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Behavioural Factors That Influence Open Defaecation among First Cycle School Pupils in the Eastern and Volta Regions of Ghana

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Abstract

Objective: The study used theory of planned behaviour model to explore behavioural factors influencing open defaecation among school pupils and assessed their knowledge and awareness on health and environmental risks of open defaecation.

Method: This was school-based cross-sectional study in which self-reported data were collected from 400 pupils aged between 9-18 years using structured questionnaires, focus group discussions, and interview. Descriptive statistics, Chi-square test, structural equation modeling and thematic concept analysis were used to examine the data.

Results: The study found high level of open defaecation (64.3%) among the pupils with knowledge of environmental risk of open defaecation being fairly high (52%). Knowledge of health risk of open defaecation was, however, low among the greater number (53%) of the pupils. Attitude was found to be strongest determinant of open defaecation intention ($r = 0.708$; $p < 0.05$). Interaction of subjective norms and perceived behavioural control was significant predictor ($r = 0.608$, $p < 0.000$) of open defaecation.

Conclusion: The study found pupils' attitudes to be strong determinant of open defaecation behaviours but limited knowledge of health risks of the practice. The study recommends health education and introduction of courses into curriculum to help increase pupils awareness of health risks of open defaecation practices.

Keywords: Behavioural factors, open defaecation, first cycle school pupils, Volta, Eastern, Ghana.

1. Introduction

The influence of behaviour on open defaecation has attracted global concern in recent times. Statistics indicates that 2.5 billion people, representing 35% world over still do not have access to improved sanitation (Prasad, 2012; Colopy, 2012; & Rahman, 2010) and one billion of this number defaecate in the open (WHO/UNICEF, 2014). An estimated 801,000 children younger than 5 years die from diarrhea diseases annually, mostly in developing countries (Liu et al., (2012). This amounts to 11% of the 7.6 million deaths of children under the age of five and means that

about 2,200 children are dying every day as a result of diarrhea diseases (Liu *et al.*, 2012). Aggregate figures across Africa points to sanitation-related diseases, as the second greatest killer of children—more than the combined effects of AIDS, malaria and measles (WHO/UNICEF/JMP, 2008). Food and water contaminated with faecal matter cause up to 2.5 billion cases of acute diarrhea among children, resulting in 1.5 million deaths (Bill and Melinda Gates Foundation, 2011; UNICEF/WHO 2008) and leaving those who survive stunted, both physically and

cognitively (Spears, 2013; Fink *et al.*, 2011). A recent multiple-country study, for example, found that diarrhoeal diseases, caused by poor sanitation resulting from open defaecation alone accounted for 25% of stunting in children up to 24 months (Checkley *et al.*, 2008).

In Ghana, faecal contamination of the environment resulting from open defaecation has been identified as the major cause of 1,800 cases of cholera affecting children aged 0-5 years annually (WHO, 2005; UNICEF, 2012). Early childhood diarrhea resulting from open defaecation does not only contribute significantly to undernutrition, wasting, stunting and reduced long-term cognitive development of children in schools but it also results in intermittent school dropout. According to Ghana Demographic Health Survey, 1 in 5 children under five in Ghana are stunted due to exposure to persistent faecal matter. Official statistics by the Ghana Health Service indicates that about 80% of all outpatients' attendance are cases of faecal related diseases (UNICEF/WHO, 2008; Ghanaian Daily Graphic, 2009).

Asides its health implications, open defaecation also has economic and social costs. Statistics indicates that poor sanitation costs Ghana 420 million cedis each year (WSP/WB, 2010) and this sum is equivalent to 1.6% of country's national gross domestic product (GDP). Asides its financial burden, open defaecation also has considerable social costs. Loss of dignity and privacy and risk of physical attack and sexual violence may not be easily valued in monetary units, but these issues are the reality and largely associated with open defaecation. Diarrhoea, resulting from poor sanitation, causes many school children to miss days from school. Besides its economic and public health concern, open defaecation seriously compromised environmental cleanliness and safety. It pollutes the coastal and marine ecosystems, fouls the environment, and reduces the aesthetic beauty of the landscape thus hindering growth in tourism industry. The greatest perceived impact of faecal matter on aesthetics is the fact that it generates pungent smells and defaces visual appearance of the environment, particularly in towns and cities. Open defaecation leads to methane and carbon dioxide generation, which eventually leads to global warming thus contributing significantly to economic losses.

The problem of open defaecation is most severe in sub-Saharan African countries, where 63% of the population lacks access to basic sanitation facilities and one billion of this number representing 75% live

in rural communities in East Asia and sub-Saharan Africa (WHO/UNICEF, 2013). The number of people practicing open defaecation has actually increased in sub-Saharan Africa, and the region now accounts for a greater share of the global total than in 1990 (WHO/UNICEF, (2015).

On Ghana's perspective, open defaecation prevalence according to water aid Ghana (WAG) (2013) has increased to 23% in 2010 from 19% in 1990, indicating that the number of Ghanaians engaged in daily open defaecation has increased from 4.8 million to over 5.7 million same periods. With the country's current population of 24,658,823 (25 million) (GSS, 2012), the actual number of Ghanaian practicing open defaecation daily is now 5,743,100 with national average figure of 24% (WSP, 2013).

