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ACCESS TO WASH SERVICES AND RESIDENTS' EXPERIENCES IN TWO CONTRASTING NEIGHBORHOODS OF ABIDJAN

Aziza Ouattara [1, 2, *], Yao Etienne Kouakou [1, 2], Brama Koné [2, 3], Kouadio Koffi [1], Iba Dieudonné Dely [2, 3], Madina Doumbia [2, 3] and Guéladio Cissé [2, 3, 4]

[1] Faculty of Sciences and Environmental Management, University Nangui Abrogoua (UNA), 02 B.P. 801 Abidjan 02, Côte d'Ivoire.
[2] Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS), 01 BP 1303 Abidjan 01, Côte d'Ivoire
[3] Faculty of Social, Biological and Physical Sciences, University Peleforo Gon Coulibaly (UPGC), BP 1328 Korhogo, Côte d'Ivoire.
[4] Swiss Tropical and Public Health Institute (Swiss TPH), University of Basel, 4123 Allschwil, Switzerland.
* Corresponding Author

ORCID Details
Aziza Ouattara: https://orcid.org/0009-0007-0773-3484
Yao Etienne Kouakou: https://orcid.org/0000-0002-4150-1499
Brama Koné: https://orcid.org/0000-0001-9624-0647
Kouadio Koffi: https://orcid.org/0009-0008-9538-6714
Iba Dieudonné Dely: https://orcid.org/0009-0005-8153-1675
Madina Doumbia: https://orcid.org/0000-0002-8599-4360
Guéladio Cissé: https://orcid.org/0000-0002-6286-976X

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ABSTRACT

Access to water, sanitation, and hygiene (WASH) is a fundamental determinant of public health in urban African settings. In Côte d'Ivoire, despite recorded progress, significant disparities persist between neighborhoods, particularly in the city of Abidjan. This study aims to document WASH access conditions among populations in two contrasting neighborhoods of Abidjan, namely Williamsville III (a precarious neighborhood) and Palmeraie (an affluent residential neighborhood). A cross-sectional survey was conducted among 403 households (197 in Palmeraie; 206 in Williamsville III) in April 2025. Data were entered in Microsoft Excel and analyzed using descriptive statistical methods in R 4.3.1. Although the water supply source was identical across households, service conditions differed markedly. Water supply interruptions affected 63.6% of households in Williamsville III, compared to only 11.6% in Palmeraie ($p < 0.001$). Regarding sanitation, septic tanks were the main wastewater disposal method in Palmeraie (80.7%) compared to 55.3% in Williamsville III, where street discharge was more prevalent (11.7% vs 3.6%, $p < 0.001$). Finally, daily waste collection was more widespread in Palmeraie (46.7% vs 25.7%, $p < 0.001$). These inequalities call for priority interventions targeting water service continuity and the improvement of sanitation infrastructure in precarious neighborhoods of Abidjan.

Keywords: Intra-Urban Inequality, Water, Sanitation, Hygiene, Abidjan

1 INTRODUCTION

Access to water, sanitation, and hygiene (WASH) constitutes a fundamental determinant of public health and population well-being in urban settings. However, despite progress made since the Millennium Development Goals, WASH deficits remain considerable across Africa. Indeed, 418 million people in Africa still lack access to a basic drinking water service, and 779 million have no access to a basic sanitation service [1]. These challenges are all the more concerning given that disparities persist among urban populations, as well as between households according to their socioeconomic status [2]. Rapid and unplanned urbanization has led to the coexistence of residential neighborhoods with adequate WASH infrastructure and precarious neighborhoods facing degraded sanitary conditions [3]. These inequalities in access to WASH services have direct repercussions on living conditions, health status, and the daily experiences of the most vulnerable populations, as demonstrated by [4] in informal settlements in East Africa.

Côte d'Ivoire is no exception to this dynamic. Deficits in WASH services remain a serious concern despite efforts made by public authorities. In urban areas, only 37.3% of the population has access to a basic drinking water service and 22.1% to basic sanitation [5]. These figures place Côte d'Ivoire below regional averages and signal persistent water and sanitation insecurity, particularly in rapidly growing urban areas. In the Autonomous District of Abidjan, this rate is even lower, as the city faces the challenges common to urban centers with several hundred thousand inhabitants, thereby undermining planning efforts and revealing significant intra-urban disparities. These disparities manifest as failures in the drinking water service. Indeed, a decline in the quantity of water distributed per person per day has been observed, in some cases reaching a complete cessation of water supply. Such disruptions are particularly felt by low-income households or those living on the outskirts of the city [6]. Consequently, monitoring inequalities in access to water, sanitation, and hygiene (WASH) services is essential to guide decision-makers in selecting and deploying the most urgent interventions.

It is within this context that the present study was conducted, in two contrasting neighborhoods of Abidjan, namely Williamsville III (a precarious neighborhood) and Palmeraie (an affluent residential neighborhood). This study aims to document WASH access conditions among populations in these two neighborhoods, in order to contribute to a better understanding of intra-urban inequalities in access to essential services in Abidjan.

