

Food Security in Ghanaian Urban Cities

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Urbanisation in Ghana could be negatively impacting the state of food security, especially in economically vulnerable groups. Food supply, safety, and quality are all aspects of food security which could be impacted.

Keywords: food quality ; food access ; food utilization ; food security ; urban Ghana ; urbanization ; urban and peri-urban agriculture

1. Introduction

Currently, more than half of the Ghanaian population lives in urban areas ^[1]. Living in urban areas increases access to income-generating opportunities as well as infrastructure and services that improve quality of living. Such services may include potable water, electricity, health care, schooling, information communication technologies, and paved roads, among others ^[2]. However, rapid and unplanned urbanization can adversely affect human health and wellbeing. Without appropriate planning and interventions, urban areas can quickly become slums where a combination of poverty, inadequate and unsafe housing, and limited opportunities to access basic services can affect residents ability to access basic necessities of life, including availability, and access to quality food and water ^[1]. Ghana is increasingly becoming urbanized, as more people migrate to city settings ^[3]. Therefore, interventions are required to prevent these adverse responses from happening in urban areas in Ghana.

Whenever there is unreliable physical and economic access to sufficient, safe, and nutritious food for all people, a situation of food insecurity, if not existing already, is imminent ^[4]. The effects of food insecurity are felt across all age groups, although young children, and women of reproductive age experience the most challenging effects of food insecurity ^{[4][5]}. Food insecurity is relatively higher in rural settings, compared to urban areas in Ghana ^[5]. However, it is becoming increasingly realized that urban dwellers, especially the most economically vulnerable population groups (including those living in slums), have specific challenges to food access, quality, and safety, in ways that increase their vulnerability to becoming food insecure and, ultimately experiencing malnutrition ^[6]. Therefore, focusing food security research efforts on vulnerable urban populations is necessary.

Key issues of interest regarding urban food security are adequacy and sustainability of food supply, food price and affordability, food safety and quality, vulnerabilities, and the capacity to mitigate them. Food supply in urban areas is dependent on interactions across several complex structural and behavioural determinants ^[1]. As more people move into cities, the farming workforce reduces, and there is loss of arable land located in or near urban areas. This land, instead, is rapidly converted for residential and industrial purposes. This situation can contribute to increased cost of food, due to reduced food supply capacity ^[7]. High population density and increased demand further exerts pressure on food supply systems, leading to increased food prices. Food prices can also be affected by poor quality infrastructure such as roads linking rural growing communities to urban areas, and cost of transportation to markets. Food prices and supply are, therefore, key issues for urban food security ^[7].

To be able to cope with food insecurity, urban-dwelling households may adopt less desirable, unhealthy, and unsustainable coping mechanisms such as purchasing food of lower quality or skipping meals ^[8]. In these coping mechanisms, quality is often traded for quantity, compromising dietary adequacy, food safety and health. Low food quality may also expose consumers in urban settings to food safety risks. Given this, it is imperative to design evidence-informed interventions to address food insecurity to improve dietary quality and safety among urban dwellers; ultimately, this will improve health and wellbeing and prevent potential illness in urban settings.

Lifestyles in urban areas are also associated with increased demand for convenience foods ^[9]. High-paced work routines that often characterise urban living, increase the likelihood of relying on prepared, processed, pre-packaged, and/or ready-to-eat foods ^[10]. While these foods are convenient, they are often energy-dense and low in nutrients. Continued exposure to such foods increases risk of diet-related non-communicable diseases (NCDs) ^[10]. Findings from two case

studies in Accra, Ghana and Nairobi, Kenya have demonstrated that urban dwellers prefer diverse diets ^[10]. However, this preference for diverse diets is limited by the high cost of nutrient-rich foods, pervasive availability and exposure to marketing of processed foods, and easy access to inexpensive unhealthy foods which are often vendored in unhealthy environments ^[11]. The current Coronavirus (COVID-19) pandemic and the local and global response to address it have magnified pre-existing food insecurity burdens relating to food availability and access in vulnerable communities within urban settings ^[12].

