

Full Length Research Paper

Review of the effects of adequate sanitary facilities on the participation and performance of the school girl child in Ghana

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Girl-child self-esteem, self-confidence and coping capacity with positive effects on their school performance is increase when. Water, sanitation and hygiene (WASH) topics are included in health education. This review explored the relationship and effect of sanitary facilities in schools on Girl-child participation, health impact on Girl-child education, the state of sanitary facilities and sanitary behaviors in public Junior High Schools and as well identified sustainable solutions and made recommendations on how to provide adequate sanitary facilities to reduce inequality in schools. This qualitative review gathered and analyzed secondary data at both global and local levels (with focus on the Ghana experience). Results: availability of sanitary facilities in schools has the potential to reduce students' absenteeism especially among the girl child. Poor sanitary facilities have an adverse impact on girls' privacy and comfort. Girls' inability to manage their menstrual hygiene affects their participation during events at school because of panic over outflow. Girls avoid eating or drinking during the day to further avoid using the sanitary facilities making it difficult to concentrate while in school. This study shows that school WASH issues are associated with health conditions like vector-borne illnesses among others and embarrassment in school toilets. The state of hygienic conveniences and services in schools are poor and inadequate. For schools with basic amenities, they are in an awful state as a result of neglect. Therefore, it is vital to provide adequate sanitary facilities in schools. This will improve the health and wellbeing of the gild child in Ghanaian schools.

Key words: Gender, girl-child education, health, hygiene, sanitation, water.

INTRODUCTION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defined education as a human

right and a force for sustainable development and peace with every goal in the 2030 agenda requiring education to

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empower people with the knowledge, skills and values to live in dignity, build their lives and contribute to their societies.

UNESCO Institute for Statistics (2019) also noticed that there gap in gender universal literateness rate. Men are typically more literate than women, despite the fact that literacy rates have generally increased for both sexes over the world. In the year 2019, over 83% of women and 90% of males worldwide were literate. The percentage of adults aged 15 and older who can read and write with understanding a brief, straightforward statement about their daily lives is known as the adult literacy rate.

The literacy gender gap affects not just adults, but also the world's younger generations, those between the ages of 15 and 24. Young men are still more literate than young women despite an overall increase in literacy. In fact, as of 2019, the gender parity index for the worldwide youth literacy rate was 0.98, showing that young women are not yet as literate as young men (UNESCO Institute for Statistics, 2019). Girls of primary school age who are not enrolled in school have reduced from 57 million to 32 million globally during the previous 20 years. Moreover, the number of males accepted to elementary schools decreased from 42 million in 2000 to 27 million in 2018. (UNICEF, 2020). Since 2007, the proportion of kids who aren't in school has largely stagnated, and currently, more girls than boys aren't attending primary school globally. Up until 2011, a higher number of girls of lower secondary school age were out of school than boys. 54 million girls and 46 million boys were not enrolled in lower secondary school education in 2000. By 2018, this was the case for 32 million boys and 30 million girls. Considering primary education, however, a higher number of girls continue to be out of school (UNICEF, 2020).

Achieving more equality in society, including between men and women, depends on education. The fourth Sustainable Development Goal (SDG) promotes opportunities for everyone to pursue lifelong learning and guarantees inclusive and equitable quality education (boys and girls). By creating non-discriminatory educational programs and curricula and dedicating enough resources for monitoring and putting equitable educational reforms into place, it reduces gender inequities in primary and secondary education.

There has been global concern about the concept of access to education, but in recent years the disparity in gender attendance is fast gaining the necessary attention (Donkor and Deni, 2016). Although receiving a lot of attention, gender disparity in education continues to be a problem around the world. Several nations, particularly developing nations like Ghana, have been battling to achieve gender equality for many years. Sub-Saharan Africa has the greatest rates of educational exclusion of any area. Children between the ages of about 6 and 11 make up more than half of those who are not enrolled in school, followed by youth between the ages of

approximately 12 and 14. UIS data show that about 60% of children between the ages of 15 and 17 are not enrolled in school. (<http://uis.unesco.org/>)

The extent of the improvement over the previous 50 years can be seen by comparing the literacy rates of senior (over 65) and young persons. 84% of the elderly in East and South-East Asia, 42% in South Asia, and 53% in West Asia were literate as of 2016. At the same time, just 10% of young people in West Asia, 9% of young people in South Asia, and about 1% of young people in East and South-East Asia were illiterate. Women in South Asia, where just 27% of old women and 86% of female youngsters are literate, show the greatest generational growth ((UNESCO Institute for Statistics, 2016).

Without a determined policy to balance educational infrastructure, school enrollment growth over the years has led to excessive strain and a structural shortage in educational facilities. It has notably resulted in pressure on the provision of hygienic amenities including the restroom, washing stations, tissue boxes, and a government program to provide sanitary pads to schoolgirls. According to Yieke (2006), inadequate or nonexistent sanitation facilities put pressure on teaching and learning quality and can contribute to indiscipline, dropout, and repeat, especially among female students.

Ghana Education Service (GES) created the School Health Education Programme (SHEP) Policy and Strategy Framework in 2010 to address the overall issue of health in schools. According to a key informant from the Ghana Education Service, the SHEP policy and strategic framework was created to serve as a guide for school health programming and provide a solid foundation for the WASH in Schools (WinS) initiative (2021). The SHEP is made up of four parts: a safe and healthy school environment, disease prevention and control, skills-based health education, food safety and nutrition education, and instruction on food safety and nutrition.

Safe water and sanitation are one of the three main intervention areas under the heading of "safe and healthy school environment," together with a healthy psychosocial school environment and a safe physical environment, according to GES (2014b). These restrooms should offer discretion, be simple to maintain, and include adequate containers for disposing of sanitary towels, preferably pedal-operated (RoK, 2009). Schools should have a waste collection, storage, and disposal policy; as a result, containers for garbage collection are required at designated locations (ibid). As girls turn 14 and reach puberty, there is a substantial correlation between proper cleanliness in schools and pupils' ability to learn and maintain good health, particularly among female students (Montgomery et al., 2012). Burgers (2000) contends that the sanitation facilities in schools in underdeveloped nations are frequently in awful conditions, posing health risks and having other detrimental effects. Sanitation facilities are understood to

be essential for children's health and sanitary behavior. In reality, most schools don't have acceptable sanitary conditions (Snel, 2004).

Cleanliness has an impact on the standard of instruction in classrooms (Furlong and Morrison, 2000). Inadequacy in sanitary facilities and how it affects girls' enrollment in Ghana's public junior high schools are the main goals of this study. There are signs that high-quality education can help the world's population reduce poverty and income inequality (Takyi et al., 2019). According to studies by Takyi et al. (2017) and the Organization for Economic Co-operation and Development (OECD), net returns on investments in education are acknowledged to have a considerable positive impact on development. The advantages of educating girls extend beyond the individual to have an impact on society and the nation as a whole. Over the years, significant attempts have been undertaken by investing enormous sums of money and resources to ensure that there is equitable development across all parts of the country. For instance, the government implemented the Free Compulsory Universal Basic Education (FCUBE) policy in 1995 after the 1992 Constitution mandated it and established the Girls Education Unit within the basic education division of the GES to better advance the interests of girls. In addition, after a successful pilot program in 2004, the Ministry of Education abolished school fees nationwide in basic education and implemented a capitation grant for all basic schools (Pajibo and Tamanja, 2017). It dealt with poverty, which is one of the major obstacles to accessing school, successfully. The grant showed that removing school fees had a direct, significant influence on enrollment at the basic level and enrolment at the second cycle level as well as on closing gender inequalities according to a key informant from Ghana Education Service, 2021.

The introduction of the various educational policies including; the capitation grant, government policy on girl child education, etc. were all targeting to achieve gender parity in schools. Notwithstanding these attempts, education experts and stakeholders are nevertheless concerned about the persistently low involvement of females, particularly in rural areas. Others have attributed this to inadequate sanitation facilities that cannot meet the needs of girl students who are entering puberty.

