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Contribution of street foods to the dietary needs of street food vendors in Kampala, Jinja and Masaka districts, Uganda

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Abstract

Objectives: To assess the contribution of street foods to the energy and nutrient needs of street food vendors.
Design: A cross-sectional descriptive study was conducted. Food intake for the street food vendors was measured using the 24 h recall method and a semi-quantitative FFQ with emphasis on the source of all foods consumed.
Setting: Kampala, Jinja and Masaka districts, Uganda.
Subjects: The study included 225 street food vendors trading in prepared cooked foods.
Results: The majority of vendors (87·6 %) were women with age range of 21–50 years. Traditional dishes were the most commonly prepared foods and classified into main meals, sauces, vegetables and snacks. The food groups consumed most commonly by street food vendors fall under energy-giving and body-building foods (0·26 (SD 0·81)). The mean daily intake of energy from street foods varied between 22·4 % and 25·6 % (2412 kJ). Carbohydrates contributed the highest proportion of energy (70·1 % to 93·4 %), followed by protein (38·6 % to 44·9 %) and fat (21·9 % to 26·3 %). Street food vendors obtained 24·0 % to 32·5 % of their RDA for Ca from street vended foods, with the lowest intake in Jinja (11·2 % to 23·9 %, $P < 0·05$). Niacin and thiamin intakes from street foods were respectively above 74 % and 150 % of the RDA. The contribution of street foods to the RDA for Zn ranged from 81·9 % to 190·9 %, and from 3·5 % to 4·9 % for retinol. Fe intake from street vended foods was 40·9 % to 49·7 % of the RDA.
Conclusions: Street foods contribute to sources of dietary energy and other nutrients among street food vendors in Uganda.

Keywords
Street foods
Street food vendors
Dietary diversity
Nutrients

Street foods are a source of inexpensive, convenient and often nutritious food for both urban and rural poor in developing countries[1–3]. Street foods are defined by the FAO[4] as ready-to-eat foods and beverages prepared and/or sold by vendors on the street from pushcarts, buckets, balance poles, stalls or shops having fewer than four permanent walls. Street foods are physically and economically accessible to most people and can play an important role in helping them meet their basic energy and nutrient needs[5]. Moreover, street food vending generates significant employment in urban areas, which is important in alleviating poverty, the major causative factor in food insecurity[5]. The mobile street food practice is one of the multiple survival strategies adopted by poor urban households to maintain and expand the base of subsistence incomes especially in the surge of economic crisis[6]. It provides a viable alternative to formal employment[7,8]. The Uganda Bureau of Statistics[9] reported that the informal sector, of which street food vending is part, employs approximately 13 % women and 10 % men of working age. Street food vending stimulates small and micro production of goods and services and encourages the development of entrepreneurship by providing a market for small manufacturing firms[10]. Food vending is often seen as a relatively quick and easy avenue to raise funds to assist with education, medical expenses and to supplement family income[11].

The FAO[12] affirmed that street foods have significant nutritional implications for consumers, particularly for middle- and low-income sectors of the population who heavily depend on them. The nutritional value of street foods depends on the ingredients used and how they are prepared, stored and sold. Street food ingredients are country specific and mostly undocumented[13]. Eating of a combination of street foods provides both the consumer and the vendor with adequate opportunity to meet their daily nutritional requirements at an affordable price. Thus, there is need to develop and use proper technologies to preserve the nutritional value of street foods[12]. However, much less is known about the quantitative

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contribution of street foods to the food and nutrient intakes of street food vendors or their consumers[14]. Data on cooked street foods and their consumption in Uganda are largely lacking. Therefore, the present study set out to assess the contribution of street vended foods to the energy and nutrient intakes of street food vendors in Uganda.

Methods

Study population

The study design was cross-sectional in nature. Only vendors who met the FAO[4] definition for street food vending and traded in wholly prepared foods were purposively randomly sampled and included in the study. Data were collected from 225 street food vendors in Jinja, Kampala and Masaka districts between the months of August 2008 and May 2009. A purposive sampling technique was used to interview only the individuals involved in the vending of wholly prepared foodstuffs. Prior to starting the study, a visit was made to explain the objectives of the study to the local council and representatives of the street food vendors. Informed consent of the vendors identified for the study was then obtained.

