

# **A Hybrid Fuzzy Multi-Criteria Decision-Making Model to Evaluate the Overall Performance of Public Emergency Departments: A Case Study**

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## **Abstract**

Performance evaluation is relevant for supporting managerial decisions related to the improvement of public emergency departments (EDs). As different criteria from ED context and several alternatives need to be considered, selecting a suitable Multicriteria Decision-Making (MCDM) approach has become a crucial step for ED performance evaluation. Although some methodologies have been proposed to address this challenge, a more complete approach is still lacking. This paper bridges this gap by integrating three potent MCDM methods. First, the Fuzzy Analytic Hierarchy Process (FAHP) is used to determine the criteria and sub-criteria weights under uncertainty, followed by the interdependence evaluation via fuzzy Decision Making Trial and Evaluation Laboratory (FDEMATEL). The fuzzy logic is merged with AHP and DEMATEL to illustrate vague judgments. Finally, the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is used for ranking EDs. This approach is validated in a real 3-ED cluster. The results revealed the critical role of Infrastructure (21.5%) in ED performance and the interactive nature of Patient safety (C<sub>p</sub>R<sup>1/4</sup> 12:771). Furthermore, this paper evidences the weaknesses to be tackled for upgrading the performance of each ED.

**Keywords:** Emergency departments; Fuzzy AHP; Fuzzy DEMATEL; TOPSIS; performance evaluation.