Forecasting of COVID-19 Cases, Hospitalization Admissions, and Death Cases Based on Wastewater Sars-COV-2 Surveillance Using Copula Time Series Model

Authors : Hueiwang Anna Jeng, Norou Diawara, Nancy Welch, Cynthia Jackson, Rekha Singh, Kyle Curtis, Raul Gonzalez, David Jurgens, Sasanka Adikari

Abstract : Modeling effort is needed to predict the COVID-19 trends for developing management strategies and adaptation measures. The objective of this study was to assess whether SARS-CoV-2 viral load in wastewater could serve as a predictor for forecasting COVID-19 cases, hospitalization cases, and death cases using copula-based time series modeling. SARS-CoV-2 RNA load in raw wastewater in Chesapeake VA was measured using the RT-qPCR method. Gaussian copula time series marginal regression model, incorporating an autoregressive moving average model and the copula function, served as a forecasting model. COVID-19 cases were correlated with wastewater viral load, hospitalization cases, and death cases. The forecasted trend of COVID-19 cases closely paralleled one of the reported cases, with over 90% of the forecasted COVID-19 cases falling within the 99% confidence interval of the reported cases. Wastewater SARS-CoV-2 viral load could serve as a predictor for COVID-19 cases and hospitalization cases.

Keywords : COVID-19, modeling, time series, copula function