Credit: The Aquaya Institute

IMPROVING WATER SAFETY AMONG WATER VENDORS IN NAIROBI

November 2025

DISCLAIMER:

This report builds on research initiated under the United States Agency for International Development's (USAID's) Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene (URBAN WASH) project, which was supported by a cooperative agreement between the United States Agency for International Development (USAID) and The Aquaya Institute. The research was completed in collaboration with Tetra Tech. The contents of this report are the sole responsibility of The Aquaya Institute and Tetra Tech and do not necessarily reflect the views of USAID or the United States Government.

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The Aquaya Institute prepared this report. Mwanarusi Mwatondo and Haleemah Qureshi led the Activity, supported by Caroline Delaire, Rachel Peletz, Lucia Nadal, Lisa Appavou, Antony Mbithi, and field enumerators. On behalf of USAID, Jesse Shapiro and Ryan Mahoney served as project advisors. On behalf of Tetra Tech and the URBAN WASH consortium, Liz Jordan, Miriam Otoo, and Tanvi Nagpal served as technical advisors.

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ABOUT URBAN WASH:

URBAN WASH (Advancing Urban Water Supply, Sanitation, and Hygiene Resilience Worldwide) was a USAID-funded applied research and technical assistance program led by Tetra Tech. The project focused on improving sustainable, resilient, and equitable WASH services in urban, peri-urban, and informal settlements in low- and middle-income countries. Designed and originally executed as a five-year program, URBAN WASH was terminated in February 2025 along with the vast majority of USAID's overseas development assistance programs.

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ACRONYMS

ANOVA	One-way Variance Analysis
DCE	Discrete Choice Experiment
FGD	Focus Group Discussion
KEWI	Kenya Water Institute
KII	Key Informant Interview
KSH	Kenyan Shilling
L	Liters
LIA	Low-income Area
mg	Milligram
MoWSI	Ministry of Water, Sanitation, and Irrigation
PPD	Pre-paid Dispenser
SACCO	Savings and Credit Cooperative Organization
SDI	Slum Dwellers International
SLP	Small Local Provider
SHOFCO	Shining Hope for Communities
UN	United Nations
UNICEF	United Nations Children's Fund
URBAN WASH	USAID Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene
USAID	United States Agency for International Development
USD	United States Dollar
WASH	Water, Sanitation, and Hygiene
WASREB	Water Services Regulatory Board
WHO	World Health Organization
WSP	Water Service Provider

EXECUTIVE SUMMARY

Households in urban, low-income areas mostly get water services from vendors (i.e., small local providers) such as kiosks, carts, tankers, and boreholes instead of regulated water utilities. Improving water quality among these vendors could promote more equitable access to clean water. In Nairobi Kenya, this research study aimed to: (i) assess vendor water quality, (ii) understand household choices for selecting vendors within low-income communities, (iii) identify vendor challenges, and (iv) investigate the extent to which ongoing regulatory initiatives have improved water vendors' service quality. The United States Agency for International Development's Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene project used these findings to facilitate a discussion among local stakeholders around how to best improve vendor water quality.

The research involved 327 household surveys, 50 vendor surveys, and 15 focus group discussions (FGDs). The household survey included a discrete choice experiment (DCE) to better understand how households value and rank hypothetical water quality certification compared to four other high-priority attributes (convenience, availability, social bonds, and price). Additionally, the project team took 76 water quality samples to measure residual-free chlorine levels and *E. coli* concentrations at vendors' collection and distribution points to evaluate the impacts of transportation and storage on water quality. Six key informant interviews provided further insights into ongoing vendor monitoring activities by the utility and other local government authorities.

Most low-income households obtain water from kiosks that source from improved systems like piped networks. Despite many vendors using the public utility's piped network, they often distribute water with insufficient residual free chlorine levels, increasing contamination risks before consumption. Water samples from collection and distribution points confirmed that chlorine concentrations decayed during vendor transportation and storage, and FGDs highlighted underlying challenges such as inconsistent piped water supply (water rationing) that aggravate quality issues.

Although the water regulator mandates utilities to oversee vendors and ensure quality, in practice, most vendors lacked oversight from authorities and demonstrated limited knowledge of water safety or quality. The regulator promoted formation of vendor associations to formalize vendors, but these associations were largely absent in the water sector. Lessons from other sectors suggested that associations required incentives, enforcement, and learning opportunities for effective regulation. Regarding possible market incentives to improve water quality, findings confirmed that perception of safe water is one of the highest-ranking factors in household decision-making in addition to convenience and availability. Meanwhile, competition is a major challenge for most vendors.

To improve water safety among vendors, the study recommends: (i) vendor training to build capacity and awareness of water safety practices; (ii) water chlorination, monitoring, and feedback to ensure water remains safe to the point of use; and (iii) a water quality certification program to enhance trust and incentivize water quality improvements. The study suggests designing incentives to promote adoption of recommendations using challenges identified by vendors. Examples of incentives could include free or discounted chlorine tablets, subsidized chlorine test kits, free water quality training, discounted professional development training, and containers for water storage. Although the study identifies the type of actions needed to improve water safety among vendors, identifying who will be responsible for and how to implement each task requires further discussions among local stakeholders.

1.0 INTRODUCTION

1.1 BACKGROUND

Nairobi is one of the fastest-growing cities in East Africa, with an estimated population of over 4.5 million, which is projected to reach 15 million by 2050 (WASREB 2022; 2010; WSUP 2018). Much of Nairobi's urban growth has been unplanned, with recent estimates suggesting that over 60 percent of the city's population resides in informal settlements or low-income areas (LIAs) (Mallory et al. 2022). Many households in these urban LIAs receive water services from small local providers (SLPs; "water vendors"), such as kiosks, carts, tankers, and boreholes, rather than from regulated water utilities. Nairobi is not alone: recent studies show that over 50 percent of the urban population in Sub-Saharan Africa rely on such small suppliers of water (Mapunda, Chen, and Yu 2018). This situation has arisen because population growth has outpaced infrastructure development, and LIAs have been overlooked historically in the provision of piped water services, creating an environment for unregulated vendors to operate (Oenga and Kuria 2006). Ensuring good water quality among these vendors would promote more equitable access to safe water.

1.2 INSTITUTIONAL FRAMEWORK FOR WATER SECTOR IN NAIROBI

The Water Act 2002 (revised in 2012 and 2016) and the 2010 Constitution of Kenya defines the responsibility for water service provision in Nairobi. The Ministry of Water, Sanitation, and Irrigation (MoWSI) leads the sector in developing legislation, policy, and strategy, while the Water Services Regulatory Board (WASREB) oversees the regulation of water service providers (WSPs) who provide services within licensed areas. The Water Resources Authority regulates the use of national water resources, including surface and groundwater. At the county level, Water Works Development Authorities are responsible for developing, maintaining, and managing national public waterworks and providing technical services and capacity building to county governments and WSPs within their jurisdiction. In Nairobi, the mandated WSP is the Nairobi City Water and Sewerage Company (Nairobi Water), while the Athi Water Works Development Agency is responsible for infrastructure development (Athi Water Works 2020).

Additionally, law mandates the County Public Health Office to oversee the quality of drinking water at community and household levels, in accordance with the Water Act, Public Health Act (Chapter 242), and Food Safety Act (Chapter 254). See Figure 1 for a summary of institutional responsibilities for water service delivery in Nairobi.

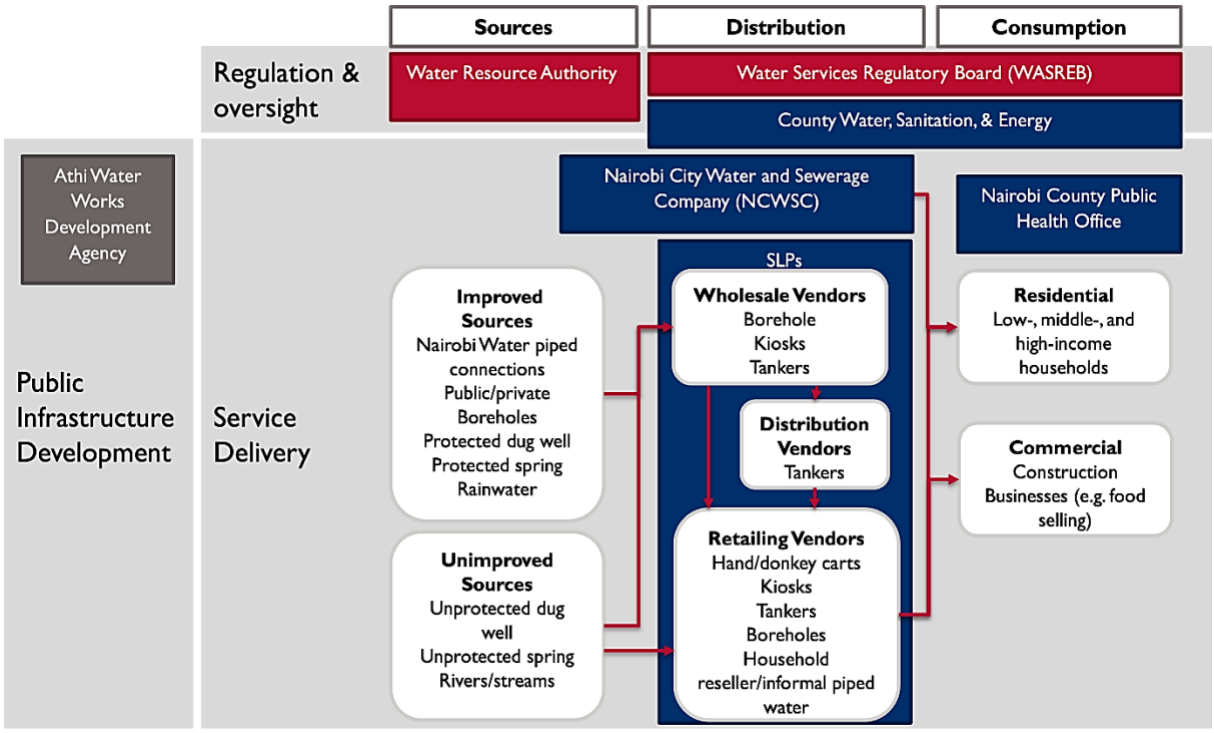

Figure 1: Summary of water regulation and delivery in Nairobi County as of 2024

In 2019, WASREB published the Guidelines on Water Vending to regulate the quality of water supplied by vendors including kiosks, tankers, boreholes, and carts (WASREB 2019) (See Table 1 for summary). However, the WASREB guidelines do not specify enforcement mechanisms for the regulatory requirements, and conversations with Nairobi Water and WASREB in 2023 revealed that the two entities had not yet come to agreement on water tariffs and licensing processes for vendors (WASREB 2023; NCWSC 2023). In early 2023, WASREB required utilities to identify vendors within their jurisdiction as the first step toward improved oversight. Following this, Nairobi Water issued a public notice for vendors to register with the utility. Between February and April 2023, 787 vendors provided partial information to the utility, such as name and contact information, but almost half (45 percent) did not provide coordinates for their business. The majority (61 percent) did not provide tax identification numbers. These 787 vendors did not include tankers, which Nairobi Water had been tracking in a separate database before February 2023, with 156 recorded as of April 2023. The total number of vendors operating in Nairobi is unknown, although stakeholders suggest there may be thousands.

