

## Nutritional composition of commonly consumed composite dishes from the Central Province of Cameroon

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### Abstract

**Primary objective** To provide nutritional composition of 34 composite dishes commonly consumed in Cameroon, in order to enable dietary intake to be calculated from a Quantitative Food Frequency Questionnaire developed specifically for this population to determine associations between diet and diabetes.

**Methods and procedures** A total of 197 recipes were collected for 34 composite dishes. Multiple samples of each dish were collected from a range of 2–16 households in the villages of Evadoula and in the city of Yaounde.

**Main outcomes and results** The average nutritional composition for these composite dishes was calculated using the US Department of Agriculture National Nutrient Database. We provide the energy, macronutrient and micronutrient content of these foods.

**Conclusions** We provide, for the first time, the macronutrient and micronutrient content of 34 commonly consumed composite dishes in the Central Province of Cameroon. Such data are essential for calculating nutrient intake and determining associations between diet and diabetes and other chronic diseases. These data may also be used for nutrition interventions aimed at modifying commonly consumed composite dishes to improve dietary intake.

**Keywords:** *Composite dishes, Cameroon, nutritional composition, recipes, dietary assessment*

### Introduction

Cameroon, West Africa has alarming rates of diabetes, obesity and other diet-related conditions, due at least in part, to the rapid transition in diet from hunter-gathering to a more modern one with low levels of physical activity (Mbanya et al. 1999; Cruickshank et al. 2001, 2001b).

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Studies determining associations between diet and chronic disease in Cameroon are limited, in part because of a lack of data available on the dietary habits of Cameroonians and also because of the deficit of data on nutritional composition of commonly consumed foods. A recent study in Cameroon highlighted a lack in knowledge of the composition of a healthy diet as a barrier to healthy dietary behaviors (Kiawi et al. 2006).

We developed a 76-item Quantitative Food Frequency Questionnaire (QFFQ) to assess long-term dietary intake in urban and rural Cameroon (Sharma et al. 1996) as part of a large international study examining the association between diet and chronic disease, primarily diabetes. However, the data for analysis of the QFFQ that would enable the nutrient intake per person to be calculated, and subsequent diet–disease associations to be explored, were unavailable.

Food composition data for Cameroon are limited, both in terms of the number of foods and the nutrients listed. Furthermore, the food composition data contain mostly nutritional composition values for single-item foods rather than composite dishes. We needed to have nutritional composition data that were specific to the composite dishes eaten in the Central Province of Cameroon and listed on our QFFQ. Biochemical analysis is costly in terms of resources, time and expenses, and was therefore not feasible. Since it is virtually impossible to biochemically analyze every composite dish listed, calculation of nutritional composition using weighed recipes was the method of choice, as has been done in many other studies (Bognar & Piekarski 2000).

The aim of this paper is to provide, for the first time, the calculated nutritional composition of composite dishes commonly consumed in the urban and rural areas of the Central Province of Cameroon. We describe the collection of the weighed recipe data and the calculated nutritional composition per 100 g of foods that were consumed in a dietary study based on 123 24-h recalls and food diaries, and were subsequently listed on a QFFQ. Such data are essential for determining diet–disease associations and could also be extremely useful for nutrition education and dietary interventions, and are necessary for the successful dietary management of diabetes in Cameroon.

## Methods

The development and description of the QFFQ have been previously presented in detail (Sharma et al. 1996). In brief, we composed a 76-item QFFQ from 24-h recalls and 2-day food diaries collected from random samples in Cite Verte, a district in the capital Yaounde, and Evadoula, a rural area 70 km away comprising 15 villages, from which three were selected. One hundred and twenty-three respondents completed dietary data (only one per household), with a response rate of 79% in the urban site ( $n = 61$ ) and 97% in the villages ( $n = 62$ ). At the urban site, 42% of the respondents were men with a mean age of 36 years, and the women had a mean age of 38 years. At the rural site, 46% of the respondents were men and the mean age of both men and women was 45 years.

