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DRIVERS OF OPEN DEFECATION IN NIGERIA RURAL HOUSES WITH SANITATION FACILITIES: AN EXPLORATORY STUDY

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ABSTRACT

The Government of Nigeria aims to end open defecation in the country by 2025. More recently, the sanitation literature revealed that having access to a toilet does not suggest its regular use, thereby adding to the open defecation burden. Owing to a paucity of documented studies, this study explores whether there are cases of open defecation in Nigeria's rural houses with toilet facilities and seeks to identify the motivating factors. Cross-sectional data were collected from 1327 houses in 15 rural settlements in Southwestern Nigeria. Houses were selected using a systematic and purposeful sampling method. Data were collected using a semi-structured interview script and supplemented with field notes. Being an exploratory study, descriptive statistics was used to analyse the data obtained and to identify the factors motivating the practice of open defecation in Nigeria's rural houses with toilet facilities in 1327 houses, 339 (25.6 %) reported defecating in the open despite having a toilet in the house. Poor toilet construction, scarcity of water, poor toilet maintenance, and collapsed/damaged toilets were the major factors motivating open defecation in the studied Nigeria rural houses with toilet facilities. This study concludes with some certainty that there were rural houses with toilets in Nigeria practicing open defecation. This finding contributes to previous observations in the sanitation literature that having a toilet in the house may be insufficient to end the practice of open defecation. In this study, several technical (including behavioural) and environmental factors acted to hinder the regular use of house toilets. Therefore, rather than prioritising continued investments and promotion campaigns in sanitation hardware, policymakers, development partners, and Water, Sanitation, and Hygiene (WASH) practitioners should also focus on the soft aspect, that is, the functioning and the regular use of toilets. The outcome of this study also informs the need to revise indicators being used to monitor progress toward national and international sanitation targets to include open defecation practices in houses with toilets.

KEYWORDS: Motivating factor; Open defecation; Rural house; Sanitation facility; Environmental factor; Technical factor; Nigeria

INTRODUCTION

Human sanitation practices started with open defecation. As civilisation progressed, individuals and countries started moving up the sanitation ladder to improved sanitation facilities. World Health Organisation (WHO) and the United Nations Children's Fund (UNICEF) (2021) define improved sanitation facilities to include flush or pour-flush toilets piped to pit latrines, septic tanks or sewer systems, pit latrines with slabs, composting toilets, and ventilated improved pit latrines. More recently, the sanitation literature revealed that having a toilet does not suggest its regular use (Coffey et al., 2014; Yogananth & Bhatnagar, 2018; Kumar & Sinha, 2019; Exum et al., 2020; Rani et al., 2020). Having access to a toilet and still defecating in the open leads to underreporting the proportion of houses practicing open defecation and stands in direct conflict with the realisation of target 6.2 of the United Nations Sustainable Development Goals (UN SDGs) as well as the Government of Nigeria's pledge to end open defecation in the

country by 2025 (FMWR, 2016). Therefore, increases from unnoticed or undocumented sources of open defecation practices may aggravate human and public health, particularly children morbidity and mortality, which in turn may contribute to lowering countries' socio-economic development. Broadly speaking, open defecation has both positive and negative values. Being a very rich source of nutrients, human excreta (urine and faeces) deposited and covered with soil can serve as an organic fertilizer, enriching the soil with nitrogen, phosphorus, and potassium. On the other side, open defecation may offer pathogens including SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) the opportunity to make their way into surface and subsurface water sources, causing increases in the number of cases of pathogenic infections. Besides this, defecating in the open can facilitate the entry of micropollutants (for example, drugs and hormones) into surface and groundwater as well as create opportunities for pathogens to spread to crops, posing adverse effects on human and animal life.

Various factors have been identified in the literature to drive open defecation in houses with access to sanitation facilities in some developing economies (Table 1). Although previously referred to as the world's open defecation capital, India seems to have more documented studies on open defecation in houses with toilet facilities than any other developing economies, Nigeria inclusive. While the proportion of Nigerian houses defecating in the open is lower in urban areas than in rural areas (FMWR, 2016), information about, and estimates of, houses with sanitation facilities still defecating in the open in Nigeria are rather thin. Despite the upsurge of rural sanitation research in Nigeria, little is known about the occurrence of open defecation in rural houses with toilet facilities and the motivating factors. Thus, a need to fill this knowledge gap. This study is also crucial because, being a signatory to the United Nations' 2030 Agenda for Sustainable Development, the Government of Nigeria has set an ambitious target aimed at realising open defecation-free status in the country by 2025 (FMWR, 2016). Other institutional measures put in place by the federal government to eliminate open defecation in the country by 2025 include signing Executive Order 009, which took effect from Wednesday, 20 November 2019, and a Pledge Card on 29 January 2022. The Pledge Card mandates both federal and state governments to provide political and financial support towards ending open defecation in Nigeria by 2025. Therefore, unrestricted open-defecation practices may jeopardise the government's efforts to realise this open-defecation-free commitment by 2025. By population, rural dwellers accounted for roughly 48.0 % of the Nigerian population in 2020 (World Bank, 2022a). In 2020, about 29.7 % of rural houses defecated in the open (World Bank, 2022b), as compared with 8.5 % in urban (World Bank, 2022c). Under the do-nothing approach, also partly driven by high population growth, about 31.6 % of Nigeria's rural dwellers are expected to excrete in the open by 2025. Therefore, the focus is on Nigeria's rural houses.

