

FACTORS CONTRIBUTING TO PREVALENCE OF OPEN DEFECATION IN TESHIE LEDZOKUKU MUNICIPALITY, GREATER ACCRA, GHANA

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Received 25th June 2021; Accepted 28th July 2021; Published online 27th August 2021

Abstract

Background: Open defecation is the disposal of human feces in fields, forests, bushes, open water bodies, beaches or other open spaces. The percentage of people without access to basic sanitation facilities in Africa was 44 percent in 2000 and 37 percent in 2010. Also, 70 percent, or two out of three people, do not have access to a toilet, a staggering statistics couple with the fact that slum growth and urbanization is raising present a difficult situation. A common solution is to share toilet facilities through partnerships of landlord and tenants. However shared sanitation in the form of public or community latrines is a pragmatic way of increasing coverage. This study seeks to examine factors associated with open defecation as well as the beliefs and perceptions towards open defecation. **Method:** A cross-sectional study using quantitative approach to collect data from participants in Teshie Ledzokuku Municipality from 18years and above. Random sampling was used to choose four (4) electoral names from the total list of 11 (West Akromadeokpo, East Akromadeokpo, Nii Ashitey Akomfra, Okesekor, Aborle-Bu, Sutsurunor, Agblesan, Tsuibleoo South, Tsuibleoo Central, Tsuibleoo North, South Teshie Nuagua Estate, North Nuagua Estate). Furthermore STATA 14 (Statacorp LP, College Station, TX, USA) software was used to analyze the data. Ethical approval was sort from Ensign College of Public Health Ethical Review committee and Ghana Health service. A written consent form was filled by each participant before beginning any questioning. **Result:** There are three hundred (300) participants. 63% of participant were 18-30years, 97% had some form education, 73% are either employed or self-employed, 41% live in household with less than 5 member and 77% have toilet facilities. The study found that open defecation is practices by both those with toilet facilities (14%) and those without toilet (47%). Major reasons for open defecation are lack of toilet facilities, poverty and the preference to openly defecate.

Keywords: Open Defecation, Sanitation, Waste Control, Public Toilet, Waste Management, Greater-Accra, and Ledzokuku Municipality.

INTRODUCTION

Open defecation is the disposal of human feces in fields, forests, bushes, open bodies of water, beaches or other open spaces, or with solid waste (WHO and UNICEF, 2017). There are two types of toilet facilities including improved facilities; which comprises of flush/pour flush to piped sewer systems, septic tanks or pit latrines; ventilated improved pit latrines, composting toilets or pit latrines with slabs. Unimproved facilities are pit latrines without a slab or platform, hanging latrines or bucket latrines (WHO and UNICEF, 2017). In 2015, about 5 billion people used an improved sanitation facility that were not shared with other households, and thus are classified as having at least basic sanitation services. In addition, 600 million people (8% of world population) used improved but shared facilities that are classified as limited sanitation services. Majority of the billion people who lacked a basic sanitation services either practice open defecation (892 million) or use unimproved facilities such as pit latrines without a slab or platform, hanging latrines or bucket latrines (856 million) (WHO and UNICEF, 2017). The United Nations Millennium Development Goals include eight goals that all 191 UN member states have agreed to try to achieve by the year 2015. The seventh goal was to ensure environmental sustainability (WHO, 2018). Furthermore it was agreed that the proportion of people without access to safe drinking water and basic sanitation should be reduced by 50% between 1990 and 2015 (UNICEF, 2011).

Although some countries were not able to achieve this goal, the Sustainable Development Goals became the new target goals to be achieved by 2030, under which goal number 6 is Water and Sanitation (United Nation Development Programme, 2019). The WHO/UNICEF Joint Monitoring Program for Water Supply, Sanitation and Hygiene (JMP) has produced regular estimates of global progress on drinking water, sanitation and hygiene (WASH) since 1990. It has established an extensive global database and has been instrumental in developing global norms to benchmark progress. The JMP was responsible for monitoring the 2015 Millennium Development Goal (MDG) target 7c5 and is now responsible for tracking progress towards the 2030 Sustainable Development Goal (SDG) targets related to drinking water, sanitation and hygiene (WASH) (WHO and UNICEF, 2017). According to Joint Monitoring Program, Improved sanitation facilities are those designed to hygienically separate excreta from human contact. People should use improved sanitation facilities that are not shared with other households, these are three main ways to meet the criteria for having a safely managed sanitation service (SDG 6.2). The excreta produced should either be:

- Treated and disposed of in the toilet premises,
- Stored temporarily and then emptied, transported and treated off-site, or
- Transported through a sewer with wastewater and then treated off-site.

basic sanitation service (SDG 1.4). According to WHO-UNICEF report there are almost 900million people still practicing open defecation in 2017 (WHO and UNICEF, 2017). Although a lot of progress has been made on provision of adequate toilets and equitable sanitation, the Joint Monitoring Program report data in the 2017 showed that Open defecation has decreased and billions of people lives have improved, this has translated into better health and diseases inhibition. Furthermore the 2017 report “No child should die or get sick as a result of drinking contaminated drinking water, being exposed to other people’s excreta, or having no place to wash their hands. No child should have to stay away from school for lack of a clean toilet and privacy. No mother or newborn should contract an infection from an unsanitary delivery room when they are most vulnerable and no one should suffer the indignity of having to defecate in the open” (WHO and UNICEF, 2017). Even though from the year 2000, a lot of progress has been made, especially in the provision of toilet facilities to the most rural communities and those who cannot afford to build their own toilet but would like to own such facility. This is why the 2030 Agenda for Sustainable Development recognize safe drinking water, effective sanitation, and good hygiene (WASH) both as an end in itself and as a driver of progress on many of the SDGS, including health, nutrition, education and gender equality (WHO and UNICEF, 2017).