The QFFQ was developed that listed all foods reported in 24-h recalls and included composite dishes for which there were no available food composition data. To calculate the nutritional composition of these dishes, the study nutritional epidemiologist (S.S.) trained field workers in each site for 5 days in how to collect, record and weigh ingredients and the final cooked weight. The field workers asked

participants who had completed the food diaries or the recalls whether they would be willing to allow their foods to be weighed. The fieldworkers attempted to obtain weighed recipes from at least five different households from various socioeconomic backgrounds for each composite dish, to obtain wide representation of the urban and rural population. An appointment was scheduled at the home of the participants, where all ingredients were weighed, as well as the final cooked weight of the various dishes. If foods had inedible portions, such as chicken bones, edible yields were calculated by subtracting the weight of these inedible parts. For foods such as potatoes in soup, only the edible portion after preparation was weighed (e.g., the weight after the removal of the peel). All food weights were obtained using electronic Soehnle kitchen scales (Magnum Scale & Bretagne Scale, Lithuania).

All the data were entered by students (X.C., M.H., M.W.) and analyzed using Nutribase Clinical Nutrition Manager version 5.18 (2004, Cybersoft Inc., Phoenix, AZ, USA), which is a computerized dietary database based on the US Department of Agriculture (USDA) National Nutrient Database for Standard Reference. The nutritional composition of each food item is given along with the number of the food group servings per 100 g. The food group servings are calculated by Nutribase Clinical, which uses the USDA food guide pyramid servings database as a standardized method for calculating servings.

The nutritional composition of each composite dish (a dish made with more than one ingredient) was calculated by entering the weight of the ingredients and the final cooked weight. An average recipe was then calculated per 100 g for each composite dish.

The study was approved by the University of the Manchester Research Ethics Review Committee and University of Yaounde Committee on Research Involving Human Subjects.

## **Results**

A total of 197 recipes were collected for 34 composite dishes. Multiple samples of each dish were collected from a range of 2–16 households. The average nutritional composition of each composite dish was calculated. Tables I, II, III and IV present the nutritional composition per 100 g. Of the 34 dishes for which recipes were collected, nine had weighed recipes for that dish obtained in both the rural and the urban settings, 10 had weighed recipes obtained in the urban setting only, and 15 had recipes obtained in the rural setting only. This is in part because some dishes are more commonly consumed in that setting where the ingredients are readily available. To better describe the actual nutritional composition, Table V presents the food group servings for each composite dish. All but eight dishes contained meat or fish. The eight dishes that did not contain meat or fish, such as Kpem, Huckleberry and pumpkin leaves soup, Koki corn and Pap, were more commonly consumed in the rural setting. None of the dishes contained any dairy product and only one dish contained a fruit item (plantain porridge: 1.2 servings of fruit per 100 g). Table VI describes each dish in more detail.

Table I. Calculated nutritional composition (per 100 g) of some commonly consumed composite dishes in urban and rural Cameroon.

