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Dimensionality of food safety and hygiene training programs for food handlers in Lusaka, Zambia

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ABSTRACT

Globally, foodborne illnesses pose a substantial threat to public health, contributing significantly to illness and death. The behaviors, awareness, and attitudes of food handlers are critical determinants of food safety. This research aimed to investigate the comprehensiveness and scope of food safety and hygiene training initiatives targeting food handlers in Lusaka, Zambia. To this end, we conducted a two-phase qualitative analysis and evaluation of available training materials. This included interviews with 18 food establishment managers/ Human resource officers" should not be capitalized unless it is part of a proper noun. The analysis was conducted manually to identify emerging themes and understanding the materials to assess the entry requirements for participants, duration of training, qualifications of trainers, topics covered and the delivery methods used. The study found no uniform format for the training materials which also lacked important topics on food safety systems and Good Agricultural Practices and Good Agricultural Practices topics. Additionally, the study found poor uptake of the training due to a lack of awareness of legal requirements, high attrition, training costs, and a lack of established institutions offering the training on a regular basis.This study recommends the standardization of food safety and hygiene training programs in Zambia, tailored to the local context. Specifically, the development of a Participant's Handbook and a Facilitator's Manual is recommended. These resources should outline qualifications and competencies required for trainers, duration and format of training and entry requirements and prerequisites for trainees.

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1. Introduction

Foodborne ailments continue to present a serious challenge to public health for both developing and developed countries. Insfran-Rivarola, et al. (1) noted that food hygiene and safety are a global human health threat due to their frequent incidents. Further, Insfran-Rivarola, at al. posited that the COVID-19 pandemic had strained global public health, especially for organizations of producers and providers along the food supply chain that faced ongoing demand to improve and to examine

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food safety and hygiene standards. Due to increased foodborne diseases (FBDs) and accompanying deaths in industrialized countries, food safety and hygiene remained a global public health concern (2).

In 2010, 31 foodborne hazards were responsible for an estimated 420,000 deaths and 600 000 000 foodborne illnesses related to agents, such as non-typhoidal *Salmonella enterica*, *Salmonella typhi*, *Taenia solium*, hepatitis A, and aflatoxins .(3) Additionally, the WHO estimates that 2 million incurable cases of food poisoning occurs annually in industrialized countries and 1 in 10 people fall sick worldwide each year. The majority of FBDs were attributed to meat-related vulnerabilities(4). Navarro-Garcia, (5) reported that about 76 000 000 FBDs led to 325,000 hospitalizations for the United States of America (USA) which led to 5000 deaths.

Studies have accounted for 12 to 18% of food-borne illnesses attributable to contaminations (6), poor food safety, and inappropriate hygiene practices linked to food handlers (4). Food safety and hygienic practices of food handlers are essential to ensure that food is free from any forms of contamination through preparation and processing for consumption and to prevent the spread of FBDs (7). Buying food from unsafe sources, inadequate cooking or reheating, holding food at room temperature, cross-contamination, poor personal hygiene, or improper food handling practices contribute to foodborne illnesses (3).

In response to food-borne diseases, state agencies have adapted strategies including food regulations and laws to monitor compliance with food safety standards (8).

In Zambia, food safety and hygiene are prioritized and legislated. The Public Health Act Cap 295 of the laws of Zambia and the Food and Drugs Act Cap 303 (later repealed to the Food Safety Act No. 7, 2019) provide a legal mandate for food establishments to comply with high standards of hygiene. Further, the law requires food handlers in food establishments to undergo food safety training.

While it is expected that compliance to these pieces of law would address the cases observed in the country, the FBDs keep increasing. This is supported by Bulto et al. (9) that observed a dearth of studies on the compliance of food handlers, particularly regarding the requirement for food safety training. Similarly, Amare et al., (10) found 19.3% *Shigella* and 21.8% *Salmonella* outbreaks were tied to food handlers. Chipabika (3), revealed that poor hygiene practices by food handlers in food establishments were at 12% causing foodborne infections in Kabwe. The study also found that 16% of food sold in in restaurants in Kalingalinga, Lusaka, contributed significantly to foodborne diseases such as *salmonella* implicating food handlers in the spread of the diseases.

