Awareness and Practices of Household And Commercial Laundry And Dry-Cleaning Service Providers Regarding Environmental And Occupational Safety In Kisumu City, Kenya

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Abstract

Laundry and dry-cleaning (LDC) work keeps households and businesses supplied with clean clothing, but it also generates wastewater and solid waste and exposes providers to chemical, physical, and ergonomic hazards. This study examined how aware household and commercial LDC providers in Kisumu City, Kenya, were of these risks and how they actually worked. A descriptive cross-sectional survey was conducted in Nyalenda A, Manyatta A, Bandani, and Korando B. Of 64 targeted providers (52 household, 12 commercial), 58 took part (response rate 90.6%). Data from interviews and an observation checklist were analyzed using frequencies, percentages, and Fisher's exact tests for selected comparisons. Most commercial providers (90.9%) and 70.2% of household providers reported awareness of environmental-safety issues, yet observed practice often fell short of this awareness. Among the 10 commercial providers observed, 80% wore dust coats, 60% gloves, 50% closed shoes, 50% boots, 40% aprons, 40% masks, 20% overalls, and 10% goggles; none of the 27 household providers observed used any personal protective equipment (PPE). Ventilation was inadequate in 70% of commercial and 25.9% of household workplaces, tools and equipment were adequate in 80% and 25.9%, and water was available in 70% and 25.9%, respectively. Most commercial providers (72.7%) discharged wastewater into drainage, whereas almost all household providers (97.9%) disposed of it onto their compounds. The study adds provider-level evidence to earlier Kisumu work on LDC wastewater and points to safety education, PPE access, better workplace conditions, reliable water, and sound waste-management systems as practical needs.

Keywords: *laundry and dry cleaning, environmental safety, occupational safety, personal protective equipment, waste management*

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1.0 Introduction

Laundry and dry-cleaning (LDC) work, whether done in the home or in a commercial shop, involves washing, bleaching, stain removal, drying, pressing, and the handling of soiled textiles. Each of these steps can bring the worker into contact with chemical, physical, and ergonomic hazards, and the process generates wastewater and solid waste. The code of practice of the International Labour Organization (ILO, 2022) for the textiles, clothing, leather, and footwear industries treats hazardous substances, unsafe workplace conditions, missing or inadequate personal protective equipment (PPE), and ergonomic strain as central occupational-safety concerns, and Landskroner and Tsai (2023) describe chemical exposure as a persistent problem in laundry and dry-cleaning work.

> *"Chemical exposure is a persistent problem in laundry and dry-cleaning work"*

Research in Kenya has already documented some of these risks. In Kisumu City, Odek et al. (2022) measured the physicochemical characteristics of wastewater from household and commercial LDC outlets, and in Nairobi, Jebet et al. (2022) evaluated occupational health practice, including potential hazards, in the laundry and linen service of a national referral hospital. What remains poorly documented is how LDC providers themselves, household and commercial alike, understand the risks and what they actually do about them. This study set out to examine that gap by looking at provider awareness and practices: PPE use, workplace conditions, water and equipment availability, and waste disposal. The work is relevant to Sustainable Development Goals (SDGs) 3 (good health and well-being), 6 (clean water and sanitation), 8 (decent work and economic growth), and 12 (responsible consumption and production) although it did not attempt to measure progress toward any of them (United Nations, 2015),

Statement of the Problem

LDC services matter for hygiene and textile care, yet the way the work is commonly done creates environmental and occupational safety problems: wastewater, chemical handling, heavy manual work, little or no PPE, poor ventilation, cramped working space, unreliable water, and careless waste disposal. Chemical, physical, and ergonomic hazards in laundry work are well documented (ILO, 2022; Landskroner & Tsai, 2023). Locally, Odek et al. (2022) raised concerns about the physicochemical characteristics of wastewater from household and commercial LDC activities in Kisumu City, and Jebet et al. (2022) examined occupational health practice among hospital laundry workers. Household providers and small commercial operators, however, do not work under the same conditions; their access to equipment, water, and safety resources varies widely. Little is known about how these providers understand safety in their daily work or how far they act on that understanding. This study therefore set out to determine the awareness and practices of household and commercial LDC service providers regarding environmental and occupational safety in Kisumu City, Kenya.

Objective of the Study

The study determined the awareness and practices of household and commercial laundry and dry-cleaning service providers regarding environmental and occupational safety in Kisumu City, Kenya.

2.0 Materials and Methods

Research Design

The study used a descriptive cross-sectional survey design. Data came from interviews and direct workplace observations, using an interview schedule and an observation checklist,

so that what providers reported could be set against what was actually observed at their workplaces. Because the design was cross-sectional, it could not establish cause and effect.

