



## **PATTERNS OF OPEN DEFECATION PRACTICE IN SOUTH- EAST NIGERIA**

**Ukpbabi, Monday Chidi**

Department of Sociology,  
Imo State University, Owerri, Nigeria  
mondaychidi75@gmail.com

&

**Ezeah, Peter Chukwuma**

Department of Sociology/Anthropology  
Nnamdi Azikiwe University, Awka, Anambra State, Nigeria  
pc.ezeah@unizik.edu.ng, pitezeah@gmail.com

### **Abstract**

Open defecation remains a significant public health challenge in Nigeria. This study investigated patterns of open defecation practice in South- East, Nigeria, especially in rural and urban slums of the region. The study was guided by two objectives, and was anchored on Transtheoretical theory which served as the frameworks for analysis. The mixed research design involving concurrent simultaneous collection of both quantitative and qualitative data was adopted. The population of the study was 22,265,421, being the projected population of South-East Nigeria by 2022. However, the target population was 1905 which was the population of six rural and urban communities of Ebonyi, Enugu and Imo states where open defecation is highly endemic in South-East, Nigeria. The multi stage sampling technique was used to select the respondents. The sample size for the quantitative component of the study was 1049 respondents' statistically derived using Taro Yamane formula, while 21 participants were purposively selected and interviewed for the qualitative In-depth Interview (IDI) component. The quantitative data were analyzed with descriptive statistics such as simple frequency distribution tables, and simple percentages. On the other hand, the qualitative data were analysed thematically. The findings show that bush defecation and "short- put method" whereby people use polythene bags to defecate and thereafter throw them away indiscriminately, were the major forms/patterns of open defecation in both rural and urban/slum areas in Southeast Nigeria. A majority of rural residents attribute open defecation to households without toilets as well as households residing in the same compounds in urban slums with shared single toilet forcing people to practice open defecation. Children were found to engage in open defecation more in the rural area and women amongst urban/slums dwellers. The study recommended an urgent need for adequate provision of water and sanitation materials in all South-East states, of Nigeria to combat open defecation. Also poverty alleviation programme by the government should be stepped up in the area. Finally, substantial awareness campaigns against open defecation should be vigorously mounted in the study area by the government.

**Keywords:** Open defecation, pattern, practices, South-East Nigeria

### **Introduction**

Open defecation involves the disposal of human feces in fields, forests, open bodies of water, beaches, or other open spaces, or even with solid waste like polythene bags in open places (UNICEF/WHO, 2015). Over 2.4 billion people globally do not have access to basic sanitation facilities such as toilets or latrines, and a recent UNICEF report (2018) revealed that 4.8 billion people worldwide lack improved sanitation facilities. India tops the list with



564 million people practicing open defecation, followed by Nigeria as the most endemic nation in Sub-Saharan Africa (UNICEF, 2018). This practice has far-reaching implications for public health, spread of diseases, environmental degradation and socio-economic development

Globally, open defecation is more prevalent in rural areas than urban areas in many developing countries like Indonesia (Kerstens et al., 2016), India (O' Reily et al., 2017), Mali, and Tanzania (Gertler et al., 2015). In 2015, only 2% of the urban population practiced open defecation compared to 24% of the rural population (UNICEF/WHO, 2017). In rural Uttar Pradesh, India, some families demolished toilets built by certain agencies to resume open defecation, perceiving faeces in latrine pits as impure and disrespectful to home shrines (Tiwaril, 2016). This highlights the influence of cultural and religious beliefs on open defecation practices.

In South-East Nigeria, open defecation is a common practice, especially among rural dwellers. In Ebonyi State, over 45.5% of the population defecates in bushes or open fields close to water sources. Similar situations are observed in Enugu (48%), Abia (1.2%), Anambra (14%), and Imo State (15.8%) (Multi-Indicator Cluster Survey, 2011). Economic barriers also drive open defecation, with households under financial pressure placing lower priority on sanitation (Jekins and Scott, 2007). Consequently, latrine owners are perceived as wealthier than non-latrine owners who practice open defecation (WHO/UNICEF, 2013).

The patterns of open defecation in Nigeria are influenced regional disparities of poverty, level education vary across different regions, influenced by factors such as poverty, level of education, access to sanitation facilities, and cultural beliefs.. In Nigeria, the practice differ by sex and age.. In some communities, plastic bags, referred to as hanging or flying toilets, are used for defecation and disposed of in rivers or roadside (Sara & Graham, 2014). Open defecation is higher among males than females and among young children and the elderly (Kirigia & Kainyu, 2000; Sara & Graham, 2014; Gross & Gunther, 2014; UNICEF/WHO, 2015).