This study contributes to a growing body of public health and sanitation research by digging deeply into the situation of rural sanitation in Nigeria and exploring factors driving rural houses with sanitation facilities to defecate in the open. The outcome of this study will help policymakers, development partners (such as UNICEF, WHO, etc., and Non-Governmental Organisations), and Water, Sanitation, and Hygiene (WASH) practitioners to understand

whether Nigeria has cases of houses with sanitation facilities practising open defecation, the motivating factors, the needed improvements to help design and implement socially-robust measures aimed at guiding effective sanitation policy reforms and health planning, and researchers in the field of sanitation to initiate studies on sustainable, rural - suited sanitation technologies in Nigeria and elsewhere. The result of the study is organised as follows: the section describing the study design and setting, including the approach to data collection and analysis. The section illustrating the study's ethical considerations, while another section presenting the results of the study. Another section discusses the results of the study, while the last section concludes the study.

MATERIALS AND METHOD

Study design and setting

The cross-sectional study follows a qualitative research approach to explore whether Nigeria has cases of rural houses with toilets practising open defecation and to identify the associated factors. The study refers to the house as a complete standalone residential building (Adeoti et al., 2021). This use differs from a household which this study refers to as a family. Although culturally supported, two or more families may occupy a house and share a toilet in Nigeria. These background illustrations are crucial to data gathering, analysis, and interpretation.

Table 1: Drivers of open defecation in houses with access to sanitation facilities in some selected developing economies

S/N	Country/Study area	Sanitation type	Major drivers	Reference(s)
a.	Ghana (Prampram, a coastal peri-urban community)	Pit latrine	Private pit latrines: - intense odour, desludging challenges, latrine inaccessible (busy or locked) Communal pit latrines: - intense odour, unhygienic conditions, user fees, distance to the nearest latrine	Obeng et al., 2015
b.	India (rural communities in Odisha state)	Pit latrine	- The pit latrines were not properly constructed (for example, the pits were too small, they lacked a door, a roof, and walls) - Poor quality of construction - Scarcity of water supply in or near the toilets - Occupational-related (for example, farmers who go to their farms in the morning) - Socialising	Routray et al., 2015
c.	India (rural houses in Perambalur district, Tamil Nadu)	Pit latrine	- Not aware of public latrines - Insufficient water available at public latrines - Open defecation is better and much more comfortable than using a latrine	Kumar and Sinha, 2019
d.	India (a village in Pune district, Maharashtra)	Latrines	Community latrines - Inadequate water supply - Not aware of the presence of community latrines - Castes based discrimination - Perceived benefits of defecating in the open	Bhardwaj et al., 2013

e.	Eastern Nepal (Hattimudha village in Morang district)	Latrines	Private pit latrines: - Alternate use of latrines (for example, storing grains) - Hygiene and maintenance issues (concerns over cleaning up after use, nuisance smell from the latrine, and the maintenance of the latrine) - Existing household norms related to latrine use (reserved for male members, elderly, special guests, or only during the night time) - Cultural norms preventing sharing latrines between female and male members in the house Communal pit latrines: - Issues with queuing (long queue and not wanting to be seen by male members while queuing in public latrines) - Issues related to privacy for females - Hygiene concern - Cultural-related norms supporting latrine sharing restriction between female and male house members.	Bhatt et al., 2019
f.	North Ethiopia (rural Communities in Gulomekada district, Tigray region)	Latrines (Pit/VIP)	- Bad smell, not safe, preference for open field, latrines as a flies spreading place, poorly constructed toilet structures, and nature of work which favours open defecation	Debesay et al., 2015
i.	India (rural Madhya Pradesh)	Toilets	- Incomplete toilet construction - Poor construction quality - Lack of adequate information about toilet maintenance - Scarcity of water for toilet maintenance - Poor awareness of the benefits of toilets - Comfortable practicing what they were familiar with - Lack of toilet use habits - Fear using a closed space	Verma et al., 2014
h.	India (rural households in Bhopal, Madhya Pradesh)	Latrines	- Habits - Very comfortable or convenient - Unaware of the harmful effects of open defecation practice - Scarcity of water - Poorly constructed toilets - Due to tradition - Toilets located far away from homes - Pits too small	Namdev and Narkhede, 2020

