

Nutritional composition of commonly consumed composite dishes in Trinidad

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Abstract

Primary objective: To calculate the nutritional composition of commonly consumed composite dishes in Trinidad in order to analyze dietary intakes obtained using a quantitative food frequency questionnaire developed specifically for the Trinidadian population.

Methods and procedures: Multiple weighed versions of each dish were collected from 53 participants throughout Trinidad. Nutritional composition was calculated using NutriBase Clinical Nutrition Manager.

Main outcomes and results: A total of 359 recipes were collected for 89 composite dishes: 19 vegetable, 15 starches, 21 meat/meat alternatives, eight seafood, 10 sweets, five beverages, 11 snacks/miscellaneous items. For each dish, the average nutritional composition (energy and 32 macronutrients/micronutrients) was calculated per 100 g.

Conclusions: The calculated nutritional composition data of 89 commonly consumed dishes in Trinidad can now be used to assess dietary intakes and determine dietary risk factors for chronic disease.

Keywords: Nutritional composition, Trinidad, recipes, dietary assessment

Introduction

Trinidad and Tobago comprise a twin island republic located in the Caribbean off the north-eastern coast of South America. The majority of its 1.3 million residents reside within the larger island, Trinidad (Central Statistics Office, Government of Trinidad and Tobago 2009). Rich in diversity, the population of this country comprise a mixture of people from South Asian, African and European ancestry (Central Statistics Office, Government of Trinidad and Tobago 2009).

Chronic diseases accounted for 61% of all deaths in Trinidad and Tobago in 2001 (Caribbean Commission on Health and Development [CCHD] 2006). The age-adjusted mortality rate of diabetes in Trinidad and Tobago was five times higher than that of the USA and Canada in 2001 (CCHD 2006).

Recent reports on the health status of the population in Trinidad and Tobago indicate that the burden of chronic disease continues to escalate, especially the prevalence of the metabolic syndrome (Ezenwaka and Kalloo 2003, CCHD 2006). The effects of chronic diseases are also being felt financially, with the cost of diabetes alone estimated to be over US\$284 million in Trinidad and Tobago in 2000 (Barceló et al. 2003).

Links between dietary patterns and lifestyle-related chronic disease such as hypertension, cardiovascular disease and certain types of cancer have been well established (Appel et al. 1997, Slattery et al. 1998, Fung et al. 2001). It is therefore imperative to identify food consumption patterns of a population when planning interventions aimed at reducing chronic

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disease risk within a specific group. However, little dietary data exist in Trinidad and Tobago. This lack of population-specific data and dietary assessment methodology has impeded attempts to determine associations between diet and risk of chronic disease. Therefore, there is a need for culturally specific instruments to assess usual dietary intakes among Trinidadians.

A quantitative food frequency questionnaire (QFFQ) is commonly used for assessing dietary intakes in large populations over a long period of time (Willett 1998, Cade et al. 2002). Previously in Trinidad, a 146-item QFFQ was developed to assess long-term dietary intake and its associations with chronic disease among Trinidadians (Sharma et al., unpublished). A culturally specific up-to-date food composition table is essential for the analysis of the energy and nutrient content of each item on the QFFQ for this population. Nutrient information is obtained by converting a reported serving size to a gram weight and multiplying it by the relevant nutritional composition data calculated from the food composition database (Willett 1998).

Food composition data exclusively for Trinidad and Tobago are limited. Food composition tables do exist for general Caribbean populations but mostly for single-ingredient foods (Caribbean Food and Nutrition Institute 2000). Recently, studies were published on the nutritional composition of mixed composite dishes for other Caribbean populations but were not specific for the Trinidadian population (Sharma et al. 2007b, 2009b). Trinidad and Tobago comprises a variety of ethnic groups and this has influenced the local cuisine, therefore food composition tables specific to this population are essential for accurate dietary assessments.

The aim of the present study was to calculate the nutritional composition of foods and drinks commonly consumed in Trinidad. These data will be used to analyze nutrient intakes calculated from the QFFQ developed for Trinidad. This study formed part of a larger study that aimed to determine the associations between diet and risk of chronic disease, and to develop a nutritional intervention program to reduce risk for chronic disease by improving dietary quality among this population.

Methods

Development of the QFFQ

In summary, 24-h dietary recalls were collected using the US Department of Agriculture (USDA) multiple-pass method among 324 persons (USDA 2002). A mixed sampling method was used to obtain a representative sample of Trinidadians. Initially participants were randomly selected from full-time university staff (occupation stratified). Added to this was a sample of purposely selected individuals residing throughout Trinidad whose socioeconomic status fell

outside those of the various categories of university staff.

The participants included 155 men and 169 women with a mean age of 43 and 44 years, respectively, from diverse ethnic backgrounds and socioeconomic status. The final QFFQ contained 146 food and drink items.

Recipe collection

Eighty-nine QFFQ items were identified for recipe collection. To collect recipes for these items, a nutrition research assistant (A.B.) and a dietitian/post-graduate student (D.G.H.) were trained for 5 days on procedures to collect, weigh, and record ingredients and final cooked weights of prepared dishes on a recipe collection form. A manual of procedures was developed to standardize recipe data collection and was strictly followed.

Fifty-three participants (five men and 48 women) were recruited from areas throughout Trinidad to take part in recipe collection. Attempts were made to include men and women from different geographic locations (both rural and urban), different socioeconomic levels and varied occupations in Trinidad. Participants were contacted by telephone or in person and appointments were made to prepare the dishes at the participants' homes.

To capture the variations in preparation methods that may occur from household to household, the research team attempted to obtain weighed recipes from at least five different households for each of the composite dishes identified from the QFFQ. Both the weight of the individual ingredients and the final weight of the cooked dish were recorded in grams using the Salter Aquatronic kitchen scale (Aquatronic Baker's Dream Scale; Salter Houseware Ltd, Fairfield, NJ, USA). The edible yield for foods that contained inedible portions, such as bones, was calculated by subtracting the weight of the inedible parts. For deep-fried dishes, the amount of oil used in cooking was determined by measuring the weight difference of oil at the beginning and end of cooking. All participants were offered a small stipend for their participation and were provided with ingredients for the recipes.

The recipes were input and analyzed using Nutribase Clinical Nutrition Manager version 7.18 (Cybersoft Inc., Phoenix, AZ, USA), which is a computerized dietary database based on the USDA National Nutrient Database for Standard Reference (SR20). The nutritional composition of each weighed recipe was calculated by entering the weight of the individual ingredients and the final cooked weight. An average energy and nutrient content was calculated per 100 g of each composite dish.

The study was approved by the Research Ethics Committee, Faculty of Medical Sciences, The University of the West Indies, St Augustine, Trinidad.

Table Ia. Nutritional composition (per 100 g) of commonly consumed vegetable dishes in Trinidad.