Study Area

Fieldwork took place from January to March 2020 in four areas of Kisumu City (Nyalenda A, Manyatta A, Bandani, and Korando B), where both household and commercial LDC activities are found. Working in the same neighborhoods made it possible to compare safety practices across the two settings.

Study Population

The target population was 64 LDC providers: 52 household and 12 commercials. Fifty-eight took part (47 household, 11 commercial), an overall response rate of 90.6%; the corresponding rates were 90.4% for household providers and 91.7% for commercial providers (Table 1).

Table 1
Target Population and Participants

Provider category	Target population	Participants	Response rate (%)
Household	52	47	90.4
Commercial	12	11	91.7
Total	64	58	90.6

Note. Data are from the author's field survey.

Sampling Procedure

Household providers were chosen by systematic sampling; commercial providers were identified through a census, with snowball sampling used where a provider could not otherwise be reached. The target was 52 household and 12 commercial providers, and 47 and 11, respectively, took part. Because the commercial group was small and the two groups were sampled differently, all comparisons were treated as exploratory.

Data Collection Instruments

Two instruments were used. The interview schedule covered participant characteristics (sex, age, education, and work experience), environmental awareness, LDC practices, waste generation and disposal, and occupational safety. The observation checklist recorded PPE use, ventilation, working space, cleanliness, workplace layout, storage, tools and equipment, water availability, and waste-disposal practices.

Observation Procedure

Observations covered 27 household and 10 commercial providers, so the observed findings rest on 37 workplaces. Workplaces were selected for observation according to providers' availability and permission to access them. Reported waste types and disposal practices, by contrast, came from all 47 household and 11 commercial interview respondents.

Data Analysis

The data were analyzed in SPSS Version 20. Frequencies and percentages summarize the findings, and Fisher's exact test was applied to selected comparisons because the commercial subgroup was small, with significance set at $p < .05$. The analysis was exploratory; no causal claims are made.

Ethical Considerations

Ethical approval and research permissions were obtained from the University of Eldoret, the National Commission for Science, Technology and Innovation (NACOSTI), and the relevant Kisumu County authorities. Participation was voluntary and informed consent was obtained from every respondent; confidentiality was protected by using codes instead of names, and photographs were taken only with permission. Three household respondents were recorded as being below 18 years of age.

3. 0 Results and Discussion

Respondent Characteristics

Of the 58 providers, 47 were household and 11 commercial (Table 2). Most household providers were women (87.2%), whereas most commercial providers were men (72.7%). In both groups the 36–50-year bracket was the largest (48.9% of household and 54.5% of commercial providers). Commercial providers had generally studied further: all had at least secondary education, compared with 34.0% of household providers, 27.7% of whom had no formal education. Household providers had typically worked longer, 80.9% of them for 10 years or more, compared with 45.5% of commercial providers. Three household respondents (6.4%) were recorded as below 18 years of age. These differences shape how the rest of the findings should be read, although training was not assessed and no statistical tests linked individual characteristics to awareness or practices.

Table 2

Characteristics of Household and Commercial LDC Service Providers

Characteristic	Household (n = 47)	Commercial (n = 11)
Sex		
Male	6 (12.8)	8 (72.7)
Female	41 (87.2)	3 (27.3)
Age		
Below 18 years	3 (6.4)	0 (0.0)
18–35 years	9 (19.1)	3 (27.3)
36–50 years	23 (48.9)	6 (54.5)
51–60 years	12 (25.5)	2 (18.2)
61 years and above	0 (0.0)	0 (0.0)
Education		
No formal education	13 (27.7)	0 (0.0)
Primary	18 (38.3)	0 (0.0)
Secondary	11 (23.4)	5 (45.5)
Tertiary	5 (10.6)	6 (54.5)
Work experience		
Less than 1 year	0 (0.0)	0 (0.0)
1–3 years	1 (2.1)	1 (9.1)
4–6 years	3 (6.4)	2 (18.2)
7–9 years	5 (10.6)	3 (27.3)
10 years and above	38 (80.9)	5 (45.5)

Note. Values are n (%). Data are from the author's field survey.

Environmental Safety Awareness

Environmental-safety awareness was reported by 90.9% of commercial providers (10 of 11) and 70.2% of household providers (33 of 47). The difference was not statistically significant (p = .257), and at the group level, awareness on its own did not appear to guarantee safe practice. Water supply, waste-collection services, infrastructure, cost, and daily work routines all shape what a provider can actually do, whatever they know. The result sits alongside Odek et al. (2022), who documented the environmental characteristics of LDC wastewater in Kisumu City; the present study adds the provider side, the practices that determine how that wastewater is handled.

