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How mathematics can save lives: mathematical modeling to support infectious disease-based decision-making

Being generally perceived as a niche discipline, mathematical modeling has become extremely popular during the COVID-19 pandemic, being brought to the forefront of lay public attention and debate. Words such as 'flattening the curve' and 'reproduction number' have become a common part of the collective lexicon. In the era of evidence-based decision-making and evidence-based medicine, mathematical models are now considered as valuable and insightful tools as epidemiological surveys and randomized controlled clinical trials. Governmental institutions and public health authorities all over the world are relying more and more on mathematics, not only to forecast the epidemic in terms of trends and projections, but also to understand societal issues, like vaccine hesitancy and behavioral adherence to recommendations and mandates. Never as in this period, mathematicians and mathematical models are playing a key role in real-time delivery of reliable and comprehensive information to predict the spread of COVID-19 and its impact, and in guiding governmental policies and best practice. However, despite this increasing popularity, mathematical modeling still appears to be more an art rather than a science, with results sometimes highly conflicting, which are hard to reconcile. So, HOW do we design a mathematical model of an infectious disease outbreak? HOW can models be harnessed to inform public health measures at different stages of an outbreak? In this talk, I will try to provide answers to these questions.