

Navigating Water Scarcity and Poor Sanitation: A Mixed-Methods Study of Rural Livelihoods and Community Development in Agortime-Kpetoe, Ghana

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ABSTRACT: *This study investigates the impact of water scarcity and inadequate sanitation on rural livelihoods and sustainable community development in Agortime-Kpetoe, a rural community located in Ghana's Volta Region. Employing a mixed-methods design, the research combined structured questionnaires administered to 95 randomly selected households with a focus group discussion involving eight community members of varied socio-economic backgrounds. Quantitative findings revealed widespread reliance on streams, wells, and sachet water due to unreliable piped supply, with over 67% of respondents reporting that water scarcity disrupts children's school attendance and 88% acknowledging that high water costs erode household disposable income. Sanitation access was similarly limited, with more than 60% of households depending on pit latrines and 62% admitting to open defecation practices. These deficits were strongly linked to frequent disease outbreaks, reduced productivity, and heightened poverty. Qualitative data highlighted the gendered burden of water collection and sanitation management, as women and girls bore the primary responsibility for fetching water, often at the expense of income-generating activities and educational opportunities. Participants also described pervasive safety risks and loss of dignity associated with inadequate sanitation facilities. The study concludes that while infrastructure exists in parts of the community, systemic challenges of reliability, affordability, and maintenance perpetuate water insecurity and poor sanitation. Addressing these issues requires integrated strategies that combine reliable infrastructure, community-driven management, behavior change interventions, and gender-sensitive policies. The findings contribute localized evidence to inform targeted interventions and underscore the critical role of water and sanitation in achieving broader development goals, including poverty reduction, health improvement, and gender equity.*

Keywords: *Water scarcity; sanitation; rural livelihoods; gender inequality; sustainable development; Ghana*



Article information

Received 5 June 2025

Accepted 30 July 2025

Published 22 August 2025

<https://doi.org/10.26765/DRJSSES34459664>

Citation: Senna, R., Adople-Attipoe, C., & Parku, S.G. (2025). Navigating Water Scarcity and Poor Sanitation: A Mixed-Methods Study of Rural Livelihoods and Community Development in Agortime-Kpetoe, Ghana. Direct Research Journal of Social Science and Educational Studies. Vol. 13(3), Pp. 24-38. This article is published under the terms of the Creative Commons Attribution License 4.0.

INTRODUCTION

Human health, dignity, and sustainable development all depend on having access to clean drinking water and better sanitation facilities. However, billions of people still lack these essentials despite global advancements, which has serious repercussions for economic productivity, gender parity, poverty reduction, and public health. Over two billion people still do not have access to safely managed drinking water, and 3.6 billion do not have access to securely managed sanitation facilities, according to the World Health Organization and UNICEF (2021). Rather than being spread equally, these losses show glaring disparities both within and between nations. The cost falls disproportionately on rural communities in low- and middle-income areas, which face systemic and infrastructure-related issues.

Global frameworks like the Sustainable Development Goals (SDGs) and the Millennium Development Goals (MDGs) have attempted to address these disparities during the last 20 years. In particular, SDG 6 calls for universal access to clean water and sanitation by 2030, acknowledging the critical role that WASH plays in accomplishing more general development goals like reducing poverty (SDG 1), improving health and well-being (SDG 3), promoting gender equality (SDG 5), and reducing inequalities (SDG 10) (Krannich & Reiser, 2023). It has been difficult to translate these global goals into concrete results at the local level, though. As Prüss-Ustün et al. (2014) argue, the persistence of water-related diseases and sanitation-related mortality illustrates the gap between policy commitments and actual improvements in living conditions, particularly in rural areas. The difficulties are particularly severe in many developing nations, where socioeconomic progress is still hampered by the lack of a dependable water supply and sanitary facilities. Chronic water insecurity and sanitation deficiencies have been caused by a combination of poor governance, climate variability, and insufficient investment in parts of South Asia, Latin America, and Sub-Saharan Africa. As women and children are usually in charge of gathering water, these circumstances disproportionately burden them, compromise food security, and aid in the spread of waterborne illnesses (Kayser et al., 2019). According to Garrick and Hahn (2021), water insecurity in these kinds of situations involves more than just physical scarcity; it also involves unfair distribution, subpar management, and weak water supply infrastructure. Sub-Saharan Africa is a prime example of these difficulties. The region still has some of the lowest rates of access to clean drinking water and better sanitation in the world, despite persistent efforts by national governments and development partners. More than 40% of people in Sub-Saharan Africa, with rural regions most affected, are estimated by the African Development Bank (Citaristi, 2022) to lack access to essential drinking water services. Unimproved sources like ponds, streams, and unprotected wells, often shared with livestock, are the main supply of water for many people in

the area. Because these sources are usually contaminated, cholera, typhoid, and diarrheal illnesses frequently break out, further taxing already overburdened health services. In Sub-Saharan Africa, inadequate sanitation and water scarcity have significant socioeconomic ramifications in addition to health ones. In rural areas, women and girls frequently spend several hours a day gathering water; time that could be spent on community service, education, or paid employment (Kayser et al., 2019). This time, poverty restricts household economic productivity and perpetuates gender inequality. According to Vaseashta (2021), the inability to have consistent access to water threatens not only the livelihoods of individuals but also the resilience of entire communities, making them more susceptible to climate shocks and escalating cycles of poverty. In the meantime, poor sanitation facilities exacerbate problems with community health by causing environmental deterioration, contaminating water sources, and spreading infectious diseases. Over the past 20 years, Ghana has made significant strides in increasing access to better water and sanitation services, especially in urban areas. Significant investments have been made in small-town and rural water systems, and national partnerships and efforts have raised the percentage of the population with access to safe drinking water. Nonetheless, there are still notable differences between rural and urban areas. While the majority of urban dwellers have access to better water sources, many rural households still rely on untreated surface water, and sanitation coverage is still quite low, according to the Ghana Statistical Service (2021). Rural communities frequently practice open defecation and rely on shared or inadequate latrines, which exacerbate persistent health issues and jeopardize attempts to meet SDG 6.

These nationwide trends of inequality are reflected in Ghana's Volta Region, particularly in the Agortime-Ziope District, which is home to Agortime-Kpetoe. Many populations still deal with sporadic or unpredictable water supplies, even though some settlements benefit from boreholes and small-town water systems. When available, piped water infrastructure is frequently ill-maintained and prone to malfunctions, leaving homes to depend on commercial water sellers, dugouts, or streams. Particularly for low-income families, the price of buying water from vendors can account for a sizeable portion of household income, which exacerbates inequality and poverty. In the meantime, many households continue to use shared facilities or engage in open defecation due to the lack of proper sanitary infrastructure. This contributes to environmental pollution, increases the risk of disease outbreaks, and compromises the dignity and safety of vulnerable groups, particularly women and girls.

In Agortime-Kpetoe, this project aims to investigate the intricate connections among community development, sanitation standards, and water availability.

In order to give a comprehensive, localized understanding of how water shortages and inadequate sanitation impact health, education, economic productivity, and social well-being, the research will combine quantitative survey data with qualitative community member insights. By doing this, it highlights the unique possibilities and problems faced by rural Ghanaian communities while building on national and international evidence. The results are intended to guide more successful, locally driven activities that complement the SDGs' overarching goals and national development agendas.

