**Social dilemmas in interventions to tackle epidemics**

**120 words abstract**

Large-scale interventions (social-distancing, contract-tracing) to supress epidemics can give rise to social dilemmas. This is a situation where, although the interventions create the best public health outcomes for society as a whole, complying with them can have significant costs for individuals, meaning that it would not be in their self-interest to do so. This prevents large-scale compliance to the interventions, hampering their success at supressing the epidemic. We combine an SIR modelling of COVID19 and game theory to study the interaction between the behavioural dynamic of compliance and the epidemiological dynamic of the disease. We show that different types of intervention shape different social dynamics. This has implications to design robust intervention strategies and identify the best conditions to successfully deploy them.

**150 words abstract**

Large-scale interventions to tackle the COVID-19 pandemic generate social dilemmas: although they create the best public health outcomes for society as a whole, complying with them can have significant costs for individuals, meaning that it would not be in their self-interest to do so. Hence, one may decide not to comply if the associated cost is not worth the benefit. Whether the intervention focuses on social distancing or contact-tracing, compliance is key to successfully supress the epidemic. Hence, to design robust intervention, it is crucial to understand the behavioural dynamic of people compliance concomitantly to the epidemiological dynamic of the disease. To do so, we combine SIR modelling and game theory approaches to assess how social distancing, contact-tracing and their combination with “immunity passport” can create conditions for such social dilemmas, preventing large-scale compliance. We discuss the implications in terms of challenges and precautions for the design of robust interventions and their successful deployment.

**250 words abstract**

Large pandemics such as the current COVID-19 require large scale interventions to be brought under control. To date, general social distancing and contract-tracing have been the two main approaches deployed to suppressing the epidemic. In both cases, the success of these interventions relies on the compliance of individuals. However, these interventions give rise to social dilemmas: although they create the best public health outcomes for society as a whole, complying with them can have significant costs for individuals, meaning that it would not be in their self-interest to do so. Hence, one may decide not to comply if the associated cost is not worth the benefit. Decision in the face of a number of strategies (here complying or not complying) is classically modelled in the game theory framework. Individuals are assumed to be rational decision-maker and aiming at maximizing their own utility, i.e. the payoff between the benefit and cost associated with each strategy. The structure of these payoffs (the shape of the benefit and cost functions) govern the type of social the social dynamic that arises. And, in the context of infectious disease, the underlying logic of different intervention strategies generate different payoff structures. Here, we combined a parametrized modelling of COVID-19 and game theory to assess how social distancing, contact-tracing and their combination with “immunity passport” can create conditions for such social dilemmas, preventing large-scale compliance. We discuss the implications in terms of challenges and precautions for the design of robust interventions and their successful deployment.