Usual diet quality among 8- to 12-year-old Brazilian children

Qualidade usual de dieta em crianças brasileiras de 8 a 12 anos

Calidad de la dieta habitual entre niños brasileños de 8 a 12 años

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Abstract

Nutritional surveys are important information sources for public policy in the food and nutrition field. They focus on assessing usual dietary patterns, because health outcomes result from the long-term intake. Here we aimed to evaluate diet quality adjusted for day-to-day variance among Brazilian children. Data were collected between March 2013 and August 2015. The sample included 8- to 12-year-old children (n = 1,357) from public schools from all administrative regions of a Brazilian city. One 24-h dietary recall (24HR) was collected for the whole sample and two 24HR for two non-consecutive days of the same week for a subsample. The Healthy Eating Index-2010 *(HEI-2010) was adapted to Brazilian food habits and the Brazilian dietary guidelines were used to evaluate diet quality. Statistical analysis included a multipart, nonlinear mixed model with correlated random effects proposed by the U.S. National Cancer Institute to correct diet quality for day-to-day variance. The adapted HEI-2010 total score was 51.8. Children with poorer diet quality (< 10th percentile) scored less than 41.1, and children with higher diet quality (> 90th percentile) scored more than 62.4. The overall adequacy of adapted HEI-2010 components was low. Higher adequacy percentages were identified for total protein foods (94.9%), greens (62.3%), and seafood and plant proteins (52.2%). Seven components showed less than 10% of adequacy: refined grains, fatty acids, dairy, sodium, total vegetable, whole grains, and empty calories. This study identified the main inadequacies among children's diet quality, which can guide promotion actions for healthy eating.*

Food Quality; Diet; Healthy Diet; Nutrition Assessment; Child

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Introduction

Unhealthy eating habits during childhood can negatively impact on children's growth and development and is a risk factor for nutritional deficiencies and non-communicable disease occurrence [1,2]. Assessing food consumption in this life stage can contribute to public policies aiming at improving food consumption adequacy [3,4].

As nutrients and foods are not consumed in isolation, dietary pattern assessment is more appropriate when investigating food consumption as it considers the synergy of nutrients and food groups. Diet quality indexes are composed of multiple interrelated dietary components and are valuable instruments to investigate dietary patterns [5,6].

In Brazil, several studies have indicated poor diet quality among children and adolescents and higher inadequacies for fruits, dairy, whole grain, and vegetables consumption [7,8,9,10]. However, these studies did not adjust the diet quality distribution for day-to-day variance, which can lead to unrealistic estimates of the proportion of children with alarmingly poor diets [11].

This study aims to evaluate diet quality adjusted for day-to-day variance among 8- to 12-year-old children from Belo Horizonte, Minas Gerais State, Brazil, measured by the *Healthy Eating Index-2010* (HEI-2010) [12], which was adapted to Brazilian food habits and to the Brazilian Ministry of Health recommendations [13]. Our results can potentially contribute to Brazilian nutrition policies that aim to improve diet quality in childhood.

Methods

This is a descriptive study conducted with 8- to 12-year-old children from Belo Horizonte, the capital city of the Minas Gerais State. Belo Horizonte has 2,375,151 inhabitants and 331.4km² of land area.

The estimated required sample size was 1,067 participants, considering a score of 50% on the adapted HEI-2010, 5% as the significance level ($\alpha = 0.05$), and 3% as a maximum estimative error. Public municipal schools (serving 1,599 children) were randomly selected and invited to participate in the study. This selection was defined according to the number of children in each regional municipality. Of those invited, 185 (11.6%) were absent on the data collection days, 53 (3.3%) presented difficulty in reporting their food consumption and were excluded from the analysis, and four (0.3%) refused to participate in the study. Thus, our final sample was comprised of 1,357 children. Children with mental impairment were excluded.

This study was conducted according to the guidelines of the *Declaration of Helsinki*, and parents provided written consent for their children to participate in the study. All measures and procedures were approved by the ethics committee.

Data were collected between March 2013 and August 2015. Dietary intake was evaluated by one 24-h dietary recall (24HR) for the whole sample (n = 1,357); a second 24HR in non-consecutive days within the same week was administered in a randomly selected subsample of 524 individuals (38.6%) to remove the effect of the within-person variance in the intake distribution. We assumed a replication rate of approximately 40% because this percentage is associated with lower loss of precision estimates [14]. Trained dieticians were responsible for conducting these interviews. Children reported all food and beverages in quantities and preparation forms. Food consumption was collected during the whole year and comprised weekdays and weekends. Real household measurements were used to help participants in reporting the amount of food consumed. In addition, when children expressed doubt about a type of food or beverage, they were shown images using a mobile phone.

