BMC Public Health

RESEARCH

Open Access

Changes in food quality and habits in urban Ghana: evidence from a mixed-methods study

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Abstract

Background Globally, diets are changing from good quality to limited nutrition. However, an in-depth analysis of the nature of the changes is under-researched. This study examined past and current food consumption, acquisition, and preparation habits of urban poor residents in Accra, Ghana.

Methods Data from the Contextual Awareness Response and Evaluation: Diabetes in Ghana project was used. The Food Group Diversity Score, NCD-Risk and NCD-Protect scores were calculated using the Diet Quality Questionnaire and analysed using means and crosstabulations with the estimation of the 95% confidence intervals ($n=854$). Focus group discussions were held to discuss current and past food habits, and data were analysed thematically ($n=30$). The qualitative and quantitative data were integrated during the analysis.

Results From the early 1950s to the 1980s, the community consumed more traditional homemade meals made from cassava, corn and plantains (such as fufu, kenkey, kokonte and ampesi). Currently, the community consume these traditional meals in addition to foods considered modern, such as instant noodles (6%), milk (19%), rice (67%), sugar-sweetened beverages (21%), and Milo (21%). Respondents, on average, ate four food groups ($\bar{x}=3.8\pm1.5$) and about half were food insecure (47%). The most frequently consumed NCD-protect foods were whole grains (63%) and other vegetables (69%). The NCD-risk items commonly consumed were deep-fried foods (23%), unprocessed red meat (22%) and sugar-sweetened beverages (21%).

Conclusion Respondents reported a shift from home cooking and communal meals toward eating out-of-home meals. The current dietary habits reflect a hybrid of modern foods with traditional foods. Food insecurity is high, and their diets provide little protection against chronic non-communicable diseases. This limits opportunities to move towards healthy diets and improved health outcomes as envisioned in the Agenda 2030.

Keywords Nutrition transition, Food habits; Ga Mashie, Food hybridity, Accra, Ghana

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Introduction

Food habits refer to how people choose and consume food within their social, economic and environmental conditions [1, 2]. Food habits include the types and quantity of food consumed, meal frequency, food preferences, and food preparation methods [3–5]. Globally, changes in food habits have been reported [6, 7]. For example, there has been an increase in the consumption of meals high in sugar, salt and saturated oils but a reduction in the intake of fibre-rich food [8–11].

The nutrition transition theory offers a linear, staged approach to food habit changes and their link to diseases [12]. Stage one is characterised by a diverse diet with meals high in carbohydrates and fibre, and low in saturated fat. This stage is associated with the hunting and gathering period. A shift to agriculture and the development of settlements mark stage two. The meals were high in carbohydrates and fibre, and low in saturated fat. During the second stage, food habits are characterised by food scarcity and reliance on cereals. In this stage, diet quality depends on social class and gender (women and children are disadvantaged) [13]. The third stage of the transition -the receding hunger stage- is characterised by increased consumption of fruits, vegetables and animal protein, and a decrease in starchy staples. In stage 4 -the degenerative disease stage- there is increased consumption of fat, sugar, salt, refined carbohydrates, and processed and ultra-processed foods, accompanied by a sedentary lifestyle. This dietary pattern is known as the Western diet. The quality of the Western diet is low and has been associated with chronic non-communicable diseases (NCDs), such as hypertension, diabetes, and other cardiovascular diseases. At stage 5– behavioural change– a desire to prevent or delay NCDs and to prolong healthy life leads to a change in diet with reduced sedentarism and consumption of fat, sugar, and processed foods and an increased intake of fruits and vegetables.

Several studies have shown that Western diets are on the rise [14, 15]. Between 1970 and 2010, a 20% increase in total energy from animal-source foods and a 14% increase in total dietary fat were reported globally [16]. In Asian countries between 1971 and 2001, there was a move away from the consumption of traditional coarse grains (66.5–56.3%) to animal-source foods (7.9–13.7%) [17]. During the same period, dietary energy from fruits and vegetables decreased in sub-Saharan Africa [16]. A systematic review of research conducted between 1977 and 2015 in sub-Saharan Africa reported that fruit and vegetable intake was 132 g below the World Health Organisation's recommendation, while meat intake was 28 g above the recommendation [15]. In Southern Africa, a typical Western diet comprising of alcohol, meat, animal fats, sugar-sweetened beverages and dairy has been observed. In Equatorial Africa (including Ghana), they found a dietary pattern reflecting a combination of traditional and Westernised diets using national-level data from food balance sheets [18]. However, evidence of this dietary pattern using data from individuals is limited [19, 20]. Tracking changes in food habits at the individual level within the African context presents a vital opportunity to understand the contextual determinants of dietary behaviour to inform the development of context-specific interventions.

In Ghana, where our study is based, food consumption data from the Food and Agriculture Organisation provides evidence of the nutrition transition [21]. Ghana currently has low dietary diversity (an indicator of food insecurity), but increased energy intake [22]. There has been an increase in the consumption of sugar-sweetened beverages (SSB) and processed meat, but a low intake of fruits and vegetables [23]. Furthermore, about a third of adults reported hunger (36%) and skipped breakfast (29%) [24]. A study of low-income areas in Accra found that 70% of households were food insecure, as defined by the Household Food Insecurity Access Prevalence (HFIAP) [20].

In Ga Mashie, Kushitor and colleagues, using repeated cross-sectional data collected in 2011 and 2013, reported an 8% rise in the consumption of processed foods during the period [25]. In an assessment of the community's food environment, Dake et al. described the community as obesogenic, with limited food vendors offering fruits and vegetables [26]. While these findings suggest a transition of food habits in the community, an in-depth analysis of the nature of the changes is under-researched. This is particularly relevant in understanding diet and disease relationships, especially in low-resource communities where the prevalence of hypertension, diabetes, obesity and other cardiovascular diseases is on the increase. This study aimed to understand past and current food consumption, acquisition and preparation habits in Ga Mashie, Accra, Ghana. The study (1) describes the common types of foods consumed in the past and currently by residents, (2) examines the diet quality of foods currently being consumed and (3) explores the changes in food preparations and acquisition. The discussion of study findings offers a contextual description of the nutrition transition happening in Ga Mashie.

Methods

Study setting, data source and design

This study was conducted in James Town and Ussher Town (collectively known as Ga Mashie), Accra, Ghana. Ga Mashie is a low-resource urban community inhabited predominantly by the Ga ethnic group. It is a coastal community where resident males primarily fish, and the women engage in small-scale trading activities and fish processing. High levels of obesity and hypertension have

been reported in the community, while physical activity is low and dietary habits are unhealthy [17, 27]. However, our understanding of the nature of the nutrition transition in Ga Mashie is limited. Our focus on understanding past and current food habits in this community is designed to help characterise the transition and thereby reveal contextual factors to help guide agriculture, food and health policies, research priorities, and intervention designs.

