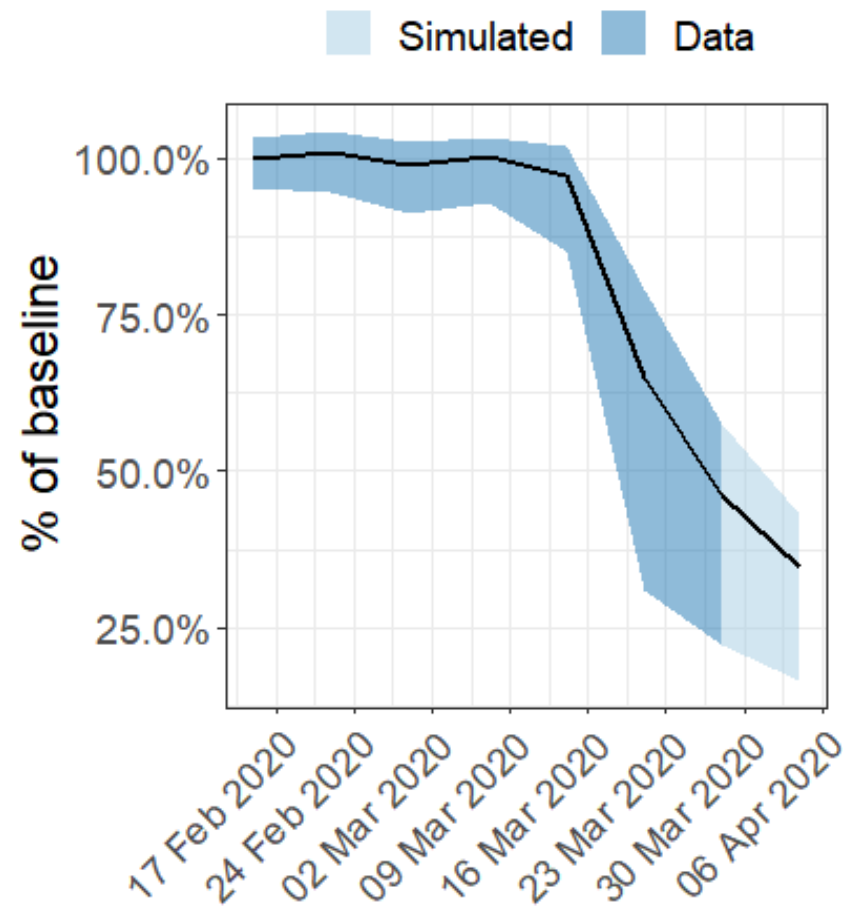
1. Vodafone (Italy & Spain)
  - Probabilities of moving
2. Google data (Continent-wide)
  - Relative population flows

