



RESEARCH ARTICLE

## Spatial and Social Factors Influencing Open Defecation in Part Of Abeokuta South Local Government Area of Ogun State.

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### Abstract

*Open defecation remains a major public health challenge in Nigeria, affecting both urban and rural areas due to rapid population growth, urbanization, and inadequate infrastructure. Limited access to sanitation facilities increases exposure to waterborne diseases and environmental contamination. This study examined the spatial and social factors influencing open defecation in parts of Abeokuta South Local Government Area, Ogun State, using a mixed-methods approach. A structured questionnaire was administered to fifty respondents through purposive sampling to assess social drivers, while geospatial analysis evaluated the proximity of open defecation sites to public toilets and water bodies. Results revealed that distances from open defecation sites to the nearest public toilets ranged between 0.344 km and 1.543 km, far exceeding the WHO/UNICEF recommended walking distance of 100–250 m and 50 m in urban settings. Social findings showed that 76% of respondents had access to sanitation facilities, comprising 40% pit latrines and 36% water system toilets, while 24% relied mainly on boreholes and wells for water supply. Cultural beliefs were identified as a relatively weak influence. Only 18% of respondents perceived cultural beliefs as responsible for open defecation, 38% believed they contributed, and 44% were uncertain, suggesting culture is not a primary determinant in the study area. The study therefore recommends the construction of additional public toilets close to markets, motor parks, and other public centers to address accessibility challenges in Abeokuta, Ogun State, Nigeria.*

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## 1. INTRODUCTION

### 1.1 Background to the Study

Open defecation refers to the disposal of human excreta in open spaces such as fields, waterways, footpaths, uncompleted buildings, markets, and under bridges instead of in hygienic, enclosed sanitation facilities. Contrary to common assumptions, this practice is not limited to rural or uneducated populations; it is prevalent in urban centers, tertiary institutions, business districts, and residential areas across Nigeria. Despite sustained national and international efforts, progress in eliminating open defecation has been minimal, with only 14 out of Nigeria's 774 local government areas officially declared open defecation-free (Adepoju, 2019). The persistence of this practice has been widely linked to poverty, inadequate sanitation infrastructure, low awareness, and entrenched socio-cultural norms (Coffey *et al.*, 2014). Nigeria's sanitation crisis gained global attention in October 2019 when the country was ranked the highest contributor to open defecation worldwide, surpassing India (Punch, 2019). More recent evidence from the 2021 WASH National Outcome Routine Mapping (WASH NORM) survey indicates that about 23% of Nigerians still engage in open defecation (FMWR, 2021). These figures highlight the severity of sanitation and hygiene challenges in the country and underscore

their implications for public health, environmental quality, and human dignity. The lack of adequate sanitation infrastructure remains a major driver, particularly in rapidly growing urban and peri-urban areas where population growth has outpaced public toilet provision.

Open defecation poses serious public health risks, especially in low- and middle-income countries. It facilitates the transmission of infectious diseases such as diarrhea, cholera, and typhoid fever through the contamination of water, soil, and food sources (Mara, 2010). These risks are exacerbated in communities with limited access to water, sanitation, and hygiene (WASH) services. Children under the age of five are particularly vulnerable due to their developing immune systems and frequent contact with contaminated environments. Recurrent exposure to fecal pathogens contributes significantly to childhood morbidity and mortality, with diarrhea remaining a leading cause of death and poor growth outcomes among young children (UNICEF & WHO, 2023). Long-term exposure to unsanitary conditions may result in environmental enteric dysfunction, which impairs nutrient absorption and leads to stunting, cognitive delays, and weakened immunity (Saleem *et al.*, 2019).

Women experience additional health, safety, and psychosocial risks linked to open defecation. The absence of safe and private sanitation facilities often forces women to defecate in secluded areas at unsafe hours, increasing their exposure to harassment and sexual violence (Saleem *et al.*, 2019). Beyond physical insecurity, poor sanitation is associated with parasitic infections such as hookworm, which can cause anemia and pose significant risks during pregnancy. These challenges are further intensified by social expectations around modesty and privacy, which constrain women's sanitation choices. The public health consequences of open defecation are evident in Ogun State, particularly in Abeokuta. Several cholera outbreaks have been reported over the past decade, often following heavy rainfall events that wash untreated fecal matter into surface and groundwater systems. In 2022, outbreaks in Iberekodo and Sabo resulted in over 200 reported infections and at least 11 deaths, largely attributed to blocked drains and open defecation practices (Ogun State Ministry of Health, 2023). Studies have also confirmed elevated levels of fecal coliforms in groundwater sources in parts of Abeokuta, directly linked to nearby open defecation sites (Osinowo & Adeyemo, 2022).