Although assessing dietary habits among children is challenging, because of their lack of literacy and writing skills, limited food recognition skills, and constraints of memory and concentration span, methods such as the 24HR are useful in capturing important information on children's individual intake of foods and drinks. No objective method for assessing dietary patterns exists, and despite the reporting bias and lack of precision associated with self-report methods, consistent links between dietary variables and prevalence of disease have been detected [15]. The consensus indicates that children below the age of 8 years unlikely are able to accurately report their dietary intake [15,16,17]. Children older than 8 years, therefore, may be asked to respond to a dietary recall themselves.

The food composition table proposed by the Brazilian Institute of Geography and Statistics (IBGE) [18] was used for obtaining food chemical compositions. Also, recipes were broken down according to their ingredients to better classify foods into their respective food groups.

Other children's information was collected aiming at characterizing the sample profile. Children's sex, age, and address were collected from school records. We classified children's social vulnerability risk by their residence address using the *2012 Health Vulnerability Index* (IVS-2012), which combines census tract socioeconomic characteristics and sanitation quality in a single synthetic indicator [19]. In addition, children's weight and height were measured to determine children's nutrition status in accordance with their body mass index (BMI). World Health Organization (WHO) growth charts [20] and the Brazilian Food and Nutritional Surveillance System (SISVAN) cut-off points [21] were used to classify children's BMI by age in: underweight, eutrophy, and overweight.

The adapted HEI-2010 was used as a measure of diet quality. The HEI-2010 [12] was published in 2013 in accordance with the *2010 U.S. Dietary Guidelines* [22] and is applied to individuals older than 2 years. It is composed of 12 items addressing total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, and empty calories. Each component has a minimum score of 0 and a maximum score of 5, 10 or 20. The total HEI-2010 score ranges from 0 to 100, with higher scores indicating higher diet quality [12]. Aiming to approximate the HEI-2010 to Brazilian food habits and to the Ministry of Health recommendations [13], some adaptations were made to the index. Box 1 shows the adapted HEI-2010 components and standards for scoring. However, this study did not aim to propose a new diet quality index for the Brazilian population; rather, we adapt the HEI-2010 to the Brazilian context.

The adaptations include: beans intake was computed using seafood and plant protein and total protein food components, instead of computing it using four components – total vegetables, green and beans, total protein foods, and seafood and plant protein. Brazilians consume beans very frequently – the prevalence of frequent consumption ($\geq$ 5 times per week) of beans is estimated in 69.9% among Brazilian adolescents [23] – and computing intake of beans in four components could overestimate their score.

In addition, ultra-processed food products (such as mass-produced packaged breads and buns; cookies; breakfast "cereals"; "cereal" and "energy" bars; milk drinks; "fruit" yogurts and "fruit" drinks; meat and chicken extracts; "health" and "slimming" products such as powdered or "fortified" meal and dish substitutes; and many ready-to-heat products including preprepared pies and pasta and pizza dishes) did not account for adequacy components (total fruit, whole fruit, total vegetables, greens, whole grains, dairy, total protein foods, seafood and plant proteins) since *Brazilian Dietary Guidelines* recommend avoiding ultra-processed food products consumption [13].

Regarding the scoring system, in our study, we used the same criteria proposed for the HEI-2010. Quantities of food and beverages consumed by children were converted into cups in accordance with the *USDA Food Composition Databases* (https://ndb.nal.usda.gov/ndb/, accessed on 02/May/2018). In case of components scored in ounces (oz), we assumed the convention 1 oz = 28.3495 grams.

The *USDA Food Patterns* are used to set the scoring standards for the HEI-2010 [12,24]. This reference translates key recommendations of the dietary guidelines into specific, quantified recommendations for types and amounts of foods to consume at 12 calorie levels [24]. Although these recommendations were set for an American population, the Dietary Guidelines Advisory Committee conducts an analysis of new scientific information on diet and health using a systematic evidence-based review methodology and prepares a report summarizing its findings [22]. Then, even though the HEI-2010 scoring criteria were not proposed based on the Brazilian Ministry of Health recommendations, these guidelines may represent general guidance to a high-quality diet.