	Keleng keleng <sup>c</sup>	Meat stew <sup>c</sup>	Kpem (cassava leaves) <sup>a</sup>	Sanga <sup>a</sup>	Huckleberry soup and pumpkin leaves <sup>a</sup>	Fish stew <sup>c</sup>	Okra pod soup <sup>a</sup>	Okra leaves soup <sup>a</sup>
Number of recipes collected	16	14	13	11	9	9	7	7
Energy (kcal)	152	186	153	244	134	188	153	128
Energy (kJ)	637	780	643	1,021	560	788	640	534
Water (g)	78.7	76.8	84.9	64.8	83.0	75.1	75.5	82.3
Protein (g)	5.7	1.1	3.0	3.0	0.9	2.1	5.4	3.8
Carbohydrates (g)	3.2	1.7	2.3	31.1	1.1	2.8	4.6	2.3
Fat (g)	13.9	20.0	15.5	12.1	14.5	19.4	13.5	12.2
Saturated fat (g)	4.7	9.3	6.6	6.0	7.1	8.3	4.7	4.4
Monounsaturated fat (g)	5.8	7.6	6.0	4.5	5.3	7.6	5.7	5.0
Polyunsaturated fat (g)	2.7	2.3	2.1	1.1	1.4	2.6	2.5	2.2
Omega-3 fatty acid (g)	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Omega-6 fatty acid (g)	2.5	2.2	2.0	1.1	1.3	2.6	2.5	2.1
Cholesterol (mg)	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total dietary fiber (g)	1.4	0.7	0.9	2.8	0.3	1.2	2.3	1.0
Thiamin (mg)	0.1	0.0	0.1	0.0	0.0	0.1	0.2	0.1
Riboflavin (mg)	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1
Niacin (mg)	1.6	0.5	0.9	0.2	0.2	1.0	1.8	1.2
Vitamin B-6 (mg)	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Total folate (µg)	59.4	13.3	55.0	8.6	32.9	25.8	60.1	44.6
Vitamin C (mg)	12.8	3.0	16.5	2.6	13.1	4.1	9.0	9.4
Vitamin A (µg retinol equivalent)	73.1	0.7	101	23.1	80.1	1.2	7.3	55.3
Vitamin K (µg)	195	3.7	269	1.0	214	5.3	21.7	148
Calcium (mg)	60.4	7.2	69.1	15.8	50.5	13.9	103	45.1
Iron (mg)	1.1	0.2	1.0	1.2	0.6	0.4	0.9	0.8
Zinc (mg)	0.6	0.2	0.4	0.1	0.2	0.3	0.7	0.4
Magnesium (mg)	39.5	8.3	32.9	23.5	18.2	16.8	43.1	29.3
Manganese (mg)	0.5	0.1	0.4	0.1	0.2	0.2	0.6	0.3
Selenium (µg)	1.2	0.3	0.8	0.2	0.3	0.6	1.1	0.9
Phosphorus (mg)	88.2	18.4	51.3	63.0	18.2	35.5	114	59.5
Potassium (mg)	298	70.0	269	167	171	113	228	209
Sodium (mg)	32.6	4.3	26.1	150	17.5	5.3	20.6	21.3

Notes: <sup>a</sup>Rural recipe. <sup>b</sup>Urban recipe. <sup>c</sup>Urban and rural recipe.

## Discussion

There are no food composition data available for composite dishes in Cameroon and we have provided, for the first time, the nutritional composition of the most commonly consumed dishes in our study areas. Cameroon is made up of many tribes whose food habits are different from each other. In the Central, West, East, South and three Northern Provinces, ground nuts or melon seeds (providing fat and protein) are usually added to almost all soups and green cooked vegetables, whereas this practice is

Table II. Calculated nutritional composition (per 100 g) of some commonly consumed composite dishes in urban and rural Cameroon.

