A Regional Model for projecting COVID-19 in Northern Mindanao, Philippines

Jayrold P. Arcede[a,*], Randy L. Caga-anan[b], May Anne E. Mata[e], Youcef Mammeri[c], Rhoda A. Namoco[d], Ian Christian A. Gonzales[f], Zython Paul Lachica[e]

[a]*Department of Mathematics, Caraga State University, Butuan City, Philippines*
[b]*Department of Mathematics and Statistics, MSU-Iligan Institute of Technology, Iligan City, Philippines*
[c]*Laboratoire Amiénois de Mathématique Fondamentale et Appliquée, CNRS UMR 7352, Université de Picardie Jules Verne, 80069 Amiens, France*
[d]*Department of Applied Mathematics, University of Science and Technology of Southern Philippines, Cagayan De Oro, Philippines*
[e]*Department of Mathematics, Physics and Computer Science, University of the Philippines Mindanao, Davao City, Philippines*
[f]*Center for Health Development Northern Mindanao, Department of Health, Cagayan de Oro City, Philippines*

Abstract

To provide the most accurate and timely advice possible for health policy makers about a reliable projections of COVID 19 in Northern Mindanao, and the possible impact of measures designed for control, we proposed a compartmental model for COVID 19 which essentially capture the dynamics at a local level with parameters suited for the region. Closed-form formulas for the basic and effective reproduction numbers of the model are obtained. Sensitivity analysis is done via Latin Hypercube Sampling - Partial Rank Correlation Coefficient methodology. Results show a strong positive correlation between basic reproduction number and the transmission rate from susceptible to exposed. Furthermore, we also provided numerical experiments for each province and the whole region. Among the results, a decaying reproductive number which approaches or below unity. Lastly, four intervention strategies were considered. Without much testing capacity and no vaccine, simulations show that the best strategy is the combination of containment, lockdown, and social distancing, but very good improvements can also be expected from amplifying the efforts to quarantine exposed individuals.

Keywords:
COVID-19, Philippines, probable, regional, quarantine

*Corresponding author:jparcede@carsu.edu.ph