# Evaluation of the Response Efforts to Foodborne Disease Outbreak in the Presbyterian College of Education- Akropong, Ghana

# Abstract

**Aim:** This study aimed to evaluate the emergency response measures implemented by the Presbyterian College of Education, Akropong, following a foodborne disease outbreak in September 2023 that affected 51 students.

**Methodology:** A mixed-methods approach was used, drawing on key informant interviews, focus group discussions with 22 stakeholders, and analysis of secondary data from the college’s After-Action Report and medical records. Key informant interviews took place in a scheduled office on campus and lasted about 45 minutes. Focus group discussions, also held on campus, lasted approximately 60-90 minutes per session. Interviews were audio-recorded and transcribed word-for-word with participants' informed consent to maintain the accuracy and authenticity of their responses. The evaluation was guided by the OECD-DAC criteria and the UNHCR Emergency Handbook.

**Results:** The College implemented five key interventions: community health education, emergency planning, clinical investigations and referrals, hygiene and safety enforcement, and stockpiling of emergency supplies. The outbreak was contained within four days, with no fatalities. While overall response efforts were timely, effective, and aligned with national health policies, prolonged emergency meetings and resource constraints in stockpiling were noted challenges.

**Conclusion:** The study highlights the importance of multi-stakeholder coordination, effective communication, and rapid response planning in managing foodborne disease outbreaks. Recommendations include streamlining emergency planning and enhancing logistical readiness. **These findings have practical implications for policymakers, educational authorities, and public health agencies in developing frameworks that strengthen outbreak preparedness and response in resource-limited academic settings.**

**Keywords:** Foodborne disease, outbreak, response efforts, evaluation, College of Education

## 1. Introduction

After an outbreak of a foodborne disease that creates an emergency, it is important to evaluate the response efforts to reflect and identify gaps, best practices, and lessons learned emerging from the emergency, as well as to suggest measures and actions to improve ongoing response or be better prepared for future emergencies (Rural Health Information Hub, 2022). Failure to act on problems identified from past emergency experiences can leave health systems and communities susceptible to the same problems during future events (World Bank, 2024; Savioa et al., 2012). Evaluating a department's response can offer insights into what supports or hinders the successful delivery of health services during an emergency (Adini and Peleg, 2013). Emergency evaluations are conducted for learning and accountability purposes; as a result, timelines for these reports are of great essence (UNCHR, 2024). An evaluation of level 3 emergency operations is to be conducted within 15 months or earlier of response, while evaluation of level 2 and level 1 emergencies may be commissioned at the request of the Senior Executive Team at any time for a real-time review (UNCHR, 2024).

Foodborne diseases are an important cause of morbidity and mortality and a significant impediment to socioeconomic development worldwide (World Health Organization, 2018). Globally, foodborne diseases kill an estimated 2.2 million people annually, with children under five years of age being the most at risk (Ameme et al., 2016; World Health Organization, 2018). These diseases are acquired by the consumption of food contaminated with toxins, viruses, bacteria, or parasites (Ameme et al., 2016; Morris & Vugia, 2021). The symptoms of foodborne diseases range from mild and self-limiting situations, such as nausea, vomiting, and diarrhea, to debilitating and life-threatening situations such as kidney and liver failure, brain and neural disorders, paralysis, and cancers, leading to long periods of absenteeism and premature death (World Health Organization, 2018).

There are many causative agents responsible for foodborne diseases, but the most common include Clostridium perfringens and Salmonella species (Clostridium perfringens - Food Safety, 2015).

Clostridium perfringens often presents with mild symptoms and with a short duration as compared with Salmonella species, which is characterized by serious intestinal complications (Clostridium perfringens - Food Safety, 2015).

From 15th September to 18th September 2023, a total of 51 students from the Presbyterian College of Education - Akropong were rushed to the Emergency Department of Tetteh Quarshie Memorial Hospital in Ghana with complaints of abdominal pain, vomiting, diarrhea, and general body weakness. The students started complaining at around 9:00 pm, and at about midnight, 32 of them had been sent to the hospital for treatment. Between midnight and 6:00 am, an additional 9 students were also sent to the hospital for emergency care. The number of reported cases went down drastically until it ended on the 4th day. None of the students were detained beyond a day at the hospital. All the students were treated and discharged within 3 to 6 hours of their visit to the hospital, and there were no fatalities.

