Riyadh Global
Digital Health
Summit

11-12 August, 2020

Global Strategic Partnership in Digital Health to Fight Pandemics

Data-driven Analysis of the Global COVID-19 Dissemination

Chiara Poletto

Researcher (CR) at INSERM, Sorbonne Université

In collaboration with:

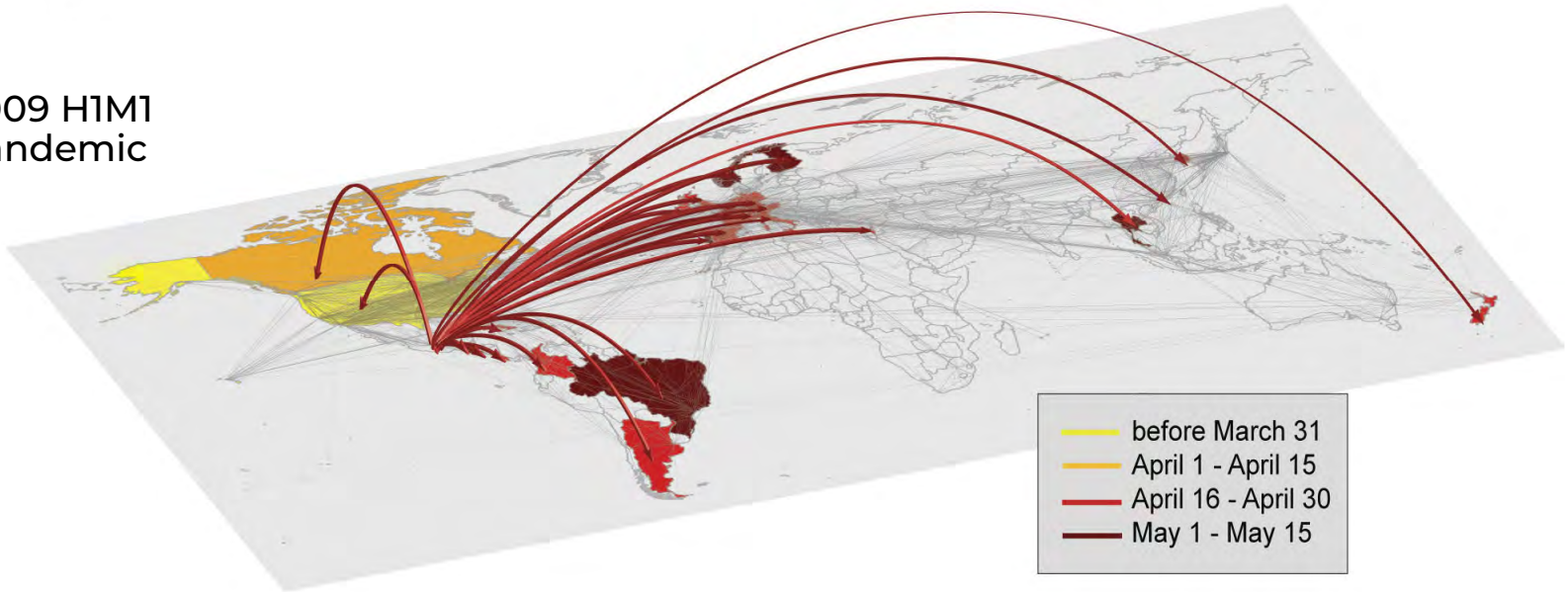
F Pinotti, L Di Domenico, E Ortega, M Mancastroppa, G Pullano, E Valdano, C Pelat, D Levy-Bruhl, Y Yazdanpanah, PY Boëlle, V Colizza

Emerging Infectious Diseases

- **Goals**
  - Assess epidemic situation
  - Quantify risk of further spread
  - Inform intervention planning
- **Challenges:**
  - Unknown transmission mechanisms and clinical manifestations
  - Limited epidemiological data
  - Human factor: awareness, behavioural change, response
- **Resources:**
  - Big data: demography, mobility, human-to-human contacts
  - Statistical, mathematical and computational modelling