Despite the existence of national policies and institutional frameworks aimed at eliminating open defecation, progress has been undermined by several systemic challenges. Chronic underfunding remains a major constraint; between 2021 and 2023, only ₦16 million was allocated to sanitation nationwide, far below the estimated USD 2.7–8.3 billion required to achieve national ODF status (BusinessDay, 2025). Weak enforcement of sanitation laws, poor coordination between key ministries, and limited capacity of environmental health officers further weaken implementation. Widespread poverty, with over 87 million Nigerians living in extreme poverty, limits households' ability to construct or maintain private toilets (World Bank, 2025), while low awareness and weak behavior-change communication continue to normalize open defecation in many communities (Ekhloragbon, 2024).

Infrastructure-related challenges also persist. In many rural and peri-urban areas, sanitation facilities are either absent or poorly maintained. Where toilets exist, issues such as long walking distances, user fees, overcrowding, lack of water, and inadequate privacy discourage their use (Ekhloragbon *et al.*, 2023; Alemu *et al.*, 2024). Even government-supported sanitation facilities often suffer from poor design, lacking doors, superstructures, or basic safety features, which undermines acceptability and sustained use (Adeoti *et al.*, 2024). While community-led total sanitation (CLTS) approaches have shown some success in mobilizing communities, their long-term effectiveness is limited by poverty, population pressure, and inconsistent government follow-through.

Importantly, the drivers of open defecation are not uniform across Nigeria. Studies show that the practice varies significantly by region, urban–rural location, education level, gender, and socioeconomic status (Abubakar, 2018). In urban areas such as Abeokuta South, where sanitation facilities exist alongside persistent open defecation, conventional explanations such as poverty and culture alone are insufficient. Factors such as the spatial location of toilets, their physical condition, accessibility to water, and user perceptions remain underexplored.

This study addresses this critical gap by integrating geospatial analysis with social perception data to better understand open defecation practices in part of Abeokuta South Local Government Area, Ogun State.

Specifically, the study seeks to identify and map locations where open defecation is practiced, assess the proximity of these sites to existing sanitation infrastructure, examine residents' perceptions of toilet condition, accessibility, and water availability, and identify the key factors driving the persistence of open defecation in the area. By combining spatial evidence with social insights, the study aims to generate context-specific knowledge that can inform targeted, effective, and sustainable sanitation interventions.

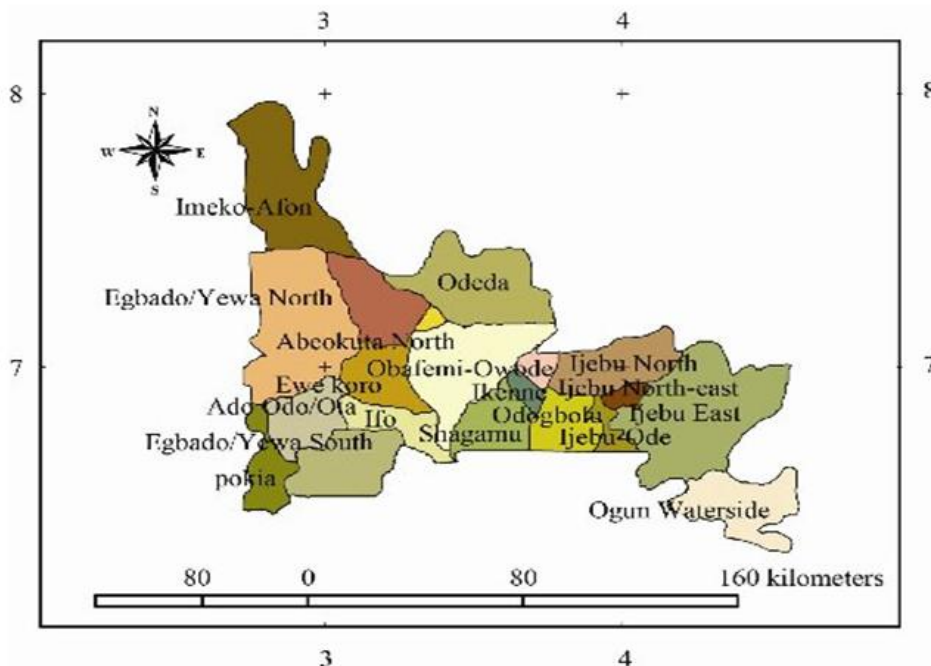
## 2. MATERIAL AND METHODS

### 2.1 Study Area

Abeokuta South Local Government Area (LGA) is in Ogun State, Nigeria, with its administrative center in Ake, Abeokuta. It covers about 71 square kilometers and had an estimated population of 250,278 as of the 2006 census (Towns & Villages, 2022). The area is mainly urban and peri-urban, consisting of residential, commercial, and institutional neighborhoods.

