

## Dietary intake among adults in Trinidad and Tobago and development of a quantitative food frequency questionnaire to highlight nutritional needs for lifestyle interventions

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### Abstract

**Primary objective** To create a food list and develop a draft quantitative food frequency questionnaire (QFFQ) for Trinidad and Tobago.

**Methods and procedures** A mixed sampling method was used to obtain a representative sample and trained interviewers administered 24-h dietary recalls. Portion sizes were assessed and the most frequently reported foods were tabulated.

**Main outcomes and results** Results are from 155 men and 169 women aged 21–64 years. The most frequently reported food items were: full-cream milk (64%), rice (61%), and sweetened fruit drinks (50%). Carbonated drinks were consumed by 28%. The most frequently consumed fruits were banana (23%) and citrus (22%); <20% consumed a vegetable food item. The final QFFQ contains 146 items: 19 breads/cakes/cereals; seven rice/pastas/noodles; 12 dairy; 26 meats/poultry/fish/soy products; 15 fruits; 34 vegetables; six legumes; 11 other; 12 drinks; four alcoholic drinks.

**Conclusions** A list of commonly consumed foods in Trinidad and Tobago was obtained and a draft QFFQ was prepared.

**Keywords:** *Quantitative food frequency questionnaire, Trinidad, Tobago, dietary assessment, nutrition intervention*

### Introduction

The increasing burden of chronic non-communicable diseases (NCDs) has adversely affected many developing countries including Trinidad and Tobago. The World Health Organization (WHO) estimates that NCDs, including cardiovascular disease, cancer, and diabetes, are now the leading cause of premature mortality in the Caribbean, accounting for nearly half the deaths of persons younger than 70 years of age (WHO 2002). The estimated economic burden of diabetes and hypertension in 2001 was US\$754 million in Trinidad and Tobago (Barcelo et al. 2003, Caribbean Commission on Health and Development [CCHD] 2006). The burden of chronic disease continues to escalate with the increasing prevalence of metabolic syndrome components such as obesity, dyslipidemia, and insulin resistance (Sargeant et al. 2001, Ezenwaka

and Kalloo 2003, Ezenwaka et al. 2007). In the Caribbean, obesity has increased at an alarming rate of almost 400% in 20 years and is accompanied by increasing rates of mortality from diabetes and hypertension (Henry 2006, CCHD 2006). There is an urgent need for sustainable, culturally appropriate lifestyle interventions to reduce chronic disease rates and their associated risk factors among Trinidadian adults.

Healthy eating and physical activity are two important components of NCD prevention (WHO 2002, Woolf et al. 2008, Centers for Disease Control and Prevention 2009). Population-specific dietary assessment provides food and nutrient intake data, upon which chronic disease associations can be investigated. In Trinidad and Tobago, there are

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limited studies assessing dietary intake patterns. Gulliford et al. (2003) administered a short food frequency questionnaire among Trinidadian adults and showed that food insecurity was associated with decreased consumption of fruit, green vegetables, and salads. However, this questionnaire was not designed as a comprehensive dietary assessment tool. Currently, there is no instrument available for determining usual dietary intake among this population. The quantitative food frequency questionnaire (QFFQ) is the most commonly used tool for assessing dietary intake in large population-based studies. QFFQs have several advantages over other dietary assessment instruments, including ease of administration and reduced time and cost (Willett 1998a, Cade et al. 2002, 2004).

In the Caribbean region, population-specific QFFQs have been developed and validated in Jamaica and Barbados (Jackson et al. 2001, Sharma et al. 1996, 2007a). While there are similarities in the diets among Caribbean countries, there are many composite and mixed dishes unique to the Trinidadian diet that are not found on these QFFQs (Ramdath et al. 2010). Trinidad and Tobago comprises a variety of ethnic groups who have influenced the local cuisine. To include information specific to Trinidadians, it was necessary to develop a new QFFQ as opposed to modifying those validated for Jamaica and Barbados where the populations are predominantly of African ancestry. In this regard, Sharma et al. (2007a, 2007b) recognized the need to generate a culturally appropriate food list for the development of a QFFQ for use within the Barbadian population.

The aims of the present study were to produce a food list, highlight foods for a nutrition intervention program, and prepare a draft QFFQ that is culturally specific to target adults since this is when many chronic diseases manifest themselves. These data will be used to support studies of associations between diet and risk of non-communicable chronic diseases in Trinidad and Tobago and to guide dietary interventions.