TABLE 1: SUMMARY OF WASREB 2019 GUIDELINES ON WATER VENDING

WASREB 2019 GUIDELINES ON WATER VENDING
1) **Approval of water sources**: Water utilities need to prepare an inventory of available water sources, test the sources for water quality, and either ban or improve the water source through treatment.
2) **Licensing:** Vendors should be licensed by both the water utility and the public health unit.
3) **Vendor associations:** Vendor associations should be formed and registered with the water utility and responsible for member activities.
4) **Sampling and testing:** Water utility and public health unit should carry out random water sampling and quality testing of vendors.
5) **Personal health and hygiene:** All vendors should pass health checks, and the public health unit should issue certificates of good health.
6) **Tank and container color:** All tanks and containers should be bright enough for visual inspection.
7) **Water tariffs:** Water utilities should determine tariffs for all vendors to be approved by WASREB.
8) **Reporting:** Water utilities should produce reports detailing the number and types of water vendors within their jurisdiction and the results of water quality sampling from vendors.

1.3 KNOWLEDGE GAPS

Despite WASREB and Nairobi Water's initial attempts toward identifying and formalizing water vendors, there is a need to better understand what opportunities, including incentives, are most effective for improving water quality among vendors. A 2022 study by the United States Agency for International Development's (USAID's) Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene (URBAN WASH) project documented case studies of cities in low- and middle-income countries with formalized vendors and found general evidence gaps of how to improve the water quality of vendors across institutional and market contexts (USAID URBAN WASH 2022). For example, inadequate water sampling and testing data along the water delivery chain hinders identification of contamination risks that different vendor types face during water delivery. This study also builds on global literature, which highlights diverse vendor interests and challenges that authorities should take into consideration when designing water quality interventions (Castro 2009; Cheng 2014; Okotto 2010; Zuin, Ortolano, and Davis 2014; Mapunda, Chen, and Yu 2018).

In Nairobi, this study aimed to: (i) assess vendor water quality; (ii) understand household choices for selecting vendors within low-income communities; (iii) identify vendor challenges, particularly related to water quality; and (iv) investigate the extent to which ongoing regulatory initiatives in Nairobi have improved vendors service quality in the water sector, as well as other sectors such as transport and pharmaceuticals. The study aimed ultimately to gather data to inform the design of potential interventions and incentive mechanisms that could encourage vendors to improve water quality.

1.4 OBJECTIVES AND RESEARCH QUESTIONS

In 2022, the URBAN WASH project initiated a partnership with Nairobi Water and the County Public Health Office to understand how best to improve water quality among vendors. The project team used discussions with local stakeholders to design implementation research that aimed to address the following questions:

1) **Vendor market share and water quality:** What types of water vendors should interventions to address water quality focus on?

2) **Vendor challenges:** What vendor pain points can be turned into levers to incentivize water safety?

3) **Ongoing quality initiatives and cross-sector learnings:** What lessons can service providers learn from ongoing initiatives and regular surveillance activities within the water sector? What lessons can authorities transfer from other sectors that have improved performance of vendors?

2.0 METHODS

2.1 STUDY DESIGN

The study employed an exploratory design using multiple methods including household and vendor surveys, focus group discussions (FGDs), key informant interviews (KIIs), and water testing to understand the water quality of vendors, experiences and decisions of households, and attempts of authorities to regulate and monitor services.

The types of water vendors studied included the four categories recognized by WASREB's guidelines (hand carts, water kiosks/standpipes, water tankers, and boreholes), as well as categories that WASREB's guidelines do not capture (See Table 2 for summary).

TABLE 2: SUMMARY OF WATER VENDOR TYPES AND DEFINITIONS USED IN THE STUDY

VENDOR TYPE	DEFINITION
Water Kiosks	Water kiosks are structures at fixed locations where customers purchase and collect water. Kiosks sell to households, businesses, or wholesale to other vendors. Following WASREB's definition, this study included standpipes in this category. Standpipes differ from kiosks in that they have no physical structure around the dispensing pipe.
PPDs	PPDs are structures at a fixed location, owned by Nairobi Water and operated by community members selected by the utility. Unlike kiosks, PPDs can only source water from Nairobi Water and only accept payment in tokens (Sarkar 2019).
Boreholes	Boreholes source and sell groundwater. This study refers to boreholes as those that are privately owned and does not include public boreholes drilled by Nairobi Water or Athi Water.
Household Resellers	Household resellers are vendors that sell tap water from their homes.
Carts	Carts can obtain water from various sources and deliver it directly to households. They could be pulled by hand, donkeys, or bicycles. In this study, all surveyed vendors were hand-pulled carts.
Water Tankers	Tankers can obtain water from various sources and sell it in bulk to residential buildings or other vendors such as kiosks.

2.2 STUDY AREAS

The team selected study areas based on the following three criteria: (i) prioritizing those communities from which vendors registered after Nairobi Water issued a public registration notice; (ii) prioritizing those communities where the county reported water safety improvement efforts such as capacity-building workshops for water vendors or distribution of Aqua tabs to combat cholera outbreaks; and (iii) representing all three of Nairobi Water's operating zones to capture diverse geographies and water supply characteristics. The team applied the above criteria to previously mapped LIAs in Nairobi (41 villages clustered in 13 areas) and selected 4 areas (Kiambio, Kibera, Mathare, and Mukuru) that met all the conditions and were greater in population. The team selected one mapped mixed-income area (Kawangware) to compare with lower-income areas. The team selected surveyed villages within the

study areas based on population size, including Kwa Ruben, Kwa Njenga, Viwandani, Hospital Ward, Mabati, Mlango, Muslim, Madiaba, Kabiro, Mashimoni, Laini Saba, Silanga and Kiambio (Figure 2).

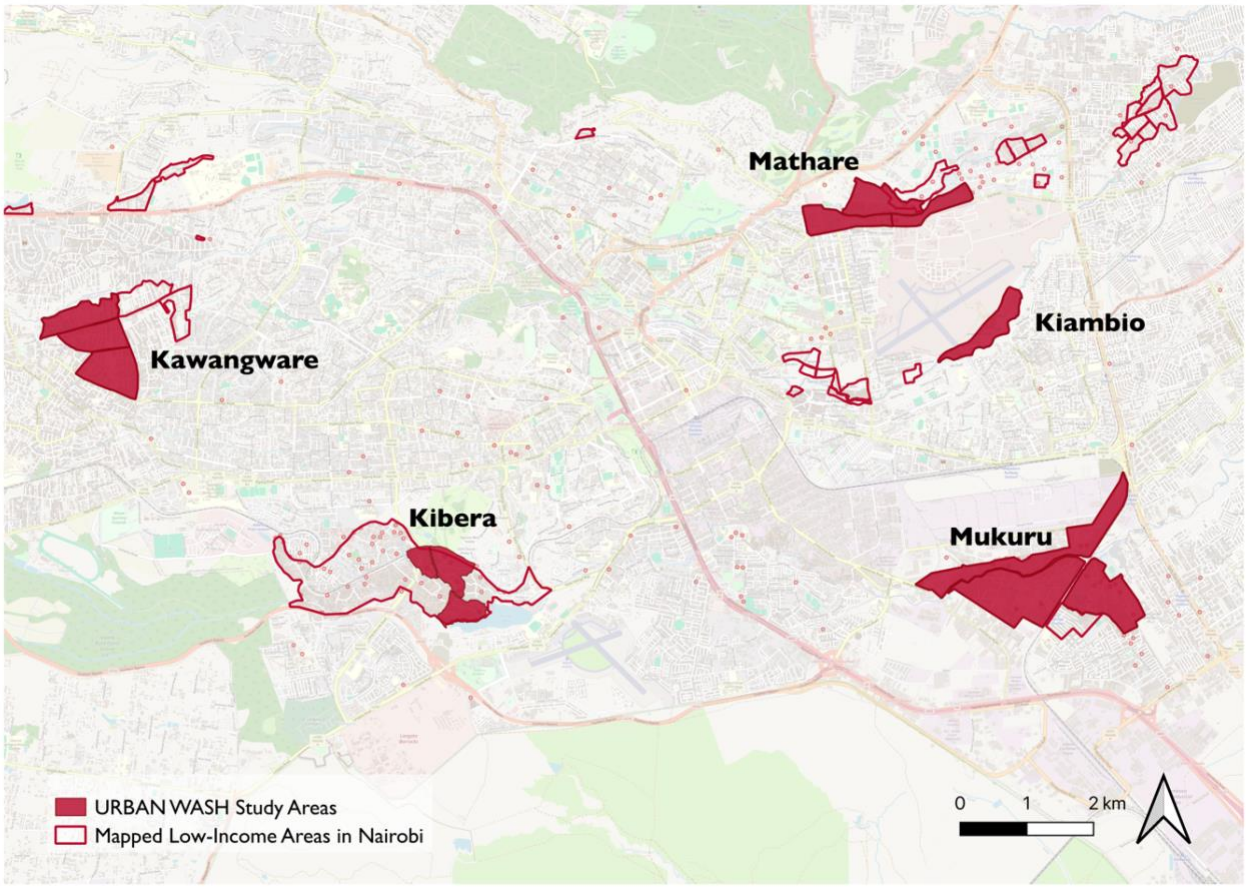

Figure 2: Map of selected study areas in Nairobi

2.3 DATA COLLECTION ACTIVITIES

2.3.1 HOUSEHOLD SURVEYS AND COMMUNITY FOCUS GROUP DISCUSSIONS

This study used population-representative household surveys to assess the market penetration of vendor types and the trade-offs that households consider when choosing vendors for their water needs (Research Question 1). The team conducted 327 household surveys, targeting a sample of respondents proportional to the total population of each community, as reported from the WorldPop 2020 United Nations (UN)-adjusted dataset. Enumerators randomly selected surveyed households by using a single random computer-generated global positioning system (GPS) point assigned to them at the start of each day of data collection. Enumerators then selected every eighth household in a randomly generated direction on the ODK software until they reached their target surveys for the day.

