

Storage and dispatch of supplies in public markets: dimensions to improve based on empirical evidence from food safety and as a sustainability strategy for the supply chain

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Abstract. The text addresses the importance of food safety worldwide, highlighting the crucial role of organizations such as the UN, WHO and FAO in promoting safe practices in the food chain. It focuses on the public markets of Guayaquil, where an alarming increase in Foodborne Diseases has been observed and various irregularities that affect food security and public health have been identified. The study uses a mixed methodological approach that combines literature review and the application of questionnaires to comprehensively address the issue of food safety in these markets. The literature review provides a broad and contextual theoretical framework, while the questionnaires collect specific data that complement the qualitative findings, thus ensuring a balanced and detailed exploration of the phenomenon. The general objective is to develop a comprehensive approach to improve food safety protocols in public markets, identifying fundamental dimensions, objectives of information gathering tools and design limitations. The need to improve infrastructure, train staff, control pests, manage waste and apply hygiene and safety measures in markets is highlighted, along with compliance with regulations and collaboration between entities. Challenges and measures are raised to improve food safety in the municipal markets of Guayaquil, highlighting the importance of comprehensive actions that address multiple aspects to protect public health and guarantee food security.

1. Introduction

The United Nations (UN) was founded in 1945 with the main objective of maintaining world peace and promoting cooperation between nations. In the area of food safety, the UN, through Food and Agriculture Organization (FAO) and World Health Organization (WHO), works to ensure access to safe and nutritious food, improving agricultural practices and promoting sustainable food systems. WHO plays a crucial role in setting standards and monitoring food-related health risks, working closely with other organizations to ensure global food security [1].

The WHO works closely with FAO and other international organizations to ensure the safety of the food we consume and avoid risks to our health. The UN has noted that contaminated foods are responsible for a large number of foodborne illnesses annually, causing not only impacts on human health but also considerable economic losses. At a food safety conference in Ethiopia in 2019, the importance of food safety at all stages of the food chain was

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highlighted, underscoring the need for investments in stricter regulations to ensure food safety for all consumers [2].

Food security is essential for sustainable development and the well-being of populations, requiring global measures to address challenges related to food contamination and ensure safe nutrition for all. The International Food Code (IFC), established by the Codex Alimentarius Commission (CAC) in collaboration with FAO and WHO, is a set of standards and guidelines intended to ensure food safety and quality worldwide. These regulations, which cover aspects such as hygiene, additives, pesticide residues and veterinary medicines, establish international standards to ensure the safety of food produced, imported or exported, as well as promote fair commercial activities internationally [3].

The Andean Community (CAN), made up of Bolivia, Colombia, Ecuador and Peru, seeks balanced and cohesive development among its members, focusing on food safety through the harmonization of regulations, the improvement of supervision and regulation systems, the training, research and access to international markets. This translates into the implementation of Andean Technical Standards that establish standardized criteria for various food products, thus guaranteeing the quality and safety of food in the region [4].

In 2017, the member countries of the Andean Parliament ratified a regulatory framework focused on food security, nutrition and food sovereignty to guarantee safe and nutritious food in the Andean region and reduce malnutrition. Decision 515 established the Andean Agricultural Health System, highlighting the importance of food safety and the Codex Alimentarius to address challenges in the region. The Phyto and Zoosanitary Regulation and Control Agency [1] in Ecuador plays a crucial role in ensuring the quality and safety of food products through regulations and supervision in collaboration with different actors in the sector [5].

The Health Regulation and Control Agency (ARCSA), attached to the Ministry of Public Health (MSP) in Ecuador, plays a fundamental role in the protection of public health by establishing and supervising regulations related to the safety, quality and effectiveness of products. For human consumption. Its work focuses on minimizing the risks associated with the consumption of foods and products that may affect the health of the Ecuadorian population. The National Codex Alimentarius Committee in Ecuador acts as an advisor to the National Government on issues related to the Codex Alimentarius, contributing to the development of standards and codes of practice to guarantee the safety and quality of food. In addition, the Ecuadorian legal framework has prioritized food safety through regulations such as the Regulation of Good Practices for Food, which establishes clear guidelines for the production and processing of safe and quality foods [6].

The commitment to food health in Ecuador is reinforced through the Organic Law of the Food Sovereignty Regime, which promotes access to healthy and culturally appropriate foods for all communities. This law establishes food sovereignty as a strategic objective and an obligation of the State. In addition, Decree No. 919 regulates the health of agricultural products to guarantee high standards of quality and safety. The Technical Health Regulations for Processed Foods, published in 2023, add specific guidelines to certify the quality of foods consumed in Ecuador. At a global level, since 1995 there has been a consolidation in the global food and agricultural trade network, with a significant increase in exchange between nations, including low- and middle-income countries, demonstrating greater collaboration and interconnection in trade international [7].

Food safety in public markets has gained importance globally, especially due to the interconnectedness and globalization of food markets. The COVID-19 pandemic highlighted the need for a strong and unified agri-food system globally. Trade, once seen primarily as an economic mechanism, is now recognized as an essential tool for achieving economic, social and environmental goals. At a global level, territorial food markets, especially wholesalers, are fundamental nodes in the food supply chain, connecting producers, intermediaries and

consumers. These markets are especially relevant in regions such as Central and South America, being crucial platforms for the transaction of perishable products [8].

In Latin America and the Caribbean, traditional markets continue to play a significant role despite the growth of supermarkets in urban areas. These street and wholesale markets are not only vital for the distribution of fresh food, but also represent cultural diversity and local culinary traditions. In Ecuador, the COVID-19 pandemic has raised the importance of food safety in public markets to unprecedented levels. A joint report highlights the need to keep food structures operational to prevent a food crisis during the health emergency, focusing on guaranteeing the availability and accessibility of food in the country. The collaboration between various organizations and financial support demonstrates the urgency of addressing these challenges in the Ecuadorian context [9].

Municipal public markets are fundamental pillars in the daily life of communities as they are points of sale for fresh products and cultural centers that promote local traditions. Its close relationship with clients and services such as access to credit and personalized advice strengthen social cohesion and community economic support. Although they are key to food and nutritional security by improving producers' incomes and offering affordable prices, they face challenges due to policies that favor supermarkets, limiting their contribution to food sovereignty. It is vital to develop policies that support traditional markets and address unfair competition to ensure access to fresh food and strengthen the cultural identity of communities [10].

It is clear that municipal public markets play a fundamental role in food security, social cohesion, and the cultural identity of communities. However, the need to establish solid theoretical dimensions that allow evaluating and improving food safety practices in these markets is evident. This involves developing conceptual frameworks that comprehensively address aspects such as product quality, supervision and regulation systems, training of the actors involved, infrastructure and risk management. These theoretical dimensions are not only crucial to ensure safe and nutritious food, but also to strengthen the resilience of public markets in the face of challenges such as unfair competition and the impacts of crises such as the COVID-19 pandemic. Therefore, it is imperative to move towards a solid theoretical approach that supports the continuous improvement of food safety in public markets, thus ensuring the health and well-being of communities [11].

2. Background

Food safety in the public markets of Guayaquil has acquired primary importance, given its direct influence on the health well-being of the community. The current figures are alarming. As of March 2023, 3,725 cases of individuals affected by Foodborne Diseases (FBD) have been documented, see table 1. For comparison, in the same period in 2022, 2,637 people affected by these diseases were reported, significant data for public health management [12].

Table 1. Number of Infected by Diseases Food in Ecuador, 2023

Guy of Disease	Guayas	Ecuador
Fever typhoid and paratyphoid	79	312
Infections due to salmonella	204	469
Hepatitis A	6	102

Shigellosis	17	69
Others poisonings food bacterial	467	2773
Total	773	3725

Investigations have revealed concerns about the suitability of food products offered in markets in the Guayaquil area. Pathogens have been discovered in several products frequently consumed by the local community. The table 2 illustrates some of these discoveries. [13].