Previous studies have established that knowledge correlates to acceptable hygiene performance of food safety (2,11). However, the dearth of research examining the content of food handler training materials to ascertain their effectiveness on behavior change motivated this inquiry. While knowledge has been established to have positive outcomes where public health is concerned, the gap in literature demands action. Therefore, taking into consideration worsening of recurrent epidemics in Lusaka which is a busiest city and an epicenter for cholera, necessitated this evaluation.

2. Materials and Methods

2.1. Study design

This study employed a qualitative approach to evaluate the dimensions of food safety and hygiene training programs on respondents selected from a fixed point in time. The study involved both human and non-human subject participants. For the human participant portion of the study, Key Informant Interviews (KIIs) were conducted, and for the non-human portion, a desk review document analysis was performed. The primary focus of the inquiry was food handler training, with an emphasis on its availability and scope.

The study was conducted in two phases: Phase 1 involved human participants, including food establishment managers and Human Resource Officers (HROs), and Phase 2 focused on reviewing training packages identified through food establishments and authorities from the Ministry of Health and the local Council.

2.2. Study setting and participants

The study was conducted in Lusaka, Zambia's capital and the busiest city. The city has a population of 2, 248, 143 and an epi-center for the majority of outbreaks in Zambia (12,13). Lusaka is one of the 11 cholera hotspots districts in Zambia (13).

The study included 18 food establishments (restaurants, supermarkets, takeaways, hotels and bars) with a total of 458 food handlers. Further, the study followed up with 9 trainers associated with the sampled food establishments and authorities. The participants were predominantly male (i.e. 23 male KIIs) with only 3 female KIIs.

The figure below summarizes the participants and documents identified and reviewed.

2.3. Sampling technique

In the first phase the researchers purposively targeted registered food establishments and further selected to interact with establishment Managers and HROs as they had records of employees and establishment. The focus on registered food establishments was due to their higher likelihood of complying with legal provisions, as well as their traceability through the local authority (the City Council). These officials also played a key role in identifying trainers for their employees, through snowball sampling for their employees where training was done. This constituted the second phase of the study and given the lack of a known population size, snowball sampling facilitated the the identification of relevant documents through referrals from initial sources. In addition to the food establishments (initial sources), the relevant authorities responsible (health inspectors from both local authority and MOH) for ensuring that provisions of the listed laws above are compiled and made referrals of trainers.