## Methods

### Sample

Participants were randomly selected from full-time university staff (occupation stratified); to these were added a subsample of individuals residing throughout Trinidad whose socioeconomic status and job profile fell outside those of the various categories of university staff. We purposely recruited participants from urban and rural areas of Trinidad based on random and constrained sampling in order to fill the missing groups. Compared with the most recent census data for Trinidad and Tobago (Central Statistics Office, Government of Trinidad and Tobago 2009), this sample was representative of the population in terms of gender distribution, ethnic composition, unemployment, range of employment profiles, and religion.

The study was approved by the Research Ethics Committee, Faculty of Medical Sciences, University of the West Indies, St Augustine and all participants gave signed informed written consent prior to entering the study.

### *Twenty-four-hour dietary recalls and food list*

Three interviewers (two undergraduate nutrition students and one [local] dietitian) were trained in the administration of 24-h dietary recalls. After reviewing the methodology, the research team established a training manual and conducted a training workshop. The 24-h dietary recalls were conducted by one of three interviewers at the respondent's workplace, home, or at the screening clinic. Recalls were conducted on both weekdays and weekend days during the months of August–December 2008. Participants were systematically probed, and information on all foods and drinks consumed during the preceding 24-h period was recorded. Portion sizes were assessed using familiar household measures (i.e. spoons, cups, glass), standard units (i.e. slice of bread), and three-dimensional food replicas (*Life/form*<sup>®</sup>; Nasco International, Fort Atkinson, WI, USA). In addition to dietary data, information on gender, age, occupation, use of prescription drugs, dietary supplements, and smoking habits were recorded.

Data from each 24-h recall were recorded on dietary assessment forms. The assessment forms also contained a list of questions to prompt for frequently forgotten foods such as sweets, alcohol, and snacks. Furthermore, interviewers asked questions regarding special dietary practices (i.e. religious practices, weight loss or low-fat diet). All dietary assessment forms were examined for completion, and if any information was missing the interviewer contacted the respondent to obtain the additional data.

All food items were coded and entered into an electronic spreadsheet (Excel 2003; Microsoft, Redmond, WA, USA). The number of respondents reporting each food or drink item was tabulated and ranked to determine the most commonly reported foods.

## Results

Dietary recalls were completed by 324 respondents; the response rate was 92%. Table I presents demographic characteristics of the respondents. Participants included 169 women (mean age = 43 years) and 155 men (mean age = 44 years) from diverse ethnic backgrounds including African, South Asian, mixed and other. Their age range was 21–64 years. Among respondents, 21% self-reported having a chronic disease, 32% reported either hypertension or hypercholesterolemia, and 20% reported being a current or past smoker.

Table II presents the percentage of people who reported consuming each food or drink item.

Table I. Summary of demographic and other information among study participants.

	Men ( <i>n</i> = 155) (%)	Women ( <i>n</i> = 169) (%)
Mean age ( $\pm$ standard deviation)	43 $\pm$ 9.9	44 $\pm$ 9.7
Ethnicity <sup>a</sup>		
African	55 (36)	73 (43)
South Asian	58 (37)	38 (23)
Mixed	30 (19)	46 (27)
Other	12 (8)	12 (7)
Employment status <sup>a</sup>		
Academic/professional	30 (19)	37 (22)
Administrative/technical/support	88 (57)	109 (64)
Security	6 (4)	1 (1)
Daily paid/laborer	19 (12)	12 (7)
Unemployed	12 (8)	10 (6)
Marital status <sup>a</sup>		
Married/common-law	89 (70)	69 (47)
Single	26 (21)	50 (34)
Divorced/widowed	12 (9)	27 (19)
Religion <sup>a</sup>		
Christian	82 (65)	108 (75)
Hindu	28 (22)	18 (12)
Muslim	7 (6)	5 (3)
Other	9 (7)	15 (10)
Self-reported medical history <sup>a</sup>		
None	63 (55)	68 (50)
Diabetes	10 (9)	3 (2)
Heart disease	3 (3)	40 (30)
High blood pressure	23 (20)	1 (1)
Stroke	–	2 (2)
Cancer	–	2 (2)
High blood cholesterol	25 (22)	40 (30)
Smoking status <sup>a</sup>		
Current	22 (19)	5 (4)
Past	17 (15)	7 (5)
Never	75 (66)	123 (91)
Dietary supplement use <sup>a</sup>		
No	40 (35)	38 (28)
Yes	74 (65)	97 (72)
Vitamin and/or mineral	68 (60)	91 (67)

<sup>a</sup>Some participants did not report information on marital status, religion, smoking status, self-reported medical history, and dietary supplement use.