Since schools are typically where children spend the majority of their waking hours during the week, having adequate sanitation is essential to preventing the spread of infections. In schools, where many children are gathered for long periods of time each day in frequently unhygienic surroundings, illnesses can spread very quickly. According to Aiello et al. (2008), diseases that children catch in schools could infect up to 50% of their family members. According to a key informant from the Ghana Education Service, WASH in Schools (WinS) is provided in Ghana as a component of conventional water, sanitation, and hygiene development programmes in

communities (2021). The EMIS study (2011/2012) states that in 2010, 49% of schools (Creche/Nursery, Kindergarten, Primary Schools, and Junior High Schools) had access to water on-site, while 56% did not. According to the report, the statistics do not accurately reflect the state and use of the facilities, and many more school WASH facilities have been built since 2010. Because of this, it is impossible to take the appropriate measures without reliable information about working school restrooms.

Inadequate sanitary facilities' impacts on girls' performance and involvement in public junior high schools are the focus of this study. Reduced poverty and income inequality among the world's population are two benefits of high-quality education. Net returns on educational investments are known to greatly advance development (Takyi et al., 2019). Some have focused attention on the lack of sanitation facilities in many schools around the world while discussing the causes of high dropout rates, particularly among girls in their adolescence (Kirk and Sommer, 2006).

The lack of sanitary facilities at schools raises the possibility that females will skip class on the days of their periods and eventually stop attending altogether, even though the overall number of missed school days that coincide with menstruation may not be appreciably high. A bigger worry is that the lack of sanitary facilities at schools can subject pubescent girls to regular verbal and physical threats of harassment at school, which could have an impact on female scholastic achievement (Adukia, 2017).

The research is necessitated by the fact that a lot of students and for the purposes of this study, female student's pick-up diseases and infections from schools as a result of poor sanitary environments in schools causing them to miss essential lessons in school. The resulting effect of such happenings widens the gender disparity in education which has been a general concern. The findings of this study will unearth situations on the ground in Ghana. The results of this study will be used as a source of information by policy makers as they develop educational regulations that will have an impact on the nation's female pupils. The study's findings will be helpful to gender activists as well since they will identify the factors that contribute to the gaps in educational achievement and attendance that should be addressed by both gender activists and educators. In light of this, the study explored these objections:

1. To investigate the relationship and effect of sanitary facilities in educational institutions on girl-child participation in public Junior High Schools.
2. To assess the health impact of adequate sanitary facilities in schools on girls' education.
3. To assess the state of sanitary facilities and sanitary behaviors in public Junior High Schools
4. To identify sustainable solutions and make

recommendations on how to provide adequate sanitary facilities towards bridging the education inequality in Junior High Schools.

METHODS

The study is based on review of literature gathered and analyzed at both global and local levels (with focus on the Ghana experience), on the study objectives. Mendeley search, Scihub database, Science Direct, Research Gate, Google, and Google scholar were among the major scientific electronic databases searched. Girls and Water or Sanitation, Girl-Child Education, Schools and Water or Sanitation, School Absenteeism and Water or Sanitation, Menstruation and Water or Sanitation, School Health and Water or Sanitation, Water, Sanitation, and Hygiene (WASH) and Schools were used as the primary search terms. All bibliographies in the included documents' bibliographies were likewise thoroughly searched for relevant documents. UNICEF, UNESCO, and WHO publications and reports were gathered. Relevant reports were found on the websites of numerous Ghanaian ministries and government bodies. The research was limited to documents that have an English abstract and article available.

The review focused on peer-reviewed researches that examined the impact of school-based WASH interventions on girl-child involvement and performance in underdeveloped nations, with Ghana as emphasis. WASH programs include hand wash resources (such as, water, soap, wash bowls, drying devices); water consumption resourcefulness; enhanced hygiene (such as, efficient lavatories, menstruation conveniences); and cleanliness behavior campaigns (such as, hand washing with soap, hygiene education). Educational results (that is, participation, performance); hygienic behaviors, knowledge, and attitudes; and health outcomes are among the reported outcomes (that is, WASH-related illness). Journal studies that established an instructive or health consequence related to the availability or lack of water and/or sanitation in schools were included. These implications include increased or decreased school involvement, being present, performance, school loafers, or any type of illness- societal, medicinal, or emotional.

The study is limited to researches published after year 2000, which served as the cutoff date to publications up to 2019. This deadline was chosen to coincide with the Millennium and Sustainable Development Goals (MDGs and SDGs), which represent world leaders' commitment to achieving long-term development. In certain situations, studies that were digitized before the cutoff date were included. This decision was made based on their relevance to the research. The review was limited to papers with an English abstract and article, as well as research that specifically looked at the impact of providing or not providing water, sanitation, and related hygiene items.

The study did not include any articles that did not have abstracts or complete texts available. Studies about day care centers were not included. Hand sanitizer studies were not included. Water interventions were divided into two categories: those intended for washing of hands (which included water, washbowls, cleanser, and dryers) and consumption. Researches concentrating primarily on the outcome of fluoride on water meant for consumption were omitted from the analysis because the outcomes of fluoride on dental health in schools have been studied thoroughly. The accessibility of conveniences to excrete or urinate (latrines, safe toilets, toilet paper, and private) or conveniences for females to handle menstruation were classified as sanitation (private place, and ways to manage or dispose menstrual supplies). Educational outcomes were among the goals targeted by this study. Girls' engagement, school attendance, and academic success were among the educational outcomes.

With a focus on Ghana, all of the relevant articles and papers were analyzed for data on the impacts of poor sanitary facilities in schools on females' educational outcomes. Each indicator was defined in terms of a) the impact of inadequate sanitary facilities on female child participation and performance in school, b) the impact of adequate sanitary facilities on girl child health, and c) the state of sanitary facilities in junior high schools. Data from relevant research was used to examine the impact and adequacy of sanitary facilities, which showed evidence that inadequacies in sanitary facilities have a negative impact on girls' educational outcomes. There were 58 papers reviewed for this investigation.

The research was organized as follows: A discussion of the impacts of poor sanitary facilities on the variable, as well as recommendations for improving sanitary conditions in public junior high schools. Because the search was conducted in English, the study of the literature was limited. It's possible that important information from non-English literature was overlooked. In addition, the literature was primarily focused on rural areas. During the search and screening of data, vital data from traditional academic peer-reviewed studies may have been overlooked. The main examination recognized 1,824 articles with headings that discuss water facility, or hygiene conveniences in the schools. An additional 10 publications identified from other sources making the 1,834 papers. One thousand Six hundred and twenty-six 1626 were excluded because they were not relevant by title and duplicates. Furthermore, 208 were screened by abstract and excluded 120 because not relevant by abstract/missing abstract. A final 88 of the articles were further screened by full text and excluded 30 because not relevant by study design, participants or subject. Finally, fifty-eight publications qualified for the tertiary full-text examination (Figure 1).

RESULTS AND DISCUSSION

Impact on girls educational outcomes (participation and performance)

In this article, reviews in poor nations that studied effect of school-based WASH programs on the girl child education output were identified. According to Pearson and Mcphedran (2008), enhanced school WASH circumstances might decrease student's absenteeism through provision of services (most notably, for menstruating females). There are indications that washing hands with soaps in schools may lessen ailment in students; thus decreasing absenteeism in schools. Adequate sanitary facilities in schools appear to impact student health and reduce absenteeism (Hetherington et al., 2017; McMichael, 2019) (Table 1).

