

Colloquium

New questions on epidemic spreading suggested by the COVID-19 pandemic

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摘 要：

The outbreak of COVID-19, reaching the level of pandemic at the beginning of 2020, represented a major shift on the answers requested to epidemic spreading models. For example, hospital capacity, real contacts and non-pharmaceutical interventions were not frequently accounted for in the literature, while the pandemic highlighted their importance. In this talk, I will present three works where we aimed at addressing some of these questions. First, the presence of undetected cases in the first half of 2020 implied a high uncertainty on the evolution of the pandemic when restrictions would be lifted; we quantified the risk of secondary waves of COVID-19 in Balearic Islands after estimating the prevalence on the first wave. Second, we created a digital twin of five Spanish cities, reproducing the contacts among the population within them in 6 interaction layers (homes, schools, universities, nursing homes, work and community); we used those digital cities to calibrate the spread of COVID-19 on them and quantify the impact of non-pharmaceutical interventions through a counter-factual analysis. Finally, we introduced a generic model of coupling between infectious diseases, demonstrating the synchronization of their peaks in both competitive and cooperative scenarios, particularizing it for the interaction between COVID-19 and seasonal flu.

References:

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- [2] JP Rodríguez, A Aleta, Y Moreno, Digital cities and the spread of COVID-19: Characterizing the impact of non-pharmaceutical interventions in five cities in Spain, *Frontiers in Public Health* (2023).
- [3] JP Rodríguez, VM Eguíluz, Coupling between infectious diseases leads to synchronization of their dynamics, *Chaos* (2023).