Despite the efforts by governments and non-governmental organization such as UNICEF/WHO, and other health-related organizations to combat the phenomena a substantial proportion of the population, particularly in the rural areas, continues to engage in open defecation due to dearth of basic social amenities and infrastructural facilities in South-East Nigeria. Addressing open defecation requires a multifaceted approach that includes improving sanitation infrastructure, promoting behavior change through education and community engagement, and implementing supportive access to safe sanitation. This study investigated the patterns of open defecation practice in South- East Nigeria

### **Study objectives**

The specific objectives of the study were to:-

1. Find out the forms or patterns of open defecation in South- East Nigeria
2. Identify the categories of people more involved and common location used for open defecation in South- East Nigeria
3. Find out common locations frequently/mostly used for Open Defecation



## Literature Review and Theoretical Framework

Open defecation practice is reported highly among men who are livestock keepers and farmers that rise early for their work in Tanzania and defecate in farm places alongside their cattle's (Howe et al, 2012). Also, the issue of using plastic bags which is commonly referred to as hanging or flying toilets has been reported in Tanzania (Sara, & Graham, 2014).

Also, in a study conducted by Owolabi, (2012) in Ikare-Akoko, southwestern Nigeria, it was established that few households made use of water closet, while the rest used pit latrine, streams, drainage channels, open places, abandoned building and dumpsites to defecate. In a study conducted by Okafor & Nwude (2016), on coastal communities and associated socio-economic characteristics: study of two Akwa Ibom State communities using a mixed-method research design on 300 respondents as sample size; affirmed that because of the poor level of income to construct an improved toilet system, members of Ibaka and Uta-Ewa of Akwa-Ibom State Nigeria have the traditional practice of defecating on the surface water. Women find toilet to be safe, convenient to use at night and during menstruation but face several difficulties when they have to defecate in the open. In the absence of toilet, women often have to hold out and wait for a female relative to accompany them to defecate in the open. Disposal of sanitary pads and changing during menstruation is extremely embarrassing and difficult for women in the absence of a toilet. They are always fearful that men may see them and face constant stress of finding a safe, yet scheduled spot for open defecation (World Bank, 2017). In children, usage of toilets was only by 46.5% while the rest of the children practice open air defecation (28.8% in urban slums, 80% in rural areas. The usual sites for urban slums to defecate openly are on open fields (77%), alongside gutter (3%) and streets (20%) (Bathija & Sarvar 2017). Also, residing in sub-urban water front areas and difficult terrain is associated with higher prevalence of open defecation in Uttarakh and India (O' Reilly et al, 2017).

### Theoretical Framework

The Transtheoretical Theory, also known as the Stages of Change (SOC) model, was popularized by James O. Prochaska in 1979 and further developed by Prochaska and Carlo DiClemente in 1983 (Prochaska & DiClemente, 1983). This cognitive model is extensively applied in understanding the processes individuals undergo when modifying behaviour, encompassing five core stages: pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska & Velicer, 1997). The theory's major assumptions include the notion that behaviour change is a process rather than a single event, and individuals move through a series of stages at their own pace, which allows for the possibility of relapse and recycling through stages (Prochaska, Redding, & Evers, 2008). It assumes that different processes of change, such as consciousness-raising, self-re-evaluation, and social liberation, are critical at various stages, and that successful change depends on matching these processes to the appropriate stage (DiClemente & Prochaska, 1998).

Scholars like Sutton (2001) have praised the model for its practical application in health promotion, noting its versatility across diverse behaviours, including smoking cessation and dietary improvements. Armitage (2009) emphasized its utility in designing tailored interventions that align with individuals' readiness to change, thereby enhancing the effectiveness of public health campaigns. Further, Hall and Rossi (2008) have highlighted the model's empirical support through numerous longitudinal studies that demonstrate its predictive validity in behaviour change interventions. Velicer et al. (2000) discussed the



model's robustness in capturing the nonlinear progression of change, acknowledging its capacity to integrate relapse as a natural part of the change continuum. Additionally, Johnson et al. (2008) underscored the model's comprehensive approach, which encompasses both cognitive and behavioural strategies to facilitate sustained behaviour change.

