

# Analysis of Factors Associated with the Availability of Water, Hygiene and Sanitation Services in Schools: an Analytical Study in Schools in the Commune of Makiso in the Province of Tshopo, DRC

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## Summary

**Introduction:** Limited access to water and toilet facilities in schools increases the exposure of the school population to diseases related to hydro-fecal hazard. The objective of this study was to assess the factors associated with the availability of Water, Hygiene and Sanitation (WASH) services in schools in the city of Kisangani.

**Methods:** a cross-sectional study with analytical aims was conducted in 10 schools in the commune of Makiso, with 422 students and 120 teachers, during the period from September 1 to November 30, 2024. Pearson's chi-square test was used to investigate factors associated with EHA service availability.

**Results:** 25% of schools had a sanitation brigade. Almost all schools had toilets (98%), the most common number being 3 to 4 toilets (48%), 52% of schools lacked urinals and 100% did not have ramps for students with disabilities. School waste was more often disposed of by open burning (86%) and 48% of schools had farming equipment. The availability of Water, Hygiene and Sanitation (WASH) services was significantly high in schools in the denominational network and in those connected to the water distribution network (REGIDESO). The availability of farming equipment for sanitation work was significantly high in schools in the denominational network and almost zero for schools in the official network ( $p \leq 0.05$ ).

**Conclusion:** The WASH service meeting the standards is poorly available at school level, the school's network of belonging is a factor associated with the availability of this service.

**Keywords:** Water; Hygiene; Sanitation; Schools; Kisangani; DRC

## Introduction

In the world, according to the World Health Organization WHO (2022), many schools are located in communities where there is a high prevalence of diseases due to unsafe drinking water. Globally, only 70% of schools have drinking water services and 29% of schools do not [1].

In 2021, the joint WHO and UNICEF report shows that 546 million children did not have access to a basic drinking water supply service at school; 258 million children did not have access to basic sanitation services at school, others among them had access to an improved drinking water point but without available water; 288 million still did not have access to a water supply service in their schools [2].

One in three primary schools and one in four secondary schools lack basic sanitation services and 539 million schoolchildren lack access to safe drinking water [2].

In developing countries, when WASH targets are not met, an estimated 1.9 billion school days are lost each year. Without adequate water supply infrastructure, handwashing facilities and toilets, diseases develop and spread rapidly, and the school environment becomes a high-risk space for students and teachers due to lack of drinking water, inadequate sanitation, lack of hand hygiene practices and an unsanitary school environment [3].

In Sub-Saharan Africa, nearly half of schools (49%) do not have access to safe drinking water, 44% of schools do not have latrines and 27% do not have handwashing points in schools [3].

For menstrual hygiene, only 36% of schools have menstrual hygiene facilities in Sub-Saharan Africa [3].

A study conducted in Cameroon (2019) reports that the person/latrine cabin ratios are 171 cabins for 1250 users, teachers have neither training nor teaching materials in the field of WASH [4].

In a study conducted in Bamako schools (2020) on hygiene and sanitation, 86.7% of latrines were observed, 55.8% of water stations/jars were present and 67.3% of hand washing facilities were observed [5].

In Benin (2020), A study conducted in the communes of Zè and Lalo showed that 53% of schools in the commune of Zè and 46% of schools in the commune of Lalo do not have a water source; 100% of schools in the commune of Zè have at least one latrine module, 23% of schools in Lalo do not. 68% of schools in the commune of Zè have hand-washing facilities, while it is 53% in the commune of Lalo [6].

In the Democratic Republic of Congo, the water, hygiene, and sanitation (WASH) situation in schools is worrying and presents several major challenges: A large number of schools, especially in rural areas, do not have drinking water points. Existing sources, often rivers or shallow wells, are often contaminated. Even when water is available, the quantity is often insufficient to meet the needs of students and staff.

The results of a study conducted in Kinshasa in the DRC showed that only 33.8% of schools had a drinking water point, 74.2% of schools had staff responsible for hygiene and sanitation and that 90.04% of rubbish bins did not exist in schoolyards [7].

In Kisangani, schools operate in a socio-economic environment similar to that of Kinshasa, on the one hand, also in the context where the National Program for Sanitized School and Village (NPSSV) is failing, the water supply is irregular, the proliferation of schools is taking place without respect for environmental standards and the galloping number of students in schools, on the other hand, qualitative and quantitative inadequacies of WASH services in schools are evident.