			- Toileting at home is considered a very dirty practice - Weather driven - Poor toilet maintenance - Offers enough time for social interactions with others	
i.	India (rural areas in Haryana district)	Latrines	- Pleasurable, comfortable, and convenient - Due to habit or tradition - To meet friends, to see fields, and roam around - Fear that the toilet pits may fill up quickly if all house members use it daily. - Due to the foul-smelling toilets in the house - Poor drainage system affecting water supply	Rani et al., 2020

This study was limited to the southwest geopolitical zone of Nigeria. The southwest is made up of 6 States: Ekiti, Ondo, Osun, Oyo, Ogun, and Lagos, covering 76852 square kilometres (FRN, 2014). The factors favouring the selection of the southwest include: a) by 2025, the human population in the southwest, estimated at 45.26 million, is expected to be the highest among the six geopolitical zones in Nigeria (FRN, 2014); b) in terms of the proportion of houses that defecated in the open in 2019, the southwest (28.1 %) accounted for the second-highest after the north-central (51.2 %) (FMWR, NBS, and UNICEF, 2020); c) apart from the north-central (50.0 %), the southwest (24.1 %) had the highest number of households that defecated in the open in 2019; and d) in terms of ethnicity of household heads that defecated in the open in 2019, the Yoruba (23.8 %) recorded the highest (Adeoti et al., 2021). These attributes suggest the need to look at the sanitation situations in the southwest more closely. In Nigeria, improving rural sanitation poses a special challenge. Since other ethnic groups also reside in the southwest, the study outcome can serve as an input in designing appropriate policy measures that may be beneficial to the entire country. Understanding the reasons associated with the practice of open defecation will also help to complement the already put-in-place institutional measures and expose aspects of rural sanitation programmes which might need strengthening and how they could be carried out.

To realise the ambitions of this study, three states in Southwestern Nigeria were purposively selected: Ekiti, Ondo, and Osun States. The ease and cost of data collection favoured the selection of these states. Therefore, limiting the study sites to three states was deliberate, mostly influenced by financial constraints. Generally speaking, most rural settlements in Nigeria lack official demographic, socio-economic, and environmental data that could ease sampling. By definition, a settlement is referred to as rural in Nigeria if the human population is less than 5000 (FRN, 2014). Since there were no official as well as rural-specific data, this study assumed a settlement is rural if the total number of houses is less than 500 (Adeoti et al., 2021). Some important data on the deliberately selected rural settlements are reported in Table 2. The cost of interview administration and compliance with COVID-19 protocols favoured the selection of

these rural settlements. Information about the sanitation situations of the selected rural settlements was scarce before the visit.

The tertiary sampling units were the houses. It is important to highlight that databases on rural houses by types of sanitation facilities are rarely kept in Nigeria. Therefore, due to the absence of a sampling frame, to identify the relevant houses, this study adopted the systematic and purposeful sampling method. This method was adopted to minimise data contamination. The introduction of contaminants in this type of study, as with most sanitation research, could jeopardise the reliability of the results. Houses sampled represented those that were willing, had the time, and were orally invited to contribute to the study. The main selection criteria were that houses had toilets and still defecating in the open by at least one house member. Therefore, houses without toilets, houses with toilets + regular use, and houses accessing public toilets (with or without a house toilet) were eliminated from the interviews, while houses with toilets + non-regular use were considered and sampled.

Data

To obtain the primary data needed for this study, face-to-face interviews using a semi-structured interview script (with some open-ended questions) were conducted on some residents of the selected rural settlements between 6 and 23 October 2021 (Table 3). Before its field application, the script was tested on 17 and 18 July 2021 in three rural settlements in the southwest: Aba Erinfun, Aso, and Ago Aduloju (n = 180). This was carried out to enhance the capacity of the questions to draw the required information (Pratt & Loizos, 1992). After the test, necessary improvements were made to the questions.

Table 2: Important data on the selected rural settlements

Rural settlement	Coordinates	Availability of Piped water	Grid electricity	Public toilet	Paved road	Total number of houses	Houses without toilets	Houses with toilets + regular use*	Houses with toilets + non-regular use
Ondo State									
Etioro	$7^0$26'N $5^0$43'E	No	Yes	No	Yes	77	15	43	19
Ayegunle	$7^0$24'N $5^0$43'E	No	Yes	Yes	Yes	89	26	26	37
Iboropa	$7^0$53'N $5^0$85'E	No	Yes	No	Yes	107	69	15	23
Ugbe	$7^0$52'N $5^0$78'E	No	Yes	Yes	Yes	116	29	44	43
Eleyewo	$7^0$27'N $5^0$28'E	No	Yes	No	Yes	100	20	64	16
Ekiti State									
Ogbese-Ise	$7^0$27'N $5^0$59'E	No	Yes	No	Yes	73	28	11	34
Obada	$5^0$25'N $7^0$19'E	No	Yes	No	Yes	41	22	6	13
Aba Jebude	$7^0$53'N $5^0$60'E	No	Yes	No	Yes	108	67	9	32
Aba Ebira	$7^0$47'N $5^0$31'E	No	Yes	No	Yes	79	43	7	29
Aba Oyo	$7^0$57'N $5^0$52'E	No	Yes	No	Yes	64	26	10	28
Osun State									
Sekona	$7^0$37'N $5^0$12'E	No	Yes	Yes	Yes	111	73	29	9
Aagba	$7^0$53'N $7^0$47'E	No	Yes	No	No	100	53	16	31
Akoda	$7^0$46'N $5^0$31'E	No	Yes	Yes	Yes	95	35	35	25
Elewure**	$8^0$46'N $5^0$42'E	No	Yes	Yes	Yes	80	80	0	0
Idi-Awe**	$4^0$57'N $5^0$30'E	No	Yes	Yes	Yes	87	87	0	0