All the students had eaten from the college’s dining hall. They ate cooked, rich, and groundnut soup with chicken for dinner. The hospital authorities suspected a foodborne disease outbreak and notified the Regional Health Directorate through the District Health Management Team (DHMT) and the Regional Food and Drugs Authority to investigate the outbreak and to offer precautionary as well as preventive measures. One year after the outbreak of the foodborne disease, the college is evaluating its response efforts for learning and accountability purposes.

## 2. Methods

### 2.1 Outbreak Setting and a Brief History

The outbreak evaluation was carried out at the Presbyterian College of Education in Akropong. The college is situated in the capital of the Akuapem North Municipality in Ghana's Eastern Region. It has a total of 1,876 students and 125 staff members. Ghana's government policy provides feeding grants to colleges of education nationwide. Accordingly, Presbyterian College of Education, like its sister colleges, offers meals to all students. These meals are prepared in the college's kitchen under the supervision of three domestic bursars, each holding at least a bachelor's degree in hospitality management and at least three years of post-qualification experience in large-scale cooking. In addition to the three supervisors, twelve junior staff assist with kitchen duties. All kitchen personnel are certified by the Ministry of Health to prepare food for public consumption. The kitchen includes three storerooms: one for tubers, another for cereals, and a cold room for storing fresh fish, meat, and other perishable items.

The college depends on two water sources for students' domestic needs: the Ghana Water Company Limited and a mechanized borehole. The primary drinking water for students is bottled water they buy from local vendors. The college has a ten-bed clinic managed by two nurses and other health professionals from the Tetteh Quarshie Memorial Hospital.

### 2.2 Study participants

The study participants consist of staff and students whose duties are directly or indirectly related to maintaining health and safety in the institution. They include the head of the institution (1), the College Nurses (2), the Dean of Student Affairs (1), the Hall Warden (1), the Hall Masters/Mistresses (8), the Quality Assurance Officer (1), the Domestic Bursar (1), and the SRC (7). These respondents made up the key participants for the study, totaling twenty-two (22).

### 2.3 Data collection.

The study adopted a mixed-method approach, drawing on various primary and secondary sources as recommended by the UNHCR Emergency Handbook. The primary source was key informant interviews. In the case of the secondary sources, the "After Action Report" (AAR) generated by the college management, as well as the report from the college nurses, was used. Every interview took place in a scheduled office on campus and lasted about 45 minutes. Interviews were audio-recorded and transcribed word-for-word with participants' informed consent to maintain the accuracy and authenticity of their responses.

The Organization for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) evaluation criteria, as updated in 2019, were used as a guide in developing the interview guide for the primary sources of data, as well as the search for the secondary data. The six criteria are effectiveness, relevance, efficiency, impact, sustainability, and coherence. These were guided by the corresponding indicative evaluation questions:

1. How responsive was the college strategy to the external environment, including the role of government (Ministry of Education, Ministry of Health, and GTEC) and local actors?
2. To what extent was the college’s response meeting the needs of students?
3. To what extent did the college achieve its envisaged outcomes?
4. How efficient and timely were the response efforts?
5. To what extent were the successes and failures in the response efforts attributed to system-related factors?
6. What more should be done?
7. What can the college learn from its preparedness efforts?

In the case of the primary sources of data, a total of four (4) key informants in the person of the head of an institution, the senior college nurse, the senior hall warden, and the dean of student affairs were interviewed on the above indicative evaluation questions. The section for each participant lasted for about 35 minutes.

In addition to the key informants’ interviews, focused group discussions were conducted for the SRC and the house masters/mistresses, with each group being seven (7) and eight (8), respectively. With the consent of the respondents, the interview sections were recorded and transcribed verbatim using the content analytic approach.