Table 2. Study about Pathogens in Food Common of Guayaquil

Food	% Samples that exceeded the limit	Pathogens detected
Bolones	70%	Klebsiella pneumoniae, E. coli, Vibrio sp.
Encebollados	80%	E. coli, Klebsiella pneumoniae, Vibrio sp.
Ceviches	60%	Klebsiella pneumoniae, Pseudomonas aeruginosa, E. coli, Vibrio sp.
Chopped fruits	60%	Staphylococcus aureus, Listeria monocytogenes
Fruit salad	100%	Listeria monocytogenes, Klebsiella pneumoniae, E. coli
Juices	100%	E.coli
fresh cheeses	100%	E.coli
Sauces	60%	E. coli , Shigella flexneri, Klebsiella pneumoniae
Raw ground beef	80%	E. coli
Raw chicken	40%	Salmonella sp.

The mayor of Guayaquil carried out an exhaustive evaluation of the 51 municipal markets, identifying numerous significant irregularities. There are 2,470 positions not yet assigned, the deficiency in fire protection systems in most markets, and a high percentage of sanitary facilities in poor condition. The pollution in the Caraguay market, which dumps waste into the Guayas River, and the presence of mosquitoes in the markets is worrying. These problems reflect the lack of safety protocols, poor maintenance, inadequate infrastructure, and the need for awareness and training among traders and other market actors. [14]

If effective action is not taken to address the situation in public markets in Guayaquil, foodborne illnesses are likely to increase, especially in the face of climate events such as El Niño. This could trigger public health crises and undermine confidence in these markets. The need to adopt measures such as cleaning, fumigation and renovation of wastewater systems, as well as improving the structure of markets, is evident. However, it is crucial to adopt a broader vision that includes training, awareness of traders and the application of protocols supported by scientific research to ensure food safety and protect the health of the population in a comprehensive manner. [15]

An effective approach to food safety practices in public markets must address various aspects to improve existing protocols. It is crucial to consider dimensions such as the hygiene and cleanliness of the facilities, the proper management of waste and waste, the training and awareness of merchants, as well as the implementation of continuous monitoring and evaluation systems. Additionally, to establish sound food safety practices, clear objectives must be defined related to the prevention of foodborne illnesses, the assurance of product quality and safety, and the promotion of healthy eating habits. The tools used to validate these practices should cover dimensions such as physical infrastructure, food handling processes, documentation and recording of practices, and assessment of potential risks. However, it is important to recognize the design limitations that may arise when developing tools to collect information on food safety protocols in public markets in Guayaquil, such as the availability of technical resources, the capacity for implementation at the local level, and the need to ensure the active and collaborative participation of all the actors involved in the process. [16]

Food safety in Guayaquil's public markets is an issue of increasing relevance that requires a thorough evaluation and a comprehensive approach to improve existing protocols. This study proposes using a methodology that includes the application of a questionnaire, detailed analysis of current regulations and a thorough review of the relevant scientific literature. The main objective will be to identify deficiencies and areas for improvement in food safety practices in these markets. The importance of this approach is based on evidence provided by recent research, such as the analysis by Gizaw [17] that highlights risks such as microbial and chemical contamination, food adulteration and the misuse of additives, underlining the need for control. Likewise, studies such as that of Iwu & Okoh [18] highlight the dangers associated with foodborne pathogens from the pre-harvest stages, which emphasizes the importance of integrated and preventive strategies to guarantee food safety in Guayaquil from production to consumer.

Research in the field of food safety reveals critical aspects that must be addressed comprehensively to ensure the safety and quality of food in the food chain. A study focused on the relationship between economic investments in infrastructure and the execution of Good Manufacturing Practices (GMP) highlights that, although improvements in hygienic-sanitary conditions are evident, deficiencies in training and procedures persist, highlighting the importance of a comprehensive that includes training and commitment of workers to effectively implement GMP [19].

On the other hand, the analysis of food fraud in the context of globalization and the complexity of food systems highlights the incidence of adulteration in the food chain and its possible adverse repercussions on public health. This analysis emphasizes the need for a robust and cohesive regulatory framework, as well as the implementation of advanced analytical tools to detect adulterations. It is highlighted that the violation of food integrity through fraud compromises human health and erodes consumer trust [20].

Furthermore, the systematic review on food safety in the Cuenca canton, Ecuador, over a significant period, highlights the urgency of adopting rigorous hygiene and control measures in all phases of food handling, transportation and storage. It also points out the importance of training and training of those responsible for the handling and sale of food, especially for those not regulated by national regulations. These findings provide a solid foundation for strategy design and establish essential criteria for future research in this critical area [21].

The comprehensive approach implemented by the Decentralized Autonomous Government (GAD) of Ambato, as described in the "Contemporary Dilemmas Magazine: Political Education and Values" article, provides an effective model to improve food safety protocols in public markets, such as those in Guayaquil. This project achieved 100% participation of merchants, with high enrollment and an extensive training program, both virtual and in-

person, greatly exceeding the established goals. The results of the Good Manufacturing Practices exams demonstrated notable success, with a significant percentage of participants improving their knowledge and application of hygiene practices. These numerical data support the effectiveness of an educational and comprehensive approach, providing a solid basis for the implementation of similar strategies in the markets of Guayaquil in order to guarantee food safety [22].

On the other hand, in the United States, a recent study by researchers focused on farmers markets in Texas and Arkansas, revealing important challenges related to food security. This study identified significant barriers to implementing effective food safety practices, such as the lack of adequate facilities, equipment, and resources containing specific food safety guidelines for these markets. Additionally, the need for formal food safety training was highlighted, as a low percentage of participants had received this training. These findings highlight the importance of continuous learning, along with Good Manufacturing Practices and proper handling, to reduce the risk of foodborne illness in these types of markets [23].

In a notable study in Nigeria, the crucial need to comprehensively intervene in food safety protocols in the marketing of fresh products is highlighted. This approach emphasizes the importance of preventing food contamination, especially in foods grown outdoors, and recognizes the critical relevance of identifying sources of pathogenic bacteria and their resistance to antibiotics, underscoring the nutritional importance of fresh produce despite the challenges of contamination [24].

Accurately identifying existing food safety practices in public markets not only seeks to recognize areas with good practices, but also highlights aspects that need improvement. The use of tools is essential to obtain a clear and objective understanding of the current situation and propose effective and adapted solutions. By addressing weaknesses in food safety systems, we seek to not only minimize the risks of foodborne illness, but also increase consumer confidence in the products sold in these markets. These actions are essential to create a safer and healthier market environment, with both local and global impact, contributing significantly to public health and the economy [25].

The overall objective of this study is to develop a comprehensive approach that addresses at least two key aspects related to food safety practices in public markets, with the purpose of improving existing protocols. To achieve this objective, several specific objectives are proposed: identify the fundamental dimensions that must be considered when establishing food safety practices in these markets; determine the objectives used in the information gathering tools to validate said practices in public markets specifically in Guayaquil; and finally, identify and establish design limitations that may arise in the application of tools to collect information on food safety protocols in the public markets of Guayaquil. These specific objectives will guide the development of effective strategies to improve food security in these important marketing spaces [26].

Food safety in Guayaquil's public markets is a complex challenge that requires a comprehensive approach. In addition to considering the microbiological and chemical aspects of food, it is crucial to address the social and cultural practices that influence food handling and consumption. Protocols must be designed to address various contaminating agents, such as pesticide residues, food additives, foreign objects and pathogenic microorganisms. Strategies such as rigorous monitoring, proper storage and handling practices, along with control and detection measures, are essential to ensure food safety in these commercial environments [28].

