

# **Determinants of anaemia among young children in Nigeria: A Bayesian hierarchical modelling**

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Anaemia, defined as a low level of functional haemoglobin (Hb) in the blood, decreases the amount of oxygen reaching the tissues and organs of the body, thereby reducing their capacity to function. Because all human cells depend on oxygen for survival, anaemia in children can lead to severe health consequences, including impaired cognitive and motor development, stunted growth, and increased morbidity from infectious disease. In Nigeria, as with other developing countries, anaemia has been identified as one of the major cause of child mortality. In this study, attempt was made to examine some individual and household characteristics as well as possible spatial variations of anaemia in children ages 6 - 59 months in Nigeria using data from the 2010 Nigeria Malaria Indicator Survey. Three models were examined. In the first model, the Hb levels of the children were examined assuming a Gaussian distribution to the response variable. Next, children were classified based on whether or not they were anaemic yielding a Binomial distribution and a Binomial probit model was assumed in this case. The third outcome was considered as an ordered category; categorizing children according to the level of being anaemic (severe, moderate, mild or normal) and was modelled assuming a cumulative probit model. The effect of metrical covariate of the child's age was assumed to be nonlinear and estimated nonparametrically while other categorical covariates are estimated in the usual parametric form. The spatial structure effect was modelled using Gaussian random fields while the Bayesian perspective of penalised splines were assumed for the unknown smooth functions. Bayesian inference is based on linear mixed model representation and the variance components are estimated based on an approximate marginal likelihood approach. Findings reveal a geographical north-south divide in mean Hb of the children while children from four states are associated with high likelihood of being anaemic. Further, important risk factors include household wealth index, sex of the child, whether or not the child had fever or malaria in the two weeks preceding the survey.

Key Words: Haemoglobin, Gaussian random fields, special effects, cumulative probit,