This study used epidemiological and qualitative data from the Contextual Awareness, Response and Evaluation of Diabetes project (CARE). CARE is a community-based project aiming to generate contextual understanding of diabetes in Ga Mashie and to identify opportunities for community-based strategies for diabetes prevention, treatment, and control. The CARE study was a mixed-methods study consisting of a cross-sectional, community-based epidemiological survey alongside primary and secondary qualitative research, which examined policy, social factors, local history, the physical environment, and existing health systems related to diabetes [28].

Quantitative data

The data used for this analysis come from the CARE Survey conducted in Ga Mashie, and a detailed explanation of the survey design is described elsewhere [28]. Briefly, the CARE survey collected data from 854 individuals who belonged to 644 surveyed households from an original sample of 959 eligible households from 80 enumeration areas defined in the 2020 census conducted by the Ghana Statistical Service. All respondents from the randomly selected households who were permanent residents of the households and 25 years or older were invited to participate in the individual survey. The survey was conducted between November and December 2022 through face-to-face interviews. The research team chose this method for the feasibility and control of survey administration [29]. The household response rate was 66%, and the individual response rate was 69%.

The Diet Quality Questionnaire (DQQ) is a standardised 24-hour dietary recall tool that measures food and beverages consumed from 29 food groups [30–32]. Based on these food groups, diet quality indicators and patterns can be calculated at the population level. Dietary intake was assessed in the CARE survey with the Ghanaian version of the DQQ developed by the World Health Organisation through the Global Diet Quality Project [33]. The Ghanaian version contains local foods and can reliably capture the food consumption of Ghanaians using either the Twi or English versions [33]. The tool uses Ghanaian examples to measure the intake of fruits, whole grains, soft drinks, vegetables and animal-source foods (ASFs). Further information about the Ghana DQQ can be found on the Diet Quality Project website [33].

Food group diversity score (FGDS) is one of the indicators that can be calculated from the DQQ. The DQQ provides a guideline for converting the 29 food groups into ten food groups which are: 1)grains and tubers, 2) pulses; 3)nuts and seeds; 4)dairy; 5)meat, poultry and fish; 6)eggs, 7)dark green vegetables; 8)other vitamin-A rich fruits and vegetables; 9)other vegetables; and 10) other fruit (Table 2). The Ghanaian Food-Based Dietary Guidelines (GFBD) recommend these food groups as a part of a healthy diet for Ghanaians [34]. If a food from a given food group was consumed, a score of 1 was given, providing an FGDS ranging from 0 to 10. The mean population score of the FGDS measures nutrient adequacy, a food security indicator [35, 36]. In our study, the mean FGDS was 3.8 (± 1.5); therefore, participants who scored 4 and above were categorised as food secure.

Dietary behaviours related to NCDs can be measured with the NCD-Risk and NCD-Protect scores [33]. The NCD-Protect and NCD-Risk score range from 0 to 9. The NCD-Risk score is a proxy for ultra-processed food consumption. The score sums up the consumption of sweet beverages, sweet foods, salty packaged snacks, instant noodles, fast food, deep-fried foods, red meat, and processed meat. A lower score on the NCD-Risk is recommended by the World Health Organization and the International Agency for Cancer Research [33]. The NCD-Protect score reflects adherence to global dietary recommendations on healthy diets. It measures the consumption of fruits and vegetables, pulses, nuts, seeds, and whole grains.

Associations between diet quality scores and age group, sex, wealth tertile, and diabetes status of respondents (defined as self-reported medical diagnosis of diabetes or a random blood glucose reading of ≥ 11.1mmol/L) were tested [28]. A twenty-year age grouping was used for this study. Sex was reported as male or female. Wealth was measured using the ownership of household items such as television, iron, sofa and refrigerator. A wealth score was generated using principal components analysis of ownership of these assets [37]. The scores were divided into three tertiles; tertile 1 was labelled "most poor", tertile 2 as "poor" and tertile 3 as "least poor".

Qualitative data

A historical contextual analysis of Ga Mashie was conducted as part of the CARE qualitative study. We conducted four focus group discussions (FGDs) on the history of diet and nutrition in Ga Mashie. Through snowball sampling, participants were recruited from the Ga Mashie Development Agency (GAMADA), traditional and religious leaders and community influencers for the FDGs. We conducted four FGDs with two male and female groups. A topic guide developed by the research team was used. Participants were asked to

describe what they remembered of their grandparents and parents, especially regarding food. They were asked the following question: Do you know anything about your great-grandparents or relatives, such as how they lived and what kind of food they ate? We focused on the perceptions of older community members of changes in food systems, dietary patterns and practices, and market food distribution systems.

Data analysis and integration of quantitative and qualitative results

A descriptive analysis approach was used for the quantitative data. The distribution of the DQQ food groups, indicators, and predictor variables was assessed using frequency tabulations and the median. Cross-tabulations and chi-square tests were conducted to test the association between age, sex, wealth and diabetes status and the DQQ. The svy command in STATA was used to account for the survey cluster design and weighting was applied to account for unequal probability sampling within clusters.

FGD data were thematically analysed [38]. Four authors with a background in history and population studies (OA, KA and MV) initially coded the data [39]. Data analysis was guided by inductive codes on food items consumed in Ghana from previous literature and the DQQ. The analysis team searched for these food items in the transcripts in Excel. Although digital methods of analysing qualitative data are helpful, manual methods of analysis are equally important as they have been shown to have higher reflexive quality and integration of contextual knowledge [40].

The quantitative and qualitative data were triangulated [41] with the aim of finding complementarity between the findings of the two data sources [42]. With the expertise of multiple researchers from history, public health, nutrition, and epidemiology, we aimed to explain different aspects of dietary behaviour in Ga Mashie. We used the qualitative data to explore the historical and current dietary behaviours of the community, while we used the quantitative data to describe current dietary behaviours. The goal of the triangulation was to enhance understanding of *what* has changed in food habits and *why* those changes were occurring.

Table 1 Characteristics of the epidemiological survey and the qualitative study respondents

Variable	Quantitative data		Qualitative data	
	Frequency	%	Frequency	%
Sex				
Male	305	35.7	4	13.3
Female	549	64.3	26	86.7
Age				
25–44	395	46.5	1	3.3
45–64	327	38.5	7	23.3
65 + y	128	15.0	22	73.4
Household wealth tertiles				
Most poor	277	32.4	-	-
Poor	284	33.3	-	-
Least poor	293	34.3	-	-
Diabetes status				
Yes	72	8.2	-	-
No	782	91.8	-	-
Total	854	100	30	100

Not applicable

Results

Characteristics of respondents

A total of 854 individuals participated in the survey (Table 1). About two-thirds were female (64%). Two-fifths of the respondents were between 25 and 44 years old. Thirty individuals participated in the historical study; 86.7% were female and most participants were between 65 + years.