A comprehensive approach to improving food safety in Guayaquil's public markets combines industrial and social elements. On the one hand, it focuses on establishing standards and processes to guarantee the quality and durability of food, through technologies and

practices that reduce contamination and improve conservation. On the other hand, the importance of addressing the awareness and practices of sellers and consumers through food hygiene education and awareness campaigns is highlighted. This approach also considers sustainability, promoting environmentally friendly agricultural practices and efficient waste management, which contributes to maintaining a healthy food system and protecting natural resources for future generations. [29]

The recognition of food safety as a human right is essential to ensure that all people, especially those in vulnerable conditions, have access to safe and nutritious food. This ethical and equitable approach guides policies and protocols toward the dignity and well-being of each individual in society. In addition, the Delphi methodology stands out as an advanced tool to consult experts in food safety and prevention of foodborne illnesses, improving efficiency and expanding its reach for the development of key tools such as Hazard Analysis and Critical Control Points (HACCP), fundamental to guarantee food safety and consumer protection. [30]

The Delphi methodology is highly applicable in the context of FBD, and its relevance is expected to increase in the future. This methodology stands out for its ability to gather and synthesize the knowledge of diverse participants, thus enriching the development of topics related to food safety. Studying this data makes it possible to evaluate acceptance and understand differences in expert opinions. Anonymity ensures greater objectivity and avoids pressure towards conformity. This methodology is applied both in the design of systems and tools to guarantee good hygienic practices and food safety, and in the description of variables and processes for effective decision making [31].

This study uses a mixed methodological approach that combines literature review and the application of questionnaires to comprehensively address the issue of food safety in public markets. The literature review provides a rich theoretical framework and a contextual perspective of the topic, while the questionnaires allow the collection of numerical and specific data that complement the qualitative findings. This combination of methods ensures a balanced and detailed exploration of the phenomenon, thus facilitating a more complete understanding of food safety practices in public markets and allowing its complexities and nuances to be effectively addressed [32].

In our study on food safety in public markets in Guayaquil, we followed a research-based methodological process, which included a prior literature review and collaborative discussion to develop a central consensus research question. We applied Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a rigorous process in systematically reviewing relevant literature. The selection of studies was made with clear inclusion/exclusion criteria, prioritizing documents up to 5 years old, except for exceptional topics such as laws or academically relevant concepts. We also incorporated news reports and newspaper articles as additional evidence to support our conclusions. [32].

We used a variety of sources, such as Google Scholar, Dialnet, Redalyc, Scielo and Scopus, to obtain scientific articles that enriched our literature review on food safety in public markets in Guayaquil. Next, we adopted a methodological approach that involved the participation of experts to select specific dimensions to evaluate in municipally administered markets. Our primary objective was to understand food safety in these settings, using synthesis matrices to present the findings in a clear and structured way [33].

Subsequently, we designed and administered a structured questionnaire to collect detailed information on food safety practices in public markets. This stage included data collection from at least one public market as a primary source, which provided us with first-hand information on the observed practices. Additionally, we complement this approach with a legal

analysis of the laws and regulations related to food safety in these markets, identifying areas for improvement and proposing recommendations to strengthen protocols [34].

Finally, we synthesize the results using synthesis matrices for an effective and structured presentation of our findings, thus providing a solid foundation for future actions aimed at improving food safety protocols in public markets. [35]

3. Results

Food safety in Guayaquil's public markets is an urgent concern due to the alarming increase in documented FBD. Recent research has found pathogens in commonly consumed foods, revealing a worrying situation in the quality and safety of the products offered in these markets. The evaluation carried out by the Guayaquil mayor's office has identified multiple irregularities in the markets, from the lack of allocation of positions to deficiencies in infrastructure and maintenance. These problems are the result of the absence of safety protocols, inadequate handling, and lack of training among merchants. [36]

In this context, the Municipality of Guayaquil is governed by a regulatory framework that seeks to ensure an efficient administration aligned with the needs of citizens. The Functional Organic Regulation establishes the administrative structure of the municipality, including the Directorate of Administration of Markets and Special Services (DACMSE), in charge of the operational management of municipal markets. This direction has the responsibility of planning, managing and maintaining the markets, also supervising cleaning and waste management to guarantee the quality of life in the canton [37]. Figure 1 shows the hierarchical level of the administrative structure mentioned.

The Department of Markets, Bays and Free Fairs, which is mentioned in Article 91, constitutes a fundamental part within the DACMSE. This department is dedicated to the daily activities of the markets, ranging from the maintenance of facilities to supporting traders and users, including the regulation of informal trade. Likewise, it coordinates social programs and services both in the markets and in other areas managed by the municipal administration [38].

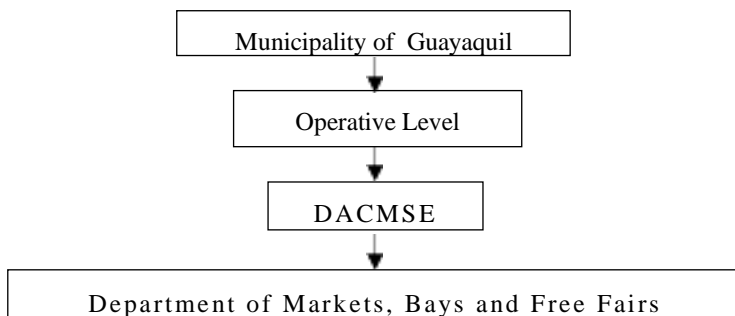


Figure 1 Level hierarchical of the city of Guayaquil in relation to the markets municipal. Information taken of the Regulation Organic M. I. Municipality of Guayaquil.

The administration system of the Municipal Markets in Guayaquil is established through regulations and regulations that define the rules to ensure their organized and efficient operation. These provisions cover aspects such as the delimitation of service areas, hours of operation, responsibilities of merchants and users, as well as rates and classification of wholesale and retail markets. In addition, specific guidelines are incorporated for the operation of

the Guayaquil Food Transfer Terminal, ensuring a comprehensive legal framework that promotes fair and safe commercial practices. In response to current challenges, it is recommended to implement immediate actions such as cleaning, fumigation and structural improvements, but the importance of a comprehensive vision that includes training, awareness and the adoption of protocols based on scientific evidence to guarantee food safety and protect the health of the population in the public markets of Guayaquil [39].

In relation to the concepts of food safety and security, the importance of understanding the differences between these concepts has been revealed. While food safety focuses on ensuring access to safe food, food safety refers specifically to the safety of food for human consumption. This understanding is deepened within the framework of the Codex Alimentarius, where elements such as Risk Assessment, GAP and HACCP are highlighted, fundamental to protecting the health of consumers and the integrity of food products worldwide [40].

The pillars of HACCP, which include risk identification and management, along with labeling, hygiene and sanitization practices, represent an essential approach to food safety. Likewise, The FOOD TECH highlights the importance of personal and food hygiene, and safe food storage, underscoring the need for safety regulations and compliance at all stages of the process. Together, these components illustrate the complexity of the topic and how the research contributes to a deeper and more nuanced understanding, with an emphasis on systematic literature review using the PRISMA method to evaluate food safety practices in public markets [41].

An exhaustive identification of studies published from 2018 was carried out, using various scientific databases such as Google Scholar, Dialnet, Redalyc, Scielo and Scopus . To refine the selection of studies, a detailed Boolean methodology was applied, using operators such as "AND", " OR " and " NOT ". These operators allowed essential terms such as "safety", "quality" and "markets" to be interconnected, guaranteeing the inclusion of sources with comprehensive discussions on these topics and excluding materials not relevant to the objective of the study, such as those focused on the mass food industry or on processes prior to the sale of products in the markets. This methodology, evidenced in Figure 2 presented, provided a specific and rigorous search approach, essential for exhaustive analysis in the field of food safety [42].

