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**Original Research Article**

# Comparative Assessment of Access to Safe Drinking Water, Sanitation and Handwashing Facilities in Selected Local Government Areas of Rivers State, Nigeria

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## Abstract

***Background:*** Access to safe drinking water, sanitation and handwashing facilities is unequal within Nigeria, but few studies compare local government areas (LGAs) with different levels of WASH compliance. We compared these services between compliant and non-compliant LGAs in Rivers State. ***Methods:*** A comparative cross-sectional study was conducted in four LGAs: Port Harcourt and Akuku-Toru (compliant) and Okrika and Emohua (non-compliant). In total, 422 adults were selected by multi-stage sampling, with a Cochran-based sample allocated in proportion to population, and interviewed using a structured questionnaire. Data were analysed with SPSS version 26 using frequencies, percentages and Pearson's chi-square test ($p < 0.05$). ***Results:*** Access to safe drinking water was reported by 94.9% of respondents in Port Harcourt, 93.9% in Akuku-Toru, 60.7% in Okrika and 50.0% in Emohua. Access to improved sanitation was 91.0%, 90.9%, 53.6% and 46.2%, and handwashing facilities with soap and water in public places were reported by 89.6%, 90.9%, 42.9% and 34.6%, respectively. Compliant LGAs had significantly higher access to safe drinking water (94.8% vs 55.6%), improved sanitation (91.0% vs 50.0%) and handwashing facilities (89.7% vs 38.9%) than non-compliant LGAs (all $p < 0.001$). ***Conclusion:*** Access to all three services was substantially better in compliant LGAs, with the widest gap in handwashing facilities. Closing these gaps in Okrika, Emohua and similar LGAs will require strengthening local WASH institutions as well as infrastructure.

**Keywords:** Safe drinking water; sanitation; handwashing facilities; WASH compliance; local government areas; Rivers State; Nigeria.

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## INTRODUCTION

Safe drinking water, adequate sanitation, and good hygiene are basic conditions for health and a central part of Sustainable Development Goal 6. Progress has been real but uneven. The latest Joint Monitoring Programme (JMP) report estimates that 2.1 billion people still lacked safely managed drinking water in 2024, 3.4 billion lacked safely managed sanitation, and 1.7 billion lacked basic hygiene services at home (WHO & UNICEF, 2025). Inadequate water, sanitation, and hygiene (WASH) remains an important cause of diarrhoeal disease and related deaths in low- and middle-income countries (Prüss-Üstün *et al*., 2019). Evidence from a recent systematic review shows that improving water quality, sanitation, and handwashing with soap can reduce diarrhoea in children (Wolf *et al*., 2022).

Nigeria is far from universal coverage. The 2021 WASH National Outcome Routine Mapping (WASHNORM) survey found that about 48 million Nigerians still defecated in the open, that only about one in ten people had access to water, sanitation, and hygiene services together, and that safe handwashing was practised by a small minority (UNICEF Nigeria, 2022).

Access is also unevenly distributed. Analysis of the 2018 Demographic and Health Survey showed that rural residents had lower odds of using an improved water source and an improved sanitation facility (Azeez *et al*., 2023), and that household water access varied by geopolitical zone, residence, and wealth (Okeniyi, 2024). National averages therefore hide differences that matter at the level of states and local governments, which are responsible for delivering services.

Rivers State, in the Niger Delta, combines a large, dense urban centre in Port Harcourt with riverine, coastal, and inland communities where piped supply is difficult to extend. In January 2025, suspected cholera killed nine people in Andoni and Akuku-Toru LGAs (The Guardian Nigeria, 2025), a reminder that WASH deficits translate quickly into outbreaks. Water quality problems have also been documented in different parts of the state, including contaminated water in Borokiri, Port Harcourt (Asemota *et al*., 2025) and faecal contamination of river water used by households in Ogoloma, Okrika (Stanley & Alali, 2018). The state's Ministry of Water Resources and Rural Development has classified LGAs by their institutional WASH capacity, including whether they have a functional WASH unit, an approved plan, budg*et al*location, and community engagement structures (Rivers State Ministry of Water Resources and Rural Development, 2023). On this classification, Port Harcourt and Akuku-Toru are compliant and Okrika and Emohua are non-compliant.