A study by Freeman et al. (2012), demonstrated sanitary facilities school interferences lessen helminth re-infection in females and females in underdeveloped Kenya, as well as former/later cross-sectional examinations identified enhanced WASH and decreased absence from school amongst girls. Studies in the same area opine that cleaning school toilets lessen the chances of pupil absenteeism (Dreibelbis, 2013); also, an ample WASH program for school improves attending schools as well as encourages gender equality in basic schools (Garn et al., 2013). Access to water as well as proper toilet situations in schools were significant areas in

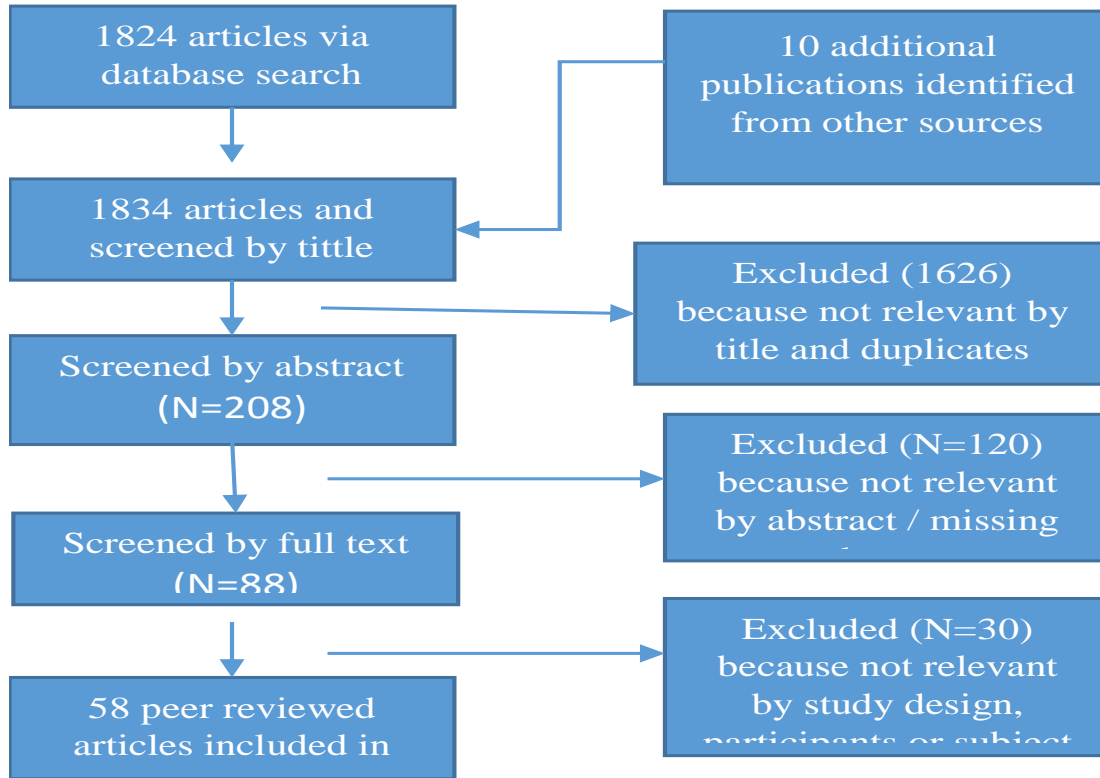


Figure 1. Flow chart showing procedure for article selection. Source: The PRISMA Group (2009)

Table 1. Outcome measures reported in included articles (n = 58).

Outcome measure and percentage of studies	Studies
Impact of Sanitary of sanitary facilities on girls education 36.2% (21/58)	Pearson and Mphedran (2008), Grant et al. (2013), Hetherington et al. (2017), Bolt et al. (2006), McMichael (2019), Jasper et al. (2012), Freeman et al. (2012), Mason et al. (2013), Dreibelbis (2013), Sumpter and Torondel (2013), Garn et al. (2013), Abioye-Kuteyi (2000), Sommer (2012), Oster and Thornton (2009), Sommer, (2009), Wanbuya and Kyalo (2014), McMahon et al. (2013), Birdthistle et al. (2011), Mahon and Fernanders (2010), Water Aid (2017), WHO (2009)
Impact of sanitary of sanitary facilities on girls health 34.4% (20/58)	Migele et al. (2007), Padma et al. (2015), Trinies et al. (2016), Hughes et al. (2004), Bieri et al. (2013), Freeman et al. (2012), Dreibelbis et al. (2014), Freeman et al. (2013), Blanton et al. (2007), Freeman et al. (2014), O'Reilly et al. (2008), Patel et al. (2012), Erismann et al. (2017), Duijster et al. (2017), Bowen et al. (2007), Greene et al. (2012), Talaat et al. (2011), Caruso et al. (2014), Grimes et al. (2017)
State of sanitary facilities at school 29.3% (17/58)	McMichael (2019), Kirk and Sommer (2006), Sommer (2009), CONIWAS (2019), Marie (2010), Gyabaah and Ackerson (2009), Mbula (2014), CWSA (2004), Sommer (2011), Anyarayer et al. (2019), Curtis and Cairncross (2003), Anyarayer (2017), Chabari (2010), GES (2014), Adukia (2017), Kremer et al. (2005)

Source: Researchers review work, 2021.

the school for pre- adolescent and menstruating girls in Tanzania (Sommer, 2012), South Asia (Mahon and Fernanders, 2010) as well as Kenya (McMahon et al., 2013); conversely, a study in Malawi did not find any effect of school WASH situations on girls' absence in school (Grant et al, 2013).

Bolt et al. (2006) and Jasper et al. (2012) offer reports of the severe effect poor hygiene facilities circumstances have on the discretion of girls' and their well-being at school as well as absence of menstrual hygiene management (MHM) supplies might influence females' involvement during school events owing to anxiety of outflow (Mason et al., 2013). Current findings highlight that inadequate supplies are available for females menstruating in economically developing nations, nevertheless analyses specify inadequate studies that elucidate the effect of enhanced MHM in schools (Sumpter and Torondel, 2013). Generally, there is no privacy and no place to adjust, wash or dry (reusable) sanitary supplies, as well as difficulty to correctly dispose menstrual supplies, as well as need for washing water (Sommer, 2012; Sommer, 2009). Most existing records are self-recounted and no recognized study enumerate precisely what schools own and lack for menstruating females.

WHO (2009) state that girls and boys are affected differently by insufficient water, sanitation as well as hygiene situations in schools; thus, contributing to uneven opportunity for learning. Occasionally, female teachers and students are mostly affected since inadequate sanitary amenities imply that they cannot show up in school for the duration of menstruation. A critical period of the month for females is regularly within the period of their menstruation. This time they require sanitary amenities to easily wash and swap their sanitary pads to make learning exciting in school.

Further studies on the effect of sanitation and hygiene on female education was reported by schools (Abioye-Kuteyi, 2000), that there are no proof that menstruation is the lone cause of female drop out; though self-reporting by female students proposes that poor toilet amenities in schools contributes to malingering, skipping classes, nonattendance, and quitting school, chiefly in the transition from primary to secondary. One randomized organized sample was done in Nepal to connect school nonattendance to menstruation (Oster and Thornton, 2009). Menstrual cups were distributed to females in the intervention group and there was follow up to check if the circulation of this tool improved attendance in schools. This shows that other vital issues may contribute attributed to the low performance or drop out of female students from schools; however the most common issue is insufficient sanitation conveniences, particularly toilets. Likewise, a number of the female students might have personal reasons for absenteeism; thus it is important to cautiously study them so as to help build their education (Oster and Thornton, 2009).

An analysis done by Wanbuya and Kyalo (2014) on the effects of inadequate sanitary facilities on school performance, 33% of respondents agreed, 9% disagreed, and 27% strongly disagreed, with 51% of respondents strongly agreeing. This effect was confirmed when it was discovered that the majority of schools with good test scores had acceptable sanitary facilities. The administrators of the study's participating schools confirmed that girls do worse than boys in class because they are constantly uncomfortable, which prevents them from participating in class activities. A girl's participation is badly impacted by frequent absences from school. Even in the short run, frequent absences from school of several days per month might have a detrimental effect on a girl's ability to study and, consequently, her academic success in school. A student may eventually drop out due to irregular attendance, inadequate learning, and consequently poor long-term results.

According to Wanbuya and Kyalo (2014), only 20.3% of women could always study correctly during their period, while 12.3% were unable to study at all. Another 67.4% could study properly on occasion but were unable to do so on other occasions. The girls also stated that their ability to study well or poorly had a significant impact on how well they performed academically. When they experienced acute pain and menstruation, the girls' capacity and willingness to study decreased since they felt completely weak and almost no motivation to do so. In addition, it was challenging for a girl to make up with her classmates in class if she missed three school days during a period each month. She might not perform well overall if she took any exams or class tests while away.

According to Water Aid (2017), aside from the health risks of inadequate sanitary facilities, it is bumpy, humiliating and places females at possibility of voiced and maybe physical mishandling. To dodge this act, they frequently skip meals throughout the day, making it difficult to focus in school. As soon as they develop to sexual maturity, females will mostly skip lessons or quit school due to indecent lavatories and changing rooms in schools.

