

## Risk factors associated with rural water supply failure: A 30-year retrospective study of handpumps on the south coast of Kenya

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### Rationale

- An improved understanding of water supply failure in rural sub-Saharan Africa will be critical to achieving the global goal of safe water for all
- The aim of the study was to identify factors that influence risk of failure and operational lifespan for handpump water supplies



### Methods

- The study site was Kwale County in Kenya, which played host to the first large scale deployment of the Afridev handpump by way of a programme that installed 550+ handpump-equipped boreholes between 1983 and 1995
- A retrospective cohort study design was employed: field data were collected to establish time to failure for handpumps, and this information was then matched with data from original installation records
- Three survival analysis techniques were used to identify risk factors for water point failure: (a) Kaplan-Meier estimates, (b) Cox proportional hazards regression, and (c) accelerated failure time models

### Results

- Of the 337 water points that were matched with data from the original installation records, the average age was 24 years and 64% were found to be functional
- Risk of failure and operational lifespans were significantly associated with salinity, static water level, geology and distance to spare parts:
  - ◇ **Salinity:** An increase in 100  $\mu\text{S}/\text{cm}$  was associated with a 2% increase in risk of failure and a 2% reduction in lifespan
  - ◇ **Static water level:** A 1 metre increase in groundwater depth was associated with a 3% increase in risk of failure and a 2% reduction in lifespan
  - ◇ **Geology:** An unconsolidated sand aquifer was associated with a 70%-108% increase in risk of failure and a 29-34% reduction in lifespan
  - ◇ **Distance to spare parts:** A 1km increase in distance to spare part suppliers was associated with 2% increase in risk of failure and a 2% reduction in lifespan

### Implications

- Post-construction support mechanisms should seek to level the playing field by mitigating the impact of more challenging environmental and geographical conditions
- Unfavourable groundwater quality should be assessed to determine if a site is suitable for investment
- Further studies are needed to better understand the causal pathways that underlie identified risk factors
- Survival analysis and longitudinal study designs could be applied more widely to increase the rigour of water point sustainability assessments

Full paper available at this link:

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