



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-latrines 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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C2.01

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