1.1 Presentation of the study area

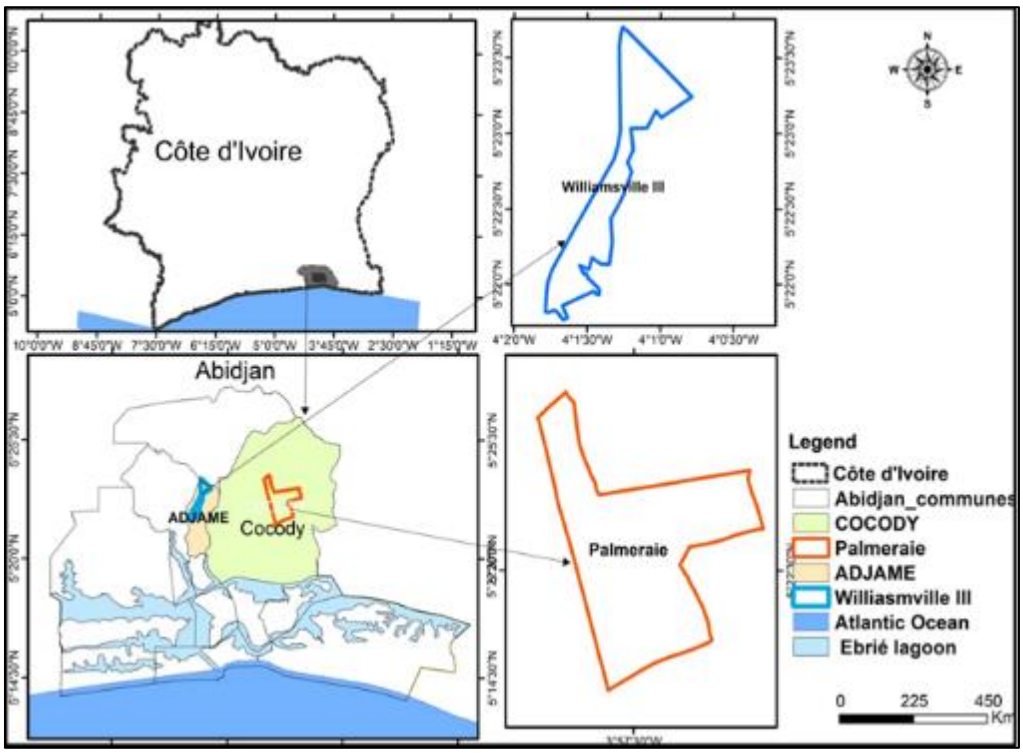

Figure 1: Location of the study area

This study was conducted in the city of Abidjan (**Figure 1**), the economic capital of Côte d'Ivoire. The neighborhood of Williamsville III, located in the commune of Adjamé, was initially selected by the HE^{2}AT project team for its precarious conditions. Furthermore, in a comparative approach, the neighborhood of Palmeraie, located in the residential commune of Cocody, was retained due to its marked socioeconomic and infrastructural contrast and its accessibility.

The choice of a comparative approach between these two types of neighborhoods aims to capture the diversity of WASH experiences within the same city.

2 MATERIALS AND METHODOLOGY

A cross-sectional survey was conducted in April 2025 among households in the neighborhoods of Williamsville III and Palmeraie. A total of 403 households (197 in Palmeraie; 206 in Williamsville III) were surveyed. The questionnaire comprised both closed and open-ended questions and was administered face-to-face using tablets with the household head or the responsible adult representing the household head. The questionnaire was pre-tested on a small sample of households not included in the main study in order to verify its clarity, relevance, and feasibility, and was subsequently revised before deployment.

Information such as sociodemographic characteristics, water access conditions, hygiene practices, and the environmental setting were collected. Access to drinking water was analyzed in terms of supply source, the occurrence of water supply interruptions, and variations in the taste, odor, and clarity of drinking water. Hygiene conditions were determined based on bathing frequencies throughout the year. Regarding the environmental setting, data included the frequency of household waste collection and the method of wastewater disposal. Prior to the administration of the questionnaire, informed consent was obtained orally. Participation was voluntary, anonymous, and data were processed confidentially. No participant was therefore compelled to complete the questionnaire. The collected data were entered in Microsoft Excel and analyzed using descriptive statistical methods in R 4.3.1. The results are presented in graphical form. The mean and standard deviation were calculated for quantitative variables. Proportions were compared using the Chi-square (χ^2) test, or Fisher's exact test when the conditions for applying the χ^2 test were not met. The significance threshold was set at 5%.

3 RESULTS

3.1 Socioeconomic characteristics of households

3.1.1 Sex of respondents

The analysis of **Figure 2** reveals that the neighborhood of Palmeraie has a majority of male respondents (40%), while Williamsville III has a majority of female respondents (74.8%) ($p < 0.001$).