	Beans stew <sup>c</sup>	Koki corn <sup>a</sup>	Ndole <sup>b</sup>	Dried fish and groundnut soup <sup>c</sup>	Corn flour and groundnuts pudding <sup>a</sup>	Steamed snails <sup>a</sup>	Cassava fufu <sup>b</sup>	Cassava pudding <sup>a</sup>
Number of recipes collected	7	7	7	6	6	6	5	5
Energy (kcal)	240	75	246	108	180	211	158	115
Energy (kJ)	1,003	315	1,029	451	755	882	662	482
Water (g)	71.9	78.8	55.7	88.3	63.7	64.8	55.5	79.4
Protein (g)	0.2	2.4	10.5	6.7	7.5	9.7	4.9	5.7
Carbohydrates (g)	0.9	17.4	4.3	1.7	16.5	6.4	32.7	4.3
Fat (g)	26.6	0.9	21.9	8.7	11.4	18.2	0.5	9.5
Saturated fat (g)	13.1	0.2	7.2	2.5	1.6	2.5	0.0	1.5
Monounsaturated fat (g)	9.8	0.3	8.7	3.8	5.6	9.0	0.0	4.6
Polyunsaturated fat (g)	2.5	0.3	4.9	2.0	3.7	5.7	0.2	2.9
Omega-3 fatty acid (g)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Omega-6 fatty acid (g)	2.4	0.0	3.6	1.7	3.5	5.7	0.0	2.9
Cholesterol (mg)	0.0	0.0	15.2	0.0	0.0	0.0	0.0	0.0
Total dietary fiber (g)	0.2	2.1	1.7	0.9	3.4	3.0	0.0	1.9
Thiamin (mg)	0.0	0.1	0.2	0.1	0.2	0.2	0.2	0.1
Riboflavin (mg)	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1
Niacin (mg)	0.1	1.2	3.0	1.1	3.6	4.5	1.6	2.4
Vitamin B-6 (mg)	0.0	0.1	0.2	0.0	0.2	0.1	0.0	0.1
Total folate (µg)	2.7	29.7	51.7	22.9	75.2	93.2	0.0	83.0
Vitamin C (mg)	2.0	5.4	8.2	0.7	3.9	2.1	0.0	15.7
Vitamin A (µg retinol equivalent)	0.0	8.9	16.7	0.0	6.5	0.0	0.0	95.3
Vitamin K (µg)	2.2	0.3	99.5	0.3	0.2	24.2	0.0	254
Calcium (mg)	4.7	3.7	52.5	17.0	23.3	41.6	1.1	76.6
Iron (mg)	0.1	0.5	1.6	0.4	1.4	1.8	1.4	1.6
Zinc (mg)	0.1	0.5	1.7	0.3	1.1	1.3	0.0	0.8
Magnesium (mg)	2.1	24.0	61.7	23.1	55.0	65.0	0.6	52.1
Manganese (mg)	0.0	0.1	0.5	0.2	0.5	0.7	0.0	0.6
Selenium (µg)	0.2	0.6	4.8	0.7	2.0	2.7	0.0	1.7
Phosphorus (mg)	4.9	64.5	144	98.4	131	142	0.0	90.3
Potassium (mg)	30.9	218	315	185	317	288	44.5	334
Sodium (mg)	4.7	4.5	49.9	37.3	7.4	10.5	1.7	23.5

Notes: <sup>a</sup>Rural recipe. <sup>b</sup>Urban recipe. <sup>c</sup>Urban and rural recipe.

not common among the North West and South West Provinces. The use of palm nuts pulp in the place of palm oil is common among the Central Provinces. However, the three Northern Provinces do not use palm oil or palm nut pulps. Hence, differences in preparation methods can have an effect on the energy and nutrient content of a dish. Determining the nutritional composition of these composite dishes is of critical importance for defining average daily nutrient intakes (Greenfield and Southgate

Table III. Calculated nutritional composition (per 100 g) of some commonly consumed composite dishes in urban and rural Cameroon.