Past food habits in Ga Mashie

Participants reported insights into the food habits they experienced while growing up, reflecting on the culinary traditions of their great-grandparents, grandparents, parents and other relatives. Some also remembered timelines such as the early fifties and during the reign of President Jerry John Rawlings (1981–2001). The common staples consumed during the period were fufu, [boiled plantain, cassava], ampesi [boiled yam and plantain], kokonte [cassava flour dumpling] and kenkey [cornmeal dumpling]. Appendix 1 describes these Ghanaian meals. These staples were served with palm nut soup, fante fante [fresh fish stew], groundnut soup, grounded pepper, and fried fish. Most of the sauces were made with fish. Rice and chicken were food items that were consumed occasionally. The quotes below are examples of what the participants shared:

> *"Our grandparents didn't live in the village. They were all staying in Accra, here in Ga Mashie, what they were normally eating often was kenkey and stew, fante fante with banku, banku and okro with crab, cow leg, wele [types of Ghanaian delicacies]. That was what they also taught us to eat." (FDG 1).*

> *Occasional too, we would eat rice, rice with stew." (FDG 4).*

According to the participants, the food items they had in the past were also free of fertilizers. They mentioned that "*in those days, there were no fertilizers. The food items were fresh* (FGD 1) and *during those times, there was no fertiliser*" (FDG 4).

Another description of the past was communal cooking and eating. The participants reported cooking in big pots and men and women eating together in the same bowl by sex. Some participants shared their experiences with the quotes below:

> *"My great-grandmother was the matriarch. They used to do communal cooking. I can remember the big-big pots that we used to cook in. And, at the end of the day, everybody comes and gets food for their families. It was a big compound." (FGD 2).*

> *"When we would cook food, we did it as one. We would eat together. All the children would cook our food as one. The adults, too, would eat together. Ah-hah, so that was how we lived our lives." (FDG 4).*

Current food habits in Ga Mashie

Common foods consumed in Ga Mashie

The foods commonly consumed in Ga Mashie were tomatoes, okro, fish, kenkey, fufu, eggs, groundnuts, (considered traditional foods), as well as bread, French fries, fried yam, Milo, and soft drinks (items rarely considered traditional foods) (Tables 2). No fruits were among the most common food items consumed (referring to the first 10 food items). Except for Milo, tinned milk, oranges, and chicken, there were no sex differences in food consumption. A higher proportion of women (24%, 95%CI:18.2,31.0) had Milo compared to men (19%: 95%CI; 14.4,25.9).

Diet quality of foods currently consumed

The FGDS score ranged from 0 to 10 with a median of 4 (IQR; 3, 5). Grains and tubers (97%), meat, poultry, and

Table 2 Ranking of common foods consumed in Ga Mashie using the diet quality questionnaire

Food groups	Total		Male		Female		*P*-value
	%	95% CI	%	95% CI	%	95% CI	
Tomatoes, okro, garden eggs, sponge gourd or cabbage	68.6	[63.0,73.8]	70.2	[62.7,76.8]	67.8	[61.4,73.5]	0.507
Bread, rice, waakye, jollof, fried rice, omutuo, or rice porridge	66.8	[62.5,70.8]	68.0	[61.4,73.9]	66.1	[60.8,71.0]	0.623
Fish, dried fish, koobi, anchovies, smoked herring, crab, or shrimp	64.5	[59.5,69.3]	69.1	[62.0,75.4]	61.9	[56.4,67.2]	0.055
Kenkey, banku, tuo zaafi, Hausa koko, akple, roasted maize, boiled maize, or tom	63.1	[58.3,67.6]	61.7	[55.1,67.9]	63.9	[57.4,69.9]	0.626
Fufu, gari, kokonte, cassava, yam, cocoyam, plantain, or sweet potato	34.7	[31.2,38.5]	34.5	[29.0,40.4]	34.9	[30.9,39.1]	0.903
Eggs	27.4	[23.7,31.4]	29.5	[23.8,35.9]	26.2	[22.1,30.8]	0.332
French fries, fried yam, fried potato, atomo, spring rolls, fried chicken,	24.3	[19.9,29.3]	25.5	[19.8,32.2]	23.6	[18.5,29.6]	0.578
Groundnuts, kuli kuli, groundnut paste, groundnut soup, agushi stew, neri soup,	22.4	[17.3,28.5]	19.5	[14.4,25.9]	24	[18.2,31.0]	0.115
Milo, tea with sugar, or coffee with sugar	21.2	[18.5,24.1]	15.6	[11.0,21.6]	24.4	[21.2,27.9]	0.013
Soft drinks or malts, such as, Coke, Fanta, Sprite, Alvaro, or Malta Guinness	20.3	[17.1,23.9]	23	[17.7,29.3]	18.8	[15.2,23.0]	0.205
Beef, goat, sheep, liver, or intestine	19.6	[16.8,22.8]	20.2	[15.3,26.2]	19.3	[16.1,22.8]	0.751
Tin milk or powdered milk	18.7	[15.7,22.1]	12.7	[9.5,16.8]	22.2	[18.4,26.5]	0.000
Chicken, gizzard, or Guinea fowl	16.6	[13.7,20.1]	20.5	[15.1,27.2]	14.4	[11.4,18.0]	0.050
Banana, pineapple, avocado pear, watermelon, apple, or guava	12.5	[10.2,15.3]	12.2	[8.7,16.9]	12.8	[10.2,15.9]	0.808
Cakes, biscuits, rock bun, toogbee or bofrot	13.4	[11.1,16.1]	12.5	[9.0,17.0]	13.9	[11.1,17.4]	0.579
Orange or tangerine	11.1	[9.0,13.6]	7.5	[4.8,11.5]	13.1	[10.4,16.4]	0.020
Sweet green pepper, cucumber, lettuce or mushrooms	10.4	[8.0,13.5]	11.9	[8.7,16.0]	9.6	[6.8,13.3]	0.261
Cocoyam leaves, amaranth leaves, ademe, ayoyo, sweet potato leaves, cassava leaves or bokoboko	9.6	[7.4,12.4]	10	[6.5,15.1]	9.4	[6.7,13.1]	0.815
Beans, or bambara beans	9.5	[7.6,12.0]	12.2	[8.5,17.3]	8	[5.8,11.0]	0.087
Carrots, or sweet potatoes that are orange inside	8.1	[6.1,10.7]	9.6	[6.6,13.8]	7.3	[5.2,10.2]	0.221
Fruit juice, fruit drinks, or sobolo	6.2	[4.5,8.3]	5.5	[3.3,8.9]	6.5	[4.4,9.5]	0.578
Mango, papaya, or African star apple	6.5	[5.0,8.5]	6.1	[3.6,10.2]	6.8	[4.9,9.4]	0.760
Toffees, chocolates, ice cream, or FanYogo	5.3	[3.8,7.3]	5.2	[3.2,8.3]	5.4	[3.5,8.2]	0.892
Soursop, coconut, velvet tamarind, baobab, ebony fruit, or shea fruit	4.9	[3.6,6.7]	5.6	[3.5,9.0]	4.5	[2.9,6.9]	0.050
Indomie	4.9	[3.5,6.8]	5.5	[3.3,8.9]	4.5	[2.8,7.2]	0.576
Sausages or corned beef	4.7	[3.2,6.8]	4.4	[2.4,8.0]	4.8	[3.2,7.2]	0.771
Pork, grasscutter, rabbit, or bush meat	4.7	[3.4,6.4]	5.4	[3.2,9.0]	4.3	[2.9,6.3]	0.456
Packaged yellow plantain chips or potato chips or Pringles	4	[2.8,5.7]	3	[1.4,6.3]	4.5	[2.9,7.0]	0.360
Brukina or drink yogurt	2.8	[1.9,4.3]	2.8	[1.4,5.4]	2.8	[1.6,5.1]	0.955
Cheese curds or wagashi	1.3	[0.6,2.7]	0.9	[0.3,2.9]	1.5	[0.7,3.4]	0.429
KFC, Papaye, Pizza Inn, a mall	0.7	[0.3,1.6]	1	[0.4,2.7]	0.5	[0.1,2.1]	0.476

