

Impact of Community-Led Science Communication on Water Sanitation Practices Among Rural Communities in Taraba State, Nigeria

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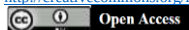
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ABSTRACT

Effective communication of scientific information remains central to improving public health outcomes in rural communities, yet many sanitation interventions in Nigeria continue to rely on top-down, one-way models of information transfer that do little to change deep-rooted behaviour. This study examined the effect of a community-led approach to communicating science on water sanitation awareness and practices among rural dwellers in Lau, Ardo-Kola, and Karim-Lamido Local Government Areas of Taraba State, Nigeria. Anchored on the dialogic and participatory models of science communication, the study adopted a quasi-experimental one-group pretest-posttest design. A multistage sampling technique was used to select 320 household heads, who responded to a structured, validated instrument titled the Sanitation Awareness and Practice Scale (SAPS) before and after an eight-week community-led science communication intervention comprising town-hall dialogues, trained community health champions, and local-language media messaging. Data were analysed using descriptive statistics (mean and standard deviation) to answer the research questions and a paired-samples t-test to test the null hypotheses at the 0.05 level of significance. Findings revealed a statistically significant increase in both sanitation awareness and sanitation practice scores following the intervention. The study concludes that community-led, dialogic science communication strategies are more effective than conventional awareness campaigns in changing rural sanitation behaviour because they position community members as active participants rather than passive recipients of scientific information. It is recommended that science educators, extension workers, and public health agencies in Taraba State institutionalise community-led communication structures including community health champions and town-hall dialogue sessions as a standard component of rural sanitation and science communication programmes.

Introduction

Science communication is the practice of conveying scientific knowledge, processes, and evidence to audiences beyond the research community in ways that inform understanding, shape attitudes, and, where necessary, support behaviour change. For decades, most science communication in Nigeria has followed what scholars describe as the deficit model, in which experts transmit information to a supposedly ignorant public through one-directional channels such as posters, radio jingles, and lectures. More recent scholarship has shown that this model rarely produces durable behaviour change, particularly on issues that are entangled with culture, tradition, and everyday survival, such as sanitation. Strategic and participatory approaches to science communication instead emphasise dialogue, two-way engagement, and the setting of clear, audience-centred objectives for public engagement (Besley & Dudo, 2022). Institutions that support inclusive, dialogic engagement have likewise been shown to strengthen the relationship between scientific expertise and the publics it is meant to serve (Kimbrell et al., 2022).

Water sanitation remains one of the most persistent public health challenges in Nigeria. National assessments have continued to document wide gaps in access to safe water and sanitation facilities between urban and rural households, with rural communities bearing a disproportionate burden of diarrhoeal disease, cholera, and other preventable infections (Federal Ministry of Water Resources, 2021). In response, the Nigerian government adopted the National Environmental Sanitation Policy to

guide sanitation promotion nationwide (Federal Ministry of Environment, 2021), and the federal "Clean Nigeria: Use the Toilet" campaign has mobilised states and local governments toward ending open defecation through community-led approaches, public awareness, and certification of open-defecation-free communities (The Borgen Project, 2025). Despite these policy efforts, rural sanitation behaviour in many parts of northern Nigeria, including Taraba State, has changed comparatively slowly, suggesting that the way sanitation science is communicated to rural audiences may matter as much as the infrastructure and policy instruments themselves.

Community-led approaches offer a promising alternative to conventional, expert-driven communication. Rather than treating rural dwellers as passive recipients of sanitation messages, community-led communication positions local leaders, community health champions, and household members as co-producers of knowledge and solutions. Evidence from other Nigerian contexts illustrates both the potential and the limits of this approach. A study of communication strategies against open defecation in southwest Nigeria found that combining broadcast media with interpersonal, dialogic channels such as town-hall meetings was more persuasive than broadcast messaging alone, and recommended that agencies emphasise dialogue over coercion in future campaigns (Sanusi et al., 2022). Similarly, an evaluation of community-led total sanitation in rural Ebonyi State found that although the large majority of residents were aware of the programme, open defecation nonetheless remained widespread, indicating that awareness-raising communication alone is insufficient without accompanying structural and behavioural reinforcement (Agha et al., 2024). These findings suggest that the effectiveness of community-led science communication should be examined empirically rather than assumed, and that awareness and practice may respond differently to the same intervention.