	Egusi (melon seed) pudding <sup>a</sup>	Pap (hot cereal) <sup>a</sup>	Snail stew <sup>a</sup>	Tomato stew <sup>c</sup>	Steamed fish <sup>a</sup>	FuFu corn <sup>b</sup>	Groundnut pudding <sup>a</sup>	Huckle berry sauce <sup>b</sup>	Okok (eru) <sup>b</sup>
Number of recipes collected	5	5	5	5	4	4	4	4	4
Energy (kcal)	25	33	143	193	77	187	403	199	200
Energy (kJ)	104	138	599	807	321	785	1,687	835	839
Water (g)	93.0	92.0	75.1	74.8	83.0	53.5	33.5	79.2	73.1
Protein (g)	3.3	0.8	11.3	4.3	12.7	3.6	18.3	5.3	4.5
Carbohydrates (g)	3.1	7.0	2.7	0.9	1.5	39.4	11.5	2.9	3.0
Fat (g)	0.1	0.2	9.8	19.4	2.4	1.5	35.0	19.2	20.0
Saturated fat (g)	0.0	0.0	3.4	9.5	0.4	0.2	4.9	8.8	7.5
Monounsaturated fat (g)	0.0	0.0	4.0	7.2	1.1	0.4	17.4	6.8	8.2
Polyunsaturated fat (g)	0.0	0.1	1.8	1.9	0.8	0.6	11.1	2.7	3.4
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Omega-6 fatty acid (g)	0.0	0.0	1.6	1.8	0.6	0.0	11.1	1.5	3.3
Cholesterol (mg)	8.9	0.0	29.0	13.2	37.0	0.0	0.0	10.8	2.4
Total dietary fiber (g)	0.3	0.7	0.7	0.5	0.6	1.7	6.1	0.9	1.4
Thiamin (mg)	0.0	0.0	0.1	0.0	0.1	0.2	0.5	0.1	0.1
Riboflavin (mg)	0.1	0.0	0.1	0.0	0.0	1.0	0.1	0.1	0.1
Niacin (mg)	0.5	0.1	1.7	0.4	1.3	3.0	8.6	1.4	1.8
Vit-B-6 (mg)	0.1	0.0	0.1	0.1	0.2	0.2	0.3	0.1	0.1
Total folate (µg)	10.4	4.3	22.4	9.4	23.0	11.0	171	67.7	57.7
Vitamin C (mg)	4.5	0.0	0.8	3.8	1.7	0.0	0.1	26.2	9.9
Vitamin A (µg retinol equivalent)	170	0.0	0.0	0.0	0.0	0.0	0.3	146	0.0
Vitamin K (µg)	0.5	0.0	0.5	1.6	0.0	0.0	1.1	391	155
Calcium (mg)	11.8	2.3	13.9	5.1	10.5	4.1	66.2	95.9	51.7
Iron (mg)	0.4	0.1	2.4	0.1	0.3	0.6	3.3	1.6	1.1
Zinc (mg)	0.2	0.1	0.8	0.1	0.4	0.2	2.3	1.1	0.6
Magnesium (mg)	10.6	4.5	158	9.4	26.9	25.0	119.7	55.5	37.3
Manganese (mg)	0.1	0.0	0.2	0.0	0.1	0.0	1.4	0.5	0.4
Selenium (µg)	4.8	0.7	0.6	6.9	19.5	1.7	5.1	3.4	1.5
Phosphorus (mg)	48.1	7.6	187	46	132	51.7	267	85.3	67.0
Potassium (mg)	212	14.6	287	132	267	62.7	502	399	229
Sodium (mg)	19.9	3.0	43.3	31.1	77.8	2.0	13.7	42.2	23.7

Notes: <sup>a</sup>Rural recipe. <sup>b</sup>Urban recipe. <sup>c</sup>Urban and rural recipe.

2003), a step to enable studies of association between nutrient intakes and diet-related diseases.

The most precise method for producing nutrient values of composite dishes is to analyze them directly (Greenfield and Southgate 2003), but this was beyond the scope and resources of the study. A calculated nutritional composition of composite dishes was therefore necessary. Several researchers have attempted to compare food

Table IV. Calculated nutritional composition (per 100 g) of some commonly consumed composite dishes in urban and rural Cameroon.