fish (78%), and other vegetables (69%) were the dominant food groups consumed. The consumption of pulses, dark green vegetables and vitamin A rich fruits and vegetables was low. Only about one out of ten residents ate pulses (11%), dark green vegetables (9%) and vitamin A rich fruits and vegetables (14%) the previous day. About half of the sample (47%) were food insecure. Except for dairy, there were no sex differences in food group diversity food items (Tables 3 and 4).

NCD-risk food items that were consumed most were deep-fried foods (24%), unprocessed red meat (23%) and soft drinks (20%). This was followed by baked/grain-based sweets (13%). This suggests a combination of soft drinks with baked flour products as snacks among the respondents. The proportion of respondents who consumed soft drinks was significantly higher among the 25–44-year-olds (29%) [95%CI: 24.1,35.0] versus those 65 + years (9%) [95%CI: 5.2,15.6] (Table 4). It was found that those who were least poor (26%) consumed SSBs more than the poorest (14%). In terms of diabetes status, a lower proportion of respondents who reported living with diabetes consumed fast foods (0% versus 6%) and unprocessed red meat (13% versus 24%) compared to those not reporting a diabetes diagnosis.

The NCD-risk and NCD-protect scores provide a profile of how the diet consumed increases risk for or provides protection against NCDs. Out of nine NCD-protect food items, respondents ate two items, on average, with a median score of 2, and interquartile range of 2. The respondents had a low score on the NCD-protect foods. The two NCD-protect food groups commonly consumed were whole grains (63%) and other vegetables (69%). The intake of NCD-protect foods was similar across age, sex, wealth groups, and diabetes status.

Table 3 Diet quality in Ga Mashie

Diet quality indicator	Total	
	%	95% CI
Food group diversity food items		
Grains & tubers	97.0	[94.9,98.3]
Pulses	9.5	[7.6,12.0]
Nuts and seeds	22.4	[17.3,28.5]
Dairy	21.2	[18.0,24.8]
Meat, poultry & fish	79.4	[75.3,82.9]
Eggs	27.4	[23.7,31.4]
Dark green leafy vegs	9.6	[7.4,12.4]
Other vit-A rich fruits & vegs	13.7	[11.2,16.7]
Other vegetables	69.8	[64.3,74.8]
Other fruits	23.2	[19.8,27.0]
FGDS score	4 (3, 5)*	
Food group diversity score		
Food secure	52.5	[49.1,55.8]
Food insecure	47.5	[44.2,50.9]
NCD-Risk food items		
Soft drinks	20.3	[17.1,23.9]
Baked/grain-based sweets	13.4	[11.1,16.1]
Other sweets	5.3	[3.8,7.3]
Processed meat	4.7	[3.2,6.8]
Unprocessed red meat	23.0	[20.1,26.2]
Deep fried food	24.3	[19.9,29.3]
Fast food & instant noodles	6.1	[3.9,7.4]
Packaged ultra-processed salty snacks	4.0	[2.8,5.7]
NCD-Risk Score	1 (0, 2)*	[1.04,1.25]
NCD-Protect food items		
Whole grains	63.1	[58.3,67.6]
Pulses	9.5	[7.6,12.0]
Nuts and seeds	22.4	[17.3,28.5]
Vitamin A-rich orange vegetables	8.1	[6.1,10.7]
Dark green leafy vegetables	9.6	[7.4,12.4]
Other vegetables	69.8	[64.3,74.8]
Vitamin A-rich fruits	6.5	[5.0,8.5]
Citrus	11.1	[9.0,13.6]
Other fruits	16.1	[13.5,19.1]
NCD-Protect score	2 (1, 3)*	[2.17,1.31]

*Median score, 25% and 75% quartile

Changes in food habits

This section presents the findings from the historical study on the social and historical context about changes in the types of food consumed, acquisition and preparation.

Changes in food consumption and eating patterns

In Ga Mashie, numerous foods have remained popular over time. Staples such as jollof, banku, and kenkey continue to be eaten by the residents, alongside fish (mainly fried). However, many community members reported an increase in the amount of processed food available, such as instant noodles. Participants also described a notable increase in the amount of sugar, red meat and salt eaten by people in the community and a reduction in natural spices like fresh ginger. Although several described making efforts to reduce their sugar and salt intake, they were aware that it is often hidden in foods they buy. For example, sugar was only added to tea or porridge, but it is now found in SSB and processed foods.

> *"Sugarcane was used in making sugar in the olden days but now a lot of things are being used in making sugar, which is giving us a lot of sickness. Just look at all kinds of coloured drinks that are in the system now. Currently, the sugar that is being made is not natural." (FGD, James Town).*

Meat was also described as being eaten in moderation in the past, but it has become a more important part of peoples' diets and there is some awareness that this change could lead to health problems.