Notwithstanding these connections between quality of existing toilets and female sanitation, some researches opined that there is no decisive indication of the connection between the provision of enhanced hygiene amenities and school attendance. Birdthistle et al. (2011), in a methodical review of obtainable literature could not back a claim that providing different toilet conveniences leads to better school admission and attendance for females.

According to a research conducted in Ghana, the only restrooms available to students at several schools, like the Adusa Municipal Assembly Primary School, are a few pit latrines and one improvised, semi-open construction. Many pupils claim to "hold it" yet admit to finding it difficult to focus in class because of the abjectly appalling state of the facilities. Improvements to institutional latrines will

help with some of the girls' absences, according to the Ghana WASH initiative. Little girls can take care of themselves without missing a full day of school with a simple extension of privacy and a brief excuse from class (Zormal, 2016). Therefore, the condition of learners' sanitation facilities has an influence on their school attendance and to a varied extent, academic performance. The results of the various studies on the effects of sanitary facilities in school on girls' educational outcomes were mixed. A number of studies in this review indicated that adequate sanitary facilities have an influence on girls' educational outcomes. Sanitary facilities in schools may hinder girls' ability to concentrate in class, attend school when menstruating, or at worst drop out of school completely (Alexander et al., 2014)

According to a research conducted in Ghana, the only restrooms available to students at several schools, like the Adusa Municipal Assembly Primary School, are a few pit latrines and one improvised, semi-open construction. Many pupils claim to "hold it" yet admit to finding it difficult to focus in class because of the abjectly appalling state of the facilities. Improvements to institutional latrines will help with some of the girls' absences, according to the Ghana WASH initiative. Little girls can take care of themselves without missing a full day of school with a simple extension of privacy and a brief excuse from class. This means that girls and female teachers cannot attend school during menstruation. Schools with adequate sanitary facilities attract and retain more female students and teachers (WHO, 2009). On the effects of adequate sanitary facilities on girl's performance, some studies confirmed that schools that performed well were found to have adequate sanitary facilities. The poor performance of girls compared to boys was due to the constant discomfort leading to less participation by girls in class work (Wanbuya and Kyalo, 2014). Continuous absence from school will lead to interrupted attendance, insufficient learning and therefore poor performance.

According to research from poor nations, girls struggle to access sanitary facilities for managing their periods and need privacy in latrines as well as water for handwashing and washing their faces because of leaks (Mason et al., 2013). Adequate sanitary facilities should be provided in schools in order to enhance girls' participation in extracurricular activities without worrying about leaking. Sanitary facilities' cleanliness may encourage girls to stay in school. When hygienic conditions are poor, girls and female teachers suffer more than boys.

In Ghana, it was reported that, majority of schools were without sanitary facilities that meet the standards of the Ghana Education Service guidelines for the provision of sanitary facilities in schools (Anyarayer et al., 2019). These conditions are even worse in the case of schools in the rural areas where we still have schools under trees. Due to these conditions, girls do not feel safe to attend school freely for fear of embarrassment. The results from

the study by Anyarayer et al. (2019), showed that, adequate provision of sanitation facilities by school authorities significantly influence its use by female students and therefore have a significant effect on girls' participation and performance in Ghana.

The study revealed that the availability of sanitary facilities in schools has a potential to reduce students absenteeism especially among the girl child. When there are adequate sanitary facilities in schools, attendance and gender parity in basic schools will improve since girls will feel comfortable to stay in school. Poor sanitary facilities conditions have adverse impact on girl's privacy and comfort and the ability to effectively manage her menstrual hygiene which affects their participation in school activities due to fear of leakage. Regular absence from school for several days a month can even in the short term have a negative impact on a girl's learning and therefore on her academic performance in school. Girls avoid eating or drinking during the day to further avoid using the sanitary facilities making it difficult to concentrate while in school. However, despite the many evidence that availability of sanitary facilities impacts girls education, some studies also brought to the attention that there is no conclusive evidence of the relations between the provision of improved sanitation facilities and girl's school attendance (Grant et al., 2013).

Impact of sanitary facilities on girls' health

Six studies state that sufficient sanitation amenities are connected to greater risk of gastrointestinal and transmissible diseases. Koopman (1978) epidemiologic study in Colombia reports statistically significant evidence for a fundamental connection between the appropriateness of toilets (toilet amenities that are durable, ample water supply, hygiene, as well as providing toiletries) with vomiting and diarrhea in the experimental schools. Rajaratnam et al. (1992) in their study opines that students in a primary school in the United Kingdom who excrete in toilets were statistically significantly more likely to have Hepatitis A owing to poor hygienic conveniences. During the study, it was discovered that the concerned school lack hand washing materials (Rajaratnam et al., 1992). Hughes et al. (2004) examination of hygiene in the Pacific Islands reports a decline in the infection of helminthic when children can access water to wash their hands and get rid of wastes. Irrespective of the quality of water, children in schools that lack water are four times more probable to contract helminthiases than those in schools with water supply (Hughes et al., 2004). From all indications, improved services regarding safe management of water for consumption and sanitation (indicators for SDG 6.1 and 6.2) for example controlled channeled water or good sewers networks to wastewater treatment can radically lead to health improvement such as leading to decrease

in diarrhoea and deaths (WHO, 2018).

According to Dreibelbis et al. (2014), other than restraining transmission of pathogen in the public space like school, school-level WASH interventions will likely decrease communal disease problem as well as increase knowledge regarding sanitation. A different study in Kenya establish that in areas experiencing water scarcity, school-based WASH interventions comprising advancement in water supply decreased diarrhea amongst siblings of students under five years who do not attend school. The authors are of the opinion that this maybe because of circulation of upgraded hygiene practices and conducts at home and in the community, or disruption of transmitting pathogen in school environments, thus decreasing contacting and transmitting of pathogen at home. Another study in Kenya documents knowledge transmission from students to their close relative, recognizing greater parental consciousness and domestic usage of water treatment using flocculent disinfectant following hygiene instruction for student and donations of products for treating water to students; enhanced household water treatment practices were nonstop over a period of one year (Blanton et al., 2007). A study of a school-based WASH intervention in Kenya documents the dissemination of information on point-of-use water treatment procedures as well as increased use of Water Guard in student homes as indicated by consuming chlorine residues in stored water; additionally, parents attested to improved hand-washing, and 38% showed proper hand-washing technique (O'Reilly et al., 2008). Erismann et al. (2017) warn, however, that while students can relay health messages to family members, genuine behavior change among them is difficult to achieve due to the difficulty of shifting practices and the wider limitations that limit increased activities (such as water scarcity).

Despite the natural confidence that improvements in school WASH conditions will be beneficial for student health, findings from school-based WASH assessments have been conflicting, according to Bowen et al. (2007) and Talaat et al. (2011). There is evidence that WASH in Schools programs improve child health and reduce illnesses connected to poor cleanliness, such as diarrhea. In a boarding school in Kenya, Migele et al. (2007) studied the effects of a straightforward water management and hand-washing intervention, which included altering clay containers with narrow mouths and ceramic lids, drinking water taps, and plastic items like soil-transmitted helminth (STH) infection (Bieri et al., 2013; Freeman et al., 2012; Freeman et al., 2013). For instance, Bieri et al. (2013) found that the incidence of STHs infection was about 50% lower in the intervention group that received a STH education package compared to the control group (4.1% vs. 8.4%, $p < 0.001$) among Chinese schoolchildren. In their research in Mali, Freeman et al. (2013) discovered that improving hygiene, access to clean water, and sanitation in schools reduces

the risk of some STHs re-infecting following deworming; however, the effects' strength varied depending on the species of helminth involved. Results, however, are not always distinct or encouraging. Rates of diarrhea were too low in the intervention and control groups during an evaluation of a hand-washing campaign program in Chinese elementary schools to pinpoint specific differences in prevalence (Bowen et al., 2007). According to several studies, fundamental interventions such as behavior modification, water treatment, and hygiene promotion did not lower incidence of diarrheal illness (Freeman et al., 2014; Patel et al., 2012). In a multi-country study, Duijster et al. (2017) discovered that there was no significant difference between intervention schools (which offered deworming and better hand washing) and control schools in the prevalence of STH at baseline and at follow-up. Moreover, a study by Greene et al. (2012) carried out in schools in western Kenya discovered that water treatment and hygiene promotion did not lower the likelihood of *Escherichia coli* contamination on students' hands; By utilizing membrane filtration and m-ColiBlue24 broth (Hach, Loveland, CO), hand rinse samples were examined for the presence of *E. coli* using conventional techniques. For each sample, 1 and 10 ml portions were filtered, and the plates were incubated at 44.5 \pm 0.5°C for 24 hours. The quantities of *E. coli* colony-forming units (CFU) per hand were calculated using both dilutions. The sample concentration was calculated by adding the concentrations and dividing the result by the total volume filtered when both plate counts fell under the detection limit. Plates with more than 200 colonies were noted as being uncountable (TNTC). The concentration was calculated only from the other plate when one plate had no colonies or TNTC. In addition, the installation of new latrines in intervention schools markedly increased the prevalence of *E. coli* among females (RR = 2.63, 95% CI 1.29-5.34), which researchers blamed on inadequate hygiene behavior modification and a dearth of soap, water, and anal cleansing supplies. The presence of *E. coli* on hands is a variable that is challenging to assess in terms of illness risk and consequences, it is crucial to emphasize.