Within the household survey, the study team administered a discrete choice experiment (DCE) to understand how households value and rank water quality certification (as a proxy for good water quality) compared to four other high-priority attributes when making decisions about which vendor to use. Pre-testing in the field informed the final list of attributes, including convenience (i.e., door-step delivery versus not), availability (i.e., available every day versus less frequently), social bonds (prior

experience or referrals versus unknown vendors) and price (i.e., 0 percent, 5 percent, and 10 percent higher than existing payments). Surveyors presented respondents with a practice scenario before moving on to six scenarios where they selected a preferred vendor based on visually illustrated attributes. To triangulate stated preferences through the DCE with existing household practices, the survey asked households to describe their main reasons for choosing current vendors.

Community FGDs supplemented household surveys to provide deeper insight into household decision-making and challenges surrounding water access. Three community FGDs included a subset of randomly selected household survey respondents, while two other FGDs included members of community water committees (i.e., individuals within the study areas who manage and maintain community water points) identified by Nairobi City County's Public Health Office.

2.3.2 VENDOR FOCUS GROUP DISCUSSIONS, IN-DEPTH SURVEYS, AND WATER QUALITY TESTING

In-depth surveys with vendors allowed the research team to identify vendor water sources and test water quality (Research Question 1), understand vendor pain points (Research Question 2), and capture ongoing vendor monitoring activities (Research Question 3).

Since the total number of vendors operating in Nairobi remains unknown, the study opportunistically sampled 4–7 respondents for every type of vendor present in the study areas. The team first identified vendors for FGDs using three sources of information: (i) vendors used by surveyed households, (ii) vendors known to a community-based organization (Slum Dwellers International [SDI]/Muungano Wanavijiji), and (iii) vendors documented within Nairobi Water's registration database. The team conducted 1 or 2 FGDs per vendor type across the 6 vendor types within the study areas (carts, water kiosks, water tankers, boreholes, household resellers, and PPDs) for a total of 10 FGDs with 53 vendors. The team conducted one FGD exclusively with women to better understand the barriers female vendors face in improving water quality. Following FGDs, the team selected 50 vendors for in-depth surveys, including 6 vendors from Nairobi Water's registration list. A subset of surveyed vendors (28 out of 50) included FGD participants who agreed to an additional interview and water quality testing, while a community partner identified the remaining vendors.

The URBAN WASH team aimed to collect two water samples from each surveyed vendor: one at the water source or collection point and one at a distribution point (i.e., where the vendor sells water to households). The team tested each sample for free residual chlorine and *E. coli*. In practice, some vendors (i.e., 17 out of 50) did not have separate collection and distribution points, such as in the case of a household reseller or a PPD where tap water from Nairobi Water's network was dispensed directly into customers' jerrycans with no storage and no conduit elements (e.g., funnel, hose). In such cases, the team classified the sampled tap water as a distribution point. If a vendor used a storage container, the team collected a water sample from the source water before storage, unless the water was inaccessible before storage. Enumerators sampled water at the distribution point of 49 vendors (1 tanker was without water) and collection points of 26 vendors (inaccessible water sources prevented the sampling of 7 vendors at their source). The team collected water samples for microbial analysis in sterile Whirl-Pak bags containing sodium thiosulfate, stored them on ice, and analyzed them within eight hours via membrane filtration and incubation on CompactDry plates (UNICEF 2017). The team processed daily field blanks and one laboratory blank per day per person, if any of those had detectable *E. coli* (i.e., >=1 colony-forming unit [CFU]/100 milliliter [mL]), the team excluded data for all samples processed that day to ensure accuracy. The team detected no *E. coli* in the blanks and measured free chlorine concentrations using the N,N-diethyl-p-phenylenediamine (DPD) method (Hach DR300 colorimeter).

2.3.3 KEY INFORMANT INTERVIEWS

URBAN WASH conducted nine KIIs with local monitoring authorities and members of vendor associations to gain deeper insights into the dynamics between the two and to better understand if and how vendors might be regulating themselves (Research Question 3). An additional four interviews explored the efforts of private water enterprises in delivering high-quality water and identified transferable lessons from the pharmaceutical and transportation sectors, both of which have attempted to regulate the performance of informal vendors (Research Question 3). Interviewers utilized semi-structured interview guides, wrote summary notes that the team later synthesized, and recorded the interviews. When required, audio recordings supplemented information from written notes to provide further details.

The team selected key informants for interviews from Nairobi Water and the County Public Health Office based on a list of staff who conduct day-to-day monitoring activities within study areas. They interviewed two County Public Health Officers and three Nairobi Water community development assistants based on their availability within the study timeframe. Through formative research, the team identified two formal private water enterprises for interviews: Shining Hope for Communities (SHOFCO) and Wonderkid. SHOFCO is a relatively mature social enterprise with ongoing water service delivery at scale within two study areas (Shining Hope for Communities (SHOFCO) 2024), and Wonderkid is an early-stage enterprise looking to partner with Nairobi Water to improve vendor service delivery across all utility service areas (Wonderkid Multimedia 2024). The team interviewed two vendor associations identified by the County Public Health Office. Finally, the County Public Health Office recommended a key informant from the county's pharmacy division for an interview on the regulatory structure of the pharmaceutical sector. The study team was unable to interview a key informant from the transportation sector due to lack of response to interview requests. Instead, the team conducted a brief literature review to identify relevant lessons.

Table 3 summarizes the data collection activities completed in this study. The National Commission for Science, Technology, and Innovation and Amref[1] approved the research protocol, and every study participant provided written informed consent.

TABLE 3: SUMMARY OF DATA COLLECTION ACTIVITIES

METHOD	NUMBER	DETAILS
Household Surveys	327	64 from Kawangware, 18 from Kiambio, 64 from Kibera, 90 from Mathare, and 91 from Mukuru
Vendor Surveys	50	13 kiosks (including standpipes), 10 tankers, 4 boreholes, 11 hand carts, 6 household resellers, and 6 PPDs
FGDs	15	• 5 community FGDs (2 including community water committees) • 10 vendor FGDs (covering 19 kiosks/standpipes, 8 PPDs, 8 tankers, 1 household resellers, 13 hand carts, and 4 boreholes)

[1] URBAN WASH conducted research under the following permit numbers from NACOSTI and AMREF respectively: NACOSTI/P/24/32998 and ESRC P1608/2023.

Interviews	13	• 2 Nairobi City County Public Health Officers • 3 Nairobi Water Community development assistants • 4 vendor association members (2 leaders and 2 members) • SHOFCO water, sanitation, and hygiene (WASH) program officer and water kiosk operator • Wonderkid chief executive office, co-founder, and business development manager • Deputy director county pharmacist
Water Quality Testing[2]		49 samples from distribution points and 26 samples from collection points

2.4 ANALYSIS

2.4.1 QUANTITATIVE ANALYSIS

To analyze market share and vendor water quality performance, the team determined quantitatively the percentage of households relying on different vendor types, percentage of vendors relying on different water sources, and percentage of vendor water samples meeting minimum water quality requirements. To evaluate factors influencing household choices regarding vendors, the team analyzed two sources of data: (i) a survey question asking households to identify reasons why they select vendors, and (ii) responses to DCE scenarios (as described in Section 2.3.1).

To test for statistically significant differences between different choices in the household survey data, the team used Brown-Forsythe and Welch's one-way variance analysis (ANOVA) and two-way ANOVA. The team used Dunnett's multiple comparisons test to compare multiple choices within pairs of groups for significant differences, for example, testing for significant differences in household's water sources based on study areas (two-way ANOVA) and within a study area or between different categories of water sources (multiple comparisons test).

The team chose a mixed multinomial logit model to evaluate DCE attribute level preferences and used the Delta method to evaluate marginal willingness to pay. They assessed respondent fatigue by comparing participants' choices to identical scenarios presented at the beginning and the end of the survey, revealing a response consistency of 98 when respondents selected the same option.

For Research Question 2, the team conducted summary statistics of vendor surveys to determine the most reported vendor challenges and the percentage of vendors with accurate responses to basic water quality knowledge questions. Similarly for Research Question 3, summary statistics of vendor surveys determined the frequency of and types of interactions between vendors and local monitoring authorities.

2.4.2 QUALITATIVE ANALYSIS

Qualitative analysis supplemented quantitative analysis for all three research questions. The team analyzed FGD transcripts for common themes using deductive and inductive coding in Excel and supplemented with information from summary notes of KIIs.

The deductive coding framework was developed using the main themes emerging from the literature review and formative research. For research question 1, key themes to analyze community focus group

[2] Each sample tested for *E. coli* and residual free chlorine.

transcripts included water availability, water quality, and household preferences. For research question two and three, the team analyzed vendor focus group transcripts for key themes such as demand and operational challenges, water quality practices, and relationships with regulating authorities. Inductive coding revealed additional themes in vendor FGDs such as strategies for coping with water shortages, revenue and costs, competition, and illegal water connections.