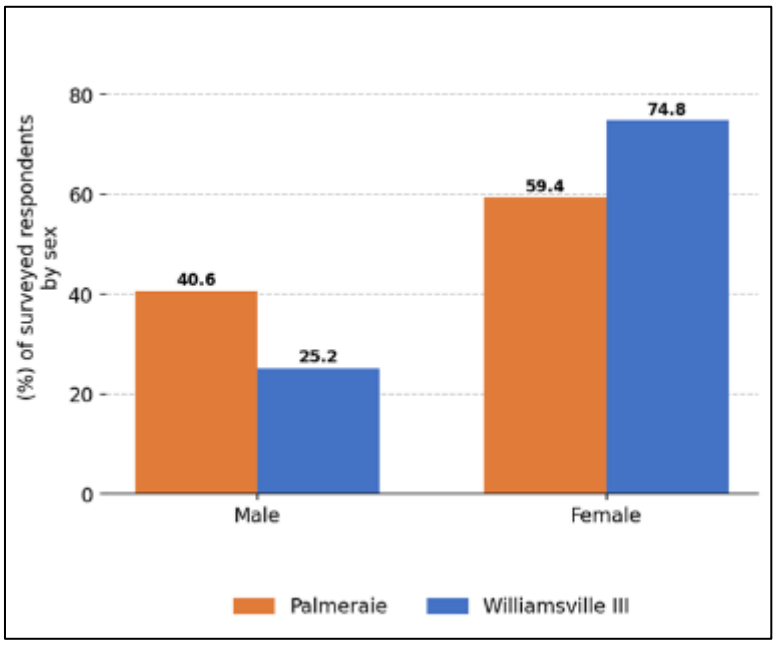

Figure 2: Sex distribution of respondents

3.1.2 Housing type among respondents

The majority of respondents in Palmeraie live in apartments (48.7%) and villas (26.9%) ($p < 0.001$). In Williamsville III, by contrast, the majority of respondents live in shared courtyards (44.7%) and row courtyards (34.0%) (**Figure 3**).

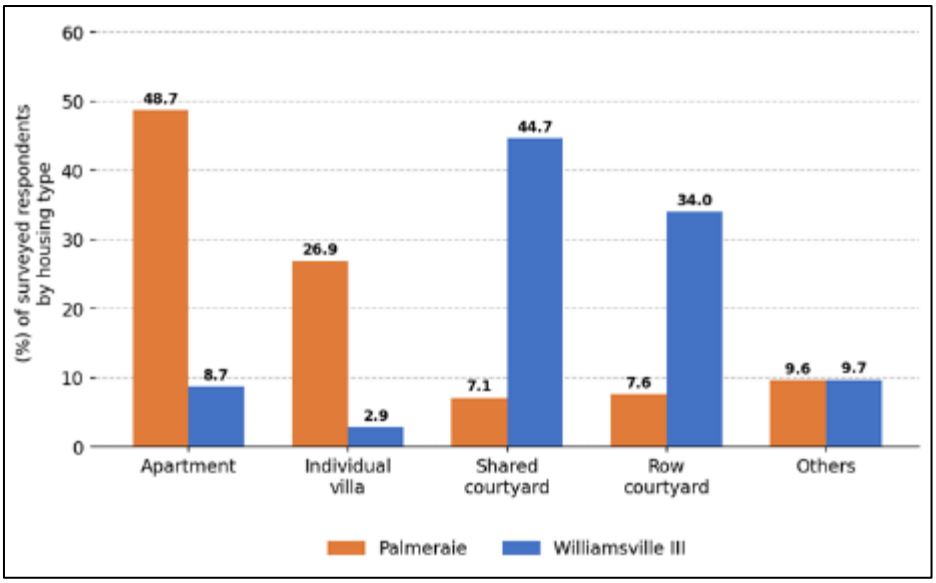

Figure 3: Housing type by neighborhood among respondents

3.1.3 Respondents' level of education

Regarding the education level of respondents, the analysis of **Figure 4** reveals that Palmeraie has a majority of respondents with a higher education degree (49.2%), while Williamsville III has the largest proportion of respondents with no schooling (43.7%) ($p < 0.001$).