Many Ghanaian rural communities still face enduring issues that jeopardize their livelihoods, health, and chances for sustainable development, even after decades of national and international measures to increase access to clean water and sanitation. According to Baur and Woodhouse (2009), in Africa, the rural population lacking access to improved water sources is six fold greater than that in urban areas, significantly impacting rural well-being. Rural communities like Agortime-Kpetoe are still underserved, despite notable advancements in urban regions. Residents frequently deal with poor sanitary facilities, a significant reliance on contaminated surface water sources, and an unpredictable piped water supply. In addition to violating basic human rights, this circumstance feeds the cycles of inequality and poverty. The wide-ranging effects of poor water and sanitation in low- and middle-income nations have been well-documented by previous studies, which have shown increased illness loads, decreased productivity, and gender-based inequities. Nevertheless, a large portion of this data is compiled at the national or regional level, providing little understanding of how these issues appear in particular localities. There is not much empirical researches that examine how water shortage and inadequate sanitation interact to influence everyday life, economic activity, and community well-being in Ghana's Volta Region, especially in Agortime-Kpetoe.

There is a substantial knowledge gap in this area. Policies and initiatives run the risk of being poorly targeted, unsustainable, or culturally unsuitable in the absence of concrete evidence of the unique obstacles encountered by rural households. Furthermore, there is a dearth of research that combines qualitative and quantitative viewpoints to fully reflect the scope of the issue as well as the lived experiences of people who are most impacted. Critical aspects of vulnerability and resilience are further obscured by the lack of gender-sensitive studies in communities where women and girls are primarily responsible for managing hygiene and collecting water. Accordingly, this study seeks to investigate the extent to which inadequate water access and poor sanitation facilities affect the livelihoods, health, and development of households in Agortime-Kpetoe. By combining survey data and community narratives, the research aims to generate actionable insights that can inform more effective, inclusive, and sustainable water and sanitation interventions in rural Ghana. One of the most enduring

development issues facing rural people around the world is access to clean drinking water and better sanitation. Over two billion people still lack access to securely managed drinking water supplies, and over 3.6 billion lack clean sanitation, according to the World Health Organization and UNICEF (2021). Global statistics have improved since the Sustainable Development Goals (SDGs) and Millennium Development Goals were adopted, but these averages mask enduring disparities between rural and urban areas. Rural communities in low- and middle-income nations are disproportionately affected by environmental contamination, irregular supplies, and inadequate infrastructure (Prüss-Ustün et al., 2014; WHO, 2019).

Inadequate water and sanitation have been shown to have a wide range of negative effects on health, economic productivity, gender equality, and educational attainment. For instance, Garrick and Hahn (2021) contend that water security involves more than just access; it also involves quality and dependability, with sporadic or contaminated supplies frequently posing more risks than complete nonexistence. This observation is especially pertinent to Ghana, where households are forced to turn to streams, wells, and other dangerous sources of water due to regular outages in piped water networks. The results of this study are consistent with this dynamic, as numerous Agortime-Kpetoe participants experienced poor tap water in spite of the presence of infrastructure. According to researchers like Kayser et al. (2019), inadequate sanitation and a lack of hygienic facilities are associated with social marginalization and a decline in dignity, particularly for women and girls, in addition to diarrheal illnesses. In rural WASH research, which typically focuses primarily on health indicators, this facet is often understudied. The gendered aspect of water collection and the significant effects of open defecation on safety and well-being were highlighted by the community members' viewpoints in this study. These lived experiences imply that cultural, behavioral, and gender norms that influence water and sanitation practices need to be addressed in addition to infrastructure. Another area where writing has advanced in sophistication is the economic consequences of water scarcity. Citaristi (2022), in the context of Sub-Saharan Africa, confirms Vaseashta's (2021) observation that the time burden of fetching water results in lost income and opportunity costs for households. In Ghana, small commerce and agriculture, both of which rely significantly on dependable water supplies, are frequently associated with rural livelihoods. This knowledge is expanded by the current study, which shows how food vendors, farmers, and traders are impacted by uneven water access, which lowers household incomes and productivity. This data shows that water scarcity is a structural obstacle to poverty alleviation and sustainable development, in addition to being a public health concern. However, localized research is essential for contextualizing how these processes unfold in particular places, even while global studies offer strong evidence of these difficulties.

The lack of attention to community-specific norms, behaviours, and resource limitations has undermined the success of many water and sanitation programs. For instance, Jenkins and Scott (2007) emphasize that the sustainability of sanitation interventions in Ghana hinges not only on infrastructure but also on culturally grounded approaches and household-level motivations. This is supported by the Agortime-Kpetoe findings, where open defecation continues despite infrastructure upgrades, driven by factors such as inadequate facilities, limited behaviour change communication, and the perceived cost of adopting improved sanitation practices.

Importantly, this study expands on earlier research by fusing qualitative and quantitative data to provide a more complex picture of the problems with water and sanitation in a rural Ghanaian community. Although previous studies have found general associations between WASH access and development outcomes, this study expands on our knowledge of how unstable water supplies, exorbitant prices, and poor sanitation infrastructure combine to limit people's ability to make a living in daily life. By doing this, it offers both empirical evidence and a theoretical justification for comprehensive, locally based solutions that take social norms and community agency into account. Ultimately, despite national and international advancements, the data still indicates that consistent funding, political will, and community involvement are needed to provide rural communities with universal access to clean drinking water and sanitary facilities. By placing Agortime-Kpetoe's experience in this larger framework, the study emphasizes how urgent it is to solve systemic injustices that sustain socioeconomic vulnerability and health hazards.

The livelihoods of rural populations around the world are still significantly impacted by the lack of access to clean water and poor sanitation infrastructure. More than two billion people still rely on unimproved water sources or spend hours fetching water, frequently from shallow wells and filthy streams, despite advancements in increasing access (World Health Organization & UNICEF, 2021). These deficiencies are systemic obstacles that influence social well-being, economic engagement, and health in rural areas rather than just being infrastructure problems. Among the most obvious and immediate repercussions of water scarcity and inadequate sanitation are health-related ones. According to Prüss-Ustün et al. (2014), one of the biggest causes of child death globally is still avoidable aquatic illnesses. Frequent episodes of parasite infections and diarrhea impair immune systems, decrease the absorption of nutrients, and eventually jeopardize academic performance and productivity. According to Garrick and Hahn (2021), the combined effects of chronic illnesses result in significant household expenses, both in the form of direct medical costs and lost wages when caregivers must give up their jobs to care for the ill. These expenses are especially great in Ghana's rural areas since households lack financial safety nets, and health services are frequently far away.

Time poverty is a crucial aspect of livelihood disruption that goes beyond health effects. Water collection is traditionally the responsibility of women and girls, who spend hours every day collecting water, which restricts their access to education, skill development, and paid employment opportunities (Kayser et al., 2019). Research from the African Development Bank (Citaristi, 2022) and other studies conducted throughout Sub-Saharan Africa demonstrate that households in water-insecure regions may waste up to 20% of their weekly productive time on water collection. For instance, residents of Agortime-Kpetoe report rising before the sun to wait in line at shaky taps or to go far to other sources, frequently arriving late and worn out. This dynamic reinforces cycles of poverty and gender inequality, as men are generally more able to engage in income-generating activities while women remain constrained by domestic responsibilities.