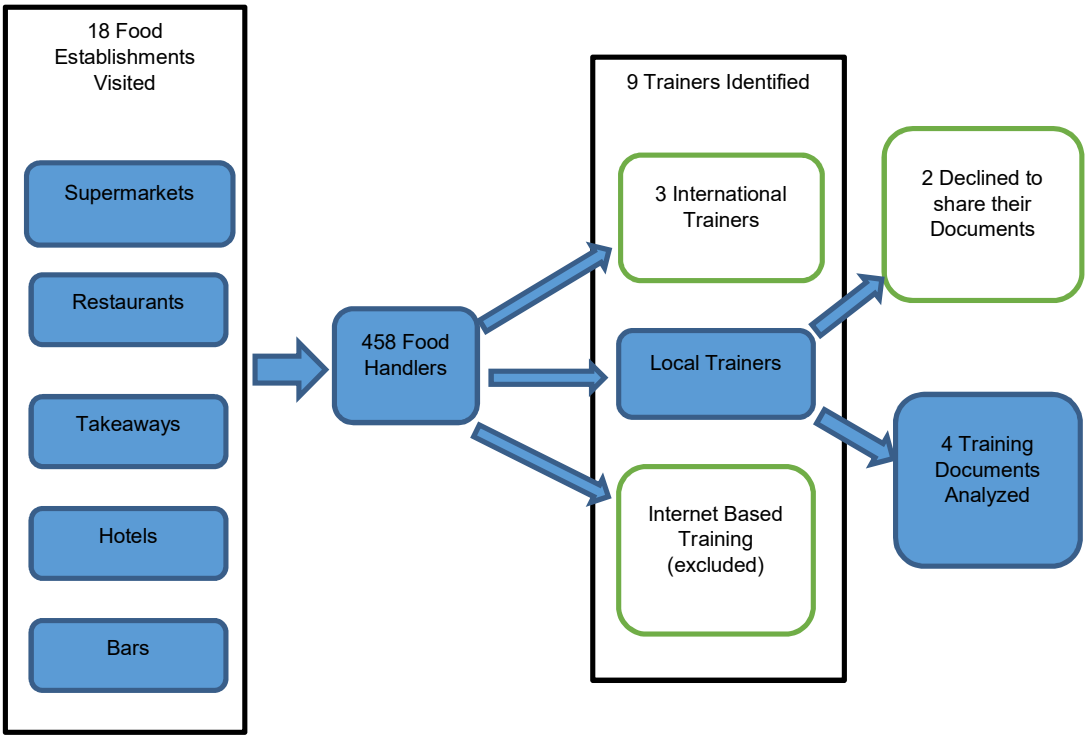

Figure 1. Participants and Study documents involved

2.4. Data collection procedure

The researchers sought authority to conduct the study and proceeded to food establishments where further permission was sought after stating the project rationale and its objectives. Care was taken to ensure that sufficient information was provided to the establishments and the trainers before proceeding with data collection. In the first phase, the managers and HROs (whichever was the case) participated in interviews, responding to questions

that reflected food handlers' interactions with food safety and hygiene. The second phase involved document analysis preceded by interactions with individuals that conduct the training. For some trainers, the interview was done using digital means such as phone calls due to their physical unavailability. Some documents were equally transmitted to the researchers using digital means such as WhatsApp and Email. Two researchers reviewed each chapter or section as applicable. Below is a summary of the processes involved.

1. **Document Retrieval**: We collected 6 documents, including training outlines, training PowerPoint Slides and reports related to food safety and hygiene programs in Lusaka.
2. **Content Analysis**: A systematic content analysis was conducted to identify key dimensions within the training materials. This includes assessing the entry requirements, duration of the training, topics covered, qualification and experience of trainers and instructional methods used.
3. **Comparative Analysis**: We compared the content across different training providers/institutions to identify commonalities, gaps, and variations.

2.5. Data analysis

The interview responses were manually analyzed to identify emerging themes and then comparing the responses between food establishments and trainers. For the desk review phase, the documents were evaluated using a procedure based on Ary et al. (14) the steps are:

2.6. Step 1 - organizing and familiarizing

This stage involved familiarization and organization to ensure that the data was easily accessible for further analysis. We became familiar with the data through reading and re-reading notes. Our comments, and other document content were organised into a form ready for analysis. First, we organized the information to represent themes of a chapter/section. Further, after establishing familiarity with the document's content, summarized it into bullet points.

2.7. Step 2 - chunking

Upon familiarization with the data and organizing it, we began coding it and reduced it to facilitate easier assimilation. Here, we categorized the identified dimensions into themes related to food safety and hygiene. We evaluated the documents by focusing on the sentences or materials that demonstrated key characteristics of a comprehensive training program.

2.8. Step 3- presentation

The identified themes emerged through an inductive process, where we generalized the information based on connections and common aspects among the categories and patterns. Interpretation is about bringing out the meaning, providing an explanation, and developing rational explanations. Lastly, we interpreted and presented the ideals explaining the description related to the findings.

3. Results

3.1. Availability and uptake of trainings on food safety and hygiene.

Table 1. Availability of training programs

	Frequency	Percent	Valid Percent	Cumulative Percent
Training Available	11	42	42	42
Training Not available	15	58	58	100
Total	26	100.0	100.0	

Table 1 shows the perceptions of food establishments regarding the availability of training programs for food handlers.

We found that food premises were aware of the need to have their staff undergo training before starting work and periodically thereafter as shown below.

