



Main meal quality in Brazil and United Kingdom: Similarities and differences



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ABSTRACT

Consumption of fast food and ready-to-eat meals has been positively associated with obesity. In the UK, ready-made meals are more often consumed than in Brazil, a country in which nutrition transition is relatively low. This study aimed to compare the nutritional quality of the main meal consumed by adults in Brazil and UK. Food record data was obtained from representative samples from UK and Brazil databases. The Main Meal Quality Index (MMQI) was applied to estimate the quality of the main meal consumed in Brazil and UK. Differences in food groups consumed in the main meal in Brazil and UK were observed using classification decision tree. Meals with higher average energy content were lunch for Brazil, and dinner for the UK. On average, the Brazilian main meal had better nutritional quality (4.42 times higher), independently of sex, age, family income, nutritional status and energy consumed, with higher scores of fiber, carbohydrate, total fat, saturated fat and energy density. However, UK's main meal included more fruits and vegetables. Food preparations combined with rice and beans were classified as Brazilian main meal, while combinations with fast food items, as fried potatoes, sandwiches and sugary beverages, were classified as UK main meals. In Brazil, the main meal quality was lower among women and obese individuals, presenting significant positive association with age, and negative association with energy intake and family income; while in UK, only age was positively associated with MMQI. Although main meals in Brazil had higher nutritional quality compared to the UK, main meals consumed in both countries need nutritional improvement.

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1. Introduction

Once considered to be problem only in high-income countries, overweight and obesity are now on the rise in low- and middle-income countries (Monteiro, Moura, Conde, & Popkin, 2004). The 2008–2009 Brazilian Household Budget Survey and the 2013 Brazilian National Health Survey found changes in the relative magnitude of malnutrition and overweight among Brazilians, showing a continuous increase in weight among adolescents and adults in recent years (IBGE, 2010; IBGE 2014). In 2013, the

prevalence of obesity in Brazil was approximately 22% among men and 16% among women, while it was approximately 24% among men and 25% among woman in the UK (WHO, 2013).

It is well known and generally accepted that the increase in overweight and obesity is the result of an obesogenic environment stemming from industrial development (Garcia, 2003). In this context, although economic growth is especially important for lower-income countries, as it allows the shift from poverty to economic prosperity, economic development and income growth may not necessarily result in higher quality of life in middle-income countries, since the population will have access to all types of food products (Egger & Swinburn, 2010). Economic development generates technological and industrial changes, resulting in dietary pattern transitions that include more inexpensive and high-calorie foods containing larger amount of fat, sugar and salt, thus leading the population to consume excessive energy (Swinburn et al.,

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2011).

Unlike Brazil, as measured by household expenditure surveys, the dietary pattern in the UK includes many ready-to-consume products (Moubarac et al., 2013). Eight different dietary patterns have been reported to explain the food habits of adults in the UK, resulting from Principal Component Analysis applied to 7-day dietary records including food weighting: (1) health-conscious; (2) chips, meat products and eggs; (3) bread, fat spread and cheese; (4) coffee/tea and cakes; (5) soft drinks and snacks; (6) breakfast cereal and milk; (7) red meat and alcohol; and (8) chicken and rice. Among them, four patterns were composed of foods rich in fats, sugar and salt with higher energy density (Gibson & Ashwell, 2011).

Although Moubarac et al. (2013) have shown that the Brazilian diet still includes a reasonable proportion of fresh foods, culinary ingredients and homemade meals, the food consumption trends indicate that there have been successive decreases in consumption of fruits and vegetables since 2002; whereas the consumption of processed foods and ready-made meals inside and away from home has presented increases in the same period in Brazil (Bigio et al., 2011; Gorgulho, Fisberg, & Marchioni, 2013; Monteiro, Levy, Claro, de Castro, & Cannon, 2010). Gorgulho et al. (2013) observed that the characteristics of the meals consumed in Sao Paulo, a highly industrialized and urbanized megacity, were not in line with national nutritional guidelines, regardless of the place of consumption.