	Bhagie/ Spinach	Curried Bodi	Fried Caraili	Corn Pie	Corn Soup	Callaloo	Curried Eggplant and Potato	Dhal	Pumpkin Talkari	Fried Ochro
Number of recipes	5	1	1	1	5	5	1	5	5	5
Energy (kcal)	107	69	141	105	74	98	59	109	116	442
Energy (kJ)	449	289	589	441	310	410	245	457	486	1851
Protein (g)	4.1	2.7	2.1	4.4	2.5	3.6	1.5	6.8	1.6	4.1
Carbohydrate (g)	8.0	9.9	8.5	15.3	14.6	7.9	10.7	17.1	12.5	17.9
Fat (g)	7.8	3.3	12.0	3.1	1.0	6.8	1.5	1.9	7.8	42.8
Saturated fat (g)	1.0	0.5	1.7	1.6	0.3	5.2	0.2	0.3	1.2	6.1
% Calories from protein	13.8	13.7	5.7	16.6	12.8	13.5	9.3	24.1	5.0	3.4
% Calories from CHO	27.0	49.6	22.7	57.3	75.2	29.4	68.5	60.8	39.5	15.1
% Calories from fat	59.2	36.7	71.6	26.1	12.0	57.0	22.2	15.1	55.4	81.4
% Calories from saturated fat	8.4	22.4	20.5	5.2	3.7	47.8	14.0	2.5	9.3	12.4
Monounsaturated fat (g)	2.2	0.8	3.4	0.1	0.2	0.6	0.4	0.6	2.2	12.2
Polyunsaturated fat (g)	4.0	1.8	6.9	0.1	0.3	0.3	0.8	0.9	4.4	24.4
Omega-3 fatty acid (g)	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Omega-6 fatty acid (g)	0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.1
Cholesterol (mg)	0.9	0.0	0.0	52.1	0.3	4.3	0.0	0.0	0.0	0.0
Sugars (g)	1.6	3.0	2.4	6.3	1.9	2.4	1.6	2.2	4.3	3.8
Dietary fiber (g)	2.8	4.0	3.0	1.0	2.2	2.6	2.4	5.2	0.9	5.7
Thiamin (mg)	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.3
Riboflavin (mg)	0.2	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.2	0.1
Niacin (mg)	0.9	0.1	0.6	0.4	0.8	1.1	0.7	0.8	0.9	1.7
Pantothenic acid (mg)	0.1	0.0	0.1	0.2	0.2	0.2	0.2	0.5	0.4	0.5
Vitamin B-6 (mg)	0.3	0.1	0.2	0.0	0.1	0.2	0.2	0.1	0.1	0.1
Total folate (ug)	219	3.8	13.4	15.1	31.8	62.1	17.5	74.5	23.3	140
Folate (DFE* _{ug})	218	3.7	13.4	15.1	37.0	62.1	17.5	74.5	23.3	140
Vitamin A (RE [†] _{ug})	522	1.8	36.9	1.2	67.3	128	0.8	2.1	497	36.0
Vitamin B-12 (ug)	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Vitamin C (mg)	34.6	19.7	77.9	3.6	3.9	24.2	9.1	1.2	14.5	40.2
Vitamin D (IU [‡])	0.0	0.0	0.0	2.6	0.7	0.0	0.0	0.0	0.0	0.0
Vitamin E [¶] (mg)	2.3	0.0	0.0	0.0	0.2	0.9	0.0	0.1	1.4	0.6
Vitamin K (ug)	538	2.0	7.0	0.0	2.0	43.2	2.5	4.2	2.5	81.2
Calcium (mg)	126	60.5	22.0	75.4	12.5	62.6	18.3	22.9	37.4	148
Iron (mg)	3.2	1.2	0.7	0.4	0.7	1.4	0.7	1.4	1.2	1.6
Zinc (mg)	0.7	0.1	0.2	0.1	0.3	0.6	0.2	0.8	0.5	1.1
Magnesium (mg)	91.9	5.2	11.5	6.3	15.8	38.6	17.9	34.1	18.8	93.0
Manganese (mg)	1.1	0.1	0.2	0.1	0.2	0.7	0.2	0.5	0.2	1.7
Selenium (ug)	2.9	0.7	1.0	0.2	2.1	2.9	0.6	0.7	0.8	2.5
Potassium (mg)	675	46	237	14	171	401	284	281	489	581
Sodium (mg)	978	409	1439	359	226	212	121	269	700	1167

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [¶] α -tocopherol Equivalent.

Results

A total of 359 recipes were collected for 89 composite dishes: 19 vegetable, 15 starches, 21 meat or meat alternatives, eight seafood, 10 sweets, five beverages, and 11 snacks or miscellaneous items. The average nutritional composition per 100 g for each dish is presented in Tables I–VII. A description of the composite dishes is presented in the Supplementary material.

The nutritional composition of similar dishes varied according to different preparation methods. For example, curried pigeon peas and soya had a higher percentage of energy from fat (40.1% and 47%, respectively) than stewed dishes (24.7% and 35%, respectively). Pan-fried minced chicken also contained more energy and percentage of energy from fat (276 kcal and 60.8% of energy from fat) than stewed chicken (261 kcal and 50.9% of energy from fat).

Among all vegetable dishes, fried ochro had the highest energy density (442 kcal/100 g) and highest percentage of energy from fat (81.4%), whilst curried eggplant and potato had the lowest energy density (59 kcal/100 g) and stewed lentils had the lowest percentage of energy from fat (11.4%). Among all commonly consumed starch dishes, paratha roti had the highest energy density (387 kcal/100 g) and highest percentage of energy from fat (41.1%). Dumpling had the lowest percentage of energy from fat (3.1%), but the highest percentage of energy from carbohydrate. Curried potato had the lowest energy density (92 kcal/100 g). Spinach (bhagie) had higher iron content (3.2g/100 g) than many of the meat-based dishes, except for curried beef, curried goat, curried duck, and curried liver. Curried duck had the highest energy density (650kcal/100 g) and highest percentage

Table Ib. Nutritional composition (per 100 g) of commonly consumed vegetable dishes in Trinidad.

	Eggplant		Tomato		Curried		Curried		Stewed		Stewed		Stewed	
	Choka	Choka	Channa and Potato	Pigeon Peas	Pink Beans	Red Beans	Black Beans	Lentils	Black- eye Peas	Stewed	Stewed	Stewed	Stewed	Stewed
Number of recipes	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Energy (kcal)	141	71	91	162	131	108	95	108	108	72	72	72	72	72
Energy (kJ)	591	296	382	679	547	451	396	452	452	302	302	302	302	302
Protein (g)	1.3	1.6	2.9	5.4	5.4	3.8	3.5	6.6	6.6	2.9	2.9	2.9	2.9	2.9
Carbohydrate (g)	8.3	9.2	15.9	20.1	21.5	17.3	15.0	17.9	17.9	12.1	12.1	12.1	12.1	12.1
Fat (g)	1.8	1.1	0.3	7.6	3.1	3.1	3.0	1.4	1.4	0.1	0.1	0.1	0.1	0.1
Saturated fat (g)	3.5	8.4	12.1	12.8	15.9	13.6	13.7	23.8	23.8	15.9	15.9	15.9	15.9	15.9
% Calories from protein	21.8	47.3	67.0	47.1	63.5	61.7	59.3	64.8	64.8	66.8	66.8	66.8	66.8	66.8
% Calories from CHO	74.7	44.2	20.9	40.1	20.7	24.7	27.1	11.4	11.4	17.4	17.4	17.4	17.4	17.4
% Calories from saturated fat	11.5	13.9	3.0	17.8	2.8	3.3	3.8	3.3	3.3	1.3	1.3	1.3	1.3	1.3
Monounsaturated fat (g)	3.6	0.9	0.6	1.5	0.5	0.5	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Polysaturated fat (g)	7.2	1.8	1.1	2.7	1.0	1.0	0.9	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Omega-6 fatty acid (g)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Cholesterol (mg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sugars (g)	3.3	4.6	0.8	0.9	4.5	4.7	4.7	3.4	3.4	2.5	2.5	2.5	2.5	2.5
Dietary fiber (g)	3.2	1.7	2.8	5.9	3.3	3.7	3.2	6.7	6.7	2.7	2.7	2.7	2.7	2.7
Thiamin (mg)	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Riboflavin (mg)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Niacin (mg)	0.7	0.8	0.7	0.8	0.6	0.6	0.4	0.8	0.8	0.2	0.2	0.2	0.2	0.2
Pantothenic acid (mg)	0.3	0.2	0.2	0.3	0.2	0.2	0.1	0.5	0.5	0.1	0.1	0.1	0.1	0.1
Vitamin B-6 (mg)	0.2	0.2	0.3	0.1	0.2	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Total folate (ug)	22.4	21.0	35.3	83.7	94.8	50.0	19.9	125	125	4.3	4.3	4.3	4.3	4.3
Folate (DFE*_ug)	22.4	21.0	33.1	83.7	94.8	49.9	19.9	125	125	3.7	3.7	3.7	3.7	3.7
Vitamin A (RE†_ug)	6.5	49.4	1.8	22.1	41.2	41.2	41.2	39.7	39.7	57.0	57.0	57.0	57.0	57.0
Vitamin B-12 (ug)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vitamin C (mg)	7.9	22.9	10.0	5.4	6.1	6.4	6.3	4.6	4.6	3.5	3.5	3.5	3.5	3.5
Vitamin D (IU‡)	0.0	0.0	0.0	0.0	2.1	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vitamin E¹ (mg)	0.3	0.7	0.4	0.7	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Vitamin K (ug)	4.6	11.3	2.8	3.8	2.5	3.1	2.5	2.3	2.3	0.8	0.8	0.8	0.8	0.8
Calcium (mg)	19.4	28.7	29.2	53.4	40.5	32.5	30.5	22.5	22.5	16.9	16.9	16.9	16.9	16.9
Iron (mg)	0.4	0.6	1.4	1.8	1.5	0.9	1.0	2.3	2.3	1.0	1.0	1.0	1.0	1.0
Zinc (mg)	0.2	0.3	0.5	0.8	0.6	0.5	0.2	1.1	1.1	0.1	0.1	0.1	0.1	0.1
Magnesium (mg)	15.4	16.9	25.1	43.9	41.0	26.9	19.0	31.9	31.9	6.4	6.4	6.4	6.4	6.4
Manganese (mg)	0.3	0.3	0.4	0.6	0.4	0.3	0.2	0.4	0.4	0.1	0.1	0.1	0.1	0.1
Selenium (ug)	0.9	1.1	1.5	3.2	1.2	1.5	0.6	2.3	2.3	0.2	0.2	0.2	0.2	0.2
Potassium (mg)	256	333	280	373	377	281	177	305	305	85.2	85.2	85.2	85.2	85.2
Sodium (mg)	345	753	242	462	563	582	575	380	380	506	506	506	506	506