*****Regular use was assumed when all house members used the toilet

**The public toilets at Elewure and Idi-Awe were not functional at the time of the study

T**able** 3: Interview script administration

State/Rural settlement	Ondo state Etioro	Ayegunle	Iboropa	Ugbe	Eleyewo	Ekiti state Ogbese-Ise	Obada	Aba Ɨehuɗe Aba Ebira	Aba Oyo	Osun state Sekona	Aagba	Akoda	Elewure	Idi-Awe
Number of houses interviewed* and scripts analysed	19	37	23	43	16	34	13	32	29	28	9	31	25	-	-

*This refers to houses with toilets + non-regular use.

- indicates no interviews were conducted in Elewure and Idi-Awe because all the houses had no toilets. These rural settlements were excluded from further analysis.

The administered script had 14 questions and three sections. The first section assembled sociodemographic data: gender of house head (or owner), age, religion, highest education, ethnicity, occupation, number of families per house, house size (number of persons, including children), house tenure of house head (or owner), type of cooking fuel, and family size. The second section compiled data on the availability and type of sanitation facility, whether house members defecate in the open (by at least one house member, at any time before the interview), mostly during which period (wet season, dry season, or both seasons), and why they defecate in the open (a major reason). Section three assembled data on water availability: available sources of water to the house, their occurrence (whether seasonal or perennial), and ownership (whether house-owned, neighbour-owned, or community-owned).

Since this study aimed at understanding whether there are cases of rural houses with toilets practicing open defecation and identifying the factors associated with the practice, questioning all the house members was ruled out as being time-consuming and may produce conflicting information. Instead, the house heads (or house owners) or any adults with some reasonable understanding of the house were interviewed in the presence of other house members. To enrich data collection, the interviews were supplemented with field notes. Because of the associated difficulties, no attempts were made to assemble data on the number of house members defecating in the open per house or their frequency.

Analysis

The collected data were entered into the Microsoft Excel Worksheets. Being an exploratory study, descriptive tests were carried out using Microsoft Excel 2013 to analyse the data obtained and identify the factors motivating the practice of open defecation in Nigeria's rural houses with toilet facilities. Although there is thin guidance in the literature, the major factors were identified to represent reasons with $n \geq 20$.

Ethical considerations

When dealing with human subjects, ethical considerations request that researchers comply with good ethical practices. Researchers are expected to provide anonymity and confidentiality assurance as well as obtain informed consent. The village heads were first contacted to gain the initial entry permission. During the entry introduction, the purpose of the study was explained. Houses were verbally invited and gave verbal approval to participate in the study. The completed scripts were assigned

numerical numbers to keep the identity of the sampled houses confidential and anonymised. The participation of houses in the study was voluntary, without any financial rewards. To further the confidentiality assurance, all the data were reported anonymously, without matching houses with their responses. It is also important to add that at the time of the study, the Institution had no Ethics Screening Committee nor was the study in conflict with any known national or state legislation.

RESULTS

Sanitation facilities

In total, 15 rural settlements and 1327 houses were visited, and 339 individuals were interviewed. Among the 1327 houses visited, 673 (50.7 %) had no toilets (see Table 2), 315 (23.7 %) had toilets + regular use (Table 4), while 339 (25.6 %) had toilets + non-regular use (Table 5). The summary, as indicated in Tables 4 and 5, suggests the availability of different types of sanitation facilities in the selected rural settlements, ranging from unimproved to improved. The proportions of houses having pit latrines without slab and flush toilets were higher in houses with toilets + non-regular use (Table 5) than in houses with toilets + regular use (Table 4). Also, the proportion of houses having pour-flush toilets was higher in houses with toilets + regular use (Table 4) than in houses with toilets + non-regular use (Table 5). Although outside the scope of this study, the factors driving toilet choice were not investigated. In all, the use of ventilated improved pit (VIP) latrines was not common in the selected rural settlements in Ondo and Ekiti states, as compared with those in Osun state (Tables 4 and 5). The reasons for this were not investigated. In addition, no attempts were made to ask questions about when the toilets were constructed and first put to use.