To evaluate the validity and consistency of the adapted version of the index, extra analyses were conducted using the *Brazilian National Dietary Survey* (INA) sample, which is part of the *2008-2009 Brazilian Household Budget Survey* (POF 2008-2009) [18]. This survey collected two diet records of non-consecutive days from 34,003 individuals over 10-years-old, who comprised approximately 25% of the total sample of the POF 2008-2009 [18]. Considering that our sample was composed of children aged 8- to 12-years-old, we limited validity and consistency analysis to individuals between 10- and 12-years-old (n = 2,296) (i.e., from INA sample).

Box 1

Adapted *Healthy Eating Index-2010* (HEI-2010) components and standards for scoring.

COMPONENT	POINTS	STANDARD FOR MAXIMUM SCORE	STANDARD FOR MINIMUM SCORE
Total fruit [1,2]	5	≥ 0.8 cup equivalents per 1,000kcal	No fruit
Whole fruit [1,3]	5	≥ 0.4 cup equivalents per 1,000kcal	No whole fruit
Total vegetable [1,4]	5	≥ 1.1 cup equivalents per 1,000kcal	No vegetables
Greens [1,5]	5	≥ 0.2 cup equivalents per 1,000kcal	No green vegetables
Whole grains [1]	10	≥ 1.5oz equivalents per 1,000kcal	No whole grains
Dairy [1]	10	≥ 1.3 cup equivalents per 1,000kcal	No dairy
Total protein foods [6]	5	≥ 2.5oz equivalents per 1,000kcal	No protein foods
Seafood and plant proteins [1,7]	5	≥ 0.8oz equivalents per 1,000kcal	No seafood and plant proteins
Fatty acids [8]	10	(PUFAs + MUFAs)/SFAs ≥ 2.5	(PUFAs + MUFAs)/SFAs ≤ 1.2
Refined grains [9]	10	≤ 1.8oz equivalents per 1,000kcal	≥ 4.3oz equivalents per 1,000kcal
Sodium	10	≤ 1,100mg per 1,000kcal	≥ 2,000mg per 1,000kcal
Empty calories [10]	20	≤ 19% of energy	≥ 50% of energy

[1] It does not include ultra-processed food products (this was an adaptation of the original HEI-2010).

[2] It includes fruit juice.

[3] It includes all forms except juice.

[4] It does not include potato and other tubers. It does not include beans (this was an adaptation of the original HEI-2010).

[5] It includes only green vegetables. It does not include beans (this was an adaptation of the original HEI-2010).

[6] It includes all sources of protein foods: all meat, eggs, seafood and plant proteins, including beans and peas.

[7] It includes seafood and plant proteins, as well as beans and peas.

[8] Ratio of poly- (PUFAs) and monounsaturated (MUFAs) fatty acids to saturated fatty acids (SFAs).

[9] It includes refined cereals and grains and derivates such as rice, refined wheat flour, pasta, bread and biscuits made with refined flour.

[10] Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is > 13g per 1,000kcal.

First, we determined whether the adapted HEI-2010 could assess diet quality independent on diet quantity. To evaluate this independence, the Pearson correlations of the adapted HEI-2010 total and component scores with energy intake were calculated. Low correlations between energy and the scores are consistent with independence. Secondly, we examined the underlying structure of the adapted HEI-2010 through principal components analysis (PCA) for determining whether 1 or > 1 dimension accounted for the systematic variation observed in the data. We also assessed the internal consistency using Cronbach's coefficient, which examines the degree of association between the components within an index. Estimates of α > 0.70 are considered reliable. Finally, to determine which components have the greater influence on the total score, we examined the correlations of each of the components with the total score. All these analyses were conducted in the Stata software, version 13.0 (https://www.stata.com).

The analytic technique used to estimate the multivariate distributions of usual diet quality is an extension of the U.S. National Cancer Institute (NCI) method and uses a multipart, nonlinear mixed model with correlated random effects to produce distributions of usual intake [25]. This technique was chosen because it enables correcting measurement error for multivariate distribution. Other methods are proposed to correct the distribution of one or two components (a ratio of nutrients, for example), but they are not applicable to multivariate distributions [11,25]. Analyses were conducted using SAS, version SAS on demand (https://www.sas.com/) and MACROS provided on the NCI website (https://epi.grants.cancer.gov/diet/usualintakes/macros_multiple.html). These MACROS score each HEI-2010 component according to its consumption and scoring criterion, and correct the distribution for day-to-day variance.

The adapted HEI-2010 total and component scores were shown as mean and percentiles (10th, 25th, 50th, 75th, and 90th). Also, the proportion of children achieving the maximum score for each adapted HEI-2010 component was used as an adequacy percent for each component.

