

Prevalence of Food-Borne Illnesses in Small-Scale Food Enterprises in Turbo Sub-County, Uasin-Gishu County, Kenya

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Abstract

Food-borne illnesses remain a persistent public health challenge globally, particularly in informal food systems where hygiene and regulatory compliance are weak. This study assessed the prevalence of food-borne illnesses in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County, Kenya. Specifically, it examined symptoms experienced by employees and supervisors, frequency of diagnoses or hospitalizations, and customer-reported symptoms. A mixed-method cross-sectional design was used, involving structured questionnaires, key informant interviews among 159 food handlers and 3 regulatory officers. Descriptive statistics were generated using means and standard deviations, while qualitative data were thematically analyzed. Findings revealed that both employees and supervisors reported common symptoms of food-borne illnesses, including stomach pain, fever, vomiting, nausea, and diarrhoea, with relatively similar mean scores across groups, indicating widespread exposure to unsafe food handling environments. Dehydration and prolonged diarrhoea were the most frequently reported conditions requiring diagnosis or hospitalization, while severe outcomes such as bloody diarrhoea and frequent vomiting were less common, suggesting possible underreporting or limited clinical confirmation. Customer-reported symptoms mirrored these patterns, with nausea, vomiting, and fever being the most frequently observed complaints, although inconsistencies between employee and supervisor reports indicated weak documentation systems. The study concludes that food-borne illnesses are prevalent but likely underreported in small-scale food enterprises in Turbo Sub-County. The burden is characterized more by moderate gastrointestinal illness than severe clinical outcomes, although dehydration and prolonged illness indicate meaningful health risks. Differences in reporting patterns and low documentation of severe cases suggest gaps in surveillance and food safety monitoring systems. The study recommends strengthened regulatory enforcement, routine inspection, and standardized reporting mechanisms, alongside continuous training of food handlers to improve hygiene practices and reduce the burden of food-borne diseases in the region.

Keywords: Food-borne illnesses, small-scale food enterprises, food safety, Turbo Sub-County, public health surveillance

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I. Introduction

Food is a fundamental human need that sustains life, supports health, and underpins socio-economic development at individual, community, and national levels. Adequate access to safe and nutritious food enhances productivity, cognitive development, and overall well-being, while food insecurity undermines health outcomes and economic stability. Globally, food systems are central to achieving sustainable development goals, particularly those related to hunger eradication and health promotion. However, the benefits of food are contingent not only on availability but also on safety and quality. Unsafe food compromises nutrition gains and contributes significantly to disease burden. According to the World Health Organization, food-related hazards diminish the positive role of food systems by exposing populations to biological, chemical, and physical risks (WHO, 2015). In Kenya, agriculture and food enterprises significantly contribute to GDP and employment, making food safety a critical concern for national development and public health protection (Government of Kenya, 2012).

Food safety refers to the handling, preparation, and storage of food in ways that prevent contamination and ensure it is safe for consumption. It encompasses measures aimed at controlling hazards across the food chain, from production to consumption. Despite global advancements, food safety remains a persistent public health challenge, with over 600 million people—nearly one in ten globally—falling ill annually due to contaminated food, resulting in approximately 33 million disability-adjusted life years and 420,000–450,000 deaths (WHO, 2015). Developed regions have implemented robust systems such as Hazard Analysis Critical Control Point

(HACCP), yet globalized food trade has increased cross-border contamination risks (Pires et al., 2021; Ragasa et al., 2017). In developing countries, weak regulatory enforcement, inadequate infrastructure, and limited awareness exacerbate food safety risks, particularly in informal and small-scale enterprises where compliance with safety standards is often inconsistent.

Food handling practices are a critical determinant of food safety, particularly in small-scale food enterprises where informal operations dominate. Proper handling includes hygiene practices such as handwashing, safe water use, temperature control, and prevention of cross-contamination. However, poor food handling remains widespread in many low- and middle-income countries, contributing significantly to food-borne disease transmission. In Africa, the burden of food-borne diseases is disproportionately high, with an estimated 91 million cases and 137,000 deaths annually (WHO, 2015). Studies indicate that contamination often occurs due to inadequate sanitation, improper storage, and limited training among food handlers (Morse et al., 2018). In Kenya, research has identified high levels of microbial contamination, including *Salmonella* and *Escherichia coli*, in food products, often exceeding acceptable standards (Kariuki et al., 2017; Kindiki et al., 2018). These findings highlight the need to strengthen food handling practices, particularly within informal food sectors.

Food-borne illnesses arise from the consumption of contaminated food and manifest through symptoms such as diarrhea, vomiting, abdominal pain, fever, and dehydration, with severe cases leading to hospitalization or death. Globally, the United States reports approximately 48 million cases annually, resulting in 128,000 hospitalizations and 3,000 deaths (CDC, 2018), while Europe records about 23 million cases and 4,654 deaths (WHO, 2015). In Africa, underreporting remains a challenge, yet evidence suggests high prevalence and frequent outbreaks. In Kenya, outbreaks such as cholera—11,033 cases in 2016 and 3,967 cases with 76 deaths in 2017—illustrate the magnitude of the problem (CDC, 2019; WHO, 2017). Customers consuming food from public establishments frequently report gastrointestinal symptoms, though many cases go unreported, masking the true burden. Food prepared outside the home has been linked to over 37% of outbreaks in some settings (Chen et al., 2022).