*Dietary Folate Equivalent; †Retinol Equivalent; ‡International Unit; ¹α-tocopherol Equivalent.

Table IIa. Nutritional composition (per 100 g) of commonly consumed starchy dishes in Trinidad.

	Vegetable Fried Rice	Macaroni Pie	Coconut Bake	Fried Bake	Roast Bake	Sada Roti	Paratha Roti	Dhalpuri Roti
Number of recipes	5	5	5	5	5	5	5	5
Energy (kcal)	122	204	328	344	296	265	387	311
Energy (kJ)	511	852	1371	1439	1239	1109	1620	1300
Protein (g)	2.7	9.3	12.2	6.6	6.6	7.4	7.1	9.7
Carbohydrate (g)	21.6	23.5	50.1	51.2	50.9	55.0	50.1	50.8
Fat (g)	2.8	7.8	11.1	12.4	7.0	1.1	17.7	7.6
Saturated fat (g)	0.5	4.0	5.0	1.5	0.6	0.2	2.1	1.1
% Calories from protein	8.9	18.5	14.0	7.7	9.1	11.5	28.1	38.8
% Calories from CHO	70.7	46.6	57.4	59.7	69.6	84.9	51.6	65.4
% Calories from fat	20.4	34.9	28.7	32.6	21.4	3.7	41.1	22.2
% Calories from saturated fat	3.7	17.7	13.7	3.9	1.8	0.7	20.6	3.2
Monounsaturated fat (g)	0.6	1.8	0.9	3.6	0.9	0.2	3.5	1.9
Polyunsaturated fat (g)	0.8	0.4	1.4	4.7	1.6	0.5	6.7	4.0
Omega-3 fatty acid (g)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Omega-6 fatty acid (g)	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3
Cholesterol (mg)	0.0	42.5	0.0	0.0	0.0	0.0	1.5	0.3
Sugars (g)	1.3	2.2	3.8	2.9	2.6	0.4	1.5	2.3
Dietary fiber (g)	1.8	1.2	3.0	1.9	1.7	2.0	1.7	5.7
Thiamin (mg)	0.1	0.2	0.5	0.5	0.5	0.6	0.5	0.5
Riboflavin (mg)	0.0	0.2	0.3	0.3	0.3	0.4	0.3	0.3
Niacin (mg)	1.6	1.2	3.6	3.7	3.7	4.2	3.8	3.5
Pantothenic acid (mg)	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.5
Vitamin B-6 (mg)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Total folate (ug)	31.3	54.1	112	114	116	131	117	135
Folate (DFE* _{ug})	46.6	84.2	175	181	185	208	186	191
Vitamin A (RE [†] _{ug})	79.1	50.7	0.0	0.0	0.0	0.0	2.5	0.8
Vitamin B-12 (ug)	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Vitamin C (mg)	3.5	0.7	0.5	0.0	0.0	0.0	0.1	0.8
Vitamin D (IU [‡])	2.6	13.1	20.4	9.3	19.9	0.0	32.1	0.9
Vitamin E [¶] (mg)	0.2	0.1	0.1	0.0	0.0	0.1	0	0.1
Vitamin K (ug)	4.4	0.6	0.2	0.2	0.2	0.2	0.2	2.6
Calcium (mg)	20.8	166	36.0	38.5	50.5	43.5	44.4	44.8
Iron (mg)	0.9	1.1	3.2	2.9	3.0	3.3	3.0	3.2
Zinc (mg)	0.5	0.9	0.6	0.4	0.5	0.5	0.5	0.9
Magnesium (mg)	22.8	20.8	18.5	14.4	14.8	16.8	15.3	30.7
Manganese (mg)	0.5	0.2	0.6	0.4	0.4	0.5	0.5	0.6
Selenium (ug)	7.0	19.9	21.5	21.1	21.5	24.5	21.8	17.9
Potassium (mg)	100	117	121	70.5	74.5	78.4	81.2	236
Sodium (mg)	202	181	376	510	497	429	279	470

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [¶] α -tocopherol Equivalent.

of energy from fat of all recipes collected (86.4%). Barfi contained the most sugar overall (59 g/100 g).

Discussion

Determining the nutritional composition of the most commonly consumed dishes in Trinidad is of critical importance for assessing overall dietary intake. The local cuisine of Trinidad is diverse due to the ethnic and cultural variety within its population, making it difficult to assess composition of traditional dishes using food composition tables that are not specific to this population. Lack of specific dietary assessment methodology for the Trinidadian population has limited the studies performed to assess dietary intake and diet–disease associations. Recipe information collected and presented here can now be used to complete the food composition table that is necessary

for the analysis of the QFFQ that was recently developed for this population (Sharma et al., unpublished). Additionally, the composite dishes were grouped according to the dietary habits of Trinidadians in order to facilitate future nutrition interventions that are culturally appropriate and population specific. Furthermore, these groupings are appropriate for developing food-based dietary guidelines in Trinidad.

Similarly named recipes in Trinidad were collected during previous studies of Barbados and Afro-Caribbean persons living in the UK (Sharma et al. 2007b, 2009b). However, nutrient values vary greatly between these recipes and those collected in Trinidad. The mauby drink recipe collected in Trinidad contained 74% more calories and 50% more sugar than the mauby recipe collected in Barbados (92 vs. 53 kcal and 20.7 vs. 13.8 g sugar). The dumplings recipe collected from other Caribbean countries are

Table IIb. Nutritional composition (per 100 g) of commonly consumed starchy dishes in Trinidad.

