



CENTER FOR
INFERENCE &
DYNAMICS
OF INFECTIOUS DISEASES



Northeastern

Data and numerical literacy: lessons from the pandemic

Alessandro Vespignani

@alexvespi



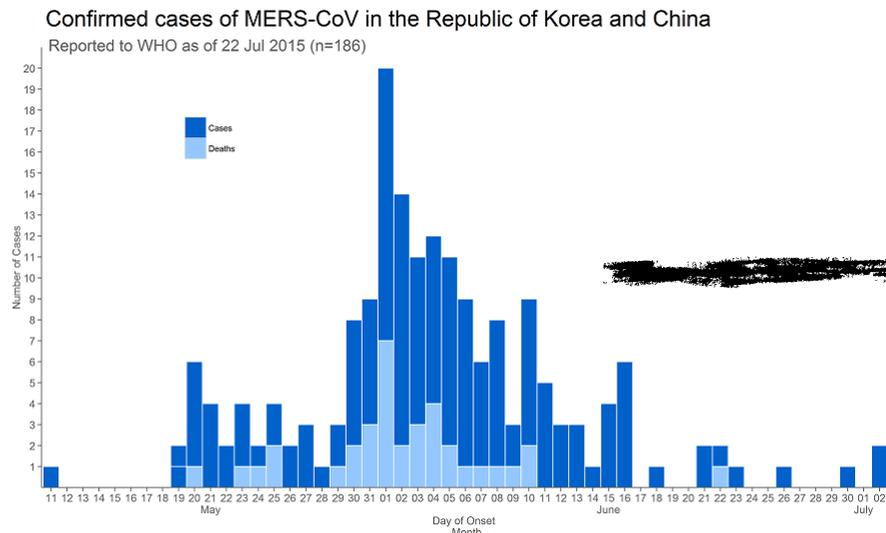
MOBS LAB

LABORATORY FOR THE MODELING OF BIOLOGICAL
AND SOCIO-TECHNICAL SYSTEMS

Actionable modeling with “NEW DATA” (big, or small)

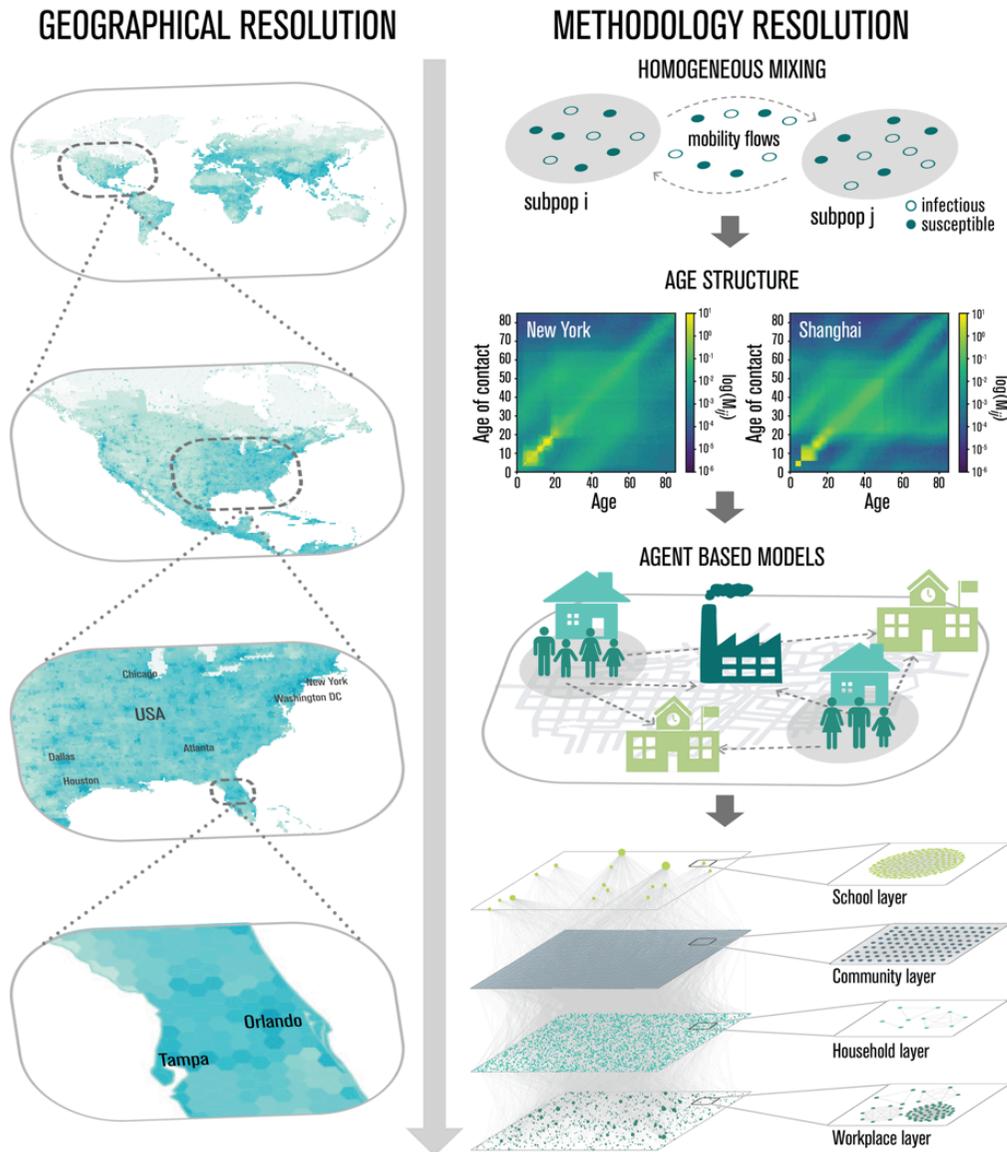
The focus is on understanding these data sets in a scientific sense and more deeply the real world processes which produced the data (Theory)