Sample size determination

The sample size was derived using the formula[15]: $n = Z^2 \times pq/d^2$, where n is the sample size required, Z^2 is the confidence interval test statistic at the desired level of significance, p is the proportion of street food vendors trading in wholly prepared foods, $q = 1-p$, and d^2 is the acceptable error willing to be committed (this is 5% at a 95% confidence interval). The confidence interval of 95% was used as the desired level of significance. At this, interval values of Z, p and d are 1·96, 0·5 and 0·05, respectively. Although 384 street food vendors were supposed to be studied, only 225 vendors were actually reached in the present study.

Data collection

Demographic characteristics of street food vendors

Demographic characteristics of street food vendors were captured by administering a questionnaire interview focusing mainly on gender, marital status, age and level of education. Demographic characteristics of the street food vendors were also determined for Masaka district, representing a rural district, to ascertain the gender dominating the street food vending business.

Dietary intake of street food vendors

A 24 h dietary recall procedure was administered to each street food vendor included in the study. A qualitative 24 h recall questionnaire (diet diversity score) was used to collect data on meal patterns and meal quality, whereas an FFQ was used to collect information on food selection patterns and portion sizes (food frequency and food variety) and cost over a period of 1 week. The purpose of this assessment was to determine the nutrient adequacy of the street food vendors' diet. The RDA was used to determine the average daily dietary intake levels that are sufficient to meet the nutrient requirements of healthy individuals. Selected nutrients were considered in the present study to determine their adequacy to meet the known nutrient needs of healthy people.

Diet diversity score

Diet diversity scores (DDS) were used to measure of the adequacy of the street food vendors' diet including the probability of adequate micronutrient intake according to Parvin *et al.* and FAO[16,17]. The DDS template used was adapted from the Food and Nutrition Technical Assistance project[18]. It classifies all foods into fourteen different food groups including: (i) cereals; (ii) vitamin A-rich vegetables and tubers; (iii) white tubers and roots; (iv) dark green leafy vegetables; (v) other vegetables; (vi) vitamin A-rich fruits; (vii) other fruits; (viii) organ meat (Fe rich); (ix) flesh meat; (x) eggs; (xi) fish; (xii) legumes, nuts and seeds; (xiii) milk and milk products; and (xiv) oils and fats. Not all of these food groups were used in the present study; those selected were identified during the pretesting of research tools and using the researchers' knowledge on eating habits of peri-urban and urban Ugandan communities.

The street food vendors were asked to recall and describe the foods consumed from when they woke up until they went to bed in the past 24 h. This included the food both prepared at the vending premises and at home. The validity and reliability of 24 h recall has been proven in several studies[19,20]. The DDS was computed by counting the number of food groups consumed by the street food vendors during each of the 7 d of recorded intake.

FFQ

The number of different food items commonly consumed by street food vendors as well as their estimated portion sizes was determined using the quantitative FFQ (QFFQ). The street food vendors were not informed prior to administering the questionnaire in order to minimize recall bias. The vendors were given clear instructions to recall their dietary habits over the previous week. The QFFQ consisted of a list of fifty-five food items with five frequency options ranging from 'never' to 'once a day'. The list was divided into eleven food groups: (i) cereals and cereal products; (ii) starchy roots and tubers; (iii) cooking green bananas; (iv) vegetables; (v) whole fruits; (vi) milk and milk products; (vii) meat and meat products including fish and poultry; (viii) legumes; (ix) spreads usually used on bread; (x) snacks; and (xi) beverages and alcohol. Estimation of portion sizes and quantities was based on the cost of the foods sold at the vending site as well as common household measuring utensils. To determine the nutrient contribution of commonly

consumed cooked street food items, standardized recipes for the commonly prepared street foods were obtained; for each recipe needed, five recipes were collected from five different vendors and the average used as the standardized recipe. Following the list of ingredients provided for each food, three vendors were then requested to recall the usual quantities of each of the ingredients used and the number of servings obtained per recipe. The quantities were reported in terms of cost or market/household measures. The market measures were then converted into weights by taking weights (scale model 361F; Sartorius AG, Gottingen, Germany) of two of each of the commonly consumed foods. Also samples of the commonly consumed street vended foods were purchased as much as possible from the same stalls as consumers and weighed.

Observations

Observations were made on the street food vendors to confirm the type of foods sold, methods of food preparation, ingredients used, and portion sizes served.

Limitation of the study

The limitation of the study was that only demographic characteristics were determined for Masaka district and it did not form part of all the measurements presented.

