Video: Solving the puzzle of a previously unseen pathogen

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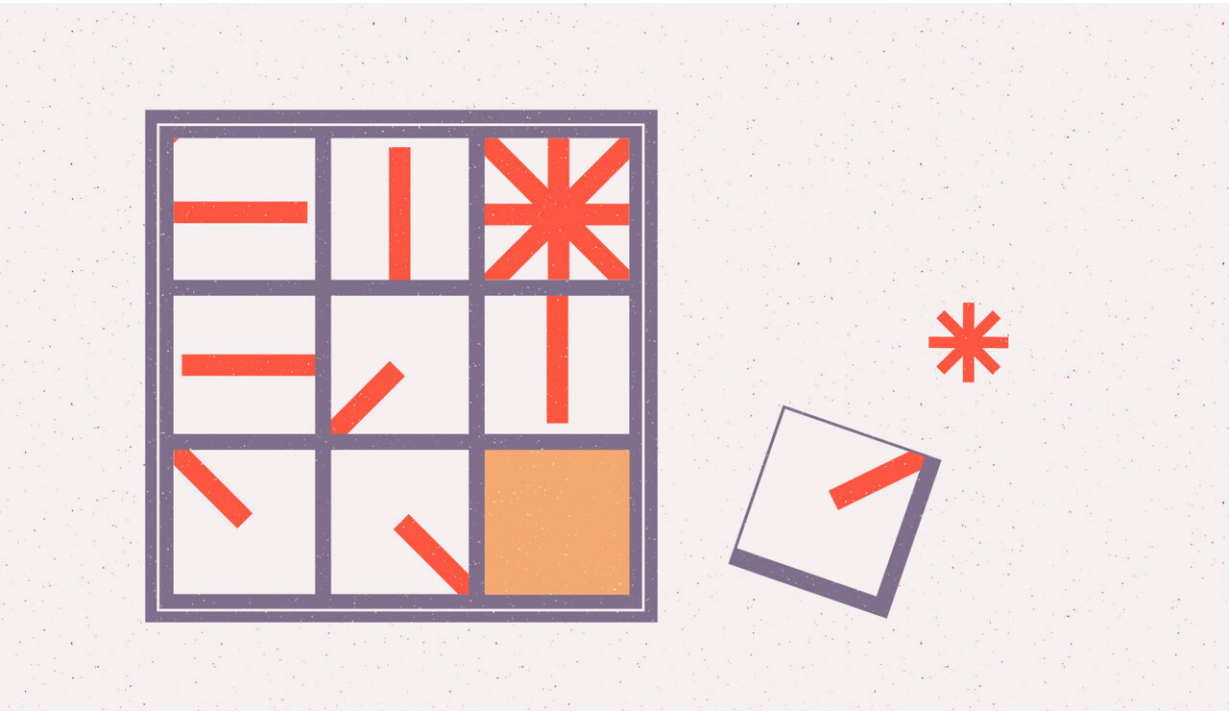

Credit: Oxford Sparks

A new animation aims to shed light on the scientific process undertaken when tackling a previously unseen pathogen.

Tackling a previously unseen pathogen – like the one that causes COVID-19 – is like piecing together a puzzle. There are many different

parameters to investigate before the pathogen can be fully understood, and before effective control measures can be put in place. So how do scientists go about solving the puzzle, and why is modelling so important?

A new animation, created by Professor Christl Donnelly and Oxford Sparks, aims to shine a light on the scientific process undertaken when we find ourselves faced with a new and unknown pathogen, whether that be a virus, bacterium or prion.

Combining data and equations

Using knowledge gained from previous outbreaks, statistical modellers combine data and equations to estimate the growth of the epidemic, in addition to other parameters such as the 'case fatality ratio', the proportion of cases who die of the disease. Such estimations are not straightforward, not least because of the huge diversity in pathogen characteristics, even among a single group, such as the coronaviruses.

For example, the virus that caused Sudden Acute Respiratory Syndrome (SARS-CoV, identified in 2003) led to serious clinical disease in all those infected. Many infected with SARS-CoV-2 h (the virus behind the current pandemic) however are asymptomatic.

It appears that individuals can transmit the virus to others whilst asymptomatic (or in a pre-symptomatic stage), making it more difficult to control. This also makes it more challenging to estimate parameters such as the infection fatality ratio, as the number of asymptomatic cases, a difficult statistic to detect, must be considered during analyses.

Informing policymakers

As the animation shows, there are many important parameters that describe how infections progress within individuals and spread through a population – knowledge of each can help to inform policymakers' decisions. Examples included the incubation period, used to determine how long periods of isolation should last, and the reproduction number (R), representing the number of individuals who, on average, will be infected by a single person with the infection. This metric has been used to assess infection risk and inform policy throughout the current pandemic.

Estimating these parameters is further complicated when scientists are faced with conflicting data, such as those from other countries. As discussed in the animation, "it's crucial to understand if that's due to other diseases, varying access to healthcare, or approaches to detection."

On the frontline

Scientists have been on the frontline in the fight again coronavirus – not only searching for a vaccine and potential treatments, but analysing data, estimating parameters and running the models which allow us to make informed decisions on how best to control the pandemic.

The new Oxford Sparks animation, launched on 6th August 2020, was created with Prof. Christl Donnelly, Professor of Statistical Epidemiology at Imperial and Professor of Applied Statistics at the University of Oxford. She is Associate Director of the MRC Centre for Global Infectious Disease Analysis.

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