2. Food Security in Ghanaian Urban Cities

2.1. Food Access

Food access information was reported in eight studies ^{[13][14][15][16][17][18][19][20]}. Two of these studies were conducted in the Ashanti region ^{[17][18]}, one each in the Western region ^[13], Central Region ^[19], Volta region ^[20], and three in the Greater Accra region ^{[14][15][16]}. These studies largely examined the factors that consumers consider as crucial in making decisions to access food from their neighborhood. In the Volta and the Greater Accra regions, cleanliness of the local surroundings, where food is sold, and the hygienic nature of the food handler, plays a key role in consumer choice of food access ^{[16][20]}. For instance, one study conducted in the Volta region in Ho ^[20] examined diners' decision-making to eat at traditional catering establishments. In this study, factors such as cleanliness of the place, sanitation and hygiene, cleanliness of staff, quality of food, and service staff behaviour were identified as influencers of consumers decisions to access and patronise cooked food sold in their neighbourhoods ^[20]. Additionally, in the Greater Accra, Central and Western regions, secure food was explained in terms of convenience in accessing food, the availability of food in the local area, and the perceived quality or healthiness of the foods that are available and accessible ^{[13][16][19]}. The quantity and cost of the foods were the least worried factors consumers considered, with respect to food access. For examples, in the Central regional capital of Cape Coast, the factors that influenced the respondent's choice of food and place of eating were the surrounding environments where the food was sold and the cleanliness of the food handlers. Price of the food was less of an issue if the food environment was clean and tidy ^[19]. On the contrary, two studies from the Ashanti ^[17] and Western regions ^[13] revealed that, price of food and vendor's willingness to offer food on credit influenced consumer food access decision-making.

2.2. Food Supply

We found only two relevant studies that reported on food supply in urban areas in Ghana ^{[21][16]}. One study was conducted in Northern region ^[21], and the other in the Greater Accra ^[16]. The study in the Northern region, Karg et al. ^[21] indicated that most of the food supply in urban areas in Ghana are from small-scale suppliers, usually originating from rural areas. In the Greater Accra region, studies reported that limited food supply was observed in low-income households. For instance, in the study published by Nagai et al. ^[16], it was revealed that due to high prices of raw foods or their processing cost mothers of low socioeconomic status were unable to acquire/process baby weaning foods, e.g., weanimix—a nutritional meal designed for children who are newly weaned from breast milk—for their newly weaned babies.

2.3. Food Safety and Quality

In the Greater Accra region, King et al. ^[22] found that street food vendors did not comply to food safety standards. In this study, 66% of food proprietors surveyed did not obtained meat supply from approved sources. In the majority of studies, food samples including, vegetables and ready-to-eat fruits salads, meat and fish, analysed in the laboratory, were reportedly contaminated with micro-organisms (bacterial, parasites) or heavy metals, above the acceptable levels for consumption ^{[22][23][24][25][26][27][28][29][30][31][32][33][34][35][17][36][37][38][39][40][41][42][43][44]}. Kortei et al. ^[43] analysed ready-to-eat salad in the Western region to determine their quality/safety for consumption, and reported that the mean coliforms and E. coli contamination levels in the salad were 6.35 ± 0.09 , and 5.1 ± 0.1 log cfu/g, which were above the acceptable safety level. In the Ashanti region, Akoto et al. ^[37] revealed that the risk index for combined pesticides due to contamination of all vegetables they analysed was above the acceptable safety standard level. Similar observations about food safety issues in raw foods were made in studies that analysed food and/or vegetable samples sold in various markets in the Greater Accra region ^{[23][24][26][27][28]}, Eastern region and Western regions ^{[43][44]}, and also dairy products in the Northern region ^[41].

2.4. Food Utilisation

36% of the elderly were reportedly skipping meals because of lack of food in their households. In the study conducted in the Western region, the authors reported that energy-dense street foods were more frequently purchased and consumed

by residents ^[13]. In the Sackey et al. ^[45] study in the Greater Accra region assessing food security and dietary diversity issues, fish compared to meat consumption was frequently observed. After following the study participants over time, the authors reported that the pattern of fish and meat consumption did not change. More people were consuming fish compared with meat consistently ^[45]. In another study in the Greater Accra region that examined urban household characteristics and dietary diversity, Dake et al. ^[15] reported that the low socio-economic class group were consumed less fruits and vegetables compared to their higher economic class counterparts. Similarly, Northern region, Saaka and colleagues ^[46] reported that women of low household wealth index were found to be 48% less likely to meet the minimum dietary diversity for women (MDD-W).