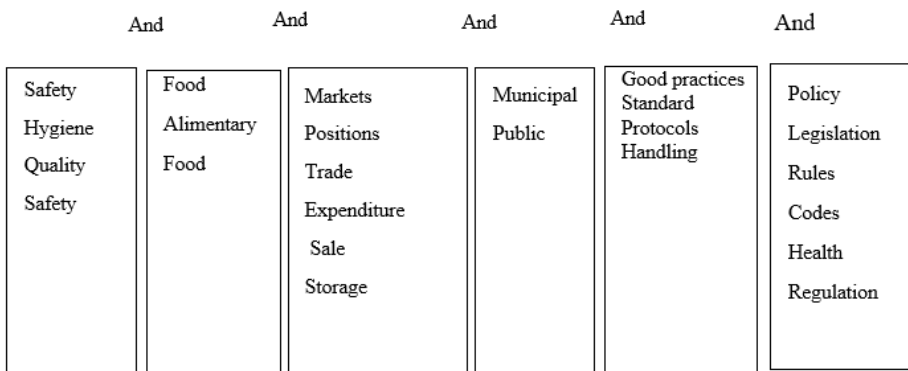


Figure 2: Methodology Boolean for security food in markets municipal.

A thorough selection process was carried out to determine the direct relevance of food safety in public markets. During this phase, those studies that, although related to food security, did not focus on markets or the specific urban environment of Guayaquil, were excluded.

Likewise, the suitability of the title and summary of each study in relation to the topic of food security in public markets was evaluated. Studies that had empirical data, applied practical methodologies, and presented results that supported management practices and policies aimed at improving food safety were prioritized, excluding theoretical or indirect research that did not directly contribute to the practical objectives of our research. This meticulous approach ensured accurate and relevant selection of studies for our analysis [43].

During the eligibility process, a comprehensive evaluation was conducted to determine the suitability of studies related to food security in public markets. This evaluation considered fundamental aspects such as the quality, relevance, consistency and applicability of the findings. Regarding the quality of the study design, the clarity and appropriateness of the methodological approach of the selected studies was reviewed, ensuring that they directly and pertinently addressed food safety in contexts similar to the Guayaquil markets [44].

Furthermore, the relevance and precision of the results was carefully analyzed, evaluating the accuracy with which the studies reported the findings related to food safety. In terms of consistency and applicability of the findings, the coherence of the results between the different studies and their direct applicability to the public markets of Guayaquil were considered, especially with regard to management practices and food safety regulations [45].

During the inclusion phase, studies that met the criteria of relevance and contribution to the research objectives in food safety in public markets were carefully selected. Priority was given to including those that offered specific and relevant details on this topic, verifying that each selected study provided detailed information on its methodologies and results, thus ensuring its direct relationship with the central theme. This ensured the incorporation of relevant, high-quality information into our analysis, resulting in the selection of 7 documents for review [46].

A crucial study conducted by Palacios (2018) at the Iñaquito Market in Quito focused on fundamental aspects of food handling, revealing significant deficiencies that were key to structuring our questionnaire. This study provided essential data to identify critical areas in food handling, which facilitated the formulation of precise questions. Furthermore, the practical solutions proposed in the study enriched our understanding of their acceptability and feasibility in different contexts, inspiring research into possible improvements and customer perceptions of food safety.

During the research process, various studies have contributed significantly to the development of a comprehensive approach to food safety in public markets. Tacuri [47] provided a detailed analysis of the safety control system at the Santa Rosa Municipal Market, based on ISO 22000-2018 regulations, which was essential to structure specific questions on food safety practices. For its part, Pino's [48] study at the Las Redes restaurant in Tonsupa delved into Good Manufacturing Practices (GMP), highlighting critical areas in food handling and providing essential insight to ensure food safety in similar markets.

In addition, the analyzes of Rodrigo (2018) in Norel México and Huaman [49] in the Lima Cercado Supply Markets revealed key aspects in the application of GMP, POES and hygienic-sanitary conditions of handlers, respectively, contributing with significant findings for evaluate and improve food safety in market environments. Finally, the work of Cargua [50] examined the effectiveness of GMP and POES in the handling of processed foods, emphasizing the importance of these practices to guarantee food safety in the food sector.

Gathering research has been essential to developing a comprehensive approach to food safety in public markets. Each study has provided critical data in addressing challenges in interpreting security regulations and practices, capturing the diversity of conditions and practices in diverse market environments. This compilation not only evaluates the current situation, but also drives the implementation of strategies to improve and comply with food safety

standards, benefiting both suppliers and consumers in these contexts. Based on the evaluation of expert criteria, four dimensions were identified as the most relevant for this study: Infrastructure, Human Resources, Storage and Handling Practices. These dimensions address specific challenges and opportunities that affect food safety, providing a robust and effective approach for the systematic inspection and evaluation of existing practices in such markets. This will allow analysis of key elements such as product quality, hygiene, administrative management and other essential factors that affect the general functioning of these markets [51].

3.1 Infrastructure

The infrastructure dimension encompasses both the architecture and physical state of the facilities, including the functionality of systems essential to maintaining an environment conducive to food safety.

The studies carried out by Palacios, Tacuri, Pino, Rodrigo, Huaman and Cargua [52, 53] have provided criteria that have helped us define the following indicators:

- The design and distribution of areas are crucial for effective cleaning management and the prevention of food contamination risks.
- The safety of food contact surfaces must be ensured using non-toxic and easy-to-clean materials.
- Pest control and the implementation of physical barriers are key aspects to avoid contamination.
- Facilities for personal hygiene and waste management are also important indicators of commitment to food safety.

It is essential to carry out a systematic and detailed evaluation of these areas to recommend improvements that ensure food safety and public health in the Guayaquil municipal market.

3.2 Human talent

The human talent dimension in relation to food safety focuses on evaluating employee training and hygiene practices, as well as the availability of personal protective equipment, fundamental aspects to protect public health.

To ensure product safety in Guayaquil's municipal markets, it is crucial to prioritize ongoing staff training in all relevant aspects, from food handling to personal and environmental safety. The effectiveness of current training programs should be evaluated to ensure that they meet the necessary standards.

Additionally, the evaluation should include an analysis of staff medical examinations, the appropriateness of clothing and footwear, compliance with hand hygiene and personal care standards, access control to critical areas, and the effectiveness of signage. and safety standards in the market. These aspects are essential to maintain the integrity of food handling processes and ensure overall food safety.

3.3 Storage

The storage dimension focuses on examining food storage conditions, including the hygiene of warehouses, the effectiveness of storage systems for preserving products, and the suitability of transportation, especially for foods that require refrigeration.

In the evaluation of storage systems in the municipal markets of Guayaquil, it is crucial to review the cleanliness and organization of the warehouses to prevent food contamination. Attention should be paid to the use of shelves or platforms that prevent food from coming into contact with harmful agents, thus facilitating effective cleaning.

Additionally, it is important to ensure that elevated storage systems are properly designed to prevent food contamination, and that refrigerated or frozen storage procedures meet specific temperature and humidity requirements. Food transportation should also be inspected to ensure that vehicles have effective refrigeration systems and protect food during transit.

Finally, the evaluation must include the conditions under which the food is sold, ensuring that it complies with all food safety regulations from packaging to presentation, to guarantee the safety of the food when it reaches the consumer.

3.4 Handling Practices

Food handling practices are carefully evaluated to guarantee compliance with the protocols that ensure the quality of the products from their arrival to the market until their delivery to the final consumer. This involves the correct application of cold chains and the protection of food against contaminants during display and sale.

It is crucial to verify the effective implementation of cold chains to preserve and display food, especially perishable foods, at adequate temperatures that prevent bacterial growth and maintain freshness until consumption. Food displays should be protected from contaminants and pests through the use of appropriate covers and clear labels, as well as the use of closed display cases or containers to ensure a physical barrier.

The use of potable water in all stages of food handling must meet standards suitable for human consumption, ensuring the cleanliness of food, utensils and work surfaces. In addition, packaging materials must be safe and first-use, avoiding the transfer of toxic substances to food and maintaining integrity and cleanliness to prevent risks of contamination during storage and display.