Whether this institutional classification corresponds to differences in what households actually experience is not well documented. Most Nigerian studies report single communities or national averages, and few compare LGAs with different levels of WASH compliance within the same state. This study therefore compared access to safe drinking water, improved sanitation facilities, and handwashing facilities with soap and water between the compliant LGAs (Port Harcourt and Akuku-Toru) and the non-compliant LGAs (Okrika and Emohua) of Rivers State, Nigeria.

# METHODS

## Study design

A comparative cross-sectional design was adopted to compare access to safe drinking water, improved sanitation facilities, and handwashing facilities with soap and water between two groups of Local Government Areas (LGAs) at a single point in time. Port Harcourt and Akuku-Toru were classified as compliant LGAs, and Okrika and Emohua as non-compliant LGAs. The study was quantitative, so that descriptive statistics and Pearson's chi-square tests could be applied at the 0.05 level of significance.

## Study area

The study was conducted in four of the 23 LGAs of Rivers State, a South-South state of Nigeria characterised by dense urban settlement, riverine and coastal communities, and inland rural areas. The LGAs were deliberately selected using the Rivers State Ministry of Water Resources and Rural Development's institutional assessments (Rivers State Ministry of Water Resources and Rural Development, 2023). Port Harcourt and Akuku-Toru had functional WASH units or departments, approved WASH plans, budg*et al*locations, and active community engagement structures. Okrika and Emohua largely lacked these features. Together, the four LGAs span urban, riverine, coastal, and peri-urban to rural settings, and cholera and other WASH-related health problems have been documented in both categories.

Within each LGA, communities were purposively selected on settlement type, documented WASH interventions or service gaps, population density, vulnerability to waterborne disease, and accessibility. Three communities were selected in Port Harcourt (Borokiri, Mile 3, and Amadi-Ama), one in Akuku-Toru (Abonnema), three in Okrika (Ogoloma, Abam-Ama, and Okochiri), and two in Emohua (Ogbakiri and Rundele).

## Study population

The target population was adult residents of the selected communities aged 18 years and above who had lived there continuously for at least six months. The estimated populations of the four LGAs were approximately 3,793,780 (Port Harcourt), 373,924 (Akuku-Toru), 319,700 (Okrika), and 289,200 (Emohua), giving a combined sampling frame of approximately 4,776,604 people.

## Inclusion criteria

Participants were eligible if they were permanent residents of a selected community, aged 18 years or older, had lived in the community for at least six months before data collection, and were willing and able to give informed consent.

## Exclusion criteria

People were excluded if they had lived in the community for less than six months, were younger than 18 years, declined consent, or gave incomplete responses after repeated clarification.

## Sample size determination

The minimum sample size for a large population was calculated with Cochran's formula (Cochran, 1977):

$$n_0 = \frac{Z^2 \times p \times (1 - p)}{e^2}$$

where Z = 1.96 for 95% confidence, p = 0.5 (the most conservative assumed proportion, because the true proportion was unknown), and e = 0.05. This gave $n_0$ = (3.8416 × 0.25) / 0.0025 = 384.16. A 10% allowance for non-response and incomplete questionnaires (38.4) was added, giving 422.6, which was rounded down to 422 respondents. The sample was allocated to LGAs in proportion to population: Port Harcourt 335, Akuku-

Toru 33, Okrika 28, and Emohua 26. The compliant LGAs therefore contributed 368 respondents and the non-compliant LGAs 54.

**Sampling technique**

A multi-stage sampling procedure was used. In stage one, the four LGAs were purposively selected on official compliance classification and ecological diversity. In stage two, communities were purposively selected as described above. In stage three, two wards or neighbourhoods per community were chosen by simple random sampling from the list of wards. In stage four, households were selected by systematic sampling: the sampling interval was the number of households in the ward divided by the number required, a random start was chosen, and every k-th household was selected. In stage five, one eligible adult per household was interviewed, chosen by simple random selection where more than one was eligible.