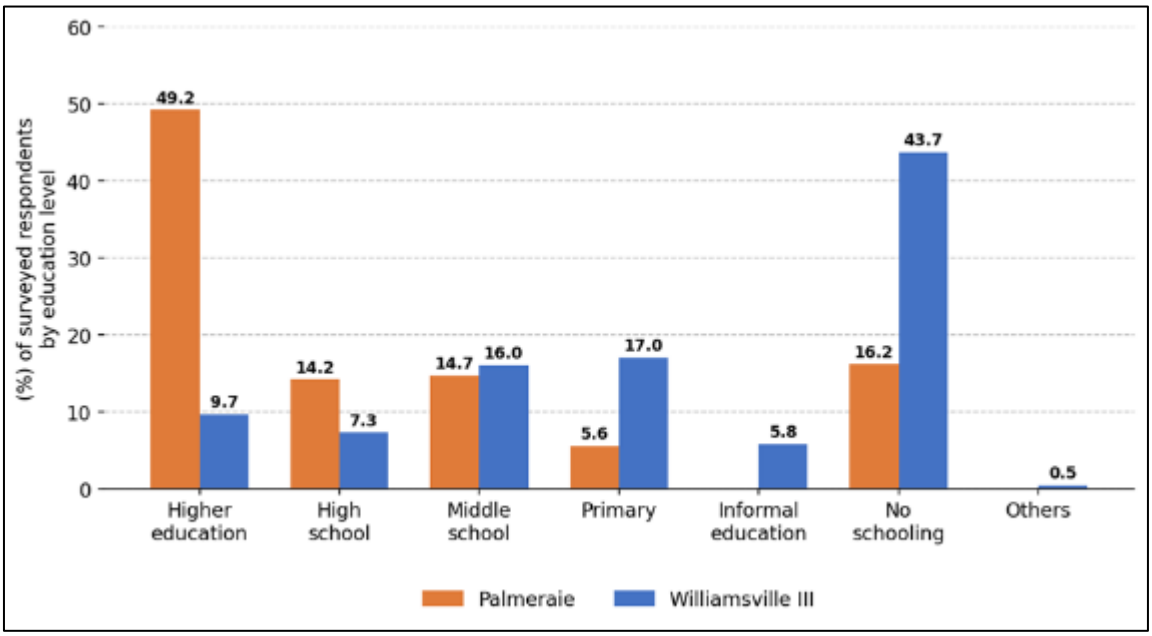

Figure 4: Level of education of respondents by neighborhood

3.1.4 Household density

The surveyed population of Williamsville III presents the highest mean household size (3.25 ± 1.62), while Palmeraie records the lowest (2.2 ± 1.37) (**Figure 5**).

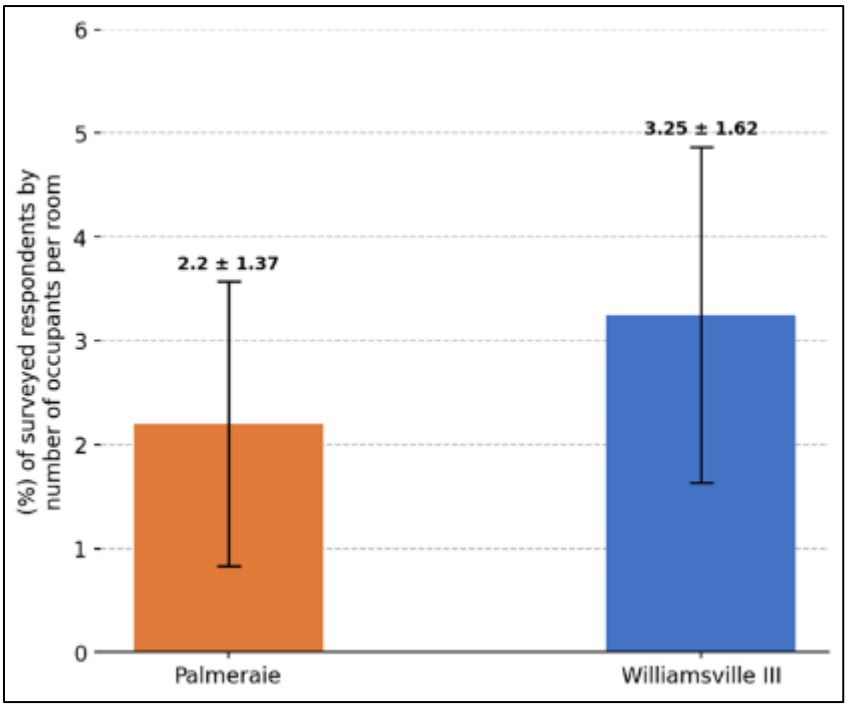

Figure 5: Household population density among respondents

3.2 Conditions of access to water

3.2.1 Main water supply source of respondents

The results of **Figure 6** show that respondents in both neighborhoods of Palmeraie and Williamsville III obtain their water supply through a connection to the city's drinking water distribution network. However, the network connection serving Williamsville III displays informal characteristics. As illustrated in **Figure 7**, water pipes, often of small diameter, run along the ground, exposed to the elements, solid waste, and stagnant water.

