



Partial Differential Equations for Asymptotic Analysis and Identifiability in Nigerian Epidemic Spread Modelling

Oghenekaro Iweala^{1,2}, Chidera Okoroanya²

¹ Nigerian Institute of Social and Economic Research (NISER)

² University of Jos

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Correspondence: oiweala@aol.com

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Author notes

Oghenekaro Iweala is affiliated with Nigerian Institute of Social and Economic Research (NISER) and focuses on Mathematics research in Africa.

Chidera Okoroanya is affiliated with University of Jos and focuses on Mathematics research in Africa.

Abstract

The study examines partial differential equations (PDEs) to model epidemic spread in Nigeria, focusing on asymptotic analysis and identifiability. The study employs a combination of theoretical analysis and numerical simulations to investigate the spread dynamics under various conditions. Asymptotic methods are applied to derive simplified models that capture long-term behaviour, while identifiability is assessed through sensitivity analysis on parameter estimates. A key finding is that the basic reproduction number R_0 exhibits significant variability across different regions in Nigeria, highlighting regional differences in epidemic control strategies. The research provides a robust framework for understanding and predicting Nigerian epidemic spread using PDE models, with a focus on parameter identifiability. Further empirical studies are recommended to validate the model predictions and explore the impact of identified parameters on epidemic outcomes. epidemic modelling, partial differential equations, asymptotic analysis, identifiability, R_0 Under standard regularity and boundary assumptions, the forecast state is modelled by $\partial_t u(t, x) = \kappa \partial_{xx} u(t, x) + f(t, x)$, and stability follows from bounded perturbations.

Keywords: African Geography, Partial Differential Equations, Asymptotic Analysis, Identifiability, Mathematical Modelling, Epidemic Spread, Nonlinear Dynamics

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