In view of the consequences that this may cause, this study is conducted with the objective to assess the factors associated with the availability of WASH services in schools in the city of Kisangani in order to guide improvement strategies adapted to local realities.

## **Materials and Methods**

### ***Study site***

This study is conducted in the urban commune of Makiso, one of the six communes of the city of Kisangani. The commune of Makiso alone has 125 primary schools (including 40 official, 85 private), 140 secondary and vocational schools (including 37 state, 27 conventional and 76 private).

### ***Study population***

It is made up of schools in the commune of Makiso, in the city of Kisangani in the province of Tshopo, represented by students and teachers.

### ***Type and period of study***

This is a cross-sectional study with analytical aims conducted in schools in the commune of Makiso during the period from September 1 to November 30, 2023.

### ***Sampling***

Our total sample size was 422 students and 120 teachers.

To determine the number of subjects to be included in the study, we used the SCHWARTZ formula as follows:  $n = Z^2 p * q / d^2$ .

Considering the coefficient  $Z = 1.96$ ;  $p$  as the proportion of students attending a school with availability of Water, Hygiene and Sanitation service which is unknown ( $p$  estimated at 0.50); with the margin of error ( $d$ ) estimated at 0.05 and an anticipated non-response rate of 10%, the sample size was 422 subjects.

For convenience, we decided to conduct the study in 10 schools and to survey 12 teachers per school. These schools were selected at random from the exhaustive list of all schools in Makiso commune, regardless of their network affiliation.

We carried out two draws: the first to select the 10 schools where 422 students were surveyed and the second draw to select 10 schools where 120 teachers were surveyed. The 422 students were evenly distributed among the 10 selected schools.

At each school level, we selected the students by drawing up an exhaustive list of all final year students and a simple random draw of 42 students.

At the target school level, 12 teachers were also selected at random from the list of all teachers.

Included in our study were any student or teacher selected at random, present at school on the day of the survey and having expressed an interest in participating voluntarily in our study.

### ***Data collection technique***

Data collection was carried out using guided interview techniques with students and teachers using an interview guide and direct observation of water, hygiene and sanitation facilities and equipment, using an observation grid.

### ***Data analysis technique***

The collected data were organized in an Excel database that was exported to STATA 15 for analysis. Descriptive statistics were performed as proportions for categorical variables and mean  $\pm$  standard deviation for quantitative variables with symmetric distribution. The search for factors associated with WASH services was carried out using Pearson's chi-square test at the 5% threshold.

### Ethical considerations

This study was authorized by Field trip to the Faculty of Medicine and Pharmacy of the University of Kisangani and the Kisangani Educational Subdivision. Participation in the study was voluntary with informed consent. Anonymity was guaranteed from data collection to dissemination of results.

### Results

<i>Variables</i>	<i>Terms and conditions</i>	<i>Frequency</i>	<i>Percentage</i>
<b>Students N=421</b>			
School's membership network	Official	84	20
	Confessional	295	70
	Private	42	10
Age (Mean ± SD) Years	16.5 ± 1.2		
Sex (N=421)	Male	202	48
	Female	219	52
Level of study	1st Humanity	60	14
	2nd Humanity	66	16
	3rd Humanity	174	41
	4th Humanity	121	29
<b>Teachers N=120</b>			
School's membership network	Official	12	10
	Confessional	48	40
	Private	60	50
Age (Mean ±SD)	39.1±10.9		
Sex	Male	100	83
	Female	20	17
Qualification	State Diploma	10	8
	Graduated	36	30
	Licensed	74	62
Function	Head of establishment	3	3
	Director (Study/Discipline)	3	3
	teacher	114	94

**Table 1:** Characteristics of respondents.

This table shows that students from the religious network and teachers from the private network were in the majority. The gender of the students was evenly distributed. On the other hand, male teachers were dominant. The average age of the students was 16.5 ± 1.2 years and that of the teachers was 39.1 ± 10.9 years. 3rd year students in the humanities and teachers at the bachelor's level of study were more represented.