Statistical analyses

The SPSS statistical software package version 12·0 (SPSS Inc., Chicago, IL, USA) and Windows Excel 2007 (Microsoft® Corporation, Redmond, WA, USA) were used for data analysis concerning the characteristics of the street food vending enterprise and quantitative and qualitative data on the contribution of street foods to dietary needs. Descriptive statistics were used to answer some of the study objectives such as to establish the characteristics of the street food vendors in Uganda.

The amounts of energy and nutrients provided per serving, as obtained from 24 h recall, was calculated using Erhardt's 2004 NutriSurvey package (http://www.nutrisurvey.de/), the US Department of Agriculture's National Nutrient Database for Windows, Release 23 (Agricultural Research Service, Beltsville, MD, USA) and FAO food composition tables for African foods (http://www.fao.org/infoods/tables_africa_en.stm). The amounts were compared with the Dietary Reference Intakes (DRI) of the Nutrition Information Centre, University of Stellenbosch[21] and US Food and Nutrition Board for women aged 19–50 years who are active. The references used were 10 054 kJ (2403 kcal)/d for energy, 30 % or less of energy from fat, 46 g protein/d, 18 mg Fe/d, 700 μg retinol equivalents/d, 1000 mg Ca/d, 1·1 mg thiamin/d, 75 mg ascorbic acid/d, 14 mg niacin equivalents/d and 8 mg Zn/d. The percentage contribution of streets foods to the dietary intake of the street food vendors was then established. The level of significance was set at 95 %.

Results

The results presented are drawn from both 24 h recall and quantitative frequency data.

Demographic characteristics

Demographic characteristics of street food vendors are shown in Table 1. The results showed that the majority (87·6 %) of the street food vendors were women. Seventy-five per cent of the street food vendors were aged between 21 and 40 years. There was no significant difference ($P = 0·901$) among the vendors with respect to

Table 1 Demographic characteristics of street food vendors sampled, Uganda, August 2008–May 2009

	Jinja (*n* 72)		Masaka (*n* 70)		Kampala (*n* 83)		Total (*n* 225)	
Characteristic	*n*	%	*n*	%	*n*	%	*n*	%
Gender of respondent								
Male	11	15·3	9	12·9	8	9·6	28	12·4
Female	61	84·7	61	87·1	75*	90·4	197**	87·6
Marital status								
Married	40	55·6	26	37·1	61*	73·5	127**	56·4
Single	25	34·7	29	41·4	17*	20·5	71	31·6
Divorced	4	5·6	7	10·0	3	3·6	14	06·2
Widowed	2	2·8	8*	11·4	2	2·4	12	05·3
Age (years)								
≤20	4	5·6	5	7·1	6	7·2	15	6·7
21–30	29	40·3	26	37·1	31	37·3	86**	38·2
31–40	26	36·1	24	34·3	32	38·6	82**	36·4
41–50	8	11·1	8	11·4	12	14·5	28	12·4
≥ 59	5	6·9	7	10·0	02	2·4	14	6·2
Education level								
None	12	16·7	11	15·7	19*	22·9	42	18·7
Primary	39	54·2	43	61·4	37	42·2	119**	52·9
Secondary	21	29·2	16	22·9	30	34·9	67	29·8

*Values were significantly different among the districts ($P < 0·05$).
**Values were significantly different within each demographic characteristic ($P < 0·05$).

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Table 2 Frequency of consumption of the different food groups by street food vendors, as measured by the quantitative FFQ, Kampala and Jinja districts, Uganda, August 2008–May 2009

	Frequency of consumption (%)				
Food group	Daily	3–4 times/d	5–6 times/d	1 time/d	Never
Beverages	36·9	11·1	6·8	3·7	41·5
Snacks	7·7	8·7	11·2	4·5	67·9
Spreads	8·2	5·4	4·5	1·9	80·0
Legumes and nuts	28·0	9·4	10·6	4·5	47·5
Meat	23·0	11·8	11·1	7·6	46·5
Milk products	24·7	3·2	4·3	3·9	63·9
Fruits	5·2	5·5	4·5	6·3	78·5
Vegetables	30·7	5·9	9·4	5·2	48·8
Bananas†	40·6	5·5	8·4	3·2	42·3
Roots and tubers	19·3	17·9	11·9	6·2	44·7
Cereals	25·9	17·5	9·4	8·7	38·5

†Cooking-type bananas (*matooke*).