Observed Use of Personal Protective Equipment

Table 3 presents observed PPE use among commercial and household LDC providers.

Table 3

Observed Use of Personal Protective Equipment

PPE item	Commercial (n = 10)	Household (n = 27)	Fisher's exact p
Dust coat	8 (80.0)	0 (0.0)	< .001
Gloves	6 (60.0)	0 (0.0)	< .001
Closed shoes	5 (50.0)	0 (0.0)	.001
Boots	5 (50.0)	0 (0.0)	.001
Apron	4 (40.0)	0 (0.0)	.003
Mask	4 (40.0)	0 (0.0)	.003
Overalls	2 (20.0)	0 (0.0)	.068
Goggles	1 (10.0)	0 (0.0)	.270

Note. Values are n (%). Providers could use more than one type of PPE; therefore, percentages are based on each PPE item and do not sum to 100%. Data are from the author's field survey.

Among the commercial providers observed, dust coats were the most common item (80%), followed by gloves (60%), closed shoes and boots (50% each), aprons and masks (40% each), overalls (20%), and goggles (10%). Differences between the groups were significant for dust coats, gloves, shoes, boots, aprons, and masks, but not for overalls (p = .068) or goggles (p = .270). Not one of the household providers observed wore any PPE at all. The reasons behind this gap, whether training, income, or access to equipment, could not be established by the study. The pattern is consistent with the ILO (2022) view that PPE matters as part of a wider safety effort that includes training, hazard control, and safe work practices, and it draws attention to the PPE adherence issues that Jebet et al. (2022) examined in a hospital laundry. Because health outcomes were not assessed, nothing here should be read as evidence of particular illnesses or injuries.

Observed Workplace Conditions

Table 4 presents observed workplace conditions.

Table 4
Observed Workplace Conditions

Condition	Commercial (n = 10)	Household (n = 27)	Fisher's exact p
Ventilation			.023
Adequate	3 (30.0)	20 (74.1)	
Inadequate	7 (70.0)	7 (25.9)	
Working space			.694
Adequate	2 (20.0)	8 (29.6)	
Inadequate	8 (80.0)	19 (70.4)	
Cleanliness			
Very clean	3 (30.0)	0 (0.0)	
Clean	5 (50.0)	2 (7.4)	
Fairly clean	1 (10.0)	15 (55.6)	
Dirty	1 (10.0)	10 (37.0)	
Work layout			
Very good	2 (20.0)	0 (0.0)	
Good	5 (50.0)	0 (0.0)	
Fair	3 (30.0)	16 (59.3)	
Poor	0 (0.0)	9 (33.3)	
Not reported	0 (0.0)	2 (7.4)	
Storage of clean clothes			
Very good	2 (20.0)	0 (0.0)	
Good	6 (60.0)	0 (0.0)	
Fair	0 (0.0)	18 (66.7)	
Poor	0 (0.0)	3 (11.1)	
Not reported	2 (20.0)	6 (22.2)	

Note. Values are n (%). Categories with no observations are shown as 0 (0.0). Fisher's exact test was applied to ventilation and working space only. Data are from the author's field survey.

Ventilation was inadequate in 70% of the commercial workplaces observed, against 25.9% of household workplaces, a significant difference (p = .023). Inadequate working space was common in both groups (80% commercial, 70.4% household) and did not differ significantly (p = .694). Commercial workplaces were generally cleaner; household workplaces were more often rated fairly clean or dirty, and their work layouts were mainly rated fair or poor. Better PPE and equipment among commercial providers did not extend to air and space, which remained problems in both settings. The concern echoes the chemical-exposure risks described by Landskroner and Tsai (2023), though since indoor air quality and chemical exposure were not measured, inadequate ventilation is reported here only as a potential safety concern.

Tools, Equipment, and Water Availability

Table 5 presents observed adequacy of tools and equipment and water availability.

Table 5

Observed Tools, Equipment, and Water Availability

Indicator	Commercial (n = 10)	Household (n = 27)	Fisher's exact p
Tools and equipment			.006
Adequate	8 (80.0)	7 (25.9)	
Inadequate	2 (20.0)	20 (74.1)	
Water availability			.023
Available	7 (70.0)	7 (25.9)	
Unavailable	3 (30.0)	20 (74.1)	
Water classified as safe	7 (70.0)	7 (25.9)	

Note. Values are n (%). Water quality was not laboratory tested; "safe" refers only to the observation checklist classification. Data are from the author's field survey.