	Chicken stew <sup>b</sup>	Eru <sup>c</sup>	Groundnut soup <sup>a</sup>	Okra pod soup <sup>b</sup>	Yellow soup <sup>b</sup>	Koki beans <sup>c</sup>	Plantain porridge <sup>b</sup>	Pumpkin leaves and huckleberry sauce <sup>c</sup>	Green vegetable sauce <sup>b</sup>
Number of recipes collected	3	3	3	3	2	2	2	2	2
Energy (kcal)	269	209	250	126	144	169	144	115	197
Energy (kJ)	1125	873	1,047	528	601	708	602	480	826
Water (g)	94.4	73.7	61.8	79.9	83.4	73.1	70.9	79.3	72.7
Protein (g)	19.2	2.2	8.1	8.0	0.1	3.2	1.6	6.0	2.6
Carbohydrates (g)	2.1	1.1	3.9	2.1	0.4	8.6	18.7	4.2	3.0
Fat (g)	20.2	22.4	23.7	9.7	16.0	14.0	8.0	9.4	20.3
Saturated fat (g)	8.6	10.9	8.0	4.4	7.9	6.8	3.9	1.3	9.4
Monounsaturated fat (g)	7.4	8.3	10.0	3.8	5.9	5.1	2.9	4.6	7.1
Polyunsaturated fat (g)	2.8	2.1	4.6	0.9	1.5	1.5	0.8	3.0	2.8
Omega-3 fatty acid (g)	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Omega-6 fatty acid (g)	2.5	2.0	4.4	0.8	1.5	1.4	0.7	2.9	1.7
Cholesterol (mg)	65.0	5.6	0.0	25.2	0.0	0.0	2.5	0.0	0.0
Total dietary fiber (g)	0.9	0.4	1.9	0.9	0.0	2.1	1.5	2.0	0.9
Thiamin (mg)	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.2	0.1
Riboflavin (mg)	0.2	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1
Niacin (mg)	4.7	0.3	2.5	1.9	0.0	0.7	0.6	2.5	0.6
Vitamin B-6 (mg)	0.3	0.1	0.1	0.2	0.0	0.1	0.2	0.1	0.1
Total folate (µg)	16.8	30.2	51.5	23.0	0.3	33.3	15.4	73.8	58.3
Vitamin C (mg)	7.8	19.4	1.3	5.0	0.4	17.1	12.1	30.1	23.7
Vitamin A (µg retinol equivalent)	13.1	114	0.0	3.9	0.0	54.2	35.8	116	124
Vitamin K (µg)	3.7	233	1.1	11.4	1.3	132	10.2	189	332
Calcium (mg)	15.5	67.0	25.4	24.8	3.5	43.8	5.4	95.7	81.4
Iron (mg)	1.1	0.6	1.0	0.9	0.0	1.6	0.5	1.3	1.3
Zinc (mg)	2.1	0.3	0.7	1.5	0.0	0.4	0.2	0.8	0.7
Magnesium (mg)	22.0	20.7	40.1	22.7	1.2	33.7	23.7	44.7	48.3
Manganese (mg)	0.1	0.3	0.4	0.3	0.0	0.6	0.0	0.6	0.4
Selenium (µg)	15.5	1.3	1.5	3.3	0.1	0.9	1.2	1.8	0.6
Phosphorus (mg)	140	35.2	120	81.7	1.7	64.4	28.4	95.2	61.2
Potassium (mg)	286	222	236	177	5.3	287	318	335	341
Sodium (mg)	69.7	34.4	27.0	29.9	1.8	13.5	6.3	19.8	31.3

Notes: <sup>a</sup>Rural recipe. <sup>b</sup>Urban recipe. <sup>c</sup>Urban and rural recipe.

composition data estimated by calculation from food composition tables, with direct chemical analyses. Boulous et al. (1996) and Porrini et al. (1986) reported a good agreement between calculation and chemical analysis, when comparing the composition of different dishes and food items consumed in their countries. Porrini et al. reported reliable data for macronutrients, but less reliable values for vitamins. Both

Table V. Food group servings<sup>a</sup> per 100 g of each composite dish in urban and rural Cameroon.

