EMORY UNIVERSITY

Center for Global Safe Water, Sanitation, and Hygiene

Viability of Healthcare Facility-Based Small Water Enterprises in Rural Rwanda

GE Foundation

Introduction

Limited access to safe drinking water in rural settings of low- and middle-income countries (LMIC) is a persistent problem. Small water enterprises (SWEs) are a popular, economical, revenue-generating option for safe drinking water provision in LMICs, especially in areas not connected to municipal water systems. SWEs have become increasingly visible in urban LMIC water markets, but less so in rural LMIC settings where lower disposable incomes, population densities, and capacity to maintain infrastructure present greater challenges for success. Few studies have evaluated the feasibility of SWEs in the rural context of LMICs.

One type of SWE is the water kiosk model: a direct water vending service that sells water from a stationary point, and may be owned and operated by a public or private organization, community-based group, NGO, or a hybrid of these entities. In rural Rwanda, the Center for Global Safe WASH (CGSW) at Emory University evaluated a pilot SWE kiosk program implemented at healthcare facilities (HCF). The study aimed to understand SWE operations in rural LMIC settings, as well as the viability of these systems under HCF management and operation.

The Rwanda HCF Water Kiosk Model

Opening Ceremony for Water Vending Kiosk at Rwanda Healthcare Facility

In 2012, the General Electric (GE) Foundation donated on-site water treatment systems (WTS) to 10 HCFs across two rural districts of Rwanda. The selected HCFs had access to electric power and a municipal water supply with few interruptions, a rain catchment system, water quality below World Health Organization's safe drinking water guidelines, and HCF management that agreed to assign staff to manage WTS operation and maintenance needs. The primary purpose of the WTS donation was to provide the HCF with safe water necessary to implement infection prevention control practices (IPC) and improve WASH, thus improving overall quality of healthcare.

The HCFs were given the option to participate in a pilot water kiosk program. By selling treated drinking water from the WTS through kiosks to the surrounding community, funds generated could help offset the cost to the HCF of WTS operation and maintenance (and potentially a earn a profit). Trained, local community health workers dispersed branded advertising and behavior change communication materials as part of an awareness campaign to inform the surrounding communities of safe water provision at the HCF, the importance of selecting safe drinking water sources, and safe drinking water collection and storage practices. The implementing organization, Assist International, provided technical support for maintenance and repair for the first three years after WTS and kiosk installation. They also trained HCF staff to maintain the system. Assist International then handed over financial and operational management of the WTS to the HCF in 2015. During implementation, Emory researchers made monthly visits to all HCFs for one year to discuss the performance of the WTS and kiosk program as well as operational and financial management practices.

Community Health Worker Demonstrate Safe Water Collection and Storage at Branded Kiosk

The evaluation of the kiosk program in Rwanda focused on its implementation and took place over one year. The three-phase approach of the evaluation included:

1. Market and demand analysis
2. Water production and program cost estimation
3. Kiosk operation and financial performance evaluation.

The market and demand analysis phase used household surveys (within 1 km of HCFs) to understand individuals' use and selection of drinking water sources as well as behaviors related to collecting and storing water. Additionally, a census of water sources within 2 km of HCFs and a scoping of existing regional water policies and guidelines was completed. The water production and intervention cost estimation included collecting information on the cost of purchasing water from the national utility, estimating operating costs, and using participatory methods and feedback from MoH, HCF and program staff, and community leaders to determine fair and equitable pricing for selling water at each kiosk. The evaluation of kiosk operation and financial performance included review of daily, weekly, and monthly logs that collected information on cost of purchased water, sales from kiosks, and frequency and reasons for kiosk closures.

Findings

Demand

The estimated demand for kiosk water was 116 m^3/month, while the observed demand was almost five times lower at 21 m^3/month. Household surveys illustrated that 81% of respondents have access to a public piped water source within a 15-minute walk, and considered distance to water source to be more important than the cleanliness of the water when selecting a water source. On average, households reported spending 35 Rwandan francs (RWF) per day on water. The distance to water source was one of the strongest factors related to demand for kiosk water. High demand was observed where few piped sources within 2 km of the HCF existed. In locations where there was a piped source within 500 km of the HCF, the demand was much lower. Demand was also high where other improved sources existed nearby, and where prices were competitive with other sources. Lowest demand was observed where kiosk price was over twice the cost of national utility water.

Summary of Key Findings

- Most survey respondents considered distance to source of drinking water more important than perceived cleanliness or safety of the water. Most had access to a public tap within a 15 min walk.
- The cost of purchasing water from national utility for treatment was the largest production cost for the HCFs, but this was offset when supplemented by collected rainwater.
- Overall, HCFs were able to use revenue from kiosks to offset WTS operation costs and maintain operations, but this financial stability was likely a result of large initial donor inputs and technical support from the implementing agency.
- Four out of nine of the HCFs evaluated accrued profits from the kiosk SWE.