Results

The sample was homogenous regarding sex (51% of male and 49% of female); most children (68.8%) were between 9- and 10-years-old, and 53.9% of them lived in low/medium social vulnerability risk areas. Almost one-third of children (32.8%) showed overweight.

The adapted HEI-2010 total score was 51.8. Children with poorer diet quality (< 10th percentile) scored less than 41.1, and children with higher diet quality (> 90th percentile) scored more than 62.4 (Table 1). None of the children scored more than 80.

The adapted HEI-2010 components adequacy was typically low. Higher percentages were identified for total protein foods (94.9%), greens (52.3%), and seafood and plant proteins (52.2%). Seven components showed less than 10% of adequacy: refined grains, fatty acids, dairy, sodium, total vegetables, empty calories, and whole grains (Table 1).

Regarding the adapted HEI-2010 validity, all component scores had low correlation with energy (r < 0.30) (Table 2). Our PCA showed five dimensions underlie the adapted HEI-2010; in other words, no single linear combination of the components of the index accounts for a significant proportion of covariation in the key food groups and nutrients that make up a total diet.

Finally, reliability analysis showed the standardized Cronbach's coefficient was 0.5795 (unstandardized: 0.6039). In addition, correlations among the various component scores ranged from 0.075 for total protein foods to 0.516 for total fruits. Eight of the components had moderate correlations (0.3 ≤ r ≤ 0.70) with the adapted HEI-2010 total score (Table 2).

Table 1

Adapted *Healthy Eating Index-2010* components and total scores for 8- to 12-year-old children. Belo Horizonte, Minas Gerais State, Brazil, 2016.

Diet quality item	Mean	Percentiles					Adequacy (%)
		10	25	50	75	90	
Total fruit	3.9	1.7	2.9	4.8	5.0	5.0	46.8
Whole fruit	3.6	0.6	1.0	2.2	4.2	5.0	40.7
Total vegetable	2.0	0.5	0.9	1.7	2.8	4.3	6.5
Greens	3.9	1.3	2.8	5.0	5.0	5.0	52.3
Whole grains	2.8	0.0	0.1	1.3	4.5	9.6	9.4
Dairy	3.2	1.4	2.0	2.9	4.1	5.4	0.2
Total protein foods	4.9	5.0	5.0	5.0	5.0	5.0	94.9
Seafood and plant proteins	3.6	0.1	2.2	5.0	5.0	5.0	52.2
Fatty acids	2.6	0.2	1.1	2.3	3.7	5.1	0.2
Refined grains	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Sodium	5.4	2.8	4.1	5.5	6.8	7.9	0.7
Empty calories	15.8	11.9	13.9	16.0	18.0	19.7	8.1
Total score	51.8	41.1	45.9	51.9	57.7	62.4	-

Table 2

Estimated correlations of the adapted *Healthy Eating Index-2010* component score and total score and energy. *Brazilian National Dietary Survey* (sample: 10- and 12-years-old), 2008/2009.

Component score	Total score		Energy (kcal)	
	r	p-value	r	p-value
Total fruit	0.516	< 0.001	0.187	< 0.001
Whole fruit	0.492	< 0.001	0.133	< 0.001
Total vegetable	0.354	< 0.001	-0.080	0.018
Greens	0.389	< 0.001	0.020	0.569
Whole grains	0.369	< 0.001	-0.044	0.065
Dairy	0.116	< 0.001	-0.098	0.003
Total protein foods	0.075	0.027	-0.061	0.149
Seafood and plant proteins	0.328	< 0.001	0.056	0.135
Fatty acids	0.288	< 0.001	-0.207	< 0.001
Refined grains	0.240	< 0.001	0.292	< 0.001
Sodium	0.343	< 0.001	0.233	< 0.001
Empty calories	0.324	< 0.001	-0.238	< 0.001

Discussion

Our study showed poor usual diet quality among a sample formed of Brazilian children and pointed out diet quality components with higher inadequacies. These results have important public policy implications.

Other studies with Brazilian children identified higher mean diet quality scores than those observed in our sample (from 59.7 to 75) according to different diet quality indexes [7,8,9,10]. Despite this, these investigations identified main inadequacies for fruits, dairy, whole grain and vegetables consumption, similar to our study [7,8,9,10].