Although Abeokuta South is more developed than many rural areas in Ogun State, the region still faces significant challenges with water supply, sanitation, and waste management (Olapeju & Majid, 2019; Attah & Alausa, 2025). Many residents lack adequate access to functional household toilets, and existing public sanitation facilities are often poorly maintained. These issues contribute to open defecation and environmental pollution in some parts of the LGA. The problems are worsened by ineffective waste disposal and weak enforcement of sanitation laws, leading to health concerns such as frequent outbreaks of waterborne diseases (Local Government Secretariat, 2023; Daily Post, 2023).

Efforts to improve sanitation in Abeokuta South Local Government Area include government programs aligned with Sustainable Development Goal 6, which emphasize access to safe water and basic sanitation services. Community projects focusing on behaviour change and waste management have also been implemented. However, progress remains limited across the LGA. Further resources and coordinated actions are required to achieve universal access to safe sanitation by 2030 (Ogun State Water Supply and Sanitation Policy, 2023).



**Figure 1.** Map of Ogun State depicting its Local Government Areas (new.ogunstate.gov.ng, 2024)

## **2.2 DATA SOURCE**

This study employed a mixed-methods design using both quantitative and qualitative approaches to examine the spatial and social factors influencing open defecation in the study area. Quantitative data on the location of open defecation sites, water bodies, road networks, and sanitation facilities were collected and analyzed with remote sensing and Geographic Information Systems (GIS). Spatial data were used to produce maps showing the relationship between open defecation sites, sanitation infrastructure, household distribution, and nearby water bodies. Qualitative data were collected on the social factors influencing open defecation practices. A structured questionnaire was administered to households, and the responses were analyzed with descriptive statistics to identify the main socio-cultural, economic, and behavioral drivers of open defecation. The combination of spatial and social data provided a broad understanding of how environmental, infrastructural, and socio-cultural factors influence open defecation practices in the study area

### **2.2.1 Sampling Technique**

This study adopted a purposive sampling technique to select respondents who are directly affected by or involved in open defecation practices. Questionnaires were administered specifically to residents living in proximity to identified open defecation sites within Abeokuta South Local Government Area. This method ensured that data were collected from individuals with relevant experience and local knowledge, which is critical for understanding the underlying factors contributing to open defecation and the availability or absence of sanitation.

### **2.2.2 Data Collection**

This study collected two types of data: geospatial data and socio-economic data, to understand open defecation practices and the state of sanitation infrastructure in Abeokuta South Local Government Area.

### **2.2.3 Geospatial Data**

Geospatial data were collected using a handheld GPS device. The information gathered included the locations of open defecation sites, toilets, households, and rivers. These data were used to produce maps that show how close households are to sanitation facilities and open defecation sites, as well as their proximity to nearby rivers.

### **2.2.4 Socio-Economic Data**

Socio-economic data were obtained through interviewer-administered questionnaires directed at residents living near areas where open defecation is commonly practiced. The questionnaire collected information on residents' access to sanitation infrastructure, the condition of toilet facilities in their homes, their reasons for engaging in open defecation, and their awareness of its health effects.

## **2.3 DATA PREPROCESSING**

Data collected in this study were analyzed based on the research objectives, using both geospatial and descriptive methods. ArcGIS software was used for spatial analysis, while Microsoft Excel was used to summarize and interpret responses from the social survey.

### **2.3.1 Mapping of Open Defecation Sites and Public Toilets**

The administrative map of Abeokuta South was imported into ArcGIS and georeferenced to match real-world coordinates. This map defined the boundary of the study area for all spatial analysis. Road network and river shape files were also added and aligned using the same coordinate system to ensure they correctly matched their spatial position within the study area.

The locations of sanitation infrastructure were collected using handheld GPS devices and formatted into a CSV file. This file included the coordinates and attributes of each facility, including their current condition and

whether they were accessible or not. The locations of open defecation were mapped as polygon shape files to assess the spatial extent of the practice within the study area.

All geospatial layers were combined in ArcGIS to produce a composite map showing sanitation infrastructure, open defecation sites, road networks, and water bodies. This map provided a spatial overview of the distribution of key features within the study area, which served as the foundation for further analysis.