	Commeal	Coo-coo	Oatmeal Porridge	Green Banana Salad	Breadfruit Oil-down	Dumplings	Curried Potato	Fried Potato
	5	5	5	1	1	5	5	5
Number of recipes	147	126	201	202	202	201	92	255
Energy (kcal)	614	527	845	845	845	842	387	1068
Protein (g)	2.3	4.8	5.3	4.4	4.4	5.3	2.0	3.1
Carbohydrate (g)	21.5	18.5	42.5	16.7	16.7	42.5	16.3	26.0
Fat (g)	6.0	3.7	0.7	14.3	14.3	0.7	2.6	16.6
Saturated fat (g)	3.3	2.0	0.1	9.2	9.2	0.1	0.4	2.4
% Calories from protein	6.3	15.1	10.7	8.2	8.2	10.7	8.5	4.7
% Calories from CHO	57.6	58.3	86.3	63.6	63.6	86.3	67.4	39.2
% Calories from fat	36.1	26.6	3.1	60.3	60.3	3.1	24.2	56.2
% Calories from saturated fat	20.2	14.3	0.5	41.1	41.1	0.5	3.9	8.5
Monounsaturated fat (g)	0.2	0.6	0.0	3.0	3.0	0.0	0.8	4.6
Polyunsaturated fat (g)	0.1	0.4	0.2	0.8	0.8	0.2	1.3	9.5
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Omega-6 fatty acid (g)	0.0	0.0	0.2	0.7	0.7	0.2	0.1	0.1
Cholesterol (mg)	0.0	12.8	0.0	20.0	20.0	0.0	0.0	0.0
Sugars (g)	0.2	9.8	2.0	6.7	6.7	2.0	1.0	1.6
Dietary fiber (g)	4.8	1.4	2.3	3.5	3.5	2.3	1.9	2.3
Thiamin (mg)	0.0	0.0	0.4	0.1	0.1	0.4	0.1	0.1
Riboflavin (mg)	0.0	0.0	0.2	0.1	0.1	0.2	0.0	0.1
Niacin (mg)	0.2	0.0	2.8	1.0	1.0	2.8	0.9	1.5
Pantothenic acid (mg)	0.1	0.1	0.2	0.4	0.4	0.2	0.3	0.4
Vitamin B-6 (mg)	0.0	0.0	0.0	0.1	0.1	0.0	0.3	0.5
Total folate (ug)	12.1	0.8	85.7	19.6	19.6	85.7	16.3	23.8
Folate (DFE*, ug)	12.1	0.8	136	19.6	19.6	136	16.3	23.8
Vitamin A (RE†, ug)	15.5	6.0	0.0	76.3	76.3	0.0	16.1	0.2
Vitamin B-12 (ug)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Vitamin C (mg)	2.9	0.3	0.0	17.3	17.3	0.0	16.9	27.8
Vitamin D (IU‡)	7.5	25.2	0.0	0.0	0.0	0.0	0.0	0.0
Vitamin E§ (mg)	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Vitamin K (ug)	5.8	0.1	0.1	5.3	5.3	0.1	3.1	1.3
Calcium (mg)	14.5	122	8.7	25.0	25.0	8.7	25.4	26.7
Iron (mg)	0.7	0.6	2.2	1.1	1.1	2.2	1.2	1.1
Zinc (mg)	0.2	0.1	0.3	0.6	0.6	0.3	0.3	0.5
Magnesium (mg)	15.4	3.0	11.0	29.8	29.8	11.0	24.6	33.2
Manganese (mg)	0.2	0.0	0.3	0.4	0.4	0.3	0.3	0.3
Selenium (ug)	0.1	0.5	15.9	3.1	3.1	15.9	0.9	1.1
Potassium (mg)	77.5	113	53	410	410	53	383	599
Sodium (mg)	290	50.3	206	62.8	62.8	206	283	802

*Dietary Folate Equivalent; †Retinol Equivalent; ‡International Unit; §α-tocopherol Equivalent.

Table IIIa. Nutritional composition (per 100 g) of commonly consumed meat or meat alternatives in Trinidad.

	Stewed										
	Curried Chicken	Minced Chicken	Stewed Chicken	Chicken Feet	Curried Beef	Minced Beef	Curried Goat	Curried Duck	Stewed Beef, Lamb or Pork	Chicken Pastelle	Beef Pastelle
Number of recipes	5	5	5	5	5	5	5	5	5	5	5
Energy (kcal)	408	276	261	318	316	322	251	650	237	257	274
Energy (kJ)	1705	1153	1092	1330	1322	1349	1050	2718	993	1075	1147
Protein (g)	25.4	16.4	23.3	23.6	21.0	16.5	27.7	16.4	16.2	7.6	7.6
Carbohydrate (g)	5.8	11.0	8.3	8.5	6.1	11.0	7.4	5.8	9.8	26.3	26.3
Fat (g)	31.6	18.9	14.6	20.7	23.4	24.0	12.6	62.7	15.0	14.0	15.9
Saturated fat (g)	7.5	3.2	3.6	5.1	10.4	9.8	5.4	19.1	4.4	1.9	4.2
% Calories from protein	24.8	23.4	36.2	30.0	26.3	20.2	43.7	10.0	27.1	11.6	10.9
% Calories from carbohydrates	5.7	15.8	12.9	34.2	7.7	13.6	11.6	3.6	16.4	48.2	37.7
% Calories from fat	69.5	60.8	50.9	59.3	66.1	66.2	44.7	86.4	56.5	48.3	51.4
% Calories from saturated fat	16.5	10.4	12.4	14.4	29.6	27.4	19.4	26.5	11.8	6.7	13.8
Monounsaturated fat (g)	11.6	1.2	5.5	7.6	7.4	8.6	3.2	27.9	5.2	2.2	4.9
Polysaturated fat (g)	10.3	2.4	4.1	5.2	3.2	2.8	3.0	12.4	3.4	3.5	3.7
Omega-3 fatty acid (g)	0.3	0.0	0.2	0.2	0.1	0.1	0.0	0.5	0.1	0.0	0.0
Omega-6 fatty acid (g)	4.3	0.1	2.3	3.1	0.5	0.5	0.4	6.4	0.6	0.0	0.2
Cholesterol (mg)	99.1	66.7	99.5	101	118	62.7	72.6	101	52.5	23.7	22.3
Sugars (g)	1.3	8.6	6.7	6.7	1.7	8.6	1.9	1.3	7.7	6.6	6.6
Dietary fiber (g)	1.8	0.5	0.3	0.3	1.8	0.5	2.3	1.8	0.4	4.0	4.0
Thiamin (mg)	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.0	0.0
Riboflavin (mg)	0.2	0.2	0.2	0.3	0.2	0.3	0.7	0.3	0.2	0.1	0.1
Niacin (mg)	8.7	0.5	8.1	0.6	3.7	4.4	5.2	5.5	3.5	0.3	1.7
Pantothenic acid (mg)	1.3	0.1	1.4	0.0	0.2	0.5	0.1	1.3	0.3	0.0	0.2
Vitamin B-6 (mg)	0.6	0.1	0.5	0.1	0.5	0.4	0.1	0.4	0.3	0.0	0.2
Total folate (ug)	18.7	6.0	22.9	107	18.0	12.1	20.2	27.2	12.6	5.6	7.7
Folate (DFE* _{ug})	18.5	5.9	23.4	107	17.8	12.0	20.0	27.0	12.5	7.1	9.2
Vitamin A (RE [†] _{ug})	65.1	30.6	124	41.9	10.0	19.0	10.8	74.0	10.9	11.2	7.1
Vitamin B-12 (ug)	0.4	0.0	0.7	0.6	3.3	1.9	1.4	0.3	1.7	0.0	0.7
Vitamin C (mg)	6.6	9.8	6.6	4.4	7.2	9.8	8.0	9.4	6.7	3.6	3.6
Vitamin D (IU [‡])	0.0	21.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	5.4
Vitamin E [†] (mg)	1.4	0.4	0.3	0.4	0.7	0.8	1.0	1.9	0.0	0.0	0.3
Vitamin K (ug)	11.4	4.4	5.8	4.1	8.3	5.9	10.0	15.8	4.5	2.4	3.0
Calcium (mg)	51.3	37.3	27.4	120	215	35.0	63.6	52.0	24.7	17.7	16.9
Iron (mg)	2.9	1.5	1.5	1.4	5.3	2.1	5.6	4.8	1.7	0.7	1.0
Zinc (mg)	2.0	0.2	1.8	0.9	4.9	3.9	5.5	2.1	3.1	0.7	1.4
Magnesium (mg)	42.3	10.8	32.2	11.8	39.9	26.1	25.5	35.1	25.6	6.9	12.3
Manganese (mg)	0.3	0.1	0.1	0.1	0.4	0.1	0.6	0.3	0.1	0.1	0.1
Selenium (ug)	20.3	0.9	17.3	4.9	29.7	14.3	13.6	17.9	17.7	0.9	5.7
Potassium (mg)	384	178	307	94.6	505	397	670	394	353	103	181
Sodium (mg)	549	1281	476	464	581	1285	761	541	610	877	879

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [§] α -tocopherol Equivalent.

Table IIIb. Nutritional composition (per 100 g) of commonly consumed meat or meat alternatives in Trinidad.