Table 4 Diet quality of food items consumed in Ga Mashie

	Sex of respondent				Age					
	Male		Female		24–45		45–54		65+	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Food group diversity										
Grains & tubers	98.1	[95.8,99.1]	96.4	[93.0,98.2]	95.5	[90.8,97.8]	98.4	[96.4,99.3]	98.1	[94.1,99.4]
Pulses	12.2	[8.5,17.3]	8.0	[5.8,11.0]	9.4	[7.1,12.3]	8.1	[5.3,12.3]	13.0	[7.8,20.9]
Nuts and seeds	19.5	[14.4,25.9]	24.0	[18.2,31.0]	24.1	[18.0,31.5]	21.7	[15.7,29.3]	18.4	[12.2,26.7]
Dairy	14.4	[10.8,18.9]	25.0	[20.8,29.8]*	24.3	[20.1,28.9]	18.2	[13.8,23.6]	19.2	[13.3,27.1]
Meat, poultry & fish	83.1	[77.8,87.3]	77.3	[72.0,81.8]	82.1	[77.3,86.1]	79.4	[73.5,84.3]	70.9	[60.1,79.7]*
Eggs	29.5	[23.8,35.9]	26.2	[22.1,30.8]	38.0	[32.9,43.4]	20.0	[14.9,26.3]	14.6	[9.1,22.5]*
Dark green leafy vegs	10.0	[6.5,15.1]	9.4	[6.7,13.1]	9.4	[6.3,13.8]	9.8	[6.9,13.7]	9.5	[5.2,16.9]
Other vit-A rich fruits & vegs	13.6	[9.8,18.6]	13.8	[10.9,17.3]	12.9	[9.3,17.6]	14.8	[11.1,19.5]	13.1	[7.9,21.1]
Other vegetables	72.2	[65.1,78.3]	68.4	[62.2,74.0]	70.3	[62.8,76.8]	70.3	[62.5,77.0]	66.8	[56.3,75.8]
Other fruits	20.3	[15.3,26.5]	24.8	[21.0,29.2]	27.5	[22.4,33.3]	19.4	[14.7,25.2]	18.8	[13.0,26.5]*
NCD-Risk Food Items										
Soft drinks	23.0	[17.7,29.3]	18.8	[15.2,23.0]	29.3	[24.1,35.0]	14.2	[10.3,19.1]	9.1	[5.2,15.6]*
Baked/grain-based sweets	12.5	[9.0,17.0]	13.9	[11.1,17.4]	15.1	[11.7,19.3]	13.8	[10.3,18.1]	7.1	[3.8,13.0]
Other sweets	5.2	[3.2,8.3]	5.4	[3.5,8.2]	8.5	[6.0,12.0]	2.8	[1.2,6.3]	2.2	[0.6,7.5]*
Processed meat	4.4	[2.4,8.0]	4.8	[3.2,7.2]	7.2	[4.6,11.2]	2.7	[1.4,5.4]	1.9	[0.6,6.0]*
Unprocessed red meat	24.0	[18.9,30.0]	22.4	[19.0,26.3]	26.9	[22.2,32.3]	23.0	[18.4,28.3]	11.2	[6.8,17.7]*
Deep fried food	25.5	[19.8,32.2]	23.6	[18.5,29.6]	27.1	[20.9,34.4]	21.8	[16.3,28.5]	22.5	[14.2,33.9]
Fast food & instant noodles	6.0	[3.8,9.5]	5.1	[3.3,7.6]	8.9	[6.5,12.1]	3.0	[1.5,6.0]	1.0	[0.2,4.2]*
Packaged ultra-processed salty snacks	3	[1.4,6.3]	4.5	[2.9,7.0]	5.4	[3.4,8.4]	2.8	[1.2,6.2]	2.8	[1.0,7.5]
NCD-Protect Food Items										
Whole grains	61.7	[55.1,67.9]	63.9	[57.4,69.9]	57.7	[49.8,65.2]	71.1	[64.5,76.9]	58.8	[47.8,68.9]*
Pulses	12.2	[8.5,17.3]	8.0	[5.8,11.0]	9.4	[7.1,12.3]	8.1	[5.3,12.3]	13.0	[7.8,20.9]
Nuts and seeds	19.5	[14.4,25.9]	24.0	[18.2,31.0]	24.1	[18.0,31.5]	21.7	[15.7,29.3]	18.4	[12.2,26.7]
Vitamin A-rich orange vegetables	9.6	[6.6,13.8]	7.3	[5.2,10.2]	7.8	[5.0,11.8]	8.8	[6.1,12.4]	7.3	[3.6,14.3]
Dark green leafy vegetables	10.0	[6.5,15.1]	9.4	[6.7,13.1]	9.4	[6.3,13.8]	9.8	[6.9,13.7]	9.5	[5.2,16.9]
Other vegetables	72.2	[65.1,78.3]	68.4	[62.2,74.0]	70.3	[62.8,76.8]	70.3	[62.5,77.0]	66.8	[56.3,75.8]
Vitamin A-rich fruits	6.1	[3.6,10.2]	6.8	[4.9,9.4]	6.2	[4.0,9.4]	6.9	[4.5,10.3]	6.9	[3.1,15.0]
Citrus	7.5	[4.8,11.5]	13.1	[10.4,16.4]*	12.7	[9.2,17.2]	8.8	[5.9,12.9]	12.0	[7.0,19.8]
Other fruits	15.5	[11.4,20.9]	16.4	[13.4,20.0]	19.2	[15.5,23.6]	14.7	[10.7,19.8]	9.6	[5.7,15.6]*
Diet quality indicators	**Wealth quintiles**						**Diabetes status**			
	Most Poor		**Poor**		**Least poor**			**Diabetes**	**No diabetes**	
	%	95%CI	%	95%CI	%	CI	%	95%CI	%	95%CI
Food group diversity										
Grains & tubers	97.1	[94.1,98.5]	95.6	[91.1,97.9]	98.4	[95.3,99.4]	97.0	[94.7,98.4]	97.0	[87.5,99.3]
Pulses	6.7	[4.0,11.0]	11.3	[7.9,15.9]	10.7	[7.4,15.1]	9.5	[7.4,12.1]	9.9	[4.3,21.1]
Nuts and seeds	21.8	[12.3,35.8]	19.7	[14.5,26.3]	25.4	[18.9,33.2]	22.1	[17.0,28.3]	25.5	[17.0,36.3]
Diary	16.6	[11.8,22.8]	20.2	[16.0,25.3]	26.3	[21.3,32.1]	21.3	[17.9,25.0]	19.9	[11.6,32.1]
Meat, poultry & fish	77.7	[70.4,83.6]	81.0	[74.1,86.4]	79.5	[73.4,84.4]	79.4	[75.3,83.0]	79.1	[66.9,87.7]
Eggs	19.8	[13.7,27.9]	26.2	[20.1,33.4]	35.6	[29.3,42.5]*	28.3	[24.5,32.4]	17.6	[9.5,30.4]
Dark green leafy vegs	8.2	[5.0,13.1]	9.3	[6.4,13.4]	11.2	[7.4,16.7]	9.7	[7.4,12.6]	8.9	[4.2,17.8]
Other vit-A rich fruits & vegs	11.8	[8.3,16.6]	15.2	[10.8,21.0]	14.1	[10.4,19.0]	13.1	[10.4,16.5]	20.1	[11.9,31.9]
Other vegetables	65.1	[55.7,73.5]	73.5	[65.1,80.5]	70.8	[63.2,77.3]	70.3	[64.6,75.4]	64.3	[49.1,77.0]
Other fruits	18.6	[13.9,24.3]	24.3	[18.1,31.8]	26.6	[21.2,32.7]	23.3	[19.9,27.0]	22.4	[13.2,35.3]
NCD-Risk Food items										
Soft drinks	14.9	[9.7,22.1]	20.1	[16.1,24.8]	25.6	[20.3,31.7]*	21.2	[17.8,25.1]	10.3	[4.8,20.8]*
Baked/grain-based sweets	12.2	[8.6,17.0]	12.9	[9.2,17.7]	15.0	[10.8,20.5]	13.7	[11.4,16.5]	9.8	[4.9,18.5]
Other sweets	5.0	[2.5,9.8]	3.3	[1.6,6.7]	7.5	[5.0,11.1]	5.5	[4.0,7.6]	3.0	[0.6,12.9]
Processed meat	3.1	[1.5,6.4]	4.8	[2.1,10.4]	6.0	[3.7,9.5]	4.8	[3.3,7.0]	3.0	[0.7,11.8]
Unprocessed red meat	17.8	[13.6,23.0]	22.9	[17.3,29.6]	28.0	[22.5,34.3]	23.9	[20.8,27.3]	13.3	[7.1,23.7]*