Regarding international data, the HEI-2010 was applied in children's diet quality assessment in the USA [26] and in Puerto Rico [27]. In comparison to 9- to 13-year-old American adolescents [26], the Brazilian children scored more in the adapted HEI-2010 and in total vegetables, greens, seafood and plant protein, and empty calorie components. In Puerto Rico, 12-year-old-children from public schools showed a mean total HEI-2010 of 49.3, and the components that scored relatively low were total fruit, whole fruit, total vegetables, whole grains, seafood and plant proteins, and fatty acids [27].

Comparisons are limited because of the diversity of indexes used in the literature, and none of the aforementioned studies considered ultra-processed food product participation in adequacy components. Sociodemographic and economic characteristics of the sample can also contribute to differences in diet quality. Younger children tend to have better diet quality than older children [26]. Gender is not associated with differences in diet quality [26]. Regarding social vulnerability, children living in low socioeconomic areas are more exposed to a lower density of establishments that sell foods, which can contribute to lower diet quality [28,29].

In addition, limitations should also be discussed in our results. First, the diet quality index used to evaluate children's usual diet quality was not proposed specifically for a Brazilian population. The actual diet quality index proposed for Brazilians was published in 2011 [30], before the *Brazilian Dietary Guidelines* were released in 2014 [13]. These new guidelines recommend preferring natural or minimally processed foods and freshly made dishes and meals to ultra-processed products. Developing a diet quality index based on Brazilian dietary guideline recommendations is very important [31] but it is also a challenge as no quantitative recommendation is made about the amounts of food to consume. Although HEI-2010 does not consider food processing in its components, the instrument is organized mostly in food groups, and its scoring system favors the consumption of natural or minimally

processed fruit, vegetables, and protein foods [12]. In addition, HEI-2010 contains the moderation components refined grains, sodium, and empty calories, usually found in ultra-processed foods [12].

To minimize this limitation and strengthen our results and conclusions, we evaluated the validity and consistency of the adapted HEI-2010 used in this study. As in other diet quality indexes [12,30,32], correlations between energy and component scores were low, denoting that the index evaluated diet quality independently on diet quantity. The indexes cited above [12,30,32] also presented from four to six dimensions according to PCAs. Regarding reliability, the original HEI-2010 [12] presented the Cronbach's coefficient of 0.68, indicating moderate internal consistency. Finally, the strongest relationships identified in this study between total score and fruits (total and whole), vegetables (total and greens), and whole grains denote that adequately consuming these food groups would provide a higher diet quality total score. By these analyses, we could conclude that the index used in this study is adequate to evaluate diet quality. However, it should be reinforced that we did not aim to propose a new diet quality index to Brazilians in this investigation.

In addition, as mentioned in the methods section, this study obtained children's intake data by their own referral, which could underestimate their food consumption [15,16,17]. Nevertheless, most studies that have evaluated the accuracy of self-reported dietary intake information by children aged between 8- and 12-year-old using direct observation, doubly labeled water or double-portion method have reported a good concordance between the reference method and the children report [17]. In this study, we also used real household measures and food images to help children define food portion sizes and identify food items.

After recognizing the study limitations, it is also important to discuss its potential. This study is the first to present the usual diet quality distribution of a sample of Brazilian children adjusted for day-to-day variance. As previously mentioned, diet quality distributions obtained from non-adjusted data can lead to unrealistic estimates of the proportion of children with alarmingly poor diets [11].

From the Brazilian public health perspective, this study has an important interface with the Brazilian School Feeding Program (PNAE). This program started in 1955 and has evolved over the years. Today, its objectives are to contribute to the students' biopsychosocial development and academic achievement by meeting their nutritional needs while in the classroom, and by supporting the formation of healthy habits through food and nutrition education. Since 2001, at least 70% of the funds are spent on basic foods and, since 2009, at least 30% of foods used in school meals are purchased directly from family farms. Thus, the quality of school meals has progressively improved; the availability of fruits and vegetables has increased. However, national standards regarding menu composition have not yet been met [33]. Our study pointed out some aspects of diet quality that could be improved in school menus.

In addition to PNAE, other public policies are to be implemented in Brazil in the coming years [34,35]. These include implementation of fiscal policies, such as taxes on sugar-sweetened beverages and energy-dense nutrient-poor products and regulation of food marketing and labeling [32,33]. These actions are necessary to change Brazilian diet quality and improve health. Our results identify food groups that are priorities to be incorporated in these actions.

In summary, we find poor diet quality among Brazilian children after adjustments for day-to-day variance. Studying usual dietary patterns among Brazilians generates findings useful for planning public policies aiming to improve diet quality.

Contributors

P. M. Horta collected and analyzed data and wrote the manuscript. E. Verly Junior and L. C. Santos participated in project creation and reviewed the manuscript.