2.5. Perceived Food Insecurity

The study by Bannor et al. ^[47] was conducted in four different contrasting cities: The Greater Accra, Bono, Ahafo and Bono East Regions, but the remaining study ^[48] did not specify the particular urban cities or regions data were collected from. These five studies assessed perceived food insecurity at the household level, using different food security questionnaires/scales, including the Household Food Insecurity Access Scale (HFIAS) ^{[45][49][47][50]}, the Food Insecurity Experience Scale (FIES) ^[47], and the Household Food Insecurity Access Prevalence (HFIAP) ^{[49][47]}. In the study conducted in the Eastern region, Pobee et al. ^[50] reported, perceived food insecurity was reported among 23% of households surveyed, with 28% of women aged 18–35 years in these households reportedly suffering from multiple micronutrient deficiencies. In the non-specified urban setting study, involving a sample of 1200 individuals aged ≥50 years ^[48], the prevalence of perceived food insecurity ranged from moderate to severe. In this study, food insecurity indicators were hunger, skipped meals or late intake of first daily meal. The results from this study show that 36% of urban households in Ghana suffer from hunger, and 29% and 5% skipped meals, and had late intake of daily meals respectively. In contrast, the study reported by Bannor et al. ^[47], conducted in Greater Accra region, Bono, Ahafo and Bono East regions, that compared perceived food insecurity between Urban Ghana and India, concluded that food insecurity in Ghana appear to be mild with an average food insecurity score of 4.05 for each household. This study surveyed 400 urban households from the four regions, using the HFIAS scale to assess perceived food security. In Accra, food insecurity, reported in Tuholke et al. ^[49] was prevalent among 70% of households. Only one household reported sourcing food from modern supermarkets and fewer than 3% produce food for consumption through gardening, farming, or fishing. The majority of the studies were conducted in the Greater Accra and Ashanti Regions. This finding is not surprising as most health and nutrition research carried out in the last three decades in Ghana have been concentrated in the major Ghanaian cities, especially Accra (in the Greater Accra Region) and Kumasi (in the Ashanti Region). Two possible explanations could be given for this: First the two regions host the most prominent academic and research institutions in Ghana (the University of Ghana and the Noguchi Memorial Centre for Medical Research, based in Accra, and the Kwame Nkrumah University of Science and Technology in Kumasi and the Kumasi Centre for Research in tropical medicine (KCCRTM), in Kumasi). The existence of these institutions, partly explain implementation of the majority of the studies in these two regions. Secondly, the two regions are the most urbanized in Ghana. This situation thus serves as an important prioritization criterion for understanding challenges of rural-urban migration and its potential impact on food security ^[51]. Although the review findings, overall, suggest that there is a need to promote further studies on food security in urban settings in Ghana, future research in the Ghanaian context should focus on other regions where food security research is limited. This approach will help deepen our understanding of the urban food security situation in more urban cities in Ghana, and not just a few bigger cities.

Notably, three out of the five food security domains (food safety/quality, food access, and food utilization) have been studied the most, especially food safety/quality ($n = 31$ studies). We did not find any study focusing on food stability; only few studies have examined the other food security domains (See **Table 1** for results). There is, thus, a clear need to prioritize these unaddressed domains in future studies. The limited number of studies in these other domains may be due to the focus of our review on the urban environment.

Table 1. Characteristics of 45 included studies and key results.