Table 3 Sources of food groups commonly consumed by street food vendors, as measured by 24 h recall, Kampala and Jinja districts, Uganda, August 2008–May 2009

	Source of food (%)			
Food group	Made at vending site	Made at home	Purchased from neighbours	Do not consume
Beverages	35·5	11·0	12·3	41·2
Snacks	14·7	2·3	15·2	67·8
Spreads	3·2	7·7	8·3	80·8
Legumes and nuts	42·5	7·2	2·6	47·7
Meat	56·6	5·6	2·1	35·7
Milk products	23·7	6·6	5·8	63·9
Fruits	11·0	10·3	3·3	75·5
Vegetables	46·8	3·5	2·6	47·1
Bananas†	50·3	3·2	3·9	42·6
Roots and tubers	41·5	8·9	4·9	44·7
Cereals	45·8	11·8	10·7	31·7

†Cooking-type bananas (*matooke*).

age in the different districts. The street food vendors had relatively low education level with at least 52·9 % of street food vendors having attained primary education only. Kampala district had the largest proportion of street food vendors with no education. There was a significant difference ($P = 0{\cdot}018$) among the districts with respect to lack of education. None of the vendors had attained tertiary level of education.

Frequency of consumption of street vended foods by street food vendors

Table 2 represents the frequency of consumption of various food groups by street food vendors in Jinja and Kampala districts. There are eleven different food groups that were commonly used and prepared in the street food enterprise. The hierarchy of food groups consumed on a daily basis was bananas (41 %), beverages (37 %), vegetables (31 %), legumes and nuts (28 %), cereals (26 %), milk products (25 %), meat (23 %), roots and tubers (19 %), spreads and snacks (8 % each) and lastly fruits (5 %). Overall the dishes commonly consumed on a daily basis were steamed *matooke* (70 %), *posho* (45 %), rice (41 %), steamed sweet potatoes (34 %), chapatti (29 %) and steamed cassava (27 %). The least consumed foods were chips and spaghetti. Sixty-three per cent of vendors reported that they drunk milk on a daily basis in the form of milk tea (milk mixed with water and tea leaves; Table 2). The other usually drunk beverage was black tea (hot water plus tea leaves; 54 %) whereas alcohol was consumed least. Tomatoes and onions accounted for 70 % of the daily vegetables utilized by street food vendors. The majority of the street food vendors (79 %) usually spent a week or more without consuming any fruit whereas half of them rarely had vegetables (Table 2). The commonly prepared green leafy vegetables included amaranthus species. Small portions of vegetables (17·5 g) were usually eaten by street food vendors. Despite the low consumption of whole fruits, 43 % of the street food vendors admitted drinking fruit juice made from a combination of passion fruit and oranges on a daily basis.

From observation, the meat and legume groups dominated in the food items prepared. Meat in the form of beef stew was eaten by 57 % (Table 3) of the street food vendors daily followed by fish (27 %) which was consumed in the form of fish stew or mixed with groundnuts. Chicken was rarely prepared and consumed as it was

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Table 4 Dietary diversity of street food vendors, as measured by 24 h recall, Kampala and Jinja districts, Uganda, August 2008–May 2009

	Proportion of foods consumed in each food group					
	Kampala (*n* 83)		Jinja (*n* 72)		Total (*n* 155)	
Food group	Mean	SD	Mean	SD	Mean	SD
Carbohydrates	0·27	0·17	0·25	0·19	0·26	0·18
Cereals*	0·23	0·16	0·34	0·20	0·29	0·18
Roots and tubers	0·20	0·18	0·23	0·20	0·23	0·18
Fats and oils*	0·14	0·13	0·06	0·14	0·10	0·14
Bananas†	0·49	0·19	0·38	0·23	0·44	0·21
Proteins	0·24	0·16	0·28	0·19	0·26	0·18
Milk and milk products	0·29	0·17	0·25	0·17	0·27	0·17
Legumes*	0·19	0·15	0·33	0·19	0·26	0·17
Meat and meat products	0·25	0·15	0·26	0·22	0·26	0·19
Vitamins and minerals	0·17	0·11	0·21	0·13	0·19	0·12
Vegetables*	0·25	0·12	0·39	0·20	0·32	0·16
Fruits*	0·10	0·10	0·02	0·05	0·06	0·08

*There was a significant difference between vendors in Jinja and Kampala: $P < 0·05$.
†Cooking-type bananas (*matooke*).

more expensive to procure and sell. Food served with chicken stew was sold at 2000 Uganda shillings (equivalent $US 1·177) which is $US 0·588 above the cost of food served with beef or fish stew. Bean stew (61 %) and groundnut paste sauce (41 %) were the most used in the legumes, nuts and pulses group. Hence, the hierarchy of the most frequently consumed sauces included beans (61 %), meat (57 %), groundnuts (41 %) and fish (27 %).