Today, pupils in the first cycle schools in Ghana defaecate in the open even though they have toilet facilities. The influence of human behaviour on sanitation in general and open defaecation in particular has been reported in many studies (WHO/UNICEF, 2015; WSP, 2012). However, limited studies have been conducted across Ghana to understand the behaviours of people who defaecate in the open. Understanding this will contribute significantly to development of intervention measures that will help people who defaecate in open revert to sustainable toilet use. This study was conducted as school-based cross-sectional survey to gather self-reported behavioural factors influencing open defaecation practices among the school pupils, assess pupils' knowledge and awareness/perceptions of environmental and health risks of open defaecation practices and use the outcomes to inform policy makers and sanitation stakeholders to develop appropriate behavioural intervention measures that will help open defaecators revert to toilet use. For the purposes and scope of this study, behavioural factor is defined as any overt action shown by pupils that prevent them from using toilets. The study used Theory of planned behaviour model (TPB) model, first as the theoretical foundation to investigate behavioural factors influencing open defaecation practices among pupils and second as a model to guide the study's methodological and analytical framework.

2. Materials and Methods

Study Area

The study was school-based cross-sectional survey which sought to explore the behavioural factors influencing open defaecation practices among pupils

in the first cycle schools. It was conducted in eight public first cycle schools selected from eight communities which comprised four rural and four urban. The study used structured questionnaire (SQ), focus group discussions (FGDs) and in-depth interview (IDI) guides to gather self-reported data. The SQ was administered to 400 randomly selected respondents and 21 FGDs comprising 11 female groups and 10 male groups held with 192 respondents randomly selected from pupils who reported to have defaecated in the open within seven days prior to the survey. On average, each FGD comprised 6-9 pupils and data was collected to the point of saturation. English was the main language used during the FGDs. The FGD sections were audiotaped using digital audio-recorders with participants consent. On average, each FGD session lasted between 45-60 minutes. The IDI was conducted with 24 pupils to assess their opinions and views on factors that prevented or influence them to defaecate in the open. Each interview session lasted between 20-30 minutes and was audiotaped.

Ethical issues such as consent for photographing, audio recording of participants' voices were strictly adhered to throughout the interview process. Quality control measures such as the need for independent completion of the questionnaires and freedom of participation or withdrawal from the study were followed. Efforts were also made to minimize methodological, personal and social desirability

biases. Ethical Clearance Certificate No. ECBAS 035/15-16 to undertake the study was given by Ethical Committee for Basic and Applied Sciences (CBAS), University of Ghana. A verbal assent was obtained from parents and appropriate guardians of participants before they were used in the study. Verbal informed consent was also provided by all respondents to participate in the study.

3. Data Analysis

Test items reliability and internal consistency were determined using Cronbach's alpha statistics. Descriptive statistics was used to determine the frequency and percentage distribution of pupils' socio-demographic characteristics and knowledge and perception of environmental and health effects of open defaecation in the sample. Chi-squared test was conducted to determine the association between self-reported behavioural factors and pupils open defaecation intention and open defaecation practices. Structural equation modeling (SEM) path analysis of variance was applied to the sample of 400 completed questionnaires to estimate mean effect sizes of behavioural variables included on attitudes, subjective norms and perceived behavioural control measuring scales on pupils open defaecation intention and actual open defaecation practices. Figures 2-7 showed the SEM path diagrams.

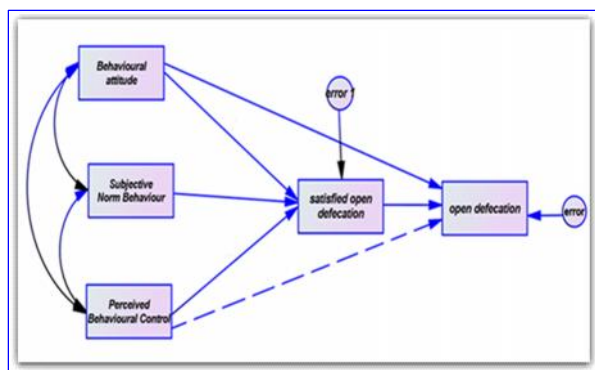


Figure 2: SEM Path Diagram (M1)

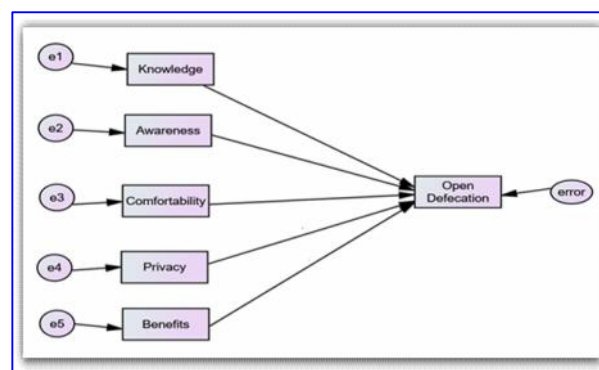


Figure 3: SEM Path Diagram (M2)