2.5 LIMITATIONS

A limitation of this study was the absence of data on the total number and types of vendors operating in the study areas. Nairobi Water's vendor registration database includes nearly 1000 entries, but stakeholders suggest anecdotally that there are even more. The vendor surveys aimed to obtain equal representation across vendor types (regardless of their actual prevalence and market share). While the data offered insights into possible trends across vendors, it did not allow for a representative assessment of each vendor type and the small sample size of 50 vendors was inadequate for testing statistical significance between vendor types. Third, the study did not inquire about the legality of vendor connections to the piped water network to prevent antagonizing the respondents and to build enough trust to sample source and distribution water for quality testing. This means that the study cannot confirm whether the team surveyed vendors with illegal connections and therefore is unable to assess the relationship between illegal connections and water quality.

3.0 RESULTS

3.1 VENDORS' MARKET SHARE AND WATER QUALITY

Most households in LIAs purchased water from vendors, most commonly from water kiosks. Convenience and water quality influenced households' selection of vendors more than other factors. Although many vendors sourced water reportedly from the Nairobi Water piped network, most of them distributed water with low levels of residual free chlorine, which increases the risk of contamination before household consumption.

3.1.1 WATER KIOSKS HAVE THE LARGEST MARKET SHARE IN LOW-INCOME COMMUNITIES

Most households (84 percent) in low-income communities purchased water from vendors, while 9 percent purchased water directly from the utility through on-premises taps or PPDs and 6 percent relied on free water sources such as rainwater, free water kiosks, shallow wells, or public boreholes (Figure 3). A majority of households (70 percent) reported using a single source of water for both drinking and domestic purposes (i.e., bathing, washing, and cooking), while the remainder used two to three sources, primarily based on availability. Households used most water sources, except boreholes, for both drinking and domestic purposes. While every household that utilized borehole water used it for domestic activities, only 20 percent of households used it for drinking purposes. Most households did not report changing sources of water between rainy and dry seasons, although they fetched water less frequently during the rainy season. During FGDs, two vendors suggested this might be due to households fetching rainwater during the rainy season.

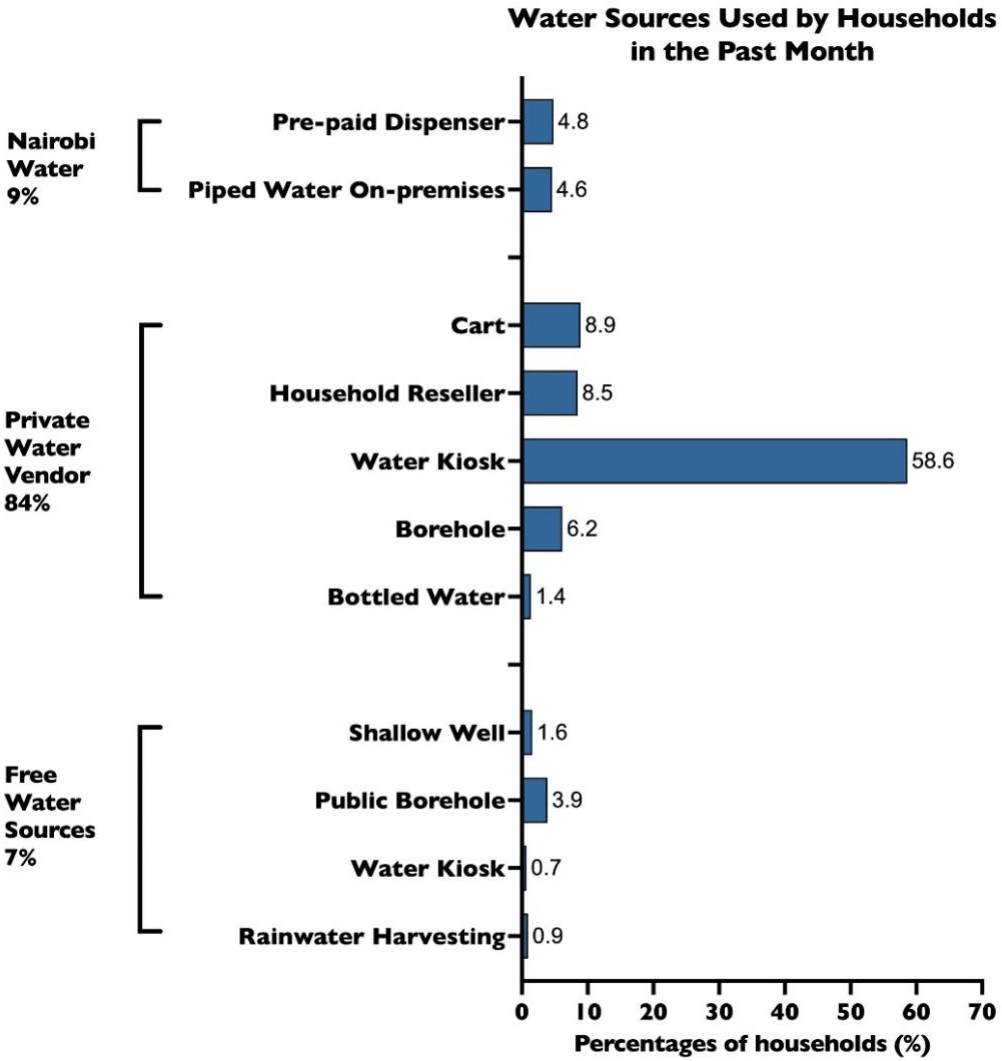

Figure 3: Percentage of households that used specified water sources in the month prior to the survey (N=327)

Although the team observed water tankers in the study areas, none of the surveyed households reported buying water directly from tankers. This might be because tankers sell water typically in bulk (5,000 liters [L] and 10,000 L) and are limited to customers accessible via wide roads. In FGDs, water tankers reported selling water primarily to businesses, schools, hospitals/clinics, residential estates with building management and storage tanks capable of bulk water storage, and occasionally to other vendors (e.g., kiosks).

Among private water vendors, most households (59 percent) relied on water kiosks (including standpipes). Kiosks maintained the largest market share in four out of five study areas (Figure 4). The only exception was Kawangware, a slightly higher-income community,[3] where households favored carts over kiosks. While the presence of different vendor types in separate communities might explain variation in market share and influence household selection, most households across communities had multiple options of vendors to choose from. When asked why they chose their vendor, only 13 percent of households reported having no alternative options. Additional

[3] Surveys confirmed that Kawangware had the lowest proportion of poor households (21.3 percent) compared to other study areas where the proportion of poor households was between 27 percent and 50 percent.

responses to this survey question, FGD discussions, and DCE results revealed several other factors that influence household decision making, discussed further below.

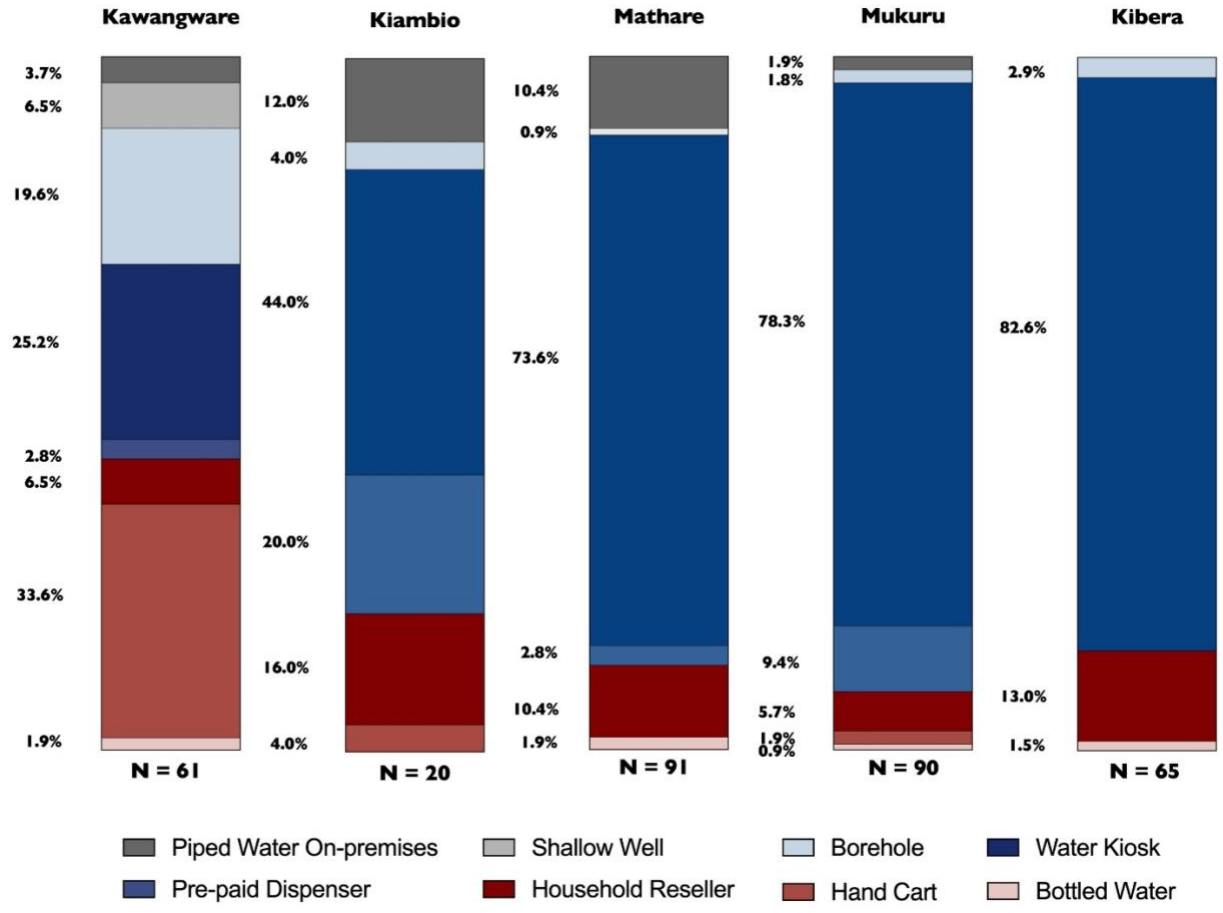

Figure 4: Percentage of water sources used by households in the five study areas (N=327)

Convenience was the most cited reason for choosing a vendor, with 51 percent of households selecting it in response to the survey question asking households why they chose their vendor. This matched FGD responses where respondents frequently described widely used water kiosks as convenient. Contrary to the survey question, the DCE results revealed that convenience attributes, such as delivery or fetching times of 10 to 30 minutes, did not influence household choices significantly. This discrepancy may suggest that there is an acceptable fetch time threshold that is less than 10 minutes or exceeds 30 minutes, or that stated preference methods such as those used in the DCE have certain limitations.