Applying the Transtheoretical Theory to the topic of "Patterns of Open Defecation in South-East Nigeria" provides a structured framework to understand and address this public health challenge. Open defecation, a deeply entrenched practice in many rural areas of Nigeria, particularly in South-East Nigeria, can be effectively analyzed through the stages of change. In the pre-contemplation stage, individuals may not recognize open defecation as a problem due to cultural norms and lack of awareness about health risks. Interventions at this stage should focus on consciousness-raising, providing information on the health impacts of open defecation and the benefits of improved sanitation (Prochaska & Velicer, 1997). In the contemplation stage, individuals begin to acknowledge the issue but may feel ambivalent about changing their behaviour. Here, motivational interviewing and community discussions can help individuals weigh the pros and cons of adopting safer sanitation practices (DiClemente & Prochaska, 1998).

During the preparation stage, individuals are ready to take action and may start planning to build or use latrines. Supportive measures, such as providing access to resources and technical assistance for constructing toilets, become crucial (Prochaska, Redding, & Evers, 2008). The action stage involves the active use of toilets and the cessation of open defecation. This stage requires ongoing support and reinforcement through community health programs and public recognition of efforts to improve sanitation (Johnson et al., 2008). Finally, in the maintenance stage, efforts should focus on sustaining behaviour change and preventing relapse. Regular monitoring, follow-up visit and community-led initiatives can help reinforce the new behaviour and address any barriers to continued use of toilets (Hall & Rossi, 2008).

The Transtheoretical Theory's relevance to this topic lies in its comprehensive approach to behaviour change, which can be tailored to the unique socio-cultural context of South-East Nigeria. By recognizing that change is a gradual process and providing stage-specific interventions, the model offers a pragmatic framework for promoting sustained improvements in sanitation practices. For instance, addressing the barriers to behavior change at each stage such as cultural beliefs, economic constraints, and lack of infrastructure can significantly enhance the effectiveness of interventions aimed at eliminating open defecation. Furthermore, the theory's emphasis on the cyclical nature of change, with the possibility of relapse, aligns well with the challenges faced in modifying deeply ingrained habits like open defecation

### **Methodology**

The study used a mixed methods research design, incorporating both quantitative and qualitative approaches. The general population of the study was 22,265,421 being the projected population of South-East Nigeria by 2022, while the target population was 1905 which was the population of six rural and urban communities of Ebonyi, Enugu and Imo states where open defecation is highly endemic in South-East, Nigeria. The multi stage sampling technique was used to select the respondents. The sample size for the quantitative component of the study was 1049 respondents' statistically derived using Taro Yamane formula, while 21 participants were purposively selected and interviewed for the qualitative In-depth Interview (IDI) component. The quantitative data were collected with structure



questionnaire schedule processed with SPSS version 24 and analyzed with descriptive statistics such as simple frequency distribution tables, simple percentages as well as graphs and charts, while the stated hypotheses were tested with chi-square ( $X^2$ ) statistic. The qualitative data were analysed thematically

## Results and Discussions

### Socio-Demographic Characteristics of the Respondents

The socio-demographic information of the respondents such as sex, age, educational attainment, marital status, place of residence, occupational, annual income, religious affiliation, were statistically analyzed, using the data obtained from the survey conducted. The information is presented in the table 1.

**Table 1: Socio-Demographic Characteristic of the Respondents**

<i>Description</i>	<i>Demographic Variables</i>	<i>Frequency</i>	<i>Percentage (%)</i>
<b>Gender</b>	Male	770	83.3
	Female	156	16.8
	<b>Total</b>	<b>926</b>	<b>100</b>
<b>Age</b>	18 – 22	148	11.1
	23 – 27	148	12.5
	28 – 32	75	8.1
	33 – 37	318	34.3
	38 - 42	155	16.7
	43 – 47	75	8.1
	48 – 52	77	8.3
	53 and Above	7	.8
	<b>Total</b>	<b>926</b>	<b>100</b>
<b>Educational attainment</b>	None	7	.8
	Vocational	88	9.5
	Primary	467	50.4
	Secondary	202	21.8
	Tertiary	162	17.5
	<b>Total</b>	<b>926</b>	<b>100</b>
<b>Marital Status</b>	Married	614	66.3
	Single/Never married	216	23.3
	Separated	7	.8
	Divorced	75	8.1
	Widowed	14	1.5
	<b>Total</b>	<b>926</b>	<b>100</b>
<b>Place of Residence</b>	Rural/riverine	563	60.7
	Urban/Slum	364	39.3
	<b>Total</b>	<b>926</b>	<b>100</b>
<b>Occupation</b>	Retired	14	1.5
	Farming/hunting/fishing	467	50.4
	Trading	61	6.6
	Paid employment	148	16.0
	Artisan	88	9.5
	Student	148	16.0
	<b>Total</b>	<b>926</b>	<b>100</b>