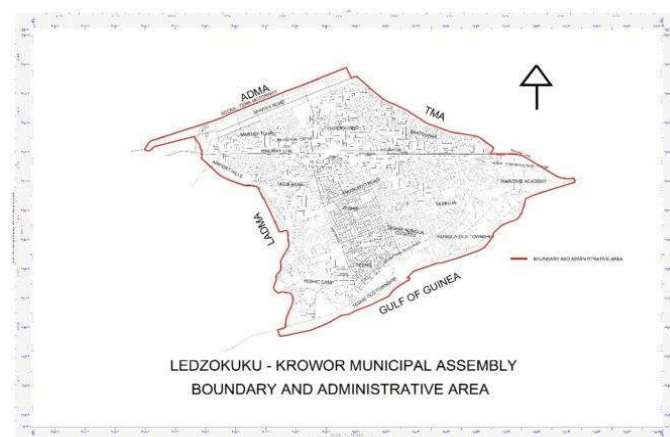
It is important to study the progress that has been made thus far and why people still defecate in the open, because certain intervention can either be stopped or changed to suit the new challenges encountered especially when it has to do with culture, norms, attitude and beliefs. The new Sustainable Development Goal has an explicit expression of ending Open defecation by 2030 (WHO and UNICEF, 2017). This goal has to be comprehensive and not only focused on building toilet but educational too, so that the community can understand the benefit of using the toilet and the risk of practicing open defecation. Some 842 000 people in low- and middle-income countries die as a result of inadequate water, sanitation, and hygiene each year, representing 58% of total diarrhea deaths. Poor sanitation is believed to be the main cause in some 280 000 of these deaths. Diarrhea remains a major communicable disease that is largely preventable. Clean water, improved sanitation, and hygiene could prevent the deaths of 361 000 children under 5 years each year. Open defecation perpetuates a vicious cycle of disease and poverty. The countries where open defecation is most widespread have the highest number of deaths of children under 5 years as well as the highest levels of malnutrition and poverty, and huge disparities in wealth (www.sanitation2008.org,2008). From Edwin Chadwick’s report on the sanitary conditions of the laboring population of great Britain (The Health Foundation, 2018) to John Snow’s investigation into the cholera epidemic in 19th century London (Hempel, 2013), sanitation has been perceive as a basic intervention. In 2002 the estimated disease burden from water, sanitation, and hygiene is 4.0% of all deaths and 5.7% of the total disease burden (in DALYs) occurring worldwide, taking into account diarrheal diseases, schistosomiasis, trachoma, ascariasis, trichiniasis, and hookworm disease (Prüss *et al.*, 2002). However a recent study conducted on the same risk exposure in 2010 only attribute 0-9% of global DALYs resulting in fall in rank between 1990 and 2010 (Lim *et al.*, 2012). Improvements of sanitation alongside water and hygiene infrastructure and appropriate health-seeking behavior are necessary for achieving sustained control, elimination, or

eradication of many neglected tropical diseases (Freeman *et al.*, 2013). According to WHO lack of access to water, sanitation and hygiene is the third most significant risk for environmental burden of disease for children and adolescents (World Health Organization, 2019). Poor wastewater management coupled with lack of sanitation facilities has aggravated the sanitation challenges in developing countries (Montgomery and Elimelech, 2007). This has led to diarrheal disease responsible for killing around 525 000 children under 5years every year out of the 1.7billion case (World Health Organization, 2017). In Africa, the percentage of people without access to basic sanitation facilities was 44 percent in 2000 and 37 percent in 2010, and In Sub-Saharan Africa, in particular, 70 percent, or two out of three people, do not have access to a toilet, a staggering statistic (JICA, 2013), coupled with the fact that slum growth and urbanization is raising (United Nations Fund for Population Activities, 1977) present a difficult situation. A common solution is to share toilet facilities through partnerships of landlord and tenants (Schaub-Jones, 2006). However shared sanitation in the form of public or community latrines is a pragmatic way of increasing coverage, but it is currently not deemed “improved toilet facility” (Mazeau *et al.*, 2014). Ghana is a middle income country with a growing population of 29 million people and is one of the most urbanized countries in Africa and almost half the country now lives in towns and cities, and of these less than one fifth has access to at least a basic sanitation service (WSUP, 2013). This has serious consequence for people’s dignity, health and ability to work or attend school. This study seeks to quantitatively examine the factors associated with open defecation as well as their beliefs and perceptions toward open defecation. Furthermore, the preference of the respondent to use toilet facility or open defecation.

METHODS

Study Site

Figure 1.0 shows the total land area of LEKMA, estimated to be 50 square kilometers. The municipality is bounded on the south by the Gulf of Guinea, stretching along the railway line into Sakumono. It is bounded on the East by the Spintex Road all the way to Coca Cola Roundabout. To the north by Motorway through to the Tetteh Quarshie Interchange (*About Ledzokuku Krowor Municipal Assembly :Ledzokuku Krowor Municipal Assembly*, 2016).



Source: Ledzokuku-Krowo Municipality Assembly, 2016

Figure 1.0. Map of Ledzokuku-Krowo Municipality

Ethics

Ethical clearance was obtained from Ensign College of Public Health Review board, and permission was sought from the district assembly of Ledzokuku Municipality before the research commenced. Participants consent was given before they were asked any question because the research participation is voluntary. To ensure confidentiality no name was used on the research questionnaire rather only identification number was used. Data will only be accessed by Principal investigator, research assistant and supervisor.

Study Design and Study Population

Quantitative method was used for this research work. A cross sectional survey was done by the researcher and research assistant for four weeks in Four (Tsuibleoo Central, Tsuibleoo North, South Teshie Nuagua Estate, North Nuagua Estate) out of Eleven of the Teshie Ledzokuku Municipality during the month of February 2020. The research study population includes all household communities in Teshie Ledzokoko, Accra. Especially compounds and house head, wife or spouse and children above 18year.

Data collection techniques and tools

The questionnaires used was self-administered and self-constructed. It enabled the researcher to evaluate the relationship between the predicting variables and the response variable. Some of the predicting variable used are educational level, age, gender, occupation, accessibility of toilet facility etc while the response variable will be open defecation practice.

Study Variables

These are the variable that will be included for the scope of the study:

Dependent Variable

- Open defecation Independent Variables
- Socio-demographic factors- Age, gender, educational level, marital status
- Socio-economic factors- Income, employment status
- Beliefs and perception toward open defecation.