In Guayaquil, the 51 municipal markets are vital centers that attract consumers from various socioeconomic strata, providing fresh food and basic products at affordable prices that directly influence their well-being and quality of life. These markets face significant challenges that require attention and coordination. As of June 2023, Guayaquil was reorganized with the adoption of 19 management areas, the result of the approval of an Ordinance by the Cantonal Council, which has had a notable impact on the structure and functioning of the city.

The municipality of Guayaquil implemented administrative management areas based on criteria such as the grouping of neighborhoods, territorial homologation and the number of populations, with a specific range of not less than 90,000 inhabitants nor more than 210,000, adjustable according to the 2022 census. They were identified significant challenges to food safety in municipal markets, such as the presence of pathogens such as *E. coli* and *Salmonella*, indicating deficiencies in hygiene and food handling practices, along with a deterioration in market infrastructure that affects the safety of sellers and consumers. Using the PRISMA methodology, 150 studies were evaluated, selecting 17 after the screening process and finally identifying 7 key studies for research on food safety in public markets, see figure 3.

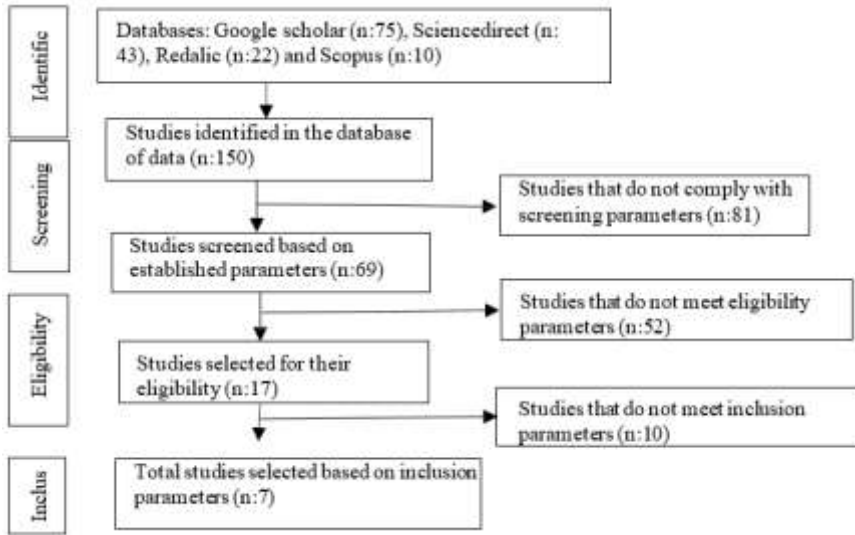


Figure 3. Diagram of flow of methodology prism. Elaborated by the authors

The analysis of 7 investigations regarding municipal management in public food security markets allowed four important dimensions to be identified: infrastructure, personnel, storage and handling practices. These dimensions are interconnected, especially handling practice, which plays an important role in ensuring food safety. 19 factors were identified in infrastructure, 8 in personnel, 5 in storage and 4 in handling. Food safety culture and constant updating of practices are crucial. These dimensions and factors are clearly represented in table 3, facilitating analysis and decision-making regarding them.

Table 3. Analysis bibliographic about the Dimensions of the Safety Food in Markets

INFRASTRUCTURE	Design and Distribution:	The areas allow for efficient maintenance, cleaning and disinfection to minimize contamination.
	Security of Surfaces:	Materials in contact with food are non-toxic and easy to clean and disinfect.
	Control of Pests:	Structures and measures that make access difficult and facilitate pest management.
	Security against Pollution:	Implementation of physical barriers in processing areas to prevent contamination.
	Accessibility for the Personal hygiene:	Availability of adequate facilities for personal hygiene of staff at strategic points.
	Barriers against invaders External:	Effective measures to prevent the entry of external contaminants such as dust, insects and rodents.
	Maintenance of Areas Critics:	Facilities in critical areas that allow maintenance, cleaning, disinfection, and minimization of cross contamination.
	Construction of Floors, Walls and Roofs:	Design and material of floors, walls and ceilings that allow for efficient cleaning and maintenance.
	Design of Unions in Critical Areas :	Concave joints between walls and floors in critical areas to facilitate cleaning.

	Design of Drains:	Floor drains with adequate protection, hydraulic seal and grease traps for easy cleaning.
	Maintenance of Cold Rooms:	Design of refrigeration and freezing chambers that allow efficient cleaning and drainage.
	Control of Access in Sensitive Areas:	Use of double doors and pest barriers in high-risk areas.
	Management of Cables in Areas Critics:	Avoid hanging cables over food handling areas.
	Lightning Suitable:	Presence of natural or artificial light similar to natural light for efficient work.
	Protection of Sources of Artificial light:	Artificial light on protected process lines to avoid contamination in case of breakage.
	Facilities Sanitary Suitable:	Hygienic services, showers and changing rooms in sufficient number and separated by gender, in accordance with safety regulations.
	Maintenance of Sanitation:	Constant cleaning and ventilation, with adequate supply of sanitary materials.
	Promotion of Personal hygiene:	Mandatory hygiene notices near sinks, especially in production areas.
STAFF	Efficient drinking water system:	Adequate supply and distribution of drinking water, with facilities for its storage and control.
	Training Keep going:	Implementation of permanent and specific training programs for staff.
	Exams Doctors:	Carrying out medical examinations before starting and periodically during the performance of duties.
	Outfit Appropriate	Use mandatory of dress clean and suitable for homework, including accessories as gloves and boots whenever necessary.
	Footwear Specific	Use of closed, non-slip and waterproof footwear by staff.
	Hygiene of Rigorous Hands	Washing hands with soap and water at key moments and after any interruption or risk of contamination.
	Coverage of Hair and Personal care	Maintenance of hair, nails, and personal appearance in accordance with hygiene standards.
	Control of Access	Restriction of entry to critical areas for unauthorized persons.
	Signaling and Rules of security	Presence of safety instructions visible and known to all staff.
	STORAGE	Hygiene in Warehouses
System of Elevated Storage		Use of shelves or platforms to avoid food contact with the floor.
Conditions of Specific Conservation		Refrigerated or frozen storage according to specific temperature, humidity and air circulation requirements of each food.
Transport Appropriate		Use of refrigerated or frozen vehicles to transport food that requires it.

PRACTICES HANDLING	Conditions of Safe Sales	Marketing of food in conditions that ensure its conservation and protection.
	Chain of cold	Application of cold chains conservation and display.
	Exhibition	Environmentally protected display.
	Water potable	I use drinking water for purification.
	Packing	Safe and first-use material packaging.

The legal review to improve food safety in the municipal markets of Guayaquil is based on several documents and laws. The Constitution of the Republic of Ecuador highlights the right to health, including access to water and food.

The government, through the Ministry of Public Health, has the responsibility of supervising and controlling food safety, as well as collaborating with municipalities in educational programs to promote hygienic and healthy practices.

The Organic Health Law establishes detailed regulations for the production, distribution and marketing of food, focusing on health surveillance and control to guarantee the quality and safety of products.

The Organic Law of the Food Sovereignty Regime and the Organic Code of Territorial Organization, Autonomy and Decentralization also address food security and the responsibility of Decentralized Autonomous Governments in providing services related to food management and the promotion of food security. For a detailed analysis of the legal dimensions established for food safety in markets, see Table 4.

