Factors Contributing to the Consumption of Unsafe Drinking Water in Liberia: A Case Study of Stephen A. Tolbert Estate, Monrovia.

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ABSTRACT

Introduction: About 70% of the population of Liberia do not have access to safe and managed drinking water. In Monrovia, exposed wells and poor sanitation systems often lead to the contamination of groundwater.

Objectives: To examine the factors contributing to the consumption of unsafe drinking water in the Stephen A. Tolbert Estate.

Methodology: We used the quantitative research design. We decided to use this design because of its ability to generalize findings based on its larger population sample size. The researcher uses the stratified probability sampling technique; using the Taro Yamane sample formula, the total sample size **(n)** for the research was equivalent to 120 from a population of 500. The studied population comprises household residents residing within Stephen Tolbert Estate. This technique positions everyone with an equal chance of being selected for the research.

Finding: The vast majority of households rely on well and tap water sources that are highly vulnerable to local contamination. There were a total of one hundred and twenty households (120) participants. Most respondents were within the 18-45 age range, representing the economically active population. 43.3% of the respondents constituted the male population, while 55% constituted the female population. However, two people decided not to mention their sex. The research results show 76.70% of the respondents have little or no awareness of local water safety initiatives.

Recommendation: To ensure water quality safety, regular testing of drinking water sources should be done by relevant agencies and authorities. Additionally, community health workers should design and redirect their awareness strategies to educate the citizens on home treatment of drinking water.

Keywords: Awareness, Community, Quality, Water

INTRODUCTION

Access to safe drinking water is an ultimate human right and a key determinant of public health. Notwithstanding, its natural water resources, Liberia faces critical challenges in ensuring safe water access, mainly in densely populated urban areas like Monrovia.. The World Health organization (2023), reported that insecure water is a leading cause of diarrheal diseases worldwide, especially in low-income countries. UNICEF (2022) reported that about 70% of Liberia's population lacks access to safely managed drinking water. In Monrovia, exposed wells and poor sanitation systems often lead to the contamination of groundwater. According to a study done by Chea and Andrew (2018) on water pollution in central Monrovia, microbial and chemical contamination were directly linked to frequent cases of waterborne diseases such as typhoid and

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cholera.. These findings reflect a broader pattern of inadequate WASH services and insufficient waste management in Liberian urban areas.

The global effects of unsafe water include a massive health crisis, mostly impacting children, leading to millions of deaths from waterborne diseases like cholera and diarrhea [1]. It also delays education, economic development, and gender equity, as it excessively affects women and girls who spend hours collecting water, and students who miss school due to illness or lack of sanitation facilities [2].

Additionally, unsafe water contributes to climate change effects, such as more frequent droughts and floods, and affects the health of ecosystems [3]. Unsafe water is a leading cause of death and illness globally, contributing to diseases like cholera, typhoid, dysentery, and diarrhea. Children especially those under five are disproportionately affected and are at higher risk of death from waterborne diseases [4]. However, poor water quality is related to various other health issues, including malnutrition, skin diseases, and even certain types of cancer [5].

Unsafe water has several negative influences on the community. The most direct effect is the increased incidence of waterborne diseases such as diarrhea, cholera, and typhoid [6]. Children and elderly residents are particularly vulnerable to these illnesses [7]. In addition, unsafe water adds to economic strain as households spend money on medical treatment and lose productivity due to illness [8]. Educational outcomes are also affected when children miss school because of sickness [9]. Environmentally, poor drainage and inappropriate waste disposal result in the contamination of both surface and groundwater, creating a cycle of pollution and disease [10].

Stephen A. Tolbert Estate is a residential community situated in Gardnerville, within Greater Monrovia. The area faces persistent challenges with water access, sanitation, and drainage. Local reports (All Africa, 2013) indicate that residents face recurrent water shortages, forcing them to depend on shallow wells or purchased water from vendors [4]. These wells are often unprotected and positioned near pit latrines or waste disposal sites, increasing the risk of contamination [11]. During heavy rains, flooding further spreads waste and pollutants, worsening water quality and raising health risk [12].

This research aims to examine the factors contributing to the consumption of unsafe drinking water in the Stephen A. Tolbert Estate, water consumption and the prevalence of waterborne diseases, and evaluate the socio-economic impacts of unsafe water on affected populations.