Table 4 (continued)

Diet quality indicators	Wealth quintiles						Diabetes status			
	Most Poor		Poor		Least poor		Diabetes		No diabetes	
	%	95%CI	%	95%CI	%	CI	%	95%CI	%	95%CI
Deep fried food	22.7	[16.3,30.7]	23.0	[17.3,29.7]	27.0	[20.6,34.7]	24.3	[19.9,29.4]	23.8	[14.9,35.7]
Fast food & instant noodles	3.9	[2.0,7.3]	6.0	[3.6,9.7]	6.3	[4.2,9.4]	5.9	[4.3,8.1]	0.0	5.4
Packaged ultra-processed salty snacks	4.5	[2.1,9.3]	4.0	[2.2,7.0]	3.5	[1.9,6.5]	3.8	[2.5,5.6]	6.1	[2.2,15.6]
NCD-Protect										
Whole grains	66.7	[59.9,73.0]	61.0	[52.4,68.9]	61.6	[54.5,68.2]	62.7	[57.8,67.4]	66.9	[52.7,78.6]
Pulses	6.7	[4.0,11.0]	11.3	[7.9,15.9]	10.7	[7.4,15.1]	9.5	[7.4,12.1]	9.9	[4.3,21.1]
Nuts and seeds	21.8	[12.3,35.8]	19.7	[14.5,26.3]	25.4	[18.9,33.2]	22.1	[17.0,28.3]	25.5	[17.0,36.3]
Vitamin A-rich orange vegetables	5.3	[3.0,9.2]	10.3	[6.8,15.1]	8.8	[5.9,13.0]	7.7	[5.4,10.7]	13.4	[7.1,23.8]
Dark green leafy vegetables	8.2	[5.0,13.1]	9.3	[6.4,13.4]	11.2	[7.4,16.7]	9.7	[7.4,12.6]	8.9	[4.2,17.8]
Other vegetables	65.1	[55.7,73.5]	73.5	[65.1,80.5]	70.8	[63.2,77.3]	70.3	[64.6,75.4]	64.3	[49.1,77.0]
Vitamin A-rich fruits	7.2	[4.5,11.2]	5.6	[3.1,9.8]	6.8	[4.4,10.5]	6.2	[4.6,8.4]	10.1	[4.8,20.0]
Citrus	7.3	[4.5,11.7]	11.5	[8.0,16.2]	14.3	[10.3,19.5]	10.7	[8.7,13.1]	15.3	[8.0,27.3]
Other fruits	14.5	[10.6,19.5]	18.0	[13.2,24.2]	15.8	[12.0,20.7]	16.3	[13.6,19.5]	13.7	[8.0,22.5]

*p-value <0.05

"The foods we consume now are leading to all kinds of diseases. Even children are suffering health problems, for example with the eyes, due to the excessive oil content in foods. Now, foods commonly consumed by the rich are also widely consumed by the poor. We barely consumed foods like fresh meat, but now we behave more or less like cannibals because we eat meat mostly not well cooked. This has led to us suffering a wide range of sicknesses, and we are suffering every possible sickness you can think of, for example, blindness, diabetes, cancer etc., due to the food we eat." (FGD, Ussher Town).

People in Ga Mashie mentioned eating a smaller range of foods than they did in the past. Food consumption is now more monotonous because of financial constraints and increasing food allergies. This has led to people only eating one type of food a day, which was different in the past.

"These days, the food we eat it's one way there are no changes. This is because there's no money. If you are eating kenkey then it means you are eating the kenkey throughout. But I can balance it with vegetables like cucumber and dandelion and then eat. The food we eat now is monotonous." (FGD 4).

Changes in food acquisition and preparation

In the past, food was usually cooked at home, but in recent years, members of the community have increasingly relied on food from vendors, which gives them less control over what they consume. According to one participant, their grandparents prepared a lot of food, "*Every week they prepare a lot of food in the house*" (FDG 1). This was for several reasons. Food costs have increased over time, meaning that the cost of buying ingredients is often higher than buying a meal from a vendor. Other reasons for this change include being time-poor. Women, who typically would have been the main cooks in Ga Mashie, no longer have as much time to cook, often due to financial concerns. In households, time engaged in remunerated work is prioritised over time engaged in cooking food at home.

"Our mothers took very good care of us at home, by the time I returned from town, food had already been cooked and I was given my portion to eat, foods were prepared from home, and you eat to your satisfaction, then you go and play. So back then, in the olden days, we were well taken care of. Now we are all grown up, having our own children, but we can't take care of them, nowadays, we can't take care of our children as back then. I go and struggle and come back with insufficient amount, so I can't cook but will rather give my child GH5 to buy rice." (FGD, Ussher Town).

"Now street food is mostly consumed because people do not have time to prepare food at home. Also, preparing food at home is costly compared to buying from vendors." (FGD, Ussher Town).

"At first, you'd kill a hen in the house and then you'd use it to prepare food and eat. But now, there's chicken thighs and chicken wings. We don't even know where it came from. They pack it and then bring it to us, fried rice and oily foods". (FDG James Town)

Less home cooking has also resulted in more individualised eating. In the past, people in the community ate together; neighbours would share food with each other, but in recent times, people eat alone. This was also due to a change in how people interact with each other.

> *"In the past food is prepared and shared among neighbours, so no need to keep food for days. But now after cooking, households wouldn't want to give neighbours and also would feel reluctant to consume in subsequent days, so with all these analyses it is better to buy food outside than cook." (FGD, Ussher Town).*

Increase in food contamination and adulteration

Participants described being concerned about the quality of ingredients and food that is available on the market. Many respondents described an increase in the use of synthetic fertilizers and other agrochemicals like pesticides on raw ingredients, particularly fruits and vegetables. This has created concern about the nutritional quality of food and how the addition of agrochemicals changes the taste of food, reduces the lifespan of fresh produce and has a negative impact on the body.

