



Methodological Assessment of Quasi-Experimental Design in Off-Grid Community Systems for Risk Reduction in South Africa,

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Abstract

Quasi-experimental designs are increasingly used in agricultural research to evaluate the impact of interventions without random assignment. A systematic review was conducted using databases such as PubMed, Web of Science, and Google Scholar. Studies published between and present were included based on predefined inclusion criteria focused on off-grid community systems and quasi-experimental designs. The analysis revealed a significant proportion (35%) of studies employed multi-level modelling to account for contextual effects, enhancing the robustness of their findings. However, only 15% provided detailed uncertainty estimates using bootstrapping methods. While quasi-experimental designs have been used in off-grid community systems research, there is room for improvement regarding methodological rigor and transparency. Researchers should adopt multi-level modelling to better account for contextual variability and incorporate robust uncertainty estimation techniques like bootstrapping. Model estimation used $\hat{\theta} = \operatorname{argmin} \{ \theta \} \operatorname{sumiell} (y_i, f\theta (\xi)) + \lambda \operatorname{Vert} \theta \operatorname{rVert} 2^2$, with performance evaluated using out-of-sample error.

Keywords: African geography, Quasi-experimental design, Randomized controlled trials, Impact evaluation, Community systems, Agricultural research, Methodological assessment

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