METHODOLOGY

We used the quantitative research design. We decided to use this research design because of its ability to generalize findings based on its larger population sample size. We used stratified random sampling. This technique allowed us to divide the community into three strata and provided the possibility for everyone to have an equal chance to be selected from each of the strata. The community is divided into three blocks, hence each of the strata represents a block. 40 participants were randomly selected from each strata. The total sample size for the research was 120. The study population comprises household residents residing within Stephen Tolbert Estate. The criteria for selection included collecting data from people age 18 and above, and below 18 years were excluded from the research. A sample size of 120 households was selected using the Taro Yamane (1967) formula.

$$n = \frac{\mathrm{N}}{1 + \mathrm{Ne2}}$$

N = estimated households in Stephen Tolbert Estate (~500)

e = margin error (0.08)

e^2 = margin of error (0.006400)

$$n = \frac{500}{1 + 500\ (0.006400)}$$

$$n = \frac{500}{4.200000}$$

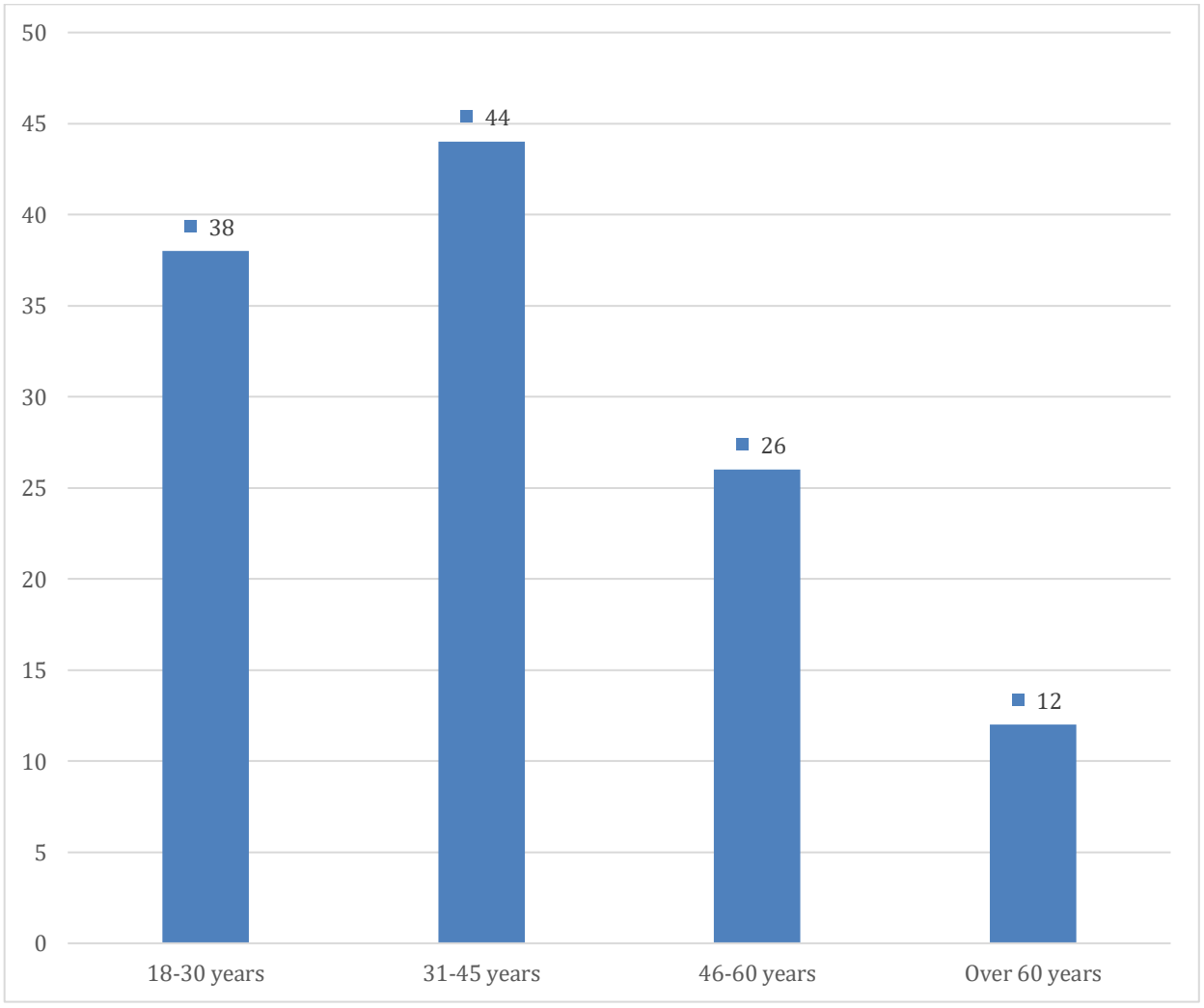
$$n = 119.047$$

Ethical Considerations:

All participants were clearly informed about the purpose and procedures of the study before data collection. Participation was entirely voluntary. Each respondent provided informed consent after understanding that they had the right to decline or withdraw from the study at any time without any penalty. The identities of participants was protected throughout the research process. No names or personal identifiers were recorded on the questionnaires. Participants remained anonymous. All information collected was treated as confidential and used strictly for academic purposes. Data were stored securely and only accessed by the researcher. Nevertheless, we must declare that there were no formal ethical approval with numbers from any Ethical Review Board, except the approval from the School.