Predict continental probabilities using both datasets

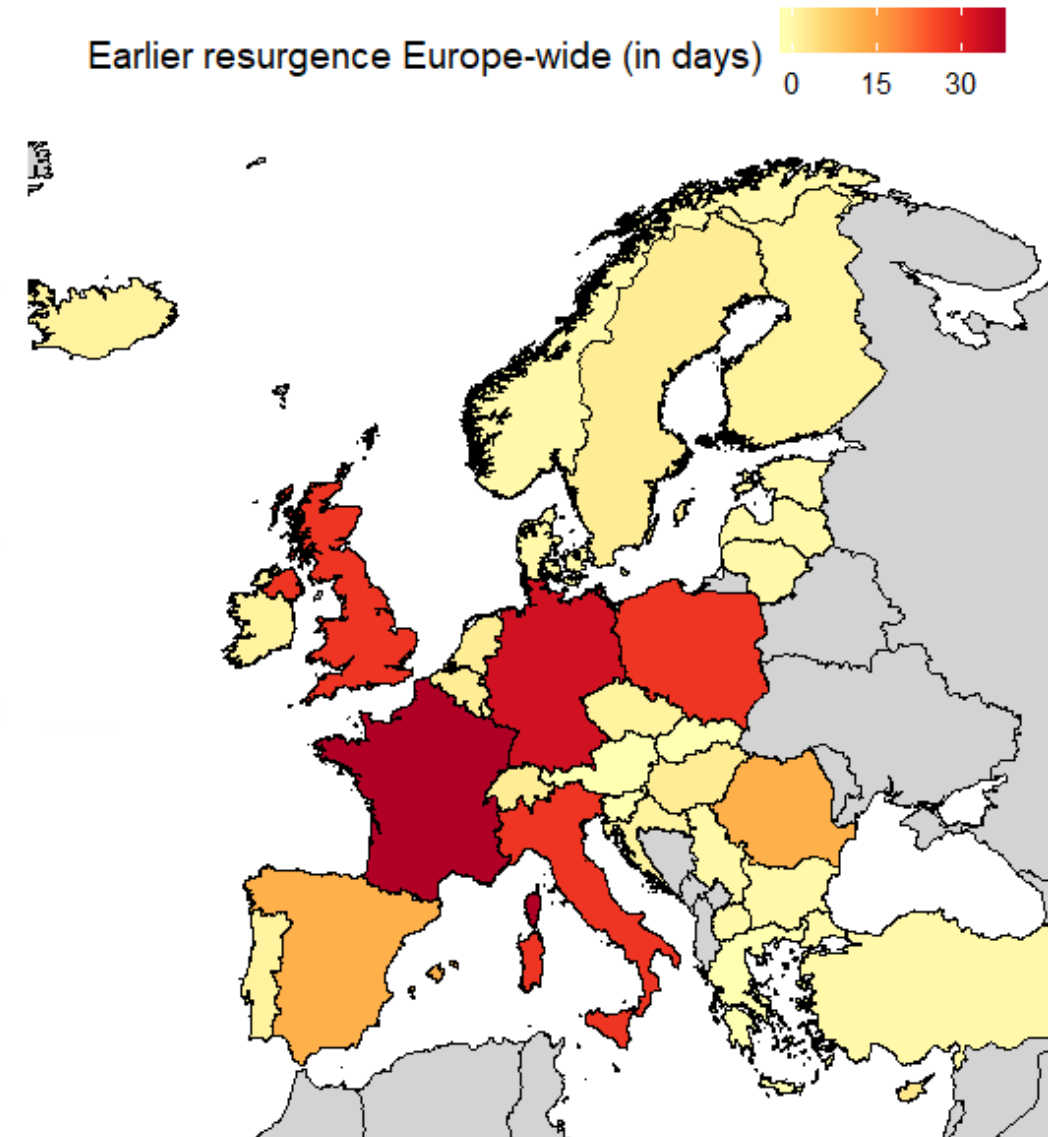
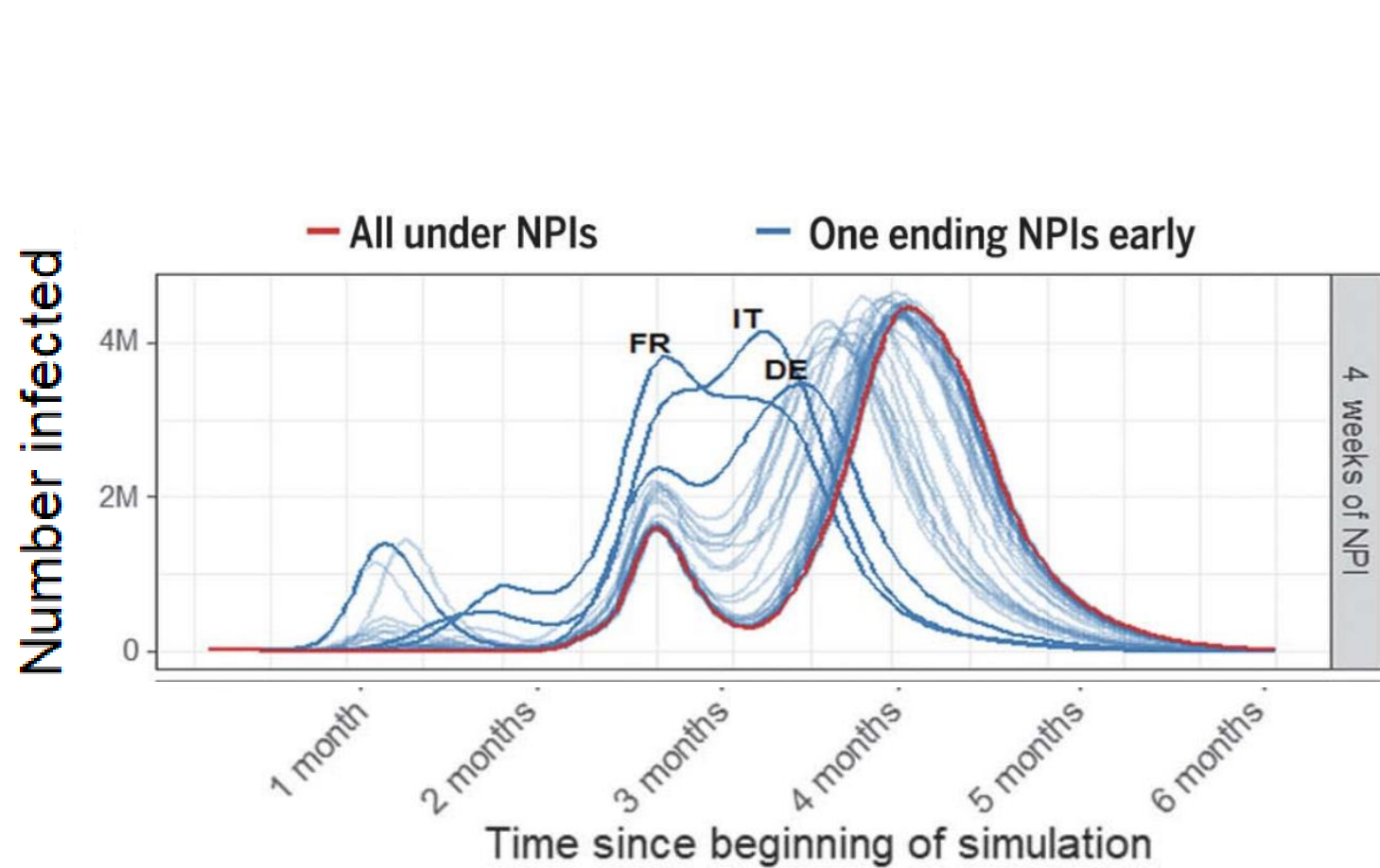