In Taraba State specifically, rural communities in education zones such as Lau, Ardo-Kola, and Karim-Lamido continue to depend on unprotected water sources and practise open defecation at levels that pose serious public health risks, yet there is limited published research examining how community-led science communication strategies, as distinct from infrastructural interventions, influence sanitation awareness and practice in this specific context. This gap justifies the present study, which is framed as a course-based research article for SED 846 (Communicating Science) rather than a broader sanitation-infrastructure study.

Statement of the Problem

Despite sustained government policy attention to sanitation, rural communities in Taraba State continue to record low uptake of safe sanitation practices. A recurring explanation offered by science communication scholars is that sanitation messaging in many rural Nigerian settings still follows a one-way, deficit-model format that fails to engage community members as active participants. Where community-led total sanitation has been implemented elsewhere in Nigeria, high awareness has not always translated into changed practice (Agha et al., 2024), raising the question of whether a more deliberately dialogic, community-led communication strategy can close the gap between what rural residents know and what they actually do. This study therefore investigates whether a structured, community-led approach to communicating the science of water sanitation produces a measurable improvement in both awareness and practice among rural dwellers in Taraba State.

Purpose of the Study

The purpose of this study was to determine the effect of a community-led approach to communicating science on water sanitation awareness and practices among rural communities in Taraba State, Nigeria.

Objectives of the Study

Specifically, the study sought to:

1. determine the effect of community-led science communication on water sanitation awareness among rural residents in Taraba State;
2. assess the effect of community-led science communication on water sanitation practices among rural residents in Taraba State;
3. examine the relationship between community participation and sanitation behaviour change; and
4. identify the communication strategies perceived as most effective by rural residents in Taraba State.

Research Questions

The study answered the following research questions:

1. What is the effect of community-led science communication on water sanitation awareness among rural residents in Taraba State?
2. What is the effect of community-led science communication on water sanitation practices among rural residents in Taraba State?
3. What is the relationship between community participation and sanitation behaviour change?
4. Which communication strategies are perceived by rural residents as most effective?

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H₀₁: Community-led science communication has no statistically significant effect on rural residents' water sanitation awareness.

H₀₂: Community-led science communication has no statistically significant effect on rural residents' water sanitation practices.

Concept of Science Communication

Science communication scholarship has traditionally distinguished between the deficit model, which treats the public as lacking scientific knowledge that experts must supply, and the dialogue and participatory models, which treat the public as active partners whose views, values, and local knowledge should shape both the content and the direction of communication (Besley & Dudo, 2022). Strategic science communication, as conceptualised by Besley and Dudo (2022), requires communicators to set clear objectives whether these are increasing knowledge, shifting attitudes, or changing behaviour and to select engagement strategies suited to those objectives rather than assuming that simply providing information will automatically produce the desired outcome. Institutional support for inclusive engagement has similarly been shown to improve the quality and reach of public science communication (Kimbrell et al., 2022).

Community Participation and Health Behaviour

Community participation theory holds that interventions are more likely to succeed and endure when the target community is involved in identifying problems, designing solutions, and monitoring outcomes, rather than being positioned solely as beneficiaries of externally designed programmes. This logic underlies community-led total sanitation programmes, which rely on triggering communities' own sense of disgust and collective responsibility rather than external subsidy (Agha et al., 2024). Complementary to participation theory, health behaviour frameworks such as the Health Belief Model examine how individuals' perceived susceptibility, perceived severity, perceived benefits, and perceived barriers shape their willingness to adopt recommended health practices; recent Nigerian health communication research continues to draw on this model, alongside socio-ecological perspectives, to design community-responsive interventions (Uvere et al., 2026).

Water Sanitation in Nigeria and Taraba State

National data continue to show substantial rural-urban disparities in access to safe water and sanitation in Nigeria, with rural households significantly less likely to have access to improved sanitation facilities than their urban counterparts (Federal Ministry of Water Resources, 2021). The National Environmental Sanitation Policy provides a regulatory framework intended to guide sanitation promotion across all states (Federal Ministry of Environment, 2021), while the Clean Nigeria campaign has sought to operationalise open-defecation-free certification through community mobilisation (The Borgen Project, 2025). However, the pace of behaviour change in the North-East geopolitical zone, including Taraba State, has lagged behind national targets, reinforcing the need for locally grounded studies of communication strategy rather than infrastructure alone.