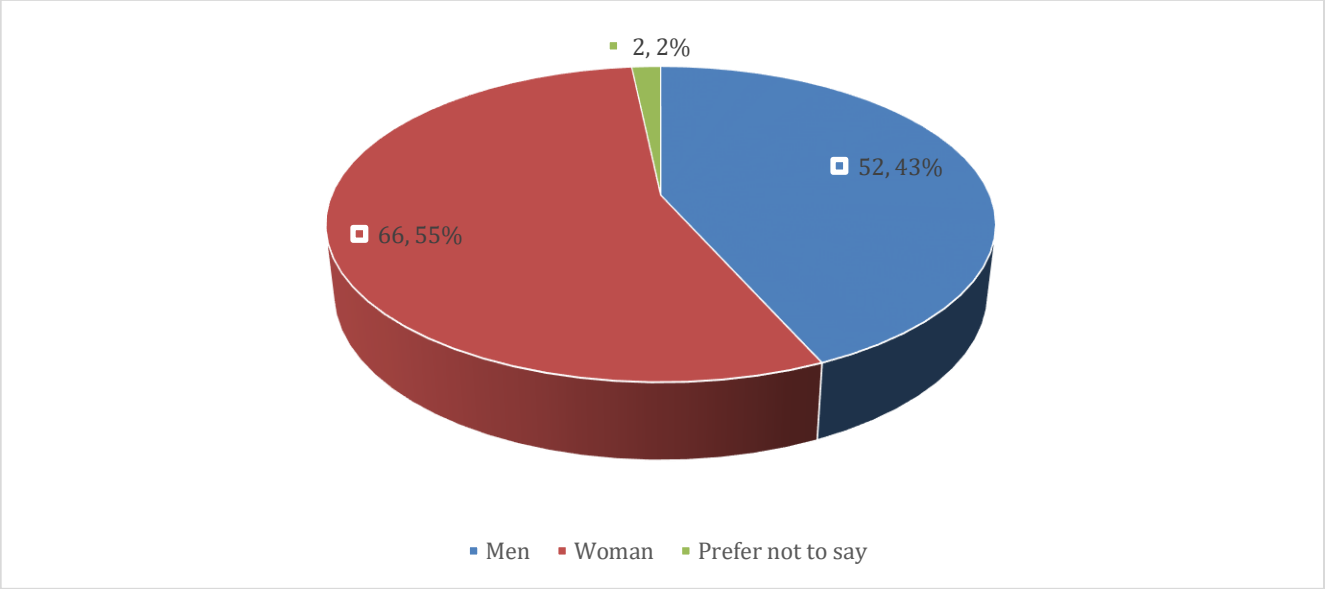
RESULTS

Figure 1: Age of respondents



Source: Field Data-2025

Figure 2: Gender of Respondents



Source: Field Data-2025

Table 1: Knowledge about drinking water sources

Length of stay	**Frequency**	**Percentage**
Length of Residence		
Less than a year	10	8.30%
1-5 years	46	38.30%
6-10 years	32	26.70%
More than 10 year	32	26.70%
Primary source of drinking water		
Tap water	48	40.00%
Well water	54	45.00%
Bottled water	10	8.30%
Other	8	6.70%
How many times do you treat your drinking water?		
Never	6	5.00%
Rarely	18	15.00%
Sometime	42	35.00%
Often	32	26.70%
Always	22	18.30%
Water quality and safety health issues are believed to be water-related		
Yes	58	48.2%
No	62	51.8%
Perceived water quality		
Excellent	4	3.3%
Good	22	18.3%
Fair	48	40.0%
Poor	46	38.3%
Unusual color, taste or odor noticed		
No	56	46.70%

Yes	64	53.30%
Total	120	100%

Source: Field Data-2025

Table 2: Awareness of local water safety initiative

Response	Frequency	Percentage
Awareness of local water safety initiative		
Yes	28	23.30%
No	92	76.70%
Level of concern about water safety		
Not concerned	10	8.30%
Somehow concerned	38	31.70%
Very concerned	72	60.00%
Suggested measures for improvement		
Regular water testing	96	80.00%
Community education	82	68.30%
Installation of purification systems	88	73.30%
Other suggestions	14	11.70%
Total	120	100%

Source: Field Data-2025

DISCUSSIONS

There were a total of one hundred and twenty household (120) participants during the research conducted in the Stephen Tolbert estate on the effect of unsafe drinking water. 44% of the total respondents were within the 31-45 age range representing the economically active population. The male respondent was 52 with the percentage of 43.3% while the female respondent formed the majority of the participants, reflecting their central role in household water management with 66 frequencies and a percentage of 55.0%. Firstly the length of residence shows that a large proportion of respondents (over 50%) have lived in the community for more than five years, this indicates that many participants have long-term experience with the water sources available in the area. Their responses about water quality, treatment practices, and health concerns are therefore likely based on repeated exposure and consistent observation rather than short-term experiences.