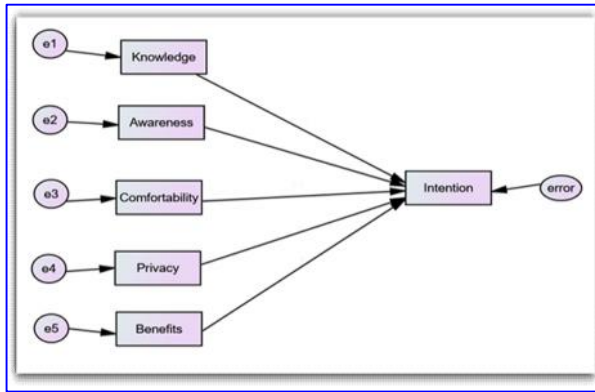


Figure 4: SEM Path Diagram (M3)

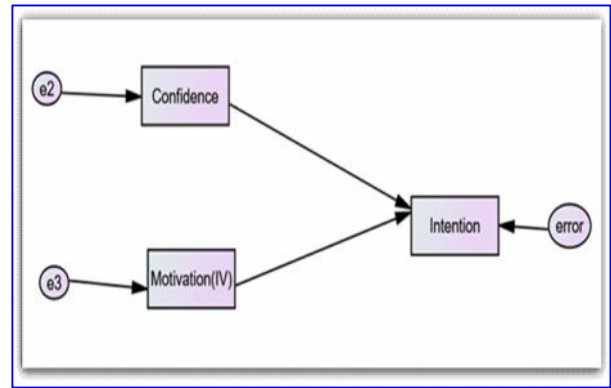


Figure 5: SEM Path Diagram (M4)

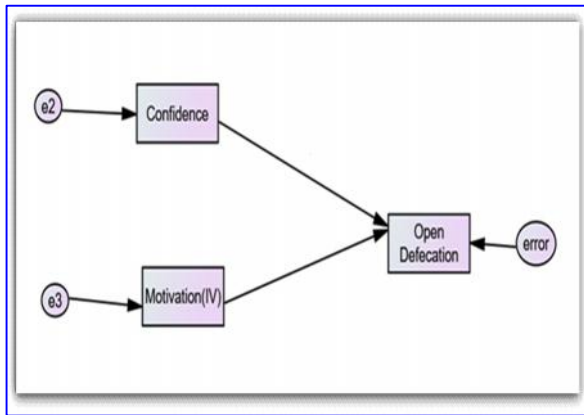


Figure 6: SEM Path Diagram (M5)

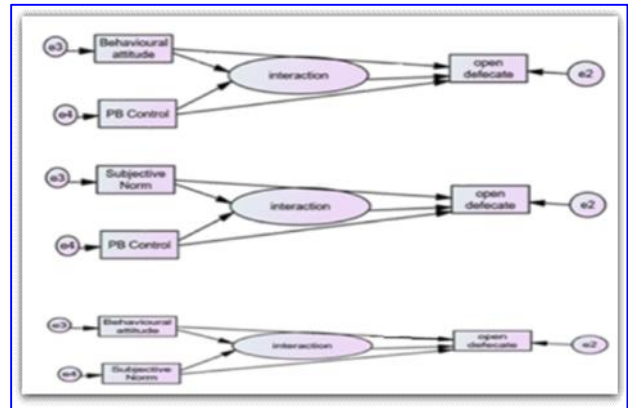


Figure 7: SEM Path Diagram (M6)

In M_1 (Figure 2), effect size of behavioural variables on attitudes, subjective norm and PBC measuring scales on pupils open defaecation intentions were estimated. The direct and indirect effect size of behavioural variables on PBC scale on pupils open defaecation practices were also determined in M_1 . The aggregate effect size of the behavioural variables on attitudes, subjective norms and PBC scales on pupils open defaecation intention and open defaecation practices were determined in M_1 . In M_2 , (Figure 3), effect size of individual variables on attitude measuring scale on pupils open defaecation practice was estimated. In M_3 , (Figure 4), effect size of individual variables on attitude measuring scale on pupils open defaecation intention was estimated. The effect size of individual variables on PBC scale on pupils open defaecation intention and actual open defaecation practices were estimated in M_4 (Figure 5 and M_5 (Figure 6) respectively. In M_6 , (Figure 7), interacting effect size of behavioural variables on pupils open defaecation practices was determined.

In M_1 . M_6 , the statistical test used was SEM path analysis in AMOS Software version 20. The effect

sizes obtained in path models M_1 . M_6 that remained statistically significant were reported together with non-significant effect sizes. All quantitative analyses were carried out at 5% level of precision (95% confident interval) with p-values reported in either one or two tailed significant levels. Significant effect sizes reported in M_1 . M_6 included path coefficient of determination (r); standard errors (SE); t-statistics (critical ratio); and their corresponding probability values (p-values). Relevant statistical tables were generated using Microsoft Excel Software version 10. This SEM path model does not rule out the influence and operation of other exogenous and endogenous variables (labeled as “errors” in the SEM path diagrams) but posit psychological variables as one of the driving forces of environmental behaviour.

The self-reported data obtained from FGDs and IDI were first transcribed verbatim into Microsoft Word for Windows and then analyzed against thematic concepts. Relevant illustrative quotes that reflected group opinions were identified and used to support the detailed descriptive analyses of the final themes.