The researcher used secondary sources of data in the form of the After-Action Report (AAR) on the outbreak from the college management and the College Nurse Monthly Report to complement as well as fill in the gap with data supplied by the focus group discussions and the key informants.

#### **2.4 Table 1: Operational Definitions of Evaluation Criteria and Focus**

| **Criteria** | **Definition** | **Operational Focus** |
| --- | --- | --- |
| **Relevance** | The extent to which the intervention objectives and design respond to beneficiaries. | Assesses whether the intervention is doing the right things by examining alignment with needs, policies, and priorities, and the appropriateness of the design. |
| **Coherence** | The compatibility of the intervention with other interventions. | Evaluates internal coherence (synergies/contradictions within implementing frameworks) and external coherence (alignment with other actors’ programs). |
| **Effectiveness** | The extent to which the intervention achieved, or is expected to achieve, its objectives, and the reasons for and factors contributing to this achievement. | Assesses whether intended results were achieved, including understanding causal relationships between activities and observed changes. |
| **Efficiency** | The extent to which the intervention delivers, or is likely to deliver, results in an economical and timely way. | Evaluates use of resources relative to results, focusing on cost-effectiveness, timeliness, and resource optimization. |
| **Impact** | The extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects. | Assesses long-term, systemic effects (economic, social, environmental, institutional) beyond the intervention’s immediate goals. |
| **Sustainability** | The extent to which the net benefits of the intervention continue or are likely to continue. | Evaluates the durability of results post-intervention, considering financial, institutional, social, and environmental sustainability. |

## 3. Analysis

A **reflexive content analysis approach** was adopted to interpret qualitative data from interviews and focus group discussions. This method builds on structured content analysis by integrating researcher reflexivity and thematic interpretation, allowing the development of meaningful subcategories and higher-order themes rooted in both theory and lived experience (Nicmanis, 2024). The OECD-DAC evaluation criteria provided the guiding framework for this analysis, facilitating systematic coding around relevance, coherence, effectiveness, efficiency, impact, and sustainability. The OECD-DAC evaluation criteria, as updated in 2019, were used as a guide in developing the interview guide for the primary sources of data, as well as the secondary sources.

## 4. Results:

The outbreak affected a significant number of students, most of whom were admitted and treated in local health facilities within hours of the onset of symptoms. The swift response from the college health unit and collaboration with external health authorities played a crucial role in minimizing complications. The college nurse, principal, and housemasters coordinated care effectively, facilitating triage, clinical investigation, and hospital referrals.

### ****4.1 Demographic Analysis of Affected Students****

A total of 51 students were referred to the hospital during the outbreak. Table 2 presents the demographic breakdown of these students by sex and age group.

#### **Table 2: Demographic Characteristics of Students Hospitalized During the Outbreak (N = 51)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **Category** | | **Frequency (n)** | **Percentage (%)** | |
|  | | **Sex** | Female | 32 | | | 62.7% | |
|  | | Male | | 19 | 37.3% | |
| **Age Group (years)** | | < 20 | | 3 | 5.9% | |
|  | | 20–25 | | 38 | 74.5% | |
|  | | > 25 | | 9 | 17.6% | |

The data show that a greater proportion of those affected were **female (62.7%),** while **males constituted 37.3%.** Although this study did not assess gender-based risk exposure, the difference may be influenced by underlying enrollment patterns, dormitory assignment, or gender-specific food access. Future research may explore these dynamics more deeply.

Regarding age, **the majority of affected students (74.5%)** were between **20 and 25 years**, which corresponds to the typical age of students in Ghanaian teacher training colleges. Students younger than 20 years (5.9%) and those older than 25 (17.6%) were less affected. These findings suggest that the core academic population was at the highest risk and should be the primary target for outbreak education, prevention, and preparedness interventions in similar settings.