However, the study also revealed mixed perceptions about what specific training was required under the laws highlighted above. Some establishments referred to their orientation of new employees and their recipes as the mandated training.

Yes, we provide training for our staff to know how we prepare our dishes (KII – Restaurant).

Which training are you referring to? Here we only do trainings in fire safety and how to prepare our foods on the menu (KII – Takeaway)

A few KIIs could relate with the question and were able to provide contact details of their trainers.

For us, we pride in quality and that's why we invest heavily in food safety. Am sure you see our staff moving around the store just to ensure only what should be safe for consumers remains on the shelves. We use international trainers from South Africa for our training and we have a regional manager that is a food safety specialist that works hand in hand with the

international trainers. For us it's a brand and we don't play around that because a simple mistake can cause international news (KII – Supermarket).

For us, we belong to a brand together with X, Y, Z (names withheld) and we are trained by X Brand (name withheld) headquartered here in Lusaka (KII – Takeaway).

For us we have one person that trains all our branches countrywide and he is the one that can help more in answering the questions about the training (KII – Takeaway)

From the responses, we identified a trend whereby food establishments that subscribe to brand names ensure their staff undergo training while other food establishments visited had not prioritized food safety and hygiene training. Further, food establishments pointed at high attrition as the contributing factor for not conducting the training along with a lack of information regarding the specific training required for their staff according to available laws.

This study followed up 9 trainers, however, we only reviewed 4 documents as 3 were international trainers and did not have access to their documents while 2 declined to share the material they use for the training.

3.2. Scope of training programs

The focus during the review of materials was on the specifics of a comprehensive program outline showing the entry requirements for training participants, duration of the training, topics covered, qualification and experience of trainers and instructional methods used among other aspects.

The 4 training materials reviewed were all unique as they lacked a uniform flow of training and consistency in the topics covered of training as well as topics covered. The following gaps were identified:

1. None of the documents outlined the entry requirements for the training of participants.
2. None of the materials outlined the duration required to deliver the training.
3. None of the materials stated the experience and the qualification of trainers required to deliver the training.
4. None of the materials covered topics to do with Food safety systems (such as the HACCP, ISO 22000, and BRC standards or Zambia compulsory standards agency/ZABS standards) and Good Agricultural Practices (GAP).
5. The materials reviewed lacked contextualization as they gave examples that may not be applicable to the local context. Some of the foods mentioned in the materials were uncommon for an average Zambian food handler.
6. One training package indicated that it was a phased program, however, only the first phase had material while the other phases had nothing.

Among the similarities identified in the materials reviewed included the following;

1. All materials discussed cross-contamination and the need for the separation of raw and prepared foods.
2. All materials covered hand hygiene in terms of hand washing and hand sanitizing.
3. All the materials discussed storage and the first-in, First-out (FIFO) principle.
4. All the materials discussed personal protective equipment (PPE)
5. Three of the materials discussed infection prevention and control (IPC), however, only two cover the need for Food Handler Examinations.

6. Two materials discussed the types of food hazards while the other two did not.

The nature of the materials was reviewed to appreciate if they were facilitators' guide or participant handbooks. We found that these materials were neither facilitators nor participant's manuals and could easily be adapted by anyone wishing to teach regardless of professional background.

The majority of trainers had a background of environmental health which has a component of food safety and hygiene. However, some trainers have no food safety or medical background whatsoever as some indicated having been trained from Hotel and Hospitality Colleges and thus felt they could train others.

Some food establishments had their training delivered online while others depended on YouTube training. We did not review YouTube content in this study as it seemed unstructured as the producers of the content either could not be contacted nor give contextual content to the laws in question. Further, the average Zambian food establishments couldn't access the same due to time and associated cost.

The lecture method was the predominant mode of delivery and referred to videos and demonstrations.

3.3. Accessibility of training programs

The study sought to review the accessibility to the training packages available and found that they were not common with the average food establishments.

Table 2 below shows availability perceptions of food establishments that participated in this study.