Small-scale food enterprises, particularly in Turbo Sub-County, Uasin-Gishu County, play a vital role in food accessibility but are often associated with heightened food safety risks due to limited compliance with regulatory standards. Despite existing frameworks such as the Public Health Act CAP 242 and KEBS guidelines, many establishments operate under suboptimal conditions, including inadequate sanitation and poor waste management (Government of Kenya, 2012; KEBS, 2022). Local studies indicate that over 30% of food handlers may carry intestinal parasites, increasing contamination risks (Ogolla, 2018). Additionally, outbreaks such as the 2024 Hepatitis A incident in Uasin-Gishu County, which recorded 19 confirmed cases and three deaths, underscore ongoing vulnerabilities. In Turbo Sub-County, the prevalence of food- and water-borne illnesses, coupled with frequent customer-reported symptoms and under-documented hospitalization rates, necessitates empirical assessment to inform targeted interventions and strengthen food safety practices.

1.1 Statement of the Problem

All food consumed within public spaces in Kenya among them small-scale food enterprises should meet established safety standards, ensuring that individuals access safe, nutritious meals that promote health and productivity. As such, there is need maintain a robust food safety system where all food establishments, including small-scale enterprises, comply with hygiene standards to minimize contamination and protect public health. Effective enforcement of regulations such as the Public Health Act CAP 242 and adherence to safe food handling practices would ensure low incidence of food-borne illnesses (Government of Kenya, 2012). However, the current situation indicates persistent food- and water-borne disease risks within the county. Kenya experiences recurrent food- and water-borne disease outbreaks, reflecting gaps in food safety enforcement and practice. National data show significant outbreaks such as over 12,500 cholera cases and 206 deaths reported in 2024, highlighting ongoing vulnerability (WHO, 2024). These trends suggest systemic challenges such as poor hygiene, weak surveillance, and inadequate enforcement of food safety standards, particularly in informal and small-scale food enterprises that dominate the local food sector. For instance, a 2024 Hepatitis A outbreak recorded 19 confirmed cases and 3 deaths across five sub-counties, including Turbo, reflecting a significant public health concern (World Health Organization [WHO], 2024).

Recent surveillance evidence demonstrates that food- and water-borne diseases constitute an ongoing public health concern in Uasin-Gishu County among which is Turbo Sub-County. In 2024, the county experienced an outbreak of Hepatitis A, with cases reported in five sub-counties, including Turbo. By 23 July 2024, 19 laboratory-confirmed cases and three deaths had been recorded at the county level. The detection of cases in Turbo Sub-County provides evidence of the occurrence of food- and water-borne disease within the study area and underscores the need for effective food safety and hygiene practices among enterprises involved in food handling and preparation. However, the exact prevalence of food-borne illnesses in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County remains understudied. Although interventions such as public health surveillance, outbreak response, and awareness campaigns have been implemented, they remain largely reactive rather than preventive. Existing studies in Uasin-Gishu County have largely focused on food security and general

health outcomes, with limited empirical data quantifying the prevalence of food-borne illnesses, customer-reported symptoms, and facility-related contamination in small-scale food enterprises (Mutua et al., 2021; Morse et al., 2018). Therefore, this study is necessary to assess the prevalence of food-borne illnesses in Turbo Sub-County, generate empirical evidence, and inform policy and practice improvements in food safety management.

1.2 Objective of the Study

To assess the prevalence of food-borne illnesses in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County.

1.3 Research Question

What is the prevalence of food-borne illnesses in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County?

II. Literature Review

2.1 Prevalence of Food-borne Illnesses

The global epidemiology of FDBs is largely dependent on the disparate presence and market commitment to food safety systems, most comprehensive in developed nations. However, the WHO report on the global burden of FDBs shows that the European region experience over 23 million mortalities, 400,000 disability-adjusted life years (DALYs), and 4654 deaths annually (WHO, 2015). Although diarrhoea was reported to be the leading FBD, parasitic infections were also found to account for over 17% of the cases. Most of the food contamination was reported in animal products and vegetables. According to European Food Safety Authority (2021) report, the region experienced over 5000 outbreaks of food-borne illnesses, with *Salmonella* accounting for the highest outbreaks. The high prevalence shows that despite the economic development of the region; food contamination remains one of the public health challenges. Local data shows an annual increase in FBD burden in most European countries. The Food Standards Agency (2022) report shows an increase in FBD burden in the United Kingdom, hitting 2.4 million cases in 2022, up from 1 million cases in 2009. Most of these cases are due to Norovirus contamination, with mapping of the transmission pathway indicating that eating out and retail foods account for the highest infections, 37% each.