Sampling

Using the prevalence rate for open defecation in the study area of 20%, confidence interval of 95%(CI95%), margin of error (e) 5% and a 5% non-response rate, sample size (n) calculation will be as follows:

$$\text{Samplesize}(n) = \frac{5^2 \times 20(1-20)}{0.05^2}$$

Where Z = confidence interval at 95% (standard value of 1.96)
P = estimated prevalence rate of open defecation (20%) e = margin of error (5%)

$$n = \frac{1.96^2 \times 0.20(1-0.20)}{0.05^2}$$

$$n = 246$$

$$\text{Adjusting for 10\% non-response rate} \\ \frac{10 \times 246}{100}$$

$$\text{Adjusted sample size} = 246 + 25$$

$$= 271$$

Actual total samples used is 300 participants.

Random sampling was used to choose four (4) electoral names from the total list of 11 (West Akromadeokpo, East Akromadeokpo, Nii Ashitey Akomfra, Okesekor, Aborle-Bu, Sutsurunor, Agblesan, Tsuibleoo South, Tsuibleoo Central, Tsuibleoo North, South Teshie Nuagua Estate, North Nuagua Estate). A systematic sampling was used to choose respondents in the four communities.

Data Analysis

The collected data was analyzed with STATA software. This data will be analyzed by means of inferential statistics that includes frequencies, means, standard deviation, percentages, correlations (descriptive statistics) and chi squares associations and logistics regression analysis (inferential statistics). Chi square will be used to show the association between variables (dependent and independent) while multiple logistics regression will be used to determine the odds ratio among the variable. A variable would be considered statistically significant if the p-value is less than 0.05.

Pre-testing

The researcher questionnaires and interview guides were pre-tested at Nuagua, because it has similar characteristics with Teshie like language, type of trade, markets; a minimum of 25 household were conveniently selected.

Outcome

This study is expected to aid in the planning of interventions and policies towards Open defecation, it will help in understanding the underlying cause of open defecation.

RESULTS

Demographic characteristics of respondents

Tables and graphs depict the various characteristics of the study population like the frequencies, percentages, means and standard deviations. The age of participants ranges from 18 years to 72 years with an average age of 30.8 year \pm 12.03. The average household size was 8 \pm 5.16. Household hold ranges from 3 to 30 persons. Majority (39%) of our participants earn less than Ghc500 per month.

Age Distribution

Figure 1. shows the age distribution of participants. Majority (63%) of the participants is between 18years and 30 years. Also, the least group (8.7%) is made up of those above 50 years. The remaining groups are 31years to 40years and above 50years making up 17.3% and 11% respectively.

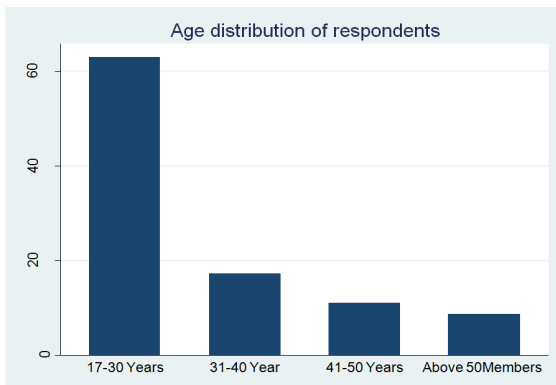


Figure 1. Age distribution of respondents

Table 1. The distribution of the demographic profile of respondents

Variables	Categories N=300	Frequency (%)
Sex	Male	156 (52%)
	Female	144 (48%)
Age	18-30 Years	189 (63%)
	31-40 Years	52 (17.33%)
	41-50 Years	33 (11%)
	Above 50	26 (8.67%)
Marital Status	Single	197 (63.67%)
	Married	67 (22.33%)
	Separated	27 (9%)
	Divorce/Widowed	9 (3%)
Educational background	No formal education	7 (2.33%)
	Basic level	99 (33%)
	Senior/Voc/Technical level	113 (37.67%)
	Tertiary	81 (27%)
Facility of interview	Household	86 (28.67%)
	Non-household	214 (71.33%)
	<500	116 (38.67%)
Family monthly income	500-1000	63 (21%)
	Above 1000	42 (14%)
	Nothing	79 (26.33%)
	1-5 Members	124 (41.34%)
Number of households	6-10 Members	120 (40%)
	11-20 Members	46 (15.33%)
	Above 20 Members	10 (3.33%)

From Table 1 above, Male constitute 52% of the total participants while Female were 48%. Majority (64%) of the participants are single, while 22.3% are married and the rest is share among Separated and Divorce/widowed of 9% and 3% respectively. Senior/Vocational/Technical level made up majority (38%) of the participants' educational background. Household with 1-5members and 6-10members constitute the high proportion of household number making up 41.3% and 40%respectively.

Occupation of Respondents

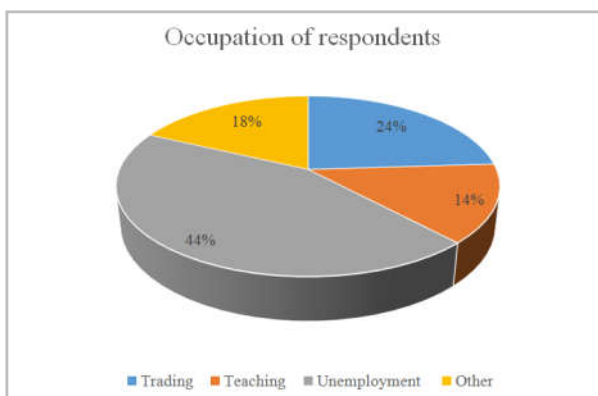


Figure 2. Occupation of respondents

From Figure 2 unemployment constitute majority (44%) of the participants whereas Trading 24%, Teaching 14% and other of 18% is made up of Technicians, carpenter, seaman, hairdresser, seamstress, mason, driver and farming.

Determinant factors of open defecation in Teshie Ledzokuku Municipality

The findings for the association or determinant factors of open defecation using percentages and frequencies as well as test of association and multivariate analysis are presented below.

