One size does not fit all: insights from a six-year impact evaluation on measuring intermittency, multiple source use, and other urban water phenomena

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As SDG and JMP indicators and targets evolve, are we measuring urban water access and use effectively?

Global indicators are useful for spurring action, rounding up financial commitments, and establishing benchmarks. An important challenge with the SDG agenda is the need to move beyond water access to also measure availability, quality, and affordability of water services. Further, global indicators need to consider important dynamics at play in rapidly urbanizing areas.

We share insights about rigorously measuring important water access and use indicators in dynamic urban contexts, in support of the SDG agenda, from an impact evaluation of urban water infrastructure investments in Dar es Salaam and Morogoro, Tanzania.

Access

💧 Urban households (a) often use **multiple sources concurrently** within the household simultaneously, and (b) have access to several **alternatives** when their primary sources are not available.

💧 **Measurement: Water source matrix.** Collects *all* sources used for *all* purposes and flags households' *primary* and *secondary* sources. Longitudinal data collection tracks trends in households' 'water portfolio' over time.


Water source matrix allows tracking changes in water source use over time.
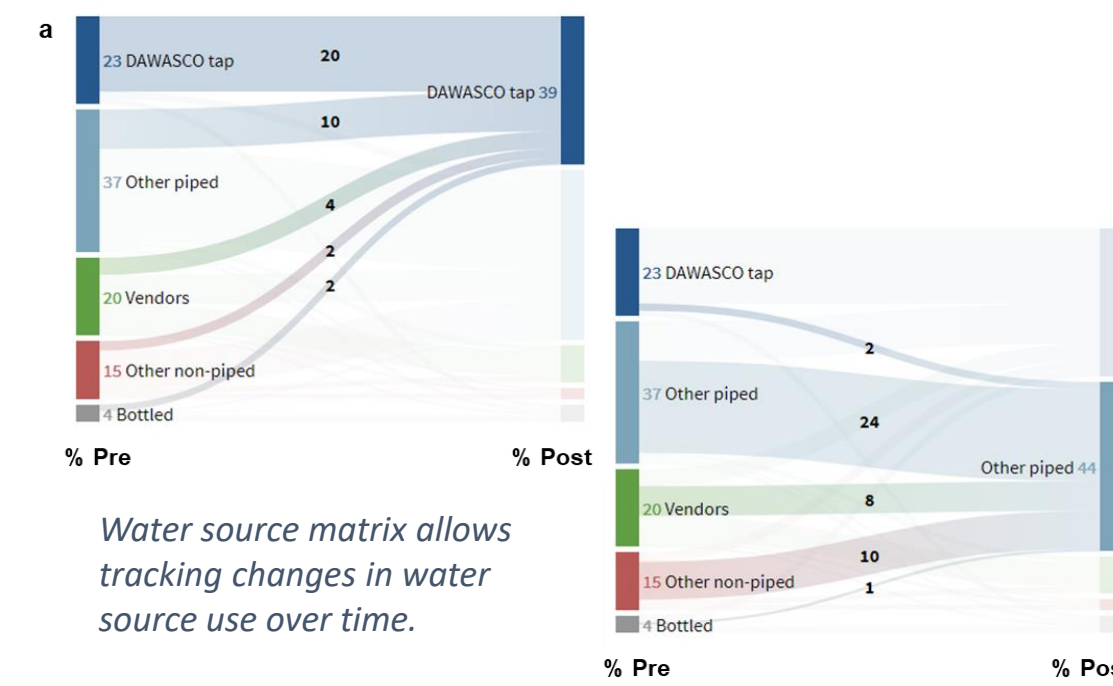
Availability

Pressure loggers were installed in one-week rotations at household taps; plus 6-7 weeks at network sampling points.

💧 Urban water systems are often characterized by **chronic intermittency**. Survey measures based on recall are imperfect, and have the potential to be 'noisy' or 'lumpy' and should be validated by direct measurements when possible.