Takeaway foods contribute to the second highest infection, accounting for 26% of the outbreaks. A 5-year study (2015 - 2019) of disease burden in the Netherlands also reported a significant contribution of the FBDs to health problems in the country. Lagerweij et al. (2020) noted that FBDs account for approximately 40% of the disease burden, 4000 DALYs in the population, and over EUR 170 million in medical costs. Evidence indicates that in the United States, the burden of FBD remains relatively high. According to the Centers for Disease Control and Prevention report (2018), there is an estimated 48 million annual cases of FBDs, resulting in approximately 130,000 hospitalizations and 3000 deaths. In the investigation of FBD epidemiology in the US, Simpson et al. (2022) reported consistently high outbreaks of illnesses over 11 years (2009-2019).

A review of the FBD surveillance by the CDC revealed over 9400 outbreaks in the study period. Although Norovirus was the leading cause of the outbreaks, accounting for 3088 outbreaks, it had the lowest severity score. Fatality rates were higher for *Streptococcus* bacteria and *Giardia* protozoa. These studies provide a comprehensive report on the burden of FBDs among the American population, demonstrating that despite the economic development, the region still suffers from a substantial burden of food contamination. The distribution of FBDs is relatively higher in Western Pacific Region compared to the European region. According to the WHO data, more than 125,000 cases are reported each year, causing over 50,000 deaths (WHO, 2016). The under-five children are the most affected group, accounting for over a third (40 million) of the illness and 7,000 deaths. Aflatoxin contamination is the major contributor to FBDs, with the majority of cases associated with a high prevalence of liver cancer.

Other studies of food-borne illnesses in the region reported a higher localized burden on the population. In the analysis of food-borne disease outbreaks between 2003 and 2017 in China, Li et al. (2020) found over 19,500 outbreaks, accounting for 235,750 cases, over 107400 hospitalizations, and 1457 deaths. Similarly, in an analysis of food-borne surveillance data between 2010 and 2020, Chen et al. (2022) found that eating out accounted largely (37.14%) for the outbreaks. These studies noted that bacteria contamination of animal products and cereals was the major cause of the outbreaks in the region.

The burden of FBDs is higher in low-income countries. According to the WHO (2015) report, the global effect of food-borne hazards is highest in Africa, accounting for an estimated 91 million illnesses and 137,000 deaths each year. Although the whole population is vulnerable, children under five are the most affected category. However, data scarcity in these regions means there is an underestimation of the current FBD burden (Desta, 2020). Igbinosa et al. (2021) assessment of food-borne pathogens in vegetables in Nigeria's retail outlets highlights the significance of food risks in disease burden in low-income settings. In an analysis of 300 samples, the authors found a high (24.6%) bacterial contamination in vegetables. Bisholo et al. (2018) also reported a high

prevalence of food contamination was also in South Africa, with over 27% cases among 87 households between 2012 and 2014. However, the majority of these cases failed to seek medical attention, pointing to an underestimation of the FBD burden in these settings.

In an assessment of the FBD burden in East Africa, Mutua et al. (2021) reviewed 71 studies on food hazards and disease distribution over 20 years between 2000 and 2020. Bacterial and parasite contamination was the most common hazard causing over 750 outbreaks in the region. Most sources of the pathogens were animal products and vegetables. Aflatoxin and antibiotic residues were also notable sources of food poisoning. An evaluation of FBD across counties in Kenya using regional estimates and 2015 WHO data also reported a consistently high burden in the population. Hoffmann and Baral (2019) estimated 15% of food-borne outbreaks occur among under-five children, with Nairobi having the highest proportion (15.7%) in the country. The estimated burden of FBDs in the counties ranged between 3.2% and 4.6% of the total disease burden, with an estimated DALYS of 5,098-58,805 and the overall country annual cost of KES 9,6043 per person.

2.2 Theoretical Framework

2.2.1 The Health Belief Model

The Health Belief Model is a psychological framework that explains and predicts health-related behaviours based on individuals' beliefs, perceptions, and attitudes toward health risks and preventive actions. The model posits that individuals are more likely to engage in health-promoting behaviour if they perceive themselves to be susceptible to a condition, believe the condition has serious consequences, perceive benefits in acting, and identify fewer barriers to performing the behaviour. Additional constructs such as cues to action and self-efficacy further influence behavioural outcomes by triggering action and enhancing confidence in one's ability to act (Alyafei & Easton-Carr, 2026).

The Health Belief Model was originally developed in the 1950s by social psychologists including Irwin M. Rosenstock, Godfrey M. Hochbaum, and Stephen Kegeles working under the U.S. Public Health Service. The model emerged from efforts to understand why individuals were reluctant to participate in preventive health programs such as tuberculosis screening (Green et al., 2020). Early formulations of the model focused on four key constructs: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers.