Open defecation and toilet usage among households

Table 2. Analysis of open defecation and toilet use by household

Variables	Categories N=300	Frequency (%)
Toilet facility in the household	No	70 (23.33%)
	Yes	230 (76.67%)
Use of toilet facility in the house	No	60 (20%)
	Yes	240 (80%)
Type of toilet facility	Water Closet	186 (62%)
	Public toilet	1 (0.33%)
	KVIP	68 (22.64%)
	Latrine	11 (3.67%)
Open defecation practice	None	34 (11.33%)
	No	235 (78.33%)
Use of the toilet facilities	Yes	65 (21.67%)
	Always	162 (54%)
	Sometimes	138 (46%)
Number of persons using a toilet facility	1-5	143 (47.67%)
	6-10	107 (35.67%)
	11-20	50 (16.66%)

Source: Field data, 2020

From the table 2 above, 76.7% of household has toilet facility and 80% use the toilet facility in their household, while 20% do not use their toilet facility. Majority (62%) of the household has water closet, 23% has KVIP while latrine users and those without toilet are 4% and 11% respectively. Only 22% of our participants practices open defecation, a majority of 78% do not practices open defecation and of these percentage only 54% use their toilet always while the rest only use their toilet sometimes. Toilet facility with one to five users has a majority of 48% while six to ten users and 11-20 users are 36% and 16% respectively.

The practice of people using the toilet they own

Table 3. Practices of participants that use their toilet facility

Do you have toilet facility in your household	Do you use the said toilet facility		
	No	Yes	Total
No	33	37	70
Yes	47.14	52.86	100.00
	27	203	230
Total	11.74	88.26	100.00
	60	240	300
	20.00	80.00	100.00

The presentation from Table 3 shows that 88.3% of those that own a toilet use it, while 11.7% own a toilet but do not use it. However, 52.8% of those that do not own a toilet tend to use a toilet facility. Out of all the participants only 47% do not own a toilet and don't use a toilet.

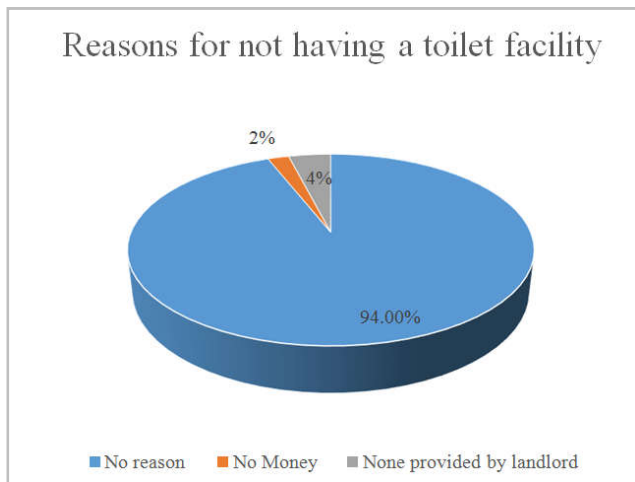


Figure 3. Reasons for the absence of toilet facility in the house

Figure 3 shows the different reasons why some of the household do not have a toilet, majority (94%) do not know why they do not have a toilet, while the other reasons are no money and none provided by landlord are 2% and 4% respectively. This is interesting considering the fact that only 11% of the participant do not have toilet.

Demographic characteristics of open defecation in Teshie Ledzokuku Municipality

Table 4 shows the demographic characteristics factors and its association with open defecation. Chi-square test was used to determine which factor has a significant association and those that don't. A significant association occurs when a factor has an alpha (α) value less than 0.05. A confidence interval of 95% was used for all the factors considered. These are some of the factors that had a significant association with Alpha value less than 0.05; Marital status (0.006), Age group (0.00), Family monthly income (0.002), Toilet facility available (0.00) and number of persons in a household (0.033). Also, Sex (0.369) and Educational background (0.12) has an Alpha value greater than 0.05 and therefore not statistically significant.

Logistics regression model for demographic factors on Open defecation practices

Table 5 below shows the individual demographic factors on open defecation practices and their level of Statistically significant (p-value). It is important to note that even though the level of significant for some factors is not statistically significant but it is very important for our study. The R on the table shows the category of reference group in each variable.

Sex & Marital status: It is clear that Males are 1.29 times more likely to practices open defecation as compare to the Female. Married couples are 0.71 times less likely to practice open defecation as compare to singles while Separated and Divorced/Widowed are 3.24 and 4.05 times more likely to practices open defecation compare with singles respectively.

Education background: All those with education are less likely to practices open defecation compare with those with no formal education. Also, the rate decreases as the educational level increase.

Family monthly income: Those earning above Ghc500 are all less likely to practices open defecation compare to those earning less than Ghc500. Also, the rate drops as the income increases.

Toilet facility available & Number of persons in a household: Those with toilet facility are 0.18 less likely to practices open defecation as compare. Also, household with 6-10 members are 0.73 less likely to practices open defecation and those above 10 members are 1.37 times more likely to practices open defecation as compared to family with 1-5member.

Members of household practicing Open defecation: Those that have member in their household that has practiced open defecation are 11.17 times more likely to practice open defecation themselves as compare to those with no member practicing open defecation.

Table 4 Demographic characteristics of Open defecation

Demographic characteristics		Open defecation				P-value
		No (n)	No (%)	Yes(n)	Yes (%)	
Sex	Female	116	80.56	28	19.44	0.369
	Male	119	76.28	37	23.72	
	Single	158	80.2	39	19.8	
	Married	57	85.07	10	14.93	
Marital status	Separated	15	55.56	12	44.44	0.006
	Divorced	4	50	4	50	
	Widowed	1	100	0	0	
Educational background	No formal education	3	42.86	4	57.14	0.12
	Basic level	76	76.77	23	23.23	
	Senior/Voc/technical	91	80.53	22	19.47	
Age group	Tertiary	65	80.25	16	19.75	0.00
	18-30 Years	158	83.6	31	16.4	
	31-40 Years	31	59.62	21	40.38	
	41-50 Years	29	87.88	4	12.12	
	Above 50	17	65.38	9	34.62	
Family monthly Income	<500	80	68.97	36	31.03	0.002
	500-1000	47	74.6	16	25.4	
	Above 1000	38	90.48	4	9.52	
Toilet facility available	Nothing	70	88.61	9	11.39	0.00
	No	37	52.86	33	47.14	
	Yes	198	86.09	32	13.91	
	1-5 Members	96	77.42	28	22.58	
Number of persons in a household	6-10 Members	99	82.5	21	17.5	0.033
	11-20 Members	30	65.22	16	34.78	
	Above 20 Members	10	100	0	0	

Table 5. Logistic regression for each demographic factor on open defecation practices