Full-cream milk was the most commonly reported food, with 64% of the population reporting it. One-half (50%) of the respondents reported consuming sweetened fruit drinks and over one-quarter (28%) reported consuming carbonated soft drinks. Bananas (23%) and tossed vegetable salad (38%) were the most commonly reported fruit and vegetable. Less than 20% of respondents consumed any whole vegetable item. Although potatoes in any form were consumed by 30%, this food item is not regarded as a vegetable in the Caribbean.

#### Development of the QFFQ

All foods reported on the 24-h dietary recalls were entered into the Excel spreadsheet. A total of 439 food and drink items were identified. Foods consumed by <5 persons were removed from the initial list. Also,

foods low in energy and nutrients (e.g. condiments and spices) were excluded due to their insignificant contribution to overall nutrient composition of the diet. A sample page of the QFFQ is shown in Appendix 1, and all food and drink items listed on the QFFQ are described in Appendix 2.

Food items of similar nutrient composition were grouped together, such as various types of yogurts or cakes. Foods that did not appear on the recall list due to seasonality of consumption and lack of availability at the time of the recall were included on the QFFQ (e.g. souse, sorrel, sapodilla, pommerac, and Christmas/black cake). The foods that were regarded as seasonal were decided upon in consultation with persons familiar with dietary intakes and in dietetic practice in Trinidad and Tobago. Food and drink items were categorized into groups such as 'drinks' or 'fruits'. The resulting QFFQ contains 146 food and drink items grouped into 10 groups: 19 breads cakes or cereals; seven rice, pastas, or noodles; 12 dairy; 26 meats, poultry, fish or soy products; 15 fruits; 34 vegetables; six legumes; 11 other; 12 drinks; four alcoholic drinks.

The QFFQ assesses frequency of consumption using eight categories: never, less than once a month, once a month, 2–3 times a month, once a week, 2–3 times a week, four to six times a week, once a day, 2 or more times a day. Portion size is assessed for each line item using either a household unit (i.e. a spoon), a 3D food model (*Life/form*<sup>®</sup>; Nasco International), or a standard portion size (i.e. a slice of bread). It is expected that the QFFQ will assess usual intake of food and drink items consumed over the previous 12 months.

#### Discussion

Nutrition and lifestyle-related chronic disease rates continue to escalate among Caribbean countries, with obesity rates soaring and diabetes rates reaching epidemic proportions (Sargeant et al. 2001, Barcelo et al. 2003, Henry 2006, CCHD 2006). Population-specific dietary information is crucial to examine the association between dietary intake and risk factors for chronic non-communicable diseases, and to inform and evaluate community-based interventions aimed at reducing chronic disease and associated risk factors among the Trinidad and Tobago population.

The QFFQ development described in this paper is similar to other QFFQs developed to determine food, food groups, and nutrient intake to inform and evaluate nutrition interventions, and to assess diet–disease associations (Jackson et al. 2001, Sharma et al. 2007a, 2009, 2010). In order to allow for cross-country comparison of diet and food group intakes in various Caribbean countries, and to allow for the evaluation of regional intervention programs to reduce NCD, it was important that a well-recognized, standardized method be employed to prepare the

Table II. Food and drink items reported by &gt; 8% of participants.

Food item	n	%	Food item	n	%	Food item	n	%
Full-cream milk (liquid, powder)	208	64	Citrus fruits (orange, Portugal, grapefruit)	70	22	Deli meats (chicken, turkey)	40	12
Rice (plain or with vegetables added)	197	61	Chicken (roasted, grilled, steamed)	66	20	Red beans	40	12
Fruit drinks, sweetened (excluding orange)	163	50	Stewed/curried meats (beef, lamb, pork, goat, duck, wild meat)	64	20	Pelau/peas and rice	40	12
Sugar	162	50	Orange drink, (sweetened)	64	20	Canned fish	37	11
Coffee	131	41	Pasta (white)	63	20	Macaroni Pie	33	10
Tea	129	40	Carrots	62	19	Deli meats (pork, beef)	32	10
Bread (whole grain)	127	39	Cucumber	56	17	Peanuts	32	10
Sada Roti/bake/roti skin, roasted, white	127	39	Margarine	55	17	Soybean/vegetable oil	31	10
Raw vegetable salad	124	38	Nuts (all types)	55	17	Minced beef	30	9
Ground provisions	121	37	Apple	54	17	Mauby drink	30	9
Bread (white)	119	37	Fish (stewed/steamed/curried/baked)	46	14	Saltfish buljol/stewed	29	9
Breakfast cereals, cold	99	31	Callaloo	44	14	Pumpkin	29	9
Chicken, stewed/curried	98	30	Cake	44	14	Butter	29	9
Cheese	97	30	Fried chicken	43	13	Mint candy	29	9
Potatoes (all preparations)	96	30	Eggs	43	13	Lentil peas	27	8
Carbonated soft drinks	92	28	Bhagi/spinach/pakchoi	42	13	Bodi, string beans	26	8
Low fat/skimmed milk (liquid, powder)	90	28	Chocolate (candy)	42	13	Salad dressing	26	8
Bananas	74	23	Pigeon peas	41	13	Beer	26	8
Lettuce	70	22	Fried fish	40	12	Dhall (split peas)	25	8
Tomato	70	22	Vegetarian items (soya, soy milk, cheese)	40	12			