Sociodemographic characteristics

The summary of the results of the sociodemographic characteristics of the sampled rural settlements is illustrated in Table 6. While the study does not intend to compare rural settlements, out of the 339 respondents, the majority were male (72.0 %), aged 51 to 75 years (52.5 %) (range: 30 to 81), Muslim (47.8 %), had secondary education (193, 56.9 %), mostly of the Yoruba ethnic group (243, 71.7 %), and had low-income jobs (339, 100 %). Also, the majority were houses that had < 4 families per house (243, 71.7 %) (range: 1 to 10) and house size with 10 to 20 persons (including children) (157, 46.3 %) (range = 1 to 31). 146 (43.1 %) houses were owned by house heads, while the majority of house heads (26.5 %) used wood as their cooking fuel. In all, the majority of house heads (262, 77.3 %) had a family size of 5 to 10 persons (range: 1 to 12).

Period of open defecation

Overall, despite having a toilet in the house 339 out of the 1327 houses reported practicing open defecation. However, the majority (204, 60.2 %) stated that they mostly defecated in the open during the wet and dry seasons (both seasons), while 2 (0.6 %) mainly defecated in the open during the wet season (Table 7). This represented houses with pit latrines without slabs.

Reasons for defecating in the open in rural houses with sanitation facilities

As illustrated in Table 7, various reasons were reported by respondents to motivate defecating in the open despite having a toilet in the house. In all, the majority (41.3 %) reported scarcity of water as the motivating factor, followed by poor toilet construction (18.6 %), poor toilet maintenance (10.6 %), and collapsed/damaged toilets (6.2 %). Overall, all the toilets were

self/house-financed. Unlike the case of India (Banerjee et al., 2013), the Government of Nigeria is yet to put in place any field interventions to drive toilet construction and expand coverage. Therefore, no governments facilitated or subsidised home toilets in the sampled rural settlements.

Water availability

The summary of results of water availability in the sampled rural settlements is presented in Table 8. Among the 339 houses, the predominant source of water was shallow/dug wells (326, 87.4 %). 277 (74.3 %) reported that the available sources of water were mostly seasonal, meaning that they dry up during the period of no rain. Overall, the house-owned water supply facility was the main source of water for toilet use for 182 (48.8 %) houses. None of the selected rural settlements had access to a piped water supply (see Table 2).

Table 4: Data on houses with toilets + regular use in the selected rural settlements (n = 315)

Site*	Type of toilet:						
	Pit latrine without a slab	Pit latrine with slab	VIP**	Pour-flush	Flush	Others	Total
Ondo State							
Etioro	3	7	0	23	10	0	43
Ayegunle	1	10	0	15	0	0	26
Iboropa	3	5	0	5	2	0	15
Ugbe	7	10	0	21	6	0	44
Eleyewo	10	21	0	27	6	0	64
Ekiti State							
Ogbese-Ise	2	7	0	0	2	0	11
Obada	2	3	0	1	0	0	6
Aba Jebude	4	5	0	0	0	0	9
Aba Ebira	3	4	0	0	0	0	7
Aba Oyo	5	3	0	2	0	0	10
Osun State							
Sekona	4	2	11	10	2	0	29
Aagba	0	2	9	5	0	0	16
Akoda	2	12	12	9	0	0	35
Total	46	91	32	118	28	0	315

*Refers to the selected states and rural settlements

**Ventilated improved pit latrine

Table 5: Data on houses with toilets + non-regular use in the selected rural settlements (n = 339)

Site	Type of toilet*:						
	Pit latrine without a slab	Pit latrine with slab	VIP	Pour-flush	Flush	Others	Total
Ondo State							
Etioro	3	1	0	6	9	0	19
Ayegunle	2	3	0	25	7	0	37
Iboropa	3	1	0	12	7	0	23
Ugbe	6	4	0	6	27	0	43
Eleyewo	0	3	0	9	4	0	16
Ekiti State							
Ogbese-Ise	19	12	0	1	2	0	34
Obada	4	6	0	1	2	0	13
Aba Jebude	23	2	0	0	7	0	32
Aba Ebira	18	11	0	0	0	0	29

Aba Oyo	23	5	0	0	0	0	28
Osun State							
Sekona	1	0	2	5	0	1**	9
Aagba	7	9	5	10	0	0	31
Akoda	7	6	5	7	0	0	25
Total	116	63	12	82	65	1	339

*This study classifies pit latrines without slab, pit latrines with slab, VIP, and bucket latrines as dry toilets, and pour-flush and flush toilets as wet toilets

**Bucket latrine

Table 6: Summary of results of the sociodemographic characteristics (n = 339)