- Interpretability
- Mechanistic approach/ML-AI
- Effective equations
- Initial conditions/prediction limits



Please note that the underlying data is subject to change as the investigations around cases are ongoing. Onset date estimated if not available. Source: WHO

Multiscale Modeling framework



Compare the results of models with different levels of detail and/or complexity, discounting artifacts due to different parameterizations, ad-hoc initial conditions, different geographical extent.

Forecast & more than forecast

- Data Analysis/modeling
- Situational awareness tools
- Intervention planning
- projections/forecast
- Vaccine allocation scenarios

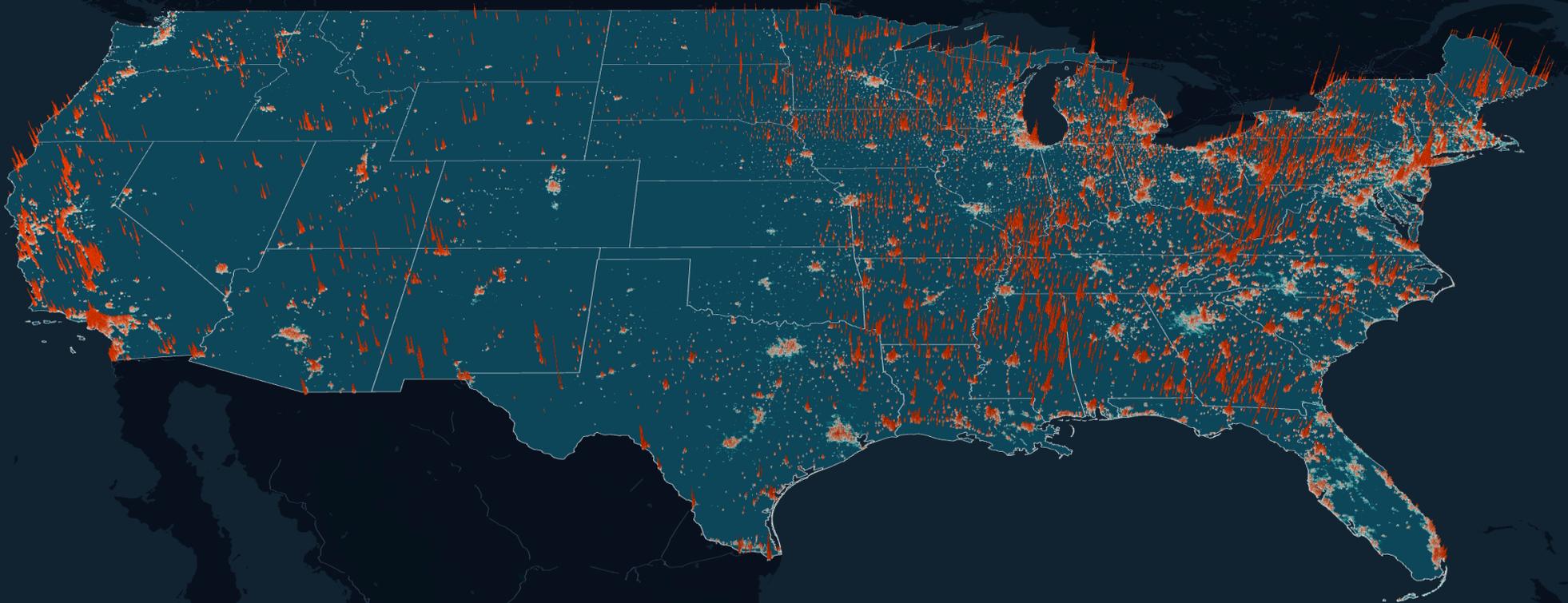
[MIDAS collaboration paper: Lofgren et al. Mathematical models: A key tool for outbreak response; PNAS 111 (51): 18095 (2014)]