Additional informations

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Acknowledgments

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Resumo

Inquéritos nutricionais são fontes importantes de informação para políticas públicas no campo da alimentação e nutrição. Seu foco é a identificação de padrões usuais de alimentação, pois desfechos de saúde resultam de consumo de longo prazo. Neste trabalho, nosso objetivo foi avaliar a qualidade da dieta ajustada pela variância diária em crianças brasileiras. Os dados foram coletados entre março de 2013 e agosto de 2015. A amostra incluiu crianças de 8 a 12 anos (n = 1.357) de escolas públicas de todas as regiões administrativas de um município brasileiro. Um recordatório alimentar de 24h (24HR) foi coletado para a amostra como um todo e dois 24HR para dois dias não consecutivos de uma mesma semana foram coletados para uma subamostra. O Índice de Alimentação Saudável-2010 (HEI-2010, em inglês) foi adaptado para hábitos alimentares brasileiros e mensagens do guia alimentar brasileiro foram usadas para avaliar a qualidade da alimentação. As análises estatísticas incluíram um modelo misto multiparte não-linear com efeitos randômicos correlacionados proposto pelo Instituto Nacional de Câncer dos Estados Unidos para corrigir a qualidade da alimentação pela variância diária. O escore total do HEI-2010 adaptado foi de 51,8. Crianças com pior qualidade de alimentação (< 10º percentil) receberam um escore de menos de 41,1, e crianças com uma qualidade de alimentação melhor (> 90º percentil) receberam um escore de mais de 62,4. A adequação geral dos componentes do HEI-2010 adaptado foi baixa. Percentuais mais altos de adequação foram observados para alimentos proteicas totais (94,9%), verduras (62,3%), e proteínas de frutos do mar e de origem vegetal (52,2%). Sete componentes demonstraram menos de 10% de adequação: grãos refinados, ácidos graxos, laticínios, sódio, vegetais totais, grãos integrais, e calorias vazias. Este estudo identificou as principais inadequações na qualidade da alimentação infantil, o que pode guiar ações de promoção de alimentação saudável.

Qualidade dos Alimentos; Dieta; Dieta Saudável; Avaliação Nutricional; Criança

Resumen

ELas encuestas nutricionales son fuentes importantes de información en el campo de las políticas públicas relacionadas con el ámbito de la alimentación y nutricional. Debido a que el estado de salud es resultado de qué se ingiere prolongadamente, el interés de este estudio está centrado en evaluar patrones dietéticos habituales. En este estudio, el objetivo era evaluar la calidad de la dieta ajustada a una varianza diaria entre niños brasileños. La recogida de datos se realizó entre marzo de 2013 y agosto de 2015. La muestra incluyó a niños con edades comprendidas entre los 8 y 12 años de edad (n = 1.357), procedentes de escuelas públicas de todas las regiones administrativas de una ciudad brasileña. Se realizó una encuesta alimenticia (24h) para la muestra completa y dos de 24h, durante dos días no consecutivos de la misma semana, para la submuestra. El Índice de Alimentación Saludable-2010 (HEI-2010), adaptado a los hábitos alimentarios brasileños y las guías dietéticas brasileñas se usaron para evaluar la calidad de la dieta. El análisis estadístico incluyó un modelo multinivel no lineal de efecto mixto, con efectos aleatorios correlacionados, propuestos por el Instituto Nacional del Cáncer de los EE.UU., para corregir la calidad de la dieta en la varianza diaria. En el HEI-2010 adaptado a ella la puntuación total fue 51,8. Los niños con una calidad de dieta más pobre (< 10º percentil) tuvieron una puntuación menor a 41,1, y los niños con una calidad de la dieta mayor (> 90º percentil) obtuvieron una puntuación superior a 62,4. La adecuación general de los componentes HEI-2010 adaptados fue baja. Los porcentajes más altos de adecuación fueron identificados por el total de proteínas en las comidas (94,9%), verduras (62,3%), marisco y proteínas de plantas (52,2%). Siete componentes presentaron menos de un 10% de adecuación: cereales refinados, ácidos grasos, productos lácteos, sodio, total de vegetales, cereales integrales, y calorías de mala calidad. Este estudio identificó las principales deficiencias en la calidad de la dieta de los niños, lo que puede servir de guía en la implementación de acciones de promoción de hábitos saludables en las comidas.

Calidad de los Alimentos; Dieta; Dieta Saludable; Evaluación Nutricional; Niño