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Evaluating Drinking Water Quality in Rural Sub-Saharan African Communities: An Exploratory Assessment Project in Rongo, Kenya

Introduction: Rongo Sub-County is a remote collection of communities located in Southwestern Nyanza Province, Kenya. The area lacks centralized water delivery or treatment infrastructure and data on drinking water quality. This pilot project, in collaboration with local non-profit Lwala Community Alliance (LCA), examined the spatial distribution of bacterial contamination and 12 chemical parameters found in the area's rain- and groundwater-sourced drinking water sources during the region's late rainy season (May-June) of 2022.

Methods: Single grab samples of drinking water sourced from roof-draining water tanks, rehabilitated springs, natural water sources, and hand-dug wells were collected. The presence of harmful bacteria and 12 chemical drinking water parameters, including copper, nitrate, and mercury levels were assessed using commercially available colorimetric testing kits. GPS coordinates of each source's location were logged to develop an interactive GIS tool for internal use by LCA. Community education and training sessions were held as needed at each site.

Results: 90 drinking water sources were evaluated for bacterial and chemical contamination. Of 57 groundwater sources, 31 sources (72%) tested at or above the Kenyan National Environmental Management Authority (NEMA) limit for nitrates (10 mg/L) in drinking water, with an average nitrate concentration across all groundwater sources of 18 mg/L. Pathogenic bacteria were detected in nearly all (32/33) of the assessed roof-draining water tanks, despite the community's widespread belief that collected rainwater was pure. The primary barrier to remediate groundwater nitrate pollution is the lack of drinking water infrastructure and an absence of community education regarding overapplication of fertilizers. Community education and increased resources for drinking water disinfection are needed to remediate widespread roof-draining water tank bacterial contamination.

Conclusions: This project successfully served as proof-of-concept that periodical, intensive surveys of drinking water sources are feasible within this community, provided the first broad survey of drinking water quality in Rongo's communities, and laid the procedural groundwork for continued monitoring. Longitudinal research is needed to expand the findings of this pilot project, as continuation of the project would provide more data on spaciotemporal trends of groundwater nitrate pollution would inform critical water transport infrastructure development.