	Chicken Pelau	Chicken Soup	Beef Soup	Beef Pelau	Stewed Turkey	Curried Liver	Minced Soya	Stewed Soya	Curried Soya	Soya Pastelle
Number of recipes	5	5	5	1	5	5	5	5	5	5
Energy (kcal)	174	72	63	223	214	253	261	170	215	252
Energy (kJ)	729	300	262	935	894	1058	1093	713	900	1054
Protein (g)	6.6	3.8	4.0	4.9	26.2	22.8	16.9	10.8	15.1	7.8
Carbohydrate (g)	25.3	9.4	9.4	26.2	8.2	10.2	23.0	17.7	14.2	30.5
Fat (g)	5.2	2.2	1.1	11.5	8.0	13.7	12.2	6.8	11.5	11.7
Saturated fat (g)	2.5	0.6	0.3	86	1.8	5.7	3.8	2.2	3.1	2.1
% Calories from protein	15.2	20.7	25.3	8.6	50.0	35.7	25.1	24.6	27.4	12.0
% Calories from CHO	58.0	51.7	59.1	46.0	15.7	16.0	34.1	40.3	25.7	47.3
% Calories from fat	26.9	27.6	15.6	45.4	34.3	48.3	40.8	35.0	47.0	40.7
% Calories from saturated fat	12.9	7.5	4.3	22.1	7.6	20.3	13.1	11.7	13.0	7.5
Monounsaturated fat (g)	0.8	0.8	0.4	1.2	2.6	2.7	2.2	1.1	2.4	2.6
Polyunsaturated fat (g)	1.0	0.5	0.1	0.3	2.8	3.1	4.5	2.2	4.4	4.3
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.2	0.1
Omega-6 fatty acid (g)	0.3	0.4	0.1	0.2	1.2	0.6	1.9	1.2	1.8	0.7
Cholesterol (mg)	12.7	7.4	6.0	18.8	95.1	290	0.0	0.0	0.0	0.0
Sugars (g)	2.9	1.5	1.5	3.9	6.7	1.7	10.0	8.9	1.6	7.1
Dietary fiber (g)	2.1	2.0	2.0	2.2	0.3	1.8	4.6	3.1	4.8	5.4
Thiamin (mg)	0.1	0.1	0.1	0.1	0.1	0.2	0.8	0.5	0.7	0.3
Riboflavin (mg)	0.1	0.1	0.1	0.1	0.2	2.9	0.7	0.4	0.5	0.3
Niacin (mg)	2.5	1.1	0.8	1.9	4.6	14.2	9.4	5.9	8.2	3.5
Pantothenic acid (mg)	0.5	0.3	0.2	0.4	1.2	7.7	0.1	0.1	0.0	0.0
Vitamin B-6 (mg)	0.2	0.1	0.1	0.2	0.5	1.3	1.2	0.8	1.1	0.4
Total folate (ug)	43.3	21.1	21.3	21.5	14.6	317	75.4	49.8	68.6	30.2
Folate (DFE* _{ug})	55.6	21.1	21.3	21.4	15.1	317	75.2	49.7	68.6	31.7
Vitamin A (RE [†] _{ug})	46.5	105	100	71.7	7.1	5257	19.0	10.5	3.3	7.1
Vitamin B-12 (ug)	0.1	0.0	0.4	0.2	0.5	62.6	0.0	0.0	0.0	0.0
Vitamin C (mg)	3.1	3.1	3.1	3.3	4.4	8.6	9.8	6.8	2.9	3.6
Vitamin D (IU [‡])	0.6	0.8	0.8	2.8	0.0	16.9	0.0	0.0	0.0	5.4
Vitamin E [¶] (mg)	0.2	0.0	0.3	0.0	0.1	1.0	2.0	1.2	0.0	0.7
Vitamin K (ug)	1.5	2.3	2.0	2.0	4.3	11.6	4.4	3.6	3.3	2.4
Calcium (mg)	30.3	15.5	15.4	74.1	29.6	41.9	45.2	33.4	45.2	20.5
Iron (mg)	1.2	0.6	0.7	1.5	2.2	6.8	2.4	1.6	2.6	1.1
Zinc (mg)	0.8	0.4	0.8	0.9	2.8	4.5	1.8	1.2	1.6	0.7
Magnesium (mg)	24.1	17.0	16.8	28.8	32.3	38.2	26.8	20.0	23.8	12.6
Manganese (mg)	0.5	0.2	0.2	0.7	0.1	0.7	0.1	0.2	0.2	0.1
Selenium (ug)	8.6	2.1	3.3	9.9	31.6	43.8	1.6	1.4	1.6	1.2
Potassium (mg)	216	205	220	265	358	486	314	223	217	152
Sodium (mg)	266	142	141	337	459	588	1715	877	706	1032

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [¶] α -tocopherol Equivalent.

prepared by frying, whereas Trinidadians prepare their dumplings by boiling, resulting in almost 40% fewer calories and nine times less fat (201 vs. 281 kcal and 0.7 vs. 6.6 g fat). Gathering specific composite dish values for Trinidadians allows for complete and accurate dietary assessment among this population.

Two methods are commonly used to obtain nutritional composition of foods, direct chemical analysis and calculating weighed recipes. Although direct chemical analysis is the most accurate measure of nutrient content (Greenfield and Southgate 2003), it is costly and unrealistic in large-scale epidemiological studies. Overall agreement between these two methods with slight variation in certain nutrients (e.g. fat) was found by Mathews (1988), Westrich et al. (1994) and McCullough et al. (1999). The slight variations in certain nutrient content observed between methods may be due to variations in food

composition tables and/or possible nutrient losses during cooking.

The nutritional composition was calculated using weighed recipes as used by other researchers and in our previous studies (Bognár and Piekarski 2000, Sharma et al. 1996, 2007a, 2007b, 2007c, 2008, 2009a, 2009b). The accuracy of the nutritional composition of these dishes depends on the reliability of the nutrition composition data used to make the calculations (Lee et al. 1995). A software package that uses extensive food composition tables from the USDA was used to analyze nutrient composition of food and drink items. There are several reasons for this choice. Most foods in Trinidad are from the US. The Caribbean Food Table is derived from US and UK tables (Caribbean Food and Nutrition Institute 2000); however, this does not contain the specific foods on our Trinidadian QFFQ. On the other hand, the USDA

Table IV. Nutritional composition (per 100 g) of commonly consumed seafood dishes in Trinidad.

	Curried Fish	Curried Crab	Curried Shrimp	Saltfish Buljol	Smoked Herring	Stewed Saltfish	Stewed Fish	Fish Broth
Number of recipes	5	5	5	5	5	5	5	5
Energy (kcal)	196	227	178	153	222	148	165	57
Energy (kJ)	821	950	743	638	928	620	690	238
Protein (g)	15.7	25.1	20.0	15.5	8.8	9.9	10.0	3.7
Carbohydrate (g)	5.7	5.9	5.6	2.6	9.0	6.3	6.7	8.1
Fat (g)	12.6	11.7	8.5	9.1	17.7	10.0	11.3	1.1
Saturated fat (g)	2.0	1.8	1.2	1.3	3.1	1.2	1.6	0.2
% Calories from protein	31.6	43.9	44.7	40.1	15.3	25.8	23.7	25.9
% Calories from carbohydrates	11.5	10.3	12.5	6.8	15.7	16.2	15.9	56.7
% Calories from fat	57.0	45.9	42.8	81.0	69.1	58.0	60.3	17.4
% Calories from saturated fat	9.2	7.1	6.1	7.7	12.6	7.3	8.7	3.2
Monounsaturated fat (g)	3.8	3.2	2.1	6.8	7.3	4.4	3.0	0.3
Polyunsaturated fat (g)	6.0	6.1	4.2	0.9	6.8	3.2	5.5	0.3
Omega-3 fatty acid (g)	0.9	0.5	0.4	0.0	0.0	0.0	0.7	0.2
Omega-6 fatty acid (g)	0.3	0.2	0.2	0.0	0.1	0.1	0.3	0.1
Cholesterol (mg)	36.3	104	142	37.3	25.1	23.3	28.8	8.4
Sugars (g)	1.0	1.3	1.2	1.4	2.1	3.3	3.4	1.1
Dietary fiber (g)	1.3	1.8	1.5	0.6	1.5	1.0	0.7	0.8
Thiamin (mg)	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Riboflavin (mg)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Niacin (mg)	3.6	3.8	2.1	1.6	2.3	0.9	1.8	0.9
Pantothenic acid (mg)	0.6	0.5	0.2	0.3	0.1	0.1	0.4	0.2
Vitamin B-6 (mg)	0.4	0.3	0.2	0.2	0.3	0.1	0.2	0.1
Total folate (ug)	17.4	68.5	11.2	14.7	18.0	16.0	16.9	13.9
Folate (DFE* _{ug})	19.2	68.3	11.0	10.6	14.1	10.3	18.5	17.6
Vitamin A (RE [†] _{ug})	171	10.0	50.1	16.8	18.7	37.4	33.4	59.0
Vitamin B-12 (ug)	2.6	12.0	0.9	2.6	3.9	1.7	0.5	0.2
Vitamin C (mg)	5.1	9.5	7.0	7.6	13.1	15.6	10.2	5.0
Vitamin D (IU [‡])	0.0	0.0	112	0.3	3.2	0.4	0.0	0.0
Vitamin E [¶] (mg)	1.1	0.9	1.6	0.7	1.0	0.6	0.4	0.3
Vitamin K (ug)	6.2	8.5	7.5	2.6	4.5	5.5	4.9	1.9
Calcium (mg)	41.1	156	78.4	32.2	36.1	21.3	26.7	15.9
Iron (mg)	1.5	2.6	3.4	0.5	0.6	0.3	0.6	0.4
Zinc (mg)	0.7	5.0	1.0	0.5	0.7	0.5	0.6	0.3
Magnesium (mg)	41.3	60.4	39.9	32.6	24.9	22.2	23.6	15.0
Manganese (mg)	0.3	0.5	0.3	0.1	0.2	0.1	0.2	0.1
Selenium (ug)	19.7	51.3	29.0	33.9	10.0	19.6	7.0	4.1
Potassium (mg)	289	554	251	421	380	338	272	170
Sodium (mg)	498	842	564	1003	856	136	684	268