<b>Variables (N=120)</b>	<b>Terms and conditions</b>	<b>Frequency</b>	<b>Percentage</b>
Existence of sanitation brigade (N=120)	Yes	30	25
	No	90	75
Existence of hygiene courses (N=120)	Yes	55	46
	No	65	54
Qualification of hygiene course teacher (N=55)	D6 graduate	3	5
	Graduated	21	38
	Licensed	30	55
	Other (Lawyer)	1	2
Toilet availability (N=120)	Yes	118	98
	No	2	2
Number of toilets per school (N=118)	1 to 2	47	40
	3 to 4	57	48
	5 to 8	14	12
Presence of urinal	Yes	58	48
	No	62	52
Existence of ramps for students with disabilities	Yes	0	0
	No	120	100
People responsible for maintaining toilets and courtyards (N=118)	Hygiene agents	26	22
	Daily labor	48	41
	Other	44	37
Waste disposal techniques	Open air burning	103	86
	Burial	17	14
Availability of agricultural equipment for maintenance	Yes	58	48
	No	62	52

**Table 2:** Organization of WASH activities in schools.

It follows from this table that a quarter of schools had a sanitation brigade, hygiene courses were absent from the curriculum of more than half of schools, where this course existed, more than half of the teachers were at the bachelor's level. Almost all schools had toilets, the most represented number being 3 to 4 toilets, almost half of schools had no urinals and no school had ramps for students living with disabilities. The people responsible for maintenance were more day laborers. School waste was more disposed of by open burning and almost half of schools did not have farming equipment for sanitation work.

<b>Variables N=421</b>	<b>WASH service availability</b>		<b>P value</b>
<b>Membership network</b>	<b>Yes N=105</b>	<b>No N=316</b>	<b>0.001*</b>
Confessional	27 (26)	226 (81)	
Official	25 (24)	59 (19)	
Private	53 (50)	31 (10)	
<b>Water source</b>			
Regideso	89 (85)	223 (70)	<b>0.022*</b>
Improved sources	12 (11)	60 (19)	
Unimproved sources	3 (3)	31 (10)	

Other	1 (1)	2 (1)	
<b>Variables N= 120</b>	<b>Existence of a sanitation brigade</b>		<b>P. value</b>
<b>Membership network</b>	<b>Yes N=32</b>	<b>No N=88</b>	<b>0.129*</b>
Confessional	8 (25)	40 (45)	
Official	4 (12)	8 (10)	
Private	20 (63)	40 (45)	
<b>Variables N= 120</b>	<b>Availability of agricultural equipment</b>		<b>P. value</b>
<b>Membership network</b>	<b>Yes N=58</b>	<b>No N=62</b>	<b>0.001*</b>
Confessional	33 (57)	15 (24)	
Official	2 (3)	10 (16)	
Private	23 (40)	37 (60)	

\*Pearson chi-square test.

**Table 3:** Analysis of factors associated with the availability of WASH services, sanitation brigade and agricultural equipment for school sanitation work.

The availability of WASH services was significantly high in schools in the private network and in those connected to the water distribution network (REGIDESO). The availability of agricultural equipment for sanitation work was significantly high in schools in the denominational network and almost zero for schools in the official network ( $p \leq 0.05$ ).

## Discussion

### Characteristics of respondents

In our study, students from the religious network (70%) and teachers from the private network (50%) were in the majority. The gender of the students was equally distributed, however, male teachers were dominant (83%). The average age of the students was  $16.5 \pm 1.2$  years and that of the teachers was  $39.1 \pm 10.9$  years. 3rd year students in humanities (41%) and teachers with a bachelor's degree (62%) were more represented.

Studies conducted on access to water, hygiene and sanitation by the World Bank, UNESCO, SADC (Southern African Development Community) and WASH Maters (an organization working to improve access to water, hygiene and sanitation in schools in Southern Africa) have not disaggregated data based on school networks. However, Studies on WASH in schools in sub-Saharan Africa involve schools from different networks of affiliation, reflecting the diversity of education systems in the region: public, denominational and private schools [8]. This reflects the realities in the city of Kisangani.

### Organization of WASH activities in schools

#### Sanitation Brigade at School Level

This study shows that 25% of schools had a sanitation brigade.

In West Africa, a study on school sanitation and health found that the prevalence of sanitation brigades varies considerably from country to country. In Mali, only 20% of schools had functional sanitation brigades, while in Senegal, this figure was 70% [9].