Global Interconnectedness and International Epidemic Spread

2009 H1M1 pandemic



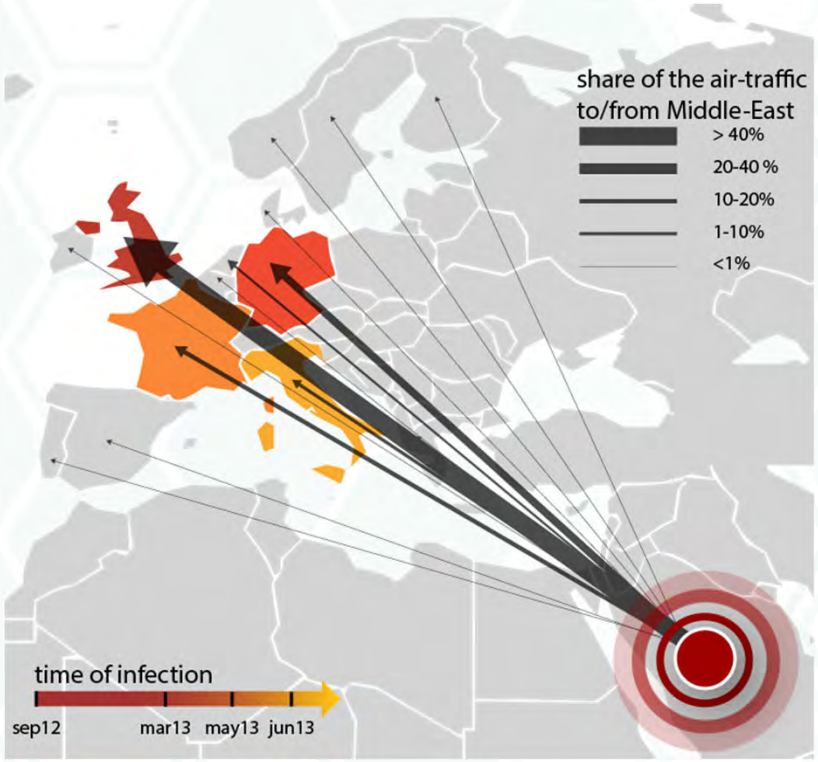
[Bajardi et al. PLOS ONE 2011]

- We can use air travel data to predict international spread
- We can combine air travel data with information on international cases for epidemiological and public health assessment

MERS: Assessment of the Epidemic Situation in Middle East

GLEAM

[Gleamviz.org, Balcan et al. PNAS 2009, Poletto et al. Eurosurveillance 2014]



- Quantify human-to-human vs. zoonotic transmission
- Assess under-reporting
- Provide projections of future spread

COVID-19 EARLY WARNING

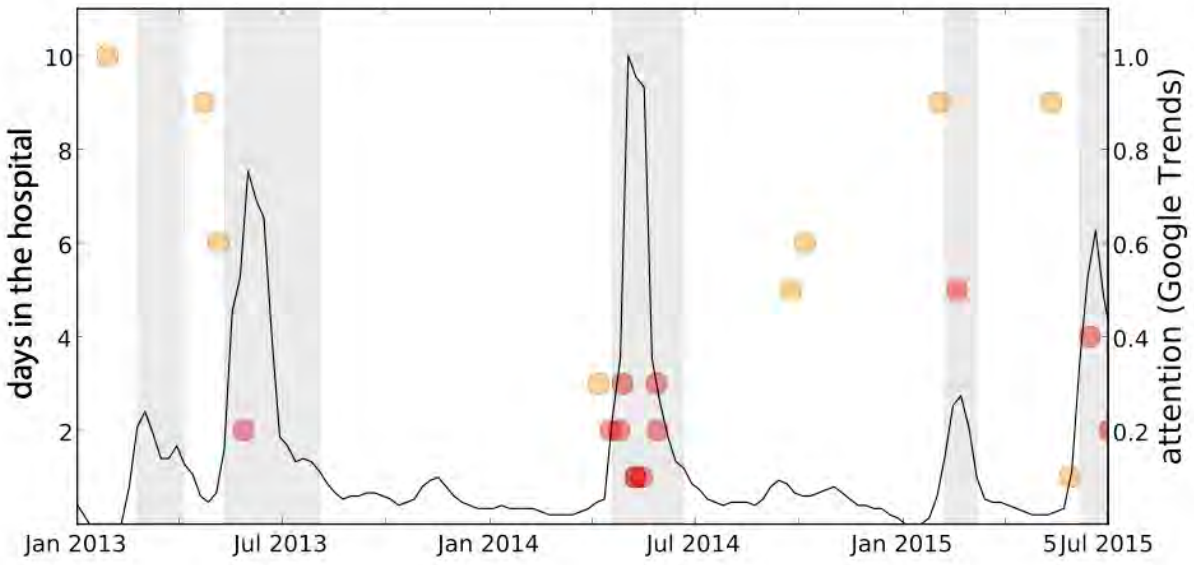
[N Imai et al. Imperial college 2020]