| Study | Region | Design | Population/Sample | Methods (Data Collection) | Key Findings | Evidence Mapped with the Food Security Domains |
|---------------------------------------|---------------|------------------------|---------------------------------|---|--|--|
| King et al., 2000) ^[22] | Greater Accra | Cross sectional Survey | Chop bar operators (n = 160) | Observation and interviews | Street food vendors not compliant to safety standards. About 66% of proprietors surveyed did not obtain their meat supply from an approved source: suggestive of food safety issue | Food safety and quality |
| Kroll et al., 2019) ^[18] | Ashanti | Cross sectional Survey | Urban households (n = 309) | Interviews using food frequency questionnaires | Widespread prevalence of low-protection diets, with a fairly even distribution of low risk and high risk diets. | Food access |
| Abass et al. 2016) ^[17] | Ashanti | Cross sectional Survey | Vegetable farms (n = 18) | Analysis of randomly selected vegetable samples, followed by interviews with consumers | Vegetable cultivated highly contaminated with faecal microorganisms (fecal coliforms, E coli). Level of fecal coliforms is function of distance to a river. Influencers of accessing food from the street were cost saving, convenience and eating on credit. | Food access, safety and quality |
| Hiamey, et al., 2013) ^[13] | Western | Cross sectional Survey | Random consumers (n = 220) | Interviews using stanardard structured questionnaires | Street food consumed frequently; particularly carbohydrate-rich foods. Affordability, convenience and access by credit were important drivers | Food access and utilisation |
| Karg et al., 2016) ^[21] | Northern | Cross sectional Survey | Food flow records (n = 14,000) | Traffic surveys of food flows on access roads | Food supply to urban areas depends highly on food type and seasonality and arrive from multiple sources. Small-scale suppliers bring in most urban food. | Food supply |
| Mensah, et al. 2017) ^[20] | Volta | Cross sectional Survey | Hotel Caterers (n = 199) | Interviews using self-administered questionnaires. | Influencers of food access are cleanliness of the place, sanitation and hygiene, cleanliness of staff, quality of food, service staff behaviour. Quantity and price were the least important factors. | Food access |
| Pobee et al., 2020) ^[50] | Eastern | Cross sectional Survey | Household (women, n = 95) | Interviews using the 18-item Household Food Insecurity Access Scale (HFIAS) | Food insecurity was reported prevalent among 23% of the households. Compared to married women, more unmarried women were food insecure | Perceived food in security |
| Sackey et al., 2018) ^[45] | G. Accra | Cross sectional Survey | Households (Men/women, n = 152) | Food insecurity was measured using the validated Household Food Insecurity Access Scale (HFIAS) | Consumption patterns of individual food groups did not change over time except within the meat and fish groups. Meat consumption decreased from 30% (baseline) to 23% (3-months) and increased to 43% (6-month visit). Fish consumption increased from 83% (baseline) to 92% (3-months) and decreased to 81% (6-months). | Food utilisation and perceived food insecurity |

| Study | Region | Design | Population/Sample | Methods (Data Collection) | Key Findings | Evidence Mapped with the Food Security Domains |
|--|----------|------------------------|--|---|--|--|
| Tuholske et al., 2020) ^[49] | G. Accra | Cross sectional Survey | Household consumers (Men/women, $n = 668$) | Household Food Insecurity was measured using the HFIAS, alongside Household Food Insecurity Access Prevalence (HFIAP) and the Food Consumption Score. | Food insecurity was prevalent among 70% of households. Only one household reported sourcing food from modern supermarkets and fewer than 3% produce food for consumption through gardening, farming, or fishing. | Perceived food insecurity |
| Gyasi, et al. 2020) ^[48] | N.S. | Cross sectional Survey | Household consumers (focusing on adults aged >50 yrs) ($n = 1219$) | Secondary data drawn from the AgeHeaPsyWel-HeaSeeB Study dataset | Skipping breakfast reported as severe food insecurity issue among people 50–64 years. 36% of participants reported being hungry because there was not food at home. | Food utilisation and perceived food insecurity |
| Nagai et al., 2009) ^[16] | G. Accra | Cross sectional Survey | Companies, Retailers, Millers consumers, ($n = 73$) | Interviews using structured Questionnaires | Reason for the lack of availability of weanimix to mothers from lower-income families include low awareness of the product. Processing and retail price also margins wean mix availability. | Food access and supply |
| Codjoe, et al. 2016) ^[14] | G. Accra | Cross sectional Survey | Urban poor households (men and women) ($n = 452$) | Secondary data drawn from second round of the Regional Institute for Population Studies (RIPS) EDULINK urban poverty and health study | Households consuming seven different food groups within a week, with a mean diversity score of 6.8. Fruits, milk and dietary produce had low dietary diversity due to high prices, lack of nutritional knowledge (taste and preference). | Food access, and utilisation |
| Dake et al., 2016) ^[15] | G. Accra | Cross sectional Survey | Urban poor households (females) (N.S) | Data on the local food environment collected and analysed using geographic positioning system (GPS) technology | The local food environment (convenience stores, abundance of out-of-home cooked foods and limited fruits and vegetables options) suggestive of an obesogenic food environment. | Food access and utilisation |
| Darko, et al. 2016) ^[39] | Ashanti | Cross sectional Survey | Raw food samples ($n = 40$) | Interviews using semi-structured questionnaire | Foods tested were above the acceptable levels and could be sources of food borne pathogens, attributed to poor food hygiene and inadequate processing. | Food Safety and quality |
| Kortei et al., 2020) ^[43] | Western | Cross sectional Survey | Fish samples ($n = 16$) | Analysis of mandomly purchased fish samples | All the examined fish species had toxic mineral concentrations within the E.U quality standard limits except for Mercury (Hg) which exceeded the set limits of WHO. | Food Safety and quality |
| Kudah, et al. 2018) ^[44] | Eastern | Cross sectional Survey | Vegetable salad sample ($n = 360$) | Analysis of randomly purchased fresh vegetables samples | 58% of the food tested (vegetables, spring onion and tomatoes) were found to be contaminated with at least one type of parasite. | Food Safety and quality |