Table 4. Analysis Legal about the Dimensions of the Safety Food in Markets

Body Legal	Dimension Established	
Constitution of the Republic of Ecuador	No establishes dimensions, power and establishes rights The State controls and regulates the health in the country.	
Law organic of Health	He Ministry of Health regulates security, quality and education food	
LORSA	Assures food healthy and culturally appropriate	
COOTAD	The GAD they must provide services and foment security food local	
No. ARCSA -DE- 067-2015- GGG	1. Infrastructure 3. Control pests and rodents	2. Equipment and Utensils 4. Cleaning and disinfection
	1. Infrastructure 2. Services 3. Equipment and Utensils 4. Marketing 5. Position of commercialization	

NTE IN EN 2687:2013	<ol style="list-style-type: none">6. Preparation of the food7. Hygiene of the food merchant8. Cleaning and disinfection9. Control of pests and rodents10. Training eleven. Control and assurance of the harmlessness
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The NTE IN EN 2687:2013 standard establishes technical guidelines for the efficient management of markets in Ecuador, focusing on hygiene, quality control and food safety. In addition, a comparative analysis of international codes was carried out to enrich the understanding of the regulations related to the sale of food on public streets. The Regional Guidelines for the Formulation of Control Measures for Street Foods in Africa, the Regional Code of Practice for Street Foods (Near East), the Regional Code of Hygienic Processing Practices and Street Food Sales (Latin America and the Caribbean) and the Regional Code of Hygienic Practices for the Sale of Food in Asia provide regulations to ensure the hygiene and safety of food sold in different regions of the world.

These codes address topics such as hygiene, preparation, storage, pest control, health and vendor training, seeking to promote the sale of safe and healthy foods. Based on these regulations and the NTE IN EN 2687:2013, a table has been developed to enrich the information on the legal points related to food safety in the municipal markets of Guayaquil.

In addition, the technical health regulations for processed foods establish specific requirements to guarantee the quality, safety and security of food in Ecuador, highlighting the importance of compliance with technical and health standards to protect the health of the population and ensure safe and quality food.

4. Discussion

The proposed matrix and the NTE IN EN 2687:2013 standard coincide in several key aspects related to food safety in the municipal markets of Guayaquil. Both highlight the importance of infrastructure, personal hygiene, the supply of drinking water, solid waste management, cleaning and disinfection, maintenance of equipment and utensils in hygienic conditions, and training of personnel on food safety issues.

In terms of infrastructure, both sources highlight the need for spaces designed and built to maintain a safe and healthy environment in the market, using safe and easy-to-clean materials. They also emphasize the importance of keeping marketing stands clean and orderly, grouping them according to the nature of the products and having adequate facilities to avoid contamination.

Regarding personal hygiene, both sources mention the importance of maintaining appropriate clothing, hand washing, and preventing cross-contamination during food handling. They also highlight the need to implement cleaning and pest control programs in market facilities.

Furthermore, both the standard and the proposed matrix underline the importance of staff training in food safety issues, specifying that all market workers must receive training in this area. Also mentioned is the need to have a person responsible for ensuring safety, technical criteria for receiving products and daily temperature controls to verify food safety.

Both the proposed matrix and the NTE IN EN 2687:2013 standard emphasize the importance of specific measures to guarantee food safety in the municipal markets of Guayaquil, from infrastructure to staff training and quality controls. Table 5 provides a comparative

analysis of the dimensions raised with the NTE INEN 2687:2013, offering further insights into each category such as storage, equipment, infrastructure, and food handling practices.

Table 5. Analysis comparative of dimensions raised with the NTE INEN 2687:2013

Established Dimensions	NTE IN IN 2687:2013	Observations
Storage	Acquisition, marketing, transportation, reception and storage of food	Do emphasis in areas clean and secure for acquisition and storage of food.
Equipment and Utensils	Equipment and Utensils	They focus on the hygiene of equipment and utensils to avoid cross contamination.
	Infrastructure	Both texts emphasize the importance of design solid, hygiene staff, and materials insurance.
Infrastructure	Services	They highlight the supply need of drinking water, clean drainage and harvest of waste.
	Control of pests and rodents	They demand control of pests and use of pesticides approved.
Staff	Training	They stand out the training for food security.
	Hygiene from the food merchant	They highlight the hygiene staff and the appropriate clothing for merchants.
Practices Manipulation of Food	Position of commercialization	They talk about the importance of maintaining clean stalls and organized.
	Preparation of the food	They address the hygiene in the handling food and contamination prevention.
	Cleaning and disinfection	They emphasize cleanliness and disinfection throughout the market.
	Safety control and assurance	They emphasize the control preventive of the food safety in the market.

The study has adjusted its strategy due to Executive Decree 111 that declares the situation of internal armed conflict in Ecuador. A sample was selected from two markets in Guayaquil. These markets were selected for their representativeness and accessibility in the current challenging environment, balancing sample and research feasibility. Although this limitation may affect the generalizability of the results, it is considered a prudent measure to ensure the quality and relevance of the data collected while maintaining the integrity of the study.

Market 1 is the largest supply center in Guayaquil and Ecuador, opened in 2000. With 6,000 merchants and 612 warehouses, it serves as the main distribution point for retail markets, hotels, restaurants and other businesses in the city. Market 2 is a prominent meeting point in Guayaquil, with a centuries-old history and a significant renovation in 2018. With 268 stalls and a diversity of sections, it reflects the cultural and commercial evolution of the city, offering a variety of products such as meats, poultry, seafood, flowers, fruits, dairy products and natural products, as outlined in table 6.

Table 6. Percentage of Compliance by Dimensions in Markets Selected

Dimensions	Market 1		Market 2		Total	
	Compliant	Fails	Compliant	Fails	Compliant	Fails
Infrastructure	40.4	59.6	54.4	45.6	47.4	52.6
Services	28.6	71.4	90.5	9.5	59.5	40.5
Equipment and Utensils	53.3	46.7	93.3	6.7	73.3	26.7
Acquisition, commercialization, transport, reception and storage food	95.7	4.3	100.0	0.0	97.8	2.2
Position of commercialization	57.9	42.1	100.0	0.0	78.9	21.1
Preparation of food	33.3	66.7	46.7	53.3	40.0	60.0
Hygiene of the manipulator of prepared foods and merchant	19.0	81.0	28.6	71.4	23.8	76.2
Cleaning and disinfection	33.3	66.7	33.3	66.7	33.3	66.7
Control of pests and rodents	100.0	0.0	100.0	0.0	100.0	0.0
Training	0.0	100.0	66.7	33.3	33.3	66.7
Control and assurance of the harmlessness	0.0	100.0	68.2	31.8	34.1	65.9
Promotion of the health	0.0	100.0	0.0	100.0	0.0	100.0

Based on the data collected from selected markets, several conclusions can be drawn and actions recommended to improve food quality and safety in these environments:

1. Infrastructure and Equipment:

- The need for significant improvements in the infrastructure of both markets is identified to ensure a safe and healthy environment.
- Market 2 shows positive compliance in services, equipment and utensils, highlighting the importance of effective management and investment in resources.
- It is recommended that Market 1 undertake urgent reforms to achieve and maintain safety standards.

2. Acquisition, Marketing and Preparation of Food:

- Market 2 demonstrates high compliance in merchandising and merchandising position, while Market 1 shows areas of improvement.
- Both markets need to implement significant improvements in food preparation practices to ensure the safety and quality of the products offered.

3. Personal Hygiene and Cleanliness:

- There is a considerable gap in the training and personal hygiene practices of food handlers and merchants in both markets.
- It is recommended to focus efforts on improving cleaning and disinfection routines to ensure a safe and healthy environment.

4. Pest Control and Food Safety:

- Both markets achieve full compliance in pest and rodent control, but additional efforts are needed to strengthen hygiene and cleaning practices.
- It is suggested to implement training programs and food safety measures to improve the current situation and ensure a safe food environment.

5. Health Promotion and Food Education:

- A crucial opportunity is identified to develop strategies that improve the well-being of merchants and customers through health promotion and food education programs.
- It is essential to review local legislation to ensure its alignment with national and international standards and establish monitoring and evaluation systems for continuous improvement.

It is advisable to strengthen the health infrastructure, the optimization of basic services for the handling and conservation of food, the implementation of continuous training programs, and the promotion of health and food education. This will require effective collaboration between the autonomous government, merchants and the public health entity for a successful and sustainable implementation.

