The Numbers Game:
The model that would have prevented our catastrophic pandemic response

“Instead of emphasizing the large body of empirical data already gathered, our public health leaders and media kept predictions of mathematical models front and center, highlighted to the public in headline after headline.” Scott Atlas, A Plague Upon Our House, Dec 2021, p 180.

“And if there’s one word I never want to hear again, it’s modelling. When was the last model that proved, with hindsight, to have been correct?” Alex Antic, Australian Senate 3 August 2022 from minute 1:57.

In the early months of 2020 widespread panic at the prospect of unpredictable surges in hospital demand from Covid-19 infections led to an almost universal imposition of extreme and unprecedented measures in what we now know was a failed attempt to control the virus. These caused, are causing and will continue to cause loss of life and severe hardship around the world.

In the end, the response to Covid-19 was a numbers game. Terrifying positive test results were played as case counts on the nightly news without context or comment. Modellers at various universities became quasi-celebrities, giving numerical shape to the next looming threat and driving public policy.

Totally implausible scenarios featuring exponential growth and model outputs reported as ‘data’ were presented daily as news, driving fear. But as emotions cool and the horrific results of public health policies driven by these numbers are exposed, we must also face the failure of the experts and their models to make realistic predictions of the pandemic’s trajectory—especially its impact on hospitals.

This catastrophe could have been prevented. Covid-19 should never have been unpredictable. After decades of research there should have been a model capable of making accurate predictions based on hospital admissions data.

A mathematical model published in December 2021 has been making accurate forecasts of Covid-19 hospital admissions in England through three Omicron outbreaks since then. Had it been discovered even two years earlier, the pandemic response would have been totally transformed—undoubtedly saving many lives.

The existence of this model, easily implemented using standard statistical software, means there can be no rationale for a return to extreme measures to protect healthcare systems.

Its origin reveals serious failures in the epidemiological modelling enterprise.

Despite decades of study on a mission to prepare for the next great influenza pandemic the key information in the annual influenza cycle had been missed.

The good news.

The fundamental problem of epidemic management, making accurate forecasts of the need for medical resources, now has a solution. And it is available to anyone with access to a standard statistical software tool—nonlinear regression.

There is no longer any reason to fear that hospitals could be overwhelmed by unknowable demand by continued outbreaks of Covid-19 (or the next seasonal influenza outbreak or other viral epidemic). Now that we can make accurate estimates of the number of hospital admissions that will be required, rational planning can replace panic.

To answer the question "How do we know it works?", the model predictions have been thoroughly checked against data. Not against simulations of epidemics or assumptions about epidemics but against data from actual epidemics, from Cholera in 1852 to the Spanish Flu in 1918-19 to Ebola in 2014.

The model predictions have been tested against Covid-19 itself so we know exactly how it would have performed since January 2020. In particular, as we mentioned above, it has been making accurate real time forecasts of Covid-19 hospital admissions in England through the three Omicron outbreaks there since December. The model was published 8 months ago.

The Model

The model is based on observational data—not theory. It is literally a mathematical description of the 'epidemic curve' of cumulative cases seen in annual influenza outbreaks, and also in Covid-19. These alternate between a curve described by a Gompertz Function (which is determined from the data by non-linear regression) during outbreaks and straight lines (which are determined from the data by simple linear regression) during the 'off seasons'.

Forecasts made by extrapolating along the curves give accurate predictions of the future. This model doesn't explain why the curves are followed. But the knowledge that they are followed allows us to make predictions and to draw inferences about properties of the epidemic process (such as the fact that it never grows exponentially or the herd immunity threshold for example).

Understanding influenza's cyclical behaviour was crucial. We observed the same pattern in the epidemic curve of Portuguese influenza cases, repeated year after year. This is not simply the familiar 'on in the winter, off in the summer'. Instead, we found a second outbreak, following Gompertz Function growth, in early autumn each year, followed by a return to linear growth before the main winter outbreak. This detailed pattern, repeated year after year in Portuguese influenza case records, is the quantitive form of Edgar Hope-Simpson's observation for the influenza cycle in the Northern Temperate zone.

And we observed exactly the same pattern in Covid-19. Michael Levitt pointed out early in 2020 that Covid-19 outbreaks were exhibiting Gompertz Function growth. But when that turned to linear growth in April or May no one recognised the significance. In influenza this annual event marks the transition to the endemic phase and the emergence of a new variant.

Covid-19 was following the seasonal pattern of influenza, as we verified in Covid-19 data in all the locations we studied in the Northern Hemisphere. (Sweden, London, Isle de France, Ontario and Portugal). Short outbreaks in early autumn in each location were followed by a few weeks of linear growth and then in December 2020 another large outbreak of Gompertz Function growth.

The Consequences

If this model of the seasonal influenza cycle had been understood before Covid-19 arrived, it would have totally transformed our response to the pandemic.

From the outset, we would have seen a familiar pattern.

First, we would have recognised from the initial Chinese data that the outbreak was following a Gompertz Function, exactly as epidemics always have from Cholera in 1853 to the Spanish Flu in 1918-19 to Hong Kong SARS in 2003 to Ebola in 2014.

This would have eliminated hysteria about exponential growth. (Perhaps it would even have dissuaded the Chinese from initiating their fateful lockdown measures.)

The Wuhan Lockdown would not have been emulated.

Critically, the model fit to the Chinese data would have revealed that infections had already started to fall before even the Wuhan train station and airport were closed and long before the rest of the dramatic shut down, so these measures could not have caused the decline of Covid-19. Although this might not have been known early enough to save the Chinese from their folly, the data and estimates required for this conclusion were available prior to the Italian lockdown and hence prior to all those that followed.

There would have been no reason for the WHO to recommend that lockdown policies should be pursued elsewhere or for anyone else to pursue them.

Hospital Admissions would have been predicted with increasing accuracy through March and April. In April 2020, with the transition from the first wave of Gompertz Function growth to linear growth, we would have been prepared for the possibility that Covid-19 would follow the influenza seasonal pattern and re-emerge in early autumn, and again in December, likely with new variants.

This would have been strongly confirmed by the autumn outbreaks, allowing time for preparation for a large outbreak in December 2020.

This in turn could have had important consequences for the initial evaluation of the vaccine program.

In particular we would have observed that the peak of infections in the winter outbreak occurred too early for the decline to have been caused by the vaccines.

We aim to discuss all these points, and their consequences over the past two years, in more detail.

There is a lot to be examined, from the the shaky foundations of ‘conventional’ epidemic models, to their role in promoting interventions.

The message we would like to leave now is for the immediate future. Covid-19 outbreaks continue to appear in the seasonal influenza ‘windows’ and, since the start of mass vaccination, have been appearing ‘out of season’ as well. All following the alternating pattern of Gompertz Function growth and linear growth.

We have the ability to predict the progress of these outbreaks in real time.There is no longer any excuse for medically, socially and economically destructive measures to ‘protect’ healthcare systems from this disease.

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