Solution of a SEIR-like model of epidemic spreading, the ômicron wave of Covid-19 and the role of initial conditions

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The ômicron wave of the Covid-19 pandemic, which evolved during the first months of 2022, developed in special conditions regarding the whole evolution of the pandemic: in many places the populations had already a reasonable degree of vaccination, the variant proved to be very aggressive but lethality was relatively low, the populations had progressively abandoned non-pharmaceutical interventions like social distancing and the use of protective masks. We considered a compartmental model, a variant of the well known SEIR model but with two classes of susceptible individuals, which can be interpreted as vaccinated and non-vaccinated and without permanent immunity, which can be tuned to fit conditions like those present during the ômicron wave. We computed exact solutions of the model in the important regimes of the early exponential growth and the late (also exponential but with slower rate) decay of the number of new infections. The solutions allow to compute the growth and decay rates as a funcion of the model parameters, as well as the time scale for the peak of infections and other dynamical observables and produces an excellent fit of the available data for different cities and countries around the world. We show results for Brazil and show that the fit parameters can be interpreted in the context of the particular conditions under which the ômicron variant spread.

Type

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