

Predicting Burnout and Emotional Exhaustion Among Nurses in South Africa

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Healthcare systems worldwide face increasing demand, placing substantial pressure on nursing staff and contributing to burnout and emotional exhaustion. This issue is particularly acute in Sub-Saharan Africa, where burnout prevalence among nurses is among the highest globally, yet context-specific risk factors remain underexplored. Identifying these factors is critical for informing targeted interventions and improving workforce sustainability.

This study develops supervised machine learning models to predict self-reported burnout and emotional exhaustion among nurses in South Africa using cross-sectional survey data (n = 1,165) collected from medical-surgical units across public and private hospitals. Burnout is measured using the 9-item Maslach Burnout Inventory (MBI), while emotional exhaustion is proxied by a validated single-item measure (“I feel burned out from my work”). An automated machine learning workflow is implemented to train and evaluate multiple classification models.

Model performance is assessed using accuracy, area under the ROC curve (AUC), and confusion matrices. The gradient boosting classifier achieves the best performance, with accuracies of 75.8% for burnout and 76.8% for emotional exhaustion using full survey data. In contrast, models using demographic variables alone perform substantially worse (60.4% and 68.5%, respectively), highlighting the importance of workplace and perceptual factors.

Feature importance analysis reveals that fatigue is the strongest predictor of both burnout and emotional exhaustion. Confidence in management is the second most influential predictor of burnout, while perceived managerial listening is the second most important factor for emotional exhaustion. These findings demonstrate the effectiveness of supervised machine learning in identifying key drivers of nurse burnout in resource-constrained settings. The results provide actionable insights for healthcare decision-makers, emphasizing the need to address fatigue and strengthen management practices to mitigate burnout and improve nurse well-being.