Margarine was the most regularly utilized spread on bread (18 %). Snacks such as samosas, pancakes, mandazi and biscuits were consumed by a few vendors. The frequency of use of foods from the eleven food groups was influenced by the types of foods commonly prepared by the vendors at their vending site.

Sources of foods consumed by street food vendors

Table 3 shows the main sources of food groups consumed by street food vendors. Forty-six per cent of all cereal products consumed by the street food vendors were obtained from the vending site. The cereal-based products included bread (52 %) purchased from shops neighbouring the vending business; rice (86 %), *posho* (71 %), chapatti (31 %) and spaghetti (29 %) were obtained from foods prepared by the vendors. The street food vendors obtained 50 % of the bananas from the food prepared in the vending business. *Matooke* (cooking-type banana; 86 %) was the most the commonly consumed food in this category. Generally, street foods contributed 42 % of the roots and tubers consumed by vendors and comprised mostly cassava (68 %) and sweet potatoes (67 %).

Most of the items consumed from the vegetable group (47 %) were also obtained from the street food business (Table 3). Minimal fruit consumption was observed at both the vending site (11 %) and home (10 %). The utilization of fruits was influenced by seasonality and cost. Seventy-six per cent of the street food vendors interviewed did not eat fruits and attributed this to their high cost.

Overall milk (63 %), beef (85 %), fish (61 %), beans (83 %) and groundnuts (70 %) were the most commonly consumed foods.

The study indicated that 71 % of foods consumed by street food vendors were prepared at the vending site. Only 15 % and 14 % of the foods were obtained at home or purchased from neighbouring stalls and shops, respectively. From observation, street food vendors tasted the food to ascertain its sensory quality and consistency before sale.

Contribution of street foods to dietary diversity of street food vendors

The results in Table 4 show the dietary diversity and proportion of foods consumed in each food group by street vendors in Jinja and Kampala districts as measured by 24 h recall. Overall, the hierarchy of food groups most commonly consumed fall under carbohydrates and protein (0·26 (SD 0·18) for both). The vitamins and minerals as well as the fats and oils groups were least consumed (0·19 (SD 0·12) and 0·10 (SD 0·14), respectively. Despite the lack of a significant difference ($P > 0·05$) in the consumption of carbohydrates at district level, the street food vendors in Kampala consumed more foods of this group than those of Jinja district. The reverse was true for protein consumption in the districts. Slightly more vendors in Jinja (0·21 (SD 0·13), $P < 0·05$) consumed vitamins and minerals than those interviewed in Kampala (0·17 (SD 0·11)). The food groups consumed were influenced by individual choice and seasonality of agricultural products.

Under the carbohydrate food groups, cooking-type bananas (*matooke*, 0·44 (SD 0·21)) were the most commonly consumed followed by the cereal group (0·29 (SD 0·18)), and lastly roots and tubers (0·23 (SD 0·18)). More cereal foods were consumed in Jinja (0·34 (SD 0·20)) than in Kampala (0·23 (SD 0·16), $P < 0·05$). The major cereal foods encountered in Jinja were *posho* (made from maize flour), chapatti and millet bread/porridge. Consumption of foods

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from the roots and tubers group was similar in both districts. Overall, the utilization of fats and oil group was highest among street food vendors in Kampala (0·14 (SD 0·13)) than in Jinja (0·06 (SD 0·14), $P < 0·05$). For the protein foods, milk and milk products, meat and meat products as well as legumes and pulses were all equally consumed in the two districts. However, there was a significant difference ($P < 0·05$) in the numbers of vendors using the legumes and pulses group in the two districts: Jinja district had more vendors utilizing legumes and pulses. The commonly encountered milk products were milk tea and yoghurt, whereas beef, chicken and fish stew were regular among the meat products. The legumes and pulses group was dominated by beans and groundnut sauces. Vegetables included tomatoes, onions, cabbage, carrots, green pepper, amaranthus species and bitter tomatoes (*Solanum* spp., locally known as *ntula*). More vegetables were being used in Jinja (0·39 (SD 0·20)) than Kampala (0·25 (SD 0·12), $P < 0·05$). From observation, vegetables especially cabbage and leafy greens were used to improve the scrumptiousness of the stews and sauces especially where cooking oil was not used.