The relevance of the Health Belief Model to this study lies in its ability to explain food safety behaviours among food handlers in medium and small-scale enterprises. Food safety practices, such as maintaining hygiene, preventing cross-contamination, and proper food storage, are largely influenced by individual perceptions of risk and responsibility. The model helps to analyze how food handlers' perceptions of susceptibility to food-borne disease outbreaks, the severity of such illnesses, and the perceived benefits or barriers to adopting safe practices influence their behaviour (Alyafei & Easton-Carr, 2024). Additionally, factors such as training, awareness, and regulatory enforcement can act as cues to action, while resource availability and knowledge influence self-efficacy (Jones et al., 2015). Therefore, the model provides a useful lens for understanding both the risk factors and the facilitators or barriers to effective food safety management in SMEs.

The Health Belief Model has faced several criticisms. One major limitation is its overemphasis on individual-level factors while neglecting broader social, environmental, and institutional influences on behaviour. The model has also been criticized for its static nature, as it does not adequately account for changes in behaviour over time or the dynamic nature of decision-making processes (Jones et al., 2015). Further, there are methodological concerns regarding the measurement of its constructs, particularly reliance on self-reported data, which may introduce bias. Critics further argue that the model oversimplifies complex health behaviours and does not sufficiently incorporate emotional, cultural, and social influences (Alyafei & Easton-Carr, 2026). Despite these criticisms, the Health Belief Model remains highly relevant for this study due to its strong explanatory power in understanding individual health behaviours contribution to the prevalence of food-borne illnesses in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County.

2.2.2 Systems Theory

Developed by Ludwig von Bertalanffy through General Systems Theory, this theory emphasizes understanding phenomena as wholes rather than isolated parts. It highlights interdependence and the idea that system properties cannot be understood by examining components alone. Later scholars, like Norbert Wiener and Talcott Parsons, expanded the theory with feedback mechanisms and social applications (Jordans, 2024). Systems Theory views systems as interconnected elements linked through relationships, feedback loops, and flows of information or resources. It emphasizes holism, interdependence, adaptation, and non-linear outcomes, where changes in one component affect the entire system (Genest, 2023).

For SMEs in Uasin-Gishu County, Systems Theory provides a holistic lens to analyze interactions among policies, regulations, infrastructure, management, and individual behaviours affecting food safety. Empirical evidence shows that both weak enforcement and poor knowledge among food handlers contribute to unsafe practices, illustrating the system's interdependencies (Jordans, 2024). The theory explains feedback loops: weak enforcement perpetuates unsafe practices, while training creates positive feedback by improving compliance and

system performance. It also captures the complexity of supply chains, showing that coordinated interactions among actors are crucial for effective food safety management (Klocek et al., 2024).

Systems theory is critiqued for being abstract, difficult to operationalize, and sometimes overemphasizing stability while neglecting power dynamics, conflict, and inequality. Its broad scope can lead to vague analysis without precise predictive power (Genest, 2023). Despite criticisms, Systems Theory remains valuable for understanding food safety as a multi-level, complex phenomenon. It allows integration of institutional, behavioural, and environmental factors, providing insights into systemic drivers of food-borne illnesses in SMEs.

III. Materials and Methods

3.1 Research Philosophy and Design

This study is anchored in the constructivist philosophical paradigm. Constructivism posits that reality is not fixed or objective but is instead shaped by human perceptions and experiences (Muhaise et al., 2020). It emphasizes that reality is subjective and varies across individuals. From this perspective, knowledge is co-created through interaction between the researcher and the participants, implying that the knower and what is known cannot be separated. As such, understanding is actively constructed by individuals rather than passively observed or discovered (Adom, 2016).

A mixed-method cross-sectional study of the factors that facilitate and hinder effective management of food safety and hygiene practices was conducted in March to May 2024 among food SMEs in the urban areas of Turbo constituency in Uasin-Gishu County, Kenya. As population-based research on effective management of food safety practices, FBD prevalence, and factors of food safety, the need for large data makes a cross-sectional design appropriate for this study (Adams & McGuire, 2022; Canelas, 2025). The mixed method design facilitates the use of multiple data collection methods, offering the flexibility required to thoroughly explore and capture the complexity of the phenomenon under investigation.

3.2 Population

The study was conducted in the urban areas of the Turbo constituency, located along Nairobi-Malaba Road. According to the Turbo Constituency report, the cosmopolitan area has approximately 210,409 population on 322.7 square kilometers subdivided into six wards (Turbo National Government Constituency Development Fund, 2022). Although the location is purely an agricultural area, the geographical positioning with the Eldoret-Webuye highway linking Kenya and other East African countries is critical to most of the population's health and cross-border business in the region. As an international trade corridor for East and Central African countries, Turbo urban market meets the basic needs, including food and sanitation facilities for many of the traders transiting the area. Most food establishments are small-scale enterprises, sourcing their supplies locally and from cross-border traders making the food chain complex and significant in understanding food safety challenges in the region.

The study targeted 264 registered food processing small-scale food enterprises that prepare and package ready-to-eat foods in the urban markets of Turbo Constituency, Uasin-Gishu County. The study population consisted of stationary food processing enterprises with a permanent location within the study area, which were also defined as having a range of six to fifty employees. This was the unit of analysis. The study also targeted respondents who included the staff working in the different departments, limited to management or supervisory roles, and operational staff. This was the unit of observation.

