

## GIS Based Spatial Modeling for Selecting New Hospital Sites Using APH, Entropy-MAUT and CRITIC-MAUT: A Study in Rural West Bengal, India

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**Abstract :** The study aims to identify suitable sites for new hospitals with critical obstetric care facilities in Birbhum, one of the vulnerable and underserved districts of Eastern India, considering six main and 14 sub-criteria, using GIS-based Analytic Hierarchy Process (AHP) and Multi-Attribute Utility Theory (MAUT) approach. The criteria were identified through field surveys and previous literature. After collecting expert decisions, a pairwise comparison matrix was prepared using the Saaty scale to calculate the weights through AHP. On the contrary, objective weighting methods, i.e., Entropy and Criteria Importance through Interaction Correlation (CRITIC), were used to perform the MAUT. Finally, suitability maps were prepared by weighted sum analysis. Sensitivity analyses of AHP were performed to explore the effect of dominant criteria. Results from AHP reveal that 'maternal death in transit' followed by 'accessibility and connectivity', 'maternal health care service (MHCS) coverage gap' were three important criteria with comparatively higher weighted values. Whereas 'accessibility and connectivity' and 'maternal death in transit' were observed to have more imprint in entropy and CRITIC, respectively. While comparing the predictive suitable classes of these three models with the layer of existing hospitals, except Entropy-MAUT, the other two are pointing towards the left-over underserved areas of existing facilities. Only 43%-67% of existing hospitals were in the moderate to lower suitable class. Therefore, the results of the predictive models might bring valuable input in future planning.

**Keywords :** hospital site suitability, analytic hierarchy process, multi-attribute utility theory, entropy, criteria importance through interaction correlation, multi-criteria decision analysis

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