It is well acknowledged that WASH infrastructure and resources are crucial building blocks for changing hygiene behaviors and lowering the risk of WASH-related infections. There is evidence, though, that latrine construction is ineffective at lowering diarrheal disease when done alone without additional water- and hygiene-related measures (Freeman et al., 2014; Duijster et al., 2017). Construction of latrines alone may not result in their use without wider hygiene promotion and latrine maintenance efforts, or (conversely) latrines may increase exposure to faecal pathogens if they are improperly used, poorly maintained, or if hygiene resources are unavailable before, during, or after use (Freeman et al., 2014; Caruso et al., 2014). The health advantages of increased WASH infrastructure and

resources in schools may depend on the toilet conditions, not just the kid to latrine ratios, as well as the consistent supply of soap and water for hand washing (Grimes et al., 2017).

The provision of sanitary amenities, such as enhanced toilet facilities and hygiene, enhances the health status of pupils/students and also motivates girls to attend school, according to various publications in the review on the subject (UNICEF, 2020). Reductions in diarrheal disease and other hygiene-related illnesses, like respiratory illnesses and soil-transmitted helminths, were observed among pupils in schools, according to disease-related outcomes (McMichael, 2019). Of these papers revealing favorable health results, The prevalence of intestinal parasite infections was observed to decline, but not under nutrition, according to a substantial percentage of people who also claimed that there were no statistically significant decreases for some disease-related outcomes. Young females who practice poor menstrual hygiene are more likely to contract fungus (Padma et al., 2015). Serious reproductive tract infections can result from recurrent infections. They are hence more susceptible to infertility (Singh et al., 2001). It is crucial to remember that girls are a vulnerable group who run the risk of suffering, especially in areas with low access to water, sanitation, and hygiene. Girls are biologically less prone than boys are to infectious disorders, such as diarrhea, when they are young (Zormal, 2016).

According to WHO (1993), access to a toilet or a safe water supply does not guarantee that hygiene and health would improve. Human conduct, or what individuals actually do, is the most important topic. Studies have shown that by practicing better cleanliness habits, diarrheal illness can be decreased even in areas without latrines. Although the statement gives every evidence that human behavior contributes to health promotion, this fact alone won't be enough to encourage children to practice proper hygiene. To encourage them to practice excellent hygiene habits at home and at school, sanitary facilities must be provided. Children will go to school every day and enjoy their education once these elements are in place.

In Ghana, where more than 9 million episodes occur each year, diarrhea causes roughly 25% of all under-five mortalities (Binka et al., 2011). In Ghana, children under five are frequently affected by diarrhea, however there is a difference between the prevalence in urban and rural areas (10.5% vs. 12.8%). (Child Health and Early Development, 2015). Simple preventive measures, like washing your hands with soap, could avoid this. Hand washing and point-of-use water treatment have both been demonstrated to lessen diarrhea among environmental interventions. To urge households to adopt these behavioral changes, more efforts are required. Improvements in rural water infrastructure and adequate maintenance at the community level significantly reduce diarrheal illness or that this infrastructure can be

maintained successfully (Zwane and Kramer, 2007). Inadequate sanitation and hygiene undermine Africans through illness, environmental disruption, poverty exacerbation through higher medical costs and poorer production, and denial of dignity to the weak and vulnerable. According to the literature mentioned above, the majority of girls in schools are always concerned about their privacy. When separate facilities are provided along with improved facilities, their health needs will be met, which implies that girls will attend school regularly and learn in a comfortable environment.

According to the study, poor school WASH conditions are linked to health problems like vector-borne illnesses like diarrhea, helminth infections, and respiratory infections as well as cases of bullying and humiliation in school restrooms (Abrahams, 2006; Leach, 2003). Establishing the impact of adequate sanitary facilities on girls' health could provide indirect evidence of the impact of adequate sanitary facilities on girls' educational outcomes given that health issues are known to affect school attendance and completion (Hunt, 2008).

State of sanitary facilities in schools

When McMichael (2019) conducted a systematic review of the literature with the goal of identifying and analyzing the impact of water, sanitation, and hygiene interventions (WASH) in schools in low-income countries, it became clear that many of these schools do not have adequate access to water facilities or programs that promote sanitation and hygiene.

The Small Projects Foundation (SPF) conducted a research in two schools in Zimbabwe that revealed 400 girls out of 700 students had to use four toilets for all of their personal hygiene needs in one of the schools, whereas 262 girls out of 400 students had to use five toilets for the same purpose. The older girls could not have privacy in the restrooms, especially when they were menstruating (Sommer, 2009). In certain instances, the status of the restrooms prevents pupils from using them, as Maria (2010) observed in her research of a South African school where she claimed that the restrooms were in such a poor condition that children were unable to use them. Some of the restrooms lacked privacy doors, while the others had damaged doors and severely rusted corrugated iron sheets, allowing visitors to see inside. The majority of the restrooms lacked water for hand washing. According to the Mbula (2014) study and UNESCO guidelines for the provision of Water, Sanitation and Hygiene facilities in schools, water should be kept next to the restrooms to make it convenient and much more likely for kids to wash their hands after using the restroom. Surveys demonstrate that many schools lack basic hygienic facilities, and even those that do provide separate facilities for boys and girls are unusable due to their dirt. According to a research by Marie (2010), which

was mentioned in Mbula (2014), most of the 6500 public schools in the Eastern Cape Province of South Africa had pit latrines that were badly kept and most of them were full, thus they were no longer in use. The study found that girls' poor attendance at school during menstruation was caused by the terrible condition of the restrooms. According to Sommer (2011), even in restrooms that are well-used and kept, girls experience discomfort when there is no seclusion from other girls, especially when urinating and managing their periods. For such schools, this presents a significant issue in terms of sanitary measures.

Although though Kenya's government, through the ministry of education, set a requirement of one toilet for every 25 girls and one for every 30 males, the situation there is appalling. This is done to maintain the restrooms' cleanliness and the division of boys from girls, which will eventually allow the students to practice good hygiene (Mbula et al., 2014). According to a research done in Kisumu, 50 kids on average shared one restroom in one of the institutions (Curtis and Cairncross, 2003). A further survey by Chabari (2010) in 9 public secondary schools in the Machakos District revealed that 66.7% of the schools did not adhere to the sanitary standards set by the Ministry of Education. The Ministry of Education's (2003) recommendations state that sanitation facilities in schools should be distributed as follows: 1:30 for boys; 1:25 for girls, and six out of the nine schools under investigation had more than 30 pupils sharing a restroom. Even though these researchers claimed that numerous students shared one restroom, they were unable to demonstrate whether or not the facilities were used hygienically. In Ghana, the government created the National Water Policy in 2007 and the National Sanitation Policy in 2010. In 2014, the Ghana Education Service created Basic Standards and an Implementation Plan for WASH in Schools with assistance from UNICEF.

Siwolo (2004) conducted research in Nairobi public schools. They discovered that one of the problems faced in the schools was the lack of adequate sanitation facilities (toilets and urinals). Also, the condition of the restrooms that were available in the investigated schools was terrible. This is due to the fact that many of the restrooms had damaged doors and were filthy.