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [¶] α -tocopherol Equivalent.

food composition tables contain data for more than 130 nutrients for over 7,000 foods and ingredients (USDA 2009), which includes the ingredients of Trinidadian recipes. Therefore, this database provides the basis for a standardized approach to calculating the nutritional composition of specific foods in Trinidad and has been frequently used to analyze dietary intake data in the Caribbean (Gossell-Williams et al. 2005, Francis et al. 2009, Jackson et al. 2009). In addition, this database has been shown to produce acceptable agreement with data from direct chemical analysis (McCullough et al. 1999, Merchant and Dehghan 2006). Finally, to ensure the consistency of country-comparison of dietary intake between Trinidad, Jamaica and Barbados, it is important for us to use the same food composition tables (USDA 2009) as

used in two other previous studies to analyze these recipes.

Appropriate nutrient retention and yield factors are applied when calculating the nutritional composition of a recipe or the raw item (USDA 1994). To obtain the content of nutrient per 100 g cooked food, the nutrient content per 100 g raw food is multiplied by the nutrient retention factor and, when appropriate, yield factors. Nutrient retention factors are based on data from USDA research contracts, recent research reported in the literature, and USDA publications. Most retention factors were calculated by the True Retention Method (%TR) (Murphy et al. 1975). This method accounts for the loss of solids from foods that occur during preparation and cooking.

Table V. Nutritional composition (per 100 g) of commonly consumed sweets in Trinidad.

	Coconut Sweet Bread	Cassava Pone	Khurma	Pamie	Banana Bread	Currant Roll	Coconut Drop	Barfi	Coconut Roll	Parsad
Number of recipes	5	1	1	1	1	1	1	1	1	1
Energy (kcal)	349	239	523	234	378	392	380	448	463	422
Energy (kJ)	1459	999	2188	980	1581	1640	1589	1874	1939	1766
Protein (g)	5.5	1.0	5.4	1.7	5.9	7.2	4.9	13.0	6.4	4.5
Carbohydrate (g)	60.0	48.3	88	38.4	7.1	48.0	63.4	60.8	5.4	61.8
Fat (g)	10.1	5.4	17.4	9.3	14.6	20.3	12.7	17.8	24.7	17.9
Saturated fat (g)	5.1	2.9	1.5	5.4	0.5	5.5	5.2	11.1	10.6	0.7
% Calories from protein	6.3	1.7	4.1	2.7	6.1	7.1	5.2	11.4	24.8	4.3
% Calories from carbohydrates	67.9	187.6	66.4	63.0	59.5	47.5	65.5	53.4	48.6	58.0
% Calories from fat	25.7	19.7	29.5	34.3	34.1	45.4	29.5	35.2	46.1	37.7
% Calories from saturated fat	13.2	10.9	2.6	20.8	4.8	1.2	12.6	6.5	4.9	1.4
Monounsaturated fat (g)	0.5	0.2	2.9	0.3	0.6	0.0	0.3	5.0	0.3	0.0
Polyunsaturated fat (g)	0.4	0.1	5.9	0.1	0.4	0.0	0.2	0.5	0.1	0.2
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Omega-6 fatty acid (g)	0.2	0.1	0.2	0.1	0.3	0.0	0.2	0.3	0.1	0.1
Cholesterol (mg)	5.1	0.0	0.0	0.0	58.3	0.0	0.0	61.1	0.0	4.1
Sugars (g)	22.6	30.4	47.9	26.1	25.5	15.9	16.1	59.0	35.8	34.5
Dietary fiber (g)	3.3	1.8	1.5	4.0	1.7	3.2	3.0	0.1	2.5	1.0
Thiamin (mg)	0.4	0.1	0.4	0.0	0.3	0.0	0.3	0.1	0.0	0.3
Riboflavin (mg)	0.2	0.0	0.3	0.0	0.2	0.0	0.2	0.6	0.0	0.2
Niacin (mg)	2.7	0.5	3.1	0.2	2.1	0.1	2.5	0.3	0.2	2.1
Pantothenic acid (mg)	0.3	0.1	0.2	0.1	0.4	0.0	0.2	1.1	0.1	0.2
Vitamin B-6 (mg)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0
Total folate (ug)	84.8	16.3	96.0	7.5	70.2	3.8	76.6	17.7	7.8	65.2
Folate (DFE* _{ug})	132	16.3	153	7.5	106	5.9	119	17.7	9.5	104
Vitamin A (RE [†] _{ug})	0.1	37.4	0	57.3	19.8	0.5	0.0	164	0.3	0.0
Vitamin B-12 (ug)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	156	0.0	0.0
Vitamin C (mg)	1.2	10.5	0.1	2.2	1.4	0.1	0.8	4.2	0.6	0.1
Vitamin D (IU [‡])	18.6	11.3	39.2	15.8	72.3	0.4	36.5	144	0.3	103
Vitamin E [†] (mg)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vitamin K (ug)	0.4	1.2	0.2	0.2	0.3	0.1	0.5	1.3	0.0	0.1
Calcium (mg)	45.3	13.1	10.4	13.8	50.5	2.3	369	447	4.9	40.5
Iron (mg)	2.9	0.5	2.5	0.8	2.5	2.8	2.7	0.3	2.6	1.7
Zinc (mg)	0.5	0.3	0.4	0.3	0.6	0.0	0.5	1.6	0.2	0.3
Magnesium (mg)	20.3	14.3	13.2	9.7	24.8	0.7	26.1	42.2	7.0	9.3
Manganese (mg)	0.6	0.4	0.4	0.4	0.4	0.1	0.6	0.0	0.3	0.3
Selenium (ug)	16.6	1.5	18.1	2.0	16.0	0.7	15.1	7.9	2.7	12.3
Potassium (mg)	217	192	64.8	156	245	208	217	649	70.6	80.7
Sodium (mg)	176	22.5	49.2	178	188	363	413	191	329	125

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [§]α-tocopherol Equivalent.

Table VI. Nutritional composition (per 100 g) of commonly consumed beverages in Trinidad.

