

Matemàtiques en portada

Coronavirus: How maths is helping to answer crucial covid-19 questions

COMMENT | COMMENT 13 February 2020
By Adam Kucharski



Maths can help better understand the spread of the new corona virus
Xiao Yijiu/Xinhua News Agency/PA Images

New Scientist, n. 3270, 22 febrer 2020



Dutch models of COVID-19 are designed to help prevent overloading of hospitals and the need to transfer patients. THOMAS ANGUS/IMPERIAL COLLEGE LONDON

Mathematics of life and death: How disease models shape national shutdowns and other pandemic policies

By Martin Enserink, Kai Kupferschmidt | Mar. 25, 2020, 6:40 PM

Science Mag, 25 de març 2020

News in focus



Nasal or throat swabs from several people can be combined in a single test.

THE MATHEMATICAL STRATEGY THAT COULD TRANSFORM CORONAVIRUS TESTING

To save time and money, several countries are using a technique called group testing, which pools samples from many people.

Nature, 583: 504-505, 23 juliol 2020

CORONAVIRUS

A mathematical model reveals the influence of population heterogeneity on herd immunity to SARS-CoV-2

Tom Britton^{1*}, Frank Ball², Pieter Trapman¹

Despite various levels of preventive measures, in 2020, many countries have suffered severely from the coronavirus 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus. Using a model, we show that population heterogeneity can affect disease-induced immunity considerably because the proportion of infected individuals in groups with the highest contact rates is greater than that in groups with low contact rates. We estimate that if $R_0 = 2.5$ in an age-structured community with mixing rates fitted to social activity, then the disease-induced herd immunity level can be ~43%, which is substantially less than the classical herd immunity level of 60% obtained through homogeneous immunization of the population. Our estimates should be interpreted as an illustration of how population heterogeneity affects herd immunity rather than as an exact value or even a best estimate.

Science 369: 846-849, 14 agost 2020



Article

Computational Analysis of SARS-CoV-2 and SARS-Like Coronavirus Diversity in Human, Bat and Pangolin Populations

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Viruses 2021, 13, 49, 30 desembre 2020

CORONAVIRUS

Vaccine optimization for COVID-19: Who to vaccinate first?

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Vaccines, when available, will likely become our best tool to control the COVID-19 pandemic. Even in the most optimistic scenarios, vaccine shortages will likely occur. Using an age-stratified mathematical model paired with optimization algorithms, we determined optimal vaccine allocation for four different metrics (deaths, symptomatic infections, and maximum non-ICU and ICU hospitalizations) under many scenarios. We find that a vaccine with effectiveness $\geq 50\%$ would be enough to substantially mitigate the ongoing pandemic, provided that a high percentage of the population is optimally vaccinated. When minimizing deaths, we find that for low vaccine effectiveness, irrespective of vaccination coverage, it is optimal to allocate vaccine to high-risk (older) age groups first. In contrast, for higher vaccine effectiveness, there is a switch to allocate vaccine to high-transmission (younger) age groups first for high vaccination coverage. While there are other societal and ethical considerations, this work can provide an evidence-based rationale for vaccine prioritization.

Science Advances 2021, 7, 3 febrer 2021