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Vaccination Coverage and Its Associated Factors in India: An ML Approach to Understand the Hierarchy and Inter-Connections

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Abstract : The present paper attempts to analyze the hierarchy and interconnection of factors responsible for the uptake of BCG vaccination in India. The study uses National Family Health Survey (NFHS-5) data which was conducted during 2019-21. The univariate logistic regression method is used to understand the univariate effects while the interconnection effects have been studied using the Categorical Inference Tree (CIT) which is a non-parametric Machine Learning (ML) model. The hierarchy of the factors is further established using Conditional Inference Forest which is an extension of the CIT approach. The results suggest that BCG vaccination coverage was influenced more by system-level factors and awareness than education or socio-economic status. Factors such as place of delivery, antenatal care, and postnatal care were crucial, with variations based on delivery location. Region-specific differences were also observed which could be explained by the factors. Awareness of the disease was less impactful along with the factor of wealth and urban or rural residence, although awareness did appear to substitute for inadequate ANC. Thus, from the policy point of view, it is revealed that certain subpopulations have less prevalence of vaccination which implies that there is a need for population-specific policy action to achieve a hundred percent coverage.

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