Besides the international training packages which were limited to supermarkets and chain stores/takeaways, the available training packages had their own limitations including

- Lack of knowledge on the part of food establishments on the requirement of the laws in this regard.

  We didn't know that there was such a law about going for training. We just know about food handler examinations and certification (KII – Takeaway Manager).

  Is there such a thing to do with training? We just employ people that already know how to cook so we don't do any training (KII - Restaurant).
- High costs of delivering the training.

  You see, most businesses do not prioritize this training and when you tell them the amount they would complain but this is very important knowledge which can help them avoid losses or lawsuits (KII – Trainer 3).

  Most people just ask and when you tell them the amount they don't proceed with the training (KII – Trainer 1).
- Lack of schedule and sites for delivery of these trainings.

  These training sessions are mostly done on invitation and we normally do them on-site. They are called jobs on training so we don't offer them throughout the year. It also depends on the number of participants that you want to train (KII – trainer 2).

  These are not like school programs, are they? We don't know where to find the same training and who trains or when they do the training (KII – Restaurant Manager).
- High attrition in the food establishments

  You see, we can't afford to train people and they just work for two weeks and stop coming for work. How many people are we going to train? Unless the government can make a rule that each one should have the training before looking for a job (KII – supermarket HR).

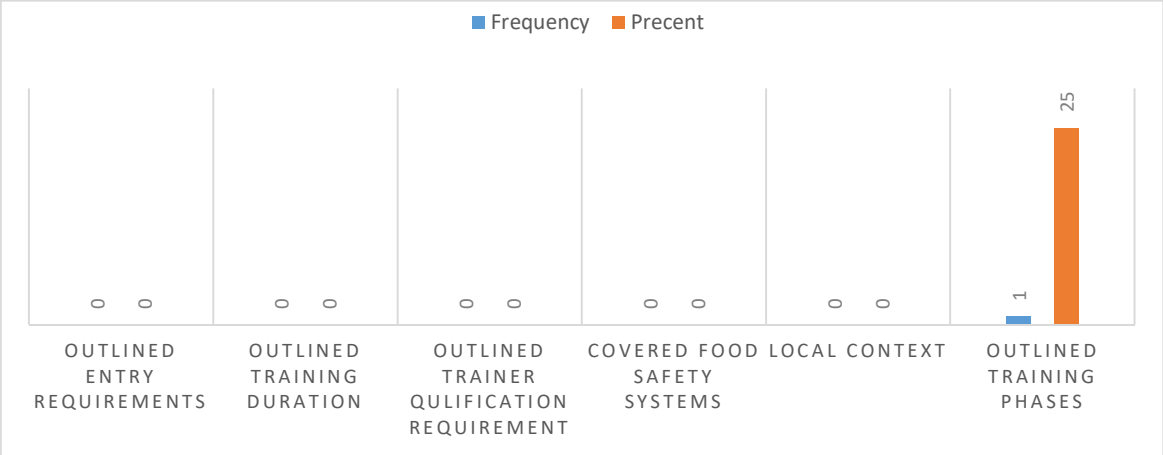

Figure 2. Scope of food safety and hygiene training materials reviewed

Table 2. Accessibility of food safety and hygiene training

	Frequency	Percent	Valid Percent	Cumulative Percent
Training program is Accessible	7	27	27	27
Training program is Inaccessible	19	73	73	100.0
Total	26	100.0	100.0	

You see, these food establishments also get tired of training people. I know it's good for us as trainers but every time they call you for training you will find strange faces (KII – Trainer).

4.Discussion

Recent studies highlight the importance of training citing it as a medium through which exchange of ideas and knowledge can be achieved (15, 16, 17). Yet, the number of foodborne illness outbreaks still remains a constant threat. This study has found no standardized training material for both training participants and facilitators in the study site. Building on the provisions of the KAP model, which holds that a person's actions or habits are determined by their knowledge (K) and that information alone will cause an individual's attitude (A) to change, which will then cause their performance to change (P; behavior) (18). Sahil et al. (19) argued that training activities that are closely linked to a physical and social environment can be more effective than food hygiene courses conducted in

settings disconnected from the workplace and use solely knowledge-based assessment techniques. Our study found that the available training programs were more theoretical and had no follow-up on the job training.

