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OPTIMAL ANALYSIS OF THE EFFECT OF D1 AND D2 VACCINES ON MEASLES VIRUS

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Abstract
Measles, an acute viral infectious disease caused by the measles morbillivirus, belongs to the paramyxovirus family. It spreads through direct contact and airborne transmission, primarily infecting the respiratory tract through coughs, sneezes, and nasal secretions. The prevalence of measles is a concern in African and developing countries where overpopulation and limited birth control measures exist. Outbreaks in such regions pose significant risks. In this study, a mathematical model was developed to analyze measles transmission, considering various immunization strategies, and the effectiveness of the Two-Dose vaccination D1(t) and D2(t). A control model was formulated, and the Disease-Free Equilibrium (DFE) state was determined. The basic reproduction number, denoted as R_0, was computed to assess the potential spread of the virus. Local stability analysis of the DFE was conducted using Jacobian Matrix Techniques, revealing that the DFE is locally asymptotically stable when R_0 is less than 1. The findings suggest that global eradication of measles is feasible if R_0 remains below one.

Key words: Basic Reproduction Number R_0, D1 and D2 Vaccination, Jacobian Matrix, Measles, Optimal Control, Stability

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