MERS: History of Travelling Cases

- Reviewed 22 imported cases confirmed by WHO 1/9/2012-31/7/2015:
  - Symptom onset
  - Date of travel
  - Date of hospitalisation
  - # Visited hospital
  - Date of isolation/death

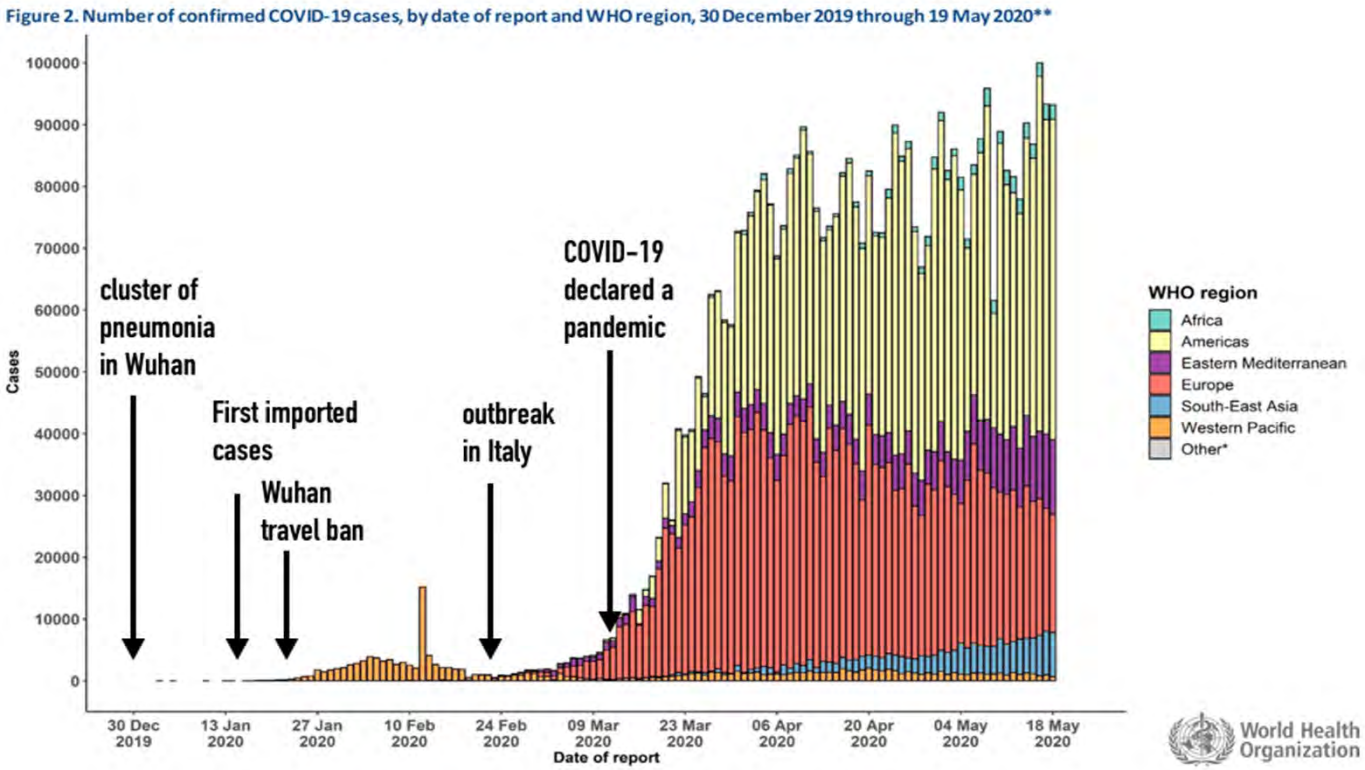
[Poletto et al BMC Inf Dis 2016]

Longer hospitalization durations increase the risk of transmission following importation



Increasing awareness at collective and public health levels worldwide associated with higher local preparedness