This was against international practice which suggests that it is essential to introduce reliable work site evaluation techniques, considering that knowledge by itself does not result in changes to food handling practices. Soon, et al. (20, 21) posited that Food safety knowledge was characterized as the comprehension of food acquired through skills or education. Food safety attitude (FSA) pertains to the feelings or beliefs regarding food safety, while food safety practice (FSP) denotes the actions or implementation of food safety measures. The understanding of food safety, along with the attitudes and practices of food handlers, is crucial. Due to lack of awareness, negative attitudes, and inadequate sanitation practices, food premises are faced with significant risks (22). In the same light, Isoni, et al. (6) in their study in Brazil observed that food handlers exhibited inappropriate hygiene practices, and operated from subpar environments, linked to increased incidence of contaminated meals. Similar factors were more pronounced in Southeast Asian and African countries (23). Furthermore, large food companies utilize various food safety methodologies in their daily operations, including Good Manufacturing Practices (GMP), Good Agricultural Practices (GAP), the Hazard Analysis and Critical Control Points (HACCP) system, and the ISO 22000 standard play a critical role to ensure the safety of their food products and prevention of food-borne diseases (24).Training of food handlers in food safety represents a highly effective strategy for the prevention of foodborne diseases within these methodologies (25).

Our study found that a majority of the food establishments were not training their staff as implied through the low participation in this study (only included food establishments where food handlers had been trained). Consistent with Zenbaba, *et al.* (26) who reviewed various papers on food hygiene practices and determinants among food handlers in Ethiopia and stated that improper food handling techniques were the primary cause of most foodborne diseases (27), yet only a little over half of Ethiopian food handlers have implemented good food hygiene practices. The researchers hypothesized that this finding may stem from insufficient training of food handlers, coupled with the regulatory team's inconsistent and weak oversight of food establishments, which was another significant aspect noted in our study. Enhancing modifiable risk factors, including food handler training, attitudes, and awareness among food handlers, plays a significant role in reducing the incidence of foodborne illness.

Consistent with these findings, a study by Reynolds, and Dolasinski, (28) which aimed at evaluating publications done between 2013 and 2018 focused on the modalities and assessment of training interventions for food handlers within food service operations. Their findings show how the lecture style emerged as the predominant modality. They added that lectures frequently incorporated visual aids such as photographs, posters, information sheets, brochures or comic books, and videos to enhance understanding. Furthermore, the topics that received the most attention included hand hygiene, with temperature controls, personal hygiene, cleaning and sanitizing, and cross

contamination following closely behind. Most studies employed a pre/post intervention questionnaire to evaluate knowledge, attitudes, and practices; this approach was absent in our study similar to the situation found in the study site where the trainers only replicate pieces of what would be part of a comprehensive training package.

Reflecting the worries expressed by food establishment managers and human resource officers regarding employee attrition, Robinson, (29) stated that the global hospitality industry and Food and Beverage (F&B) sector is plagued by high employee turnover rates, which detriments consumers' perception of service value, satisfaction, and loyalty.

This study identified a significant element pertaining to effective food hygiene practices, which could facilitate the development of practical training interventions aimed at enhancing compliance with food hygiene standards in food establishments. Food safety could be enhanced by the Hazard Analysis and Critical Control Point (HACCP) system, however its effectiveness in reducing foodborne illnesses depends on its proper application along with the provision of a conducive or enabling environment, infrastructure that is hygienic and the implementation of excellent hygiene practices (3). Available literature suggests that a significant portion of foodborne infections are caused by food workers' inadequate food handling procedures or practices (30). For instance, improper farming methods, contamination during production, packaging, or distribution, or contamination at retail establishments can all result in the presence of pathogens in food (31).