Nutritional quality of commonly consumed street foods in Uganda

The purchased serving portions of commonly consumed street foods and their energy and nutrient contents are shown in Table 5. The serving portion sizes varied among the foods and the street food vendors. Thus, the serving sizes (Table 5) are averages for the street food vendors. The foods providing the highest level of energy were millet bread (6881 kJ/serving), *posho* (2228 kJ/serving) and boiled rice (2215 kJ/serving) in descending order. The commonly prepared and consumed sauces were beef stew, fish stew, bean stew and groundnut paste (usually mixed with smoked fish, cowpea leaves or sesame seeds). Apart from the sauces providing protein, ranging from 5·4 g/serving in meat to 107 g/serving in beans, they were also the major sources of fat. Fat among other commonly consumed street foods was obtained from groundnuts and fish stew (cooking oil added to improve palatability). Groundnuts and fish stew respectively accounted for approximately 22 % and 11 % of the energy needs from fat for the vendors.

Energy and nutrient intakes from street vended foods among female street food vendors

Table 6 presents the average energy, macro- and micronutrient intakes from street vended foods consumed by female street food vendors in Jinja and Kampala districts. The mean energy intake from street foods was 2412 kJ/d. There was no significant difference ($P > 0·05$) in the energy consumed from street foods among the female street food vendors by district. Among the macronutrients, carbohydrate intake was the highest for female street food vendors in both districts at 96·20 (SD 13·41) g and 106·28 (SD 15·17) g

Table 5 Average energy and nutrient contents of typical street food dishes in Uganda, Kampala and Jinja districts, August 2008–May 2009

Food product	Serving (g)	Energy (kJ)	CHO (g)	Protein (g)	Fat (g)	Fe (mg)	Retinol (μg)	Ca (mg)	Thiamin (mg)	Ascorbic acid (mg)	Niacin (mg)	Zn (mg)
Boiled rice	158	2215	199	17·5	1·3	4·3	0	22·4	0·5	0	13·4	0
Steamed bananas†	358	963	58·0	3·1	1·4	0·9	0	17·9	0·1	22·1	2·4	0·5
Steamed sweet potatoes	58	347	17·3	1·7	0·9	1·6	0	20·5	0	0	0	0
Steamed cassava	33	487	51·3	1·8	0·4	0·4	0	21·5	0·1	27·7	1·2	4·5
Posho‡	142	2228	118	7·9	1·9	1·3	0	2·8	0·1	0	3·8	0·5
Millet bread	450	6881	514	27·9	12·1	9·3	0	164	1·8	189	18·5	6·9
Steamed yams	175	805	42·3	3·3	2·9	1·4	1·4	89·3	17·5	175	175	0
Beef stew	185	403	2·5	5·4	9·3	12·2	18·8	7·2	0·02	6·5	0·2	0·4
Fish stew	252	1836	2·5	41·7	27·9	0·7	18·8	6·3	0·1	6·5	5·4	0·04
Bean sauce	458	3743	212	107	6·9	32·7	18·6	487	1·5	10·4	9·6	10·9
Groundnut sauce	208	2576	40·8	21·4	46·4	17·0	469	855	1·7	58·8	13·3	5·3
Boiled amaranthus	17·5	15	0·7	0·4	4·3	0·1	0	13·5	0·03	0	0	0·1
Fried cabbage	29·6	186	1·3	0·4	4·3	0·1	0	12·5	0·03	0	0·08	0·05

CHO, carbohydrates.
†Cooking-type bananas (*matooke*).
‡Made from maize flour.

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Table 6 Energy and nutrient intakes from street foods consumed by female street food vendors, Kampala and Jinja districts, Uganda, August 2008–May 2009

	District							
	Kampala		Jinja		Overall intake			
Nutrient	Mean	SD	Mean	SD	Mean	SD	*F* value	Significance
Energy (kJ)	2552	212	2273	240	2412	160	0·753	0·387
Carbohydrates (g)	96·20	13·41	106·28	15·17	101·24	10·12	0·248	0·619
Protein (g)	21·11	1·92	17·32	2·17	19·22	1·45	1·712	0·192
Fat (g)	21·57	2·54	16·7 1	2·88	19·14	1·92	1·594	0·208
Fe (mg)	8·56	1·05	7·75	1·19	8·15	0·79	0·260	0·611
Retinol (μg)	37·42	6·58	21·30	7·45	29·36	4·97	2·631	0·106
Ca (mg)*	194·53	28·12	87·79	31·81	141·16	21·23	6·320	0·013
Thiamin (mg)	3·13	0·67	1·22	0·76	2·18	0·51	3·537	0·061
Ascorbic acid (mg)	29·29	6·34	30·71	7·17	30·00	4·79	0·022	0·882
Niacin (mg)	10·16	2·22	13·95	2·51	12·05	1·68	1·279	0·259
Zn (mg)*	19·36	5·78	6·54	2·45	10·91	4·36	3·758	0·054

*There was a significant difference between vendors in Kampala and Jinja: $P < 0·05$.

