

Modelling Immunisation Coverage in Nigeria: a Bayesian Structured Additive Regression Approach

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Abstract

About 10 million children under the age of five die every year worldwide. One quarter of these deaths are caused by diseases that are preventable with vaccines. According to the World Health Organization, immunization currently saves between 2 and 3 million lives per year. It is one of the most successful and cost-effective public health interventions. In developing countries in particular, infant and childhood mortalities are related to childhood diseases. Therefore, low vaccination coverage increases the risks of a child to various diseases such as diarrhoea, measles, malaria, etc. In spite of the efforts from government and donor agencies, Nigeria still remains the county with least vaccination coverage in Africa. However, empirical evidence revealed substantial geographical variations on immunization coverage in Nigeria. In attempt to address the menace of low vaccination coverage in Nigeria, this paper aims at providing policymakers with tools to design effective interventions which can lead to frugal utilization of the scarce resources which is prominent in developing countries. We explore flexible structured additive regression model within a Bayesian context. All parameters are assumed to be random variable, hence appropriate priors are assigned on them. For instance, Gaussian Markov random field prior was assigned on spatial component while Bayesian B-spline prior is assumed for all non-linear effects. Findings revealed substantial significant spatial effect, nonlinear effect of mother's age at birth and child's age; and children who were delivered in hospitals are more likely to be fully immunised. Furthermore, respondent's educational attainment and partners' educational attainment, children in urban areas and firstborns are more likely to be fully immunised. In conclusion, findings from this Chapter provide insight to policy formulation. Scarce resources have been identified as a major challenge towards implementation of necessary intervention strategies in sub-Saharan African countries, including Nigeria. This paper provides policy-makers with tools to enhance appropriate policy formulation on improving access to and coverage of immunisation; which can also assist in allocating resources to states or districts where the resources can be effectively utilized.

Key Words: effective policy formulation, Gaussian Markov random field, geographical variations, preventable diseases, vaccination