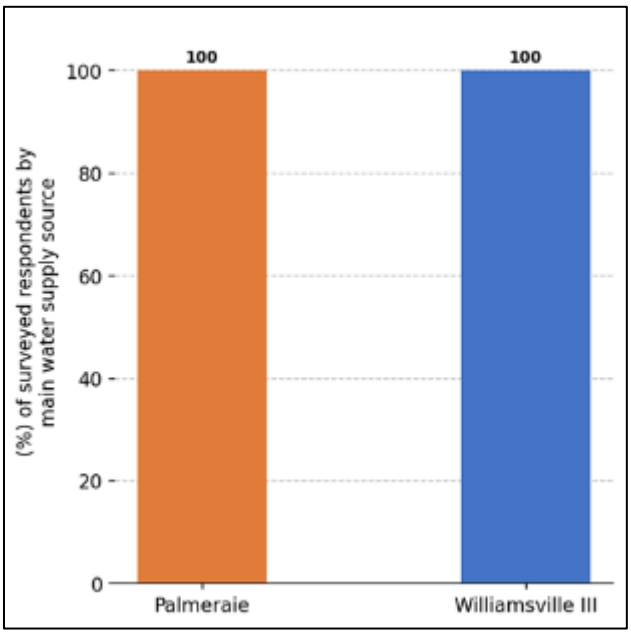

Figure 6: Main water source among respondents by neighborhood

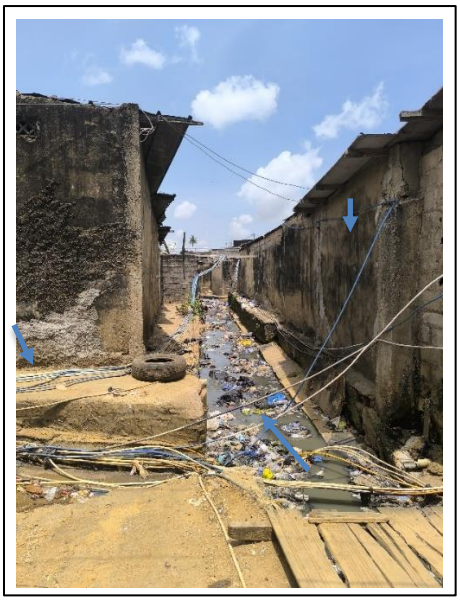

Figure 7 : Household water connection in Williamsville III

3.2.2 Frequent household water supply interruptions among respondents

When asked whether they frequently experience water supply interruptions, 63.6% of respondents in Williamsville III reported frequent water cuts, compared to 11.6% in Palmeraie ($p < 0.001$) (**Figure 8**).

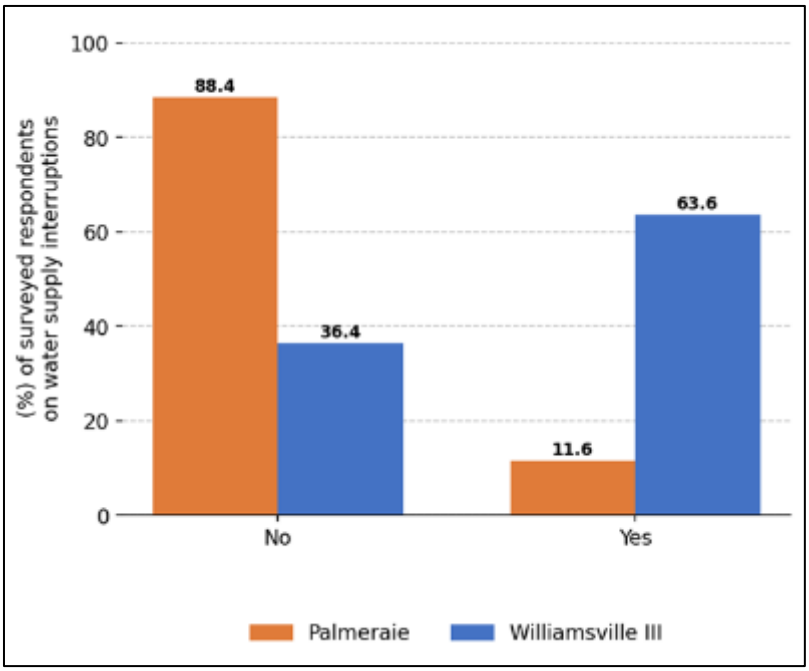

Figure 8: Frequent household water supply interruptions

3.2.3 Consistency of water odor throughout the year

The analysis of **Figure 9** shows that the odor of drinking water differs significantly between Palmeraie and Williamsville III ($p < 0.001$). Although consistent odor is the dominant response in both neighborhoods (71.6% in Palmeraie and 67.0% in Williamsville III), variation in odor throughout the year is significantly more frequent in Williamsville III (29.1%) than in Palmeraie (11.7%).

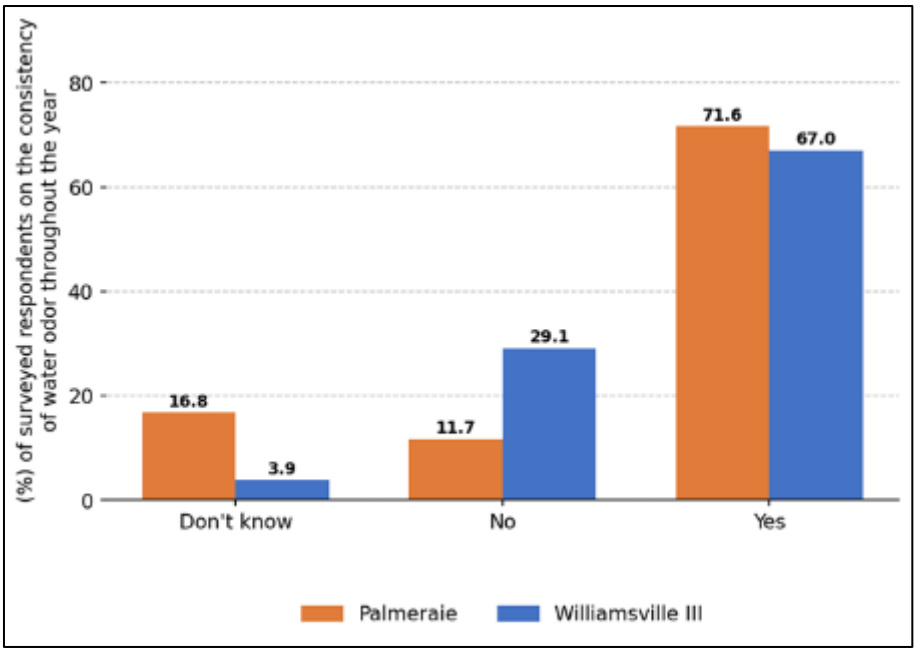

Figure 9: Neighborhood-level consistency in perceived water odor

3.2.4 Consistency of water clarity throughout the year

In both neighborhoods, responses to the question of whether drinking water maintains the same clarity throughout the year are balanced: 53.3% and 47.6% in Palmeraie and Williamsville III respectively (**Figure 10**).