### 4.2 Matrix on Emergency Response Efforts in the College

All the secondary sources of data for the study solicited from AAR and the college nurse report confirmed the occurrence of the outbreak of foodborne diseases in the Presbyterian College of Education from the 15th to the 18th of September, 2023, with 51 students rushed to the Tetteh Quarshie Memorial Hospital, with almost all the victims’ showing signs of abdominal pains, vomiting, and general body weakness. It was also observed that all the victims were treated and discharged between 3 to 6 hours after their referral to the hospital, and there was no fatality recorded.

The first criterion considered was relevance, and the corresponding indicative question was, to what extent is the college's response strategy meeting the needs of students? Relevance in emergency response was defined by OECD (2021). The extent to which intervention's objectives and design respond to beneficiaries' needs and priorities and alignment with national and institutional policies. The study found that the college used community health education, emergency planning, and risk assessment and mitigation strategies as emergency response efforts in the college. Refer to Table 3 for the matrix on emergency response efforts in the college.

#### **Table 3. Matrix on Emergency Response Efforts in the College**

| **Response Efforts** | **Actions** |
| --- | --- |
| **Community Health Education** | - Awareness creation on the outbreak by college nurses- Early detection signs and preventive practices by college nurses and DHMT- Promotion of food safety and hygienic practices by the DHMT |
| **Emergency Planning** | - Engagement of key stakeholders in their roles in emergency management |
| **Clinical Investigation and Referral** | - Examination of each case by college nurses- Administration of appropriate first-aid- Referral of severe cases to the District Hospital |
| **Prevention/Mitigation Strategies** | - Enforcement of strict food safety and hygiene standards at the kitchen, food vending points, and students’ residences |
| **Stockpile of Needed Inputs** | - Procurement of additional First Aid supplies and PPEs |

The question as to whether the college response efforts were relevant in meeting the needs of the students was explored. To respond to this issue, Table 3 presents the general summary of the findings. The interpretation found in Table 3 indicates that most students became calm, and their anxiety about the effects of the outbreak was reduced when the students realized that the situation was under control and stakeholders knew what to do in their response efforts. For instance, an SRC member spoke of how relevant the emergency response efforts of the college management were:

*”We are grateful to the Management of the college for the various interventions put in place to address the health concerns on campus. The education on food safety, hygienic practices, and early detection of symptoms saved a great deal. The swift manner in which the key officers such as the college nurses, hall masters/mistresses, and the college responded to emergency calls was worth commending as it reduced the fears students had about the outbreak. We were happy to note that, for one’s unauthorized food vendors were barred from selling to students on campus.” (FGD1- SRC.P1).*

A Hall Staff also had this to say on the relevance of a Specific emergency response effort:

*The emergency planning meeting involving the hall staff ( hall masters/mistresses), the Dean of Students Affairs, the college nurses, the domestic bursars, the transport officer, the Estate Officer, SRC, and management was very important and timely in helping all key stakeholders to be responsive to expected roles as duty bearers in such an emergency. ( FGD2-Hall Staff.P4).*

A common complaint from some students that negatively impacted the response efforts of the college was the frequency and length of emergency planning meetings, which often kept some activities delayed.

*Some students were very sick, they were rushed to the hospital and no management member followed up to check on the situation of the affected students because management members were having emergency meetings (FGD1-SRC.P5).*

*We were not very happy as students when at a point the duty of transporting victims to the clinic as well as to the hospital fell on students due to the frequent meetings the responsible officers were engaged in. (FGD1-SRC. P7)*

The management of the college and the college nurses were content that the response efforts of the college paid off as the college was able to contain as well as eradicate the outbreak within four days of its emergence. These emergency response efforts were indeed relevant in restoring health and safety that was jeopardized by the outbreak of foodborne disease on campus back to normalcy.

*I really went through a lot as a college nurse, for the four days the college was hit by foodborne disease. Calming students down, attending to emergencies, making referrals, attending emergency planning meetings, and engaging students in health and safety education were all difficult moments but it paid off in the end as the outbreak was eradicated. (Int. P.3)*

Coherence was the second evaluation criterion used. This criterion examined the extent to which other interventions supported or undermined the college emergency efforts and vice versa. The indicative evaluation question, which served as a guide, was how responsive was the college strategy to the external environment, including the role of government (Ministry of Education, Ministry of Health, and GTEC) and local actors?

