

Prediction of cumulative death cases in Indonesia due to COVID-19 using mathematical models

ABSTRACT

Different growth models such as Baranyi-Roberts, Von Bertalanffy, modified Gompertz, Morgan-Mercer-Flodin (MMF), modified Richards, modified Logistics and Huang utilized in fitting and analyzing the COVID-19 outbreak pattern showing the cumulative number of SARS-CoV-2 deaths in Indonesia as of 15 July 2020. Out of all the models tested MMF was found to be the best one considering its highest adjusted R² and the lowest RMSE values. Parameter such Accuracy and Bias Factors were found to have values close to unity (1.0). Values generated from the MMF model includes the maximum growth of death rate (log) of 0.051 (95% CI from 0.34 to 0.49), the curve constant (d) that affects the inflexion point of 0.4212 (95% CI from 1.029 to 1.171), lower asymptote value (b) of -1.72 (95% CI from -2.53 to -1.22) and the maximal total number of death (y_{max}) of 889,201 (95% CI from 260,016 to 7,464,488). The MMF forecasted that the total death toll in Indonesia would be 5.315 (95 per cent CI from 5.079 to 5.562) and 6.857 (95 per cent CI from 6.450 to 7.289) on the 15th August and 15th September 2020 respectively. The prediction accuracy of the model used in this research article is a powerful tool for epidemiologists to monitor and evaluate the level the severity of COVID-19 in Indonesia in the coming months. Besides that, just like any other model, due to the intermittent nature of the COVID-19 dilemma both in the local and global context, these values must be considered with caution.

Keyword: COVID-19; Total infection; Pandemic; Mathematical model; MMF