### **2.3.2 Proximity Analysis**

To assess how close open defecation sites are to existing sanitation infrastructure and nearby water bodies in Abeokuta South, this study used Euclidean Distance and Buffer Analysis in ArcGIS. The Euclidean Distance tool calculated the straight-line distance from each open defecation site to the nearest sanitation facility. This helped determine how far residents had to travel to access a public toilet. Based on standards used in urban sanitation planning, a threshold of 250 meters was used as a reference for a reasonable walking distance to sanitation services (WHO/UNICEF JMP, 2023). Locations beyond this distance were considered underserved.

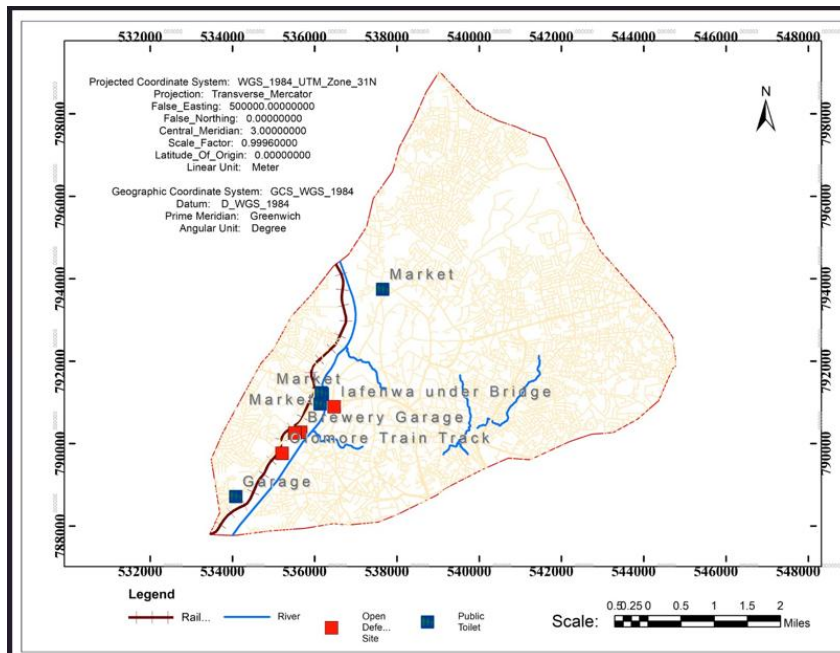
To examine the risk of contamination, Buffer Analysis was used to check how close open defecation sites are to surface water features like rivers and streams. A 100-meter buffer was created around all mapped water bodies. Any open defecation site falling within this buffer zone was flagged as a potential risk for water contamination, especially during rainfall when runoff is more likely.

This analysis helped identify which areas need urgent sanitation interventions, either because toilets are too far away or because open defecation poses a risk to nearby water sources.

### **2.3.3 Perception and Cultural Factors**

Data from the questionnaire were analyzed using descriptive statistics in Microsoft Excel. Responses were grouped to reflect people's attitudes toward public toilets, preferences between toilet use and open defecation, cultural beliefs around sanitation, and awareness of health risks. Frequencies and percentages were calculated to summarize the responses, while charts and tables were used to show patterns in the data. This part of the analysis helped to explain the nonphysical factors, such as social norms, stigma, or poor toilet conditions, which influence why people continue to practice open defecation even when facilities are nearby. Together, these insights were used to complement the geospatial findings and give a fuller understanding of the problem.

### 3. RESULTS



**Figure 2.** Geospatial Location of Open Defecation Sites and Sanitation Infrastructure.

The map in Figure 2 shows the location of public toilets and the locations where people openly defecate in the Abeokuta Local Government Area of Ogun State. The map visually reviewed the geospatial pattern of open defecation sites and the available toilets.