4. Results and Conclusion

Table 1: Socio-demographic Characteristics of Study Participants

Participants Socio-Demographic Characteristics	Frequency (N=400)	Percentage (%)
Sex Distribution		
Male	200	50
Female	200	50
Age Distribution (Year)		
9—13	183	45
14—18	217	55
Class/Level		
Primary 4—6	192	48
JHS 1—3	208	52
Religious Affiliation		
Christianity	356	89
Muslem	36	9.0
Traditional	8	2.0
Ethnic Affiliation		
Ga—Dangme	55	13.8
Ewe	216	54.0
Akans (Fante & Asante)	61	15.2
Akuapem	61	15.2
Others (Moshi & Guan)	7	1.7

Table 2: Pupils General Knowledge of Risks of Open Defaecation Practices

Variable Category	Choice Category	Frequency	Percentage (%)
Open defaecation	Bad practice	359	89.8
	Don't know	27	6.9
	Good practice	14	0.4
Total responses		400	100

Table 3: Pupils Knowledge of Environmental Effect of Open Defaecation Behaviour

Table 4: Pupils Knowledge of Health Effect of Open Defaecation Behaviour

			Open defaecation has bad effects on Health		
Category Choices	Frequency	Percentage	Category Response	Frequency	Percentage (%)
Undesirable effect	208	52	Unlikely	212	53
Desirable effects	172	43	Don't know	48	12
Don't know	20	5	Likely	140	35
Total	400	100	Total	400	100

There was association between pupils' knowledge and Association: $\chi^2 = 65.062, p=0.002$
 Environmental risk of OD: $\chi^2 = 44.961, p=0.006$

Table 5: Subjective Norm: Influence of Social Injunctions on Pupils Open Defaecation

I defaecate in the open place because people whose opinion I take also do it.

Sex Groups	Frequency/Percentage Distribution of Choice Category in the sample by sex					
	Strongly disagree	Disagree	Don't Know	Agree	Strongly agree	Total
Male Pupils	97 (48.5)	50(25.0)	11(5.5)	19(9.5)	23(11.5)	200(100)
Female Pupils	115 (57.5)	42(21.0)	4(2.0)	25(12.5)	14(7.0)	200(100)

Table 6 Subjective Norm: Influence of Role Model on Pupils Open Defaecation Behaviour

For me to defaecate in the open is...

Sex Groups	Frequency/Percentage Distribution of Choice Category in Sample by sex					
	Very difficult	Difficult	Don't Know	Easy	Very easy	Total
Male pupils	34(17.0)	51(25.5)	7(3.5)	98(48.5)	10(5.0)	200(100)
Female pupils	58(28.0)	25(12.5)	12(6.0)	89(44.5)	16(8.0)	200(100)

Table 7: Perceived Behavioural Control (PBC): Influence of Perceived Confidence on Pupils Open Defaecation Behaviour

People who are important to me think that I should defaecate in the open.

Sex Groups	Frequency/Percentage Distribution of Choice Category in the Sample by Sex					
	Strongly disagree	Disagree	Don't Know	Agree	Strongly agree	Total
Male Pupils	32(16.0)	91(45.5)	16(8.0)	47(43.5)	19(18.5)	200(100)
Female Pupils	89(44.5)	57(28.5)	10(5.0)	33(16.5)	11(5.5)	200(100)

Table 8: Association between Open Defaecation and Demographic and Behavioural Variables Structural Equation Modeling (SEM) Path Analysis Results

Independent Variables	Dependent Variables				Items Reliability
	Open Defaecation Intention		Open Defaecation Behaviour		Cronbach's Alpha value
	χ^2	p-values	χ^2 Values	p-values	
Pupils Demographic Characteristics					.85
Sex	1.264	0.867	19.671	0.003*	
Settings	4.394	0.355	20.087	0.003*	
Age	17.678	0.798	44.082	0.830	
Education	17.701	0.818	43.841	0.173	
Ethnicity	39.067	0.334	20.087	0.025*	
Religion	5.646	0.687	10.158	0.602	
Behavioural Factors Influencing Open Defaecation					
Attitude (Pooled)	242.050	0.037*	270.053	0.042*	.87
Knowledge of open defaecation risk	33.975	0.035	61.384	0.005*	
Awareness of open defaecation risk	61.663	0.005*	43.931	0.008*	
Perceived convenience of toilet use	54.014	0.000*	54.014	0.000*	
Perceived privacy in school toilet	66.315	0.006*	79.451	0.047*	
Perceived benefits of open defaecation	79.451	0.047*	68.437	0.001**	
Subjective Norm (pooled)	81.965	0.000*	0.111	0.026*	.85
Descriptive norm (social injunctions)	38.041	0.009*	42.943	0.072	
Perceived influence of role model	47.065	0.000*	37.593	0.038*	
	70.263	0.001*	351.650	0.001**	.84
Perceived Behavioural Control (Pooled)					
Perceived confidence	44.249	0.000*	24.132	0.000*	
Perceived Intrinsic Motivation	0.168		0.126	0.014*	
		0.001**			

*Independent variables which show significant associations/correlations with dependent variables (open defaecation intention & open defaecation behaviour. Association/correlation is significant at 0.05 level (two-tailed) and 0.001 level (one-tailed).