## 2. How effective were lockdowns?

Relative movements for week of March 28th compared to Jan-Feb 2020



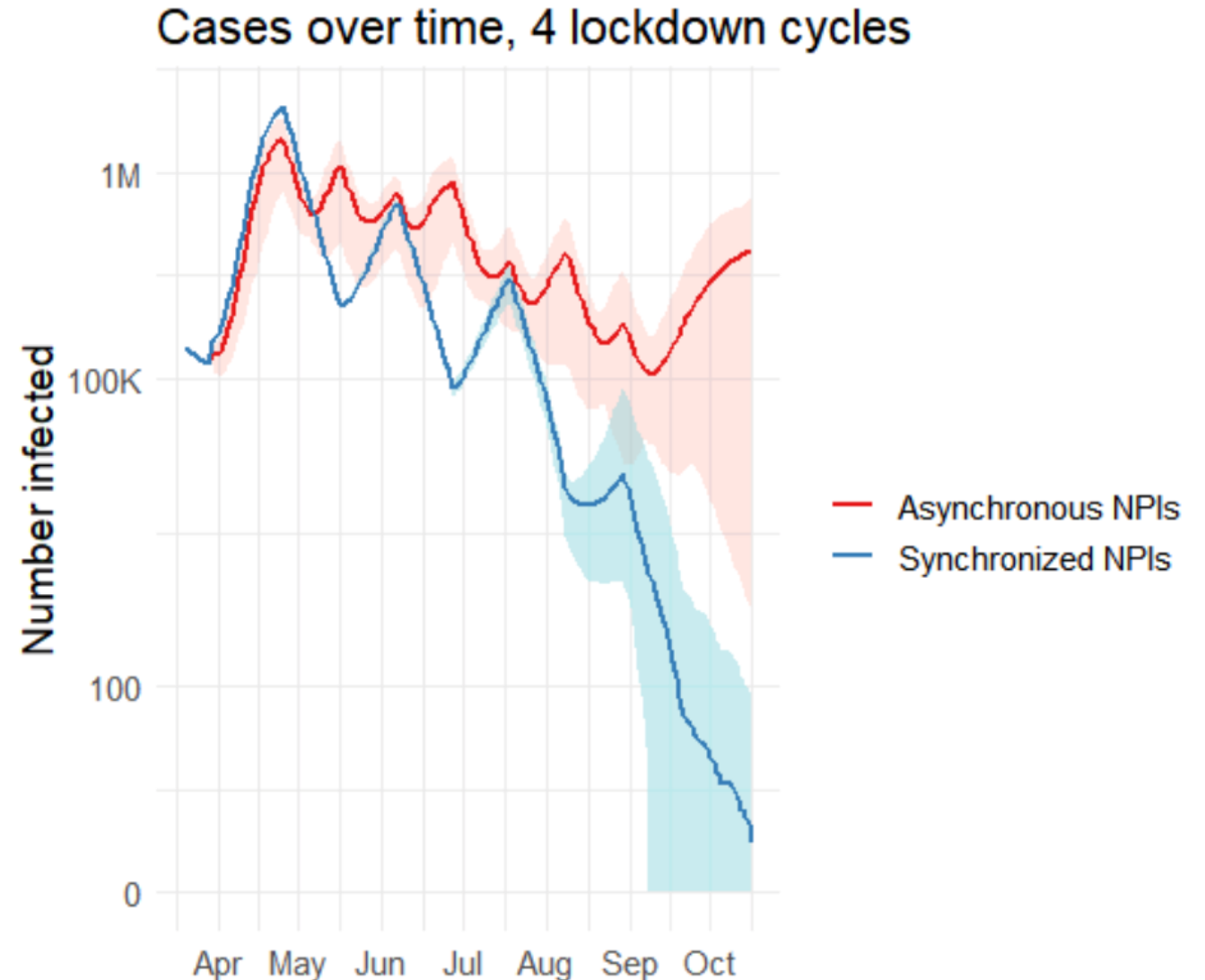
# Simulation 1: What if all coordinated but one?





# Simulation 2: What if unsynchronized cycles?

- 3 weeks on, 3 weeks off
  - Holding total # of weeks equal
- Synchronized: 0 cases in 90% of simulations
- Unsynchronized: 5%



# Summary: coordination and resurgence

- Resurgence up to 5 weeks earlier if certain countries ease NPIs
  - Time for expanding testing, developing treatments and vaccines