Variables		OR	P- value	95% CI
Sex	Female		R	
	Male	1.29	0.37	0.74-2.24
Marital status	Single		R	
	Married	0.71	0.377	0.33-1.52
	Separated	3.24	0.006	1.40-7.48
	Divorced/Widowed	4.05	0.055	0.97- 16.92
Educational background	No formal education		R	
	Basic level	0.23	0.064	0.47-1.09
	Senior/Voc/technical	0.18	0.033	0.38-0.87
	Tertiary	0.18	0.038	0.04-0.91
Age group	18-30 Years		R	
	31-40 Years	3.45	0	1.76-6.78
	41-50 Years	0.7	0.535	0.23-2.14
	Above 50	2.7	0.03	1.10-6.60
Family monthly Income	<500		R	
	500-1000	0.76	0.43	0.38-1.51
	Above 1000	0.23	0.01	0.08-0.70
Toilet facility available	Nothing	0.28	0.002	0.13-0.63
	No		R	
Number of persons in a household	Yes	0.18	0.00	0.1-0.33
	1-5 Members		R	
Member of household practicing Open defecation	6-10 Members	0.73	0.323	0.39-1.36
	Above 10 Members	1.37	0.388	0.67-2.81
Child feces thrown in the open	No		R	
	Yes	11.17	0.000	5.97-20.9
Do you have a child below 3 years	No		R	
	Yes	4.18	0.000	1.98-8.86
	No		R	
	Yes	2.11	0.013	1.17-3.82

Table 6. Multivariate logistics model of factors associated with open defecation

Logistic regression	Number of obs	=	300
	LR chi2(12)	=	62.09
	Prob >chi2	=	0.0000
Log likelihood = -125.75082	Pseudo R2	=	0.1980

Do you practice open defecation	Odds Ratio	Std. Err.	z	P> z	[95%Conf. Interval]
Educational background					
Basic level	.9462337	1.05251	-0.05	0.960	.1069533 8.371491
Senior/Voc/Technical Level	.5326783	.5795389	-0.58	0.563	.0631512 4.493121
Tertiary	.5045423	.554643	-0.62	0.534	.0585022 4.351338
New age					
31-40 Year	4.07569	1.743793	3.28	0.001	1.762028 9.427347
41-50 Years	.7945986	.4822156	-0.38	0.705	.2418699 2.610441
Above50 Members	2.164341	1.168826	1.43	0.153	.7510083 6.237442
Family monthly income					
500-1000	.9291045	.3747129	-0.18	0.855	.4214736 2.048136
Above 1000	.321797	.193821	-1.88	0.060	.0988317 1.047774
Nothing	.3408137	.1570193	-2.34	0.019	.1381505 .8407785
Do you have toilet facility in y					
Yes	.1716253	.062585	-4.83	0.000	.0839811 .3507367
Numb house new					
6-10 members	.5094514	.1896379	-1.81	0.070	.2456133 1.056705
above10members	.6678084	.3059331	-0.88	0.378	.2720844 1.63908
_cons	2.000861	2.191339	0.63	0.527	.2338745 17.11793

Table 7 Perceptions towards open defecation and hand washing in Teshie Ledzokuku Municipality

People perception on Open defecation		Open defecation				P-value
		No (n)	No (%)	Yes (n)	Yes (%)	
Preference of home toilet to Open defecation	Privacy	71	87.65	10	12.35	0.00
	Convenience	49	80.33	12	19.67	
How do you feel about open defecation	Hygiene	2	100	0	0	0.00
	Safety	102	77.86	29	22.14	
	Status and Prestige	11	44	14	56	
Use of soap and water for hand washing	Good	212	87.24	31	12.76	0.00
	Bad	17	37.78	28	62.22	
	Nothing	6	50	6	50	
	No	9	45	11	55	0.00
	Yes	226	80.71	54	19.29	

Inappropriate disposal of child feces: Persons who discriminately dispose their child feces are 4.18 times more likely to practice open defecation as compare to those who dispose child feces appropriately.

Multivariate logistics model of factors associated with open defecation

From Table 6 Above, the multivariate logistic regression analysis output using the variables that were statistically significant like Educational background, Age group, Family monthly income, availability of toilet facility and number of household members. The model is a good model because the p-value is 0.000 which is less than 0.05, even though only 19.8% of the variability in outcome can be predicted by the explanatory variable used. The table shows that as educational level increases the likelihood of open defecation reduces. Those with basic education, senior/voc/technical, and tertiary are less likely to open defecate by 0.946, 0.533, 0.505 respectively as compared to those without education while holding all other variable constant. Also those between 31-40 years and Above 50years are 4.076 and 2.164 times respectively more likely to practice open defecation while those between 41-50years are 0.795 times less likely to practice open defecation as compared with those between 18-30years, while holding other variable constant. The table further shows that only the variable 'do you have a toilet facility' is statistically significant because it has a p-value of less than 0.05. even though all the variables used for the multivariate were statistically significant in predicating open defecation with unadjusted odd ratios.

Perceptions towards open defecation and hand washing in Teshie Ledzokuku Municipality

From Table 7, Safety was the most (102) reason for preference of home toilet to open defecation table, next was privacy (71). Also, those (29) who practices open defecation believes that they are safe when they practice open defecation instead of using a home toilet facility that sometimes is unclean. Majority (87.24%) of participants in 'good' category feel good for not practicing open defecation, while 62.2% in the category of 'bad' feel bad about themselves while practicing open defecation. 80.71% of the participants that do not practice open defecation wash their hands with soap and water, while 19.29% of those that practice open defecation also use soap and water for hand washing. However, 55% of those that practice open defecation do not use soap and water for hand washing. All three variable are closely associated with open defecation as their p-value are all zero, this shows that all variables are highly statistically significant.

To evaluate the link between proper handling and disposal of child stool and open defecation

Table 8. Link between having a child under 3year, how their stools been disposed and adult open defecation

link between children stools disposal and open defecation		Open defecation				p-value
		No (n)	No (%)	Yes (n)	Yes (%)	
Do you have any children below 3 years	No	184	81.78	41	18.22	0.012
	Yes	51	68	24	32	
Are the child feces thrown in the open area?	No	218	81.65	49	18.35	0.00
	Yes	17	51.52	16	48.48	

From Table 8 81.78% of participants who do not have any children below 3year do not practice open defecation and for those with children only 32% practice open defecation. Also 81.65% of those who do not throw children stool in the open do not practice open defecation, while 48.48% of those throwing children stool in the open practice open defecation. Both variables are good predictors of open defecation because their p-values are 0.012 and 0.00 respectively.