Adequate tools and equipment were found in 80% of commercial workplaces but only 25.9% of household ones (p = .006). Water was available in 70% of commercial workplaces against 25.9% of household settings (p = .023). Resource scarcity of this kind bears directly on hygiene and on how waste is managed: a provider without water or proper equipment has fewer safe options. It should also be remembered that the "safe" label for water came from the observation checklist, not from laboratory testing. Limited water and equipment may partly explain why environmental awareness so often failed to become safe practice.

Types of Waste Generated

Table 6 presents the types of waste reported by respondents.

Table 6

Types of Waste Generated by LDC Activities

Waste type	Commercial (n = 11)	Household (n = 47)
Dirty water or wastewater	11 (100.0)	47 (100.0)
Soil particles	10 (90.9)	47 (100.0)
Waste solvents	9 (81.8)	3 (6.4)
Spotting residues	7 (63.6)	1 (2.1)
Melted buttons	5 (45.5)	0 (0.0)
Lint	4 (36.4)	0 (0.0)

Note. Values are n (%). Multiple responses were permitted; therefore, percentages do not sum to 100%. Data are from the author's field survey.

Every provider reported wastewater or dirty water, and soil particles were nearly as common. Commercial providers reported waste solvents and spotting residues far more often than household providers, which may reflect more specialized cleaning processes in commercial outlets, although the processes themselves were not measured. Volumes and chemical composition were not measured either. These findings add to the characterization of LDC wastewater in Kisumu by Odek et al. (2022) a picture of which wastes are generated and how providers say they handle them.

Waste-Disposal Practices

Table 7 presents reported waste-disposal practices.

Table 7
Reported Waste-Disposal Practices

Disposal practice	Commercial (n = 11)	Household (n = 47)	Fisher's exact p
Burning waste	2 (18.2)	24 (51.1)	.090
Burying waste	2 (18.2)	26 (55.3)	.043
Wastewater disposed onto compound	6 (54.5)	46 (97.9)	.001
Wastewater disposed into toilet or latrine	1 (9.1)	37 (78.7)	< .001
Wastewater disposed into drainage	8 (72.7)	1 (2.1)	< .001
Waste chemicals disposed into drainage	8 (72.7)	2 (4.3)	< .001
Waste wrapped for collection	5 (45.5)	10 (21.3)	.131
Wastewater used for mopping	1 (9.1)	45 (95.7)	< .001
Worn-out tools or equipment sold to motor dealers	0 (0.0)	10 (21.3)	.182

Note. Values are n (%). Multiple responses were permitted; therefore, percentages do not sum to 100%. Data are from the author's field survey.

Disposal practices diverged sharply. Commercial providers most often sent wastewater and waste chemicals into drainage systems (72.7% each). Household providers discharged wastewater onto their compounds (97.9%) or into toilets or latrines (78.7%), or used it for mopping (95.7%). Several of these differences were significant: wastewater disposed into toilets or latrines and into drainage, waste chemicals disposed into drainage, and wastewater used for mopping (all p < .001), as well as wastewater disposed onto compounds (p = .001) and burying of waste (p = .043). The pattern again suggests that awareness had not become safe practice. The results complement Odek et al. (2022) while leaving open whether particular disposal practices have actually damaged the environment, since contamination was not measured. What the findings do make plain is the need for better disposal facilities, water supply, waste-collection services, and practical guidance, in line with the Water Quality and Waste Management Regulations (Government of Kenya, 2024a, 2024b), which came into force after the fieldwork was completed.

Health and Occupational Safety Implications

The study points to occupational-safety concerns, but it measured no health outcomes. No PPE was seen on household providers, and inadequate ventilation was common in commercial workplaces. LDC work can expose providers to chemicals, heat, water, electrical equipment, and repetitive manual tasks, and

Landskroner and Tsai (2023) and Jebet et al. (2022) describe comparable hazards. Personal exposure, injuries, and occupational diseases were outside the scope of this study, so what it shows is a set of unaddressed risks and gaps in preventive practice, not confirmed health effects.

Integrated Environmental and Occupational Safety

Environmental and occupational safety turned out to be two sides of the same problem. Commercial providers had better PPE, equipment, and water, yet ventilation and working space remained weak points. Household providers were short of PPE, equipment, and water, and almost all disposed of wastewater onto their compounds even though most reported awareness of environmental-safety issues. Any intervention therefore has to reach both settings and pair awareness-raising with practical support: PPE, water, equipment, ventilation, and proper waste management. The findings are relevant to SDGs 3, 6, 8, and 12 (United Nations, 2015), though progress toward the goals was not measured.

