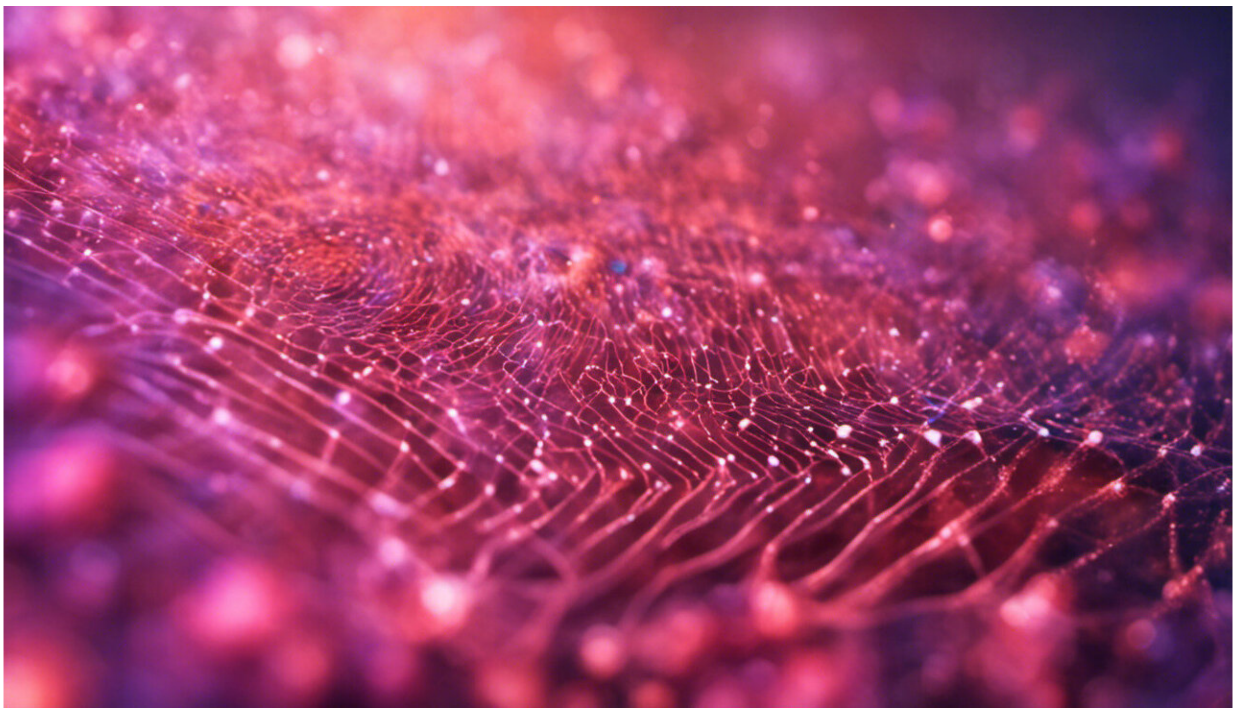
Using prediction models to manage the coronavirus outbreak

April 3 2020



Credit: AI-generated image (disclaimer)

The COVID-19 pandemic poses an unprecedented challenge for policymakers across Europe, given the pace at which its effects are unfolding. The current coronavirus outbreak marks the return of an old and familiar enemy. Nothing has killed more human beings than the viruses, bacteria and parasites that cause disease, like the Black Death, smallpox, the Spanish flu and malaria. In fact, infectious diseases are still a leading cause of death worldwide.

Increased efforts to combat COVID-19 and other recent outbreaks like Ebola and the severe acute respiratory syndrome epidemic have highlighted the need for forecasting epidemic evolution. The EU-funded EPIFOR (Complexity and predictability of epidemics: toward a computational infrastructure for epidemic forecasts) project has been at the forefront of such endeavors to better predict and control the spread of epidemics. Computational epidemiology, which combines various disciplines like mathematics, statistics, computational sciences and epidemiology, helps scientists collect and integrate large data sets on historical epidemics with which to develop computational models. These can be utilized to provide detailed and accurate predictions of the spread of future epidemics. A researcher involved with EPIFOR explains how the project helped scientists develop such models in a news item on the European Research Council (ERC) website.

Vittoria Colizza from the French National Institute of Health and Medical Research (Inserm) says: "As part of the ERC-funded EPIFOR project, which ran from 2008-2013, together with my team I have developed an array of computational tools that could provide accurate predictions of future viral outbreaks, enabling a timely and efficient response to the threat. The aim was to enhance our ability to control the transmission of a disease, to better target interventions and to understand more about its effects on large populations."

Race against time

Colizza points to the 2009 H1N1 pandemic (swine flu) and the MERS-CoV epidemic that coincided with the lifetime of EPIFOR. Both gave the researchers the opportunity to test their approaches in real-life situations. "These experiments confirmed the significant capabilities of the computational models developed and provided useful patterns on the potential future spread of infectious diseases."

She adds that at Inserm, experts "are working around the clock as part of a multi-disciplinary team to help manage the health crisis caused by the COVID-19 outbreak. Our work is supported by several other H2020 projects; however, the computational models and other tools developed during the EPIFOR project laid the foundation for this work and are proving to be instrumental." Scientists involved with such efforts have also produced several papers "using computational models to predict the spread of the disease and the expected impact of mitigation measures being implemented all over Europe," Colizza says. One example is a report published on Inserm's EPIcx lab website. It evaluates the impact of school closure and telework, focusing on three regions in France (Île-de-France, Hauts-de-France and Grand Est). "Numerical results show that school closure alone would have limited benefit in reducing the peak incidence (less than 10% reduction with eight-week school closure for regions in the early phase of the epidemic). When coupled with 25% adults teleworking, eight-week school closure would be enough to delay the peak by almost two months with an approximately 40% reduction of the case incidence at the peak."

More information: EPIFOR project: cordis.europa.eu/project/id/204863

Provided by CORDIS