Composite dish	Number of meat and meat alternative servings	Number of vegetable servings	Number of grain servings
Keleng keleng <sup>d</sup>	0.7	0.3	0
Meat stew <sup>d</sup>	4.2	0.2	0
Kpem (cassava leaves) <sup>b</sup>	0.3	0.3	0
Sanga <sup>b</sup>	0	0.2	1.7
Huckleberry soup and pumpkin leaves <sup>b</sup>	0	0.3	0
Fish stew <sup>d</sup>	1.6	0.2	0
Okra pod soup <sup>b</sup>	0.6	0.5	0
Okra leaves soup <sup>b</sup>	0.5	0.2	0
Beans stew <sup>d</sup>	0.1	0.2	0
Koki corn <sup>b</sup>	0	0	0.9
Ndole <sup>c</sup>	1.4	0.2	0
Dried fish and groundnut soup <sup>d</sup>	1.0	0.1	0
Corn flour and groundnuts pudding <sup>b</sup>	0.8	0	0.7
Steamed snails <sup>b</sup>	3.0	0.1	0
Cassava Fufu <sup>c</sup>	0	0	2.0
Cassava pudding <sup>b</sup>	0.7	0.3	0
Egusi (melon seeds) pudding <sup>b</sup>	0.5	0.5	0
Pap (hot cereal) <sup>b</sup>	0	0	0.4
Snail stew <sup>b</sup>	1.5	0.1	0
Tomato stew <sup>d</sup>	0.7	0.2	0
Steamed fish <sup>b</sup>	0.4	0.3	0
Fufu corn <sup>c</sup>	1.6	0.3	0
Groundnut pudding <sup>b</sup>	3.2	0	0
Huckleberry sauce <sup>c</sup>	0.6	0.6	0
Okok (eru, cooked with ground nuts) <sup>c</sup>	0	0.2	0
Chicken stew <sup>c</sup>	2.4	0.5	0
Eru <sup>d</sup>	0.4	0.3	0
Groundnut soup <sup>a</sup>	1.2	0.1	0
Okra pod soup <sup>c</sup>	1.3	0.3	0
Yellow soup <sup>c</sup>	0	0.1	0
Koki beans <sup>d</sup>	0	0.2	0.4
Plantain porridge <sup>c</sup>	0.2	0.1	0
Pumpkin leaves and huckleberry sauce <sup>d</sup>	0.7	0.2	0
Green vegetable sauce <sup>c</sup>	0.7	0.6	0

Notes: <sup>a</sup>Based on the USDA Pyramid Servings Database (USDA 2000). <sup>b</sup>Rural recipe. <sup>c</sup>Urban recipe.

<sup>d</sup>Urban and rural recipe.

authors attributed the reason for the slight discrepancies to variations in food composition, as well as to possible nutrient modifications during the cooking process.

We used the USDA Food Composition Tables (FCT) and the nutritional composition for some nutrients may vary in Cameroon, particularly those associated with soil content. However, Cameroon has very limited food composition data that we could use and the nutrient list is more complete in the USDA FCT than other food composition tables currently available. We did not account for some vitamin losses that could have occurred during cooking. For foods where we did not have the exact



Table VI. Description of the composite dishes from the Central Province of Cameroon.