**Research instrument and data collection**

Data were collected using a structured, interviewer-administered questionnaire covering respondents' sociodemographic characteristics, access to improved drinking water, availability and functionality of sanitation facilities, and hygiene practices, including handwashing with soap and water. Section A captured sociodemographic characteristics, while Section B assessed access to improved drinking water, sanitation facilities, and handwashing facilities, including their availability and functionality. Direct observation of water points, latrines, and handwashing stations was carried out where feasible to verify self-reports, and LGA WASH plans and intervention reports were reviewed for context. Content and face validity were established by expert review in public health, environmental health, and WASH programming. The instrument was pre-tested among 30 respondents from a comparable non-study community. Reliability was assessed by test–retest after about two weeks and by Cronbach's alpha, with a coefficient of at least 0.70 regarded as acceptable.

**Method of data analysis**

Questionnaires were checked for completeness and analysed using Statistical Package for the Social Sciences version 26. Frequencies and percentages summarised respondent characteristics and WASH indicators for each LGA and for the compliant and non-compliant groups. Pearson's chi-square test of independence compared access to safe drinking water, improved sanitation, and handwashing facilities with soap and water between the two groups, with statistical significance set at $p < 0.05$.

**Ethical considerations**

Ethical approval was obtained from the Research Ethics Committee, Faculty of Basic Medical Sciences, Rivers State University (RSU/FBMS/REC/25/407). Informed consent was obtained from all participants after the study's purpose, procedures, potential risks, and benefits were explained in a language they understood. Participation was voluntary, and participants were free to withdraw at any time without penalty. Confidentiality was maintained by using identification codes instead of names, and all data were stored securely. The study was conducted in accordance with the principles of the Declaration of Helsinki (World Medical Association, 2013).

## RESULTS

**Sociodemographic characteristics of respondents**

All 422 targeted respondents were interviewed: 335 in Port Harcourt, 33 in Akuku-Toru, 28 in Okrika, and 26 in Emohua. Respondents were aged 20 to 50 years, and those aged 30–40 years formed the largest age group in every LGA. Tertiary education was most common in the compliant LGAs, whereas secondary education was most common in the non-compliant LGAs, where some respondents had no formal education (Table 1).

**Table 1: Socio-demographic characteristics of respondents by LGAs**

| Characteristic | Port Harcourt (n = 335) | Akuku-Toru (n = 33) | Okrika (n = 28) | Emohua (n = 26) |
|---|---|---|---|---|
| **Age group (years)** | | | | |
| 20–30 | 91 (27.2) | 9 (27.3) | 8 (28.6) | 7 (26.9) |
| 30–40 | 214 (63.9) | 21 (63.6) | 15 (53.6) | 14 (53.8) |
| 40–50 | 30 (9.0) | 3 (9.1) | 5 (17.9) | 5 (19.2) |
| **Gender** | | | | |
| Male | 183 (54.6) | 18 (54.5) | 14 (50.0) | 15 (57.7) |
| Female | 152 (45.4) | 15 (45.5) | 14 (50.0) | 11 (42.3) |
| **Highest education** | | | | |
| No formal education | 0 (0.0) | 0 (0.0) | 2 (7.1) | 1 (3.8) |
| Primary | 10 (3.0) | 2 (6.1) | 3 (10.7) | 3 (11.5) |
| Secondary | 80 (23.9) | 10 (30.3) | 15 (53.6) | 14 (53.8) |
| Tertiary | 245 (73.1) | 21 (63.6) | 8 (28.6) | 8 (30.8) |
| **Occupation** | | | | |
| Student | 81 (24.2) | 12 (36.4) | 10 (35.7) | 8 (30.8) |
| Farmer | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |

| Characteristic | Port Harcourt (n = 335) | Akuku-Toru (n = 33) | Okrika (n = 28) | Emohua (n = 26) |
|---|---|---|---|---|
| Trader | 132 (39.4) | 8 (24.2) | 11 (39.3) | 12 (46.2) |
| Civil servant | 122 (36.4) | 13 (39.4) | 7 (25.0) | 6 (23.1) |
| **Years lived in community** | | | | |
| 1–10 | 20 (6.0) | 2 (6.1) | 4 (14.3) | 5 (19.2) |
| 10–20 | 133 (39.7) | 13 (39.4) | 11 (39.3) | 10 (38.5) |
| 20–30 | 91 (27.2) | 9 (27.3) | 8 (28.6) | 7 (26.9) |
| 30–40 | 91 (27.2) | 9 (27.3) | 5 (17.9) | 4 (15.4) |
| **Marital status** | | | | |
| Single | 122 (36.4) | 12 (36.4) | 10 (35.7) | 9 (34.6) |
| Married | 203 (60.6) | 20 (60.6) | 15 (53.6) | 14 (53.8) |
| Divorced/separated | 10 (3.0) | 1 (3.0) | 1 (3.6) | 1 (3.8) |
| Widowed | 0 (0.0) | 0 (0.0) | 2 (7.1) | 2 (7.7) |

***Note: Values are presented as n (%).***

**Access to safe drinking water, improved sanitation, and handwashing facilities**

Access to all three services was higher in Port Harcourt and Akuku-Toru than in Okrika and Emohua (Table 2). Reported household access to safe drinking water was 94.9% in Port Harcourt and 93.9% in Akuku-Toru, compared with 60.7% in Okrika and 50.0% in Emohua. Pipe-borne water was the main source in the compliant LGAs, while respondents in the non-compliant LGAs relied more on wells, boreholes, and rivers or streams. Almost no respondents in the compliant LGAs used river or stream water as their main source, whereas about one in five did so in the non-compliant LGAs.

Access to improved sanitation facilities was reported by 91.0% of respondents in Port Harcourt and 90.9% in Akuku-Toru, against 53.6% in Okrika and 46.2% in Emohua. Most respondents in the compliant LGAs rated the cleanliness of sanitation facilities as excellent or good, while most in the non-compliant LGAs rated it fair, poor, or very poor.

Handwashing facilities with soap and water in public places were reported by 89.6% of respondents in Port Harcourt and 90.9% in Akuku-Toru, but by only 42.9% in Okrika and 34.6% in Emohua. This was the widest gap among the three services.

**Table 2: Access to safe drinking water, improved sanitation, and handwashing facilities by LGAs**

| WASH indicator | Response | Port Harcourt (n = 335) | Akuku-Toru (n = 33) | Okrika (n = 28) | Emohua (n = 26) |
|---|---|---|---|---|---|
| Household access to safe drinking water | Yes | 318 (94.9) | 31 (93.9) | 17 (60.7) | 13 (50.0) |
| | No | 17 (5.1) | 2 (6.1) | 11 (39.3) | 13 (50.0) |
| Primary source of drinking water | Pipe-borne water | 235 (70.1) | 24 (72.7) | 8 (28.6) | 5 (19.2) |
| | Borehole | 80 (23.9) | 7 (21.2) | 7 (25.0) | 7 (26.9) |
| | Well | 12 (3.6) | 1 (3.0) | 6 (21.4) | 7 (26.9) |
| | River/stream | 3 (0.9) | 0 (0.0) | 5 (17.9) | 5 (19.2) |
| | Others | 5 (1.5) | 1 (3.0) | 2 (7.1) | 2 (7.7) |
| Household access to improved sanitation facilities | Yes | 305 (91.0) | 30 (90.9) | 15 (53.6) | 12 (46.2) |
| | No | 30 (9.0) | 3 (9.1) | 13 (46.4) | 14 (53.8) |
| Cleanliness of sanitation facilities | Excellent | 190 (56.7) | 20 (60.6) | 4 (14.3) | 2 (7.7) |
| | Good | 105 (31.3) | 10 (30.3) | 6 (21.4) | 5 (19.2) |
| | Fair | 30 (9.0) | 2 (6.1) | 8 (28.6) | 7 (26.9) |
| | Poor | 8 (2.4) | 1 (3.0) | 7 (25.0) | 8 (30.8) |
| | Very poor | 2 (0.6) | 0 (0.0) | 3 (10.7) | 4 (15.4) |
| Handwashing facilities with soap and water in public places | Yes | 300 (89.6) | 30 (90.9) | 12 (42.9) | 9 (34.6) |
| | No | 35 (10.4) | 3 (9.1) | 16 (57.1) | 17 (65.4) |