💧 **Measurement: Pressure logger devices + survey recall.** Sensors at household taps on a rotating one-week schedule, ahead of surveys. This allows a direct, objective measure of availability, and validation of household survey recall.
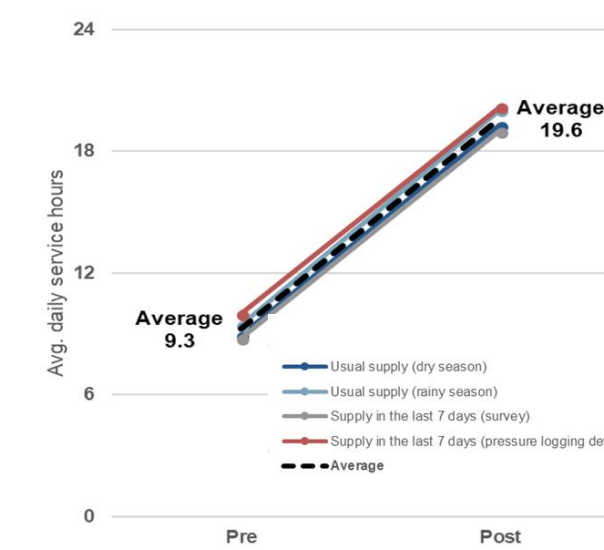

Study validated household survey recall with pressure logging devices. Household survey questions were refined through a sub-study using cognitive interviewing.

Quality

💧 Intermittency affects **water quality** delivered to household taps. In addition, household water storage provides opportunities for re-contamination.

💧 **Measurement: Water quality testing.** Using WHO compact dry plate methodology, tested water across the distribution network. Allows longitudinal measurement of quality across the distribution network, and pinpointing where quality breaks down.
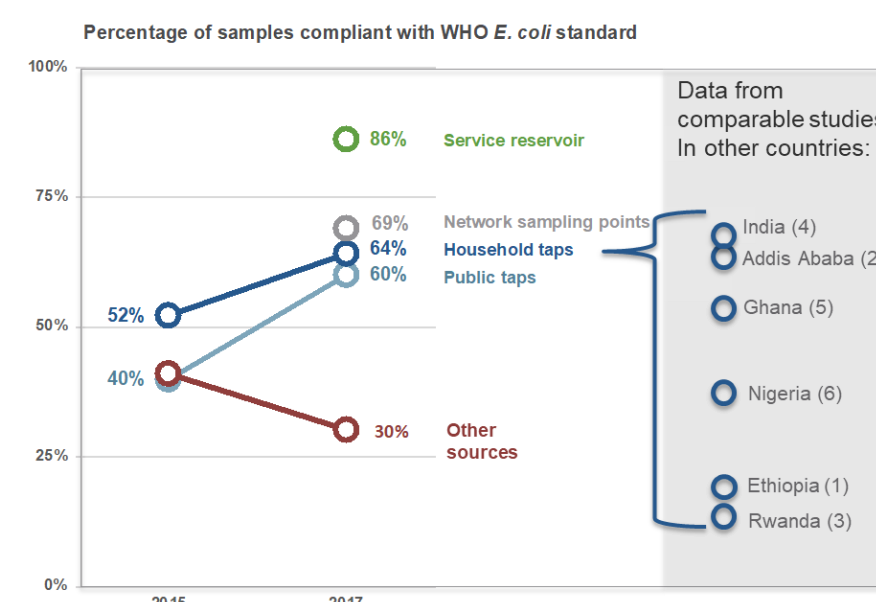
Water quality tests for turbidity, free chlorine residual, and E. coli were conducted at multiple points across the distribution network, longitudinally.

Coping

💧 Intermittency and sub-standard quality lead households to **store and treat water**. **Substitution effects** between lesser quality/treatment and better quality/no treatment are also relevant.

💧 **Measurement: Storage & treatment modules + direct observation.** Collects total storage capacity in the household; direct observation module scores storage hygiene for all types of containers in household. Module for treatment collects all methods used and cost, for primary & secondary sources. Allows analysis of coping practices and measuring substitution effects over time in urban areas.

Impact Evaluation Overview

Background

💧 The Millennium Challenge Corporation (MCC) and the Government of Tanzania (GoT) implemented an urban water infrastructure project to increase and improve the supply of piped water.

💧 Social Impact conducted a rigorous impact evaluation of the MCC Tanzania Water Sector Project (WSP), to assess how improvements in urban water supply infrastructure affect health and human capital outcomes in Dar es Salaam and Morogoro, Tanzania.

Methods (Dar es Salaam)

💧 Design: Quasi-experimental impact evaluation measuring effect of supply and access improvements on household economic and health outcomes. Primary analyses employed fixed-effects panel regression and coarsened exact matching.

💧 Data sources: This rich dataset includes household surveys, in-depth qualitative interviews, sensors to measure water availability, water quality testing using WHO Compact Dry Plate methodology, direct observation at water treatment plants, interview with utilities, secondary data analysis.

*Final report with all results, and data collection instruments will be made available publicly on the MCC Evaluation Catalog. **Requests for additional information/materials can be directed to the Social Impact contact below.***

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