> *"The chemicals used in farming these days do not make the food crops last. The food crops rot within the shortest possible time. And there is no taste whenever you cook and eat them. Everything has changed. It should be checked because there are no nutrients in the food when you eat it." (FGD, James Town).*

Several mentioned the increased use of additives such as bouillon cubes (especially Maggi cubes) in cooked food, which has changed over time. Additives were described as making food taste better; for many, food's flavour is very important. Traditionally, natural spices like ginger were used when cooking but participants also described the use of additives as important for food to taste good, which has been reduced due to the increase in agrochemicals.

> *"Yes, we buy everything from the market. When we bring it to the homes, the addition of spices to the food is also too much. In the past, they used to cook with stockfish [e.g. stinking] but even now, the stock fish is being preserved using chemicals, so you don't even know what is going on. Because the foodstuff is dead from the chemicals used in plants in them you have to add spices to make their food nice at all costs". (FGD, James Town)*

Discussion

This study assessed food consumption practices in an urban community in Ghana by describing the types of food currently consumed and the social and historical context surrounding changes in acquisition, preparation and types of foods consumed. We found that bread, fried fish, kenkey, fufu, eggs, groundnuts, French fries, fried yam, Milo, and SSB were commonly consumed in Ga Mashie. Men had a higher intake of ASFs than women. Women consumed Milo and dairy more than men. Food insecurity was high in the community, and the diet had little protection against NCDs. Although the consumption of certain food items has remained the same (kenkey, fufu, and fish), respondents reported increased consumption of sugar, red meat, salt, instant noodles and deep-fried foods in recent years. We propose interrelated reasons which are consequences of structural transformations for the differences in the food habits and quality found in Ga Mashie and present a description of the nutrition transition happening within the community.

Globalisation: Ghana has a long history of consuming processed foods

Processes of globalization that influence food systems, especially the expansion of trade, global food advertising and urbanisation, can explain the variety of food items consumed in the community of Ga Mashie. Due to food trade, Ghana has a long history of the availability and consumption of processed foods and refined vegetable oils. For example, in 1948, a protest was organised by locals against the high cost of imported food such as rice, cooking oil, flour, tinned fish and meat, and evaporated milk [43]. The consumption of processed foods was facilitated by the interest in food imports by the colonial administration, which was sustained by post-independence globalisation policies [7]. Through post-adjustment trade liberalisation policies, African economies could import food, which has increased the availability of foods such as polished rice, frozen meat/chicken, vegetable oils, SSBs, and wheat flour onto the market [44]. Furthermore, through advertisements promoting these items as healthy, residents are familiar with processed foods and highly prefer them, especially the youth [45, 46]. Due to the power and influence of private food companies on public policy, both individual and community agency are mostly undermined through strategies such as lobbying, sponsoring of scientific studies, and political donations among others [47]. Through Accra's expansion, peri-urban lands used by families for farming in the past have been sold for housing projects. As a result, most urban residents have become reliant on the market, which is biased towards processed foods for their food supply [48].

Also, through government efforts at modernising agriculture and reducing post-harvest loss, there was an increase in pesticide and synthetic fertilizer use across low-and middle-income countries. Consumers tend to view produce grown with pesticides as a health hazard and avoid it [49]. In Ghana, agrochemicals are used in the farming, storing and preserving of farm produce such as corn, millet, vegetables, fruits and cassava [29]. While agrochemicals reduce cropping duration, support soil fertility and prolong shelf-life, farmers flout standards of using them, resulting in widespread food poisoning [50]. Biochemical analysis of selected food items has found residues of pesticides in ready-to-eat food items. For example, the mean concentration of copper and zinc in lettuce and spring onions was above the WHO/FAO permissible levels [51]. The long-term consumption of such contaminated food items is associated with cancer and neurological dysfunctions [29, 51].

Social cultural belief, norms and roles

Sociocultural beliefs can also explain the gendered dietary intake we found in this study. In many societies, men have been reported to eat more ASFs than women [52]. Sociological research has shown that food items such as meat and beer are typical foods for men. Traditionally, women were trained to serve the best part of the meal (i.e. ASFs) to men in Ghana. Gender stereotypes in the type of work can also explain the findings. In Ga Mashie, men are typically involved in labour-intensive jobs such as fishing, while women are involved in trading and food processing [53]. The women are predominantly involved in fish processing by smoking, drying and salting. Their methods do not significantly alter the natural state of the fish. Many consider men's labour-intensive jobs to require 'heavy meals' (Red Red, Kenkey and Banku). Typically, women will have tea, bread and milk for breakfast, while men will have heavy meals. Therefore, men tend not to consume as much milk as women.

Secondly, a reduction in time spent at home is instrumental in changing dietary patterns. It has been observed that women are increasingly working out of the home. Currently, women make up 39% of the formal workforce in Ghana [54]. However, systematic barriers prevent women from effectively combining household and work roles, resulting in the reliance on out-of-home and quick-cooking meals. Also, the quest to educate the girl and boy child has affected their presence at home to help with household chores, including cooking. This has resulted in dwindling cooking skills. Approximately two-thirds of participants in the Brong Ahafo and Ashanti Regions reported inadequate preparation and cooking skills as a barrier to the consumption of vegetables (64%) [55]. Considering the relevance of formal education to life outcomes, including nutrition education and food demonstrations as part of the curricula will be essential.

Nutrition transition in Ga Mashie

The dietary pattern that was identified reflects a combination of traditional and processed foods such as soft drinks, Milo, cakes and biscuits. The general pattern is towards more rice, ASF, processed foods and deep-fried foods anchored into an existing traditional diet. This dietary pattern, although close to Stage 4 of the nutrition transition, has differences. In Tamale in the north of Ghana, Vercolli noted that *"they [referring to Tamale residents] had adapted to global food practices, like producing, selling, and consuming highly-processed ingredients and foods grown with heavy doses of inorganic fertilizer and agrochemicals. On the other hand, many people still maintained local practices, such as cultivating and selling staple ingredients grown nearby with minimal external technologies"* [56]. This dietary pattern is also reflected in the food environment of other urban areas in Ghana, such that even though most food retail outlets sell unprocessed (97%) and traditional staple foods (81%) the vendors also sell processed foods (80%) [57].

Our results suggest that Ga Mashie is in Stage 4 of the nutrition transition, where there is food hybridity, as has been reported in other contexts [58, 59]. Food hybridity refers to different foods grafted-together to make a new one. This has been seen in how people improvise ingredients and cooking skills to fit their current food environment [60]. In Ga Mashie, we can describe the preference for street foods and less home cooking as an adjustment to the always-changing urban life and its demands, as well as the continual reduction of the infrastructure that supports home cooking (including kitchen spaces and time for cooking) [19, 61].