Water quality was the second most cited reason for choosing vendors (23 percent of households), **and its proxy, water quality certification,[4] was the most influential attribute in the DCE** (coefficient = -2.02[5]). Although there is no formal certification process for water vendors in

[4] Water quality certification is not currently required for vendors in Nairobi, but the team explained to households that it serves as a hypothetical proxy of water safety.

[5] The coefficient is a metric used to assess the potential influence of a particular attribute (i.e., and its levels) on the choice of SLP. A more negative distinction coefficient indicates that the attribute has a stronger negative

Nairobi, households strongly preferred certified water over uncertified options in the hypothetical scenarios. This finding underscores the importance of perceived water safety and highlights the potential for introducing a vendor certification program to improve water quality and meet consumer expectations.

Availability of water was another influential factor, cited by 13 percent of households as their reason for selecting vendors, and ranked as the second highest influencing attribute in the DCE. Households demonstrated a strong preference for vendors that had water available daily over those with availability once a week (coefficient = -1.42) or 2–3 times per week (coefficient = -0.72). Focus groups further reinforced the importance of consistent access as households across study areas reported water scarcity or rationing as one of their main challenges.

Social bonds ranked as the third most important factor in the DCE, with households preferring known vendors over unfamiliar ones (coefficient = -0.42). This resonated with focus group discussions where participants reported trusting kiosks, seeing that water kiosk operators often resided in the same community as their customers and used the same water they sold.

Price had a relatively smaller impact on household choice (coefficient = -0.04) compared to other attributes in the DCE, even though vendors are not equally priced. Kiosks and boreholes were the cheapest private vendor options at a median cost of 5 Kenyan shillings (KSH) per 20 L (0.04 United States dollars [USD][6]), according to both household and vendor reports. PPDs were the cheapest option overall (USD 0.007 per 20 L), equivalent to the price of piped water, but focus group participants noted the limited number of PPDs, as well as challenges with inconsistent supply and restricted storage capacity. Household resellers and tankers[7] were double the cost of kiosks (USD 0.09 and USD 0.08 per 20 L respectively), and carts were the most expensive option at four times the cost of kiosks (USD 0.16 per 20 L). Despite the expense, focus group participants reported that carts had the ability to source water from various locations, ensuring continuity of supply even when other vendors with piped connections were constrained. This reinforces the suggestion that price may be less influential than convenience, quality, and availability.

3.1.2 WATER DISTRIBUTED BY VENDORS DID NOT MEET STANDARDS FOR RESIDUAL CHLORINE LEVELS

Vendors' Water Sources

Most surveyed vendors, excluding boreholes, reported sourcing their water directly or indirectly from the Nairobi Water piped network (Figure 5). Kiosks and home resellers sourced water primarily from the Nairobi piped network. Carts and water tankers often obtained piped water from kiosks but reported travelling to different sources as needed when piped water was unavailable and kiosks could not sell water.

influence on the likelihood of choosing an option. For example, a distinction coefficient of -2.02 suggests that certification has a greater impact on the choice decision compared to a distinction coefficient of -1.42 for availability.

[6] All USD amounts are based on exchange rates, using a conversion rate of KSH 129 KSH per USD 1 as of September 2024.

[7] Since no households reported purchasing water from tankers, the cost of tanker water is based on reports from surveyed tanker operators only.

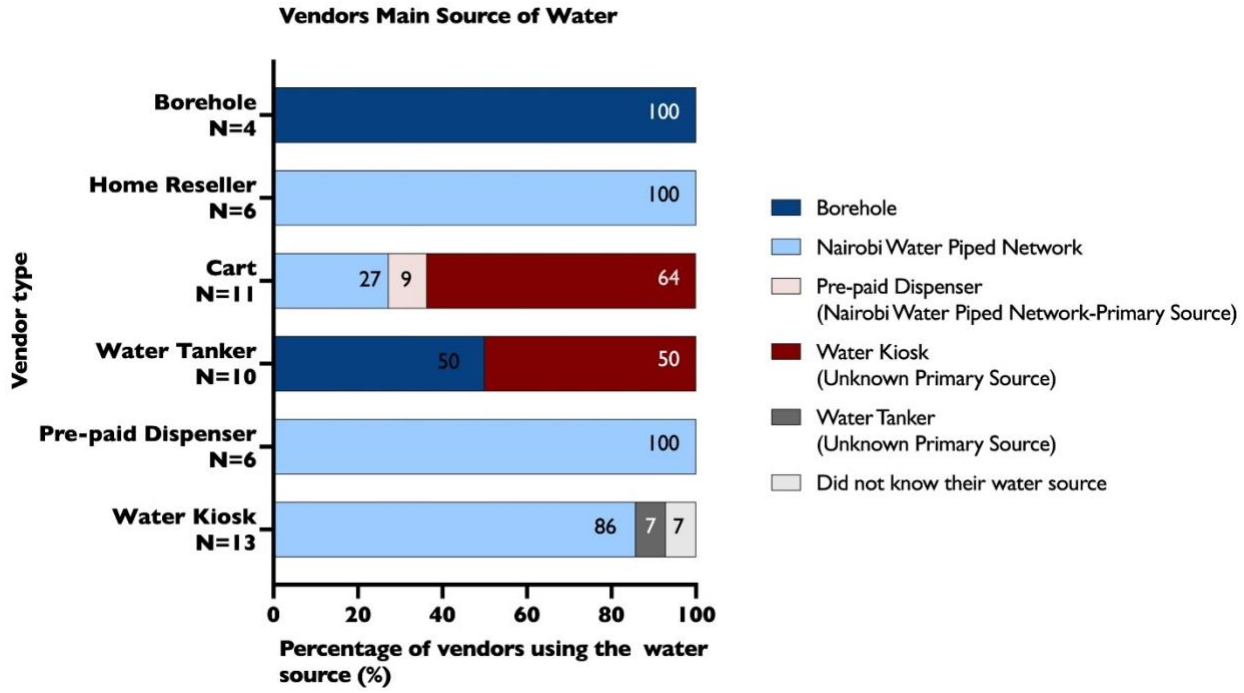

Figure 5: Reported sources of water for different vendors

Vendors' Water Quality

Water from vendor's points revealed low levels of microbial contamination, with no presence of *E. coli* in 78 percent of distribution water samples across vendors. Vendor reliance on piped water could have contributed to these lower contamination levels since it is an improved, chlorinated water source[8]. However, community FGDs revealed that the study areas typically face the challenge of "water rationing" (unavailability of piped water, further discussed in Section 3.4), which could prompt vendors to switch to unimproved water sources and increase the risk of microbial contamination in the water supplied by vendors. For example, at distribution (Figure 6), all the water tankers with samples detecting *E. coli* sourced their water from boreholes, while those that didn't have *E. coli* sourced water from a water kiosk. During vendor FGDs, both carts and tankers indicated that they switch water sources depending on the customer's location, favoring a source in proximity to the customer and the customer's request for a specific type of water, such as freshwater ('tap') or salty ('borehole') water. Carts mentioned that they would change their water source if their usual source had no water due to intermittency.

[8] Improved drinking water sources are defined as water sources that, based on their design and construction, can deliver safe water (Joint Monitoring Programme by WHO and UNICEF 2024).

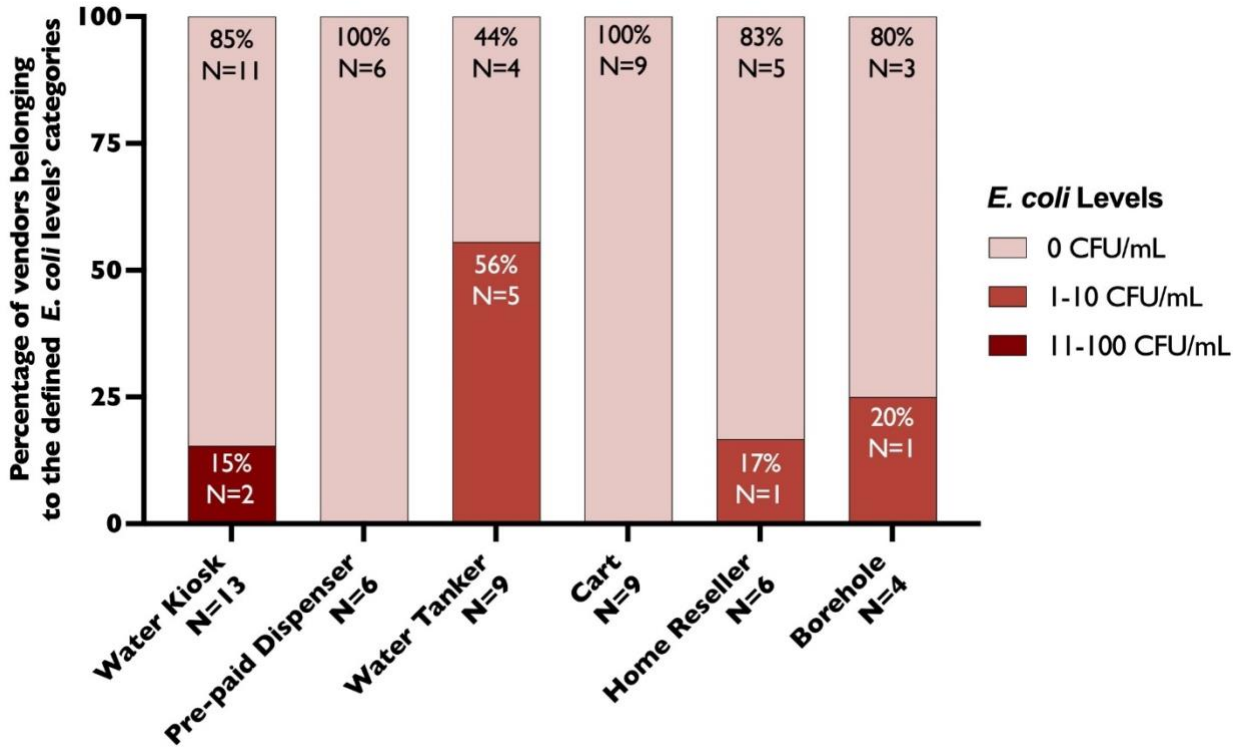

Figure 6: Percentage of vendors with specified levels of E. coli at distribution points.