Table 7 Energy and nutrient intakes from street foods as a percentage of the RDA among female street food vendors, Kampala and Jinja districts, Uganda, August 2008–May 2009

	% of RDA		
Nutrient	Kampala	Jinja	Overall % of RDA
Energy (kJ)	23·3–27·5	20·2–25·0	22·4–25·6
Carbohydrates (g)	70·1–84·3	70·1–93·4	70·1–93·4
Protein (g)	41·7–50·1	32·9–19·5	38·6–44·9
Fat (g)	23·8–30·1	17·3–24·5	21·9–26·3
Fe (mg)	41·7–53·4	36·4–49·7	40·9–49·7
Retinol (μg)	4·4–6·2	1·9–4·1	3·5–4·9
Ca (mg)*	33·3–44·5	11·2–23·9	24·0–32·5
Thiamin (mg)*	223·6–345·5	41·8–180	151·8–244·3
Ascorbic acid (mg)	30·6–47·5	31·4–50·5	33·6–46·5
Niacin (mg)	56·7–88·4	81·7–115·9	74·1–98·1
Zn (mg)	169·5–314·3	51·1–112·4	81·9–190·9

*There was a significant difference between vendors in Kampala and Jinja: $P < 0·05$.

for Jinja and Kampala, respectively. Protein and fat intakes were almost the same in both districts.

With the exception of Ca and Zn, street foods provided minimal amounts of the other micronutrients (Fe, thiamin, niacin, ascorbic acid and retinol) to the female street food vendors. Street foods provided significantly higher intakes of Ca (194·53 (SD 28·12) mg, $P < 0·05$) and Zn (19·36 (SD 5·78) mg, $P < 0·05$) in Kampala than in Jinja district (87·79 (SD 31·81) mg and 6·54 (SD 2·45) mg, respectively). The major sources of Zn in the street food vendors' diet were beef, beans, groundnuts and millet. Fish, beans, sesame seeds and milk were the major sources of Ca.

Contribution of energy and nutrients from street foods to RDA

Table 7 shows the contribution of street foods to the energy, macro- and micronutrient needs of the female street food vendors as a percentage of the RDA for active women aged 19–50 years. Generally street foods contributed 22·4 to 25·6 % (2412 kJ) of the overall daily energy requirements of active women. There was no significant difference in energy contribution from street foods to vendors' energy needs between Jinja (20·2 to 25·0 %) and Kampala (23·3 to 27·5 %). For macronutrients, 70·1 to 93·4 % of the RDA for carbohydrates, 38·6 to 44·9 % of the RDA for protein and 21·9 to 26·3 % of the RDA for fat could be obtained by consumption of street foods (Table 7). No differences existed in the macronutrient contributions from street foods in both districts at $P = 0·05$ level of significance. The contribution of Fe from street vended foods was 40·9 to 49·7 % of the RDA. No significant difference ($P > 0·05$) was observed between the districts. The contribution to the RDA for retinol from street foods was marginal, at 3·5 to 4·9 %. On average, the vendors obtained 24·0 to 32·5 % of their Ca needs from street foods; the contribution of street foods to Ca needs of the vendors was lower in Jinja (11·2 to 23·9 %, $P < 0·05$) compared to Kampala (33·3 to 44·5 %). The percentage contribution of street foods to the RDA for Zn among street food vendors ranged from 81·9 to 190·9 % and did not differ between districts. Niacin and thiamin from street foods provided respectively more than 74 % and 150 % of the RDA, with the latter being significantly higher in Kampala ($P < 0·05$). Street foods contributed 33·6 to 46·5 % of the RDA for ascorbic acid.