| Study | Region | Design | Population/Sample | Methods (Data Collection) | Key Findings | Evidence Mapped with the Food Security Domains |
|------------------------------|----------|------------------------|---|--|--|--|
| Kunadu et al., 2019) [52] | G. Accra | Cross sectional Survey | Consumers ($n = 176$), farmers ($n = 21$) & diary product ($n = 140$) | Analysis of randomly purchased samples of diary milk and milk products, followed by questionnaires interviews with consumers | Fecal coliforms in dairy products, such as brukina, wagashi, and yogurt exceeded the specified limit of 10 CFU/mL, while the prevalence of <i>E. coli</i> and <i>K. pneumoniae</i> were 70 and 65%, respectively. Generally, respondents perceived indigenous dairy as unsafe. | Food Safety and quality |
| Abubakari et al., 2015) [36] | Ashanti | Cross sectional Survey | Cooked food sample ($n = 170$) | Analysis of purchased ready prepared fruit-salad samples | Ready to be eaten salad foods was a food concern. Three samples tested showed positive to <i>E. coli</i> O157:H7. Mean logcfu/g of total coliforms and <i>E. coli</i> were found to be 6.35 ± 0.09 and 5.1 ± 0.1 . | Food Safety and quality |
| Adam, et al., 2014) [19] | Central | Cross sectional Survey | University students ($n = 1106$) | Interviews using structured questionnaires | Students' concern on food temperature as a food safety issue. Clean and hygienic eating tables as a key food safety concern and predictor of choice of eating place. | Food access, Food Safety and quality |
| Addo et al., 2007) [23] | G. Accra | Cross sectional Survey | Cooked food sample ($n = 10$) | Analysis of randomly purchased cooked food samples | Food samples contaminated with Bacteria. 35% of food tested were positive for other coliform bacteria. Almost all (70 %) of the swabs positive for coliforms were from either a cutting board or a working surface | Food Safety and quality |
| Adzitey, et al., 2020) [41] | Northern | Cross sectional Survey | Food sample ($n = 200$) | Analysis of randomly purchased food and diary milk and milk products | Milk products and other food samples tested were found to be contaminated with <i>Salmonella enterica</i> . | Food Safety and quality |
| (Adzitey, et al., 2018) [24] | G. Accra | Cross sectional Survey | Meat sample ($n = 32$) | Analysis of selected beef and other food samples | Heavy metals were found present in varying concentrations in foods sample, but were below the maximum limit, and so less harmful for consumption | Food Safety and quality |
| Akoto et al., 2015) [37] | Ashanti | Cross sectional Survey | Vegetable sample ($n = 20$) | Fresh vegetable samples were randomly purchased and analysed using standard methods | Varying degrees of contamination found in Vegetables. Overall risk index for combined pesticides due to consumption of all vegetables was >1 which pose as a health risk. | Food Safety and quality |
| Egbon 2013) [25] | G. Accra | Cross sectional Survey | Food sellers ($n = 148$) | Fresh legumes samples were randomly purchased and analysed using standard methods. | Cowpea was found to be infested with <i>callosobruchus maculatus</i> and <i>sitophilus oryzae</i> . | Food Safety and quality |