Scenario analysis

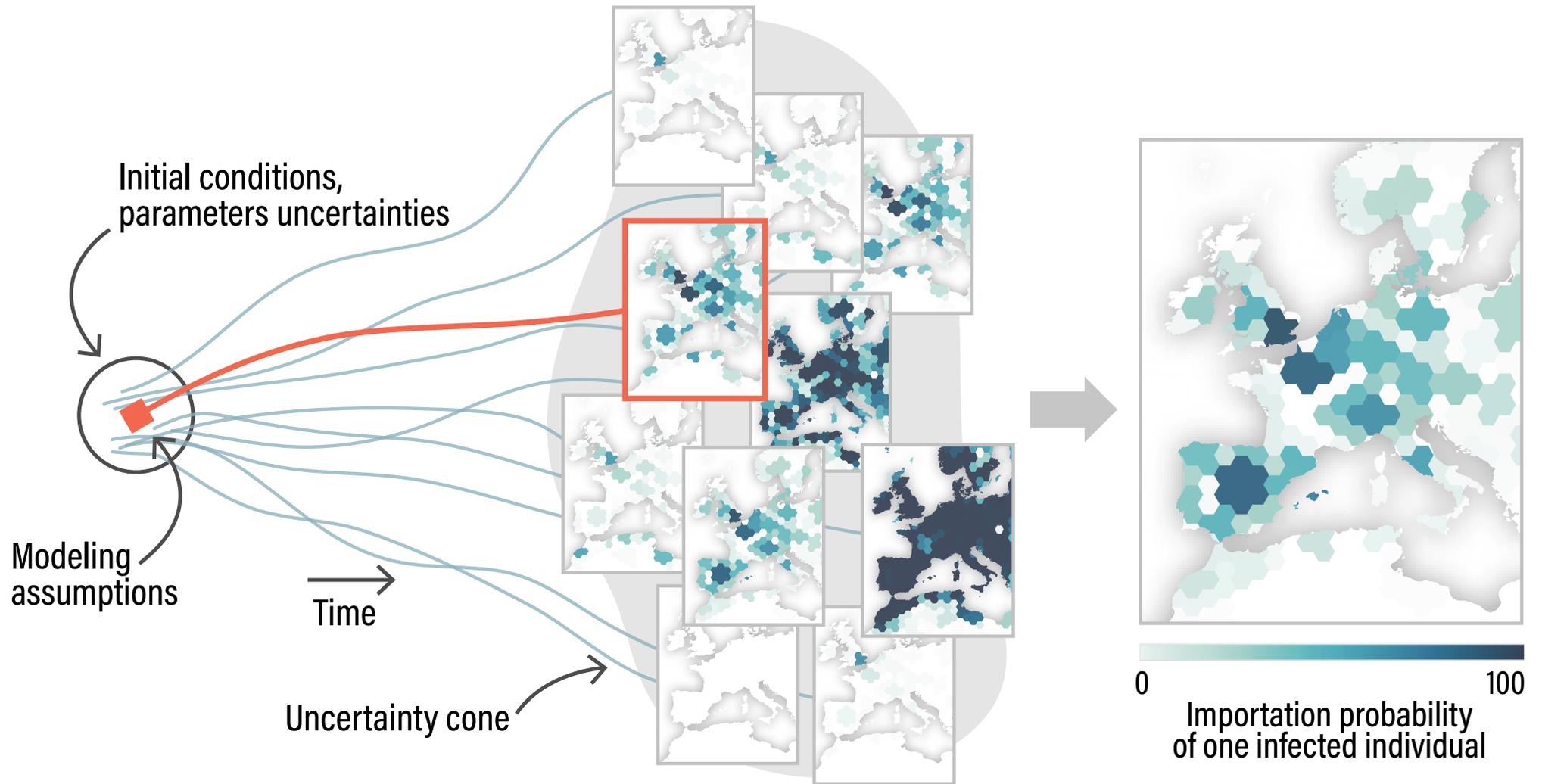
- Scenarios are not forecasts !!!
- Based on assumptions (social behavior, interventions, policies, boundary conditions..etc.)
- Scenarios offers a range of possible “evolutions”: from the worst-case to the most optimistic ones.
- The worst-case scenario is generally called “baseline” as it defines the benchmark to evaluate the “success” of other scenarios and disentangle the effect of different policies.

FORECAST

- Current data on interventions, social behavior and have limited time horizons (2-4 weeks).



Communicating uncertainty



“Models aren’t made to be unquestioned oracles.
They’re not trying to tell us one precise future, but
rather the range of possibilities given the facts on the
ground”



Data

<https://projects.fivethirtyeight.com/covid-forecasts/>