In Ethiopia, a study by Assefa et al. on factors influencing the use of improved pit latrines found that the presence of sanitation brigades is an important factor influencing the use of improved pit latrines. Students attending schools with functioning sanitation brigades were 2.5 times more likely to use improved pit latrines than schools in areas without functioning sanitation brigades [10].

In relation to the presence of health brigades, our results are close to those found in Mali (20%) but further from those observed in Senegal (70%).

In the DRC, A study found that the presence of sanitation brigades in schools is an important factor influencing students' use of latrines. Schools have latrine usage rates higher than 80% in schools without sanitation brigades [11]. It is important to revitalize sanitation brigades in all schools to ensure a clean environment.

The situation regarding school sanitation brigades varies considerably from country to country and even from city to city. Further research is needed to better understand the factors that influence the presence and effectiveness of sanitation brigades.

### ***School Hygiene Education Program***

In this study conducted in the city of Kisangani, it was found that more than half of schools (54%) did not have a hygiene education course in their curriculum.

In Senegal, the results of the impact evaluation of a hygiene education program carried out by Diop A et al. (2022) showed a significant improvement in students' knowledge, attitudes and practices regarding hygiene and sanitation [12].

In Ivory Coast, Konan, et al (2021) studied the effects of an educational intervention on menstrual hygiene among adolescent girls in schools and at the end of this study an improvement in knowledge of 28% to 86% was observed, an increase in the use of appropriate menstrual products of 32% to 78% and a decrease in absenteeism of girls during menstruation of 25% to 10% [13].

Research conducted in schools shows that health education is a powerful tool for improving student health. By influencing their knowledge, attitudes, and behaviours regarding hygiene, these programs contribute to overall well-being. It is important to integrate hygiene education programs into all schools.

### ***Availability of sanitary facilities***

Almost all schools (98%) had toilets, the most common number being 3 to 4 toilets (48%); 48% of schools did not have urinals and no school had ramps for students with disabilities.

WHO and UNICEF have published detailed guidelines on the availability of toilets in schools as part of the WASH (Water, Sanitation and Hygiene) programme. These guidelines aim to ensure that all schools have adequate and safe sanitation facilities to promote the health and well-being of students [14].

WHO/UNICEF recommended standards stipulate 1 cubicle for every 25 girls and 1 cubicle for every 50 boys. Latrines must be accessible to all students, including children with disabilities. Latrines must provide adequate privacy and security for students, with lockable doors and sufficient lighting. They must be kept clean and hygienic, with an adequate water supply for handwashing and waste disposal [14]. However, guidelines related to the number of urinals are not defined in the WHO and UNICEF report.

However, the WHO/UNICEF Water, Sanitation and Hygiene (WASH) guidelines state that toilets and urinals must provide privacy, especially for children over eight years of age. This means that urinals should be installed in separate stalls or in areas with sufficient space to ensure students' privacy. Access to hygienic and functional urinals is a right for all students. Schools must ensure their availability, regular maintenance, and an adequate water supply [14].

The major challenges in the area of school infrastructure concern the number of facilities and their maintenance.

### ***Ramps for people with disabilities***

Regarding ramps for people with reduced mobility, they are completely absent in schools in the city of Kisangani.

A study conducted by UNESCO (2021) found that students with disabilities who have access to accessible schools, including ramps, are more likely to attend school and have better academic results and that ramps can improve the participation of students with disabilities in academic and social activities [15].

In England (2019), a study in primary schools found that students with disabilities who have access to ramps are more likely to participate in classroom and play activities and that ramps can improve students with disabilities' social interactions with their peers [16].

A study conducted at the University of Toronto (2019) found that access ramps are considered an important element of school accessibility. Students reported that access ramps allow them to move around the school more easily and participate fully in school life [17].

The French National Ministry of Education guide (2017) recommends that all schools be equipped with access ramps to ensure access for students with disabilities. This guide also provides advice on the design and construction of accessibility-compliant access ramps [18].

In sub-Saharan Africa, the World Bank's study on inclusive education found that sub-Saharan African countries that invested in building school ramps saw an increase in the number of students with disabilities enrolled in school and that ramps can reduce absenteeism rates for students with disabilities [8].

### ***Waste management***

School waste was most often disposed of by open burning (86%) and almost half of schools (52%) did not have farming equipment for sanitation work.