Characteristic (house head)	Ondo state	Ekiti state	Osun state	n	%
Gender					
Male	101	95	48	244	72.0
Female	37	41	17	95	28.0
Age					
< 51	46	80	31	157	46.3
51 – 75	89	55	34	178	52.5
> 75	3	1	0	4	1.2
Religion					
Christian	90	47	21	158	46.6
Muslim	35	85	42	162	47.8
Traditional	13	4	2	19	5.6
Highest education					
No formal education	14	5	0	19	5.6
Primary	35	54	17	106	31.3
Secondary	86	62	45	193	56.9
Higher	3	15	3	21	6.2
Ethnicity					
Yoruba	133	45	65	243	71.7
Ebira	4	46	0	50	14.7
Hausa	1	3	0	4	1.2
Igbo	0	6	0	6	1.8
Idoma	0	6	0	6	1.8
Igede	0	10	0	10	2.9
Gara	0	20	0	20	5.9
Occupation*					
Low-income occupation**	138	136	65	339	100.0
Number of families per house					
< 4	104	89	48	241	71.1
4 - 7	33	47	17	97	28.6
> 7	1	0	0	1	0.3
House size (number of persons, including children)					
< 10	50	62	21	133	39.2
10 – 20	46	74	37	157	46.3
> 20	42	0	7	49	14.5
House tenure					
Owned	77	44	25	146	43.1

Rented	15	63	35	113	33.3
Inherited	42	10	5	57	16.8
Gifted	0	7	0	7	2.1
Gifted (tenant)	4	12	0	16	4.7
Type of cooking fuel					
Wood	19	53	18	90	26.5
Gas	7	25	15	47	13.9
Charcoal	6	33	29	68	20.1
Kerosene	30	7	2	39	11.5
Charcoal & wood	12	0	0	12	3.5
Kerosene & wood	45	8	0	53	15.6
Gas, kerosene & wood	8	0	0	8	2.4
Gas & wood	2	2	0	4	1.2
Gas, kerosene & charcoal	2	0	0	2	0.6
Kerosene & charcoal	1	2	0	3	0.9
Kerosene & gas	6	3	0	9	2.6
Gas & charcoal	0	3	1	4	1.2
Family size					
< 5	23	42	11	76	22.4
5 – 10	114	94	54	262	77.3
> 10	1	0	0	1	0.3

*Based on the assumption that occupation and income are directly linked

**Owing to the absence of official (or government) classifications, this study assumes Low-income occupation as any occupation earning: $< 2 \times 10^6$ Naira per annum, Middle: $2 – 4 \times 10^6$ Naira per annum, and high: $> 4 \times 10^6$ Naira per annum. As per the data obtained from the field, low-income occupations include farming (small-holder agricultural farmers), auto-mechanic, trading, bricklaying, fashion designing, shoemaking, vulcanizing, welding, driving (car, bike), hunting, barbing, herbalist, government worker (in rural areas), bag making, hairdressing, plumbing, food selling, electrician, motor car retailing (attendant), carpentry, retiree (school principal, policeman).

Table 7: Summary of results of a period of open defecation and reasons for defecating in the open (n = 339)

Parameter	Ondo state	Ekiti state	Osun state	n	%
Period of open defecation					
Wet season	0	2	0	2	0.6
Dry season	58	60	15	133	39.2
Both seasons	80	74	50	204	60.2
Reason for defecating in the open					
Poor toilet construction	17	37	9	63	18.6
Scarcity of water	61	64	15	140	41.3
Poor toilet maintenance	28	1	7	36	10.6
Collapsed/damaged toilets	0	21	0	21	6.2
Full pit	2	2	3	7	2.1
Occupational-related (stay more on the farm)	0	4	0	4	1.2
Accessibility	0	6	0	6	1.8
Hygiene problem	3	0	2	5	1.5
Children unable to sit on toilet seats	0	0	2	2	0.6
The need to smoke	0	0	1	1	0.3
Fear of infection	0	0	3	3	0.9
Convenience	0	0	11	11	3.2
Faulty water closet	0	0	1	1	0.3

Personal choice	13	0	0	13	3.8
Sanitation facility water requirement	0	0	3	3	0.9
Too many people in the house	1	0	8	9	2.6
The nearness of bush to farm	13	0	0	13	3.8
Collapsed pit	0	1	0	1	0.3

Table 8: Summary of results of water availability in the sampled rural settlements (n = 373) (there were houses with multiple sources of water)

Parameter	Ondo state	Ekiti State	Osun state	n	%
Sources of water					
Shallow/dug well	126	135	65	326	87.4
Deep well	11	19	0	30	8.0
Stream*	1	8	0	9	2.4
River*	0	8	0	8	2.2
Occurrence					
Seasonal	90	149	38	277	74.3
Perennial	48	21	27	96	25.7
Ownership					
House owned	70	77	35	182	48.8
Neighbour owned	49	64	29	142	38.1
Community-owned	19	29	1	49	13.1

*Culturally, streams and rivers are community-owned in the southwest. In some other cases, a dug well or a deep well can also be community-owned, depending on the providing sources. For example, a deep well provided by an NGO to a community.