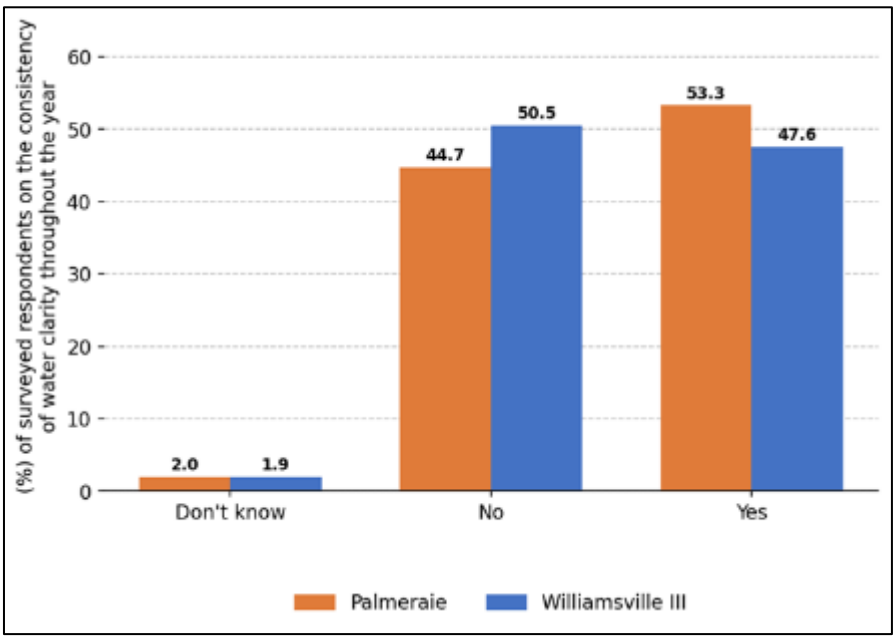

Figure 10: Neighborhood-level consistency in perceived water clarity

3.2.5 Consistency of water taste throughout the year

When asked whether drinking water maintains the same taste throughout the year, nearly two thirds of households in Palmeraie (66.5%) report a consistent taste, compared to 61.7% in Williamsville III ($p < 0.001$). By contrast, variation in taste is markedly more reported in Williamsville III (32.5%) than in Palmeraie (18.3%) (**Figure 11**).

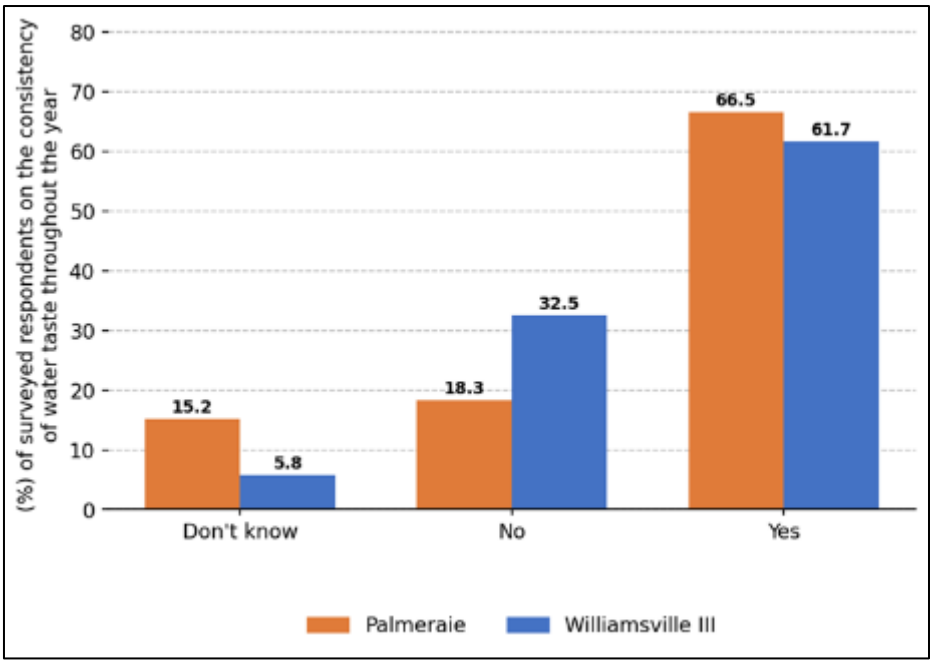

Figure 11: Neighborhood-level consistency in perceived water taste

3.3 Daily household bathing frequency

Figure 12 summarizes the daily bathing frequency among households in both neighborhoods. The majority of households in both neighborhoods bathe twice a day (62.4% in Palmeraie; 68.9% in Williamsville III). One third of households in Palmeraie (33.0%) bathe three times a day, compared to 28.2% in Williamsville III.