3.3 Eligibility Criteria/Inclusion criteria

The study included food-related SMEs listed in the Uasin-Gishu County Ministry of Trade and Industrialization's 2024 register and operating within Turbo Sub-County for at least one year. Eligible respondents were proprietors/employers and employees aged 18 years and above, with at least one year of service in the enterprise, who provided informed consent. The register comprised 264 SMEs, which constituted the sampling frame.

The study excluded enterprises that were closed, inactive, or unavailable during the data-collection period, as they could not provide current information on food-handling and management practices. Respondents who were unavailable during the data-collection period, declined to participate, or were unable to provide informed consent were excluded. Respondents who were not directly involved in the day-to-day operations or food-related activities of the enterprise were also excluded, as they were considered unlikely to provide reliable information on the practices under investigation. In addition, enterprises or respondents whose relevant information could not be adequately verified were excluded to maintain the reliability and completeness of the study data.

3.4 Sample Size Determination

Yamane's formula for finite population sampling was used in calculating a representative sample size for this study given by the Yamane (1967) formulae.

$$n = \frac{N}{1 + N(e^2)}$$

Where,

n = the required sample size

N= 264 registered number of food processing SMEs that prepare and package ready-to-eat foods in the urban areas of Turbo constituency

e = margin of error, 0.05

Applying the formula resulted in a sample size of 159 food processing SMEs from which one participant from each of the selected food SMEs was selected. In addition, a representative staff from certification, licensing, and inspection departments in KEBS, the Ministry of Agriculture, and public health within Uasin-Gishu County were purposively sampled for Key Informant Interviews (KII) bringing the total sample size for the unit of observation to 163 respondents.

Identification and sampling was done using a list of the current food SMEs operating in the area obtained from the Uasin-Gishu County Ministry of Trade and Industrialization offices was used as the sampling frame. Systematic random sampling was then applied to select the SMEs. Additionally, three participants were purposively sampled from KEBS, the Ministry of Agriculture, and public health within the county for Key Informant Interviews to provide expert views on the topics of interest in the study.

3.5 Data Collection Methods

For the quantitative component, the study utilized survey questionnaires as the main data collection tools. Surveys were widely used to gather information from large populations, particularly on attitudes, perceptions, and behavioural patterns that were difficult to measure using other methods (Domede & Dinkelman, 2022). The study employed Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) to collect qualitative data. KIIs were conducted with the Sub-County Public Health Officer, County Trade Officer, food safety/public health inspectors, and other relevant regulatory officials involved in food safety oversight. FGDs were conducted separately with SME employers and employees involved in food handling and related activities to explore their experiences with food safety practices and policy implementation. Consistent with Ruslin et al., (2022), semi-structured interviews facilitated the exploration of issues, experiences, and contextual factors that were not adequately captured through structured instruments and also informed the development of subsequent data collection instruments.

3.6 Data Analysis Methods

Data was entered and cleaned in Microsoft Excel and analyzed in R software. Excel provides a more user-friendly layout for data entry and editing, placing limits for information and display per cell, with R software appropriate for producing good data visualizations (Naylor et al., 2022). A descriptive analysis was conducted to provide summary statistics (frequency and percentages) of the variables of interest, including demographic characteristics calculated as proportions. Multiple regression analysis was conducted to infer the relationship between factors and effective management of food safety practices in food processing plants. This quantitative analysis assumed normality in the distribution of observations.

Qualitative data from FGDs and KIIs was analyzed using the latest version of NVIVO. Transcription of the audio files was automatically coded using the Nvivo software before importing Word documents for analysis. Braun and Clarke's (2006) six-step framework was applied in identifying patterns and themes in the qualitative data.

3.7 Ethical Considerations

Ethical clearance and consent to participate in the study was sought from the relevant authorities and respondents before data collection commencement. The research and data collection instruments were subjected to approval by the Human Research Review Board of Moi University to ensure content validity. Further approval was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Additional permission to collect data for the study was sought from the selected small-scale food enterprises. Informed consent was obtained from the eligible participants during data collection. The data was de-identified using codes to ensure participants' confidentiality and privacy are upheld. There were no incentives provided for the participants. The data will also be safely kept in password-protected computer files and safe boxes to protect them from unauthorized access.

IV. Results

The study achieved a 100% instrument response rate which was a strong survey response rate is critical to enhancing the credibility and dependability. Table 1.

4.1 Demographic Characteristics of Participants

Table 1 Summary of participant demographic characteristics

Variable	Age		Gender		Education Level		
Category	Mean (SD)	Median	Female (%)	Male (%)	Primary (%)	Secondary (%)	Tertiary (%)
Characteristics	SD = 28.2	Med = 27	63%	37%	12.9%	60%	27.1%

The demographic profile presented in Table 4.1 indicates that respondents in small-scale food enterprises in Turbo Sub-County are relatively young, with a mean age of 28.3 years (SD = 6.0) and a median age of 27 years. This suggests a workforce largely composed of individuals in their early productive years, which has important implications for food safety practices. A younger workforce is typically more adaptable and receptive to training interventions, particularly in adopting modern hygiene and food handling protocols. However, the relatively low dispersion in age (SD = 6.0) also implies limited variability in experience levels, which may translate to insufficient practical exposure to food safety risks and mitigation strategies. Consequently, while the workforce may possess the energy and flexibility required for compliance with food safety standards, there is a likelihood of gaps in experiential knowledge, potentially increasing vulnerability to unsafe food handling practices and associated food-borne illnesses.