Although largely free from microbial contamination (*E. coli*), water distributed by vendors often did not meet minimum quality standards. At vendor collection points, 46 percent of water samples did not meet the recommended minimum free chlorine residual of 0.2 milligrams (mg)/L (WHO 2024; 2014). At vendor distribution points, 67 percent of samples did not meet this standard. (Figure 7). Free residual chlorine protects against recontamination by microbes or the growth of biofilms but decreases naturally over time (WHO 2024; Spon 2008). Home resellers and water kiosks reported storing water for 2–3 days on average before sale, likely contributing to degradation in chlorine residual between collection and distribution; 98 percent of households reported storing water after purchase, further increasing the risk of recontamination before use.

In addition to storage, improper water handling, such as using dirty containers, can lower free chlorine residuals. While most surveyed vendors (88 percent) used containers for water transport and/or storage, only 40 percent of those who used containers reported cleaning them with soap or bleach. Vendors who did not use containers delivered water directly from the tap (i.e., PPDs and home resellers) or boreholes without storage.

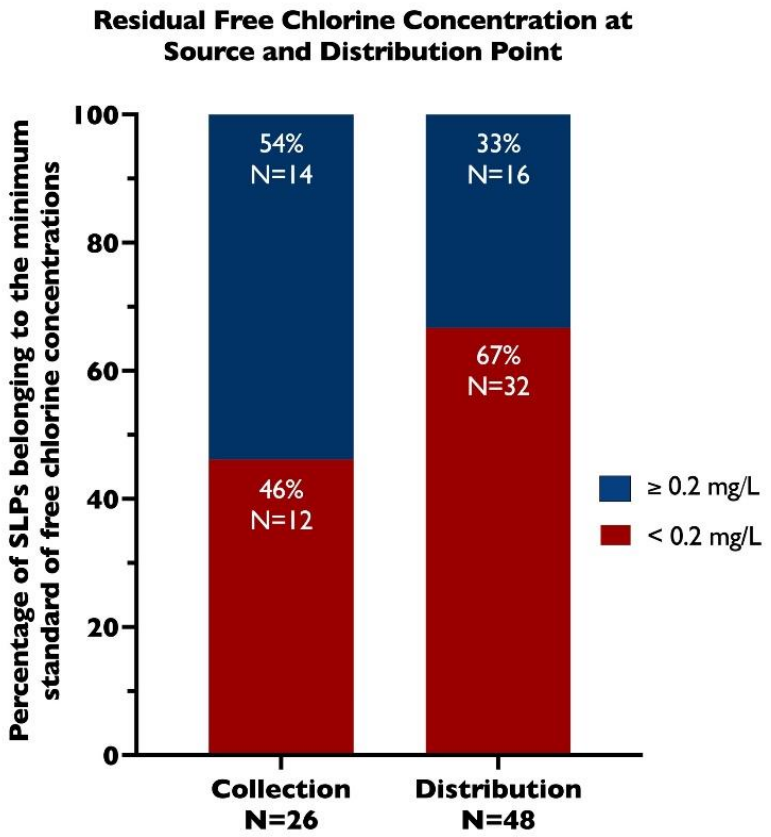

Figure 7: Percentage of vendors meeting the minimum standard of free chlorine concentrations at the vendors collection and distribution points

3.2 VENDOR CHALLENGES

Vendors cited several operational and financial challenges, some of which authorities could leverage to design incentives to improve water quality in the future. Challenges included water rationing, competition among vendors, high cost of purchasing water, and limited knowledge of water safety or quality.

3.2.1 WATER RATIONING IS THE MOST COMMON CHALLENGE FOR VENDORS

Water rationing was the most common challenge cited by surveyed vendors (30 percent), followed by competition among vendors (22 percent; including competition with illegal connections), and the high cost of purchasing water (11 percent). Water rationing appeared as a common theme in FGDs, during which 59 percent of community members and 28 percent of vendors reported experiencing water shortages due to piped water rationing. FGDs revealed that past government initiatives have tried to address the challenges of piped water rationing by distributing storage tanks and drilling new boreholes in particular communities. The following quote from a water kiosk operator describes water scarcity due to piped water rationing in one of the study areas:

> *"Nowadays the water distribution is rationed, where you find that we have a supply on Friday and as from Monday no water supply all through Tuesday, so this renders us idle with no income, that's the challenge." –Water Kiosk FGD respondent (Mathare)*

Purchasing water was the largest recurring monthly expenditure for most vendors, except boreholes that do not have to purchase water (Figure 8). Paying employees was the second largest expense for home resellers, handcart operators, and water kiosks/standpipes, while fuel was the second-highest expense for water tankers. Vendors did not report recurring expenditures for water treatment or other quality improvements. The study excluded PPDs from this analysis due to their distinct business model.[9]

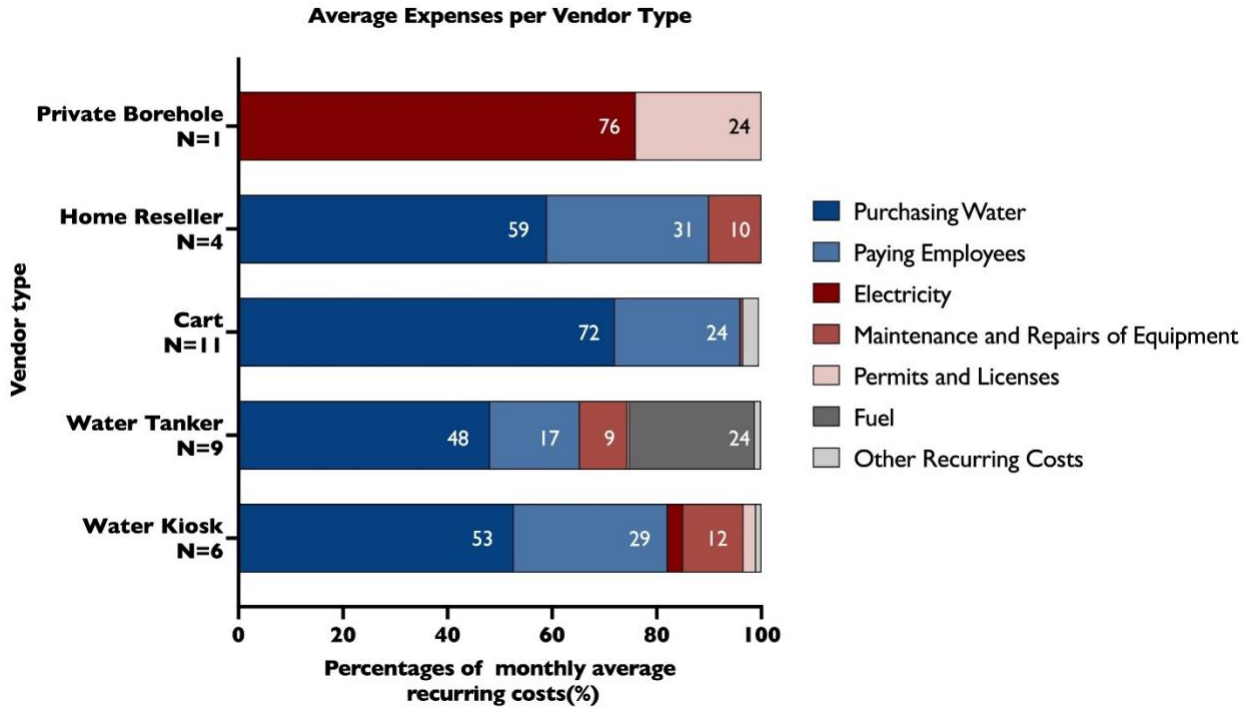

Figure 8: Percentage of monthly average recurring costs for different types of vendors[10]

Additional challenges highlighted during FGDs included high electricity bills for boreholes, physical demands of hand carts, Nairobi Water's unresponsiveness to requests for equipment repairs for PPDs, poor road conditions, cumbersome business requirements for water tankers, and lack of water pressure or robust water pipes for water kiosks. During a women-only FGD, female vendors highlighted that they found the profession risky since piped water was available mostly during early morning or late-night hours when work conditions were more insecure due to threats of robbery or vandalism. Some of the women experienced workplace disputes with their employers who owned the kiosks they operated.

3.2.2 LIMITED KNOWLEDGE AMONG VENDORS CREATES BARRIERS TO IMPROVED WATER SAFETY

Lack of adequate knowledge can create significant obstacles for vendors to improve water quality. **Most vendors revealed limited knowledge on water quality when asked general questions about it**. For instance, 60 percent of vendors were unaware that the government set standards for water quality. Among the 40 percent who were aware that the government set standards, none knew what the

[9] PPDs do not have the same expense and revenue categories as other vendors. Instead of buying and selling water, PPD operators sell tokens, earning a commission from the utility on the number of tokens sold.