| Study | Region | Design | Population/Sample | Methods (Data Collection) | Key Findings | Evidence Mapped with the Food Security Domains |
|--------------------------------|----------|------------------------|---|---|--|--|
| Feglo 2012) [40] | Ashanti | Cross sectional Survey | Raw food samples (n = 6) | Raw foods were selected randomly and analysed using standard methods | High levels of bacterial contamination at varying degrees detected in food types tested (higher levels of contamination than acceptable reference) | Food Safety and quality |
| Ayroe et al., 2016) [38] | Ashanti | Cross sectional Survey | Consumers (n = 200), and meat samples (n = 105) | Analysis of meat samples, followed by questionnaire interviews with meat sellers sampled randomly | High proportion of offals sold in Kumasi contained lesions (abscesses, metazoan parasites and granuloma). | Food Safety and quality |
| Fosu et al., 2017) [26] | G. Accra | Cross sectional Survey | Fruits & vegetables samples (n = 3483) | Fresh fruits and vegetable sampled randomly and analysed using standard methods | Pesticides residues were detected fruits and vegetables tested. Samples tested contained levels above the MRL levels. | Food Safety and quality |
| (Nyarko, et al., 2011) [27] | G. Accra | Cross sectional Survey | Fish sample (smoked salmon) (N.S) | Smoked fish samples randomly selected and analysed using standard methods | Microbial counts for samples collected from the smoking sites were within acceptable limits of Ghana Standard Board (GSB), while those from marketing centres were not. | Food Safety and quality |
| (Nyarko, et al., 2011) [42] | Central | Cross sectional Survey | Food sample (tiger nuts) (n = 24) | Fresh fruits samples were randomly selected and analysed using standard methods | Tiger nuts (non-sterile) sold in markets in cape coast are contaminated with high bacteria loads that are implicated in both food spoilage and food-borne diseases. | Food Safety and quality |
| (Obeng et al., 2018) [28] | G. Accra | Cross sectional Survey | Vegetable sample (tomatoes) (n = 120) | Raw vegetables samples were randomly selected and analysed using standard methods. | Varying levels of antibiotic resistance bacteria found in tomatoes sold at various markets centres in Ghana. | Food Safety and quality |
| (Omari, 2018) [53] | G. Accra | Cross sectional Survey | Fast foods sellers (n = 425) | Interviews using structured questionnaires | Respondents expressed concerns about food hazards and other food safety issues: pesticide residue in vegetables, excessive use of artificial flavour enhancers and colouring substances, bacterial contamination, leaked harmful substances from plastic packages and general unhygienic conditions under which food is prepared and sold. | Food Safety and quality |
| (Omari, 2017) [54] | G. Accra | Cross sectional Survey | Fast foods consumers (n = 425) | Interviews using structured questionnaires | Consumer concerns about safety of fast foods. Consumers' perception of safety of fast food influenced by components of trust (institutional competence and openness). | Food Safety and quality |