Due to the complexity of the diet and the potential interactions among dietary components, analyses of daily dietary patterns are being applied in nutritional epidemiology, taking into account different foods and food groups consumed (Waijers, Feskens, & Ocké, 2007). However, while studying dietary patterns has promoted understanding of food consumption, examining the composition of each meal may help to increase our ability to understand diet-disease patterns (Hearty & Gibney, 2008). Differences in a single meal could be sufficient to produce benefits or damage to health, given that meals with distinct composition elicit different postprandial responses (Monfort-Pires & Ferreira, 2016). After a relatively short intervention in breakfast, Monfort-Pires and Ferreira observed reductions in fasting and postprandial cytokines.

Cross-national comparisons of meal quality have rarely been attempted, but an assessment of diet quality between countries would be especially valuable. Clearly, the UK and Brazil are in different stages of nutritional transition (IBGE, 2010; Wang, McPerson, Marsh, Gortmaker, & Brown, 2011). An examination of similarities and differences between both countries can provide insights into how to confront the current epidemiological reality. Based on the above, the aim of this study was to compare the nutritional quality and composition of the main meal consumed by adults in Brazil and the UK.

2. Methods

The characterization of the meals, analysis of dietary quality and association with nutritional status were completed using two databases with nationally representative samples: one in the UK and one in Brazil.

2.1. UK data

The UK data were extracted from the National Diet and Nutrition Survey (NDNS) rolling program, a cross-sectional household survey that objectively gathered data on food consumption, nutrient intakes and nutritional status from a representative UK population (UK, 2014). This national survey has been conducted on a continuing basis each year since 2008; being selected data of the first four years (2008–2012) for this study. It aims to collect data

from 1000 people per year (500 adults aged 19 years and older, excluding pregnant women, as well as 500 children aged 1.5–18 years) from all four countries in the UK: England, Wales, Scotland and Northern Ireland. The sample was selected from the Postcode Address File and clustered into primary sampling units. Full details of the survey's methodology and procedures are provided in the user guide published by the UK Food Standards Agency (UK, 2013). Information on demographics and general health, cooking skills and facilities, shopping and food preparation practices, eating habits, food avoidance and physical activity were collected during a computer-assisted personal interview. In the context of the present study, data from 1441 individuals aged 19–59 years who provided complete interview and dietary data were used.

2.2. Brazilian data

The Brazilian data were extracted from the National Dietary Survey (INA), an individual food intake module of the 2008–2009 Brazilian Household Budget Survey (HBS). This survey was conducted by the Brazilian Institute for Geography and Statistics. It aimed to measure income spent, family assets and consumption patterns, including data on individual food consumption (IBGE, 2010). Individuals were also interviewed about demographic and economic issues and nutritional status. The HBS 2008–2009 involved the use of two-stage cluster sample following the geographical and statistical stratification of the primary sample units, based on the 2000 Brazilian Demographic Census. A sub-sample of 25% of households from the original 2008–2009 BHBS sample was randomly selected for investigation of individual food consumption in the INA. Details about the database and methodology have been reported (Sichieri, Pereira, Martins, Vasconcellos, & Trichopoulou, 2008). In the context of the present study, data from 16,730 adults (19–59 years old, excluding pregnant women) living in urban areas who provided complete interviews were included.

2.3. Dietary data collection

In both studies, trained interviewers traveled to individuals' homes to ask them questions. Food consumption was measured via food records. HBS respondents completed two measures on nonconsecutive days, whereas NDNS respondents completed four measures (two weekdays and two weekend days). They reported all food and drink consumed on these days, as well as the time of the meal, quantities consumed according to portion sizes, cooking method and source of the food. Trained interviewers supervised the quality of dietary data reported during collection. Specifically, they reviewed information presented in food records to identify errors in completion and make necessary corrections.

2.4. Main meal quality

The criteria to define each meal were time-slots of consumption defined by the participants (Meiselman, 2008): 6–10 a.m. for breakfast, 11–15 p.m. for lunch and 18–21 p.m. for dinner. The eating episode with the higher energy contribution was considered in these time-slots. Next, the main meal was defined as the meal with the highest contribution to overall daily consumption of energy and nutrients for the population in each country.

The Main Meal Quality Index (MMQI), a previously developed and validated index, was used to assess the nutritional quality of the meal (Gorgulho, Pot, Sarti, Fisberg, & Marchioni, 2015; Gorgulho, Gerda, & Sarti, 2016). The average scores and inter-quartile intervals of the MMQI and its components were presented for each country. Additionally, to compare Brazil and the United

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