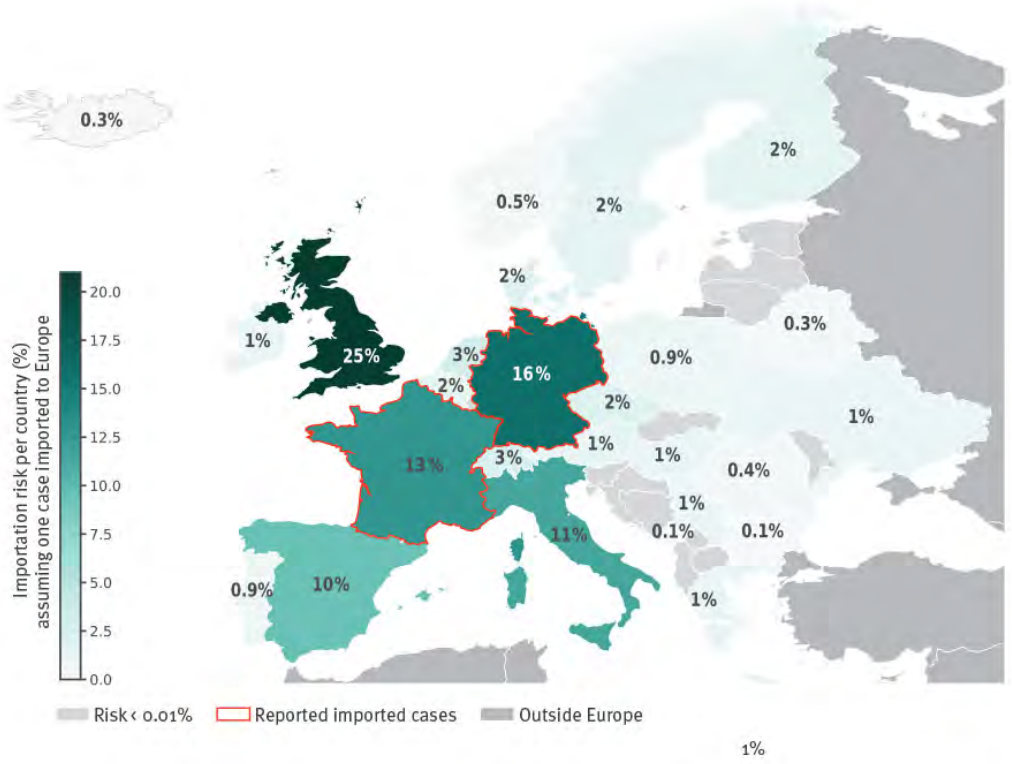
COVID-19: Global Invasion



- Risk of importation & global spread
- Impact of containment interventions in China (**travel ban of Wuhan, travel restrictions China, lockdown)**
- Control measures at the borders (case identification and isolation)

[Pullano et al Eurosurveillance 2020; Pinotti et al. PLOS Medicine 2020]

COVID-19: Global Invasion



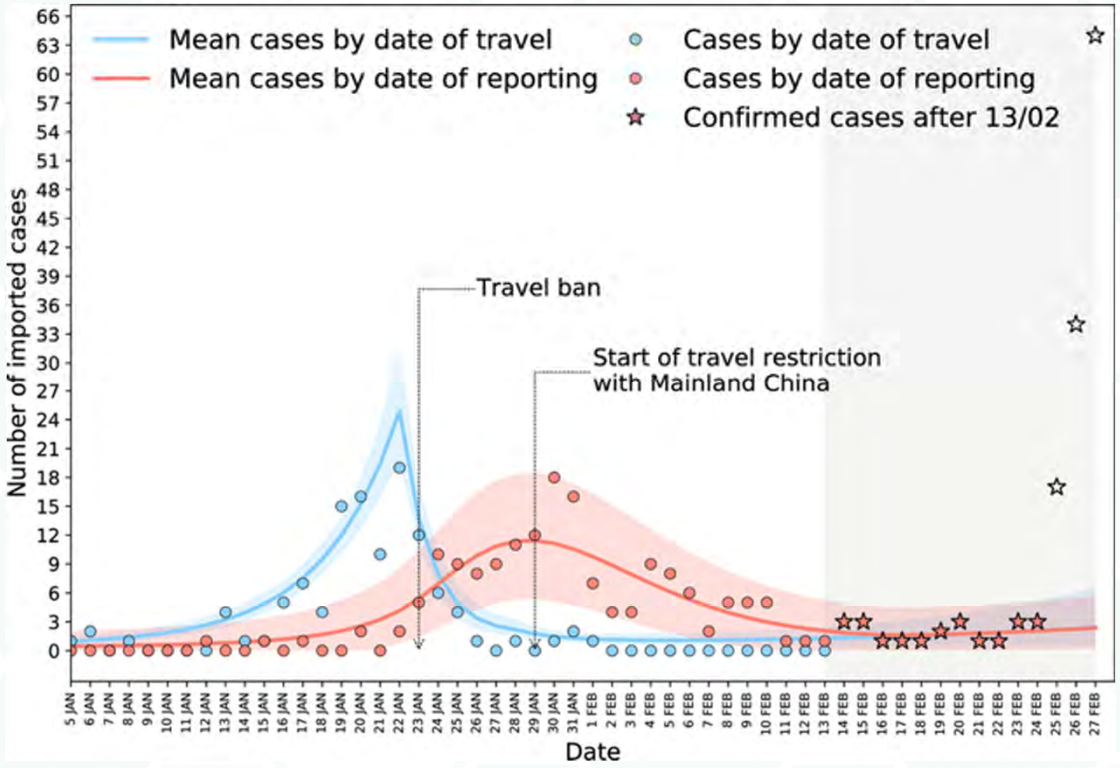
[Pullano et al Eurosurveillance 2020]

