



Evaluating System Reliability in Public Health Surveillance Networks: A Randomized Field Trial in Tanzania

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Abstract

Public health surveillance systems are critical for monitoring infectious diseases in low- to middle-income countries (LMICs), such as Tanzania. These systems rely on reliable data collection and transmission mechanisms to inform effective public health interventions. A randomized field trial was conducted to assess the reliability of public health surveillance systems in Tanzania. Participants were randomly assigned to either an intervention or control group, and data collection processes were monitored for accuracy and completeness. The findings indicate that there is a significant improvement ($p < 0.05$) in system reliability when using a two-stage randomization process compared to traditional single-stage assignments. This randomized field trial provides robust evidence on the effectiveness of different assignment methods for enhancing public health surveillance systems' reliability. Based on this study, it is recommended that future evaluations of public health surveillance networks in Tanzania adopt a two-stage randomization process to ensure more accurate and reliable data collection. Treatment effect was estimated with $\text{text}\{ \text{logit} \}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: Tanzania, Geographic Information Systems (GIS), Cluster Randomization, Data Quality Control, Surveillance Networks, Public Health Metrics, Reliability Analysis

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