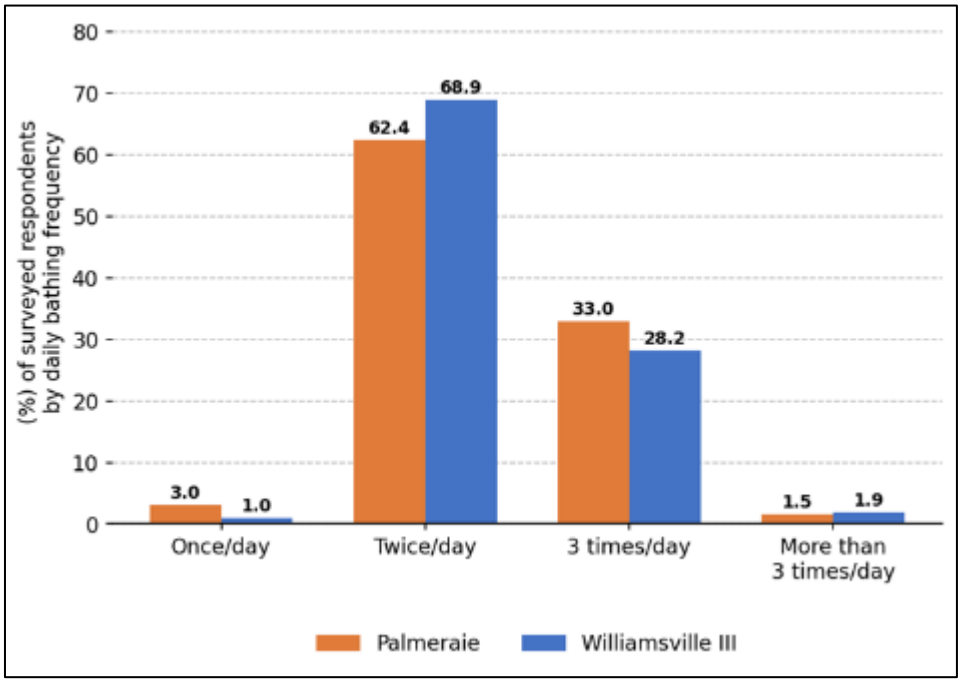

Figure 12: Frequency of daily bathing by neighborhood

3.4 Conditions of access to sanitation

3.4.1 Wastewater disposal modes

Wastewater disposal methods vary significantly between Palmeraie and Williamsville III ($p < 0.001$). While septic tanks are the dominant method in both neighborhoods, their use is more widespread in Palmeraie (80.7%) than in

Williamsville III (55.3%). Williamsville III stands out for a higher proportion of households (37.4%) disposing of their wastewater through other means: 25.7% directly into drainage channels and 11.7% into the street (**Figure 13**).

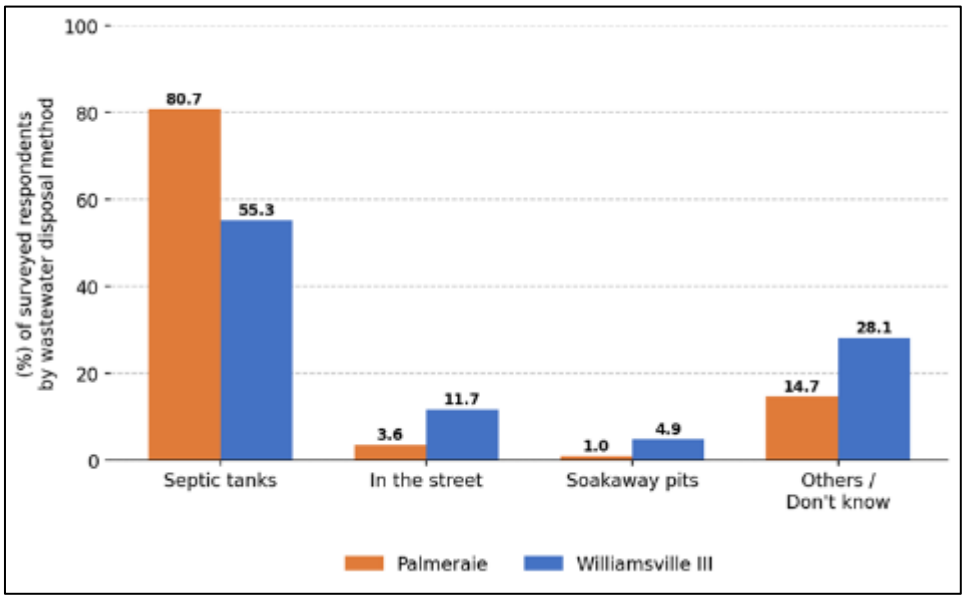

Figure 13: Wastewater disposal methods by neighborhood among respondents

3.4.2 Waste collection frequency

Figure 14 addresses the frequency of household waste collection in both neighborhoods of Palmeraie and Williamsville III. Waste collection frequency differs significantly between the two neighborhoods ($p < 0.001$). In Palmeraie, collection is primarily daily (46.7%), while in Williamsville III, it takes place mostly every two days (35.9%) or every three days (30.1%).