Finally, the importance of making a comparison of the costs of implementing good practice practices with respect to the benefits in public health is established, referring to a delimited sector, as well as the incidence of fines for poor control.

5. References

1. Agrocalidad. (2020). La inocuidad de alimentos, un asunto de todos. <https://www.agrocalidad.gob.ec/la-inocuidad-de-alimentos-un-asunto-de-todos/>
2. F. O. Alvarado, J. Vera, G. Féрман, & A. C. García. (2022). "Políticas públicas locales y soberanía alimentaria: el mercado tradicional de Miahuatlán de Porfirio Díaz, Oaxaca." *Acta Universitaria*, 32, 1-22. <https://doi.org/10.15174/AU.2022.3604>
3. Arcsa. (2012). Agencia Nacional de Regulación, Control y Vigilancia Sanitaria (Arcsa) Doctor Leopoldo Izquieta Pérez. <https://www.controlsanitario.gob.ec/wp-content/uploads/downloads/2020/06/Creacio%CC%81n-y-competencias-de-Arcsa.pdf>
4. Arcsa. (2023). Normativa técnica sanitaria para alimentos procesados, 2023. https://www.controlsanitario.gob.ec/wp-content/uploads/downloads/2023/07/RESOLUCION-ARCSA-DE-2022-016-AKRG_NORMATIVA-TECNICA-SANITARIA-SUSTITUTIVA-ALIMENTOS-PROCESADOS.pdf
5. CAN. (2002). Decisión 515. <https://www.comunidadandina.org/StaticFiles/DocOf/DEC515.pdf>
6. CAN. (2014). Resolución N° 1685. <https://www.comunidadandina.org/ressources/resolucion-1685/>
7. W. Cargua. (2022). Elaboración de un manual de Buenas Prácticas de Manufactura (BPM) en la empresa de "Lácteos Estrellita", perteneciente a la parroquia de Aloasi Cantón Mejía. <https://repositorio.uta.edu.ec/bitstream/123456789/34925/1/AL%20816.pdf>
8. Ciudadano. (2023). Alcalde Aquiles Álvarez presentó su segundo informe relacionado a cinco importantes áreas municipales – Alcaldía Ciudadana de Guayaquil. <https://www.guayaquil.gob.ec/alcalde-aquiles-alvarez-presento-segundo-informe-relacionado-cinco-importantes-areas-municipales/>

9. Concejo Cantonal de Guayaquil. (2007). Bienes municipales ordenanzas y reglamentos municipales referidos a bienes municipales.
10. Concejo Cantonal de Guayaquil. (2010). 2010-.06-01-Reglamento-organico-funcional-del- Municipio-de-Guayaquil. Alcaldía Ciudadana de Guayaquil.
<https://www.guayaquil.gob.ec/wp-content/uploads/2021/10/2010-06-01-Reglamento-organico-funcional-del-Municipio-de-Guayaquil.pdf>
11. Concejo Municipal de Guayaquil. (2019). Ordenanza sustitutiva reglamentaria de la terminal de transferencia de víveres de guayaquil.
12. O. V. Cordero Ahiman (2022). Ley Orgánica del Régimen de la Soberanía Alimentaria de Ecuador. *Revista Chilena de Nutrición*, 49(S1), 34–38.
<https://doi.org/10.4067/S0717-75182022000400034>
13. J. D. Ardila, J. P. Rátiva, B. Cardona, L. Montoya Agudelo, Y. Blanco Cardona, C. Alveiro Montoya Agudelo, L., Rondón Rangel, A. L. Muñoz Restrepo, D. Romero Camargo, P. Mesa Ochoa, V. Santamaría Echeverry, Yubicely Blanco, L. Cardona, O. Barragán, R. Gaudio, M. Martínez, J. Moncayo, N. Castillo, M. Hans Cediell, C. Pérez Muñoz, M. Edna, P. Pérez, S. Rua, F. Otarona (2022). IV Encuentro Internacional de Investigación en Economía Solidaria e Innovación Social: Conexión Generacional – ESIS 2022. <https://doi.org/10.16925/ECAM.05>
14. N. Escobar, S. Beas, N. Gras, M.A. Ronco (2023) Fraude alimentario: Pasado, presente y futuro. *Revista Chilena de Nutrición*, 50(1), 106–116. <https://doi.org/10.4067/S0717-75182023000100106>
15. FAO. (2020). Guía para el Día Mundial de la Inocuidad de los Alimentos 2020. www.fao.org/world-food-safety-day
16. FAO. (2022). El estado de los mercados de productos básicos agrícolas 2022. In *El estado de los mercados de productos básicos agrícolas 2022*. FAO.
<https://doi.org/10.4060/cc0471es>
17. FIAN. (2020). Crisis Alimentaria. <https://www.fian.org/es/publication/articulo/crisis-alimentaria-en-ecuador-nuestro-derecho-a-la-alimentacion-en-tiempos-de-covid-19-2606>
18. Food and Agriculture Organization of the United Nations (2020). Instrumento de evaluación del sistema de control de los alimentos: Introducción y glosario. <https://www.fao.org/publications/card/es/c/CA5334ES>
19. Freire, C. E., Carrera, F. M., Hurtado, G. E., Matute, J. S., Freire, C. E., Carrera, F. M., Hurtado, G. E., & Matute, J. S. (2022). Análisis de las relaciones internacionales del Ecuador con la Comunidad Andina de Naciones (CAN) para determinar su efecto en el flujo del comercio internacional de la región. *Información Tecnológica*, 33(1), 25–34.
<https://doi.org/10.4067/S0718-07642022000100025>
20. Galarza, M. S. M., Troya, F. A. B., & León, A. G. P. (2023). Prácticas de economía circular en mercados públicos. *RECIAMUC*, 7(2), 305–316.
[https://doi.org/10.26820/RECIAMUC/7.\(2\).ABRIL.2023.305-316](https://doi.org/10.26820/RECIAMUC/7.(2).ABRIL.2023.305-316)
21. Gizaw, Z. (2019). Public health risks related to food safety issues in the food market: a systematic literature review. *Environmental Health and Preventive Medicine* 2019 24:1, 24(1), 1–21. <https://doi.org/10.1186/S12199-019-0825-5>
22. Gustavo Noboa. (2002). Reglamento de Buenas Prácticas para alimentos procesados. <https://www.controlsanitario.gob.ec/wp-content/uploads/downloads/2013/11/REGLAMENTO-DE-BUENAS-PRACTICAS-PARA-ALIMENTOS-PROCESADOS.pdf>
23. E. Huamán, W. Zárate (2019). Análisis situacional de las condiciones higiénico-sanitarias del manipulador de alimentos en los mercados de abastos de lima cercado enero - junio 2017.