[10] Only vendors that reported all costs were included in this analysis (i.e., Figure 8)

standards were. Furthermore, when asked if they thought clear water indicated good water quality, 70 percent agreed, even though clear water can be contaminated.

3.3 ONGOING QUALITY INITIATIVES AND CROSS-SECTOR LEARNINGS

Vendors were not regularly monitored for water quality, and the relevant authorities reported insufficient staff capacity to effectively monitor vendors at scale. Alternative models to ensure safe water delivery in low-income contexts involved private enterprises who faced their own challenges with scaling their market share while maintaining quality. Beyond the water sector, transportation and pharmaceutical services faced similar challenges with large networks of small local providers, but attempted quality regulation through umbrella organizations like Savings and Credit Cooperative Organizations (SACCOs), which do not currently exist for the water sector and present their own challenges.

3.3.1 MOST SAMPLED VENDORS WERE NOT REGULARLY MONITORED FOR WATER QUALITY

At present, Nairobi Water performs water quality tests and conducts inspections for PPDs. For other vendors, such as water kiosks, Nairobi Water reads water meters and addresses grievances related to piped water, such as broken pipes and water shortages, but does not sample regularly for water quality even though WASREB mandated the utility to oversee water quality for all vendors. In parallel, the County Public Health Office conducts infrequent and ad-hoc water quality tests across different types of vendors and possibly more frequent testing at the household level. Interviews with Nairobi County's public health officers revealed that their responsibilities included distributing Aquatabs (i.e., chlorine tablets), testing water, and inspecting tanks, particularly in response to a public health concern (e.g. cholera outbreak). Both Nairobi Water and County staff revealed preferences for some vendors over others by referring to hand carts and household resellers as "elusive" and "illegal." Interactions between the two authorities are limited and only occur when County Public Health Office personnel encounter unauthorized (i.e., illegal) connections or hazards within the water system. Despite these reported monitoring actions, **only 12 percent of vendors in this study reported that Nairobi Water or the County's Public Health Office had ever tested their water for microbial contamination or residual chlorine**. Furthermore, 52 percent of vendors had never interacted with officials from either Nairobi Water or the Nairobi City County's Public Health Office. Key informants from both Nairobi Water and Nairobi City County's Public Health Office identified insufficient staff capacity as a substantial barrier to effective water quality monitoring, suggesting that vendors greatly outnumber existing field officers.

Beyond Nairobi Water and the County, vendors interacted occasionally with the police who enforce traffic and parking regulations and check for business licenses. Vendors complained that police officers often exploited their authority by harassing vendors and soliciting bribes, particularly from tanker operators, who are more visible to traffic police due to their presence on the roads.

> *"As you prepare to pour water in the client's tank, you find the constables[11] waiting for you to pay them something. So you pay them so that you can continue working and avoid more issues with them…Even for the traffic police, you have to bribe them for you to pass." – Tanker Operator*

Most surveyed vendors (96 percent) were not members of vendor associations, even though WASREB has called for formation of vendor associations to formalize vendors and

[11] County constables are county officers tasked with enforcing county by-laws, protecting county properties and installations, and carrying out additional duties as assigned by the authorities.

improve service quality. Some community associations include water vendors within their members, but the main objective of these groups is not to regulate or monitor water quality. For example, of the two associations that URBAN WASH interviewed, one was a 20 year old landowners association that advocated collectively for access to water and sanitation, while the other was over a decade old and aimed to engage youth in business ventures such as garbage collection and selling water. Both associations owned a single water kiosk each, but members did not engage exclusively in water vending and did not monitor water safety practices within the group.

3.3.2 SOCIAL ENTERPRISES ARE ATTEMPTING TO DELIVER SAFE WATER IN LOW-INCOME AREAS BUT HAVE LIMITED MARKET SHARE AND WATER QUALITY CHALLENGES

SHOFCO is a social enterprise that distributes water to households in two LIAs of Nairobi (Kibera and Mathare) through PPDs. SHOFCO sources water from boreholes, treating it at a reverse osmosis plant and transporting it via aerial piping to PPDs' storage tanks to avoid vandalism and contamination. So far, personnel reported that they serve 20 percent of the households in Kibera. In addition to reaching a relatively small proportion of households, staff reported challenges in meeting peak demands due to the limited storage capacity, and in managing appropriate residual chlorine levels throughout the distribution system (between the reverse osmosis plant, tanks, and PPDs).

Another private enterprise, Wonderkid, provides technological platforms and applications designed to support water utilities. Recently, Wonderkid developed an application named Maji Safi, aimed at regulating utility-approved water vendors (primarily tankers) and ensuring delivery of safe water. The application is designed to gather customer requests and relay them to the water utility, which, in turn, will deploy approved water tankers. As of July 2024, three Kenyan utilities outside of Nairobi had been onboarded to the application but the water vendor component of the application had not yet launched . Staff at Nairobi Water who were aware of this initiative shared their concerns that water tankers might not voluntarily sign up for this service because of the planned monthly subscription fees for vendors to be on the application. Furthermore, similar previous efforts by the Nairobi City government to provide "Uber-like" water tanker services were not widely adopted. Formative URBAN WASH research revealed that private tankers were willing to strike if the service continued since it threatened their businesses due to competition. Finally, there were no current plans for the application to incorporate water quality assurance methods, although the designers were interested in incorporating this in the future.

3.3.3 OTHER SECTORS REVEAL THAT EFFECTIVE REGULATION THROUGH ASSOCIATIONS REQUIRES INCENTIVES, ENFORCEMENT, AND LEARNING OPPORTUNITIES

Kenya's transportation and pharmaceutical sectors offer lessons for regulating SLPs, although no regulatory framework alone is sufficient to improve service quality. Both sectors involve large numbers of individual operators and/or vendors like the water sector, and both need regulations to maintain safety and ensure public health.

Matatus, privately owned minibuses used as shared taxis, emerged as an informal mode of transportation to address the inadequacies of public transport services (Rasmussen 2012). With its swift growth, the sector faced challenges such as safety concerns, inefficiencies, and disorder. In 2010, the government mandated all matatus operators to become members of SACCOs or management companies (Behrens et al. 2017). SACCOs are member-owned financial cooperatives that provide savings and credit services to their members. Literature suggests that the quality of matatus service improved after regulation through SACCOs but required strong enforcement actions since many individual operators did not want to lose their autonomy (Wandere 2021; Behrens et al. 2017). Some requirements, such as fleet management systems and cashless fare payment systems, were too expensive or complex for SACCOs

to enforce and thus remain a challenge (Behrens et al. 2017).

In the pharmaceutical sector, the Pharmacy and Poisons Board requires pharmacists to register with the regulator, to be members of the Pharmaceutical Society of Kenya, and to attend regular professional development activities to earn enough credits to renew licenses. Despite the structure, the regulator faces challenges including a lack of sufficient resources to monitor every pharmacy and drug, often resorting to reactive monitoring after users' lodge complaints.

WASREB's 2019 guidelines for water vendors to form and join associations mimic the regulatory efforts of the transportation and pharmaceutical sectors, which required vendors to join SACCOs or other similar associations. However, key differences include the following:

- In other sectors, to overcome resistance from individual vendors, the regulatory authority enforces the mandate for vendors to join organizations unlike the water sector, where WASREB does not enforce the guideline to join associations.
- SACCOs provide financial incentives for members, while existing associations for water vendors do not guarantee or provide financial support.
- The pharmaceutical sector requires training as a part of regulatory activities, while WASREB's guidelines do not identify training or define other specific best practices for associations to impart to members.

Without addressing the need for incentives, enforcement, and training, WASREB's guidelines will likely lack effectiveness.

4.0 IMPLICATIONS AND RECOMMENDATIONS

The study indicated that most households in Nairobi's LIAs rely on vendors for water services rather than receive water directly from the piped water network. Water distributed by most vendors in the study did not meet safety standards for residual chlorine, and authorities inadequately monitored vendor water quality. Vendors lacked the knowledge to address water safety requirements and struggled with underlying challenges such as water rationing. Although the regulator is pushing for the formalization and regulation of water vendors, including through registration drives and the development of vendor associations, most of the sampled vendors did not engage in these initiatives.

To address these challenges, URBAN WASH developed recommendations informed by the research findings, which the team refined through a comprehensive stakeholder engagement process. The team collected stakeholder feedback in multiple phases, starting with seven targeted meetings with 70 total participants.[12] The team then held a workshop designed to discuss and refine the proposed recommendations, attended by 14 individuals representing Nairobi Water, the Nairobi County Public Health Office, Wonderkid, WASREB, SDI, and MoWsSI. URBAN WASH organized outcomes from the stakeholder engagement process into the following recommendation categories: (i) vendor training; (ii) water chlorination, quality monitoring, and feedback; and (iii) water quality certification.

Stakeholders agreed on the need to address water safety among vendors, particularly through vendor professionalization and public awareness, but the workshop highlighted key differences or unanswered questions that will require further discussion to fully operationalize recommendations. For instance, the regulator highlighted concerns with rolling out a water quality certificate before vendors had met other requirements for licensing, including but not limited to sharing tax identification information and joining associations. The group of stakeholders struggled to identify or designate individual agencies with specific implementation responsibilities due to overlapping governmental mandates. Finally, URBAN WASH encouraged stakeholders to consider incentives that might motivate vendors to undertake actions on water safety. However, governmental actors typically prioritize enforcing mandates over designing incentives and require more discussions to do so.

The recommendations below represent a balance between technical feasibility and the priorities of stakeholders.

4.1 VENDOR TRAINING

Before vendors can improve water quality, they need to be equipped with relevant knowledge and skills related to water safety. Offering vendors capacity-building trainings that cover essential topics, such as water quality standards, interpreting water quality test results, safe water handling and storage methods, and chlorine dosing guidance, could begin to bridge this gap. A government agency like the Kenya Water Institute (KEWI), or the Nairobi County Public Health Office, could facilitate this training based on their respective roles in the sector. The Kenyan parliament mandates KEWI to provide training, consultancy, research, and development services in the water sector while fostering collaboration between public and private sectors and other stakeholders to advance water and sanitation development. Similarly, the Nairobi County Public Health Office has expertise in water quality and deploys staff occasionally to

[12] Meetings took place with Nairobi Water (6 attendees), Athi Water Works Development Agency (10 attendees), Kenya Water Institute (7 attendees), Nairobi County Public Health Office (17 attendees), WASREB (10 attendees), SDI (14 attendees), and MoWSI (6 attendees).

educate households and vendors on chlorinating water and handling water using safe practices. The Public Health Office has readily available personnel to lead train-the-trainer programs for water vendors.