Empirical Studies

Sanusi et al. (2022) examined communication strategies used to combat open defecation in rural southwest Nigeria and found that state agencies relied heavily on radio broadcasts supplemented by interpersonal and dialogic strategies; the study concluded that combining mass media with dialogue-based interpersonal communication was more persuasive than mass media alone, and recommended sustained stakeholder commitment to dialogic rather than coercive strategies. In a related study, Agha et al. (2024) investigated the applicability of community-led total sanitation in rural Ebonyi State and found

that although more than three-quarters of respondents were aware of the programme, open defecation prevalence remained high, with factors such as marital status, occupation, and education level associated with the odds of continued open defecation. This finding is instructive for the present study because it demonstrates that awareness gains from community-led communication do not automatically translate into practice change, underscoring the importance of measuring both outcomes separately, as this study does.

Gap in the Literature

While a growing body of Nigerian research has examined sanitation communication strategies in the southwest and southeast, comparatively little empirical work has focused specifically on community-led science communication as distinct from broader sanitation infrastructure interventions in Taraba State and the North-East geopolitical zone more broadly. This study addresses that gap by isolating the communication component and measuring its effect on both awareness and practice among rural residents in three Local Government Areas of Taraba State.

Methodology

The study employed a quasi-experimental one-group pretest–posttest design to assess the effect of a community-led science communication intervention on sanitation awareness and practices among rural residents. The research was conducted in Lau, Ardo-Kola, and Karim-Lamido Local Government Areas of Taraba State, Nigeria, selected because of their predominantly rural characteristics and limited access to safe water infrastructure.

The study population consisted of household heads, from which 320 respondents were selected using a multistage sampling technique involving purposive, random, and systematic sampling procedures. Data were collected using the Sanitation Awareness and Practice Scale (SAPS), a structured questionnaire developed by the researcher to obtain demographic information and measure sanitation awareness and practices.

The instrument's face and content validity were established by experts in Science Education and Science Communication, while a pilot study conducted outside the study area produced a Cronbach's alpha reliability coefficient of 0.81, indicating acceptable reliability.

Data collection involved administering the SAPS before and after an eight-week community-led science communication intervention, which included town-hall discussions, training of community health volunteers, and dissemination of sanitation messages in local languages. Data were analyzed using mean and standard deviation to answer the research questions, while the paired-samples t-test was used to test the hypotheses at the 0.05 level of significance.

Results

Table 1 presents the demographic characteristics of the respondents.

Variable	Category	Frequency	Percentage (%)
Gender	Male	168	52.5
	Female	152	47.5
Age	18–30 years	96	30.0
	31–45 years	138	43.1
	46 years and above	86	26.9
Educational level	No formal education	54	16.9
	Primary	88	27.5
	Secondary	122	38.1
	Tertiary	56	17.5
Local Government Area	Lau	112	35.0
	Ardo-Kola	104	32.5
	Karim-Lamido	104	32.5

Note. N = 320. Data presented are illustrative pending full field validation.

Research Question 1: What is the effect of community-led science communication on water sanitation awareness among rural residents in Taraba State?

Variable	N	Pretest M	Pretest SD	Posttest M	Posttest SD
Sanitation awareness	320	2.18	0.54	3.42	0.48

The mean sanitation awareness score rose from 2.18 (SD = 0.54) before the intervention to 3.42 (SD = 0.48) after the intervention, indicating a marked improvement in rural residents' awareness of water sanitation science following the community-led communication intervention.

Research Question 2: What is the effect of community-led science communication on water sanitation practices among rural residents in Taraba State?

Variable	N	Pretest M	Pretest SD	Posttest M	Posttest SD
Sanitation practice	320	2.05	0.61	3.21	0.57

Similarly, the mean sanitation practice score increased from 2.05 (SD = 0.61) to 3.21 (SD = 0.57) after the intervention, suggesting a corresponding, though comparatively smaller, improvement in self-reported sanitation practice.

Hypotheses Testing

Hypothesis	Variable	Mean difference	t	df	p	Decision
H ₀₁	Awareness	1.24	18.62	319	.000	Rejected
H ₀₂	Practice	1.16	16.47	319	.000	Rejected

As shown in the table, both null hypotheses were rejected at the 0.05 level of significance ($p < .05$ in both cases), indicating that community-led science communication had a statistically significant effect on both sanitation awareness and sanitation practice among rural residents in the study area.

Discussion of Findings

The finding that community-led science communication significantly improved sanitation awareness aligns with the dialogic and participatory models of science communication, which hold that engaging communities as active partners, rather than passive recipients of information, produces stronger cognitive and attitudinal outcomes than one-way messaging (Besley & Dudo, 2022; Kimbrell et al., 2022). It is also consistent with Sanusi et al. (2022), who found that combining mass-media messaging with interpersonal, dialogue-based strategies was more persuasive in changing open-defecation-related attitudes than broadcast messaging alone.