Structural Equation Modeling (SEM) Path Analysis Results

Table 9: Coefficients Result Table for Effect Size of Behavioural Factors on Pupils' Open Defaecation Intention

Behavioural Factors (Attitudes)	Impact	Dependent Variables	Standardized Effect Size (r)	S.E.	t-statistics (P-value)
Perceived privacy in school toilets	→	OD	-0.06	0.022	-1.212(0.226)
Perceived convenience from toilet use	→	OD	0.116	0.029	2.347(0.019)*
Awareness of open defaecation risks	→	OD	-0.028	0.038	-0.558(0.577)
Knowledge of open defaecation risks	→	OD	0.073	0.037	1.483(0.138)
Perceived benefit of open defaecation	→	OD	-0.019	0.038	-0.391(0.696)

Table 10: Coefficients Result Table for Effect Size of Behavioural Factors on Pupils' Open Defaecation Practices

Independent Variables	Impact	Dependent Variables	Standardized Effect Size (r)	S.E.	t-statistics (p-value)
Attitude * Subjective norm	---->	Open Defaecation	0.363	0.132	44.101(0.002)*
Attitudes * PBC	---->	Open Defaecation	0.390	0.112	36.824(0.000)*
PCB * Subjective norm	--->	Open Defaecation	0.608	0.112	36.824(0.000)*

Table 11: Interaction Effect Size of Behavioural Factors (Attitude & PBC) on Pupils Open Defaecation Practice

* = interact.

Behavioural Factors	Relationships	Antecedent Dependent Variable	Standardized Effect Size (r)	S.E.	t-statistics (p-value)
Pupils attitude	----->	OD intention	0.708	0.665	10.177(0.000)*
Pupils subjective norm	----->	OD intention	0.035	0.272	0.917(0.359)
Pupils perceived behavioural control	----->	OD intention	-0.114	0.321	-2.961(0.003)*

Table 13: Effect Size of Individual Behavioural Factors on Pupils Open Defaecation

Behavioural Factors	Relationship	Dependent Variables	Standardized Effect Size (r)	S.E.	t-statistics (p-value)
Pupils satisfied intention	----->	OD behaviour	0.58	0.132	44.101(0.000)*
Pupils perceived behavioural control	----->	OD behaviour	-0.06	0.321	-3.052(0.002)*

Behavioural Factors (Attitudes)	Impact	Dependent Variables	Standardized Effect Size (r)	S.E.	t-statistics (P-value)
Perceived privacy in school toilets	→	Intention	0.018	0.029	0.365(0.715)
Perceived convenience from toilet use	→	Intention	0.081	0.039	1.619(0.106)
Awareness of open defaecation risks	→	Intention	-0.044	0.051	0.884(0.377)
Knowledge of open defaecation risk	→	Intention	-0.016	0.049	0.329(0.743)
Perceived benefits of open defaecation	→	Intention	-0.033	0.050	0.653(0.514)

OD = open defaecation

Results of Focus Group Discussions (FGDs)

The two major themes identified from the FGDs relate to: (i) personal convenience and health and (ii) environmental risks.

Group narratives that related to personal convenience and health

“...No scent in the bush”— (A female pupil, FGD, Kofisah M.A. Basic School).

“One experiences good ventilation.”— (A male pupil, FGD, Monome D.A Basic School).

“You feel very comfortable to defaecate.” — (A male pupil, Kedzi-Havedzi A.M.E Zion School).

“You don’t contract diseases from friends who also use the toilet.” — (A female pupil, FGD, Begoro Presby Basic School).

“...open defaecation is bad because we eat the faeces ourselves.”— (A male pupil, FGD, Monome D.A Basic School).

Group narratives that relate to environmental risks

“It pollutes drinking water sources, gives us diseases and destroy the environment” — (A female pupil, FGD, Kedzi-Havedzi A.M.E Zion School).

Results of In-depth Interview (IDI)

The two major themes identified from the IDI related to: (i) personal and public health and (ii) environmental risks.

Group narratives that relate to personal and public health

“...open defaecation bring about diseases to us.”— (Male pupil, IDI, Kofisah M.A. Basic School).

“It is not good because we eat the faeces ourselves when we defaecate in the bush; this is because rain water washes the faeces into water bodies and contaminate them and when we drink water from the water bodies, we drink the faeces”—(A female pupil, IDI, Begoro Presby Basic School).

“When snails are at the place where you defaecate, they would eat the faeces and when we eat the snails, we also eat the faeces.”— (Male pupil, IDI, Kofisah M.A. Basic School).

Group narratives that relate to environmental health

“...It is not good because it destroys the environment.”— (Male pupil, IDI, Kofisah M.A. Basic School).

“...It pollutes our drinking water sources” — (A male pupil, IDI, Kedzi-Havedzi A.M.E Zion School).

5. Discussion

The study explored the behavioural factors that influence open defaecation among pupils in the first cycle schools and assessed knowledge and perception of pupils on health and environmental risks of open defaecation. The study found that the behavioural factors influencing pupils’ open defaecation practices stemmed from their attitudes, subjective norm, perceived control behaviour, intention and interactions of these variables.