Name of dish	Description
Keleng keleng	A dish that consists of a green leafy vegetable sliced and boiled with ground nuts, meat or fish (especially dried meat or fish). It has a thick consistency and is eaten with garri, corn or cassava fufu.
Meat Stew/chicken stew/fish stew	A sauce made of tomatoes with meat (such as chicken and pork), snails or fish. It is eaten with rice, plantains, yams, cassava or any other starchy foods.
Kpem	A thick vegetable sauce made with cassava leaves and palm nut pulp. Ground nuts or melon seeds can be added. It is eaten with starchy foods.
Sanga	A dish of fresh corn boiled with cassava, huckleberry or pumpkin leaves in palm nut pulp. It is eaten as a meal.
Huckleberry and pumpkin leaves soup	A soup of leafy vegetables cooked with tomatoes, onions and other spices and ground nuts. Fish or meat is usually added. It is eaten with starchy foods and popular in the central part of Cameroon.
Okra pod soup	A soup that is prepared with fresh okra, dried fish, tomatoes, spices and ground nuts. It is eaten with garri, corn and cassava fufu.
Okra leaves soup	Leaves of okra plant prepared in the same way as keleng keleng.
Bean stew	A stew made of dried beans, tomatoes, crayfish, onions and palm oil.
Koki corn/koki beans	A dish of ground fresh corn or beans mixed with palm oil, salt, onions and some green leafy vegetables and then wrapped in leaves and steam cooked. The koki beans is eaten with starchy foods while the koki corn is eaten alone as a snack.
Ndole	It is a sauce made of washed bitter leaves ( <i>vernonia</i> ) and cooked with meat, dried shrimps and ground nut paste.
Steamed snails	Snails are mixed with spices and wrapped in banana leaves and steam cooked. It is eaten with starchy foods.
Cassava fufu	A dish of fermented cassava flour cooked into a paste and served with different soups.
Corn fufu	A dish made of dried ground corn and cooked into a paste. It is eaten with okra and njamnjama soups.
Cassava pudding	A dish made of grated fresh cassava mixed with palm oil and salt and then wrapped in hard leaves and steamed cooked. It is eaten as a snack.
Egusi or melon seed pudding	A dish made of ground melon seeds (egusi) mixed with water, dried fish and spices and then wrapped in leaves and steamed cooked. It is served with boiled cassava, yams, and plantains.
Pap	A dish made of hot cereal, fermented corn, sorghum or millet flours and mixed with water, sugar and lemon. It is eaten with bread or Beignet for breakfast. It is also a weaning food.
Steamed fish	Prepared and cooked in a manner similar to steamed snails.
Groundnut pudding	A dish made of fried ground peanuts mixed with water and spices and then wrapped in leaves and steam cooked. It is served with starchy foods.
Njamanjama	A typical dish in the North West Province of Cameroon, which is made of Huckleberry leaves cooked and sautéed in palm oil. It is eaten with corn fufu.
Chicken stew	Prepared and cooked in a manner similar to meat stew.

Table VI (Continued)

Name of dish	Description
Eru (gnetum)	A dish made of sliced leaves of eru cooked with prepared cow skin, meats, dried fish, crayfish and palm oil. It is eaten with cassava fufu. It is common to the South West Province.
Groundnut soup	A soup or sauce made with fried ground nuts, tomatoes, onions, spices and fish. It can also be called fish soup. It is eaten along with rice and other starchy foods.
Yellow soup	A translucent homogenized soup made with palm oil, meat stock, and many local spices. It is also called achu soup. It is eaten with achu (a starch) or taro. It is common to the Northwest and West Provinces.
Plantain porridge	A dish of green plantains cooked with meats, tomatoes, onions, spices and palm oil. In the West Province, groundnuts are added. It is served as a meal.
Vegetable soup	A soup made of any kind of green vegetables cooked with any form of meat, tomatoes, onions, spices and melon seeds (egusi). It is served with starchy foods.
Okok	A dish of sliced gnetum cooked with ground nuts, meats, palm oil and other ingredients. It is served with cassava and other starchy foods. The method of preparation is common to the Central Province.

matching food in the USDA FCT database, mainly green leafy vegetables, we used the most similar food available in the USDA FCT database.

Almost all food composition data are limited, especially for developing countries where biochemical analyses are too costly. We have provided the nutritional composition of the 34 most commonly consumed composite dishes in the Central Province of Cameroon. These calculated food composition did allow the calculation of nutrient intakes for the study participants (Mennen et al. 2000) and therefore the association between diet and disease to be determined (Mbanaya et al. 1999; Cruickshank et al. 2001a,b). The availability of this new food composition data will also facilitate further nutrition-related studies.

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