**Compliant versus non-compliant LGAs**

The two compliant LGAs, Port Harcourt and Akuku Toru (n = 368) were compared with the two non-compliant LGAs, Okrika and Emohua (n = 54), the differences in access to safe drinking water, improved sanitation, and handwashing facilities with soap and water were all statistically significant ($p < 0.001$).

**Table 3: Comparison of compliant and non-compliant LGAs**

| Service | Compliant LGAs, n (%) | Non-compliant LGAs, n (%) | $\chi^2$ | p-value |
|---|---|---|---|---|
| Access to safe drinking water | 94.8 (349) | 55.6 (30) | 79.40 | < 0.001 |
| Access to improved sanitation | 91.0 (335) | 50.0 (27) | 62.04 | < 0.001 |
| Handwashing facilities with soap and water | 89.7 (330) | 38.9 (21) | 86.79 | < 0.001 |

***Note: All three tests are statistically significant at p < 0.05.***

## DISCUSSION

Access to drinking water differed considerably between the compliant and non-compliant LGAs. Respondents in the compliant LGAs relied predominantly on piped water, whereas those in the non-compliant LGAs reported greater dependence on wells, boreholes, and surface water. This agrees with national analysis of the 2018 Demographic and Health Survey, in which rural residents had lower odds of using an improved water source (Azeez *et al*., 2023), and with evidence that household water access varies by geopolitical zone, residence, and wealth (Okeniyi, 2024). It also aligns with the JMP's conclusion that inequalities within countries remain a major barrier to universal access (WHO & UNICEF, 2025).

Our results differ from those national analyses in one respect. Both treat settlement type as a main axis of disadvantage, yet Akuku-Toru, a riverine LGA, reported access comparable to that in Port Harcourt, the state's main urban centre. Residence alone therefore does not explain the gap, and institutional investment and service delivery appear to matter alongside it. Okeniyi (2024) recommended expanding borehole provision as a feasible option, which is consistent with the borehole use we saw in Okrika and Emohua. However, the type of source matters for safety. A study of groundwater in two Nigerian communities found that wells carried a higher sanitary risk and more faecal indicator bacteria than boreholes, and that unprotected well design features such as a faulty fence and a small apron were linked to contamination (Olalemi *et al*., 2023). Respondents in Okrika and Emohua used wells and boreholes together, and some also used rivers or streams, so reported access probably overstates the safety of the water they drink.

Reported access to a source is also not the same as access to safe water in the compliant LGAs. Contaminated water has been documented in Borokiri, Port Harcourt, where slow sand filtration was evaluated as a treatment option (Asemota *et al*., 2025), and faecal contamination has been reported in river water used for domestic purposes in Ogoloma, Okrika (Stanley & Alali, 2018). The first finding shows that a compliant, urban LGA can still have water quality problems, so the gap in safety between the two groups may be narrower than the gap in access. The second shows that the non-compliant LGAs rely on sources with documented contamination, which may widen it. Because inadequate water, sanitation, and hygiene contribute substantially to diarrhoeal disease in low- and middle-income countries (Prüss-Üstün *et al*., 2019), either possibility carries a health risk. Water quality testing is needed to settle this.

Improved sanitation followed the same pattern. Access was high in both compliant LGAs, whereas roughly half of households in the non-compliant LGAs lacked it, and respondents there rated the cleanliness of their facilities much lower. This is in line with the rural disadvantage in improved sanitation reported nationally (Azeez *et al*., 2023), although our comparison is between LGA types rather than rural and urban areas.

