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Mathematical modeling of COVID-19 pandemic in the context of sub-Saharan Africa: a short term forecasting in Cameroon and Gabon

Abstract
We propose and analyze a compartmental model of COVID-19 to predict and control the outbreak. We first formulate a mathematical model for the dynamical transmission of COVID-19 in the context of sub-Saharan Africa. We provide the basic properties of the model and compute the basic reproduction number R0. After, assuming continuous measurement of the weekly number of newly COVID-19 detected cases, newly deceased individuals and newly recovered individuals, the Ensemble of Kalman filter (EnKf) approach is used to estimate the unmeasured variables and unknown parameters using real data of COVID-19. We calibrated the proposed model to fit the weekly data in Cameroon and Gabon. We present the forecasts of the current pandemic in these countries using the estimated parameter values and the estimated variables as initial conditions. Our findings suggest that at 23 August 2020, R0 was approximately 1.31050 in Cameroon and 1.49976 in Gabon meaning that the disease will not die out without any control measures in theses countries. Short-term predictions show that the COVID-19 pandemic will still increase in the future in theses two countries affected by this pandemic. However, long term predictions reveals that the COVID-19 undetected cases will play an important role in the spread of the disease. Further, we found that there is a necessity to increase timely the surveillance by using awareness program, detection process and the eradication of the pandemic is highly dependent on the control measures taken by each government.

Keywords : COVID-19; Mathematical model; Basic reproduction number; EnKf; Forecasts