<b>Annual Income</b>	No income	229	24.7
	Below N300,000	102	11.0
	N300,000 – N500.000	588	63.5
	N600,000 – N800 – 000	7	,8
	N900,000 and Above	0	0
	<b>Total</b>	<b>926</b>	<b>100</b>
<b>Religious Affiliation</b>	Christianity	526	56.8
	Islam	0	0
	African Traditional Religion	400	43.2
	<b>Total</b>	<b>926</b>	<b>100</b>

*Field survey: 2023*

Table 1 shows the socio-demographic characteristics of the respondents. In the table it can be seen that 770(83.3%) were males while the rest were females. As for age the table shows that 318(34.4%) were 33-37 years of age; the table also shows that 467(50.4%) were primary school holders while 7(.8%) had no form of education. It can also be observed that 614(66.3%) were married while 7(.8%) were separated from marriage. In terms of place of residence, the study shows that 564(60.7%) reside in rural/riverine area the rest reside in the cities. This implies the population is mostly rural/riverine residents suggesting that some of the places considered urban does not actually qualify as urban centers. The table also shows that 467(50.4%) were farmers while 14(1.5%) were civil service retirees. It can also be observed that 588(63.5%) earned 300,000 to 500,000 annually, while none of the respondents earned up to a million naira in a year. The income data implies that a majority of the respondents are of average or below poverty level. Lastly, in terms of religious affiliation 526(56.8%) were Christians, while the rest of the respondents were traditional religious worshippers. This implies that a majority of the respondents are Christians as the Southeast regions is mostly populated by Christians of different denominations.

**Forms/Patterns of Open Defecation Practice Engaged by Rural and Urban/Slum Dwellers in South East, Nigeria**

Questionnaire items 29 – 35 were used to answer this research objective.

The respondents were first asked about the forms of open defecation available in their localities. The responses are presented in table 2

**Table 2: Respondents views on the forms of open defecation**

<b>Responses</b>	<b>Residential Localities</b>		<b>Frequency</b>	<b>Percentage</b>
	<b>Rural</b>	<b>Urban</b>		
Use of pointed sticks to dig holes	108	30	138	20.4
Use of Uncompleted buildings	30	130	160	23.6
Short-put method by the use of polythene bags	18	140	158	23.3
Bush defecation	205	15	220	32.5
<b>Total</b>	<b>361</b>	<b>315</b>	<b>676</b>	<b>100</b>

*Field survey: 2023*

Table 2 shows that 205 (56.7%) rural dwelling respondents identified bush defecation, as against 140(44.4%) urban / slum dwellers that identified use of “short- put method” by the use polythene bags as the major forms of defecation in the study area., while only identified use of uncompleted building and bush defecation amongst the rural and urban dwelling





respondents respectively in the study area. This implies that bush defecation and “short- put method” by the use polythene bags are the major form/pattern of defecation in both rural and urban/slum dwellers a in Southeast Nigeria. The respondents stated that they were constrained by the number of improved toilets facilities in a compound which compel many to seek alternative options to practice open defecation. The qualitative data have divergent responses with some supporting the quantitative data while others did not.

A respondent said...

I reside in a flat so there is no how I use open defecation or public toilet system; *I have water cistern toilet in my house and that serves me very well* (**Male, Building Engineer, 48 years Urban resident**).

One respondent stated differently...

We reside in open or general compound many people use the same pit toilet, there is no water system in the house like if you're leaving in a self-contain or flat, this one is general toilet (**Female, farmer, 56 years of Age, Urban resident**).

### Category of People that Engage in Open Defecation

Further, the respondents were asked the category of people that engage open defecation. The findings are presented in table 2.