- <https://repositorio.uwiener.edu.pe/bitstream/handle/20.500.13053/3021/TESIS%20Humam%20Elizabeth%20-%20Z%20Wilber.pdf?sequence=1&isAllowed=y>
24. L. M. Huerta, M. A. Corredor, S. P. Daza, J. A. Chivara (2022). Markets as Territorial Spaces of Gastronomic Tourism, Assessment of Bogota's Typical Gastronomy. *Cuadernos de Geografía: Revista Colombiana de Geografía*, 31(1), 128–145. <https://doi.org/10.15446/RCDG.V31N1.88754>
 25. Huertas Angelica. (2020). Contextualización del concepto de inocuidad en el concepto de seguridad alimentaria y nutricional. *AlimentosHoy*, 27(48), 27–50. https://www.acta.org.co/acta_sites/alimentos hoy/index.php/hoy/article/view/544
 26. C. D. Iwu, A. I. Okoh (2019). Preharvest Transmission Routes of Fresh Produce Associated Bacterial Pathogens with Outbreak Potentials: A Review. *International Journal of Environmental Research and Public Health* 2019, Vol. 16, Page 4407, 16(22), 4407. <https://doi.org/10.3390/IJERPH16224407>
 27. Jairo, R. (2020). El impacto del COVID-19 en la cadena alimentaria y el suministro de alimentos.
 28. D.A. Jiménez-López., E. A. Pérez-García, N. Martínez-Meléndez, R. Solano (2019). Orquídeas silvestres comercializadas en un mercado tradicional de Chiapas, México. *Botanical Sciences*, 97(4), 691–700. <https://doi.org/10.17129/BOTSCI.2209>
 29. D.A. Lampert., G.A. Leotta, S. Porro (2022). A documentary analysis of the approach to foodborne diseases in scientific-technological careers: the cases of Veterinary Medicine and Food Engineering. *Analecta Veterinaria*, 42(2). <https://doi.org/10.24215/15142590e068>
 30. S. Martinelli, S. Cavalli (2019). Healthy and sustainable diet: A narrative review of the challenges and perspectives. In *Ciencia e Saude Coletiva* (Vol. 24, Issue 11, pp. 4251–4262). Associação Brasileira de Pós - Graduação em Saude Coletiva. <https://doi.org/10.1590/1413-812320182411.30572017>
 31. Mohammad, Z. H., Yu, H., Neal, J. A., Gibson, K. E., & Sirsat, S. A. (2019). Food Safety Challenges and Barriers in Southern United States Farmers Markets. *Foods* 2020, Vol. 9, Page 12, 9(1), 12. <https://doi.org/10.3390/FOODS9010012>
 32. M. S. Morante, F. A. Benítez Troya, A. G. Parrales León (2023). Prácticas de economía circular en mercados públicos. *RECIAMUC*, 7(2), 305–316. [https://doi.org/10.26820/re- ciamuc/7.\(2\). cabril.2023.305-316](https://doi.org/10.26820/re- ciamuc/7.(2). cabril.2023.305-316)
 33. MSP. (2021). Comité del Codex Alimentario, responsable de la inocuidad alimentaria en Ecuador, desarrolló primera reunión ordinaria – Ministerio de Salud Pública. <https://www.salud.gob.ec/comite-del-codex-alimentario-responsable-de-la-inocuidad-alimentaria-en-ecuador-desarrollo-primera-reunion-ordinaria/>
 34. MSP. (2023). Informe de personas con ETA SE14-2023. <https://www.salud.gob.ec/wp-content/uploads/2023/05/ETAS-SE-14.pdf>
 35. N. S. Nyokabi, J. F. Lindahl, L. T. Phelan, S. Berg, G. Gemechu, A. Mihret, Wood, J. L. N., & Moore, H. L. (2023). Exploring the composition and structure of milk and meat value chains, food safety risks and governance in the Addis Ababa and Oromia regions of Ethiopia. *Frontiers in Sustainable Food Systems*, 7, 1085390. <https://doi.org/10.3389/FSUFS.2023.1085390/BIBTEX>
 36. OIRSA. (2016). Manual de análisis de peligros y puntos críticos de control - HACCP. OMS, OPS, & FAO. (2017). Manipuladores de alimentos. <https://www.fao.org/3/i7321s/i7321s.pdf>
 37. ONU. (2019). Primera Conferencia Internacional FAO/OMS/UA sobre inocuidad alimentaria. <https://www.who.int/docs/default-source/resources/chairpersons-summary-addis-ababa-es.pdf>

38. ONU. (2023). El estado de la seguridad alimentaria y la nutrición en el mundo 2023. FAO; IFAD; UNICEF; WFP; WHO; <https://doi.org/10.4060/cc3017es>
39. H. Onyeaka, O.C. Ekwebelem, Eze, U. A., Q. I. Onwuka, J. Aleke, O. Nwaiwu, J. O. Chionuma (2021). Improving Food Safety Culture in Nigeria: A Review of Practical Issues. *Foods* 2021, Vol. **10**, Page 1878, 10(8), 1878. <https://doi.org/10.3390/FOODS10081878>
40. OPS. (2019). Folleto - Inocuidad de los alimentos, un asunto de todos: Guía para el Día Mundial de la Inocuidad de los Alimentos 2019 - OPS/OMS | Organización Panamericana de la Salud. <https://www.paho.org/es/documentos/folleto-inocuidad-alimentos-asunto-todos-guia-para-dia-mundial-inocuidad-alimentos-2019>
41. Organización de las Naciones Unidas. (2013). Código de prácticas regional para los alimentos vendidos en la vía pública (cercano oriente). https://www.fao.org/fao-who-codexalimentarius/sh-proxy/es/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B71R-2013%252FCXP_071Rs.pdf
42. Organización de las Naciones Unidas para la Agricultura y la Alimentación. (2018). Tu guía de la FAO: libro de actividades. Organización de las Naciones Unidas para la Alimentación y la Agricultura. <https://www.fao.org/3/i9752es/i9752es.pdf>
43. Organización de las Naciones Unidas para la Alimentación y la Agricultura. (2001).
44. Código Regional De Prácticas De Higiene Para La Elaboración y venta De Alimentos En Las Calles (América Latina y el Caribe). https://www.fao.org/fao-who-codexalimentarius/sh-proxy/es/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B43R-1995%252FCXP_043Rs.pdf
45. Organización de las Naciones Unidas para la Alimentación y la Agricultura. (2017). Código Regional de Prácticas de Higiene para los Alimentos. https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B76R-2017%252FCXC_076Rs.pdf
46. Organización Mundial de la Salud. (1999). Directrices Regionales para la formulación de medidas de controles de los alimentos que se venden en la vía pública en África. https://www.fao.org/fao-who-codexalimentarius/sh-proxy/es/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B22R-1997%252FCXC_022Re.pdf
47. RAE. (2022). Definición mercado | Diccionario de la lengua española | RAE - ASALE. <https://dle.rae.es/mercado>
48. P.R. Reyes, I. Espinoza (2018). Satisfacción del cliente con la actividad comercial de los mercados públicos de la Heroica Ciudad de Huajuapán de León, Oaxaca / Customer satisfaction with the commercial activity of the public markets of the Heroica Ciudad de Huajuapán de León, Oaxaca. *RICEA Revista Iberoamericana de Contaduría, Economía y Administración*, 7(13), 95–113. <https://doi.org/10.23913/RICEA.V7I13.113>
49. D. Rodrigo, A. Corona (2018). Evaluación de un sistema de control sanitario (BPM y POES) para la gestión de una certificación HACCP. <http://reini.utcv.edu.mx/bitstream/123456789/533/1/8815.pdf>
50. E. M. Silvia, V. Bonilla, C. Tannia, M. Poveda, F. Aníbal, P. Franco. (2022). Calidad de los alimentos preparados en los mercados del GAD Municipalidad de Ambato. Fortalecimiento de medidas preventivas y principios básicos de higiene para garantizar la inocuidad. *Dilemas Contemporáneos: Educación, Política y Valores*. <https://doi.org/10.46377/DILEMAS.V10I1.3366>
51. Y. A. Tacuri Mocha, M. A. Cortez Rivera (2022). Propuesta de aplicación del diseño de la norma ISO 22000 -2018 en el mercado municipal del cantón Santa Rosa. Universidad

- de Guayaquil. Facultad de Ingeniería Química. <http://repositorio.ug.edu.ec/handle/re-dug/61127>
52. J. O. Ulloa, E. M. Arteaga, A. M. Avilés, S. P.D Moscoso (2020). Revisión sistemática de estudios sobre inocuidad alimentaria en Cuenca, Ecuador, periodo 1981- 2017. *Segurança Alimentar e Nutricional*, 27, e020024–e020024. <https://doi.org/10.20396/SAN.V27I0.8654199>
 53. Vlir Network. (2019). Resultados de contaminación microbiana de alimentos de consumo masivo en Quito, Guayaquil y Cuenca. <http://www.vlirnetworkecuador.com/red-interuniversitaria-de-inocuidad-alimentaria-del-ecuador/>