

# Dynamics of Infectious Disease Spread and Health-related Behaviours

9 – 13 May 2022 Lorentz Center@Oort

## Scientific Report

### Description and aims

The COVID-19 pandemic again reminds us of the complex interplay between disease epidemiology and health-related beliefs and behaviours, which takes place in the context of dynamic social/contact networks. These interlinked processes pose a major challenge for infectious disease control as they may generate local vulnerabilities for (continued) epidemic potential and may sustain or even widen social inequities in health.

The workshop aimed to formulate an integrated conceptual model describing the link between beliefs, behaviour, networks, and transmission, building up from the individual level to the societal level. This will lay the foundations for future quantitative models that can further unravel these dynamics and inform policy, accounting for the fact that citizens are far from idealised rational agents.

### Tangible outcomes

At the end of the workshop we have formulated several tangible outcomes that we will work on together. The workshop participants will develop a position paper on how during the first two years of COVID-19, transmission models faced challenges with respect to behavioural aspects of transmission, how these affected policy choices, what is needed to improve the ability of models to inform policy (in terms of data and model aspects), and where/when this is feasible. The position paper will form the basis for a competitive grant application about the value and robustness of modelling behaviour within epidemiological models. In addition, based on the lessons learned from the workshop process, a new method for eliciting causal loop diagrams for complex transdisciplinary problems will be proposed and written up in the form of a paper.

### Scientific issues/outcomes

During the workshop, the participants started the development of a causal loop diagram (CLD) describing the links between infectious disease epidemiology, behaviour, and social networks. This exercise brought to light that more time was needed to develop a common language between disciplines and that the standard approach to CLD was not suitable for the complexity of the issue in the context of the high diversity of expertise present. We therefore focused on defining a common problem statement across disciplines: some modelling of behaviour in epidemiological context has been done, but it has never been successfully used to actually inform policy decisions. Apart from the issue that most epidemiological models consider behaviour to be static, those that actually do consider the population dynamics of behaviour have not been validated well. Therefore, the question remains whether linking behaviour dynamics to disease spread models can actually aid policy decisions and help mitigate disease spread in practice, or that integrating behaviour into the epidemiological models is merely a scientific/theoretical endeavor. As such, there is a need to compare the predictive performance of (simple) models for the linked dynamics of behaviour and transmission across different settings. During the workshop, we further explored several ideas and concepts for what such integrated models might look like.

### Organization/format

The workshop was held in hybrid form with the majority of participants attending live about 5 people attending online via Zoom. The sessions consisted of a mix of plenary talks (blocks of 2 to 4 talks of 30 minutes each) and interactive break-out sessions during which we used sticky notes, white boards (real and online jamboards), and semi-structured assignments to elicit expert knowledge and opinion about scientific questions. Summaries of break-outs fed back into plenary discussions. The topics of the break-out sessions were adapted at various stages during the workshop to match the pace of the group. To identify and prioritize post-workshop activities, we used Mentimeter and polls in Slack. To stimulate and facilitate discussion among participants, and to avoid online fatigue among online participants, the workshop schedule included ample time for lunch and coffee breaks as well as a block of time (one afternoon) without program to absorb delays or to schedule impromptu break-outs.

**Luc Coffeng** (Erasmus MC Rotterdam, The Netherlands)

**Tessa Blanken** (University of Amsterdam, The Netherlands)

**Rick Quax** (University of Amsterdam, The Netherlands)