The study found that the response efforts of the college were in sync with the Ministry of Health's protocol for emergency management, which emphasizes clinical investigations and referral, first aid, evacuation, and triage. Again, the college response efforts were found to be in sync with the Health Policy of Ghana, which aims to provide equitable, affordable, and responsive health services to improve the quality of life for all citizens, including students. Finally, the college's response efforts were in sync with Ghana's School Health Policy, which focuses on providing a supportive environment for students' health and well-being. The principal of the college spoke about the complementary nature of the college's response efforts and the fact that it was in harmony with other health policies:

*We consulted widely before developing the college’s emergency response efforts. Experts assured the college that if these efforts are properly implemented, the outbreak would be eradicated. I am aware that the college’s response efforts aligned with the Ghana Ministry of Health's emergency management protocols, Ghana Health Policy, and Ghana's School Health Policy, adding value to the college's emergency management. (Int. P1)*

A college nurse also spoke about the coherence nature of the response efforts of the college:

*I cannot do things fortuitously especially during this emergency as my superiors are watching every emergency step I take. There are laid down protocols for emergency management, and as a professional, I must keep to them and be able to write a report that is consistent with the template of emergency management. (Int. P6)*

The effectiveness of the response efforts was considered. Broadly, this criteria looks at the extent to which the intervention achieved or is expected to achieve its objectives while taking into account the relative importance of the objectives (Opare et al., 2013). The indicative evaluation question was how effective was the targeting strategy? Almost all the SRC members and the Hall staff who spoke on community health education also talked about the fact that it was effective in creating awareness of the outbreak in the college community and in educating the college community on the danger signs of the foodborne outbreak as well as emphasizing good food safety and personal hygiene practices. This was what one SRC member had to say:

*The Disease Control Officer’s seminar held during the outbreak indicated that whenever someone has any of the following symptoms, bloody stool, prolonged vomiting, diarrhea and a fever higher than 1020 F the affected person should be rushed to the clinic for attention since it can have dire consequences. There should be strict observance of personal hygiene, avoid eating food that is cold, and avoid cross-contamination. This information was very helpful in reducing the impact of the disease outbreak. (FGD1-SRC. P4)*

The case of how effective the emergency planning activities contributed to mitigating the effects of the outbreak was explored as indicated in Table 2, found that most discussants applauded the management of the college for inviting all key stakeholders in emergency management, such as the Dean of Student Affairs, college nurses, hall warden, hall masters/mistresses, transport officer, and SRC for an emergency planning meeting. This planning meeting offered the opportunity for the key stakeholders to reflect on their duties and execute them without delay. It also offered the opportunity for the management of the college to take stock of all needed inputs that would be required during the outbreak period and provide them immediately. Inputs from a hall staff and an SRC, respectively, on this discussion were profound:

*I was very happy with the urgency with which the management of the college called for an emergency planning meeting involving all stakeholders in health and safety issues to discuss what to do during this crisis period, and how to do it. I think this planning phase was effective in energizing us to work. (FGD2-Hall staff. P8).*

*This is the first time the SRC is experiencing a foodborne disease outbreak, and without this emergency planning meeting we at our level will not know how to calm our students down and what to do in this emergency. (FGD1-SRC P2)*

From Table 3, the effectiveness of another college response effort, which is clinical investigation and referral was assessed. Almost every interviewee indicated that the college nurses did very well in attending to each case promptly by investigating if it was a foodborne disease. All foodborne diseases were referred immediately to the nearest hospital. Comments from the Principal and the Dean of Student Affairs:

*I had no cause to worry about the management of the emergency crises on campus since the two nurses were seen discharging their duties without delay. Those who needed first aid and, or referrals were given promptly. (Int. P1).*

*I spent most of the time during the outbreak period at the college clinic observing the turn of events and supporting where necessary. I found the nurses very apt at their work. I have yet to receive any adverse comments on the role played by the college nurses in this emergency crisis (Int.P2*).