DISCUSSION

This study discovered that there were cases of open defecation in 339 rural houses in Nigeria despite having a toilet in the house. This finding contributes to the body of sanitation literature which revealed that having a toilet in the house does not suggest its sustained use (Venkateswarlu, 2019; Kumar & Sinha, 2019; Exum et al., 2020; Rani et al., 2020; Namdev & Narkhede, 2020). This finding reveals the possibility of national and international sanitation survey results underreporting the proportion of houses practicing open defecation in Nigeria. It also draws attention to the importance of sanitation campaigns, monitoring, and policy measures to promote the functioning and regular use of toilets. In terms of the motivating factors (Figure 1), poor toilet construction, scarcity of water, poor toilet maintenance, and collapsed/damaged toilets were the identified major factors motivating open defecation in rural houses with sanitation facilities in Nigeria. These results are consistent with some previous studies. Looking at some rural areas in Odisha, India (Routray et al., 2015), some villages in Dharmapuri district, south India (Yogananth and Bhatnagar, 2018), some houses in Kotgaun, Nepal (McMichael, 2017), and Rajasthan, India (Exum et al., 2020), lack of water was significantly reported as a factor associated with open defecation in houses with access to sanitation facilities. Routray et al. (2015) and Yogananth and Bhatnagar (2018) also identified poor toilet construction and poor toilet maintenance (Namdev & Narkhede, 2020) as drivers of open defecation in houses with sanitation facilities. Drawing on the field data, rural houses were more likely to have relatively large house members, while most house heads were also more likely to have a relatively large

family size (Table 6). An implication of these is that house heads may be preoccupied with the urge to cater to the daily needs of members, thereby dipping their financial capacities to provide for the repairs of toilets. Repairing faulty or collapsed/damaged toilets entails some cost. Some other scholars also observed that houses with limited funds were less likely to spend on toilets, thereby encouraging open defecation practices (Busienei et al., 2019; Bhatt et al., 2019; Osumanu et al., 2019). With many families in a house sharing a toilet (Table 6), there is a high likelihood of accessibility issues (as a result of overcrowding), while the likelihood of adequate toilet maintenance may also be low (Heijnen et al., 2015). Some house owners reported that they had to lock the toilets due to poor cleaning after use, forcing house members to defecate in the open. Both accessibility and poor toilet maintenance were reported factors that motivated open defecation in rural houses with toilet facilities (Table 6).

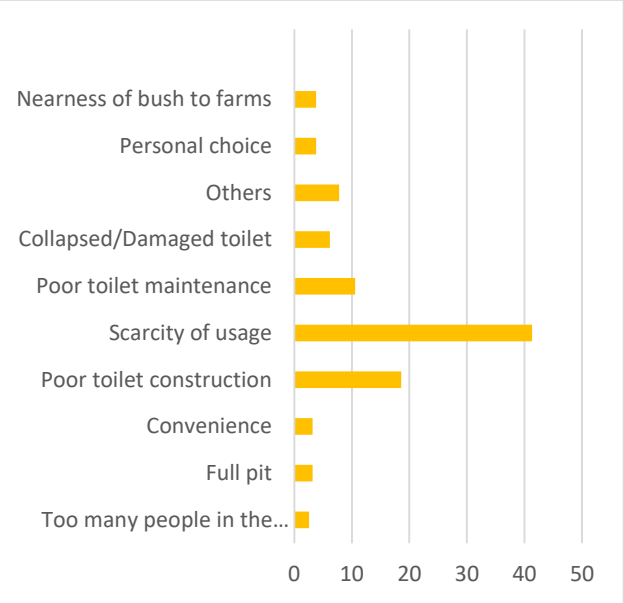

Figure 1: Factors motivating open defecation in Nigeria's rural houses with toilets

In all, poor toilet construction, scarcity of water, poor toilet maintenance, and collapsed/damaged toilets were factors associated with increased health/safety risks and decreased toilet use. Water did matter in most rural houses, particularly as it affected water for flushing, post-defecation hygiene, and toilet cleaning. Individuals with inadequate water supply were more likely to practice open defecation. As noted by Banerjee et al. (2013) in Nandivargam village, India, the absence of water to flush toilets compelled house members to opt for open defecation. As the data revealed, the case of water scarcity in the studied rural settlements was more of an environmental issue. Because of its rainfall situation, on average, the southwest with a substantial deficit from November to April enjoys surplus water between May and October. Almost 74.3 % of the available water sources for house use were seasonal (Table 8). Of the 339 houses, 326 (87.4 %) depended on shallow/dug wells. 240 (73.6 %) of these wells were reported to be seasonal. The data further revealed that 82 (56.6 %) houses that emphasised scarcity of water had wet toilets, while 63 (43.4 %) that had dry toilets also reported scarcity of water. Users of dry toilets were more likely to need water to wash their hands after touching toilet doors, or shit-hole covers, or to clean up after use. Lack of water for toilets and post-defecation hygiene could discourage the sustained use of toilets and encourage houses to embrace open defecation (McMichael, 2017). This suggests the need for policymakers and development partners working in the field of sanitation in Nigeria to consider water availability when designing policy measures and WASH interventions aimed at (a) encouraging moving up the sanitation ladder from dry to wet toilets, and (b) promoting toilet use in Nigeria rural houses. Therefore, the contribution of this study can be summed up as follows: a) it has confirmed that open defecation

in rural houses with toilets also exists in Nigeria. This remains unknown before this study, b.) the results of this study can contribute to theory development on factors motivating open defecation in houses with toilets, c) revisions of metrics being used to monitor progress on open defecation.