**Table 1.** Distance between Defecation Sites and Public Toilet

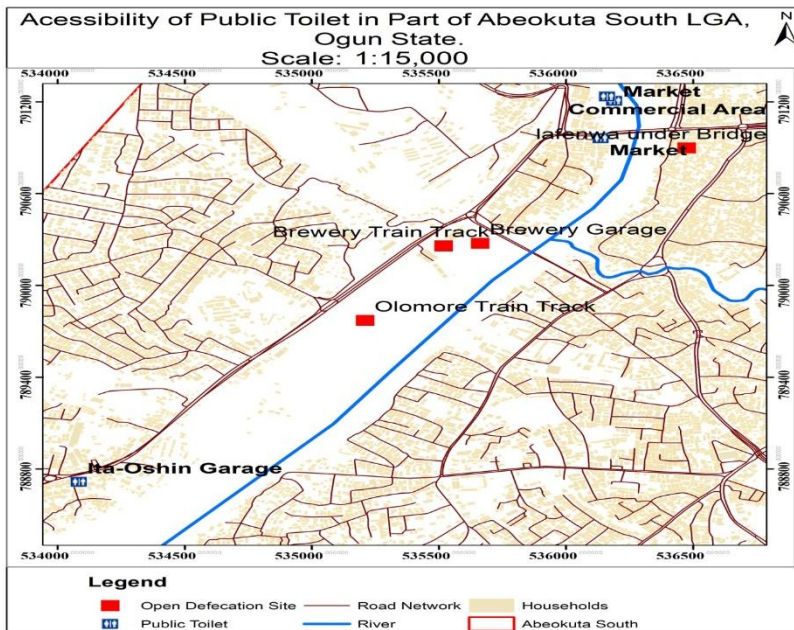
	Open Defecation Site	Distance to Nearest Public Toilet
1	Olomore Train Station	1.543km
2	Brewery Train Track	0.936km
3	Brewery Garage	0.834km
4	Lafenwa under bridge	0.344km

Table 1 shows the distance between regions where people openly defecate and the nearest toilet. The results in Figure 1 and table 1 revealed that public toilets in Abeokuta south Local Government Area (LGA) are farther than 100 to 250 metre walking standards recommended for shared sanitation facilities (WHO/UNICEF, 2023). The distance between the nearest public toilet and where people openly defecate in Abeokuta South ranges from 1.543 km at Olomore Train Station to 0.344 km at Lafenwa under Bridge. Three of the four sites identified in this study are farther than the 100–250 metre recommended walking distance for shared sanitation facilities (WHO/UNICEF, 2023). Even the closest site at Lafenwa exceeds the ideal 50-metre distance in an urban area (Sphere Association, 2018). The findings in this study indicate that public toilets are inaccessible within acceptable walking distances in Abeokuta South LGA of Ogun State.

These findings support existing studies that show distance to sanitation facilities influences open defecation practice. Sahoo *et al.* (2015) reported that far distances to toilets reduce their usage, particularly in low-income urban areas. Similarly, Kwaghe *et al.* (2020) found that households located beyond 250 metres from toilets in Nigeria were more likely to practice open defecation. The findings in this study aligns with the findings of previous studies. However, the persistence of open defecation at Lafenwa under the bridge despite having a public toilet at about 344 metres indicates that proximity alone is insufficient when facilities are poorly maintained or socially unacceptable, a point also noted by Saleem *et al.* (2019).

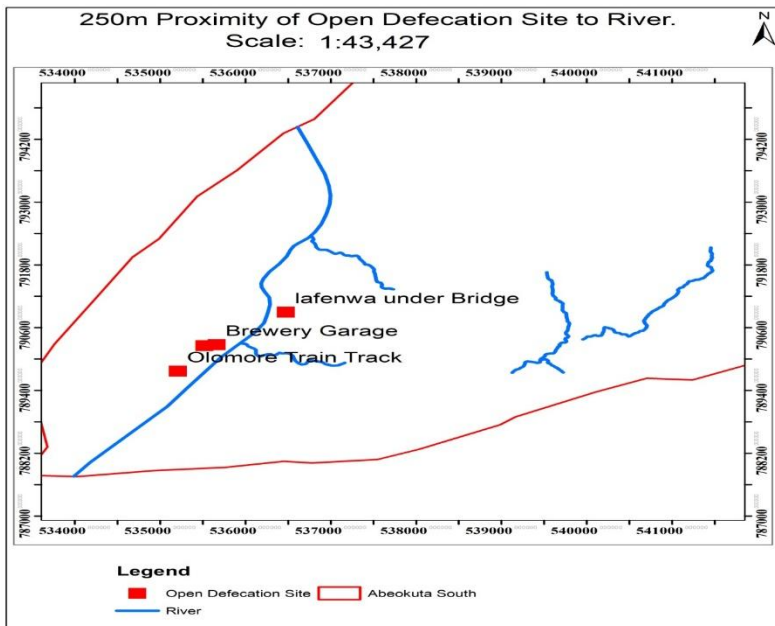
The findings highlight the need for strategic siting of sanitation facilities within walking distance of households, particularly in open defecation areas such as Olomore and Brewery. Public toilets should be sited at a close distance to areas where people openly defecate and should be maintained, as poor maintenance and unhygienic conditions can discourage use even when facilities are nearby (Saleem *et al.*, 2019). This approach would reduce reliance on distant or unsafe sites for defecation.