Water access and agriculture productivity are directly linked, further undermining economic livelihoods. Water scarcity can destroy agricultural production, lower household food security, and undermine local markets in agrarian economies, according to Vaseashta (2021). Ghanaian farmers frequently depend on rain-fed farming, which is augmented by domestic water storage. Water scarcity inhibits the production of crops for sale, in addition to affecting personal consumption due to unpredictable rainfall and a lack of irrigation infrastructure. As a result, households experience unstable earnings and are more susceptible to changes in the price of food.

By polluting communal spaces and raising the prevalence of disease, poor sanitation exacerbates these impacts. The spread of cholera and typhoid, which disproportionately afflict populations already dealing with precarious health systems, is facilitated by open defecation and inadequate latrines. According to Kayser et al. (2019), inadequate sanitation infrastructure can also compromise safety and dignity, particularly for women and children who are at risk of harassment and abuse when they defecate in public. These interconnected elements produce a vicious cycle whereby illness, poverty, and lost output steadily weaken the resilience of households.

Global frameworks like the Sustainable Development Goals have brought attention to these issues, yet many efforts just address infrastructure without taking sociocultural norms and behavioral factors into sufficient account. In addition to policies that address affordability and maintenance, studies like as those conducted by Jenkins and Scott (2007) show that community ownership and engagement are necessary for long-term gains in WASH services.

By presenting concrete data from Agortime-Kpetoe on how unstable water supplies and inadequate sanitation impair productivity, damage health, and prolong socioeconomic vulnerabilities, the current study adds to this body of work. By doing this, it draws attention to the necessity of comprehensive, locally specific solutions that tackle the social as well as the infrastructure aspects of rural communities' water and sanitation problems.

With the establishment of the Sustainable Development Goals (SDGs) by the United Nations, the connection between water, sanitation, and community development has become more prominent in the global policy discourse. A key component of achieving other goals, such as poverty reduction (SDG 1), good health and well-being (SDG 3), quality education (SDG 4), gender equality (SDG 5), and reduced inequalities (SDG 10), is SDG 6, which aims to "ensure availability and sustainable management of water and sanitation for all" (Krannich & Reiser, 2023). These goals' interconnectivity emphasizes that enhancing water and sanitation infrastructure is a prerequisite for achieving comprehensive community development rather than a stand-alone goal.

Access to water is crucial for promoting social participation and economic development. The World Health Organization and UNICEF (2021) claim that insufficient water supplies raise household expenses, limit small businesses, and result in losses in agricultural output. Rural towns that don't have a variety of revenue streams are disproportionately impacted by these economic challenges. According to Vaseashta (2021), water security is essential to sustainable development since it promotes livelihoods, resistance to climate shocks, and health. Households with consistent access to water, for instance, are better equipped to carry out profitable endeavors like market gardening, food processing, and raising livestock, all of which support regional economic development.

Access to sanitation is also essential to the health of the community. In addition to raising disease rates, inadequate sanitation infrastructure jeopardizes the safety, participation, and dignity of vulnerable populations, particularly women and children. Kayser et al. (2019) point out that when sanitary facilities are inadequate or dangerous, women and girls frequently encounter major obstacles to education and employment. SDG 4 on high-quality education and SDG 5 on gender equality are closely related to this dynamic. If schools don't have clean, private restrooms, girls are more likely to miss school or drop out during their periods. Therefore, enhancing sanitation is an equitable strategy that can benefit entire communities rather than only being a health intervention. Social and cultural standards that dictate the use and upkeep of water and sanitation supplies also influence community development. According to Jenkins and Scott (2007), community ownership and culturally relevant methods are essential for WASH projects to be sustainable in rural Ghana. New infrastructure frequently deteriorates in the absence of proactive involvement and a feeling of local accountability. This realization is particularly pertinent to SDG 11, which highlights the necessity of creating human settlements that are secure, resilient, inclusive, and sustainable. Participants in this survey voiced their dissatisfaction with projects that have been shelved and emphasized the significance of integrating infrastructure spending with behavioral modification and education.

Perhaps the most direct measure of the relationship between water, sanitation, and development is health outcomes. According to the World Health Organization (2019), better WASH services could stop hundreds of thousands of deaths from diarrheal illnesses alone each year. A positive cycle of growth is reinforced in healthier communities, which are more productive, have lower healthcare expenditures, and can invest more in income-generating and educational endeavors. SDG 3, which aims to promote wellbeing at all ages and reduce communicable diseases, is in line with this.

Moreover, access to water and sanitation directly influences poverty dynamics. Households forced to spend disproportionate time and money securing water or treating preventable illnesses are less able to accumulate assets or invest in the future (Garrick & Hahn, 2021). This undermines progress towards SDG 1 on poverty eradication and SDG 10 on reducing inequalities. In rural Ghana, the study site demonstrates how these burdens cluster in marginalized communities, compounding disadvantage over generations.

The current research builds upon this growing body of evidence by situating the experiences of Agortime-Kpetoe within the broader SDG framework. While prior studies have shown that improved WASH services contribute to better development outcomes, this study provides local-level insights into the practical barriers and lived experiences that shape implementation. By highlighting community perspectives on reliability, affordability, and dignity, it offers a more holistic understanding of how water and sanitation improvements can drive sustainable development when integrated with social and policy interventions.

Women and girls in rural areas are disproportionately impacted by water scarcity, which limits their social and economic engagement and perpetuates gender inequality. In many low-income environments, women are largely in charge of gathering water, frequently trekking great distances several times a day (Kayser et al., 2019). Their chances for schooling, earning a living, and taking part in community decision-making are all restricted by this time-consuming burden. According to Vaseashta (2021), girls in Ghana usually arrive late or skip school entirely because they have to assist their moms in fetching water, which lowers their educational attainment and diminishes their possibilities for the future.

There is also a clear gendered influence on the health effects of limited access to water. Particularly for teenage girls whose bodies are still developing, carrying high quantities of water can result in musculoskeletal injuries and chronic pain (World Health Organization & UNICEF, 2021). Furthermore, women and girls frequently put the needs of males and small children ahead of their health and hygiene when water is limited. This makes it more difficult to manage menstrual hygiene, which raises school absenteeism and causes stigma in the community.

These difficulties are made worse by safety considerations. Women and girls are at risk for

