



UPPSALA
UNIVERSITET

INTERNATIONAL SCIENCE PROGRAMME ISP

#ISP60years webinars: COVID-19 propagation mathematical modeling: The case of Senegal

The outburst of the COVID-19 pandemic has raised several questions leading to a complex system in terms of modeling. Indeed, the modeling of the epidemic, at the level of a country, needs considering each of the different sources of contamination as well as the public health authorities strategy, in a specific way.

With this in mind, we develop a mathematical model of the COVID-19 epidemic in Senegal. In the model, the population is subdivided into five compartments:

- susceptible,
- infected but asymptomatic,
- symptomatic,
- quarantined, and
- recovered immune people.

In addition, due to its important impact in the propagation of the disease, we add one more variable:

- the number of infected objects.

Therefore, the model corresponds to a system of six non-linear ordinary differential equations we submit to an analytical study to prove the relevancy of the model, simulate the evolution of the epidemic, and retrieve epidemiological parameters, namely the infection rate and the basic reproduction number, R_0 .

Based on the Senegalese territory COVID-19 data, we simulate various scenarios as for the evolution of the epidemic in the country, in order to predict the peak and its magnitude with regard to the application of barrier measures.

We also explore the option of collective immunity with special protection for vulnerable people. In doing so, non available parameters are identified using some mathematical identification technics.