Implications

There may be major repercussions if food handlers do not receive regular food safety and hygiene training, including but not limited to:

1. **Inconsistent training**: Food handlers may receive varying levels of training, leading to knowledge gaps and inconsistent practices.
2. **Increased risk of foodborne illnesses**: Inadequate or lack of training can result in improper handling, preparation, and storage of food, raising the possibility of contamination and food-related diseases.
3. **Lack of accountability**: Without standardized training, it's challenging to hold food handlers accountable for their actions, making it difficult to ensure compliance with food safety regulations.
4. **Negative impact on public health**: The absence of standardized training materials can lead to a higher incidence of foodborne illnesses, affecting public health and safety.
5. **Economic consequences**: Food safety breaches can result in costly recalls, legal liabilities, and damage to a food establishment's reputation.
6. **Inefficient use of resources**: Without standardized materials, training programs may be duplicated, wasting resources and effort.
7. **Difficulty in assessing competency**: Standardized training materials help assess food handlers' competency, which is crucial for ensuring food safety.
8. **Limited scalability**: Non-standardized training materials can hinder the expansion of food businesses, as training programs may not be easily replicable.
9. **Regulatory challenges**: The lack of standardized training materials can make it difficult for regulatory

bodies to ensure compliance with food safety regulations.

10. **Negative impact on consumer trust**: Repeated food safety breaches can erode consumer trust in the food industry, leading to long-term consequences for businesses and the econom

5. Conclusion

The inconsistency of Food Safety and Hygiene training programs/materials along with inadequate training creates knowledge gaps and inconsistent practices in the food industry which further leads to increased risk of foodborne illnesses. Even though food safety procedures have been strengthened significantly, food-borne diseases continue to register a significant threat on the populations of wealthy nations annually, and are much more prevalent in low-and -middle income countries (LMICs) like the one investigated. Prioritizing training over supervision is crucial for fostering consumer trust in the country's food safety system and for establishing a strong regulatory framework for both domestic and foreign food trade that promotes economic growth.

To mitigate this established gap, we recommend the following specific actions be taken at policy, implementation and supervisory/compliance levels;

1. The Ministry of Health, the Ministry of Local Government and Rural Development charged with the mandate to assure public health should develop and implement a comprehensive training curriculum that segments food safety and hygiene into modules which cover topics for the production, transportation, preparation, storage and serving.
2. The Ministry of Health, the Ministry of Local Government and Rural Development should regulate the training of food handlers by ensuring only qualified and affiliated trainers using a generic curricular are permitted to conduct training.
3. Food establishments to ensure they obtain training from trainers to the recognized by the said ministries to ensure quality of training. Further, they can prioritize food handlers that possess a training certificate when hiring while facilitating training of the untrained.
4. Authorized officers to supervise the training of food handlers in each catchment area for quality assurance. Further, emphasis on the importance of such training must be made on all inspections in food premises.

By prioritizing food safety and hygiene training, we can protect consumers' health and well-being, prevent foodborne illnesses, and maintain an elevated degree of food safety standards in food establishments.

As an extension of this study, we recommend that future research can focus on technology-based training solutions (e.g., online modules, virtual reality), collaborative efforts between industry, government, and academia to develop and share best practices and continuous monitoring and evaluation of training effectiveness and impact on food safety and hygiene.

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Authorship Contributions

CM the principal investigator conceptualized the paper and completed the initial draft before sending it to MK, LS, and SL who are equally subject experts and co-investigators. All the investigators collected data and reviewed the manuscript. MK reviewed and enhanced the findings' reporting. After reviewing the text, LS enhanced the ideas' coherence, while SL enhanced the

findings' presentation and approved the paper for publication.

Declaration of Competing Interests

The authors declare that they have no competing interests.

Availability of data and Materials

The data reported and supporting this paper were sourced from existing literature and are therefore available through a detailed reference list.

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Consent for Publication

The authors give the journal's Editorial Board permission to publish the paper. Additionally, every respondent gave their verbal and written approval, which we recorded by having them check the signature consent section of the questionnaire.

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