In addition to water safety knowledge, capacity building could include other professional development topics like financial management to support vendor business operations. While stakeholders could offer water quality training free of cost, they could offer other professional development training at a discounted rate for vendors who complete water safety training as an incentive to enroll.

Vendor training could be standalone as a first step toward improving water safety or for longer-term impact and could be coupled with other recommendations in this chapter. For instance, if a vendor's water quality tests remain unsatisfactory during monitoring (see Section 4.2), regulators could require vendors to undergo the training again.

Furthermore, for vendors to enroll voluntarily in training, engagement activities like pre-sensitization campaigns must raise awareness of the training program and foster trust among vendors. The messaging should highlight the content and advantages of the training while addressing potential concerns or misconceptions.

4.2 WATER CHLORINATION, QUALITY MONITORING, AND FEEDBACK

Adequate levels of free residual chlorine are essential to reducing the possibility of water contamination during household storage. However, only 10 percent of sampled vendors supplied water meeting minimum levels of residual free chlorine (0.5 mg/L), required by the World Health Organization (WHO 2024), even though 62 percent of vendors directly sourced chlorinated piped water supplied by Nairobi Water. To maintain appropriate chlorine concentrations, Nairobi Water could adjust chlorination at their treatment plants, or vendors could dose their water with chlorine prior to distribution.

During the workshop, Nairobi Water emphasized that it was their responsibility to chlorinate water and raised concerns over potential health risks related to improper water chlorination by vendors. These concerns stem from Nairobi Water's mandate to deliver quality water to Nairobi County residents and its view of vendors, particularly those sourcing water from Nairobi Water, as an extension of its service delivery. In contrast, the Nairobi County Public Health Office supported giving vendors the authority to chlorinate at vendor distribution points, provided the vendors receive proper training and monitoring. This support was based on the County's existing practices of distributing Aquatabs (chlorination tablets) on a small scale to vendors and households on an ad-hoc basis and its experience with water quality monitoring. The Nairobi County Public Health noted that when they detect insufficient chlorine in piped water, they request super-chlorination at the source by contacting Nairobi Water's field personnel. However, this process involves substantial delays, leaving communities exposed to unsafe water in the interim.

Even if Nairobi Water ensures adequate chlorine levels at the meter, chlorine concentrations decay during transportation or storage between the meter and the final vendor distribution point. Increasing chlorination within the distribution network may result in higher residual chlorine levels for those not transporting or storing water, potentially leading to complaints about taste and odor.

Chlorination at the vendor level offers a more targeted safeguard against contamination after water leaves Nairobi Water's control at the meter. By chlorinating at the point of distribution, vendors can provide consistently safe water to consumers without relying on the delayed interventions of Nairobi Water. This approach is adaptive to local conditions, allowing vendors to adjust chlorine levels based on the volume of water they handle, which varies by location and vendor type.

URBAN WASH recommends vendors chlorinate their water routinely before distribution. Nairobi Water would remain responsible for chlorinating water up to the meter and ensure consistent chlorine levels during bulk distribution, while all vendors (i.e., including those who rely on piped and non-piped water sources) would chlorinate water before distribution (i.e., during storage).

To ensure that vendors adhere to chlorination requirements and dose accordingly, regulators would have to put in place a water quality monitoring program where a local authority (e.g. the County or Nairobi Water) would test vendor water at distribution points on a monthly or quarterly basis.. After every test, vendors would receive results and actionable insights if required. During the workshop, stakeholders suggested incorporating digital solutions such as unstructured supplementary service data (USSD)[13] codes or short message service (SMS) to communicate results quickly and simplify feedback between monitoring authorities and vendors. Potential incentives could involve offering vendors free or discounted chlorine tablets to enhance water safety affordably and offering free or subsidized test kits for vendors to monitor water quality themselves. The training mentioned earlier (Section 4.1) would provide vendors with the knowledge necessary to interpret the water quality test results and recognize the steps to take if the outcomes are unfavorable.

The remaining challenge is selecting the appropriate authority to take on responsibility for a water quality monitoring program at scale. The prevalence of overlapping responsibilities between Nairobi Water and the Nairobi County Public Health Office regarding water safety , presents multiple options for managing the water chlorination recommendation. For instance, WASREB tasked Nairobi Water with overseeing water vendors within their jurisdiction. However, the Water Act, the Public Health Act (Chapter 242), and the Food Safety Act (Chapter 254) also tasks Nairobi County Public Health Office with ensuring public health including through safe water quality (i.e., by conducting water quality testing and vendor capacity building at the community level and distributing Aquatabs in response to public health outbreaks). Despite these complementary initiatives, Nairobi Water and the County Public Health Office have not yet streamlined their activities actively to improve water quality among vendors. Regulators should clarify and streamline the roles and responsibilities of all stakeholders involved to enhance operational efficiency. This process would require agreement around which agency is responsible for water safety, such as free residual chlorine concentration, at discrete points in the supply chain, as well as regular dialogues around shared responsibilities to harmonize policies and address emerging conflicts.

4.3 WATER QUALITY CERTIFICATION PROGRAM

A water quality certification program could offer households a visible assurance of compliance with safety standards, promoting consumer trust and helping households identify vendors with good water quality. DCE results showed that certification can outweigh other household decision-making factors and influence consumer choice toward safe water. URBAN WASH recommends that regulators issue certificates for display to vendors who complete water safety training successfully and participate in routine water quality monitoring (described in Sections 4.1 and 4.2.). Engagement with vendors should promote certification, informing vendors about advantages such as increased customer trust and potential business growth while highlighting offered incentives. In parallel, community awareness campaigns should build demand for certification among households by helping the public recognize and understand the importance of certified vendors.

[13] USSD codes are abbreviated numerical sequences used on mobile phones to access various services or features without needing an internet connection. For instance, in Kenya, dialing *144# allows consumers to view their airtime balance.

Most stakeholders, including WASREB, the County Public Health Office, and Nairobi Water, exhibited interest in a water quality certification program. However, these stakeholders supported collectively expanding the certification program beyond water quality. They suggested that stakeholders design a comprehensive vendor licensing or regulation program that integrates compliance with all WASREB directives for vendors alongside other established public health standards. However, SDI, representing community members and some vendors, warned that a vendor licensing or regulatory program might create resistance among vendors toward adopting water safety recommendations, primarily due to fears regarding licensing fees, lack of autonomy, and potential additional taxation. SDI highlighted possible difficulties in administering certification, especially if vendors employ fake certificates.

URBAN WASH recognizes that licensing is part of WASREB's long-term plans for ensuring water safety. However, the urgent need to address water quality issues and the anticipated resistance to licensing from vendors necessitates a strategic, phased approach. The first step should be to implement a water quality certification program to prioritize water safety improvements. Licensing and other regulatory measures can follow once stakeholders educate vendors about these requirements and their associated benefits. If water quality certification breeds trust successfully between vendors and government authorities, it may also increase the effectiveness of subsequent licensing efforts. Stakeholders could also design incentives to further minimize resistance to formalization plans. Workshop participants identified discounted license fees during the first few years as an incentive for formalization.

Beyond phasing implementation of certification and licensing, stakeholders discussed possible implementors of a water quality certification program and noted the need for further consideration of roles and responsibilities. On one hand, the Nairobi County Public Health Office has experience implementing a food safety certificate program and is the best fit to implement water quality training and monitoring on which water quality certification would be contingent. Unifying training, monitoring, and certification under one authority would streamline all processes. However, existing mandates dictate that Nairobi Water should implement water vendor licenses, overseen by WASREB. If certification and licensing are combined, Nairobi Water will need to be responsible for certification either solely or jointly with the County Public Health Office. A joint program between Nairobi Water and Nairobi County necessitates further discussion as it could produce process inefficiencies and would require additional regulatory oversight since WASREB does not oversee the County Public Health Office.

4.4 CONCLUSION

The recommendations above reflect a multifaceted approach to improving water quality among vendors, informed by research and refined through collaborative stakeholder engagement. If implemented effectively, URBAN WASH anticipates these recommendations to yield several key benefits:

- *For Vendors:* Enhanced knowledge, professionalism, and business opportunities;
- *For Households:* Increased consumer awareness to make informed choices, greater trust in water provision, and increased access to safe and reliable water; and
- *For Authorities:* Improved compliance with safety standards, reduced public health risks, and streamlined institutional responsibilities.

These recommendations identify the type of actions needed to improve water safety among vendors. However, identifying who will be responsible for each task and how it will be implemented still requires further attention. To resolve this challenge, URBAN WASH recommends that stakeholders continue collaborating and co-designing details to tackle outstanding issues including the following:

- Streamline overlapping responsibilities between stakeholders to prevent conflicts of interest or duplication of efforts;
- Establish mechanisms to ensure accountability among stakeholders for their assigned roles;
- Identify sustainable resources for funding and capacity development to implement the recommendations effectively; and
- Define clear incentives to encourage vendors to comply with the recommendations, particularly if new responsibilities (e.g. chlorination) increase vendor costs.

To address these issues, stakeholders must collaborate across sectors (i.e., water and public health), with community partners, and with vendors to fully grasp household needs and vendor concerns. Cross-sectoral collaboration could rely on a small group of relevant staff from WASREB, Nairobi Water, and Nairobi County who meet on a routine basis. Meanwhile, community engagement could take place on an as-needed basis such as prior to a cross-sectoral collaboration meeting to design new programs. This engagement will help ensure that all responsible parties, including institutions, vendors, and households, embrace the recommendations.

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