In terms of gender distribution, the majority of respondents are female (63%), compared to 37% male, indicating that women play a dominant role in food handling and preparation within these enterprises. This aligns with broader trends in informal food sectors across developing countries, where women are primary actors in food vending and preparation. Regarding education levels, most respondents have attained secondary education (60%), followed by tertiary education (27.1%) and primary education (12.9%). This suggests a moderately educated workforce with basic literacy and comprehension skills necessary for understanding food safety guidelines. However, the relatively lower proportion of tertiary education may limit advanced understanding of food safety standards such as Hazard Analysis Critical Control Point (HACCP). Overall, the demographic characteristics imply a workforce with strong potential for capacity building, but one that may require targeted training to bridge gaps in technical knowledge and practical food safety implementation.

4.2 Prevalence of food-borne in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County

The prevalence of food-borne illnesses in Turbo Sub-County was examined along the following constructs; symptoms experienced by employees and supervisors, the frequency of diagnoses or hospitalizations, and the complaints reported by customers. The results are presented in the following sub-sections.

4.2.1 Experienced Symptoms of Food-borne Illness

The analysis of common symptoms of food-borne illnesses is shown in Table.2.

Table 2 Mean Values of Experienced Symptoms of Food-borne Illness

Experienced symptoms	Employee (M, SD)	Supervisor (M, SD)
Diarrhoea	1.26 (0.47)	1.39 (0.66)
Vomiting	1.51 (0.61)	1.48 (0.57)
Stomach pain or cramps	1.59 (0.70)	1.60 (0.76)
Nausea	1.45 (0.55)	1.32 (0.59)
Fever	1.59 (0.66)	1.60 (0.68)

Source: Author 2026

The findings in Table 4.2 indicate that symptoms associated with food-borne illnesses are present across both employees and supervisors in small-scale food enterprises, though with varying intensities. The most frequently reported symptoms are stomach pain or cramps (employees: M = 1.59, SD = 0.70; supervisors: M = 1.60, SD = 0.76) and fever (employees: M = 1.59, SD = 0.66; supervisors: M = 1.60, SD = 0.68), suggesting a consistent pattern of gastrointestinal and systemic infection-related manifestations within the establishments.

These symptoms are commonly associated with bacterial and viral food contamination, indicating potential lapses in hygiene, storage, or handling practices. The relatively similar mean scores between employees and supervisors also imply that exposure to contaminated food or environments may be widespread within the food production and service chain rather than isolated to a specific occupational level.

Vomiting and nausea show moderate variation between the two groups, with employees reporting slightly higher means for both vomiting ($M = 1.51$, $SD = 0.61$) and nausea ($M = 1.45$, $SD = 0.55$) compared to supervisors (vomiting: $M = 1.48$, $SD = 0.57$; nausea: $M = 1.32$, $SD = 0.59$). This may suggest that employees, who are more directly involved in food preparation and handling, experience greater exposure to contamination risks. Diarrhoea, although generally considered a primary indicator of food-borne illness, records the lowest mean scores in both groups (employees: $M = 1.26$, $SD = 0.47$; supervisors: $M = 1.39$, $SD = 0.66$), which may reflect underreporting, misclassification of symptoms, or limited severity recognition among respondents. Overall, the results suggest a persistent but possibly underreported burden of food-borne illness symptoms within small-scale food enterprises, highlighting potential gaps in food safety practices, health monitoring, and illness reporting systems in Turbo Sub-County.

4.2.2 Diagnosed or Hospitalized for Food-borne Illnesses Related to Facility Food

The results in Table 4 presents a summary of the mean frequency of Diagnosis or Hospitalization from Food-borne Illnesses.

Table 3 Mean Frequency of Diagnosis or Hospitalization from Food-borne Illnesses

Diagnosed or hospitalized	Employee (M, SD)	Supervisor (M, SD)
Bloody diarrhoea	1.20 (0.51)	1.02 (0.15)
Diarrhoea > 3days	1.39 (0.51)	1.21 (0.41)
Frequent vomiting	1.16 (0.46)	1.06 (0.24)
Dehydration	1.66 (0.63)	1.47 (0.53)
High fever	1.42 (0.56)	1.38(0.56)

Source: Author 2026

The findings in Table 3 indicate that diagnosed or hospitalization-related outcomes of food-borne illnesses are present among both employees and supervisors in small-scale food enterprises, with dehydration emerging as the most frequently reported condition. Employees reported the highest mean for dehydration ($M = 1.66$, $SD = 0.63$), followed by supervisors ($M = 1.47$, $SD = 0.53$), suggesting that severe fluid loss—often associated with acute gastroenteritis—is a common consequence of food-related infections in these settings. High fever was also consistently reported among both employees ($M = 1.42$, $SD = 0.56$) and supervisors ($M = 1.38$, $SD = 0.56$), indicating systemic infection patterns likely linked to bacterial or viral contamination. Additionally, diarrhoea lasting more than three days was reported more among employees ($M = 1.39$, $SD = 0.51$) than supervisors ($M = 1.21$, $SD = 0.41$), suggesting prolonged illness episodes that may reflect delayed treatment, repeated exposure, or inadequate preventive practices within food establishments.