Reasons for open defecation practices

Table 9. Reasons for practices of open defecation

Variable	Category	Frequency (%)
Reasons for Open defecation	Normal	234 (78%)
	Free	9 (3%)
	No smell	7 (2.33%)
	No queue	5 (1.67%)
	No toilet	38 (12.67%)
Place of Open defecation	Water shortage	7 (2.33%)
	Bush	106 (35.33%)
	Beach	122 (40.67%)
	Refuse dump sites	18 (6%)
	Gutters	24 (8%)
	Uncompleted building	9 (3%)
	House backyard	21 (7%)

From Table 9 majority (78%) of respondents said practicing open defecation is normal, and 12.67% said they practice open defecation because there is no toilet facility. About 35.33% open defecate in the bush and 40.67% at the beach and seaside.

DISCUSSION

Demographic characteristics and Educational background of respondents

From the findings only 2.3% of participants has no formal education, this indicates that majority of the participants has some form of education. Although Educational background having P-value of 0.12 is not statistically significant in our findings, it has a relationship with open defecation because the likeliness of open defecation practice decreases as educational level increases from Basic education to Tertiary with odds ratios of 0.23 and 0.18 respectively. Also, with high level of education, where 97.7% has one form of education from Basic to Tertiary but only 14% is engaged in formal employment, while 42% are in the informal sector and 44% unemployed. Out of the high number of educated participants only 14% earns above One Thousand Ghana cedis even though 27% have completed Tertiary education and 59.6% earn below One Thousand Ghana cedis (Ghc1000) per month. This indicates that there is high school enrollment but small good paying formal job opportunities therefore the reason why 42% are either trading or artisan.

Determinant factors of open defecation in Teshie Ledzokuku Municipality

The study shows 21.7% of participants practice open defecation which consist of individuals with (13.9%) and without (47.1%) toilet facility at home. However, 23.3% of participants has no toilet at home and 94% of these individuals do not have any reason why they do not have any toilet at home only few says because landlord did not provide and monetary issues. Also, of the number that practices open defecation 75% see it as normal. It is worrying as the mindset

towards open defecation is wrong. Sequel to Tarraf, 2016 findings that lack of toilet facility is a determining factor of open defecation and However from the study 11.7% of participants has toilet at home but do not use it for whole range of reason and 5% has toilet that is not functioning. The provision and use of toilet facilities are important component of the strategy for breaking the cycle of transmission of excreta-related disease (CSWA, 2004). The study further shows that those that have members of their family practicing open defecation are 11.2 times more likely to practice open defecation compare to those without any family member practicing open defecation. This is the highest odds ratio in the study and it is exacerbated by the general feelings toward open defecation as normal way of life. This is a significant factor in our findings. From the Table 9 above about 234 participants making up 78% saw open defecation as normal, in fact only 7 participants practice open defecation because it is free. This shows that money isn't the main cause for open defecation. Furthermore, out of the 38 participants that has no toilet only 18 practices open defecation meaning that it can be a choice one makes and not really the current situation. But the major problem is that majority including those who do not practices open defecation see it as normal, making cultural issues. This is very similar to the findings of (Tarra 2016) in india where people see open defecation as normal.

Table 10. Those having toilet with and without problems

Are there any problems in the use of the said toilet facility	Do you have toilet facility in your household		
	No	Yes	Total
No	19	161	180
Yes	16	15	31
Don'tknow	35	54	89
Total	70	230	300

Table 11. Number of persons using a toilet and those who always use their toile

How many people use the said toilet facility	Doyou0usethe toilet facility		
	Always	Sometimes	Total
1-5	83	60	143
6-10	56	51	107
11-20	23	27	50
Total	162	138	300

Table 12. How people feel about their toilet facility

Do you have toilet facility in your household	How do you feel about open defecation			
	Bad	Good	Nothing	Total
No	36	25	9	70
Yes	207	20	3	230
Total	243	45	12	300

From Table 12 it can be seen that 230 of the participants has toilet facility in their homes, however in Table 11 only 162 persons always use their toilet facility, this is closely related to the 161 persons that has toilet without problems in table 10. Also, it is clear from Table 11 that as number of those using the toilet increase the number of those always using their toilet reduces. It can be inferred that as more people use the said toilet facility it becomes very difficult to keep clean thereby discouraging people from using it. This also shows in table 12 where 20 of the persons with toilet feel good about open defecation. This is similar to the findings of (Osumanu, Kosoe and Ategeeng, 2019) that owing a toilet isn't a the main predicting factor for open defecation but having toilet used by fewer person.

Perceptions of open defecation and hand washing in Teshie Ledzokuku Municipality

Another good predictor of open defecation from our study is hand washing. From Table 7 80.7% of our participants practices hand washing and do not practice open defecation. It can be implied that good hygiene has more to do with our decision to practice open defecation. Additionally, good hand washing practice can inhibit sickness and prevent transmission of communicable disease.

Open defecation practice in Teshie Ledzokuku Municipality

From Table 5 males are 1.29 times more likely to practices open defecation compare to female, also only 2.3% of our participants has no formal education this is important as there is a decreasing likeliness to practice open defecation as education level improves from Basic level to Tertiary. However, the age group that is most likely to practice open defecation is 31-40year. This is further shown from Table 4.9 where the major group with high family income is those between 18-30years. Meaning that those between 31- 40year are most likely to practices open defecation. Also, those with household numbers above 10 are 1.37 times more likely to practices open defecation compare to those that has 1-5 members. Finally, those that live in houses where a member of the house practice open defecation are 11.17 times more likely to practice open defecation compare to those where no household member practice open defecation. And participants that throw child stool in the open are 4.18 times more like to practice open defecation compare to those who don't.