According to a study by Adukia (2017), instructors may also be negatively impacted by school latrines in ways that disproportionately affect girls in their adolescence. If a school has restrooms, teachers could be more likely to work there or show up for work there (Kremer et al., 2005). Particularly female teachers are frequently believed to boost girls' attendance through improving girls' safety and serving as role models (Kirk and Sommer, 2006). Due to safety concerns, some parents in traditional neighborhoods forbid their daughters from attending classes offered by male teachers. For some girls, the idea of being sexually harassed by male teachers makes them feel safer with female educators

(Adukia, 2017). Despite the literature's emphasis on teenage girls, boys may likewise worry about privacy and safety. When using school restrooms, boys occasionally express fear of being taunted and tormented, and they may feel embarrassed to use an exposed urinal in front of other people. Boys are concerned about their privacy and are at risk of being harassed and molested at school. Younger girls and boys are also often victims of bullying (Adukia, 2017).

Schools in West African nations struggle with major sanitation and hygiene issues that affect kids' health and regular attendance at school. According to reports from EMIS (2018) that are currently accessible, 30 and 49% of all basic schools in Ghana (including public and private) do not have access to basic water and sanitation services. The percentage of public basic schools with access to renovated restrooms climbed from 60 to 65% between 2013 and 2018. The percentage of private basic schools with access to renovated restrooms decreased from 84 to 82% within the same time period. This indicates that from 69 to 70%, there was just a 1% increase in access to improved sanitation on a national level. It is believed that at current rate of advancement, it may take the nation 150 more years to provide new restrooms for the remaining 30% of all schools. In terms of having access to clean water, there was a 6% decline from 57% to 51% between 2013 and 2017. While the percentage of public schools having access to better drinking water facilities decreased from 44 to 42% during the same time period, private basic schools instead saw a decrease from 78 to 74%. As a result, between 2013 and 2017, there was a 6% decrease in the number of basic schools with access to upgraded drinking water facilities nationwide (CONIWAS, 2019).

According to Gyabaah and Ackerson's (2009) investigation into sanitation at basic schools in Ghana's Tano South District, 83% of the 30 selected schools lacked access to safe drinking water, and 53% lacked toilet facilities. In addition, this study showed that 47% of schools had on-site restrooms, whereas 53% lacked such amenities. There were 13% pit latrines, 17% two-seater KVIP, and 17% six-seater KVIP in the restrooms. According to the National Development Planning Commission's Operation Handbook for Education Planning, Budgeting, Monitoring, and Evaluation at the District Level, this was well below the District's expected threshold of 70%. (2003). According to Gyabaah and Ackerson's (2009) investigation into sanitation at basic schools in Ghana's Tano South District, 83% of the 30 selected schools lacked access to safe drinking water, and 53% lacked toilet facilities. In addition, this study showed that 47% of schools had on-site restrooms, whereas 53% lacked such amenities. There were 13% pit latrines, 17% two-seater KVIP, and 17% six-seater KVIP in the restrooms. According to the National Development Planning Commission's Operation Handbook for Education Planning, Budgeting, Monitoring, and

Evaluation at the District Level, this was well below the District's expected threshold of 70%. (2003). A fresh design for kids is clearly needed, especially in terms of the size of the squatting hole. All schools lacked appropriate restrooms, with the exception of Akobro Community JHS, where there were less than 50 people per squatting hole.

According to Anyarayer et al. (2019) and another study conducted in Ghana, many senior high schools there lack basic sanitary facilities, and the few restrooms that do exist are in appalling condition. It is unusual to discover bathrooms that are separate for males and girls. Where separate restrooms are offered, their dirty state renders them useless. In other instances, the state of these restrooms is so poor that female students find them unusable and opt to indulge in open defecation instead (Anyarayer, 2017). Some female pupils were in such a terrible condition that they were unable to use the restrooms. Some of the restrooms lacked privacy doors, while the others had damaged doors and severely rusted corrugated iron sheets, allowing visitors to see inside.

WASH in Schools (WinS) in Ghana has so far been provided as a component of conventional water, sanitation, and hygiene promotion programmes in communities, claims GES (2014). In 2010, 49% of schools (Creche/Nursery, Kindergarten, Primary Schools, and Junior High Schools) had access to water on-site, according to UNICEF's 2020 report. The numbers do not reflect the state and usage of the facilities, and since 2010, numerous additional school WASH facilities have been built. As a result, there is no reliable information on working water and sewage systems in schools. Because WinS is a project-based strategy, the GES of the Ministry of Education (MoE), which is in charge of it, has had considerable difficulty coordinating and harmonizing WinS initiatives. This is mostly because the GES was frequently underutilized in this project-based approach.

Despite the government of Ghana's efforts to offer sanitary facilities in schools, the state of the restrooms in schools is poor and insufficient (Child Health and Early Development, 2015). The majority of schools do not have access to the most basic sanitary and hygienic amenities, such as separate restrooms, water for hand washing, and a waste disposal system that complies with GES national standards. For schools that have the basic facilities, they are in deplorable state due to poor maintenance.

Gyabah and Acherson (2009) and Anyarayer et al. (2019) have published studies that highlighted the inadequate sanitary conditions in Ghanaian schools. Several of the current facilities don't provide hygienic facilities in schools according to national and international standards. This indicates that the spaces are unclean and dangerous for students to use. Students miss critical lessons as a result of travelling great distances and performing open defecation. The lack of adequate sanitary facilities could have a number of causes. One argument could be that the government does not care

about sanitary facilities in schools since it does not invest in them and does not provide schools the money to fix their current sanitary facilities. Another issue can be that teachers don't prioritize sanitary facilities because they don't understand how important they are, or they don't supervise the facilities because their jobs are unclear or they are overworked and unable to take on more duties.

Sustainable solutions and recommendations on how to provide adequate sanitary facilities towards bridging the education inequality in Junior High Schools

Access to restrooms in schools promotes equity, respect, and inclusion. Sanitary facilities in schools are important from a human rights standpoint. In order to attain universal and equitable access to clean and cheap drinking water, sanitation, and hygiene for all, the Sustainable Development Goals (SDGs) indirectly underline the need to expand WASH beyond household settings. Using the indicator of the "percentage of schools with access to: (a) basic drinking water; (b) single-sex basic sanitation; and (c) basic handwashing facilities," the SDGs specifically mention WASH in Schools in Target 4 of the goals (McMichael, 2019). But, the goal is to achieve positive results across a variety of indicators, including an improvement in educational performance, in addition to providing acceptable ratios (attendance, participation and performance) of girls and other WASH-related diseases, hygiene behavior.

The study found that there is a desire to implement cleanliness policies and rules in schools, but that standards for building sanitary facilities have either not been followed or are not present. Thus, it is advised that the required actions be made to strictly enforce cleanliness laws and guarantee that hygienic facilities in schools are built to requirements. By constructing and modernizing educational facilities that are child, disability, and gender sensitive and offer a secure, nonviolent, inclusive, and productive learning environment for all, this will assist achieve SDG objective 4a and close the access gap.

The budget for operation and maintenance of WASH in schools should be included by the government. Only with sufficient budgetary allocation can school restroom and water facilities be adequately maintained and run. This can make it easier for governments and donors to fund school-based WASH initiatives and help organizations create and carry out successful programs. It is crucial to have a budget set aside for sanitary facilities in schools as this may have an impact on how well girls perform academically there. It would be opportune and beneficial for the government, educational institutions, and civil society organizations to step in and enable schools in low resource areas have a sustainable budgetary allocation for WASH facilities.