In terms of drinking water sources, the majority of respondents depend on well water (45%) and tap water (40%), while only a small percentage rely on bottled water (8.3%) or other sources (6.7%). This heavily dependence on wells and taps suggests that households are largely dependent on local, possibly untreated or poorly maintained water systems. This finding aligns with Kaidbey et al,. (2025) article on the gap between tap water beliefs and preference for drinking from the tap [13]. Considering Liberia as a developing Country recovering from war, the quality of drinking water is still a major challenge as the urban environment still finding it difficult to bridge the gap. In the worst cases, most of the wells mentioned have not been treated over the years, yet the waters from them are widely consumed by the inhabitants. Diarrhea remained the second leading child mortality condition in Liberia, which has its transmission from unsanitary food and water, accounting for about 8% of deaths in under five children [14]. Wells, in particular, are often vulnerable to contamination from nearby latrines, surface runoff, and poor sanitation practices. This explains why many respondents expressed concerns about water safety.

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The findings on respondents' perception of water quality shows varied opinions regarding the condition of drinking water in the community. As presented in the results, respondents rated the quality of water as fair, good, poor, or unusual, with some reporting noticeable taste or odor. A notable proportion of respondents perceived the water as poor or indicated the presence of unusual taste or smell. This suggests a level of dissatisfaction with the quality of drinking water among many residents.

According to Manganellie et al,. (2023), large blooms in water bodies are commonly form by Cyanobacteria. These bacterial can produce cyano-toxins with toxic effects on humans and animals that can cause water to have bad taste. The presence of unusual taste or odor in drinking water is often linked with probable contamination, poor source protection, or inadequate treatment [15]. Respondents who rated the water as poor or reported unusual characteristics may be experiencing water that is affected by environmental factors such as nearby waste disposal, open defecation, or poorly maintained water sources, most especially during the dry season. These conditions can compromise water quality and lead to changes in taste, color, or smell.

In contrast, some respondents rated the water quality as fair or good. This variation in perception may be influenced by differences in water sources, treatment practices, or storage conditions at the household level. For example, households using protected wells, boreholes, or treated water may perceive the quality as better than those relying on unprotected sources such as open wells, or surface water. Similarly, households that practice proper water treatment methods, such as boiling or chlorination, may report improved water quality compared to those who do not.