In contrast, severe indicators such as bloody diarrhoea and frequent vomiting were reported at lower frequencies across both groups. Bloody diarrhoea recorded very low means among supervisors ($M = 1.02$, $SD = 0.15$) and slightly higher but still low values among employees ($M = 1.20$, $SD = 0.51$), suggesting that while severe infections exist, they are less commonly diagnosed or reported in these establishments. Frequent vomiting also remained relatively low (employees: $M = 1.16$, $SD = 0.46$; supervisors: $M = 1.06$, $SD = 0.24$), which may indicate underreporting or misclassification of illness severity. Overall, the pattern of results suggests that although severe food-borne illness outcomes are not highly prevalent, moderate to significant clinical manifestations—particularly dehydration and prolonged diarrhoea—are common, pointing to ongoing risks associated with food handling practices and hygiene conditions in small-scale food enterprises in Turbo Sub-County.

4.2.3 Frequency of Customers' Reported Symptoms of Food-borne Illnesses

The results in Table 4 presents a summary of the mean frequency of customer-reported food-borne illnesses.

Table 4. Mean Frequency of Customer-Reported Food-borne Illness Symptoms

Frequency of customers' symptoms	Employee (M, SD)	Supervisor (M, SD)
Diarrhoea	1.20 (0.51)	1.27 (0.45)
Vomiting	1.39 (0.51)	1.29 (0.46)
Stomach pain or cramps	1.16 (0.46)	1.52 (0.57)
Nausea	1.66 (0.63)	1.24 (0.43)
High fever	1.42 (0.56)	1.34 (0.48)

Source: Author 2026

The findings in Table 4.4 show variation in the frequency of customer-reported symptoms of food-borne illnesses between employees and supervisors in small-scale food enterprises. Among employees, nausea records the highest mean score ($M = 1.66$, $SD = 0.63$), followed by high fever ($M = 1.42$, $SD = 0.56$) and vomiting ($M = 1.39$, $SD = 0.51$). These results suggest that employees, who are often directly engaged in food preparation and service, perceive nausea-related complaints as the most frequently reported symptom among customers. Diarrhoea ($M = 1.20$, $SD = 0.51$) and stomach pain or cramps ($M = 1.16$, $SD = 0.46$) are comparatively less frequently reported by employees. This pattern may reflect differences in symptom visibility, reporting practices, or customer disclosure behavior within food establishments.

In contrast, supervisors report a different pattern, with stomach pain or cramps ranking highest ($M = 1.52$, $SD = 0.57$), followed by high fever ($M = 1.34$, $SD = 0.48$), vomiting ($M = 1.29$, $SD = 0.46$), diarrhoea ($M = 1.27$, $SD = 0.45$), and nausea ($M = 1.24$, $SD = 0.43$). This variation between employees and supervisors suggests possible differences in reporting roles, observation points, or exposure to customer feedback channels. Overall, the relatively low but consistent mean scores across all symptoms indicate that customer-reported food-borne illness cases exist but may be underreported or not systematically documented. The presence of symptoms such as nausea, vomiting, and fever aligns with typical manifestations of food contamination, pointing to ongoing food safety risks within small-scale food enterprises in Turbo Sub-County.

4.2.4 Burden of food-borne illnesses

Participants across both employee and supervisor groups expressed concern on the burden of food-borne diseases, acknowledging frequent reporting of gastrointestinal symptoms, including vomiting and diarrhoea, attributed to food consumption within the facilities. Supervisors expressed concern about the cost implications of these customer complaints that often affect business performance.

"We sometimes receive feedback about stomach upsets, and it affects our customer flow the next day." – Supervisor, FGD.

Employees shared similar concerns, highlighting gaps in the operational workflow, including improper handling of leftovers and rushed food preparation during peak hours, as key sources of food contamination.

"Peak hours make it difficult to follow everything. Sometimes we don't reheat food well because customers are waiting." – Employee, FGD.