Conclusion

The availability of adequate sanitary facilities in schools have a positive implication on girls' educational outcomes (school performance and participation). It is critical to gain a better understanding of how good sanitary facilities in schools affect educational and health results. This can assist governments and funders in allocating money to school-based WASH initiatives, as well as agencies in designing and implementing effective interventions. The goal of the study was to see how poor sanitary facilities affected girls' performance and involvement in public junior high schools. The availability of proper sanitary facilities in schools has a favorable impact on girls' educational results (school performance and participation) as well as their health, according to the findings of the study. The investigation also looks into the current state of the sanitary facilities. It was discovered that school sanitary facilities were insufficient. The poor status of sanitation and hygiene in public schools has been linked to inadequate sanitation and hygiene facilities in schools. A lack of hygiene education offered during school hours, as well as a lack of maintenance of school infrastructure, has contributed to poor sanitation in schools. Despite the fact that the government and non-governmental organizations have taken initiatives to ensure that schools have proper sanitation, the study showed that these efforts are insufficient to resolve the problem. The study concludes based on the findings that, having a financial allocation for sanitary facilities in schools is crucial, as this can have an impact on a school's educational success for girls. It is critical for the government, educational institutions, and civil society organizations to intervene to ensure that schools in low-resource areas have a stable budget.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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REFERENCES

- Abioye-Kuteyi EA (2000). Menstrual Knowledge and Practices amongst Secondary School Girls in Ile Ife, Nigeria. *Journal of the Royal Society for the Promotion of Health* 120(1):23-26.
- Adukia A (2017). Sanitation and education. *American Economic Journal of Applied Economics* 9(2):23-59.
- Aiello AE, Coulborn RM, Perez V, Larson EL (2008). Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *American Journal of Public Health* 98(8):1372-1381.
- Alexander KT, Oduor C, Nyothach E, Laserson KF, Amek N, Eleveld A, Ombok M (2014). Water, sanitation and hygiene conditions in Kenyan rural schools: are schools meeting the needs of menstruating girls? *Water* 6(5):1453-1466.
- Anyarayer BK (2017). Dynamics of sustainable behavior change in sanitation practices in Nadowli-Kaleo district (Doctoral dissertation).
- Anyarayer BK, Alhassan A, Faisal AM (2019). Access to Improved Sanitation Facilities and Female School Attendance: A study of Savelugu Municipality of Ghana. *Journal of Arts and Humanities* 8(1):56-67
- Bieri FA, Gray DJ, Williams GM, Raso G, Li YS, Yuan L, McManus DP (2013). Health-education package to prevent worm infections in Chinese schoolchildren. *New England Journal of Medicine* 368(17):1603-1612.
- Binka E, Vermund SH, Armah GE (2011). Rotavirus as a cause of diarrhea among children under 5 years of age in urban Ghana: Prevalence and serotypes/genotypes. *Paediatric Infectious Disease Journal* 30:718-730.
- Birdthistle I, Dickson K, Freeman M, Javidi L (2011). What impact does the provision of separate toilets for girls at schools have on their primary and secondary school enrolment, attendance and completion? A systematic review of the evidence. *Social Science Research Unit, Institute of Education, University of London* 6 p.
- Blanton E, Ombeki S, Oluoch GO, Mwaki A, Wannemuehler K, Quick R (2010). Evaluation of the role of school children in the promotion of point-of-use water treatment and hand washing in schools and households-Nyanza Province, Western Kenya, 2007. *The American journal of Tropical Medicine and Hygiene* 82(4):664-671.
- Bolt E, Shordt K, Krukkert I (2006). School Sanitation and Hygiene Education: Results from the Assessment of a Six-country Pilot Project. *UNICEF*: New York, NY, USA.
- Bowen A, Ma H, Ou J, Billhimer W, Long T, Mintz E, Luby S (2007). A cluster-randomized controlled trial evaluating the effect of a hand washing-promotion program in Chinese primary schools. *The American Journal of Tropical Medicine and Hygiene* 76(6):1166-1173.
- Burgers L (2000). Background and rationale for school sanitation and hygiene education. New York.
- Burrows G, Acton J, Maunder T (2004). Water and sanitation. The education drain. *A WaterAid Report. Education Media Report* 3:1-21.
- Caruso BA, Freeman MC, Garn JV, Dreibelbis R, Saboori S, Muga R, Rheingans R (2014). Assessing the impact of a school-based latrine cleaning and hand washing program on pupil absence in Nyanza Province, Kenya: a cluster-randomized trial. *Tropical Medicine and International Health* 19(10):1185-1197.
- Child Health and Early Development (2015). Ghana Demographic and Health Survey.
- Community Water and Sanitation Agency, (CWSA, 2004). Small Towns Sector Policy. CWSA, Accra.
- Curtis V, Cairncross S (2003). Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *The Lancet Infectious Diseases* 3(5):275-281.
- Donkor AK, Justice DK (2016). Girls' education in science: The challenges in northern Ghana. *Journal of Education and Social Policy* 3(1).
- Dreibelbis R, Freeman MC, Greene LE, Saboori S, Rheingans R (2014). The impact of school water, sanitation, and hygiene interventions on the health of younger siblings of pupils: a cluster-randomized trial in Kenya. *American Journal of Public Health* 104(1):91-97.
- Dreibelbis R, Greene LE, Freeman MC, Saboori S, Chase, RP, Rheingans R (2013). Water, sanitation, and primary school attendance: A multi-level assessment of determinants of household-reported absence in Kenya. *International Journal of Educational Development* 33(5):457-465.
- Duijster D, Monse B, Dimaisip-Nabuab J, Djuharnoko P, Heinrich-Weltzien R, Hobdell M, Soukhanoung P (2017). 'Fit for school'—a school-based water, sanitation and hygiene programme to improve child health: Results from a longitudinal study in Cambodia, Indonesia and Lao PDR. *BMC Public Health* 17(1):302.
- Erismann S, Diabougba S, Schindler C, Odermatt P, Knoblauch AM, Gerold J, Cissé G (2017). School children's intestinal parasite and