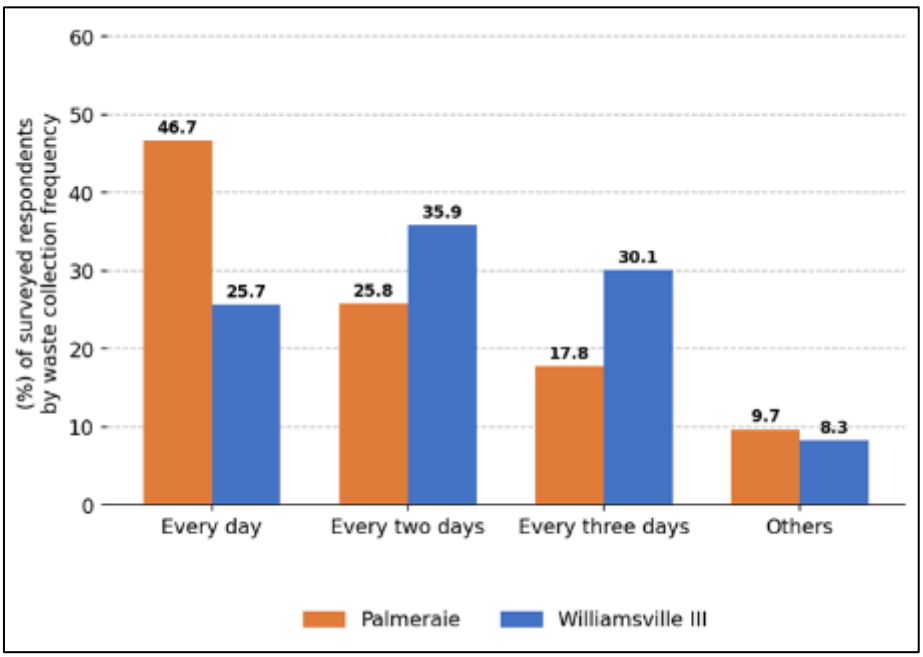

Figure 14: Frequency of household waste collection by neighborhood

4 DISCUSSION

Access to water remains satisfactory in both neighborhoods in terms of network connection. However, Williamsville III stands out for a markedly higher proportion of households exposed to frequent water supply interruptions. This gap could be explained by the informal status of the neighborhood, which limits the possibilities of formal individual connections, as well as by the likely ageing of the pipelines serving this area, which are more susceptible to pressure

losses and supply disruptions. This finding is consistent with the work of Koukougnon, (2015) on the disadvantaged neighborhood of Gobelet, in the commune of Cocody, which shows that the marginalization of informal areas in the water distribution service compels households to develop parallel supply systems informally connected to the public network. This observation is also documented by Adams, (2018) in Malawi, where national coverage statistics conceal a similar intra-urban disparity between formal and informal neighborhoods within the same city.

This irregularity in water supply appears to have an impact on the perceived quality of water, which is more subject to variation in Williamsville III than in Palmeraie. The most likely mechanism relates to pressure instability within the network. Indeed, pressure fluctuations following supply interruptions promote the resuspension of sediment deposits in pipelines and can produce temporarily turbid water at the moment of service restoration, as demonstrated by Han *et al.* (2018) regarding the relationship between pressure surges and particle remobilization in distribution networks. This phenomenon has been documented by Konan *et al.* (2008) in the neighborhood of Yopougon-Koweït, where drinking water quality deteriorated in direct relation to the households' supply conditions.

This same differentiated constraint is found on the sanitation side. The disposal of wastewater into the street and drainage channels in Williamsville III could be explained by the individual investment cost that an autonomous sanitation system represents, which is difficult to bear for households with limited incomes, in the absence of a collective sewage network in this type of neighborhood. This mechanism is corroborated by the sanitation diagnostic for sub-Saharan Africa carried out within the framework of the Africa Infrastructure Country Diagnostic [11], which identifies Côte d'Ivoire among the countries where, even in served areas, the sewage network covers only a marginal fraction of the population, forcing the vast majority of households to rely on individual sanitation systems whose cost remains out of reach for the poorest half of the urban population. The lower frequency of household waste collection most likely reflects a public service deficit. This finding is consistent with the work of Andrianisa *et al.* (2016) which shows that in Abidjan, the weakness of formal pre-collection in certain areas has encouraged the emergence of informal waste collectors as a palliative response by households, and with data from the African Development Bank [13] according to which a significant share of waste generated in the Abidjan metropolitan area still escapes formal collection. The resulting accumulation of waste in Williamsville III constitutes a public health risk factor. Indeed, irregular collection of biodegradable household waste in the Ivorian urban context promotes the proliferation of disease-carrying parasites [14,15].

5 CONCLUSION

This study highlighted that access to water, water quality, associated hygiene practices, and sanitation conditions within the living environment do not constitute independent dimensions but rather form a chain of compounding constraints in Williamsville III, while remaining broadly under control in Palmeraie. These inequalities will require priority interventions targeting water service continuity and the improvement of sanitation infrastructure in precarious neighborhoods of Abidjan, and more particularly in Williamsville III.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

The authors confirm that informed consent was obtained from all participants and that all identifying details have been anonymized.

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