Discussion

The street food sector is characterized by a high proportion of women in Uganda. This is partly attributed to the nature of the business since, in African culture, food preparation is the responsibility of women[14]. Similar findings were reported in previous studies[1,2,22,23], which indicated that the majority of street food vendors were women who balance the income-generating opportunities of street food vending with traditional household child care duties. Selling wholly prepared food is a coping

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strategy to acquire income among poor women[4,12]. The male vendors involved in street food business employed women to do the cooking. This indicates the willingness and ability of women to use their competitive advantage of greater skills in cooking to contribute to household income. Illiteracy was indicated to characterize the street food vendors[2,5,24]. Their low education levels are associated with poor hygiene practices during handling and storage of foods which increase the risk of street food contamination and thus affect nutrition quality[25].

In the study districts, traditional dishes formed a major part of the foods commonly consumed by street food vendors. Similar findings were reported in the study of dietary intake of adolescents in Nigeria[26]. Street foods are indicated to provide affordable nutrients to a majority of people, especially low-income groups, in developing countries[1,14]. Different food groups were encountered but the street foods were based mainly on carbohydrates and protein in the study areas. Similar findings on the percentage of street food vendors selling foods of different food groups according to locality were reported in Nairobi[27]. The street foods contributed to the energy intake of the vendors. The energy intake observed in the present study was within the range observed from street foods in Calcutta[28], where an urban worker obtained approximately 2573 (SD 389) kJ (615 (SD 93) kcal) from street foods daily. Carbohydrates provided the highest proportion of energy from street vended foods in both districts of the present study; however, the slight differences can be attributed to the main source of carbohydrates in Jinja, which is dominated by cereals, in comparison to bananas in Kampala. The proportions of energy from protein and fat were marginally different in both districts and ranges were in accordance with those documented in other street foods[28].

In Nairobi, the contribution of street foods to daily energy needs fell within the range 13–36 % of the RDA[29]. In the present study this range was 22·4–25·6 %. This similarity can be attributed to similarities in the street foods vended in Kenya and Uganda. However, the value was 59·17 % of total energy intake reported for Nigerian urban market women[14]. The difference is attributable to the dominance of roots and tubers and use of fats/oils in the Nigerian diet.

The macronutrient levels observed in the street foods studied are comparable to values documented previously[14,27]. The substantial contribution of street foods to recommended dietary intakes of carbohydrates and protein observed in the present study agrees with that found (25 % to 50 %) for adolescents attending school and urban market women in Nigeria. The Fe levels obtained from the street vended foods in the present study are also comparable with 56·0 % and 58·7 % of mean Fe intake reported for Nigerian urban market women[14]. The differences observed in the Ca contribution from street foods between the two districts in the present study can be explained by the dominance of foods like milk and milk products (yoghurt), sesame seeds, groundnut paste and beans in Kampala district. However, the overall percentage range was lower than the 81 % contribution of street foods to Ca intake reported in Nigeria[14]. This is due to the fact that 84·9 % of dairy products consumed by Nigerian urban market women were obtained from street foods. Low percentage of retinol contributed by street foods in the present study is attributable to the marginal consumption of fruits and vegetables and limited use of fats and oils fortified with vitamin A. Studies in Nairobi also revealed a poor intake of vitamin A from street vended foods[29]. Use of cooking oil was minimal among our Ugandan street food vendors owing to perceived adverse effects on their health. The higher use of cooking oil in Kampala was mainly because fats and oils are used to improve the palatability of dishes made from fish, chicken and beans. As government policy, cooking oil in Uganda is fortified with vitamin A; however, its low use may frustrate efforts aimed at reducing the prevalence of vitamin A deficiency. Nutrition education and sensitization of these street vendors is necessary if the sector is to use street foods as a vehicle to alleviate this deficiency. The low intake of fruits may also have nutritional implications with regard to the prevalence of micronutrient deficiencies, especially vitamin A deficiency, among women in Uganda. The street foods contributed ascorbic levels lower than the 83 % reported in Nigeria[14].

Conclusions

Street food vending plays a major role as the main source of food eaten by street food vendors in Uganda. Street food vending still operates as an informal sector, thus receiving less attention from central government, whereas it greatly contributes to the energy and nutrient needs of the people. The contribution of street foods to the nutrition of consumers depends upon the types of food offered by vendors, the nutritional content of the foods, the food preparation technique, the choices of the consumers and the place of street foods in the total diet of different types of consumers. Based on the information gained in the present study, street food provides a good target for improvement of the total diet of the urban poor in terms of variety, amount and nutritional quality. The results suggested that street foods contributed more energy than micronutrients, thus indicating a low nutrient density of the street foods. Therefore, there is need to improve the variety of street foods if adequate nutrient supply is to be realized.

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