- nutritional status one year after complementary school garden, nutrition, water, sanitation, and hygiene interventions in Burkina Faso. *The American Journal of Tropical Medicine and Hygiene* 97(3):904-913.
- Freeman MC, Clasen T, Brooker SJ, Akoko DO, Rheingans R (2013). The impact of a school-based hygiene, water quality and sanitation intervention on soil-transmitted helminth reinfection: a cluster-randomized trial. *The American Journal of Tropical Medicine and Hygiene* 89(5):875-883.
- Freeman MC, Clasen T, Dreifelbis R, Saboori S, Greene LE, Brumbach B, Rheingans R (2014). The impact of a school-based water supply and treatment, hygiene, and sanitation programme on pupil diarrhoea: a cluster-randomized trial. *Epidemiology and Infection* 142(2):340-351.
- Freeman MC, Greene LE, Dreifelbis R, Saboori S, Muga R, Brumbach B, Rheingans R (2012). Assessing the impact of a school-based water treatment, hygiene and sanitation programme on pupil absence in Nyanza Province, Kenya: a cluster-randomized trial. *Tropical Medicine and International Health* 17(3):380-391.
- Garn JV, Greene LE, Dreifelbis R, Saboori S, Rheingans RD, Freeman MC (2013). A cluster-randomized trial assessing the impact of school water, sanitation and hygiene improvements on pupil enrolment and gender parity in enrolment. *Journal of Water, Sanitation and Hygiene for Development* 3(4):592-601.
- Ghana Education Service (GES) (2014b). WASH in Schools National Implementation Model. Accra: GES.
- Grant M, Lloyd C, Mensch B (2013). Menstruation and school absenteeism: evidence from rural Malawi. *Comparative Education Review* 57(2):260-284.
- Greene LE, Freeman MC, Akoko D, Saboori S, Moe C, Rheingans R (2012). Impact of a school-based hygiene promotion and sanitation intervention on pupil hand contamination in Western Kenya: a cluster randomized trial. *The American Journal of Tropical Medicine and Hygiene* 87(3):385-393.
- Grimes JE, Tadesse G, Gardiner IA, Yard E, Wuletaw Y, Templeton MR, Drake LJ (2017). Sanitation, hookworm, anemia, stunting, and wasting in primary school children in southern Ethiopia: Baseline results from a study in 30 schools. *PLoS Neglected Tropical Diseases* 11(10):e0005948.
- Gyabaah D, Awuah E, Ackerson NOB (2009). Sanitation in basic schools—a case study in Tano south district. In *West Africa Regional Sanitation and Hygiene Symposium*, Accra, Ghana.
- Hetherington E, Eggers M, Wamoyi J, Hatfield J, Manyama M, Kutz S, Bastien S (2017). Participatory science and innovation for improved sanitation and hygiene: process and outcome evaluation of project SHINE, a school-based intervention in Rural Tanzania. *BMC Public Health* 17(1):1-15.
- Hughes RG, Sharp DS, Hughes MC, Akau'ola S, Heinsbroek P, Velayudhan R, Galea G (2004). Environmental influences on helminthiasis and nutritional status among Pacific schoolchildren. *International Journal of Environmental Health Research* 14(3):163-177.
- Hunt FM (2008). Dropping out from school: A cross country review of literature. *Create Pathways to Access*. Research Monograph, No. 16.
- Jasper C, Le TT, Bartram J (2012). Water and sanitation in schools: a systematic review of the health and educational outcomes. *International Journal of Environmental Research and Public Health* 9(8):2772-2787.
- Kirk J, Sommer M (2006). Menstruation and body awareness: linking girls' health with girls' education. *Royal Tropical Institute (KIT), Special on Gender and Health* pp. 1-22.
- Koopman JS (1978). Diarrhea and school toilet hygiene in Cali, Colombia. *American journal of epidemiology* 107(5):412-420.
- Kremer M, Chaudhury N, Rogers FH, Muralidharan K, Hammer J (2005). Teacher absence in India: A snapshot. *Journal of the European Economic Association* 3(2-3):658-667.
- Leach F, Fiscian V, Kadzamia E, Lemani E, Machakanja P (2003). An investigative study of the abuse of girls in African schools 666-45478.
- Mahon T, Fernandes M (2010). Menstrual hygiene in South Asia: a neglected issue for WASH (water, sanitation and hygiene) programmes. *Gender and Development* 18(1):99-113.
- Marie F (2010). Breaking the silence: Menstrual hygiene management—rural India.
- Mason L, Nyothach E, Kelly A, Odhiambo FO, Eleveld A, Vulule J, Phillips-Howard PA (2013). 'We keep it secret so no one should know'-A qualitative study to explore young schoolgirls attitudes and experiences with menstruation in rural Western Kenya. *PLoS One* 8(11):e79132.
- Mbula SE, Mulwa A, Kyalo DN (2014). Access to improved sanitation: implication for sustainable implementation of hygiene practices in secondary schools in Machakos County.
- McMichael C (2019). Water, sanitation and hygiene (WASH) in schools in low-income countries: A review of evidence of impact. *International Journal of Environmental Research and Public Health* 16(3):359.
- Migele J, Ombeki S, Ayalo M, Biggerstaff M, Quick R (2007). Diarrhea prevention in a Kenyan school through the use of a simple safe water and hygiene intervention. *The American Journal of Tropical Medicine and Hygiene* 76(2):351-353.
- Ministry of Education Youth and Sports (MOEYS) and Ghana Education Service (GES) (2003). *Operational Manual for Education Planning, Budgeting, Monitoring and Evaluation at the District Level*. Ghana Education Service, Accra.
- Montgomery P, Ryus CR, Dolan CS, Dopson S, Scott LM (2012). Sanitary Pad Interventions for Girls' Education in Ghana: A Pilot Study 7(10):e48274.
- O'reilly CE, Freeman MC, Ravani M, Migele J, Mwaki A, Ayalo M, Quick R (2008). The impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents: Nyanza Province, western Kenya, 2006. *Epidemiology and Infection* 136(1):80-91.
- Oster E, Thornton R (2009). Determinants of technology adoption: Private value and peer effects in menstrual cup take-up (No. w14828). *National Bureau of Economic Research*.
- Padma D, Kelly K, Baker AD, Tapoja S, Sunita S, Bhabani SD, Bijay P, Arati N, Mary B, Bibiana B, Pravas RM, Pinaki P, Sandy C, Belen T (2015). Menstrual Hygiene Practices, WASH Access and the Risk of Urogenital Infection in Women from Odisha, India; doi: 10.1371/journal.pone.0130777
- Patel MK, Harris JR, Juliao P, Nygren B, Were V, Kola S, Hoekstra RM (2012). Impact of a hygiene curriculum and the installation of simple hand washing and drinking water stations in rural Kenyan primary schools on student health and hygiene practices. *The American Journal of Tropical Medicine and Hygiene* 87(4):594-601.
- Pearson J, McPhedran K (2008). A literature review of the non-health impacts of sanitation. *Waterlines* 27(1):48-61.
- Rajaratnam G, Patel M, Parry JV, Perry KR, Palmer SR (1992). An outbreak of hepatitis A: school toilets as a source of transmission. *Journal of Public Health* 14(1):72-77.
- Siwolo AI (2004). The Financial challenges facing the management of primary schools by the head teachers after the introduction of free primary education: a case of Westlands division, Nairobi (Doctoral dissertation, University of Nairobi, CEES, Kenya).
- Snel M (2004). The worth of school sanitation and hygiene education (SSHE): case studies. Delft: IRC International Water and Sanitation Centre.
- Sommer M (2009). Ideologies of sexuality, menstruation and risk: girls' experiences of puberty and schooling in northern Tanzania. *Culture, Health and Sexuality* 11(4):383-398.
- Sommer M (2011). Integrating menstrual hygiene management (MHM) into the school water, sanitation and hygiene agenda. 35th WEDC International Conference, Loughborough, UK, 2011.
- Sommer M (2013). Structural factors influencing menstruating school girls' health and well-being in Tanzania. *Compare: A Journal of Comparative and International Education* 43(3):323-345.
- Sommer M, Vasquez E, Worthington N, Sahin M (2012). WASH in schools empowers girls' education. *Proceedings of the Menstrual Hygiene Management in Schools*. New York.
- Sumpter C, Torondel B (2013). A systematic review of the health and social effects of menstrual hygiene management. *PLoS One* 8(4):e62004.
- Talaat M, Afifi S, Dueger E, El-Ashry N, Marfin A, Kandeel A, El-Sayed N (2011). Effects of hand hygiene campaigns on incidence of laboratory-confirmed influenza and absenteeism in schoolchildren, Cairo, Egypt. *Emerging Infectious Diseases* 17(4):619.

- Trinies V, Garn JV, Chang HH, Freeman MC (2016). The impact of a school-based water, sanitation, and hygiene program on absenteeism, diarrhea, and respiratory infection: a matched-control trial in Mali. *The American Journal of Tropical Medicine and Hygiene* 94(6):1418-1425.
- UNESCO Institute for Statistics (2019). Global adult literacy rate from 2009 to 2019, by gender. Worldwide; available online at <https://www.statista.com/statistics/1220131/global-adult-literacy-rate-by-gender/>.
- UNESCO Institute of Statistics (2016). Country readiness to monitor SDG 4 education targets, regional survey for the Asia and Pacific region. ISBN 978-92-9189-202-0; Ref: UIS/2016/SDG/TD/13; <http://dx.doi.org/10.15220/978-92-9189-202-0-en>
- UNICEF (2020). Out-of-school population among lower secondary school children from 2000 to 2018, by gender. Worldwide; UNICEF; 2000/2018 report. Available online at: <https://www.statista.com/statistics/1218471/out-of-school-population-among-lower-secondary-school-children-by-gender/>.
- Water Aid (2017). *Out of Order: The State of the World's Toilet*. London, UK: Water Aid available online at: <https://www.wateraid.org/uk/publications/out-of-order-the-state-of-the-worlds-toilets-2017>.
- World Health Organization (WHO) (1993). *Improving water and sanitation hygiene behaviors for the reduction of diarrhoeal disease. The report of an informal consultation.* WHO/CWS/93.10. Geneva.
- World Health Organization (WHO) (2009). *Water, Sanitation and Hygiene Standards for Schools in Low-cost Settings*; Adams J, Bartram J, Chartier Y, Sims J (eds.), World Health Organization: Geneva, Switzerland.
- Yieke FA (2006). *Free Primary Education (FPE) in Kenya: Examining the Benefits, Challenges and Sustainability.* Kef: Commission for development studies at the Austria academy services: MDG project database.
- Zormal F (2016). *School sanitation, hygiene and the coping strategies among girls in the Junior High Schools in the Wa Municipality, Ghana* (Doctoral dissertation).
- Zwane AP, Kremer M (2007). What works in fighting diarrheal diseases in developing countries? A critical review. *The World Bank Research Observer* 22(1):1-24.