While many of the discussants found the mitigating strategy of adhering strictly to food safety and hygiene practices effective, a few saw it as not an effective intervention. They were of the view that the outbreak had already occurred and what need was there to keep to the strict standard of washing hands under running water? This is what some of the students' representatives had to say:

*We have already been hit by the outbreak, so why do we have to worry ourselves to frequently wash our hands under running water*? (FGDI-SRC. P3)

*Tightening the food safety practices at the college kitchen is a good thing to do, but to spend money to purchase Veronica buckets for hand washing, I am not sure I am in support. (FGD1-SRC. P7).*

The effectiveness of the last college response effort was explored, and many interviewees agreed to the fact that the stockpile of first aid inputs and PPEs during the period of the outbreak, though expensive, was a good intervention. The college nurses commented that they felt at ease working once the inputs needed to work during the outbreak period were provided:

*Equipping the clinic with first aid inputs and PPEs was enough motivation to work since I felt empowered and secure. (Int. P4)*

*One of the most impactful interventions was the stockpiling of the clinic with emergency items such as first aid inputs and PPEs. We did not have to delay in attending to cases because all inputs needed were available. (Int. P5).*

The efficiency of the college response efforts was the next evaluation criterion explored. OECD defined efficiency in emergency response as the extent to which the intervention delivers, or is likely to deliver results in an economical and timely way (OECD, 2021). The indicative evaluation question was how efficient and timely were the responses of community health communication, emergency planning, clinical investigations, referral, mitigating strategies, and a stockpile of needed inputs? The study found that almost all the interviewees were happy that the response efforts of the college were able to curtail the outbreak within four days. A college nurse gave this positive comment on the college's response efforts.

*The professional advice the college sought from the DHMT on how to manage the outbreak is commendable. All the response efforts were very effective in eradicating the foodborne disease within the shortest time. (Int. P4)*

The Principal of the college also believed that the commitment of the college nurses as well as the efficient way by which the nurses supervised all the response efforts, were contributory factors to the early eradication of the outbreak on campus.

*The presence of the hardworking and committed nurses as well as their meticulous supervision of the various response efforts, cannot be taken for granted in the eradication efforts. (Int. P1)*

The impact of the response efforts was another criterion that was explored. Impact, as defined by OECD, looks at the extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, high-level effects (OECD, 2021). The study found that the response efforts of the college were able to restore the well-being and safety of students after an outbreak of foodborne disease had shattered the lives of many. For instance, the college nurses spoke about the impact the response efforts had on the students:

*I am not surprised at all that our response efforts paid off and were very successful in restoring the well-being and safety of students because our activities were monitored and supervised by the DHMT. (Int. P5)*

*The most significant impact of the response efforts of the college was that no lives were lost during the outbreak and the well-being and safety of students were restored. (Int. P4)*

The final evaluation criterion, sustainability is the extent to which the net benefit of the intervention continues or is likely to continue. Many discussants were of the view that apart from stockpiling first aid inputs and PPEs which are not sustainable, the rest including ensuring strict health and safety standards, community health education, clinical investigation, and referral were sustainable in promoting a safe environment for students:

*I am not sure the college will have problems with organizing activities such as community health education, keeping to strict health and safety standards, and clinical investigations and referrals as these are part of the routine health activities the college must embark on (FGD1-SRC. P6).*

*The college takes its supplies from the hospital, and it is not the norm for the hospital to stockpile clinics with deliverables; therefore, this current stockpiling is not sustainable. (FGD2-Hall Staff. P3).*

## 5. Discussion

The outbreak of foodborne disease in educational institutions is not a rare event (Opare et al., 2013) and is often underreported among developing countries where systematic foodborne disease surveillance and epidemiological studies are uncommon (Ahiabor et al., 2024; Ameme et al., 2016). This study has shown that at the core of managing an outbreak of foodborne disease is time-sensitive care involving multiple caregivers who are both professional healthcare providers such as college nurses and physicians and no health professionals such as deans of students, hall masters/mistresses, and transport officers.