Conclusion

The study found that open defecation is practices by both those with toilet facilities (14%) and those without toilet (47%). Major reasons for open defecation include; lack of toilet facilities, poverty, the use of one toilet by many and the preference to openly defecate. Furthermore, Hand washing has a significant influence on open defecation, our study finds that 80.7% of participants who practice hand washing after using the toilet do not practice open defecation. Participants with higher education, better income and small household are less likely to practices open defecation. Also, sex had no association with the practices of open defecation.

Abbreviation

WHO- World Health Organization
 UNICEF- United Nations Children's Fund
 JMP- Joint Monitoring Program
 WASH- Water, sanitation and hygiene
 SDG- Sustainable Development Goal
 MDG- Millennium Development Goal
 DALYs- Disability-Adjusted Life Years
 UNFP- United Nations Fund for Population
 SANIPATH- Sanitation Pathways
 OD- Open Defecation

DECLARATIONS

Ethics approval and consent to participate: Ethical clearance was obtained from Ensign College of Public Health Review board, and permission was sought from the district

assembly of Ledzokuku Municipality before the research commenced. Participants consent was given before they were asked any question because the research participation is voluntary. To ensure confidentiality no name was used on the research questionnaire rather only identification number was used. Data will only be accessed by Principal investigator, research assistant and supervisor.

Consent for publication: I Ike Onyema Obi hereby declare that I participated in the study and in the development of the manuscript titled “Factors contributing to prevalence of open defecation in teshie ledzokuku municipality, greater accra, Ghana”. I have read the final version and give my consent for this article to be published in BMC Public Health journal.

Availability of data and material: The datasets generated and analyzed during the current study are not publicly available due to protection against misuse of data, but are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

Acknowledgement: I thank God for his protection and grace. I thank the Management of Ledzokuku Municipal Assembly for their assistance in engaging the community. I thank my wife Gloria Ike and Son Martin Obinna Ike for their understanding and support during this Thesis Project. A special thanks to my Supervisor Dr. Reuben Esena for your continuous corrections and critique during this Thesis work and to all the Faculty and members of Ensign College of Public Health thank you. I thank Harriet Noye my research Assistant for helping me in data collection. Sincerely I am grateful to all the author sand publishers of the literatures used in this script, without which I would not have been able to complete my work.

Authors’ contribution: IOO provided data acquisition, data analysis and interpretation, and primary drafting and editing of the article. RE provided supervision for the research work final approval of article. HUO, CMK, NA, GOM and JY were responsible for analytic design, critical revision of article and final approval.

REFERENCES

About Ledzokuku Krowor Municipal Assembly:Ledzokuku Krowor Municipal Assembly(2016). Available at: <https://lekmagh.org/about-lekma/>.

Abubakar, I. R. (2018) ‘Exploring the determinants of open defecation in Nigeria using demographic and health survey data’, *Science of The Total Environment*, 637–638, pp. 1455–1465. doi: 10.1016/j.scitotenv.2018.05.104.

Adogla-Bessa, D. (2017) *\$150m GAMA project in limbo; only 900 toilets to show - citifmonline.com*, *Citifm*. Available at: <http://citifmonline.com/2017/05/15/150m-gama-project-in-limbo-only-900-toilets-to-show/>.

Amfo-Otu, Richard; Debrah, Edward Waife; Adjei Kwakwa, Paul; Yeboah, S. (2012). Determinants of willingness to pay for improved waste management | *DownloadTable*.

Antwi-Agyei, P. *et al.* (2015) ‘A farm to fork risk assessment for the use of wastewater in agriculture in Accra, Ghana’, *PLoS ONE*. Edited by A. M. Ibekwe, 10(11), p. e0142346. doi: 10.1371/journal.pone.0142346.

Association, I. (2019) ‘Pre-Test Insights Association’, *Insights*

Association 2019. Available at: <https://www.insightsassociation.org/issues-policies/glossary/pre-test>.

Atuahene, Y. O. (2010) ‘Enhancing sanitation services delivery in the Ejura-Sekyedumase District. BY Yaw Owusu Atuahene, B.A (HONS)GEOGRAPHY’.

Creswell, J. (2013) ‘mixed methods: integrating quantitative and qualitative data studying patient- centered medical home models.’, *agency for healthcare research and quality*, 13, pp.1–5.

Diane Coffey, Aashish Gupta, Payal Hathi, Dean Spears, Nikhil Srivastav, S. V. (2017) ‘Understanding Open Defecation in Rural India’, *Economic and Political Weekly*, 52(1), pp.7–8.

Freeman, M. C. *et al.* (2013) ‘Integration of Water, Sanitation, and Hygiene for the Prevention and Control of Neglected Tropical Diseases: A Rationale for Inter-Sectoral Collaboration’, *PLoS Neglected Tropical Diseases*. Edited by S. Liang. Public Library of Science, 7(9), p. e2439. doi: 10.1371/journal.pntd.0002439.

Hamer, D. H. *et al.* (2016) ‘Beliefs, Behaviors, and Perceptions of Community-Led Total Sanitation and Their Relation to Improved Sanitation in Rural Zambia’, *The American Journal of Tropical Medicine and Hygiene*. The American Society of Tropical Medicine and Hygiene, 94(3), pp. 553–562. doi: 10.4269/ajtmh.15-0335.

Hempel, S. (2013) ‘John Snow.’, *Lancet*. Elsevier, 381(9874), pp. 1269–1270. doi: 10.1016/S0140-6736(13)60830-2.

Hyötyläinen, T. and Orešic, M. (2013) ‘CHAPTER 8. Data Handling’, in *RSC Chromatography Monographs*, pp. 183–194. doi:10.1039/9781849737272-00183.

JICA (2013) *The Challenge of Improving Sanitation in Sub-Saharan Africa | News & Features | JICA*. Available at:https://www.jica.go.jp/english/news/focus_on/ticad_v/articles/article24.html.

Kukreja, R. (2019) *How Open Defecation Affects Human Health and Environment and its Solutions - Conserve Energy Future*. Available at: <https://www.conserve-energy-future.com/how-open-defecation-affect-human-health-environment-and-solutions.php>.

Lechtenberg, U. (2019) ‘Types of Research Designs - Organizing Academic Research Papers’, *Sacred Heart University*, pp. 1–18. Available at:<https://library.sacredheart.edu/c.php?g=29803&p=185902>.