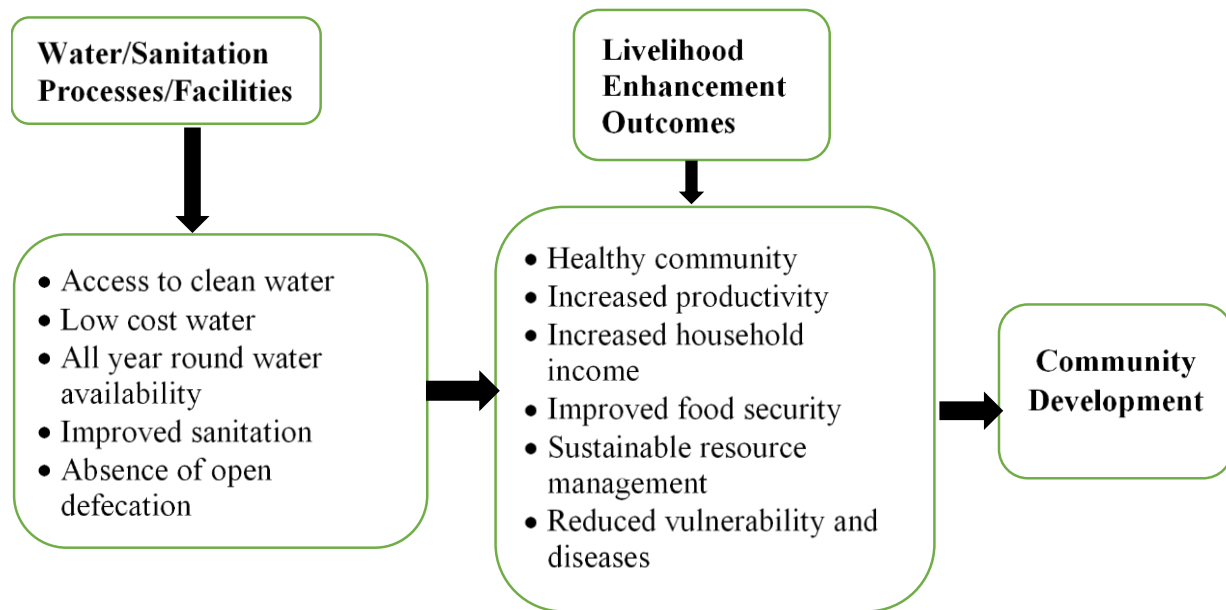


Figure 1: The Nexus between Water/Sanitation, Livelihood Enhancement Outcomes, and Community Development. Source: Developed by Researchers, 2022.

harassment, abuse, and accidents along dimly lit paths when they must fetch water early in the morning or after dark (Garrick & Hahn, 2021). These dangers foster an atmosphere in which a lack of access to water damages not just one's bodily well-being but also one's sense of security and dignity. Participants in this study in Agortime-Kpetoe noted that the daily battle to obtain water feeds a vicious cycle in which gender discrimination and poverty are closely intertwined. Therefore, addressing water scarcity is essential for promoting gender equity, sustainable community development, and public health. This study is conceptualized as a result of the interplay among three distinct but interrelated variables: water and sanitation processes and facilities, livelihoods enhancement outcomes, and sustainable community development. This relationship is illustrated in (Figure 1). The study makes significant contributions to the understanding of the relationship between water, sanitation, and rural livelihoods, particularly within the context of developing nations. By focusing on the Agortime-Kpetoe community in Ghana's Volta Region, it provides targeted insights into how deficits in water and sanitation infrastructure directly affect socio-economic development. This study not only fills a theoretical gap in the existing literature but also offers actionable data for policymakers and stakeholders aiming to address these pressing issues.

This research advances theoretical frameworks linking water, sanitation, and hygiene (WASH) outcomes with socio-economic determinants, particularly in rural settings. It highlights how factors such as a youthful population and low levels of formal education shape water and sanitation

practices. These findings validate and expand upon prior global research (UNESCO, 2018; Makarigakis. & Jimenez-Cisneros, 2019), contextualizing them within the socio-cultural and economic realities of rural Ghana. Additionally, the study delineates how water scarcity and inadequate sanitation infrastructure limit health outcomes, educational opportunities, and economic productivity, thus broadening the scope of WASH-related development paradigms.

Moreover, the research offers policy-oriented insights by identifying specific challenges, such as the reliance on shared sanitation facilities and the erratic supply of pipe-borne water. These findings stress the importance of incorporating community-specific variables into water and sanitation policy design, particularly in rural areas. Emphasizing the link between hygiene practices and educational attainment further underscores the necessity of integrating education and awareness programs into WASH interventions.

The study provides clear, practical recommendations for tackling water and sanitation challenges to enhance rural livelihoods and support sustainable community development. Firstly, it underscores the critical need for infrastructure improvements. The unreliable flow of pipe-borne water in the community highlights the importance of investing in robust water supply systems, such as boreholes and storage facilities. Similarly, expanding decentralized sanitation infrastructure can reduce dependence on shared facilities, minimize open defecation, and improve hygiene outcomes. Health and hygiene interventions are another key recommendation. Regular community health education campaigns focused

on disease prevention and promoting hygiene practices, such as proper hand washing and waste disposal, are essential to curbing disease outbreaks linked to poor sanitation.

The study also identifies water-related labour inefficiencies as a major impediment to productivity. Addressing this issue through targeted interventions, such as the provision of proximate water collection points, would enable children to attend school regularly and adults to participate in income-generating activities. Furthermore, subsidizing water and sanitation services or offering financial support to households could reduce the economic burden on families, enhancing their disposable income and overall living standards. Lastly, the integration of water and sanitation improvements into broader rural livelihood enhancement programs is crucial. The study suggests incorporating WASH initiatives into microfinance schemes, agricultural support programs, and community development projects to maximize their impact on productivity and sustainability. By addressing the multifaceted impact of water and sanitation challenges on rural livelihoods, this study provides valuable contributions to both theory and practice. Its findings are essential for policymakers, development practitioners, and community stakeholders seeking to design and implement effective WASH interventions. The proposed solutions aim not only to alleviate immediate infrastructural deficits but also to foster long-term socio-economic development in rural communities.

MATERIALS AND METHODS

In order to fully comprehend the ways that water shortages and inadequate sanitation affect livelihoods and community development in Agortime-Kpetoe, this study used a mixed-methods research methodology that combined quantitative and qualitative techniques. According to district planning reports and estimates from the 2010 Population and Housing Census, the study area, which is in Ghana's Volta Region's Agortime-Ziope District, is home to an estimated 8,000–10,000 people. The community is primarily rural, and its primary economic activities are small-scale trading and agriculture. Despite the existence of piped water infrastructure, inhabitants are often forced to rely on streams, dugouts, and commercial water vendors due to the supply's frequent unreliability. The sample size was determined using Cochran's formula for sample size calculation. This formula is suitable for large populations and provides a conservative estimate to ensure adequate representativeness. With a 95% confidence level ($Z = 1.96$), an assumed proportion (p) of 0.5 to maximize variability, and a margin of error of 10% ($e = 0.1$), the initial sample size calculation yielded 96.04 respondents. To account for the finite population size of approximately 10,000 residents, the finite population correction was applied, resulting in a final adjusted sample size of approximately 95 households. This sample was

deemed sufficient to produce reliable and generalizable findings within the community context.

A simple random sampling technique was used to select households for participation. The sampling frame was developed with assistance from local leaders to ensure inclusivity and coverage of all sections of the community. Each household had an equal probability of selection, minimizing sampling bias. Quantitative data were collected through a structured questionnaire designed to capture information on household demographics, sources of water, sanitation practices, and the perceived effects of water scarcity and poor sanitation on health and livelihoods. The questionnaire was reviewed by experts for content validity and pre-tested in a neighboring community to refine clarity and relevance.

To complement the quantitative data, qualitative insights were gathered through a Focus Group Discussion involving eight community members purposively selected to represent a range of ages, genders, and socio-economic backgrounds. The discussion explored community perceptions, coping mechanisms, and recommendations for improving water and sanitation services. All discussions were audio-recorded with the consent of participants and later transcribed verbatim to allow for thematic analysis.

Ethical considerations were rigorously observed throughout the research process. Ethical approval was obtained from the Ethics Review Committee of the Evangelical Presbyterian University College. Community entry protocols were followed, including consultations with traditional leaders and local authorities to secure support and approval for the study. All participants provided informed consent, and confidentiality and anonymity were strictly maintained.

