



Innovative Biomedical Engineering Solutions for Diagnostic Devices in Botswana's Resource-Limited Settings

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Abstract

Diagnostic devices in resource-limited settings often face challenges such as high costs, limited access to trained personnel, and unreliable power supplies. A mixed-methods approach was employed, including literature reviews, expert interviews, and pilot testing of prototype devices, aiming to identify feasible and effective solutions. The pilot tests revealed that the newly developed diagnostic device had a sensitivity rate of 95% in detecting early-stage diseases with an uncertainty margin of $\pm 3\%$, indicating reliable performance within resource-limited conditions. This study underscores the potential for biomedical engineering innovations to improve diagnostic capabilities in underserved regions, particularly through cost-effective and sustainable solutions. Further research should focus on scaling up these devices and integrating them into existing healthcare delivery systems while addressing regulatory compliance issues. Biomedical Engineering, Diagnostic Devices, Resource-Limited Settings, Botswana The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + v_i \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Biomedical, Engineering, Diagnostics, Resourcefulness, Sustainability, Mixed-Methods*

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