Even though each caregiver’s role cannot be ranked above others, the college nurse plays a critical role, as in most cases he/she is the only professional health worker in the college and is expected to identify potential health problems, coordinate first aid and CPR training, evaluate emergency readiness, and develop response plans (National Association of School Nurses, 2019; Cagginello et al., 2011). Delays in any of these interventions can increase morbidity or lead to preventable deaths. The timely delivery of the response efforts of various gatekeepers was central to the successful containment of this outbreak, which was managed within four days with no fatalities. This finding supports earlier research that delays in emergency care can lead to avoidable deaths or reduced treatment efficacy (Chang et al., 2016).

Importantly, the prompt containment was attributed to prior emergency planning meetings that defined stakeholder responsibilities. The coordination between the college nurse and principal ensured a seamless referral and treatment system, aligning with Jin et al. (2023) and WHO's Emergency Care System Framework (2018), which emphasize coordinated response pathways from the point of emergency to definitive care.

An important dimension of the outbreak was the demographic profile of those affected. Out of the 51 students hospitalized, a higher proportion were female (62.7%), while males accounted for 37.3%. Though the study did not explore sex-specific exposures, this imbalance may reflect the underlying gender composition of the student population or suggest differential exposure risk based on food access, hall assignment, or other behaviors. In terms of age, the majority of affected students (74.5%) were within the 20–25-year range, which corresponds to the typical demographic of college students. Those under 20 (5.9%) and over 25 years (17.6%) were less affected. These insights are essential for designing targeted awareness campaigns and preparedness strategies that consider gender and age-related vulnerabilities in institutional settings.

To better understand how the college's response compares to global expectations, Table 4 presents a structured comparison between the actual emergency timeline at the Presbyterian College of Education (PCE) and international emergency response standards, such as those from WHO, FEMA, and UN OCHA.

#### **Table 4: Comparison of PCE Outbreak Response Timeline with International Emergency Response Standards**

|  |  |  |  |
| --- | --- | --- | --- |
| **Emergency Phase** | **International Standard Timeline** | **PCE Response (As Described in the Manuscript)** | **Commentary/Alignments** |
| **Detection & Alert** | Within 0–2 hours of first symptoms | Initial cases reported around 9:00 p.m.; 32 students hospitalized by midnight | **Timely**: Prompt case identification and escalation to care |
| **Initial Response Activation** | Within the first 6 hours | Additional 9 students referred between midnight and 6:00 a.m. | **Prompt**: Nighttime referrals indicate engaged response |
| **Incident Coordination** | Emergency meeting within 12 hours | Coordination meeting held the following morning | **Slight Delay**: No structured command during first night |
| **Health Communication & Education** | Within 24 hours | Health education launched between Day 1 and Day 2 | **Minor Delay**: Should accompany or precede clinical interventions |
| **Logistics & Stockpiling** | Parallel with care (<24 hours) | Stockpiling delayed due to procurement bottlenecks | **Delayed**: Highlights logistical readiness gaps |
| **Containment & Control** | Within 3–7 days | Full containment by Day 4 | **Effective**: Rapid, coordinated effort led to success |
| **After-Action Reporting** | Within 1–4 weeks post-outbreak | Internal AAR timely; formal study delayed by 1 year | **Mixed**: Recall bias possible due to late evaluation |
| **Coordination with Health Authorities** | Within 24 hours | DHMT informed; no FDA report received after 1 year | **Weak**: External accountability and lab confirmation lacking |

As Table 4 demonstrates, although the college’s initial detection, triage, and containment efforts met or surpassed global standards, certain stages such as logistical readiness, health communication, and coordination with health authorities experienced avoidable delays. These delays reflect broader systemic challenges faced by many institutions in low-resource settings.

The issue of the relevance of the college's response efforts such as health education, emergency planning, clinical investigations and referrals, mitigation practices, and availability of supplies is notable. These actions align with WHO protocols for community emergency care (WHO, 2018; Rural Health Information Hub, 2022), and Ghanaian health blueprints including the Ministry of Health's Accident and Emergency Services Policy (2016), National Health Policy (2020), and Ghana's School Health Policy (WASH Ghana, 2024).