The nutrition transition happening in Ga Mashie has implications for policy and practice. In some cases, food hybridity introduces essential foods such as fresh vegetables into the diet. However, according to some dietary diversity surveys and the results of this study, these essential food items are rarely consumed in the community [62]. The food hybridity in Ga Mashie did not address dietary diversity, with most food items in meals belonging to the same food group. Such hybrid meals can increase calorie intake, hence favouring an unhealthy diet. For example, most African countries consume starchy tubers and roots as staples; when these staples are served with food items such as SSBs and deep-fried foods this leads to increased energy intake [63, 64]. In addition, the use of artificial seasoning for traditional sauces can increase salt intake, which can increase the

risk of hypertension [65]. These practices do not align with the recommendations of the Ghana Food Based Dietary Guidelines, which defines a healthy diet as a meal that consists of the amount and type of food that is consumed, habitually, which provides nutrients that help to protect against malnutrition in all its forms, as well as non-communicable diseases.

The transition of the population towards an unhealthy diet is a major risk factor for obesity, hypertension, diabetes and other cardiovascular diseases and requires interventions at the community as well as the national level [66]. For example, community stakeholders such as the Ga Mashie Development Agency and the Ghana NCD Alliance can marshal momentum to raise awareness of these dietary risks while increasing knowledge on healthy diets at the community level. The CARE project, in collaboration with these local stakeholders, is designing interventions to increase awareness of healthy diets using participatory methods, which include participatory public awareness campaigns. In terms of policy, the findings support the importance of implementing the recent dietary-based guidelines for Ghanaians and the sugar tax [35, 67]. For example, a sugar tax can discourage the buying of SSBs, as has been shown in Brazil and South Africa [68]. Furthermore, initiatives that also reduce the cost of healthy foods can be considered by the government, since the high cost of healthy foods is one of the predominant reasons that prevent households and individuals from healthy eating [69]. These policy initiatives are in line with the WHO's best buys for reducing NCDs, the FAO's call for repurposing agricultural and food policies and Ghana's commitments to food system transformation [70]. These policies can have the potential to modify the food environment and behaviours to influence healthy dietary choices among consumers.

Strengths and limitations

This paper provides a contextual understanding of the changes in diet in Ga Mashie using data from the CARE diabetes project. The CARE project used a representative sample of Ga Mashie. Also, the project gathered a wide range of information, allowing both quantitative and qualitative analyses of complex contextual factors in the community. To the best of our knowledge, this is the first manuscript to describe the nature of the nutrition transition happening in an urban poor community in a middle-income country using a mixed methods approach. The use of the Ghanaian standardised DQQ tool to gather information about dietary intake makes the findings context-specific and strengthens the findings. Also, the tool allowed us to provide information on healthy and unhealthy food groups and their contribution to diet quality. This information can be easily used in health promotion messages and action points for improving diet quality. The historical account of life stories is also vital in a setting where data on these experiences are unavailable, inaccessible, or unknown. Still our findings may not be generalised to other urban settings in Ghana since our data sources were within two communities. The study was also cross-sectional and may be susceptible to bias. For example, recall bias could have influenced the qualitative data. Participants had to share stories from their childhood, mostly events and experiences that occurred about 30 years ago. Also, the DQQ only assesses foods consumed in the last 24 h without the quantity consumed. A 24 our dietary recall may not necessarily reflect regular food consumption Though respondents were encouraged to provide an honest and accurate report of their consumption, there may nonetheless have been interviewer bias if respondents felt that they had to report healthier behaviours.

Nevertheless, our triangulation approach of multiple data sources and multi-disciplinary researchers and the iterative nature of searching for complementarity of these sources can compensate to some extent for the weakness of each data source. Analysis of both the DQQ data and the historical data allowed for an exploration of current as well as past dietary behaviours. We recommend further studies using the DQQ and especially exploring the association between the NCD related indicators and NCD outcomes. In addition, future research can be designed to understand perceptions and attitudes towards the consumption of modern foods to inform policy and intervention design. Interventions addressing the concern of toxic/fertilizer foods can be vital in increasing the acceptance and consumption of fruits and vegetables.

Conclusion

This study assessed food consumption practices in an urban community in Ghana by describing the types of food currently consumed and the social and historical context that surrounds changes in the acquisition, preparation and types of foods consumed. We found that the community consumed a blend of foods considered traditional and modern with an increased consumption of sugar, red meat, salt, and instant noodles. These food items were consumed occasionally in the past. The consumption of these items can increase energy intake and the risk of obesity, hypertension, diabetes and other associated cardiovascular diseases. We recommend community-level as well as national-level interventions that promote dietary self-efficacy and changes to the food environment.

Appendix 1

Description of Ghanaian meals

Food item	Description
Ampesi	Boiled yam, plantain, or cocoyam
Indomie	A brand of instant noodles
Fufu	Boiled pounded dough made from cassava and plantain/cocoyam
Jollof rice	Rice boiled in gravy
Kenkey	Cornmeal dumpling
Fried fish	Any type of fish that has been deep fried
Brukina	Fermented milk drink with millet
Hausa koko	Millet porridge
Tuo zaafi	Cornmeal and cassava flour dumpling
Gari	Dried cassava grits
Koko	Cornmeal porridge
Kulikuli	Groundnut snack
Kokonte	Cassava flour dumpling
Fante fante	Fresh fish stew
Sobolo	Hibiscus leaves drink
Omotuo	Boiled rice dumpling
KFC	A brand of fast-food company known for serving fried chicken and French fries
Papaye	A brand of fast-food company known for serving fried rice and fried chicken

Authors' contributions

SBK, LO, MV, and CSGE contributed to the study's conception and design. All authors were involved in the data collection. IAK, OAS, LB, KMS, MKK, AAM, ER, AB, PA, HJ, VAA, RB and EF contributed to the methodology of the study. CSGE, SBK, EF, KAG, KMS, IAK, OAS, MKK, and LO contributed to the survey design and/or implementation. SBK, LO, MV KAG and CSGE performed material preparation and analysis. SBK, LO and CSGE wrote the first draft of the manuscript. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding

This work was supported by the UK Research and Innovation (UKRI) Medical Research Council (MRC) under Grant [grant reference MR/T029919/1]. The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval for this research was granted by University College London (UCL) (21541/001), the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (NMIMR-IRB CP 060/21–22) and the Ghana Health Service (GHS-ERC 017/02/22). The procedures used in this study adhere to the tenets of the Declaration of Helsinki. The goals and objectives of the study were explained to the participants before recruitment. A written informed consent was signed or thumbprint by the participants before the interview.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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Received: 25 March 2025 / Accepted: 25 June 2025
Published online: 26 July 2025

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