The perception of poor water quality can also be influenced by visible factors such as turbidity, sediment, or the presence of debris in water. In addition, changes in taste or odor may result from biological contamination, chemical presence, or stagnation of water in storage containers. Poor storage practices, such as the use of unclean containers, lack of covering, or dipping of hands and cups into storage vessels, can further deteriorate water quality even if the original source is relatively safe.

These findings highlight the need for improved water quality management within the community. Efforts should focus on regular monitoring of water sources, protection of water points from contamination, and promotion of household water treatment and safe storage practices. Public health education programs should also be strengthened to raise awareness about the importance of maintaining water quality and recognizing signs of contamination.

Overall, the dissatisfaction expressed by a significant portion of respondents indicates the need for interventions aimed at improving both the safety and acceptability of drinking water. Ensuring access to clean, safe, and good-tasting water is essential for protecting public health and preventing waterborne diseases.

Table 2 presents respondents' awareness of local water safety initiatives. The results show that some residents are aware of water safety initiatives, while others are not. This suggests that awareness programs may not be reaching all members of the community effectively.

For example, some respondents who live close to central locations such as community meeting points, health posts, or water distribution areas reported being informed about activities like water treatment campaigns, sanitation talks, and safe water storage practices. In contrast, residents living in more remote or less accessible sections like the Russian community in the Stephen Tolbert estate indicated that they had not received any information about these initiatives. This difference shows that awareness efforts may be concentrated in certain areas rather than evenly distributed throughout the community as seen in the article title "Effects of community driven water, sanitation and hygiene intervention on diarrhea, child growth and local institutions" by Quattrochi (2025). The suggest that diarrhea and growth faltering in early childhood reduce survival and impair neurodevelopment [16].

Several factors could account for the observed gaps in awareness. First, communication methods used to disseminate information may be limited. If awareness messages are only shared during community meetings or through selected groups, individuals who do not attend such meetings may be excluded. Second, low community

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participation can also affect awareness levels, as some residents may be unavailable or uninterested in attending educational sessions.

Additionally, limited outreach by environmental health workers or community health volunteers may contribute to the problem. If sensitization activities are not conducted through house-to-house visits or wider community engagement, some households may remain uninformed.

Language differences and low literacy levels may also hinder effective communication, especially if information is presented in technical language or written formats that some residents cannot easily understand.

Furthermore, inadequate use of mass communication channels such as local radio, posters, or public announcements may reduce the reach of awareness campaigns. In communities where these methods are underutilized, information dissemination becomes restricted to a small group of individuals.

These findings imply that awareness strategies should be strengthened to ensure equitable information distribution. This may include the use of multiple communication channels, increased door-to-door sensitization, involvement of community leaders, and the use of local languages to convey messages. Improving awareness across the entire community is essential for promoting safe water practices and preventing waterborne diseases.

Findings on the level of concern about water safety show that respondents fall into categories such as not concerned, somewhat concerned, and very concerned. A considerable proportion of respondents expressed concern about water safety, indicating that unsafe drinking water is an issue of importance in the community.

Suggested Measures for Improvement

Respondents suggested several measures for improving water safety. These include regular water testing, community education, installation of purification systems, and other suggestions. The high percentage in favor of regular water testing and installation of purification systems shows strong community support for interventions to improve drinking water safety.

CONCLUSION

The primary sources of drinking water in the Stephen Tolber Estate are wells and tap waters. Water quality safety continue to pose a challenge as the community is faced with limited awareness on water quality and limited facilities for water quality safety. Unsafe water is a leading cause of death and illness globally, contributing to diseases like cholera, typhoid, dysentery, and diarrhea. Children especially those under five are disproportionately affected and are at higher risk of death from waterborne diseases. The findings from this research is significant to researchers and policy makers as it will serve as a base line document for the community. This highlights the need for strengthened water safety measures and increased community engagement on safe drinking water practices.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

- To ensure water quality safety, regular testing of drinking water sources should be done by relevant agencies and authorities
- Water purification systems should be installed or improved within the community to enhance the safety of drinking water.
- Health education is key in addressing highly entrenched issues, hence, community health workers should design and redirect their awareness strategies on educating the citizens on home treatment of drinking water.
- Existing water safety initiatives should be expanded to ensure wider community coverage and participation.

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