COVID-19: in Search for Answers to Major Questions

Researchers use mathematical modelling to predict the persistence of SARS-CoV-2 in the human population after its initial pandemic stage and compute a more realistic picture of the coronavirus infection rate .

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Five-Year Projection

One study (Kissler et al. 2020) attempts to answer a major question: how SARS-CoV-2 will persist in the human population after its initial pandemic stage. The authors have built a model of multi-year interactions to investigate for what duration social distancing measures would be necessary to maintain control of the coronavirus.

While acknowledging the efficiency of one-time social distancing in containing the number of critical cases within hospital capacity, the authors warn about the infection resurging once these measures are lifted. It is highly likely that SARS-CoV-2 will not be soon eradicated by intensive public health measures, as was the case with SARS-CoV-1, and instead will circulate seasonally, following the behaviour of pandemic influenza.

If you want to share your experience and perspective on COVID-19, please do.

The study suggests that over the next five years the crucial factor would be the duration of human immunity. Therefore, longitudinal serological studies are needed to determine the extent of population immunity, whether immunity wanes, and at what rate.

The results also show that infections resurge when the simulated social distancing measures are lifted, whether the measures are one-time or intermittent. One simulated scenario projects an intense winter outbreak overlapping with flu season and exceeding capacity of hospitals. Another shows a resurgence in the coronavirus in 2025, hence, new therapeutics absent, surveillance and intermittent distancing may need to be maintained into 2022.

Estimating Unreported Cases

Another modelling study (Krantz and Rao 2020) applied a mathematical model to factors such as population density, proportion of urban population, and age groups. The researchers also considered 'transmission probability' and analysed the trends in reported case numbers. 9 March was the cutoff date for the study.

The results show that, for example, Italy reported one case for every four projected cases, which means about 30,223 cases were not reported. South Korea also was reporting one case for about every four likely cases. For Spain the ratio was one case for about every 53 likely actual cases, ie about 87,405 cases were not reported. For China the researches provide two ranges: 1 in 149 and 1 in 1,104, which translates to anywhere from 12 million to 89 million cases not reported.

Due to time limitations of the study, the U.S., where the outbreak was delayed, could not be included in the analysis. A quick follow-up assessment on April 6 indicated a reporting rate of two out of every three actual cases there. The authors assumed that at least 194,000 cases at that 6 April moment were likely unidentified.

In Search for Antibodies

The U.S. National Institutes of Health in Bethesda, Maryland, has launched the COVID-19 Pandemic Serum Sampling Study Launch, a 'serosurvey' aimed to determine how many adults in the country without a confirmed COVID-19 history have antibodies to the virus, ie were previously infected. Analysis of blood samples from up to 10,000 volunteers should provide critical data for epidemiological models.

To date, reporting of U.S. cases of COVID-19 has mostly relied on molecular tests, which effectively identify active infection. In contrast, the antibody test determine whether a person was previously infected with SARS-CoV-2 and recovered. Analysing the blood samples found to contain antibodies, researchers may additionally assess the volunteers' immune responses to the virus.

References

Krantz S and Rao A (2020) Level of under-reporting including under-diagnosis before the first peak of COVID-19 in various countries: Preliminary Retrospective Results Based on Wavelets and Deterministic Modeling. Infection Control & Hospital Epidemiology , 1-8. doi:10.1017/ice.2020.116

Kissler SM et al. (2020) Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period.   Science, 14 Apr 2020:eabb5793. DOI: 10.1126/science.abb5793

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