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RESOURCE

Acute health risks to community hand-pumped groundwater supplies following Cyclone Idai flooding

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Description / Abstract

This longitudinal flood-relief study assessed the impact of the March 2019 Cyclone Idai flood event on E. coli contamination of hand-pumped boreholes in Mulanje District, Malawi. It established the microbiological water-quality safety of 279 community supplies over three phases, each comprising water-quality survey, rehabilitation and treatment verification monitoring. Phase 1 contamination three months after Idai was moderate, but likely underestimated. Increased contamination in Phase 2 at 9 months and even greater in Phase 3, a year after Idai was surprising and concerning, with 40% of supplies then registering E. coli contamination and 20% of supplies deemed ‘unsafe’. Without donor support for follow-up interventions, this would have been missed by a typical single-phase flood-relief activity. Contamination rebound at boreholes successfully treated months earlier signifies a systemic problem from persistent sources intensified by groundwater levels likely at a decade high. Problem extent in normal, or drier years is unknown due to absence of routine monitoring of water point E. coli in Malawi. Statistical analysis was not conclusive, but was indicative of damaged borehole infrastructure and increased near-borehole pit-latrine numbers being influential. Spatial analysis including groundwater flow-field definition (an overlooked sector opportunity) revealed ‘hit-and-miss’ contamination of safe and unsafe boreholes in proximity. Hydrogeological control was shown by increased contamination near flood-affected area and in more recent recharge groundwater otherwise of good quality. Pit latrines are presented as credible e-coli sources in a conceptual model accounting for heterogeneous borehole contamination, wet season influence and rebound behavior. Critical to establish are groundwater level - flow direction, hand-pump plume draw, multiple footprint latrine sources - ‘skinny’ plumes, borehole short-circuiting and fast natural pathway (e.g. fracture flow) and other source influences. Concerted WASH (Water, Sanitation and Hygiene) sector investment in research and policy driving national water point based E. coli monitoring programs are advocated.

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