| Study | Region | Design | Population/Sample | Methods (Data Collection) | Key Findings | Evidence Mapped with the Food Security Domains |
|---------------------------------------|----------|------------------------|--|--|---|--|
| (Mahami 2014) ^[55] | G. Accra | Cross sectional Survey | Probiotic yoghourts samples (<i>n</i> = 20) | Milk and milk products were sampled randomly and analysed using standard methods | About a quarter of imported and local yoghurt samples were below the recommended standard of ≥ 106 CFU/ml. PH values of samples were within the recommended standard of ≤ 4.5 . | Food Safety and quality |
| (Mensah, 2014) ^[56] | Ashanti | Cross sectional Survey | Consumers (<i>n</i> = 200) | Interviews using structured questionnaires | Consumers concerns about safety and quality of leafy vegetables in the retail market due to excessive use of chemicals and contaminated water for vegetables production. Further concerns expressed regarding mishandling of leafy vegetables in the retail market, which was viewed as a health risk. | Food Safety and quality |
| (Mensah et al., 2002) ^[29] | G. Accra | Cross sectional Survey | Food samples (<i>n</i> = 117) | Food samples were selected randomly and analysed using standard methods | Mesophilic bacteria were detected in 356 foods (69.7%): 28 contained <i>Bacillus cereus</i> (5.5%), 163 contained <i>Staphylococcus aureus</i> (31.9%) and 172 contained <i>Enterobacteriaceae</i> (33.7%). Most of the foods sample (salads, macaroni, fufu, omo tuo and red pepper) were contaminated with Mesophilic bacteria (<i>Bacillus cereus</i> , <i>Staphylococcus aureus</i> and <i>Enterobacteriaceae</i>) above acceptable levels. | Food Safety and quality |
| (Otoo 2013) ^[57] | B. Ahafo | Cross sectional Survey | Mothers/caregivers (<i>n</i> = 246) | Interviews using food frequency questionnaires | Children consumed from at least four food groups and Orphans had a higher dietary diversity than non-orphans did. | Food utilisation |
| (Pesewu et al., 2014) ^[30] | G. Accra | Cross sectional Survey | Vegetable samples (N.S) | Vegetables were sampled randomly and analysed using standard methods | Food sample tested have high bacterial contamination. | Food Safety and quality |
| (Sinayobye 2011) ^[31] | G. Accra | Cross sectional Survey | Food mill operators (<i>n</i> = 21) and food samples (<i>n</i> = 36) | | Food samples were found to be contaminated with microorganisms. The contamination load increased with the milling time | Food Safety and quality |
| (Soriyi, 2008) ^[32] | G. Accra | Cross sectional Survey | Beef sample (<i>n</i> = 128) | Meat samples were selected randomly and analysed using standard methods | Beef samples were contaminated with Aerobic mesophiles (189-23000 cfu/g), <i>Staphylococcus aureus</i> (22–59 cfu/g), <i>Bacillus cereus</i> (17–41 cfu/g), <i>Clostridium perfringens</i> (21–48 cfu/g) and <i>Escherichia coli</i> (31–2200 cfu/g). | Food Safety and quality |

| Study | Region | Design | Population/Sample | Methods (Data Collection) | Key Findings | Evidence Mapped with the Food Security Domains |
|---------------------------------|-------------------------------------|------------------------|--|---|--|--|
| (Quansah et al., 2018) [33] | G. Accra | Cross sectional Survey | Vegetable sample (n = 50) | Vegetables were sampled randomly and analysed using standard methods | Food sample tested positive for enterococci and fecal coliform. | Food Safety and quality |
| (Yeboah-Manu et al., 2010) [34] | G. Accra | Cross sectional Survey | Food samples (n = 27) | Foods were sampled randomly and analysed using standard methods. | Slightly above half of the food tested had E. coli values within the acceptable limits while 40.7% were outside the limit—unsafe for consumption. | Food Safety and quality |
| (Kortei et al. 2021) [58] | Multiple urban settings | Cross sectional Survey | Food sample (n = 80) | Raw foods samples selected randomly and analysed using standard methods. | 61.25 % of the food sample tested positive for AFB1 and ranged from 0.38 ± 0.04–230.21 ± 22.14 µg/kg, of which 41.25 % of the samples were above the European and Ghana food safety standards limits. | Food Safety and quality |
| Olu-Taiwo et al. 2021) [35] | G. Accra | Cross sectional Survey | Meat samples (from n = 6 open markets) | Beef samples selected randomly and analysed using standard methods. | Bacterial contamination of retailed beef sold in different Accra markets. Beef samples mostly contaminated with Staphylococcus spp. (34%), Klebsiella oxytoca (17%), Enterobacter spp. (15%), and Proteus vulgaris (3%). | Food Safety and quality |
| (Saaka et al. 2021) [46] | Northern region | Cross sectional Survey | Women (n = 423) | 24hr dietary recall of dietary intake/food consumption. | Results showed that women of low household wealth index were 48% less likely meet the minimum dietary diversity for women (MDD-W), while those from households of poor food insecurity were 88 % less likely to achieve the MDD-W. | Food utilisation |
| (Bannor et al. 2020) [47] | G. Accra, Bono, Ahafo and Bono East | Cross sectional Survey | Farmers (n = 400) | Food security status of urban households was assessed using the HFIA Scale and Food Insecurity Experience Scale (HFIES) | Households food insecure in Ghana were reportedly mildly, with an average food security score of 4.05 for each household | Perceived food security |

Notes: F = Farmers, W = Women and MP = milk products, G. = Greater, N.S. = Not Stated.

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