Attitude refers to the degree to which the person has a positive or negative evaluation of a behaviour (Ajzen & Fishbein, 1980, as cited in Ajzen, 1988) and have been reported in many studies to correlates significantly with intentions (Beck & Ajzen, 1991; Armitage & Conner, 2001; Smith *et al.*, 2008). The direct positive mean effect size of attitude on pupils intention to engage in open defaecation reported in this study was 0.708 with $p < 0.05$. This suggests that behavioural variables included on attitude measuring scales—perceived knowledge and awareness of open defaecation risks, perceived convenience of using school toilets, perceived level of privacy in the school toilet and perceived benefits of open defaecation—accounted for 71% of variance in pupils’ satisfied intention to engage in open defaecation. This further indicated that pupils in the study schools hold higher favourable attitudes toward open defaecation intention. Earlier studies (Fishbein, 1991; Kim & Hunter, 1993) showed that individual with high attitude towards environmental behaviour had significantly large effect size attitude on intention. This suggested that the high mean positive effect size of pupils’ attitudes on their open defaecation intention found in this study may originate from the parents, siblings, peer group, and family situation. The result of this study reveals that some of the communities within which the pupils come from have no toilet facilities

and therefore defaecate in the open. Due to absence of toilet in the community, pupils may model these open defaecation behaviours during off-school hours from the homes and community and exhibit it in the school when they evaluate it to be more convenience than toilet use. This finding agreed with the Social Learning Theory (Bandura, 1977) which postulated that observational learning, and the resulting imitation, are fundamental processes within socialization process. The socialization process involves values and beliefs (attitudes) formation from what they observe, hear and listen to from interactions with their environment—family, peers, community and mass media. This was also observed in the FGDs where a pupil narrated that he defaecate in the open because the chief also does it. A study by Tronick & Beeghly (2011) also reported that the socialization process helps children develop a sense of self which determines their behaviour. In support of this assertion, Kerr *et al.*, (2012) argued that parental attitudes and behaviours have greater influence on their children’s behaviours.

Evidences from plethora studies showed that human behaviour is guided not only by attitudes (Ajzen & Fishbein, 1980; Godin, & Kok, 1996) perceived behavioural control (Bandura, 1986), but also by perceptions about others’ beliefs (Ajzen & Fishbein, 1980) and behaviours (Fishbein & Ajzen, 1975). This constitutes individual subjective norm which refers to “the person’s perception that most people who are important to him or her think he/she should or should not perform the specific behaviour in question” (Fishbein & Ajzen, 1975). This suggests that the behavioural factors influencing pupils’ open defaecation practices may have strong root cause from their subjective norm belief system. The result of this study, however, reveals that subjective norm has less significant effect size of 0.035 (4%) on pupils intention towards open defaecate behaviour ($r = 0.035$, $p = 0.359$). This suggests that in aggregation, behavioural variables included in subjective norm measuring scales (descriptive norm, extrinsic motivation and role models influence) played less significance role in influencing pupils’ intention towards open defaecation behaviour. This result is consistent with discussions in the literature reviewed. For a wide range of behaviours, the correlation of prediction of intentions from subjective norms ranges from .34 to .42 (Albarrac’ in *et al.*, 2001; Armitage & Conner, 2001). One possible theoretical explanation put forwards to explain this proposition is that an individual under social influence will try to conform to the expectations of others (Shen, *et al.*, 2006). When

individual evaluates the social influence to be positive, the behaviour is executed (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). In contrast, where it is unfavourable individual tends to avoid executing any intended action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The low mean effect size of variables included on the subjective norm measuring scales on pupils satisfied open defaecation intention (0.04) reported in this study is on the lower side compared to what was reported in theoretical literature reviewed (0.34) (Armitage & Conner, 2001). This low effect size may be ascribed to multiples of different personality factors simultaneously affecting pupils open defaecation behaviour intention. First, the pupils used in this study (9-18 years) are largely adolescents and who are unlikely to hold high and stable behavioural intention towards open defaecation practice since their intentions, particularly those relating to behaviours that are considered negative are checked by social pressure from significant others such as parents, teachers, peers to engage or not engage in the behaviour.

Studies showed that environmental behaviour can stem from individual PBC belief system. The PBC is the perceived ease or difficult of performing a behaviour under different situations when the behaviour may go beyond one's controllable aspects of predicting behaviour directly or through intention (Ajzen, 1991). Behavioural variables included on PBC measuring scale were perceived confidence and intrinsic motivation. Study (Ajzen, 2005) showed that people's behaviours are strongly influenced by their confidence in their ability to perform them. Given a sufficient degree of actual control over behaviour, people transform their intention into action when the opportunity arises to do so. This further suggested that behavioural control can have a direct effect on behaviour itself, in addition to the indirect effect mediated by intention (Ajzen, 2005). Findings from the present study confirmed both assertions. This study found that PBC inversely influences pupils open defaecation behaviour and intention both directly (6%; $p=0.002$) and indirectly (-11%; $p=0.003$) via intention. This suggests that PBC has inverse mean moderating effect size (influence) on both pupils' satisfied open defaecation intention and actual open defaecation behaviour. This finding was comparable to what was reported by one earlier study (Smith *et al.*, 2008) which found no or limited effect of PBC on both intention and behaviour.