Quantitative data were analyzed using descriptive statistics, including frequencies and percentages, to identify trends and patterns among variables. Qualitative data from the Focus Group Discussion were coded and analyzed thematically, allowing emergent themes to enrich and contextualize the quantitative findings. This mixed-methods approach provided a nuanced understanding of the multidimensional impacts of water and sanitation challenges on rural livelihoods and community development in Agortime-Kpetoe.

RESULTS AND DISCUSSION

Socio-Demographic Characteristics of Respondents

Interpreting the study's results requires an understanding of the respondents' sociodemographic profile. How people experience and react to water scarcity and sanitation issues depends on a number of factors, including age, education, marital status, household composition, employment sector, and dwelling style. This section provides insight into the social and economic context in which water and sanitation issues arise by summarizing

Table 1: Socio-Demographic Characteristics of Respondents.

Variable	Category	Frequency	%
Age group	Below 20 years	22	23.2
	20–29 years	13	13.7
	30–39 years	30	31.6
	40–49 years	20	21.0
	Over 50 years	10	10.5
	Total	95	100.0
Level of formal education	No formal education	29	30.5
	Primary education	38	40.0
	Secondary education	19	20.0
	Tertiary education	9	9.5
	Total	95	100.0
Marital status	Single	30	31.6
	Married	24	25.3
	Separated	18	18.9
	Divorced	8	8.4
	Widowed	15	15.8
	Total	95	100.0
Number of children	None	24	25.3
	Less than 3	48	50.5
	Between 3–5	15	15.8
	Between 6–8	8	8.4
	Total	95	100.0
Sector of employment	Unemployed	40	42.1
	Private sector	36	37.9
	Public sector	19	20.0
	Total	95	100.0
Type of residence	Compound residence with shared toilet facility	52	54.7
	Compound residence with its own toilet facility	31	32.7
	Chamber & hall self-contained	12	12.6
	Total	95	100.0

Source: Field Data, 2025

the salient features of the 95 Agortime-Kpetoe survey respondents. The findings are shown in (Table 1).

Regarding age, Table 1 indicates that respondents were predominantly within the economically active population. About 31.6% (n=30) were between 30–39 years, followed by 23.2% (n=22) below 20 years of age. An additional 21.0% (n=20) fell within the 40–49 years bracket, while 13.7% (n=13) were aged 20–29 years. Only 10.5% (n=10) were over 50 years. This age distribution suggests a youthful to middle-aged community, which has implications for household water needs and labour availability for water collection.

In terms of education, 40.0% (n=38) of respondents had completed primary education, and 20.0% (n=19) had secondary education. A substantial proportion—30.5% (n=29)—reported no formal education at all, while only 9.5% (n=9) had attained tertiary-level qualifications. The relatively low levels of higher education may affect awareness of hygiene practices and the adoption of improved sanitation behaviors. The marital status profile indicated that 31.6% (n=30) were single, while 25.3% (n=24) were married. Additionally, 18.9% (n=18) were separated, 15.8% (n=15) were widowed, and 8.4% (n=8)

were divorced. These figures show that a significant portion of the population may be heading single-parent households, potentially influencing economic vulnerability and the capacity to invest in improved water or sanitation facilities.

Again, household composition data revealed that 50.5% (n=48) of respondents reported having fewer than three children. A smaller proportion, 15.8% (n=15), had between 3–5 children, while 8.4% (n=8) had between 6–8 children. Notably, 25.3% (n=24) indicated they did not have any children. Household size has important implications for daily water consumption and sanitation facility usage.

Regarding economic activity, 42.1% (n=40) of respondents were unemployed, reflecting a relatively high level of economic dependence and potential barriers to affording improved services. Meanwhile, 37.9% (n=36) were employed in the private sector, and 20.0% (n=19) worked in the public sector. The predominance of unemployment and informal sector work suggests financial constraints may limit the adoption of household water storage solutions or sanitation upgrades.

Housing conditions further underscore infrastructural and environmental health challenges.

Table 1 indicates that more than half of the respondents, 54.7% (n=52), lived in compound residences with shared toilet facilities. Another 32.7% (n=31) lived in compound residences with their toilets, and only 12.6% (n=12) reported living in chamber and hall self-contained units. This indicates that shared sanitation is the dominant housing arrangement, heightening risks of contamination and inadequate hygiene, especially during periods of unreliable water supply.

Overall, the socio-demographic profile suggests that the community faces multiple intersecting vulnerabilities: limited education, high unemployment, and housing conditions that predispose residents to poor sanitation outcomes. These factors are critical to understanding the dynamics of water access, health risks, and the feasibility of community-driven interventions.

Access to Safe Drinking Water in the Community

The findings reveal significant challenges in consistent, equitable access to safe drinking water among households in Agortime-Kpetoe. When respondents were asked whether they had easy access to water in their households, 47.4% (n=45) disagreed, and 16.8% (n=16) strongly disagreed. Only 35.8% (n=34) agreed that water was easily accessible in their homes. These responses suggest that for a majority of residents, obtaining water requires effort, time, or reliance on external sources. This was echoed in the Focus Group Discussion (FGD), where one participant observed:

"Sometimes for a whole week, there is no water in our pipes, so we must wake up early to fetch from the stream or buy from vendors."

Perceptions of piped water regularity further highlight systemic reliability problems. Approximately 34.7% (n=33) disagreed and 18.9% (n=18) strongly disagreed that piped water flowed regularly. Only 12.7% (n=12) strongly agreed and 23.2% (n=22) agreed with this statement, while 10.5% (n=10) were neutral. This demonstrates that more than half of the respondents experience frequent interruptions, aligning with reports of infrastructure limitations common in many rural Ghanaian districts.

Seasonal variability further exacerbates access challenges. Nearly half of the respondents, 49.5% (n=47), disagreed that there was easy water access throughout the year, and 22.1% (n=21) strongly disagreed. Only 15.8% (n=15) strongly agreed, underscoring that water scarcity worsens during dry periods. FGD narratives reinforced this, with one woman sharing:

"When the dry season comes, we suffer. The stream becomes very dirty, but we have no choice."

Regarding main sources of water, only 14.7% (n=14) strongly agreed and 20.0% (n=19) agreed that piped water in their households was their main source. In contrast,

40.0% (n=38) disagreed and 25.3% (n=24) strongly disagreed, indicating widespread reliance on alternative sources. Indeed, when asked whether wells were their main domestic water source, 18.9% (n=18) strongly agreed and 37.9% (n=36) agreed, while 43.2% (n=41) disagreed. This split illustrates that wells remain important but not universally preferred, likely due to concerns about water quality and availability.

Notably, dependence on rivers and streams was high. Approximately 44.2% (n=42) strongly agreed and 18.9% (n=18) agreed that they rely on these sources for their water needs, while 36.9% (n=35) disagreed. This highlights that for a significant proportion of households, natural water sources are essential, despite known contamination risks. One FGD participant explained:

"We know the stream water is not safe, but if the taps are dry, we have no other option."

Cost remains a barrier to accessing adequate quantities of clean water. Nearly half of respondents, 44.3% (n=42) disagreed and 18.9% (n=18) strongly disagreed that the cost of water was low in the community. Only 14.7% (n=14) strongly agreed and 10.5% (n=10) agreed, while 11.6% (n=11) were neutral. This suggests that affordability constraints further limit water security, particularly for low-income households. Interestingly, bottled and sachet water emerged as a supplementary strategy. Approximately 32.7% (n=31) strongly agreed and 23.2% (n=22) agreed that they depend on bottled or sachet water for domestic use, mainly for drinking and cooking. However, 44.2% (n=42) disagreed, indicating reliance on such sources is substantial but not universal, likely because of affordability limitations.