	Milo	Grapefruit Drink	Orange Drink	Mauby	Grapefruit Orange Drink
Number of recipes	5	5	5	5	5
Energy (kcal)	97	63	62	92	61
Energy (kJ)	407	264	261	385	256
Protein (g)	3.7	0.1	0.1	0.0	0.1
Carbohydrate (g)	13.6	16.0	15.6	23.1	15.3
Fat (g)	3.3	0.0	0.0	0.0	0.0
Saturated fat (g)	1.9	0.0	0.0	0.0	0.0
% Calories from protein	15.0	0.6	0.6	0.0	0.9
% Calories from carbohydrates	54.8	99.3	99.3	100	99.0
% Calories from fat	30.2	0.0	0.0	0.0	0.0
% Calories from saturated fat	17.6	0.0	0.0	0.0	0.0
Monounsaturated fat (g)	0.1	0.0	0.0	0.0	0.0
Polyunsaturated fat (g)	0.0	0.0	0.0	0.0	0.0
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.0	0.0
Omega-6 fatty acid (g)	0.0	0.0	0.0	0.0	0.0
Cholesterol (mg)	11.7	0.0	0.0	0.0	0.0
Sugars (g)	13.0	15.8	14.8	20.7	15.1
Dietary fiber (g)	0.0	0.0	0.0	0.0	0.0
Thiamin (mg)	0.1	0.0	0.0	0.0	0.0
Riboflavin (mg)	0.2	0.0	0.0	0.0	0.0
Niacin (mg)	1.7	0.0	0.0	0.0	0.0
Pantothenic acid (mg)	0.6	0.0	0.0	0.0	0.0
Vitamin B-6 (mg)	0.2	0.0	0.0	0.0	0.0
Total folate (ug)	1.1	0.1	0.0	0.0	0.0
Folate (DFE* _{ug})	1.1	0.1	0.0	0.0	0.0
Vitamin A (RE [†] _{ug})	11.5	0.0	0.0	0.0	0.0
Vitamin B-12 (ug)	0.2	0.0	0.0	0.0	0.0
Vitamin C (mg)	8.1	8.6	7.6	0.0	10.8
Vitamin D (IU [‡])	30.5	0.0	0.0	0.0	0.0
Vitamin E [¶] (mg)	0.1	0.0	0.0	0.0	0.0
Vitamin K (ug)	0.0	0.0	0.0	0.0	0.0
Calcium (mg)	167	8.3	1.8	1.5	3.0
Iron (mg)	1.4	0.2	0.1	0.0	0.1
Zinc (mg)	0.1	0.0	0.0	0.0	0.0
Magnesium (mg)	25.2	2.1	0.5	0.8	0.5
Manganese (mg)	0.0	0.0	0.0	0.0	0.0
Selenium (ug)	0.9	0.1	0.1	0.0	0.1
Potassium (mg)	33.6	18.2	0.2	0.0	0.2
Sodium (mg)	51.2	3.9	2.5	1.5	2.5

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [¶] α -tocopherol Equivalent.

We recognize that there are several limitations to this type of study. A nutrient database based on foods in the USA was used to calculate the nutritional composition of Trinidadian dishes, which might not reflect the true values of some nutrients in the dishes. Missing values for certain nutrients in the database such as vitamin D may result in underestimation of these nutrients. However, no other complete and specific database was available for the Trinidadian population when we completed this study. In addition, we were not able to account for the difference in soil content, animal feeding practices, grain enrichment, and food fortification between Trinidad and the USA. It is also possible that we did not collect all variations of each recipe as prepared by Trinidadians. Also, only one recipe was obtained for some composite dishes and seasonal foods. However, attempts were made to collect five versions of recipes

for most dishes listed on the QFFQ to increase the variety captured by our data. Additionally, participants were recruited of various age groups, from different socioeconomic backgrounds, and from all over the island of Trinidad.

Conclusion

We have provided the nutritional composition data for a substantial number ($n = 89$) of commonly consumed composite dishes in Trinidad. Such up to date and culturally appropriate data can be used to calculate energy and nutrient intakes using the QFFQ for Trinidad and to determine associations between diet and risk of chronic disease among Trinidadians. This new data can also be used to design nutritional intervention programs by modifying the nutritional composition of these dishes to improve dietary quality in this population.

Table VII. Nutritional composition (per 100 g) of commonly consumed snacks and miscellaneous dishes in Trinidad.

	Doubles	Pig Souse	Saheena	Phulourie	Alloo Pie	Beef Pie	Cheese Pie	Cheese Paste	Mango Chutney	Mango Talkari	Mixed Seasoning
Number of recipes	5	1	5	1	5	1	1	5	3	1	5
Energy (kcal)	278	108	315	389	273	332	415	424	70	182	78.3
Energy (kJ)	1163	450	1318	1628	1144	1388	1735	1775	295	762	328
Protein (g)	5.8	10.0	10.3	11.5	5.3	10.5	12.1	30.4	1.9	1.1	1.8
Carbohydrate (g)	36.4	0.8	45.1	43.6	42.2	24.0	29.8	3.1	16.1	34.3	13.3
Fat (g)	12.5	7.3	11.0	19.7	9.3	22.5	28.8	39.0	0.4	5.9	2.8
Saturated fat (g)	4.5	2.0	1.6	2.8	1.1	6.7	10.2	15.2	0.0	0.8	0.4
% Calories from protein	8.3	36.9	12.8	11.6	7.8	12.3	11.3	25.0	10.0	2.2	8.6
% Calories from carbohydrates	51.8	2.8	56.4	43.9	61.7	28.2	27.9	11.0	85.5	70.4	62.3
% Calories from fat	40.0	60.3	30.8	44.5	30.6	59.2	60.8	72.4	4.5	27.4	29.1
% Calories from saturated fat	14.6	16.3	4.6	6.5	3.6	3.5	12.2	32.3	0.0	18.2	6.1
Monounsaturated fat (g)	2.5	3.6	3.0	5.5	2.2	2.6	1.88	5.7	0.0	1.7	0.7
Polysaturated fat (g)	5.0	0.7	6.1	11.1	4.5	0.2	0.2	0.6	0.1	3.1	1.5
Omega-3 fatty acid (g)	0.0	0.0	0.0	0.1	0.0	0.0	0.07	0.2	0.0	0.0	0.0
Omega-6 fatty acid (g)	0.2	0.6	0.3	0.3	0.2	0.2	0.13	0.4	0.1	0.1	0.1
Cholesterol (mg)	0.0	48.0	0.0	0.0	0.0	20.7	21.0	69.3	0.0	0.0	0.0
Sugars (g)	0.6	0.3	2.1	2.8	1.1	4.4	3.7	1.9	7.4	22.0	6.0
Dietary fiber (g)	3.0	0.2	7.2	9.6	2.0	0.8	1.0	0.3	1.4	2.0	1.6
Thiamin (mg)	0.3	0.0	0.5	0.5	0.4	0.0	0.0	0.0	0.1	0.0	0.0
Riboflavin (mg)	0.2	0.0	0.3	0.2	0.2	0.1	0.1	0.2	0.1	0.0	0.1
Niacin (mg)	2.3	0.3	3.3	2.7	3.1	1.5	0.2	0.1	0.4	0.4	0.5
Pantothenic acid (mg)	0.3	0.1	0.6	0.7	0.4	0.2	0.1	0.3	0.2	0.1	0.2
Vitamin B-6 (mg)	0.2	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.1	0.2
Total folate (ug)	90.5	3.2	147	147	83.7	6.5	8.7	12.5	6.4	6.8	16.7
Folate (DFE* _{ug})	130	0.1	189	178	131	8.2	11.1	12.5	6.4	6.8	15.1
Vitamin A (RE [†] _{ug})	2.4	0.5	57.6	2.8	0.6	5.4	53.2	175	18.1	14.0	38.4
Vitamin B-12 (ug)	0.0	0.2	0.0	0.0	0.0	0.6	0.2	0.5	0.0	0.0	0.0
Vitamin C (mg)	2.1	1.4	11.0	1.8	3.7	2.1	1.3	1.5	18.2	100	25.9
Vitamin D (IU [‡])	0.0	0.0	0.0	0.0	7.6	0.5	2.4	45.2	0.0	0.0	0.0
Vitamin E [§] (mg)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0
Vitamin K (ug)	2.6	0.8	4.1	5.0	1.5	2.2	0.9	2.2	7.1	4.2	31.8
Calcium (mg)	27.4	4.0	59.6	127	34.3	11.5	146	437	56.0	57.5	61.8
Iron (mg)	2.5	0.5	3.3	3.2	2.3	2.6	2.7	0.5	0.8	2.0	1.5
Zinc (mg)	0.6	0.5	1.0	1.2	0.4	1.3	0.7	1.9	0.3	0.3	0.4
Magnesium (mg)	21.6	4.8	40.9	50	18.2	8.1	6.8	19.0	9.7	18.8	21.4
Manganese (mg)	0.6	0.0	0.7	1.2	0.4	0.1	0.0	0.0	0.4	0.3	0.5
Selenium (ug)	13.5	10.8	14.1	10.5	15.1	5.4	3.6	9.2	3.6	1.5	2.3
Potassium (mg)	126	37	394	397	185	118	31.0	85.2	174	159	200
Sodium (mg)	381	525	379	1350	465	509	527	549	2836	599	2745

*Dietary Folate Equivalent; [†]Retinol Equivalent; [‡]International Unit; [§] α -tocopherol Equivalent.