- Synchronized easing/reinstatement can end community transmission

- Results broadly apply to different regions

- USA
- LMICs

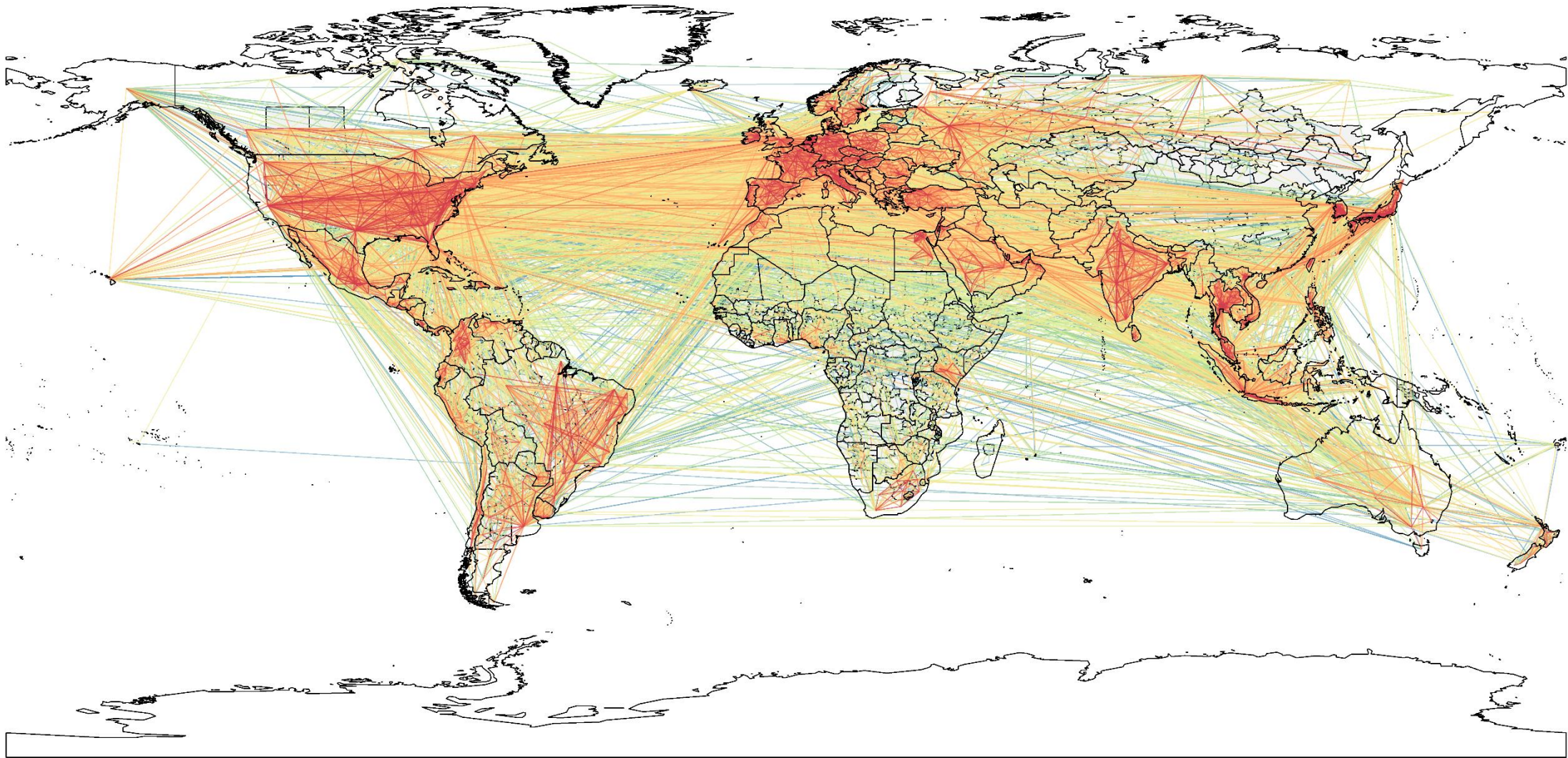
## RESEARCH ARTICLE

### **Global COVID-19 pandemic demands joint interventions for the suppression of future waves**

 Ruiyun Li,  Bin Chen, Tao Zhang,  Zhehao Ren,  Yimeng Song,  Yixiong Xiao,  Lin Hou,  Jun Cai,  Bo Xu, Miao Li, Karen Kie Yan Chan,  Ying Tu, Mu Yang, Jing Yang, Zhaoyang Liu, Chong Shen, Che Wang, Lei Xu, Qiyong Liu, Shuming Bao, Jianqin Zhang, Yuhai Bi,  Yuqi Bai, Ke Deng, Wusheng Zhang, Wenyu Huang,  Jason D. Whittington,  Nils Chr. Stenseth, Dabo Guan,  Peng Gong, and Bing Xu



# Next steps: Global data

















# Further information

RESEARCH ARTICLE

## Assessing the impact of coordinated COVID-19 exit strategies across Europe

 N. W. Ruktanonchai<sup>1,2,\*†</sup>,  J. R. Floyd<sup>1,\*†</sup>,  S. Lai<sup>1,\*†</sup>,  C. W. Ruktanonchai<sup>1,†</sup>,  A. Sadilek<sup>3</sup>, P. Rente-Lourenco<sup>4</sup>, X. Ben<sup>3</sup>,  A. Carioli<sup>1</sup>,  J. Gwinn<sup>5</sup>,  J. E. Steele<sup>1</sup>,  O. Prosper<sup>6</sup>,  A. Schneider<sup>3</sup>,  A. Oplinger<sup>3</sup>, P. Eastham<sup>3</sup>,  A. J. Tatem<sup>1</sup>



[www.worldpop.org](http://www.worldpop.org)

 @WorldPopProject

E-mail: [J.R.Floyd@soton.ac.uk](mailto:J.R.Floyd@soton.ac.uk)

 @jessRfloyd