draft QFFQ for Trinidad and Tobago. When compared with a previously validated QFFQ in the Caribbean (Jackson et al. 2001, Sharma et al. 1996, 2007a), the present QFFQ revealed several food items unique to Trinidad. The preparation methods and nutrient composition of foods listed in the previous QFFQ (Ramdath et al. 2010) differ significantly, thus requiring the creation and validation of a separate QFFQ as suggested by Cade et al. (2004).

Although short-term recalls (i.e. food diaries) can provide more precise data, long-term assessment methods (e.g. QFFQs) are more suitable to address research questions regarding impact of diet on the development of chronic disease over time (Willett 1998a, 1998b). The QFFQ is relatively inexpensive and allows measurement of long-term dietary intake among a large population sample (Solomons and Valdes-Ramos 2002, Taren et al. 2002). We recognized that there is some seasonal variation in the availability of some food items, especially fruits and vegetables; as such, these were added to the QFFQ based on discussions with persons familiar with dietary intakes and in dietetic practice in Trinidad and Tobago. Further, we have accounted for the addition of new food items during the QFFQ validation exercise.

Shahar et al. (2003) as well as Cade et al. (2002) outlined three crucial steps required for the creation of a new QFFQ: compose a food list, define portion sizes, and classify categories of frequency of consumption. The present study focused on each of these steps of QFFQ development. Moreover, for the first time an appropriate food list has been prepared and portion sizes collected from the Trinidadian population. Items selected for the food list must have a large variety of consumption between respondents, be commonly consumed, and contribute significantly to nutrient intake (Willett 1998a, Cade et al. 2002, 2004, Shahar et al. 2003). This QFFQ contains a comprehensive list that is culturally appropriate, and was developed using a standard methodology as reported in previous studies (Sharma et al. 1996, 2007a, 2009, 2010).

The only previous attempt at assessing culturally specific food frequency intake for Trinidad was a very short questionnaire that focused on consumption of food groups (e.g. fruit and vegetables) (Gulliford et al. 2003). Exercises similar to this study in the Caribbean have yielded food lists containing 69 and 148 items in Jamaica and Barbados, respectively (Sharma et al. 1996, 2007a, Jackson et al. 2001). Methods used in this study were consistent with the recommended QFFQ development procedures and yielded a list that contains a variety of 146 food and drink items consumed by the participants.

Our results highlight specific foods to be targeted for a nutrition intervention program and illustrate the need for such a program among Trinidadian adults. For example, respondents reported a low consumption of fruit and vegetables as compared with the consumption of sweetened fruit juices and carbonated

drinks. These results coupled with high rates of reported chronic disease underscore the urgent need for evidence-based dietary interventions in Trinidad and Tobago. A nutrition intervention could easily focus on replacing sweetened drinks with unsweetened fruit juices and sugar-free drinks. Using similar methodology, Sharma et al. (2008) have identified comparable needs in Barbados where sugar intakes were almost four times the Caribbean recommendation, while intakes of calcium, iron in women, zinc, and dietary fiber were below recommendations. In addition, sweetened drinks and juices provided over 40% of total sugar intake among Barbadians.

A limitation of this QFFQ is the lack of a validation study. However, such a study is planned and will be conducted using similar methods to other validation studies (Stram et al. 2000), and used in calculating nutrient values and dietary intake patterns in Trinidad and Tobago.

## Conclusion

The present study developed, for the first time, a Trinidad-specific QFFQ that when validated will enable assessment of the associations between dietary intake patterns and chronic disease within the Trinidadian population.

## Supplementary material available online

### Appendix 1

Sample page of the QFFQ

### Appendix 2

Food and drink items listed on the QFFQ

## Declarations of interest

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