Article

Publicly Available Simulation Models for COVID 19 Analysis

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**Abstract:**

**Keywords:** COVID 19, Coronavirus, Simulation

1. Introduction

The COVID 19 coronavisus emerged as a threat to both life and economies in countries throughout the world [1]. The virus, COVID 19, is a coronavirus that may be transmitted through aerosol transmission or contact [2]. This virus emerged in the Wuhan province of China [3], and the transmission as well as the fatality rate are high [4,5]. Models of incidence and prevalence have led to pandemic status [6]; however, the actual infection and exposure rate cannot be known due to incomplete testing [7] and lack of antigen testing [8]. Economies have developed countries have suffered significant effects due to efforts to contain the virus [9]. These efforts include social distancing, which has an uncertain effect on flattening the spread of the virus [10]. Understanding the life cycle of this virus, therefore, is exceedingly important to evaluating which prevention efforts should be used.

This study addresses the life cycle of the virus using simulations based on real-world data posted by the European Centre for Disease Prevention and Control [11]. The study uses publicly available simulation modeling available at \_\_\_\_\_\_\_\_\_\_\_\_ to demonstrate that the initial phase of the virus is finite. Further, the study investigates whether containment efforts may “flatten the curve,” [12], reducing the number of severe presentations.

2. Experimental Section

This study leverages the time series data from the European Centre for Disease and Prevention Control (ECDPC) [11]. These data provide time series for both confirmed cases and deaths by day. Population for the infected areas is also available. Data are current through 3/25/2020. Simulation data are updated every day.

The hypothesis for the study is that COVID 19 morbidity, mortality, and expiration might be predicted. The study speculates that social distancing may have little to no effect in reducing the spread of the disease (flattening the curve) in areas where controls were initiated later rather than earlier. A separate model, loosely based on the 1926 S-I-R (susceptible, infected, recovered) model [13] with the inclusion of immigration and emigration [14], is proposed as an alternative based on the assumption that no interventions are sufficiently capable of reducing the infection.

Using the ECDPC data, this Monte Carlo simulation leverages ECDPC data to fit susceptible, infected, recovery / death, immigration, and emigration distributions based on countries who have recovered from the initial wave of the infection. These distributions are then applied to other countries to forecast the duration and mortality rates.

3. Results

3.1. Descriptive Statistics

3.2. Simulation Flowchart

3.3. Verification and Validation

4. Discussion

5. Conclusions

This section is not mandatory, but can be added to the manuscript if the discussion is unusually long or complex.

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**Conflicts of Interest:** The author declares no conflict of interest.

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