While the college successfully restored student health and well-being within four days, implementation challenges were evident. These included the time-consuming nature of planning meetings, delayed PPE procurement, and communication lapses between stakeholders. These must be addressed to strengthen emergency preparedness and are consistent with findings from Zanello et al. (2015).

Finally, the study’s limitations such as recall bias and the lack of microbiological confirmation due to weak coordination with external health agencies, must be acknowledged. Although emergency care was effective, institutional learning and system-wide improvements require formal protocols, timely documentation, and reliable reporting pathways to external agencies like the FDA and DHMT.

## 6. Conclusion and Recommendation

This study examined a real-time institutional response to a foodborne disease outbreak in a teacher training college in Ghana. The findings demonstrate that early detection, prompt clinical care, and coordinated internal stakeholder engagement contributed significantly to containing the outbreak within four days without any fatalities. The college nurse and supporting personnel played key roles in triage, referral, and care coordination, confirming the value of well-functioning internal gatekeepers in low-resource academic environments.

However, analysis of the response against international emergency standards revealed delays in health communication, logistics, and coordination with external health authorities such as the DHMT and FDA. The absence of formal reports and laboratory confirmation of the etiologic agent represents a critical gap in surveillance, limiting the accuracy of outbreak documentation and future preparedness.

Also, demographic analysis showed that females and students aged 20–25 were disproportionately affected. These findings emphasize the need for age- and gender-sensitive emergency response strategies in academic institutions.

While the outbreak was successfully contained, the incident underscores the need for improved institutional protocols, real-time documentation, regular simulation exercises, and stronger links with district and regional health directorates to ensure evidence-based, timely, and efficient emergency responses in the future. Based on the study findings and analysis, the following recommendations are proposed:

1. **Institutional Emergency Plans**: Colleges should establish and routinely update formal emergency response protocols, including clearly defined roles for internal stakeholders and a structured coordination framework aligned with WHO and national guidelines.
2. **Prepositioning of Supplies**: Colleges must maintain an emergency stockpile of PPEs, first aid materials, and basic diagnostic tools to ensure readiness during foodborne or other public health emergencies.
3. **Training and Simulation**: Routine emergency drills and simulations should be conducted, including students and nonclinical staff, to build institutional capacity for early response and coordination.
4. **Strengthen Health Authority Engagement**: Colleges must formalize collaboration with district and regional health directorates to ensure timely reporting, access to laboratory testing, and improved epidemiological support during future outbreaks.
5. **Enhance Surveillance and Documentation**: Immediate post-outbreak documentation and submission of After-Action Reports (AARs) should be prioritized to reduce recall bias and support institutional learning.
6. **Targeted Health Education**: Outbreak prevention strategies should be customized to the most affected demographic groups, particularly females and students aged 20–25 years, as identified in this study.

By implementing these recommendations, academic institutions will be better positioned to prevent, detect, and respond effectively to public health emergencies, thus safeguarding student welfare and contributing to broader public health resilience.

## Abbreviations

**AAR**, After Action Report; **DAC**, Development Assistant Committee; **DHMT**, District Management Team; FDA, Food and Drugs Authority; **GTEC,** Ghana Tertiary Education Commission; **MOE**, Ministry of Education; **OECD**, Organization of Economic Co-operation and Development; **SRC,** Students Representative Council; **UNHCR,** United Nations High Commissioner for Refugees; **WHO**, World Health Organization;

## Ethical approval and consent

Approval for the evaluation of the response efforts was given by the Akuapem North DHMT. This evaluation was considered a response to a public health emergency from a tertiary institution in the municipality and therefore did not receive a formal review from the Ethical Review Committee. All respondents provided consent and were assured of confidentialit

sOption 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1. ChatGPT (Large Language Model)

2. For language refinement and grammatical correction

3. For formatting citations and references

4. **Model and Source Information**

* **Model:** GPT-4o (OpenAI’s advanced multimodal language model)
* **Version:** July 2025 release
* **Source**: Google (via the collaborative AI platform)

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