Quality perceptions were mixed and leaned negative. About half of respondents, 50.5% (n=48) disagreed that their main water source was of very good quality, and 16.8% (n=16) strongly disagreed. Only 13.7% (n=13) strongly agreed and 10.5% (n=10) agreed, while 8.4% (n=8) remained neutral. These perceptions are consistent with documented issues of contamination in unprotected streams and wells. Taken together, the data and narratives illustrate a landscape of water insecurity marked by unreliable piped supply, dependence on surface sources, cost barriers, and low confidence in water quality. These findings highlight that infrastructural improvements must be coupled with affordability measures, education on safe water handling, and reliable maintenance to ensure sustainable progress.

Access to Improved Sanitation in the Community

Maintaining environmental health, avoiding sickness, and fostering dignity all depend on improved sanitation. Access to sanitation is frequently restricted in rural areas like Agortime-Kpetoe because of economic, cultural, and infrastructure constraints. This section looks at the kinds of sanitation facilities that households have access to, usage

trends, such as open defecation, and the degree of waste management that is done securely. The results show important gaps impeding the advancement of universal sanitation access and offer crucial insight into the community's hygiene behaviors. The results show that sanitation access in Agortime-Kpetoe remains limited, with widespread dependence on unimproved facilities and practices that pose significant health and environmental risks. Access to flush toilets is notably low. Only 21.0% (n=20) of respondents agreed that they have a flush toilet in their house, while 67.4% (n=64) disagreed and 11.6% (n=11) strongly disagreed. This means nearly four out of five households lack this basic sanitation infrastructure. The FGD echoed this reality, with one participant explaining:

"Most of us cannot afford to build flush toilets. Even those who have them sometimes cannot use them because there is no water."

Again, when asked about reliance on pit latrines or bucket latrines, 12.6% (n=12) strongly agreed and 61.1% (n=58) agreed, altogether nearly three-quarters of households. Only 26.3% (n=25) disagreed. This underscores that basic sanitation solutions remain the primary option in most homes. Open defecation also emerged as a substantial concern. A combined 62.1% of respondents, 25.3% (n=24) strongly agreeing and 36.8% (n=35) agreeing, acknowledged that their household engages in open defecation. While 37.9% (n=36) disagreed, the data confirm that this practice remains common. During the FGD, a respondent shared:

"When the latrines are full or too dirty, people have no choice but to go to the bush. It is shameful but there is no other way."

Regarding shared facilities, 37.9% (n=36) strongly agreed and 25.3% (n=24) agreed that they share their toilet with other households in the compound. While 10.5% (n=10) disagreed and 26.3% (n=25) strongly disagreed, the majority still rely on shared arrangements. This increases the risk of disease transmission, particularly when cleaning responsibilities are unclear or neglected. Waste treatment practices are also inadequate. Nearly half of respondents, 44.2% (n=42) disagreed, and 25.3% (n=24) strongly disagreed that excreta from their toilet is sent to a treatment plant. About 30.5% (n=29) were neutral, suggesting limited awareness or concern about final waste disposal. FGD participants described informal management methods, with one noting:

"Sometimes the waste is just dumped somewhere outside the town or buried. We don't have any treatment system."

Indeed, informal disposal is widespread. Approximately 43.1% (n=40) strongly agreed and 29.5% (n=28) agreed that they bury excreta around the house or in nearby bush

areas. Only 17.9% (n=17) disagreed, and 10.5% (n=10) strongly disagreed. These findings indicate that unmanaged excreta disposal remains a routine practice, with significant implications for groundwater contamination and public health. Interestingly, while sanitation practices lag, reported bathing habits were more positive. All respondents stated that they bathe at least three times daily, with 27.4% (n=26) strongly agreeing and 72.6% (n=69) agreeing. This reflects strong cultural norms around personal hygiene, even in the context of limited infrastructure. As one FGD participant put it:

"Even if we don't have water in the pipes, we find a way to bathe. It is about respect and feeling clean."

Overall, the data demonstrate that sanitation in the community is characterized by dependence on shared and unimproved facilities, widespread open defecation, and informal waste management. These challenges are consistent with national rural sanitation deficits but are particularly acute here due to limited household resources, inadequate infrastructure, and lack of affordable options. The combination of poor sanitation and unreliable water supply compounds health risks, especially for children and marginalized groups. These findings suggest that any effort to improve sanitation must combine infrastructure investment with behavior change communication, community-driven maintenance systems, and clear support for affordable household toilets and safe waste disposal mechanisms.

Effects of Water Scarcity and Poor Sanitation on the Livelihoods of Community Members

The economic and social well-being of rural households is significantly impacted by water scarcity and poor sanitation. These issues have a direct impact on income, productivity, health, and education in Agortime-Kpetoe, frequently making poverty cycles worse. This section examines how women and girls are disproportionately affected by the disruption of everyday life, the rise in health-related costs, the reduction of time for economic activities, and the lack of access to safe water and adequate sanitation. According to the findings, maintaining rural livelihoods and attaining long-term community development depend heavily on basic water and sanitation facilities. The data reveal that water scarcity and poor sanitation exert far-reaching impacts on household welfare, educational outcomes, productivity, and poverty in Agortime-Kpetoe. Regarding education, 67.4% (n=64) of respondents strongly agreed and 23.1% (n=22) agreed that water scarcity affects school attendance among children. Only 9.5% (n=9) disagreed. These figures highlight that the daily burden of fetching water disrupts children's learning, either because they assist in collection or fall ill from consuming unsafe water. In the Focus Group Discussion (FGD), one participant shared:

“Children are often late to school because they have to help fetch water. Sometimes, when they get sick from the water, they stay home for many days.”

Economic vulnerability is similarly acute. An overwhelming 88.4% (n=84) strongly agreed and 11.6% (n=11) agreed that high expenditure on water reduces their disposable income, leaving little for other necessities. This finding is consistent with national evidence that the poorest households in Ghana spend a disproportionately high share of their income on water procurement. Health-related effects emerged as a central concern. Approximately 85.3% (n=81) strongly agreed and 14.7% (n=14) agreed that scarcity and poor water quality negatively affect their health, demonstrating near-universal recognition of the problem. Similarly, 67.4% (n=64) strongly agreed and 18.9% (n=18) agreed that there are frequent disease outbreaks in the community, while only 13.7% (n=13) disagreed. During the FGD, one respondent remarked:

“Almost every household here has experienced diarrhea or stomach problems. It has become a normal thing, but it should not be.”

Poor sanitation was also widely perceived as a driver of disease. About 71.6% (n=68) strongly agreed and 15.8% (n=15) agreed that sanitation conditions promote sicknesses, while 12.6% (n=12) disagreed. These findings underscore that the health burden is not only from water contamination but also from the persistent practice of open defecation and poor waste management. Gendered impacts were evident in water collection responsibilities. A combined 64.3% of respondents, 43.2% (n=41) strongly agreeing and 21.1% (n=20) agreeing, reported that women and girls are primarily responsible for fetching water. Fewer disagreed, with 16.8% (n=16) disagreeing, 12.6% (n=12) strongly disagreeing, and 6.3% (n=6) neutral. These patterns reinforce existing literature on the gendered burden of water scarcity. One woman explained in the FGD:

“Women are the ones who wake early to fetch water. Men sometimes help, but it is mainly the work of women and girls.”