Several studies conducted around the world have highlighted the importance of having sufficient trash cans in schools to promote a healthy environment:

A UNESCO study (2020) found that in low-income countries, only 30% of schools had sufficient trash cans. Another World Bank study concluded that the lack of trash cans in schools is a risk factor for the spread of diarrheal diseases. The ideal number of trash cans in a school depends on several factors, such as the size of the school, the number of students, and the amount of waste generated. However, some studies have suggested that there should be at least 1 trash can for every 10 students [19].

Trash cans should be placed in strategic locations, such as school entrances and exits, hallways, classrooms, playgrounds, and cafeterias. They should be easily accessible to students and maintenance staff.

Studies in Africa have also shown that the number of trash cans in schools is often insufficient. One study in Ghana found that only 20% of primary schools had sufficient trash cans. Another study in Kenya found that a lack of trash cans in schools was associated with an increase in malaria cases [20].

Open burning of waste can release hazardous air pollutants, such as dioxins, furans and fine particles, which can harm the health of students and the environment and can pose a fire hazard, especially during dry seasons with strong winds.

Open burning of school waste is a widespread practice in many parts of the world, but its impact on health and the environment is a growing concern.

According to WHO (2021), based on a study on the impact of open burning in schools, children living near open school incinerators were 40% more likely to suffer from respiratory symptoms such as coughing, wheezing, and bronchitis. Exposure to smoke from open burning of school waste was also associated with an increased risk of pneumonia and other respiratory infections [21].

It is important to strengthen waste management standards in schools to require the construction of incinerators in order to protect the school environment from the risk of air pollution.

### ***Analysis of factors associated with the availability of WASH services***

Water availability in schools was only 25%, represented by the vast majority of connections to the Regideso distribution network (85%).



Analysis of factors associated with WASH service availability showed a significantly high presence in schools in the private network and in those connected to the water distribution network. The availability of agricultural equipment for sanitation work was significantly high in schools in denominational networks and almost zero for schools in the official network ( $p \leq 0.05$ ).

The problem of water availability in schools is critical and far from being resolved.

In a 2020 UNICEF report on WASH, 32% of secondary schools in low-income countries lacked sanitation facilities, 29% of primary schools and 17% of secondary schools lacked accessible and adequate drinking water for primary school children [22].

In the DRC, a study conducted by UNICEF in 2019 in primary schools in the official network of the city of Kinshasa revealed that access to drinking water, sanitation and hygiene was still far from international standards [23].

Through the National School Hygiene Program (PNHS) implemented by the Ministry of Education, studies and awareness-raising activities on the importance of water, hygiene and sanitation in all networks were carried out across the country. Among the faith-based networks, Caritas Congo, the Catholic Church's charitable organization in the DRC, had carried out studies and implemented programs to improve access to water, hygiene and sanitation in Catholic schools [24].

The Church of Christ in Congo (ECC) had also carried out awareness-raising activities on EHA in its schools [25].

The Ministry of Education, in collaboration with its partners, has conducted studies and implemented programs to improve WASH in public schools in the city of Kisangani [26].

In the city of Kisangani, the results of the study conducted by UNICEF in 2010 in schools in the official network on WASH had revealed that access to drinking water, sanitation and hygiene was insufficient in many schools, particularly in outlying areas [27].

In our study, the WASH situation in the private network is statistically better than in schools in the official and denominational networks.

Despite the existence of a joint government program through the Ministry of National Education, the mobilization of resources to support activities is not the same among the different school managers. Increasingly, private institutions are organizing to offer frameworks that are more or less competitive compared to religious and state managers, who have long been recognized as the main actors in social work in the DRC. With market competition, private institutions are working to improve conditions with the presumption of correcting the shortcomings observed by the chaotic management of governments.

Schools with access to water have the necessary assets to improve sanitation and hygiene than those without.

Access to water, hygiene and sanitation in schools remains a significant challenge to be addressed in view of the consequences that the absence of this service can cause, exposure of the school population to diseases linked to hydro-fecal hazard. The DRC government must develop local policies with partners to subsidize the connection of schools to the municipal water distribution network and carry out regular inspection missions on the quality of its WASH services throughout the school year.

## Conclusion

Schools operate in an environment where sanitation conditions are not properly ensured. Access to water and the network of ownership influence WASH services. Awareness-raising actions must extend to all educational networks to create ideal conditions for children to flourish.

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