Comparison with Previous Kisumu Research

Set against Odek et al. (2022), which examined the physicochemical characteristics of wastewater from household and commercial LDC activities in Kisumu, the present study covers ground the earlier work could not. The earlier study supplied laboratory evidence on the environmental side; this one documents awareness, workplace conditions, resources, waste generation, and disposal as providers experience them. Read together, the two trace LDC activity from waste generation through workplace practice to its environmental consequences.

Limitations of the Study

This study has several limitations. The design was cross-sectional, so no causal relationships can be inferred. The commercial subgroup was small (11 interviewed and 10 observed), household and commercial providers were sampled by different methods, and observations covered only 37 of the 58 participating providers; all comparisons are therefore exploratory. Because no adjustment was made for multiple comparisons, the risk of false-positive findings cannot be ruled out. Awareness was self-reported and was not cross-tabulated against individual practice, so the relationship between awareness and practice is described at the group level. Finally, chemical exposure, indoor air quality, wastewater composition, water quality, and health outcomes were not measured, so the findings describe potential risks rather than confirmed harm.

4.0 Conclusion

Providers were broadly aware of environmental safety, but that awareness rarely showed in how they worked. Commercial providers had better access to PPE, equipment, and water, though ventilation and working space stayed problematic. Household providers lacked PPE, equipment, and water to a much greater degree, and wastewater and waste-disposal practices of concern were widespread. Safety education on its own will not close these gaps; it has to come with practical resources, suitable infrastructure, and working waste-management systems. The study adds provider-level evidence to previous Kisumu research. Because chemical exposure, occupational diseases, injuries, wastewater toxicity, indoor air quality, and laboratory water quality were not measured, the findings describe potential environmental and occupational risks, not confirmed harm.

5.0 Recommendations

1. Environmental and occupational safety education**.** Kisumu County authorities, training institutions, and professional organizations should offer practical safety education to both household and commercial providers. Chemical handling, PPE use, ventilation, water management, wastewater handling, waste segregation, and emergency procedures all belong in that training.

2. Provision and use of PPE. Providers need gloves, protective clothing, closed footwear, masks, and eye protection appropriate to the task. Equipment alone is not enough; training on correct use, maintenance, and replacement has to accompany it.
3. Improvement of workplace conditions. Commercial operators should improve ventilation and provide adequate working space. Household providers should be helped to set aside working areas that limit exposure to chemicals, heat, electrical hazards, and contaminated materials.
4. Water and sanitation. Reliable water supplies in LDC workplaces could reduce the pressure to dispose of wastewater on compounds, in open drainage, or by other unsafe routes. Washing, drainage, and sanitation facilities should follow where possible.
5. Waste management. Providers, household and commercial alike, need training in identifying and separating waste streams and in using appropriate collection, treatment, or disposal systems. Wastewater should be handled in line with the applicable environmental requirements rather than discharged wherever convenient.
6. Chemical-waste management. Commercial providers working with solvents, spotting agents, bleaching agents, and other chemicals need specific guidance on storage, handling, and disposal. Chemical residues do not belong in drainage systems.
7. Integrated county oversight. County environmental-health, occupational-safety, and environmental-management authorities should plan for household and commercial providers alike. Regulation on its own will not reach informal providers with few resources; it needs to be combined with education and practical support.

Implications for Practice

The findings matter for county environmental management, occupational safety, LDC training, and community health. First, LDC activities happen in households as well as in formal businesses. Programs aimed only at registered commercial operators will miss the household providers, who have the least access to safety information, PPE, water, and waste-management infrastructure. Second, education has to move beyond raising awareness to changing practice. Providers need workable mechanisms for wastewater collection, waste segregation, and disposal, not only information about pollution. Third, PPE should be one element in a broader preventive approach that also covers ventilation, workspace organization, suitable equipment, and hands-on training.

Directions for Future Research

Future studies should draw larger samples of both household and commercial providers and test whether safety practices are associated with education, training, experience, and access to resources. Once samples are large enough, chi-square tests (where their assumptions hold), Fisher's exact test for small categories, and effect sizes with confidence intervals would strengthen the analysis. Direct measurement should follow: indoor air quality, chemical exposure, wastewater characteristics, water quality, and occupational-health outcomes. Longitudinal and intervention designs would then show whether safety education, PPE provision, better water supply, and better waste-management systems actually improve environmental and occupational safety.

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