Water scarcity was also strongly linked to reduced productivity and compromised livelihoods. About 68.4% (n=65) strongly agreed and 14.7% (n=14) agreed that it affects their ability to engage effectively in economic activities, mainly because of time spent collecting water. A smaller proportion, 16.9% (n=16), disagreed. Similarly, 64.2% (n=61) strongly agreed and 21.1% (n=20) agreed that inadequate water affects their economic lives by limiting their ability to prepare food for sale. Only 14.7% (n=14) disagreed. A female trader in the FGD emphasized:

“When there is no water, I cannot cook food to sell. That means no income for the day.”

The link between water scarcity and poverty was also evident. Approximately 67.4% (n=64) strongly agreed and 10.5% (n=10) agreed that scarcity increases poverty levels in the community. Only 14.7% (n=14) disagreed, and 7.4% (n=7) strongly disagreed. These findings indicate that beyond health and inconvenience, water scarcity directly undermines household economic security and community development. Overall, the results clearly show that water scarcity and poor sanitation are not isolated challenges but systemic issues intertwined with health, gender, education, and poverty. The FGD narratives reinforced that while residents have developed coping strategies, such as waking early or purchasing sachet water, these are inadequate and unsustainable in the long term. Addressing these challenges requires not only infrastructure improvements but also affordability measures, behavior change interventions, and support systems that acknowledge the gendered dimensions of water collection and household vulnerability.

Relationship between Water, Sanitation, and Community Development

The findings demonstrate that respondents overwhelmingly recognize the fundamental role of water and sanitation in driving sustainable community development, health improvements, and poverty reduction. Regarding economic activities, 61.1% (n=58) of respondents strongly agreed and 38.9% (n=37) agreed that the availability of water promotes economic livelihoods. This unanimous agreement underscores the centrality of reliable water access for agriculture, food processing, and small businesses in Agortime-Kpetoe. As observed in earlier sections, water shortages directly disrupt income-generating activities, leading to lost earnings and heightened vulnerability among low-income households.

The impact of water access on time use was also evident. A majority, 71.6% (n=68), strongly agreed and 28.4% (n=27) agreed that easy access reduces the time spent collecting water. This perception aligns with broader evidence in Sub-Saharan Africa that water scarcity forces women and children to dedicate significant hours to collection, reducing time available for education and productive work. The near-universal agreement in this community suggests that time poverty is a shared experience and a major driver of opportunity loss. Health benefits of clean water were strongly affirmed. Approximately 81.1% (n=77) strongly agreed and 18.9% (n=18) agreed that access to clean water reduces sicknesses and diseases. This consensus resonates with WHO estimates that improved water can prevent up to 50% of diarrheal disease cases. In the study's FGD discussions, participants repeatedly linked water quality to frequent stomach illnesses and child morbidity,

underscoring the local relevance of this finding. Sanitation improvements were similarly recognized as critical to reducing mortality and promoting community health. About 60.0% (n=57) strongly agreed and 22.1% (n=21) agreed that improved sanitation reduces child and adult mortality. Only 17.9% (n=17) disagreed, likely reflecting either skepticism about the effectiveness of previous interventions or lack of direct experience with improved facilities. When asked whether improved sanitation ensures a healthy environment and community, 66.3% (n=63) strongly agreed and 25.3% (n=24) agreed. Just 8.4% (n=8) disagreed. This reinforces the understanding that sanitation is not only about individual households but about environmental cleanliness and disease prevention for the entire settlement. As one FGD participant noted:

“If the community is clean and there is no open defecation, everyone benefits. The children will not always be sick.”

Finally, respondents strongly linked water access to poverty reduction and improved livelihoods. About 72.6% (n=69) strongly agreed and 27.4% (n=26) agreed that easy access to water enhances livelihoods and helps reduce poverty. This 100% agreement reflects shared experiences that water scarcity undermines productivity, increases costs, and traps households in cycles of deprivation. Taken together, these results demonstrate that residents of Agortime-Kpetoe have a clear, collective understanding of the interdependence between water, sanitation, health, economic opportunity, and sustainable community development. This understanding is consistent with the Sustainable Development Goals, particularly SDG 6 (clean water and sanitation), SDG 1 (poverty reduction), and SDG 3 (good health and well-being). However, the persistent gaps between awareness and action highlight that while communities recognize what needs to change, they often lack the means to address these challenges without external support, infrastructure investment, and sustained community engagement.

Gender Dimensions of Water and Sanitation Challenges

The Focus Group Discussion (FGD) underscored that water scarcity and poor sanitation in Agortime-Kpetoe are profoundly gendered issues, with disproportionate impacts on women and girls across several dimensions. Participants repeatedly emphasized that women bear the primary responsibility for securing water for their households, a role that consumes substantial time and energy each day. As one female respondent explained:

“Women are the ones who wake up at dawn to fetch water. Even when we are tired or sick, we must go, because there will be no water for cooking or bathing if we don’t.”

This daily burden limits women’s participation in income-generating activities, as time spent collecting water could

otherwise be invested in farming, trading, or other productive work. Several women described how the hours devoted to water collection forced them to close their businesses temporarily or prevented them from expanding their economic activities. The time constraints also reduce opportunities for adult education, community leadership, and participation in decision-making spaces, perpetuating cycles of economic and social marginalization. The FGD also revealed that water scarcity affects girls’ schooling. When water is unavailable, girls are often expected to assist their mothers in fetching it, leading to frequent lateness and absenteeism. One participant recounted:

“My daughter sometimes misses morning classes because she has to help me carry water. If there is no water, she cannot go to school until we finish.”

Inadequate sanitation facilities further compound gender-specific vulnerabilities. Women and girls expressed concerns about safety and dignity when using shared toilets or practicing open defecation. Privacy is often lacking, and the fear of harassment or assault is pervasive, particularly after dark. Menstrual hygiene management was highlighted as an additional challenge, as the lack of private, clean spaces to change or dispose of sanitary materials forces many girls to stay home during menstruation, further undermining educational attainment. Beyond the practical and safety concerns, women described the psychological stress associated with these responsibilities. Several respondents spoke of constant anxiety over whether there would be enough water for their children to bathe or enough money to buy from vendors when the taps failed. One woman captured this sentiment succinctly:

“It is always in our minds. Even when you are working or resting, you are thinking about where to get water next.”

Overall, the FGD narratives make clear that water and sanitation challenges in Agortime-Kpetoe are inseparable from gender inequality. Women and girls shoulder the largest share of the physical labour, health risks, opportunity costs, and emotional strain. Addressing these gendered impacts requires not only infrastructure investments but also policies and interventions that intentionally reduce the burden on women, improve safety, and create opportunities for equitable participation in community development decisions.

Correlation between Water Reliability and Health

To further investigate the relationship between water access and health outcomes in the community, a correlation analysis was conducted. While earlier sections of this study revealed that many households rely on alternative sources due to irregular piped supply, it remained important to statistically assess whether perceptions of piped water reliability were associated with

Table 2: Spearman's Rho Correlations between Perceived Water Regularity and Perceived Health Effects of Scarcity and Poor Quality (N = 95).