Attitude towards behaviour, according to Ajzen (2002) can override the effect of self-efficacy (Ajzen, 2002). For example, if a person has strong subjective knowledge about open defaecation behaviour, the person will have higher confidence in the ability to engage in that behaviour. This further suggested that the mediating mean effect of PBC on intention will be weaker when individual has high subjective knowledge about the behaviour. The present study, however, reported low mean effect size of subjective knowledge (4%) on pupils open defaecation intention and this might have accounted for the low mean effect size of PBC (11%; $p=0.003$) on pupils open defaecation intentions and may be attributed to the conditions of the school system as pupils' self-efficacy to engage in open defaecation behaviour is largely limited by school rules and regulations governing sanitation behavioural intentions including the open defaecation behaviour. Again, the school toilet systems, as reported throughout the FGDs sections and the checklist observation results, lacked adequate comfortability, privacy and security, and personal defaecation preferences and might have accounted for high intention of pupils (58%) to engage in open defaecation behaviour. One theoretical explanation to this is found in social cognitive theory which posits that individuals do not simply respond to situational influences, but rather they actively seek and interpret information (Nevid, 2009), prior to the execution of the behaviour. The more favourable the evaluation outcome, the stronger the PBC towards performing the perceived behaviour (Nevid, 2009).

Moreover, the behavioural achievement of PBC depends upon confidence and accuracy of perceptions. The low level of self-efficacy of pupils to engage in open defaecation practices as reported in this study may be ascribed to their low level of knowledge and perception about risks of open defaecation. This was observed in this study where more than half of participants have less knowledge about health effects of open defaecation. For example, if an individual perceive low accuracy of perception, PBC may not be realistic with respect to little information (Ajzen, 1991). A study by Yzer (2012) reported that when moderation effects of PBC on behaviour intention is weak, PBC is likely to affect the behaviour directly; he further explained that the actual control of individual over his or her environment does not guarantee that the performance of the behaviour will occur in a specific situation. By this, Yzer (2012) means that an individual cannot engage in any behaviour for which he or she does not have the required skills and resources to execute. He concluded that situational

factors are likely barriers to enhancing the behaviour performance (Yzer, 2012). Evident from the results of the present study, however, indicates that the open defaecation behaviours observed among the pupils are largely influenced by behavioural factors emanating from their attitudinal belief systems with minimal contributions from pupils PBC belief system.

The influence of intention on pupils open defaecation practices was also determined. Intentions are self-instructions that encourages or inhibits individual to execute particular behaviours (Triandis, 1980). Previous studies on intention-behaviour relations (Armitage & Conner, 2001; Sheeran, 2002) showed that intentions have strong associations with environmental behaviours. Finding from present study reveals that the mean positive effect size of intention on pupils open defaecation behaviours was 58%. This mean positive effect size is comparable to what was reported in some previous studies (Fisher & Fisher, 1992 & Gollwitzer, 1993). Authors of these studies found mean intention-behaviour correlation of .47 (47%). Similar studies have also reported mean behaviour-intention correlation of .53 (53%) (Notani, 1998); and as high as .62 (62%) (Van den Putte, 1993). The high mean positive effect size of 0.58 (58%) of pupils' behavioural intention on their open defaecation behaviour reported in this study has some relevant implication for policy makers and sanitation stakeholders whose objectives aim at ending open defaecation as emphasized in the post 2015 sustainable development goal 6 target 2. This study strongly suggests that it is important to present information on health and environmental risks of open defaecation behaviour to pupils to help shape their attitudes towards the elimination of the open defaecation behaviours. Whilst doing this there is the need to stress subjective norms or opinions that reject the open defaecation behaviour. Thus, from the view point and perspective of the present study, intention of pupils in first cycle schools has positive statistical significant impact on their open defaecation behaviours. The theoretical significance of these findings resides in the fact that several important conceptual frameworks in social and health psychology propose that changing behavioural intentions can bring about behaviour change (Bandura, 1989 & Gibbons *et al.*, 1998). These findings suggest that the next decade of research on behavioural factors influencing open defaecation practices should concentrate more on the pupils' attitudes, intention, and situational factors as postulated by the theoretical frameworks of this study.

The mean aggregate effect sizes of behavioural variables included on attitudes, subjective norm and PBC measuring scales on pupils open defaecation behaviour reported in this study was 58%, a correlation coefficient of .58; $p=0.003$). This finding is consistent with some previous studies which found mean correlation ranging between 0.45 and 0.60 (Beck & Ajzen, 1991; Armitage & Conner, 2001). Within the aggregate effects, behavioural attitude largely accounted for over two-third (82%) of the variance of pupils open defaecation behaviour and 71% of pupils' intention to engage in open defaecation behaviour. This high mean positive effect size might have resulted from the application of the mixed methods in data collection. Studies (Olsen, 2004; Blaikie, 1991) showed that combining two methods help overcome the weaknesses or intrinsic biases and the challenges that come from single method studies. The influence of subjective norm within the aggregate effect size on pupils overall open defaecation behaviour and behavioural intention was $r = 0.02$, $p<0.05$ and $r = 0.035$, $p<0.05$) respectively. These findings were on the low side compared to .34 (34%) reported in previous study. These variations may be attributed to the average age difference of the sample population involved in present study (9-18 years) compared to the previous studies (above 20-60 years). Studies showed that humans have mindreading belief systems which helps them reason about how beliefs might influence individual actions, interpersonal communications, and conducts, and the belief system of children is low compared to the adults (Apperly, *et al.*, 2006). Thus, developing intention towards specific environmental objects may be limited in children compared to adults (Apperly, *et al.*, 2006). Similar results were also reported in related studies (Armitage & Conner, 2001; Armitage & Conner, 2001) which found low correlation values of intention 0.39 (39%) for aggregate mean effect of attitudes, subjective norms and PBC on behaviour.