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References

- Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, Bray GA, Vogt TM, Cutler JA, Windhauser MM, et al. 1997. A clinical trial of the effects of dietary patterns on blood pressure. *N Engl J Med* 336:1117–1124.
- Barceló A, Aedo C, Rajpathak S, Robles S. 2003. The cost of diabetes in Latin America and the Caribbean. *Bull World Health Org* 81(1):19–27.
- Bognár A, Piekarski J. 2000. Guidelines for recipe information and calculation of nutrient composition of prepared foods (dishes). *J Food Comp Anal* 13(4):391–410.
- Cade J, Thompson R, Burley V, Warm D. 2002. Development, validation and utilization of food frequency questionnaires—a review. *Public Health Nutr* 5:567–587.
- Caribbean Commission on Health and Development. 2006. Report of the Caribbean Commission on Health and Development. Pan American Health Organization, Caribbean Community Secretariat. Jamaica: Ian Randle Publishers.
- Caribbean Food and Nutrition Institute, Pan American Health Organization, Pan American Sanitary Bureau, Regional Office of the World Health Organization. 2000. Food Composition Tables for Use in the English-speaking Caribbean. 2nd ed. Kingston, Jamaica: Caribbean Food and Nutrition Institute.
- Central Statistics Office, Government of Trinidad & Tobago. 2009. Distribution of the Total Population 2000 [Online] Available at: <http://www.cso.gov.tt/statistics/census2000.aspx>. Accessed on 30 October 2009.
- Ezenwaka C, Kallou R. 2003. Indices of obesity, dyslipidemia and insulin resistance in apparently healthy Caribbean subjects. *J Clin Lab Anal* 17:6–11.
- Francis DK, Van den Broeck J, Younger N, McFarlane S, Rudder K, Gordon-Strachan G, Grant A, Johnson A, Tulloch-Reid M, Wilks R. 2009. Fast-food and sweetened beverage consumption: Association with overweight and high waist circumference in adolescents. *Public Health Nutr* 12(8):1106–1114.
- Fung TT, Rimm EB, Spiegelman D, Rifai N, Tofler GH, Willett WC, Hu FB. 2001. Association between dietary patterns and plasma biomarkers of obesity and cardiovascular disease risk. *Am J Clin Nutr* 73:61–67.
- Gossell-Williams M, Fletcher H, McFarlane-Anderson N, Jacob A, Patel J, Zeisel S. 2005. Dietary intake of choline and plasma choline concentrations in pregnant women in Jamaica. *West Indian Med J* 54(6):355–359.
- Greenfield H, Southgate DAT. 2003. Food Composition Data Production, Management and Use. 2nd ed. Rome: Food and Agriculture Organization of the United Nations.
- Jackson M, Walker S, Simpson C, McFarlane-Anderson N, Bennett F. 2009. Are food patterns associated with prostate cancer in Jamaican men: A preliminary report. *Infect Agent Cancer Suppl* 1:S5.
- Lee RD, Nieman DC, Rainwater M. 1995. Comparison of eight microcomputer dietary analysis programs with the USDA Nutrient Data Base for Standard Reference. *J Am Diet Assoc* 95:858–867.
- Matthews RH. 1988. Recipe calculations vs analytical values. In: Proceedings of the Thirteenth National Nutrient Databank Conference, 6–8 June, Framingham, MA, USA.
- McCullough ML, Karanja NM, Lin PH, Obarzanek E, Phillips KM, Laws RL, Vollmer WM, O'Connor EA, Champagne CM, Windhauser MM. 1999. Comparison of 4 nutrient databases with chemical composition data from the Dietary Approaches to Stop Hypertension trial. DASH Collaborative Research Group. *J Am Diet Assoc* 99(8 Suppl):S45–S53.
- Merchant AT, Dehghan M. 2006. Food composition database development for between country comparisons. *Nutr J* 5:2.
- Murphy EW, Criner PE, Gray BC. 1975. Comparison of methods for determining retentions of nutrients in cooked foods. *J Agric Food Chem* 23:1153–1157.
- Sharma S, Cade J, Jackson M, Mbanya JC, Chungong S, Forrester T, Bennett F, Wilks R, Balkau B, Cruickshank JK. 1996. Development of food frequency questionnaires in three population samples of African origin from Cameroon, Jamaica and Caribbean migrants to the UK. *Eur J Clin Nutr* 50:479–486.
- Sharma S, Cao X, Harris R, Hennis AJ, Leske MC, Wu SY; Barbados National Cancer Study Group. 2007a. Dietary intake and development of a quantitative food-frequency questionnaire for the Barbados National Cancer Study. *Public Health Nutr* 10(5):464–470.
- Sharma S, Harris R, Cao X, Hennis AJ, Leske MC, Wu SY; Barbados National Cancer Study Group. 2007b. Nutritional composition of the commonly consumed composite dishes for the Barbados National Cancer Study. *Int J Food Sci Nutr* 58(6):461–474.
- Sharma S, Mbanya J, Cruickshank K, Cade J, Tanya A, Cao X, Hurbos M, Wong M. 2007c. Nutritional composition of commonly consumed composite dishes from the Central Province of Cameroon. *Int J Food Sci Nutr* 58(6):475–485.
- Sharma S, Cao X, Gittelsohn J, Ethelbah B, Anliker J. 2008. Nutritional composition of commonly consumed traditional apache foods in Arizona. *Intl J Food Sci Nutr* 59(1):1–10.
- Sharma S, Iwasaki M, Kunieda C, Cao X, Ishihara J, Hamada GS, Miyajima NT, Tsugane S, LeMarchand L. 2009a. Development of a quantitative food frequency questionnaire for assessing food, nutrient, and heterocyclic aromatic amines intake in Japanese Brazilians for a colorectal adenoma case–control study. *Intl J Food Sci Nutr* 60(Suppl 7):S128–S139.
- Sharma S, Yacavone M, Cao X, Samuda PM, Cade J, Cruickshank K. 2009b. Nutritional composition of commonly consumed composite dishes for Afro-Caribbeans (mainly Jamaicans) in the United Kingdom. *Intl J Food Sci Nutr* 60(Suppl 7):S140–S150.
- Slattery ML, Boucher KM, Caan BJ, Potter JD, Ma K-N. 1998. Eating patterns and risk of colon cancer. *Am J Epidemiol* 148:4–16.
- United States Department of Agriculture. 1994. USDA Table of Nutrient Retention Factors, Release 3. Nutrient Data Laboratory, US Department of Agriculture National Agricultural Library [Online] Available at: <http://www.nal.usda.gov/fnic/foodcomp>. Accessed on 15 June 2010.
- United States Department of Agriculture. 2002. Automated Multiple-Pass Method. Beltsville: USDA/ARS Food Surveys Research Group; c2002–09 [Online] Available from: <http://www.ars.usda.gov/Services/docs.htm?docid=7710>. Accessed on 30 October 2009.
- United States Department of Agriculture. 2009. Agriculture Research Services. Products and Services SR 20 [Online] Available at: <http://www.ars.usda.gov/Services/docs.htm?docid=1747>. Accessed on 16 June 2010.
- Westrich BJ, Buzzard IM, Gatewood LC, MCGovern PG. 1994. Accuracy and efficiency of estimating nutrient values in commercial food products using mathematical optimization. *J Food Comp Anal* 7(4):223–229.
- Willett W. 1998. Food frequency measures. In: Willett W, editor. *Nutritional Epidemiology*. 2nd ed. New York: Oxford University Press. p 74–100.