Variable	1	2
Piped water in the community flows regularly.	1.000	0.854**
Scarcity and poor water quality affect our health.	0.854**	1.000

**Correlation is significant at the 0.01 level (2-tailed).

Source: Field Data, 2025

reported health challenges. Establishing such a link provides empirical support for the widely observed but often under-quantified effects of water insecurity on public health in rural settings. Table 2 shows the calculated correlation between water availability and the health status of residents. A Spearman's rank-order correlation was conducted to examine the relationship between the perceived reliability of piped water in the community and respondents' self-reported health effects associated with water scarcity and poor water quality. The analysis revealed a strong, positive correlation, $r_s = 0.854$, $p < 0.001$, $N = 95$. This indicates that as the reliability of piped water improves, perceived health problems decrease significantly. Conversely, residents who experience erratic or no flow of piped water are more likely to report negative health outcomes such as frequent illness and waterborne diseases. The findings of this study highlight the persistent challenges of water scarcity and inadequate sanitation infrastructure in Agortime-Kpetoe and their multifaceted impacts on health, livelihoods, education, and gender equity. The discussion is organized thematically to integrate both quantitative results and qualitative narratives systematically.

Water Access and Reliability

A key finding of this study was the high dependence on alternative water sources despite the presence of piped infrastructure. Over 47% of respondents reported lacking easy access to water in their homes, while nearly two-thirds relied on streams or wells during shortages. These patterns reflect national statistics reported by the Ghana Statistical Service (2021), which show that rural households remain disproportionately excluded from reliable water access. Focus Group Discussions (FGDs) corroborated this reality, with participants describing recurrent shortages, long walks to streams, and frequent reliance on sachet water. These narratives confirm Prüss-Ustün et al.'s (2014) argument that infrastructural availability does not necessarily translate into safe access when systems are unreliable or unaffordable. The strong correlation between piped water reliability and perceived health impacts ($r_s = 0.854$, $p < 0.001$) provides robust statistical backing for these community experiences, emphasizing reliability as a critical determinant of household health.

Health and Educational Implications

The study revealed that water scarcity significantly affects

health outcomes, with more than 85% of respondents acknowledging that poor water quality compromises their health. FGDs highlighted recurring diarrheal diseases and skin infections, particularly among children. Similar to Kayser et al. (2019), the findings illustrate how inadequate water supply contributes to disease burdens while undermining education. Over two-thirds of respondents indicated that water shortages disrupt school attendance, especially for girls tasked with water collection before classes. FGD narratives vividly described children arriving late or missing school due to time spent fetching water, reinforcing Garrick and Hahn's (2021) view of water insecurity as a driver of intergenerational poverty and lost opportunities.

Sanitation Practices and Environmental Health

Sanitation practices in Agortime-Kpetoe remain highly constrained. More than 60% of respondents reported sharing toilet facilities, while many households continued to rely on pit latrines or practiced open defecation. This creates fertile grounds for disease transmission and environmental contamination. Qualitative accounts confirmed the discomfort and health risks associated with overcrowded sanitation facilities. These results align with WHO and UNICEF (2021) estimates that billions globally lack safely managed sanitation, and Jenkins and Scott's (2007) observation that inadequate investments and behavior change interventions perpetuate open defecation in rural Ghana. The local testimonies underscore that the problem extends beyond infrastructure gaps, touching on cultural practices, affordability, and community enforcement.

Economic Consequences of Water Scarcity

Water scarcity was also found to carry significant economic implications. More than 88% of respondents reported that high water expenditures reduced their disposable income, while over 68% indicated that shortages disrupted their livelihoods. FGD participants, particularly women traders, explained how lack of water forced them to close businesses or lose customers. This finding mirrors Vaseashta (2021), who emphasized the direct translation of water collection time into lost productivity, and Kayser et al. (2019), who noted the compounded burdens of time poverty and income loss for women. The convergence of quantitative statistics and qualitative testimonies makes clear that water insecurity not only undermines household resilience but also

reinforces gendered economic disparities.

Water, Sanitation, and Sustainable Development

Nearly all respondents recognized the critical role of water and sanitation for poverty reduction, health improvement, and sustainable livelihoods. This aligns with Krannich and Reiser (2023), who highlight the integrated nature of the Sustainable Development Goals (SDGs), particularly SDG 6 (Clean Water and Sanitation) and SDG 1 (Poverty Reduction). The FGDs echoed this collective understanding, with participants linking clean water to better health, reduced medical expenses, and improved quality of life. Yet, the persistence of these challenges in Agortime-Kpetoe underscores that achieving SDG targets requires systemic interventions that address affordability, reliability, and community ownership not just infrastructure provision.

Gender Dimensions of Water and Sanitation Challenges

A recurring theme in both the survey and FGDs was the disproportionate burden carried by women and girls in managing water and sanitation challenges. Women were consistently identified as primary collectors of water, with narratives describing long hours spent walking, exposure to safety risks, and disruptions to economic and social participation.

These findings align with global evidence that water insecurity reinforces gender inequality (WHO & UNICEF, 2021). The local accounts add nuance, showing how women traders lose income due to water shortages, and how schoolgirls sacrifice education to collect water. The results call for gender-responsive interventions that not only expand infrastructure but also reduce the specific burdens faced by women.

Integrated Perspective

Taken together, the results demonstrate that water and sanitation challenges in Agortime-Kpetoe are not merely technical or infrastructural deficits but multidimensional problems that intersect health, education, livelihoods, and gender equity. Both statistical evidence and lived experiences converge to suggest that addressing these issues requires integrated strategies: reliable infrastructure, affordability measures, behavior change communication, and inclusive governance models that empower communities to manage WASH services sustainably.

Conclusion

This study examined the interrelated challenges of water scarcity and inadequate sanitation in Agortime-Kpetoe, demonstrating how these deficits undermine health, education, livelihoods, and sustainable community

development. The findings revealed that although some piped water infrastructure exists, access remains unreliable and unaffordable for many households, forcing widespread dependence on unsafe sources such as streams and wells. The majority of respondents linked these conditions to frequent disease outbreaks, economic disruption, and diminished school attendance, particularly among children. Sanitation practices were similarly constrained, with most households relying on pit latrines or practicing open defecation due to the lack of affordable and reliable facilities. These patterns not only perpetuate health risks but also contribute to environmental contamination and compromise the dignity and safety of women and girls. The gender dimensions of these challenges were especially pronounced: women bear the primary responsibility for water collection and sanitation management, resulting in time poverty, exposure to violence, and reduced opportunities for economic participation and education. The study contributes to the existing literature by providing localized, empirical evidence that illustrates how infrastructural deficits interact with poverty, gender inequality, and social norms to shape development outcomes in rural Ghana. The results reinforce the broader argument that achieving Sustainable Development Goal 6, ensuring availability and sustainable management of water and sanitation for all, requires more than the expansion of infrastructure. It demands integrated interventions that combine reliable service provision with behavior change communication, affordability measures, and inclusive governance approaches that engage communities as partners in solution design and maintenance. Overall, the findings underscore the urgency of addressing water and sanitation challenges as foundational prerequisites for improving health, reducing poverty, advancing gender equity, and achieving sustainable development in rural contexts like Agortime-Kpetoe. Future interventions must be holistic, community-driven, and sensitive to the specific vulnerabilities and aspirations of residents to create lasting change.

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