Our findings for Port Harcourt contrast with an earlier account of its waterfront communities, where most sanitation was privately owned hanging toilets discharging into the watercourse, pit latrines were generally absent, and tidal backwash returned waste to the settlements (Nwankwo, 2018). That account is a blog post from 2018 and not a peer-reviewed survey, so the comparison is indicative only. Several explanations are possible. Conditions may have improved since 2018. Our Port Harcourt sample also included inland neighbourhoods such as Mile 3, not only waterfront settlements. Finally, most Port Harcourt respondents had tertiary education, which may mean that our sample is better off than the waterfront residents described. The cleanliness ratings in the non-compliant LGAs add a further point: having a facility does not guarantee that it is hygienic, and maintenance depends on the local institutions and community structures that distinguish compliant from non-compliant LGAs.

The widest gap was in handwashing facilities with soap and water. In the non-compliant LGAs, most respondents reported that such facilities were not available in public places. This resembles the national picture, in which safe handwashing is practised by only a small minority of Nigerians (UNICEF Nigeria, 2022), and the situation in Nigerian primary schools, where many schools lacked designated handwashing stations and soap was absent from those assessed (Maani-Abuzahra *et al*., 2025). Across sub-Saharan Africa, limited handwashing facilities are common (Endalew *et al*., 2022), and only a minority of households wash their hands with essential agents (Tamene *et al*., 2023). Against this background, the high availability in Port Harcourt and Akuku-Toru stands out, and the non-compliant LGAs resemble the regional norm.

Two comparisons suggest that infrastructure, rather than willingness, may be the main barrier. In a pooled analysis of households, having a fixed

handwashing place was associated with higher odds of handwashing with essential agents (Tamene *et al*., 2023), and a systematic review of schools in sub-Saharan Africa linked hand hygiene practice to the availability of facilities and materials, and found that students generally reported moderate to good practice (Bishoge *et al*., 2023). If so, the facilities gap we found in Okrika and Emohua would limit hand hygiene even where behaviour is favourable. We did not measure handwashing behaviour, so this remains an inference.

One finding runs against the regional pattern. In the pooled analysis of 29 sub-Saharan African countries, urban households had higher odds of limited handwashing facilities (Endalew *et al*., 2022), whereas the more urban compliant LGAs in our study had better availability. The two sets of results are not directly comparable, because that analysis used household survey data and our indicator was availability in public places as reported by respondents. Even so, the contrast suggests that urban residence by itself does not secure hygiene infrastructure, and that local institutional capacity may matter more.

This study also found that households in the two LGAs classified as compliant, Port Harcourt and Akuku-Toru, had markedly better access to safe drinking water, improved sanitation, and handwashing facilities with soap and water than households in the two non-compliant LGAs, Okrika and Emohua. The differences were statistically significant for all three services, and the two LGAs within each group resembled each other closely. This suggests that the Ministry's institutional classification reflects real differences in what household's experience, and that the gap is not explained by one LGA alone.

### Strengths and Limitations

The study compared four LGAs with different institutional profiles within a single state, using the same instrument, which reduces differences caused by methods. Several limitations apply. Proportional allocation meant that the non-compliant LGAs contributed a much smaller sample than the compliant LGAs, which reduces precision for those groups. LGAs and communities were purposively selected, so the findings may not apply to every community in each LGA. Access and handwashing facilities were self-reported, and the handwashing indicator referred to public places rather than the household, so it is not identical to the JMP household indicator. Water quality was not tested, and the cross-sectional design cannot show that compliance caused the differences. Future work should include direct observation, water quality testing, and household-level hygiene measures.

## CONCLUSION

Access to safe drinking water, improved sanitation, and handwashing facilities with soap and water was substantially and significantly better in the compliant LGAs of Rivers State than in the non-compliant LGAs. Closing these gaps in Okrika, Emohua, and similar LGAs will require strengthening local WASH institutions as well as building infrastructure.

### Authors' Contributions

The authors contributed to the study design, data collection and analysis, manuscript drafting, and critical revision. All authors read and approved the final manuscript.

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**Conflict of Interest:** The authors declare that they have no conflict of interest.

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