This study strengthens the environmental health and sanitation behavior framework. It provides empirical evidence of how distance and spatial accessibility influence open defecation in urban Nigeria. It confirms that physical access interacts with social and cultural drivers, consistent with Sahoo *et al.* (2015), who emphasized that infrastructural and behavioral factors must be addressed together for effective sanitation interventions.



**Figure 3.** Road accessibility of Sanitation Infrastructure.

Figure 3 shows the distribution of sanitation facilities across different populations in Abeokuta South. The result revealed that densely populated areas like Brewery Garage and nearby markets have only one or two public toilets, which cannot meet demand. This shortage, especially in busy areas, likely contributed to open defecation practice in the area. This is consistent with Olapeju & Olapeju (2022) that the key determinants of open defecation include lack of toilet access.



**Figure 4.** 250m Proximity of Open Defecation Sites to River.

The map in Figure 4 shows the distance of the open defecation site from the river. The map visually revealed that two of the four open defecation sites identified in this study are less than 250m from the river.

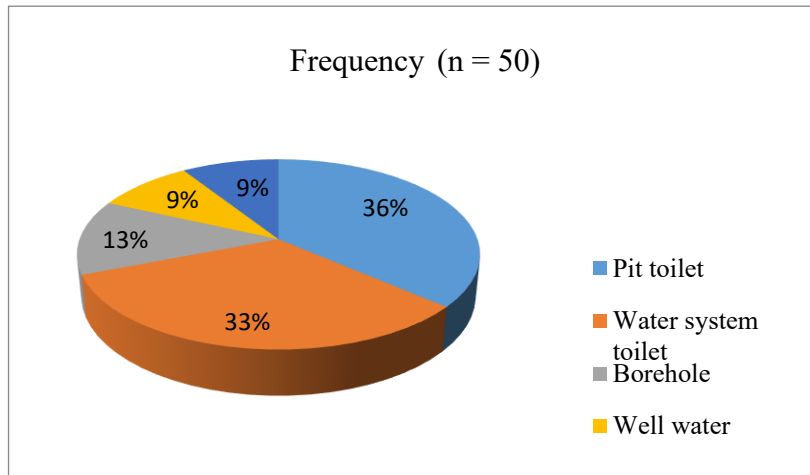
**Table 2.** Distance of the Open Defecation Sites from the River

S/N	Open Defecation Site	Distance to River
1	Olomore Train Station	344m
2	Brewery Train Track	250m
3	Brewery Garage	165 m
4	Lafenwa under the bridge	258m

The results of the proximity analysis showed that all open defecation sites in Abeokuta South are located close to rivers, ranging from 0.165 km (165 m) at Brewery Garage to 0.344 km (344m) at Olomore Train Station. These findings are consistent with reports from The Punch (July 11, 2018) and The Guardian (August 27, 2020) that communities along the Ogun River defecate along the river, which was reported to have caused a cholera outbreak with at least 10 people hospitalized in Lafenwa and Ita-Oshin areas. The proximity (165–250 m) of open defecation sites to rivers in Abeokuta South indicates a high risk of waterborne disease transmission, particularly during rainfall events that wash fecal waste into rivers.

**Table 3.** Access to Sanitation and Water Facilities

Facility Type	Frequency (n = 50)	Percentage (%)
Pit toilet	20	36.0
Water system toilet	18	33.0
Borehole	7	13.0
Well water	5	9.0
No facility available	5	9.0