- Air travel provided accurate projection of COVID-19 global dissemination

[Chinazzi et al Science 2020; Bogoch et al. J Travel Med 2020

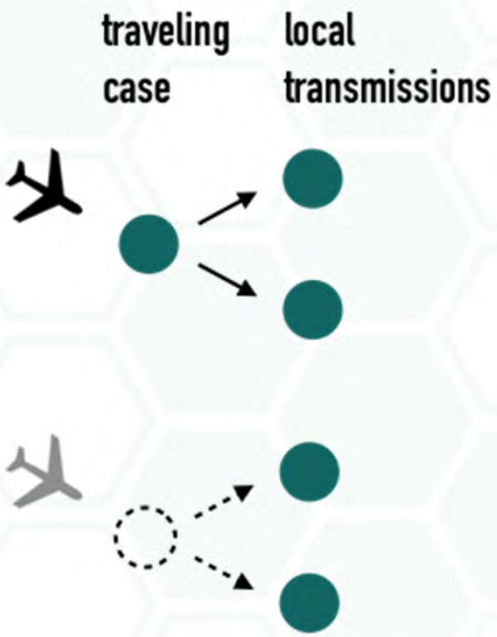
COVID-19: Global Invasion

- Reviewed 288 imported cases confirmed by WHO before 14/2/2020:
  - Symptom onset
  - Date of travel
  - Date of hospitalisation
  - Secondary transmissions
  - Transmission clusters



[Pinotti et al. PLOS Medicine 2020]

COVID19: Global Invasion



Index case	Number of clusters	Cluster (size)
Traveller(s) identified prior to cluster detection	15	cDE01 (16), cFR02 (12), cVN02 (7), cKR01 (5), cSG04 (5), cKR04 (3), cMY01 (3), cSG11 (3), cVN01 (3), cGB01 (2), cKR02 (2), cKR03 (2), cKR05 (2), cUS01 (2), cUS02 (2)
Traveller(s) not identified or retrospectively	8	cSG01 (10), cSG02 (8), cJP01 (4), cCA01 (3), cKR06 (3), cTH04 (3), cFR01 (2), cJP02 (2)
Unknown	19	cSG13 (8), cSG09 (5), cJP03 (3), cJP06 (3), cSG14 (3), cJP04 (2), cJP05 (2), cJP07 (2), cSG03 (2), cSG05 (2), cSG06 (2), cSG07 (2), cSG08 (2), cSG10 (2), cSG12 (2), cTH01 (2), cTH02 (2), cTH03 (2)

- Only 36% of traveling cases were detected
- Silent epidemics in seeded countries

[Pinotti et al. PLOS Medicine 2020]

Conclusion

- Analysis of global spread based on air travel data and records of traveling cases provides risk assessment, epidemiological and public health understanding
- Accounting for response and spontaneous reaction to the epidemic remains an important challenge
- Need for more data and for advance statistical and modelling approaches

THANK YOU

G20
SAUDI ARABIA 2020

وزارة الحرس الوطني - الشؤون الصحية
Ministry of National Guard - Health Affairs

المركز السعودي للشراكات الاستراتيجية الدولية
Saudi Center For International Strategic Partnerships

RGDHS2020.COM