Lim, S. S. *et al.* (2012) ‘A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010’, *The Lancet*, 380(9859), pp. 2224–2260. doi: 10.1016/S0140-6736(12)61766-8.

Majlesi, A. *et al.* (2013) ‘Antibiotic Susceptibility of Helicobacter pylori Clinical Isolates in’, *enteric pathogens*, 01(01), pp. 8–11. doi:10.5812/ijep.9344.

Mazeau, A. *et al.* (2014) ‘Emerging categories of urban shared sanitation’, *Water and Environment Journal*, 28(4), pp. 592–608. doi:10.1111/wej.12075.

Media, G. (2018) *Residents at Teshie laud GAMA project and call for massive patronage - Media, 2018*. Available at: <https://www.gnglobalmedia.com/2018/02/07/residents-teshie-laud-gama-project-call-massive-patronage/>.

Montgomery, M. A. and Elimelech, M. (2007) ‘Water And Sanitation in Developing Countries: Including Health in the Equation’, *Environmental Science & Technology*, 41(1), pp. 17–24. doi: 10.1021/es072435t.

MyJoyonlie (2019) *Making Accra cleanest city in Africa by*

- 2020: Akufo-Addo making progress? - MyJoyOnline.com. Available at: <https://www.myjoyonline.com/news/2019/February-21st/making-accra-cleanest-city-in-africa-by-2020-akufo-addo-making-progress.php>.
- Njuguna, J. and Muruka, C. (2017) 'Open Defecation in Newly Created Kenyan Counties: A Situational Analysis', *Journal of Health Care for the Poor and Underserved*, 28(1), pp. 71–78. doi: 10.1353/hpu.2017.0009.
- Obeng, P. A. et al. (2015) 'Usage and Barriers to Use of Latrines in a Ghanaian Peri-Urban Community', *Environmental Processes*, 2(1), pp. 261–274. doi:10.1007/s40710-015-0060-z.
- Okertchiri, J. A. (2008) *Ending Open Defecation: A right Denied?* - DailyGuide Network. Available at: <https://dailyguidenetwork.com/ending-open-defecation-a-right-denied/>.
- 'Open-defecation: An enemy to tourism in Ghana - News Ghana' (2010) <https://www.newsghana.com.gh/>. Available at: <https://www.newsghana.com.gh/open-defecation-an-enemy-to-tourism-in-ghana/>.
- Osumanu, I. K., Kosoe, E. A. and Ategeeng, F. (2019) 'Determinants of Open Defecation in the Wa Municipality of Ghana: Empirical Findings Highlighting Sociocultural and Economic Dynamics among Households.', *Journal of environmental and public health*. Hindawi Limited, 2019, p. 3075840. doi: 10.1155/2019/3075840.
- Posker, D. (2020) 'LibGuides: Research Methods: What are research methods?'
- Prüss, A. et al. (2002) 'Estimating the burden of disease from water, sanitation, and hygiene at a global level.', *Environmental health perspectives*. National Institute of Environmental Health Science, 110(5), pp. 537–42. doi:10.1289/ehp.110-1240845.
- Saran Shantikumar (2018) 'Methods of sampling from a population | Health Knowledge', *Health Knowledge*, pp. 1–7. Available at: <https://www.healthknowledge.org.uk/public-health-textbook/research-methods/1a-epidemiology/methods-of-sampling-population>.
- Schaub-Jones, D. (2006) *Sanitation Partnerships: Overview Paper - Resources • SuSanA*. Available at: <https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/1884>.
- Tenkorang, J. A. (2014) 'Factors Associated with Return Migration in Wa Municipal in the Upper West Region.' University of Ghana.
- The Health Foundation (2018) Edwin Chadwick's Report on the sanitary conditions of the labouring population of Great Britain was published | Policy Navigator.
- Thys, S. et al. (2015) 'Why Latrines Are Not Used: Communities' Perceptions and Practices Regarding Latrines in a Taenia solium Endemic Rural Area in Eastern Zambia', *PLOS Neglected Tropical Diseases*. Edited by M. Gyapong. Public Library of Science, 9(3), p. e0003570. doi: 10.1371/journal.pntd.0003570.
- Tsikata, K. K. (2013) World Bank Approves Funds to Boost Water and Sanitation Services to Urban Residents and Improve Natural Resource Management in Ghana. Available at: <http://www.worldbank.org/en/news/press-release/2013/06/06/world-bank-approves-funds-boost-water-sanitation-services-urban-residents-improve-natural-resource-management-ghana>.
- UNICEF (2011) *UNICEF - Goal: Ensure environmental sustainability, United Nations Goal 7*.
- UNICEF (2014) *Eliminate Open Defecation | UNICEF Report*.
- United Nation Development Programme (2019) 'Sustainable Development Goals | UNDP in Malaysia', *Planning & Development Ministry*. Available at: <https://www.my.undp.org/content/malaysia/en/home/sustainable-development-goals.html>.
- United Nations Fund for Population Activities (1977) *Annual review of population law, 1977 international agreements, constitutional provisions, legislation, regulations, judicial decisions, legal pronouncements*. United Nations Fund for Population Activities.
- WHO (2018) *Millennium Development Goals (MDGs)*, WHO. World Health Organization.
- WHO & UNICEF JMP (2018) *Open defecation*.
- WHO and UNICEF (2017) *Progress on Drinking Water, Sanitation and Hygiene - Joint Monitoring Programme 2017 Update and SDG Baselines*, Who. doi: 10.1111/tmi.12329.
- World Health Organization (2017) 'Diarrhoeal disease.', *Clinical medicine (London, England)*, pp. 488–91.
- World Health Organization (2019) 'WHO | Burden of disease attributable to selected environmental factors and injuries among Europe's children and adolescents', *World Health Organization*. World Health Organization.
- WSUP (2013) 'Kenya | Water & Sanitation for the Urban Poor', wsup.com.
- www.sanitation2008.org (2008) *Sanitation*.
- Yogananth, N. and Bhatnagar, T. (2018) 'Prevalence of open defecation among households with toilets and associated factors in rural south India: an analytical cross-sectional study', *Transactions of The Royal Society of Tropical Medicine and Hygiene*. Narnia, 112(7), pp. 349–360. doi: 10.1093/trstmh/try064.
- Rhoda Afisah Kotomah, 2018 Thesis (Unpublished)