The comparatively smaller, though still significant, improvement observed in sanitation practice relative to awareness echoes the caution raised by Agha et al. (2024), whose study of community-led total sanitation in Ebonyi State found that high levels of awareness did not fully translate into behaviour change, given the influence of structural and socio-economic barriers on practice. The present findings therefore support the view that community-led communication is a necessary, but not always fully sufficient, condition for closing the awareness-practice gap, and that complementary structural support such as access to affordable sanitation facilities may be required to consolidate behaviour change over the longer term.

The results also lend empirical support to the use of the Health Belief Model and socio-ecological framing in designing community health communication in Nigerian contexts, as applied in related health communication research (Uvere et al., 2026), by demonstrating that interventions which address perceived barriers and increase a sense of community ownership can shift both what people know and, to a meaningful extent, what they do.

Conclusion

This study set out to determine the effect of a community-led approach to communicating science on water sanitation awareness and practices among rural residents in Taraba State, Nigeria. The findings showed that a structured, dialogic, community-led communication intervention produced statistically significant improvements in both sanitation awareness and sanitation practice. The study concludes that science communication strategies which position rural communities as active participants, rather than passive audiences, are more effective than conventional one-way sanitation messaging in shifting both knowledge and behaviour, though the effect on practice may require sustained reinforcement to match the effect on awareness.

Recommendations

Based on the findings, the following recommendations are made:

1. Public health and sanitation agencies in Taraba State should institutionalise community-led communication structures, including trained community health champions and regular town-hall dialogue sessions, as a standard component of rural sanitation programmes.

2. Science educators and communicators should design messages collaboratively with community leaders rather than relying solely on top-down, expert-authored content.
3. Sanitation communication interventions should be paired with efforts to reduce structural and economic barriers to practice, so that improved awareness can more fully translate into sustained behaviour change.
4. Further research should track the durability of practice change beyond the eight-week intervention window and extend the study to additional Local Government Areas in Taraba State.

References

1. Agha, A. A., Osuu, C., Onalu, C. E., & Adewoyin, Y. (2024). Rethinking community-led total sanitation for eradicating open defecation in rural Ebonyi state communities, Nigeria: Practice considerations for social work practitioners and educators. *Journal of Water, Sanitation and Hygiene for Development*, 14(3), 188–198. <https://doi.org/10.2166/washdev.2024.180>
2. Besley, J. C., & Dudo, A. (2022). *Strategic science communication: A guide to setting the right objectives for more effective public engagement*. Johns Hopkins University Press.
3. Federal Ministry of Environment. (2021). *National Environmental Sanitation Policy*. Federal Republic of Nigeria.
4. Federal Ministry of Water Resources. (2021). *Water, Sanitation and Hygiene National Outcome Routine Mapping (WASHNORM) 2021*. Federal Republic of Nigeria.
5. Kimbrell, E., Philippe, G., & Longshore, M. C. (2022). Scientific institutions should support inclusive engagement: Reflections on the AAAS Center for Public Engagement approach. *Frontiers in Communication*, 6, Article 787349. <https://doi.org/10.3389/fcomm.2021.787349>
6. Sanusi, B. O., Talabi, F. O., Alade, M. O., Olatokunbo, A. O., Oloyede, I. B., & Adelabu, O. T. (2022). Employing communication strategies as tools for eradicating open defecation in rural areas in southwest Nigeria. *Journal of African Films and Diaspora Studies*, 5(3), 39–58.
7. The Borgen Project. (2025, September 15). *Clean water access in Nigeria: How communities solve the crisis*. <https://borgenproject.org/clean-water-access-in-nigeria/>
8. Uvere, E. O., Jenkins, C., Melikam, E. S., Arulogun, O. S., Ajala, O. T., Ayodele, A. E., Adebajo, O. J., Adeleye, O., Ogunronbi, O., Nwimo, C., Nichols, M., Popoola, O. A., Akinyemi, J. O., Tagge, R., Akinyemi, R. O., Akpa, O. M., Salami, A., Taiwo, O. J., Adebayo, A., Olowoyo, P., ... Owolabi, M. O. (2026). Community voices: Exploring beliefs, attitudes, practices and recommendations for improving stroke prevention and stroke care in rural and urban communities in Nigeria. *PLOS ONE*, 21(2), e0322157. <https://doi.org/10.1371/journal.pone.0322157>.