**Table 2: Respondents views on the Category of People That Practice Open Defecation Toilets**

Responses	Residential Localities		Frequency	Percentage
	Rural	Urban		
Children	143	125	268	39.6
Women	98	64	162	23.9
Men	76	41	117	17.3
Visitors	18	28	46	6.8
Everyone	52	31	83	12.3
<b>Total</b>	<b>387</b>	<b>289</b>	<b>676</b>	<b>100</b>

*Field survey: 2023*

Table 2 shows that 268(39.6%) (98 rural and 64 urban) identified women as the category of people that often use open defecation at every slightest opportunity, while 46(6.8%) (18 rural and 28 urban stated that category of people that often use open defecation are visitors. Women consider their body open as such by far more susceptible to contracting diseases more than men. It therefore implies that perhaps the women considered the house toilets unclean and so they try to avoid getting infections thereby using open defecation more regularly. Although the utilization of open defecation might also expose them to other forms of insecurity and violence for example rape.

### Common Locations of Open Defecation

Finally, the respondents were asked about the common locations for open defecations.. The responses are presented in Table 3.

**Table 3: Respondents views on the Common locations for open defecation in their communities**

Responses	Residential Localities		Frequency	Percentage
	Rural	Urban		
Farmland defecation	70	19	89	13.2
Stream defecation	84	31	115	17.0
Bush defecation	121	69	190	28.1
Gutters and drainages	45	38	83	12.3
Uncompleted building	67	132	199	29.4
<b>Total</b>	<b>387</b>	<b>289</b>	<b>676</b>	<b>100</b>

*Field survey: 2023*

Table 3 shows that 121(28.1%) of rural population identified bush defecation while 132(45.7%) of urban population identified uncompleted buildings. From the data on a general it could be observed that a majority both rural and urban a majority of the respondents 199(29.4%) identified uncompleted buildings. This implies that both at the rural and urban area open defecation occur mostly in uncompleted buildings this could be because such buildings tend to give the individual cover from public notice.

### Discussions

The study investigated the Patterns of Open Defecation Practice in South- East Nigeria The major forms or patterns of open defecation identified in the study are bush defecation practices and short-put method by the use of polythene bags. On the category of persons that mostly engage in open defecation children and women were found to engage more in open defecation in South-East, Nigeria. This probably maybe because women consider their private genitals more susceptible to contracting diseases from the utilization of latrine however, with open defecation such diseases might be mitigated especially in rural areas where open defecation is endemic. Findings by Okafor & Nwude (2016), did not align with this study finding. Their study found that women in Ibaka and Uta-Ewa rather prefer to use toilets which they find to be safe than open defecation although in the absence of toilets, women often have to hold out and wait for a female relative to accompany them to defecate in the open. The fear might be as a result of heightened attacks on women within the area. The study found that the respondents consider the water system flush toilet system as the most preferred toilet for use in households. However, the study by Howe et al, (2012) found that open defecation practice is reported highly among men who are livestock keepers and farmers that rise early for their work in Tanzania and defecate in farm places alongside their cattle's. The study by O' Reilly et al, (2017) associated residing in rural areas as a pattern that supports practice of open defecation. One of the major forms or patterns of open defecation identified by the respondents in the study found out that a majority of the respondents engaged in bush defecation practices. Also, other forms of open defecation are streams/rivers defecation, and short-put method by the use of polythene bags.

### Conclusion

The findings in this highlight the significant effects of open defecation practices in Southeast Nigeria Despite efforts by the government and non-governmental organizations to combat open defecation, this study found that the interventions did not factor contexts in which the phenomenon thrives leading to limited success. The consequences of open defecation are thus, profound, affecting public health, education and economic productivity.





The study underscores the necessity for a multi-faceted approach to address open defecation, combining infrastructural development with community engagement. Empowering local communities through participatory approaches and fostering behaviour change, towards achieving open defecation free society in South-East Nigeria are worthwhile. While the challenges are significant, the potential benefits of eradicating open defecation through improved public health, and social well-being of the people should be paramount. Therefore concerted efforts are essential for the success of future initiatives for complete elimination of open defecation in South-East region in particular and Nigeria at large.

### Recommendations

Based on the research findings, there is the need for environmental cleanliness and provision of adequate water supply for the elimination of open defecation in South-East and Nigeria at large. The following recommendations are therefore put forward:

1. To address open defecation and maintain environmental cleanliness, the Nigerian government should adopt the following strategies:-
  - Adopt Community-Led Total Sanitation (CLTS) to empower communities take charge of their sanitation need through awareness campaigns, encouraging behavior change and promoting the construction of latrines
  - Provide Sanitation Infrastructure and invest in building public toilets, especially in rural arrears and urban slums, and ensure their maintenance and accessibility.
  - Embark on Education and Awareness Campaigns through nationwide campaigns to educate people about the health hazards of open defecation and the benefits of proper sanitation practices
2. The government should Develop and promote gender-specific sanitation solutions that address women's unique concerns and safety needs. This could include the construction of women-friendly toilets with adequate privacy, security measures, and hygiene facilities. Additionally, community programs should focus on educating women about safe sanitation practices and involve them in the design and implementation of these solutions to ensure their needs are adequately met.