The cases of poor toilet construction, poor toilet maintenance (entailing toilet cleaning after use and repair of faults), and collapsed/damaged toilets were more technical-related (with some behavioural element in the case of toilet cleaning after use) problems. As observed in this study, toilets without a wall, or a roof, toilets with cracked walls or floors, toilets with damaged walls, floors, or roofs, or with collapsed walls or pits were less likely to be used. Among the 192 houses having dry toilets, the majority (50, 26.0 %) ascribed non-regular use to poor toilet construction. 10 (5.2 %) reported poorly maintained toilets, while 26 (13.5 %) emphasised collapsed/damaged toilets. Only 19 (12.9 %) houses with wet toilets ascribed non-regular use to poor maintenance, while some users of pour-flush toilets commented that their toilets still smell even after flushing ascribing it to poor construction. Compared with houses having dry toilets (26), no houses with access to wet toilets reported collapsed/damaged toilets, except 2 houses that had a collapsed pit. This suggests that dry toilets were more likely to have technical-related problems than wet toilets. This has implications for practice, especially when advocating for toilet construction as a means of curtailing open defecation practices in rural houses and expanding coverage. However, the extent to which low income, availability of open space to defecate, or any other enabling factors contribute to the inability to repair faulty toilets in the selected rural settlements was not investigated. This merits future research.

STUDY LIMITATIONS

Despite the merits of the adopted sampling method for primary data collection, this study has some important limitations. First, the study sites were limited to 3 states and 15 rural settlements. Therefore, its application in Nigeria requires some caution. Second, the respondents might have exaggerated or underreported some attributes that a cross-sectional study may not be able to detect. For example, there is a tendency for respondents to have reported regular toilet use despite non-regular use and concealed the main reason for defecating in the open. Third, it is possible that because the study was carried out during the tail end of the wet season, the use of toilets may be higher than when the study was carried out during the dry season. The effect of this may likely inflate the data on houses with toilets + regular use. Lastly, this study did not measure houses with sanitation facilities with open defecation-free slippage rates or its associated driving factors. Also, the reasons why house members opted to defecate in a particular season (dry, wet, or both) were not investigated as well as the quality of house water sources. Why rural houses with faulty or collapsed toilets could not initiate repairs merits future research. This will help policymakers and development partners understand what matters most when promoting regular toilet use in Nigeria's rural houses. Notwithstanding its limitations, this study has some significant implications for policy and practice. It provides insights into what matters most when designing appropriate policy measures, sanitation promotion programmes, and WASH interventions aimed at ending open defecation in rural houses with toilets in Nigeria. This study also supports the need to revise targets

and indicators used to monitor hygiene and sanitation progress to include open defecation practice by at least one house member in houses with toilets, rather than simply counting the number of houses with access or without access to toilets. In all, the study outcome provides important baseline information for future studies as well as direction for policy measures aimed at realising open defecation-free status, especially in Nigeria's rural areas, by 2025.

CONCLUSIONS AND RECOMMENDATIONS

This study found that there were cases of rural houses with toilets in Nigeria defecating in the open. This finding contributes to previous studies which revealed that having a toilet in the house does not ensure its regular use, especially when there are important technical and environmental obstacles to its use. Notwithstanding its limitations, the study concludes with some certainty that individuals in rural houses with poorly constructed toilets, scarcity of water, poorly maintained toilets, and collapsed/damaged toilets are more likely to practice open defecation. As an implication, all these major factors are associated with increased health/safety risks and decreased toilet use. Therefore, future rural sanitation programmes in Nigeria would need to focus on addressing these obstacles to realise Goal 6, Target 6.2 of the UN SDGs, and the ambitious 2025 open defecation-free target of the Government of Nigeria. On the environmental side, since the provision of piped water lies within the purviews of state and local governments, investing in rural water supply becomes a necessary step to curtailing water scarcity and supporting the regular use of toilets. On the technical (and behavioural) side, the governments (federal, state, and local) should mount enlightenment campaigns and educational programmes in rural areas on the implications of open defecation on human and ecosystem health and its feedback loop on disposable income. This may help to motivate houses to consider repairing faulty/damaged toilets and improve toilet maintenance and construction. However, the extent to which awareness campaigns as a standalone factor will help persuade houses to desist from defecating in the open and use the toilets remains rather unknown. Overall, to improve the impact of sanitation interventions, this study suggests that governments, development partners, and WASH practitioners in Nigeria should pay additional attention to toilet functioning and track its actual use, rather than only access and coverage. It is still unclear whether, and to what extent, low income impacts the ability of houses to repair faulty toilets in the studied rural settlements. This merits future research.

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