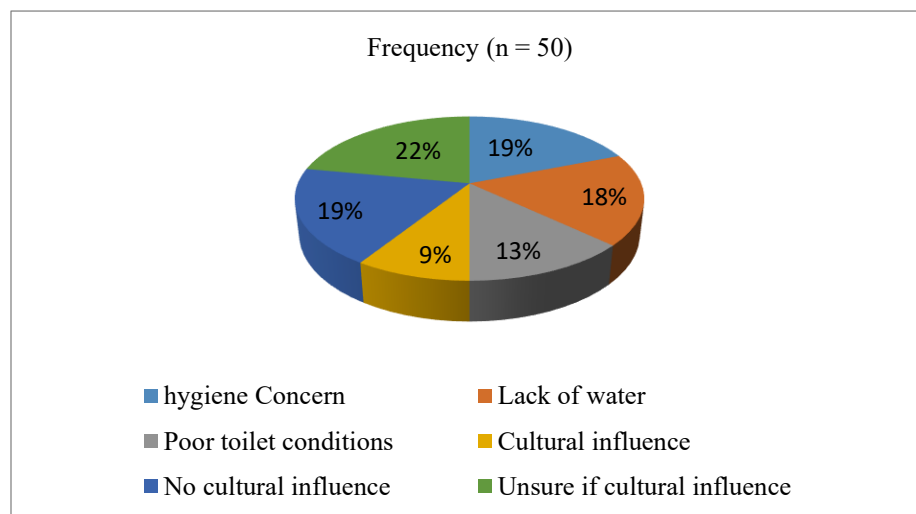


**Figure 5.** Access to sanitation facilities

Table 3 and Figure 5 show the number and percentage of respondents who have access to different sanitation and water facility types. The frequency analysis shows that out of 50 respondents, 76% reported having access to either pit latrines (36%) or water system toilets (33%). While only 24% of respondents have access to water facilities, which are essential for maintaining clean sanitation infrastructure. This includes 14% who rely on boreholes, 10% who use wells, and another 10% who reported having no sanitation facilities at all. The 10% and 14% reliance on well water and boreholes, respectively, may often be inadequate for supporting water-dependent sanitation systems. The findings also revealed a relatively higher use of pit latrines compared to water-based toilets. This suggests that infrastructural and economic constraints, particularly the limited availability of reliable water sources, have contributed to the continued practice of open defecation in Abeokuta South.

**Table 4.** Frequency of Reported Reasons for Practicing Open Defecation

Reason for Open Defecation	Frequency (n = 50)	Percentage (%)
hygiene Concern	19	38
Lack of water	18	36
Poor toilet conditions	13	26
Cultural influence	9	18
No cultural influence	19	38
Unsure if cultural influence	22	44



**Figure 6.** Reasons for Practicing Open Defecation

Table 4 and Figure 6 show the reasons cited for engaging in open defecation. The top reasons include concerns about toilet hygiene (38%), lack of water for toilet use (36%), and poor toilet conditions (26%). These findings suggest that open defecation in Abeokuta South is driven more by the perceived inadequacy of existing facilities rather than their absence. This supports the theory of functional use, which emphasizes the importance of usability and cleanliness alongside availability (Jenkins & Curtis, 2005).

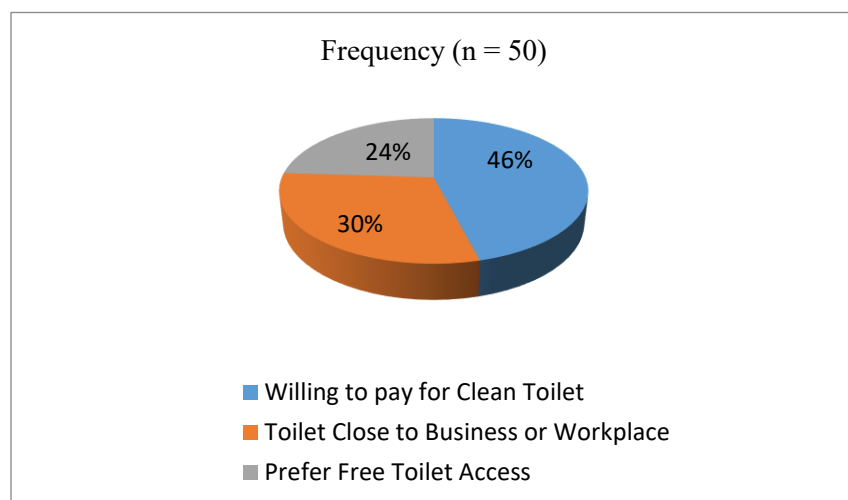
The findings indicate that increasing toilet numbers may not be enough without addressing hygiene standards and water access. Hygiene concerns were the most common reason for open defecation, with 38% of respondents citing this as a reason.

Cultural beliefs may not be the primary driver of open defecation in Abeokuta South. While 18% of respondents believed cultural beliefs encourage open defecation, 38% disagreed, and 44% were uncertain. This uncertainty suggests that cultural beliefs may play a limited role, and more information is needed to understand the factors influencing behavior.

The findings in this study suggest that access to clean toilets has a greater influence on open defecation than cultural norms. To address open defecation, sustainable management systems are needed, such as community-led cleaning initiatives or employing staff to maintain toilets. Further qualitative research is necessary to understand sanitation practices in Abeokuta South.