Price

The cost of water for treatment through the WTS was on average 14 RWF/20L (0.02 USD) when all water was purchased from the national utility, and 9 RWF/20L (0.01 USD) when purchased water was supplemented with collected rainwater. No labor or operational costs were able to be determined at the time of the study because the HCFs integrated WTS and kiosk operation duties into existing staff roles without further compensation. Additionally, at the time of the study the donor and implementing agencies were supporting the cost of repairs and operations outside of water purchases. Large financial inputs from the donor and technical support early on in this program likely contributed to overall feasibility, and it is unlikely that the HCFs in the study and in similar low-resource settings would be able to manage high upfront costs without this support.

Community Members Purchase Treated Drinking Water from Healthcare Facility Kiosk

Cost Recovery

While all HCFs experienced fluctuation in revenue over the study period, overall the water sales from kiosks were able to cover WTS operation costs. Across all study sites, kiosks were fully operational for an average of 70% of the study observations (ranging from 100%-30%). Two-thirds of kiosks did experience kiosk closures which lasted at least one-day, and nearly all closures were due to municipal water or electricity interruptions. Across the study period for all HCFs, a range of 23,000 RWF (26 USD) in financial losses to 26,500 RWF (30 USD) profit resulted from the kiosk SWEs. After removing data from the only outlier kiosk that consistently ran at a loss, the average monthly profit for the kiosks was 5,300 RWF (6 USD). The kiosk that ran consistently at a loss was the only one to offer credit-based water sales and also experienced piping leaks that were not identified and resolved during the study period.

Lessons Learned

The Consumer Base

The results indicated that the target population is sensitive to cost. Therefore, setting competitive pricing for water is important to maintain demand for water within the community. Although the HCFs had access to a piped water source, occasional water shortages did at times interrupt kiosk services. Studies have shown that consistent supply is important to maintain a consumer base, as users may choose other water sources (even unimproved sources) if they perceive one to be unreliable, which may have been influential to the underestimated demand for kiosk water in the market analysis phase. Higher demand was observed where other improved water sources existed nearby, suggesting that this SWE model may be more successful where the target population is accustomed to paying for improved water.

Important Take-aways

- Demand in target population, vendor competition, and consistent operation are critical to maintain the consumer base necessary to support SWE kiosk operations in this context.
- Installing WTS and kiosk SWE at rural HCFs could be a serious financial challenge without donor support, as significant costs of the WTS as well as the first years of many operational costs were not provided by the HCF.
- Assigning existing staff which required no additional labor costs was an important success factor. It is important to consider how an increased demand for water and potential need for additional staff could impact the system.

Donor Support

One limitation of this study was that the full operational costs, including maintenance and repair, were unable to be determined because the donor and implementing agency provided this support during the study. Revenue and small profits from kiosk sales were able to offset cost of purchasing water for the WTS, but it is unclear if kiosks were generating enough to cover supplies and maintenance of the WTS and kiosks. Furthermore, the cost of the WTS in this study is $15,000 USD, which may be an insurmountable capital cost without donor support.

Staff and Labor

All of the HCFs in this study agreed to integrate operations and management of the WTS and kiosk into existing staff duties with no addition hires or compensation. Some studies have indicated an increased demand for SWE water the longer it is in place. A higher demand could result in the need to hire additional management staff, and it is unclear if sales would be enough to support additional labor costs. It should be carefully considered that an increase in demand in this context could result in decreased profitability.

Overall, this study provided some evidence that in the proper setting with external financial support, the HCF kiosk SWE model could be a viable approach to safe drinking water provision in rural LMICs, as four of the nine HCFs in this study profited. Operation and labor costs as well as consumer demand trends should be carefully considered before implementing a similar program.

**This brief is a summary of the following research publication:

Huttinger, Alexandra, et al. "Small water enterprise in Rural Rwanda: Business development and year-one performance evaluation of nine water kiosks at health care facilities." *International journal of environmental research and public health* 14.12 (2017): 1584.

About the Center

The Center for Global Safe Water, Sanitation, and Hygiene (CGSW) focuses on increasing access to safe drinking water, adequate sanitation, and appropriate hygiene as part of a global strategy to break the cycle of poverty and disease in developing countries. For more information, please visit **www.washconhcf.org** or email **WinHCFaction@emory.edu**

EMORY UNIVERSITY
Center for Global Safe Water, Sanitation, and Hygiene

Rollins School of Public Health
Emory University1518 Clifton Rd NE
Atlanta, GA, USA 30322

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