### References

- Bathija, G. V., & Sarvar, R. (2017). Defecation practices in residents of urban slums and rural areas of hubballi, Dharwad: a cross sectional study. *International Journal Of Community Medicine And Public Health*, 4(3), 724–728.  
<https://doi.org/10.18203/2394-6040.ijcmph20170747>
- Evans B. (2009). Sustainability and Equity Aspect of Total Sanitation Programmes. *Water Aid*.
- Gertler, P., Shah, M., Alzua, M. L., Cameron, L., Martinez, S., & Patil, S. (2015). How does healthpromotion work? Evidence from the dirty business of eliminating open defecation. Working paperseries. Center for Effective Global Action, University of California.
- Gross, E., & Gunther, I. (2014). Why do households invest in sanitation in rural Benin: Health, wealth, orprestige? *Water Resources Research*, 50, 8314–8329.
- Howe, T., Davidson, B., Worrall, L., Hersh, D., Ferguson, A., Sherratt, S., & Gilbert, J. (2012). 'You needed to rehab ... families as well': family members' own goals for aphasia rehabilitation. *International journal of language & communication disorders*, 47(5), 511–521. <https://doi.org/10.1111/j.1460-6984.2012.00159.x>



- Jenkins, M. & Scott. B. (2007). *Behavioural Indicators of Household Decision-making and Demand for Sanitation and Potential gains from Social Marketing in Ghana Social Science and Medicine* 64(12) 2427- 2442.
- Kertens, S. M., Hutton, G., Indra, F., Grietje, Z, (2016), An Integrated Approach to Evaluate Benefits and Costs of Wastewater and Solid Waste Management to Improve the Living Environment: The Citarum River in West Java, Indonesia. *Journal of Environmental Protection* 7(11):1439-1465
- Kirigia J. &Kainyu L. (2000). Predictors of Toilet Ownership in South Africa: *East African Medical Journal*.77 (12), 667-672
- Multiple Indicatory Cluster Survey (2008). Situation of Open Defecation in States and FCT.
- O'Reilly, K., & Budds, J. (2017). Sanitation citizenship: state expectations and community practices of shared toilet use and maintenance in urban India. *Environment and Urbanization*, 35(1), 238-254. <https://doi.org/10.1177/09562478221148027>
- Owolabi, R and Adebowale O (2017). Health Information Management Personnel Service Quality and Patient Satisfaction in Nigerian Tertiary Hospitals. *Global Journal of Health Science* 9(10)
- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51(3), 390-395. <https://doi.org/10.1037//0022-006X.51.3.390>
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12(1), 38-48. <https://doi.org/10.4278/0890-1171-12.1.38>
- Prochaska, J. O., Redding, C. A., & Evers, K. E. (2008). The transtheoretical model and stages of change. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 97-121). Jossey-Bass.
- Sara, S. & Graham J. (2014). Ending Open Defecation in Rural Tanzania: Which Factors facilitate Latrine Adoption. *International journal of environment research and public health*, 11, 9854-9872 doi. 10.3390/ijerph 11090-9854
- Tiwani. A., and Sadhana, C. (2016). Assessment of Ambient Air Quality in the Vicinity of Cement Industries. *International Journal of Applied Research and Technology* 1(1): 39-46
- Unicef (2015). *Child Faeces Disposal in Nigeria 2015* International Bank for Reconstruction and Development/The World Bank and Unicef.
- UNICEF/WHO (2015). *Progress on Sanitation and Drinking Water 2015 Update and MDG Assessment*, Geneva.
- Velicer, W. F., Prochaska, J. O., Fava, J. L., Norman, G. J., & Redding, C. A. (2000). Smoking cessation and stress management: Applications of the transtheoretical model of behavior change. *Homeostasis in Health and Disease*, 40(5), 258-267. [https://doi.org/10.1016/S0033-3506\(99\)00147-5](https://doi.org/10.1016/S0033-3506(99)00147-5)
- WHO/UNICEF (2013). *Progress on Sanitation and Drinking Water*.