

When will the coronavirus pandemic peak?



The 2019–20 coronavirus pandemic is an ongoing pandemic of coronavirus disease (Covid-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). We have carried out some analysis of the daily data on the number of new cases of Covid-19 and the number of new deaths attributed to it for 191 countries as reported to the European Centre for Disease Prevention and Control who make their data freely available. According to that source, the first case worldwide was recorded as December 31st 2019 (day 1). Since that date there have been around 1.3 million cases worldwide and more than 70 thousand deaths. The pandemic has led to major economic dislocations as a result of the common government policy response of school and business closures. Our data analysis is targeted at the following questions:

1. When will the peak number of disease cases arrive in each country and worldwide?
2. What will be the total number of cases and the total number of deaths resulting directly from the pandemic?
3. When will the number of new cases reduce to a negligible amount?

The peak number of cases is important for the planning of national health resources. Provided the peak number is not too great, one may have some confidence that the health system can cope. The earlier the peak is passed and the number of new cases are reduced to a negligible amount the sooner the economic dislocation caused by the enforced social distancing and isolation measures can begin to be reversed.

We work with a quadratic time trend regression model applied to the log of new cases/deaths for each country. This model allows an upward trend that may reach a single peak depending on the parameters and then turnaround and trend back downwards; this seems to accurately describe the trajectory of the epidemic as it played out in China and qualitatively what we would expect from epidemics in general. The Chinese central government imposed a lockdown on the city of Wuhan on January 23rd, on day 24. Their peak numbers were passed on day 42 for cases and on day 50 for deaths. We use our model to predict when the peak of the epidemic will occur in terms of new cases and new deaths in the other 190 countries and worldwide. The first case in the US was reported on 20 January; other countries reported their first cases somewhat later. Many (but not all) countries have imposed social distancing measures with different degrees of strictness and at different times so we can expect the precise evolution of the disease in each country to be correspondingly different and to change perhaps in response to the policy measures imposed. Therefore, we estimate the model separately for each country and work only with the most recent 21 days of data, which uses only the most prescient information. The model seems to work quite well for many countries in terms of goodness of fit measures and diagnostic tests. As predicted there is a quite a degree of heterogeneity in the parameter estimates country by country.

We next comment on some of our key results. We find that for the UK, based on data up to 6 April 2020, the peak is most likely to occur before 11 April at around 5500 new cases per day and that the number of new cases will become negligible within 40 days. The total number of cases is predicted to be around 132,000. Fatalities will lag behind cases. The UK does not yet have an estimated peak day for fatalities but it should be within a couple of weeks of the peak in new cases. Furthermore, the number of new cases per day is predicted to be negligible within 40 days. We find that Italy and Spain have already clearly passed their peak number of cases, and the USA has credibly passed its peak. Many other countries are approaching their peaks. Some large (in terms of reported cases) exceptions are Russia, Denmark, India, and Malaysia, where it is still too early to estimate when their peak time will occur. We also find that the world as a whole is close to its peak with a peak number of daily cases around 80000 and a total number of nearly 2.3 million cases to result. We are predicting that the number of new cases per day will be negligible within 40 days worldwide. We provide Frequentist confidence intervals for our estimated parameters of interest and of course they are quite wide in some cases. We provide regular updates on our result at the website <http://covid.econ.cam.ac.uk/linton-uk-covid-cases-predicted-peak>.

Our results suggest that the end of the pandemic is in sight, which is good news for everyone. Nevertheless, we acknowledge that it is a fundamentally challenging task to predict the evolution of the pandemic just based on these summary statistics, especially since there are some well-known issues with the data quality. In addition, even if the peak is passed, there may be a second peak if social distancing measures and travel restrictions are relaxed too soon.



Notes:

- *This blog post is based on [When will the Covid-19 pandemic peak?](#), Special Paper No. 18 of LSE's Systemic Risk Centre, April 2020.*
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