**Table 5.** Factors That Would Encourage Use of Public Toilets

Encouraging Factor	Frequency (n =50)	Percentage (%)
<b>Paid and clean toilets</b>	23	46.0
<b>Toilets located close to business areas</b>	15	30.0
<b>Free access to toilets</b>	12	24.0



**Figure 7.** Factors That Would Encourage Use of Public Toilets

Table 5 shows factors that will encourage the use of sanitation infrastructure other than open defecation. Among the 50 respondents, 46% were ready to pay for using sanitation infrastructure provided they are clean, 30% stated they would be more likely to use toilets if they were located nearby, while 24% preferred free access to toilets to encourage them to use them other than open defecation. The willingness to pay for clean toilets challenges the narrative that low usage is purely economic; instead, it reveals a value-for-quality perspective among users. This finding supports studies by Coffey *et al.* (2014), who argue that demand for sanitation is closely tied to factors such as cleanliness, privacy, and social acceptability, rather than just affordability. These findings suggest that policy and programmatic interventions should prioritize service quality over cost reduction, especially in commercial hubs where demand is higher. Interventions such as pay-per-

use sanitation models with ensured cleanliness and regular monitoring could enhance user adoption and contribute significantly to reducing open defecation practices in Abeokuta South.

**Table 6.** Perception of Health Risks Associated with Open Defecation

Perception of Health Risk	Frequency (n=50)	Percentage (%)
Open defecation is a health risk	42	84.0
Open defecation is not considered a health risk	8	16.0

Table 6 shows the perception of people living proximate to open defecation sites on the health risks associated with the practice. Out of the 50 respondents, 42 (84.0%) reported that open defecation is a health risk, while 8 (16.0%) reported that they do not consider it a health risk. This finding shows that most respondents are aware of the health implications of open defecation, including its association with diseases such as cholera, diarrhea, and other sanitation-related illnesses. The findings from this study suggest that the persistence of open defecation in Abeokuta South is not primarily due to a lack of awareness of its health consequences, but may instead arise from other factors such as inadequate access to sanitation facilities or socio-economic constraints.

#### 4. DISCUSSION

The results revealed significant spatial, infrastructural, and behavioural factors influencing open defecation in Abeokuta South LGA. Mapping showed that open defecation sites are located far beyond the recommended 100–250 m walking distance to public toilets (WHO/UNICEF, 2023), with distances ranging from 0.344 km to 1.543 km, making sanitation facilities largely inaccessible. Despite this, the persistence of open defecation at Lafenwa, even at 344m from a public toilet, highlights that proximity alone is insufficient when toilets are poorly maintained (Saleem *et al.*, 2019). Road accessibility analysis showed shortages of sanitation facilities in densely populated commercial areas such as Brewery Garage, consistent with findings by Olapeju & Olapeju (2022). Proximity assessment further revealed that all open defecation sites lie close to rivers (165–344m), posing severe risks of water contamination, consistent with reported cholera outbreaks along the Ogun River. Household survey results showed that 76% of respondents used pit or water-system toilets, but limited water access (24%) and reliance on boreholes/wells hindered effective sanitation. Major reasons for open defecation were hygiene concerns (38%), lack of water (36%), and poor toilet conditions (26%), indicating that facility quality influences behaviour more than cultural norms, aligning with Jenkins & Curtis (2005). Although 84% acknowledged the health risks of open defecation, the practice persists due to inadequate, inaccessible, or unhygienic sanitation facilities. Respondents highlighted that clean pay-per-use toilets (46%), conveniently located facilities (30%), and free access (24%) would encourage safer sanitation behaviour, supporting Coffey *et al.* (2014), who stressed cleanliness and acceptability over affordability. Overall, the study demonstrates that infrastructural inadequacies, poor facility management, and limited water access drive open defecation more than cultural beliefs, emphasizing the need for strategically located, well-maintained sanitation facilities to reduce the practice in Abeokuta South.

#### 5. CONCLUSION

This study demonstrates that open defecation in Abeokuta South LGA is primarily driven by spatial inaccessibility, inadequate sanitation infrastructure, poor facility conditions, and limited water availability rather than lack of awareness or strong cultural beliefs. Geospatial analysis revealed that most open defecation sites are located far beyond the recommended walking distance to public toilets, while proximity to rivers poses significant public health risks, including water contamination and disease outbreaks. Although the majority of residents recognize the health risks associated with open defecation, poor hygiene conditions, insufficient water supply, and inadequate maintenance of existing toilets discourage their use. The findings confirm that improving sanitation outcomes in urban Nigeria requires addressing both physical access and service quality to influence behaviour effectively.

## Recommendation

To reduce open defecation and improve access to safe sanitation in Abeokuta South, public toilets should be strategically located within 100–250 meters of high-risk areas, existing facilities should be rehabilitated and properly maintained, a reliable water supply must be ensured, GIS-based planning should be integrated into sanitation policies, and sustained community engagement alongside behavior change initiatives should be promoted.

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