4.3 Discussions

4.3.1 Symptoms experienced by employees and supervisors

The findings indicate that both employees and supervisors in small-scale food enterprises reported gastrointestinal and systemic symptoms of food-borne illnesses, particularly stomach pain, fever, vomiting, and nausea. This pattern generally agrees with global and regional literature, which identifies these symptoms as the most common clinical manifestations of food contamination (WHO, 2015; CDC, 2018). Studies in Africa similarly report that food handlers frequently experience gastrointestinal illnesses due to poor hygiene and contaminated food exposure (Morse et al., 2018; Mutua et al., 2021). However, the relatively low mean scores for diarrhoea in this study partially disagree with global evidence, which consistently identifies diarrhoea as the dominant symptom of food-borne disease outbreaks (WHO, 2015). This discrepancy may reflect underreporting, symptom misclassification, or low health-seeking behaviour among workers. The implication is that food-borne illness in Turbo Sub-County may be under-identified, masking the true burden and weakening early detection systems in small-scale food enterprises.

4.3.2 Frequency of diagnoses or hospitalizations

The results show that dehydration, prolonged diarrhoea, and high fever are the most commonly reported conditions requiring diagnosis or hospitalization among employees and supervisors. This finding agrees with global evidence, where dehydration and diarrhoeal diseases are major causes of hospitalization from food-borne illnesses, particularly in low- and middle-income countries (WHO, 2015; CDC, 2018). Studies in Africa also confirm high severity outcomes due to delayed treatment and weak health systems (Bisholo et al., 2018; Igbinosa et al., 2021). However, the relatively low frequency of bloody diarrhoea and frequent vomiting partially disagrees with epidemiological patterns in severe bacterial infections, which often report these as key indicators of acute food-borne outbreaks. This suggests possible under-diagnosis or limited access to formal healthcare reporting systems in Turbo Sub-County. The implication is that the actual severity of food-borne illnesses may be underestimated, limiting effective surveillance and timely public health response in small-scale food enterprises.

4.3.3 Frequency of customers' reported symptoms

Customer-reported symptoms show moderate frequencies of nausea, vomiting, fever, diarrhoea, and stomach pain, with variations between employees and supervisors in perceived prevalence. These findings agree with global evidence, which shows that eating-out environments, particularly informal food outlets, are significant contributors to food-borne illness exposure (Chen et al., 2022; WHO, 2015). The dominance of symptoms such as nausea and vomiting aligns with findings from developed regions where food contamination in ready-to-eat meals is a major source of outbreaks (CDC, 2018). However, the inconsistencies between employee and supervisor reporting patterns disagree with expectations of uniform reporting systems, suggesting weak documentation structures and subjective reporting biases. The implication is that surveillance systems in small-scale enterprises are fragmented, leading to unreliable customer complaint tracking. This weakens outbreak detection and reinforces the need for standardized reporting and stronger food safety monitoring systems in Turbo Sub-County.

4.3.4 Overall implication

Across all constructs, the study generally aligns with extant literature on the global burden of food-borne illnesses but reveals context-specific weaknesses in reporting, diagnosis, and surveillance. The inconsistencies and relatively low mean scores across severe indicators suggest underreporting and weak health system integration at the enterprise level. This supports literature highlighting that Africa—and Kenya in particular—suffers from significant data gaps in food-borne disease surveillance (WHO, 2015; Mutua et al., 2021). The findings therefore imply that the true prevalence of food-borne illnesses in Turbo Sub-County is likely higher than recorded, necessitating strengthened monitoring systems, improved food handler training, and more robust regulatory enforcement in small-scale food enterprises.

V. Conclusions and Recommendations

5.1 Conclusions

The study concludes that food-borne illnesses are present in small-scale food enterprises in Turbo Sub-County, Uasin-Gishu County, as evidenced by the consistent reporting of symptoms such as stomach pain, fever, vomiting, nausea, and diarrhoea among both employees and supervisors. Although the severity levels appear moderate, the similarity in symptom patterns across occupational groups suggests widespread exposure to contaminated food or unsafe handling environments within these enterprises. The findings further indicate that food safety challenges are systemic rather than isolated, reflecting persistent gaps in hygiene practices, food storage, and preparation procedures. Overall, the study establishes that food-borne illness remains a public health concern within the local food service sector.

The study also concludes that diagnosed cases, hospitalization outcomes, and customer-reported symptoms reinforce the existence of a hidden but significant burden of food-borne diseases in the study area. Dehydration, prolonged diarrhoea, and fever were the most commonly reported severe outcomes, indicating that some cases progress beyond mild symptoms. However, low reporting of severe indicators such as bloody diarrhoea suggests underreporting or weak surveillance systems. Differences in reporting between employees and supervisors further confirm inconsistencies in monitoring and documentation practices. Therefore, the true prevalence of food-borne illnesses is likely underestimated, limiting effective public health response and masking the actual magnitude of the problem in Turbo Sub-County.

5.2 Recommendations

The study recommends that the County Government of Uasin-Gishu, through public health departments, strengthen routine inspection and enforcement of food safety standards in small-scale food enterprises, with particular emphasis on hygiene compliance, food storage practices, and safe preparation methods. Regular monitoring should be complemented by mandatory certification and periodic refresher training for food handlers

to improve awareness and adherence to safe food handling practices. Additionally, standardized reporting systems for food-borne illness symptoms and customer complaints should be introduced to ensure accurate documentation and early detection of outbreaks within Turbo Sub-County.

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