MODELLING THE COVID-19PANDEMIC: VARIANTS AND VACCINES

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Key Words: *COVID-19, compartmental model, SIR model, SARS-CoV-2, mathematical modelling.*

ABSTRACT

On December 2019, a new virus emerged and started to spread through the Chinese city of Wuhan, the SARS-CoV-2. On 30 January 2020, the WHO declared the COVID-19as a *public health emergency of international concern*. On 11 March 2020, it is declared the first pandemic caused by a coronavirus. Since then, lifestyle has been notably conditioned to this fact, and researchers have been working quickly and hard to improve the understanding of this unknown disease and shed some light on this situation.

This last year, new SARS-CoV-2 variants have emerged and most of the European population is fully vaccinated against COVID-19. Here, we present a θ-SIR model that has been tested with real data during this pandemic. It is an improvement of previous models (see [1, 2]) -now we incorporate new compartments to consider vaccination and divide each infectious compartment depending on the amount of different SARS-CoV-2 variants, to finally apply it to the territory of Italy (see [3]).

Compartmental models are very used models to treat epidemics mathematically. One of the main advantages of these models is the fact that its parameters are directly related to real biological processes, and hence they may give intuition about the functioning of some unknown processes (for example, the real magnitude of the pandemic studying the evolution of the asymptomatic cases, or estimations of the number of beds needed).

The main result of the article presented here (i.e., [3]) is the definition of an effective reproduction number R_t for each variant – this led us to foresee the high probability of the variant Alpha generating a third wave in Italy, which finallyhappened.

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