The interaction effect size of behavioural factors on pupils open defaecation practices was also estimated. The study found that when behavioural variables included on subjective norm measuring scale were interacted with variables on PBC measuring scales, together they produced mean effect size of 0.608 (61%) with $p=0.000$. Similarly, when behavioural variables included on subjective norm and attitude measuring scales were interacted, a mean positive effect size of 0.36 (36%) was produced with p value of 0.002. These results suggest that the high pupils open defaecation behaviour reported in this study may be attributed to the interacting effects of composite

behavioural factors and this has strong implication for policy makers and sanitation stakeholders whose objectives aim at ending open defaecation as emphasized in the post 2015 sustainable development goal 6 target 2. This suggests that in designing intervention strategies to address open defaecation behaviour change, the behavioural factors included on the three psychological measuring scales, which were found to be influencing open defaecation behaviours in the schools, must be integrated to produce greater effect size on open defaecation behaviour change. Teachers and parents' disagreement on pupils present and future open defaecation behaviours could contribute significantly to pupils lower intentions to defaecate in the open. Helping pupils who defaecate in the open to desist, could have a positive impact on preventing open defaecation intention and initiation.

Knowledge and Perception of Health and Environmental Risk of Open Defaecation

A greater number of pupils (53%) were unaware of the health risk associated with open defaecation practices. This was also evident in FGDs sections where pupils attached greater preference to open defaecation than toilet use. For example, a female pupil from Oboaho D.A Basic School said: *"There is no scent in the bush so I go there; I get some neatness in the bush"*. Also, a male pupils from Kedzi-Havedzi A.M.E Zion Basic School narrated his experience: *"You feel very comfortable to defaecate in the bush."* These findings suggest that pupils' knowledge of faecal-oral transmission routes was low. This can be very dangerous because school environments are high populated and any outbreak of faeco-oral diseases such as typhoid, cholera, diarrhoea, hepatitis, trachoma can easily spread among the school population and cause high health impacts. This finding supported two previous studies (Hathi *et al.*, 2014 & Spears *et al.*, 2014) who reported that pathogens are more easily transmitted in high population density environments where knowledge about health risk associated with open defaecation is low and this increases the public health risks and human capital costs. In Ghana, the first cycle schools are high population density environments and if open defaecation is practiced in such a highly populated environment, it can result in spread of faeco-oral diseases, thus increasing out-patient population. Similarly, an outbreak of diseases in the school can also extend to the homes, and the community. Study by Aiello *et al.*, (2008) demonstrated that infections which children contract in schools will lead to infections in up to half of their household members

and that 88% of diarrheal diseases are caused by inadequate sanitation and inappropriate hygiene (Bill & Melinda Gates Foundation, 2011; WHO, 2008). Avoidance of open defaecation depends, to a greater extent, on pupils' knowledge and awareness of quantum of health and environmental risks of the practice. There is also suggestive evidence that improving sanitation through avoidance of open defaecation can decrease stunting (Spears, 2012).

6. Conclusion and Limitations

The results of the study show that open defaecation is being nurtured in the first cycle schools and despite pupils' high knowledge of risks associated with open defaecation behaviours, they continue to engage it. In conclusion, the study has provided strong theory-based evidence on behavioural factors influencing open defaecation practices in the first cycle schools. Also, the knowledge of environmental risks associated with open defaecation practices was fairly high. Knowledge of health risks of open defaecation practices was, however, low among the greater number of the pupils. The contributions of these factors therefore provided holistic understanding of the subject of open defaecation and upon which some useful recommendations have been made.

The Ministry of Health must intensifies their health education on the consequences of open defaecation behaviours in the basic schools and the communities in which the schools are located through posters, videos, and television broadcasting. Also, the Ministry of Education must introduce courses that can help both pupils and teachers to acquire knowledge in current trends in best sanitation practices. This also underscores the need for government to build a strong enabling environment through sanitation policy guidance coupled with adequate financing arrangement for the sanitation departments of Municipal, Metropolitan and District Assemblies to enable them carry out their mandate not only to the communities but also the schools within the communities.

This study is without limitations. The first limitation had to do with reliance on self-report measures as the main source for gathering data. This may be biased by social desirability. Secondly, the survey did not assess other confounding situational variables that may trigger open defaecation intention. Future efforts must be largely tailored towards these areas of research. Nonetheless, the study brings out relevant behavioural factors influencing open defaecation practices and

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knowledge and perception of pupils on health and environmental consequences of open defaecation.

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Competing Interests

The authors declare that they have no competing interests.

Consent for Publication

Consent for publication of the data is given by all Authors.

Ethics Approval and Consent to Participate

Ethical Clearance Certificate No. ECBAS 035/15-16 to undertake the study was given by Ethical Committee for Basic and Applied Sciences (CBAS). A verbal assent was obtained from parents or appropriate guardians of participants before they were used in the study. Informed consent was provided by all study participants to participate in the study.

Data availability

For data request, please contact the authors.

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