

## Feasibility of using of a simplified question in assessing diet quality of adolescents

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**Abstract** *This study aims to analyze the applicability of a simplified question in assessing diet quality of adolescents in a cross-sectional school-based study carried out in a sample of high school students. Diet quality self-perception was obtained when the participant was inquired about own diet considering “excellent”, “good”, “fair” or “poor” responses. We evaluated meals habits and food intake through food frequency questionnaire. The revised version of the Brazilian Healthy Eating Index (BHEI-R) was estimated and we identified three dietary patterns using factor analysis. “Good” self-perceived diet quality was reported by 56% of adolescents and was associated with regular consumption of fruits and vegetables, meal profile and high healthy eating index scores. However, consumption of foods harmful to health was not perceived as characteristic that affects diet quality. The evaluated question showed sensitivity of 28% to detect good quality diets and specificity of 79% to identify low nutritional value diets. The use of a simplified question to assess dietary habits of adolescents is limited, since the consumption of high-fat, high-sugar and high-sodium food was not recognized as an indicator of low quality diet.*

**Key words** *Self-perception of diet, Diet quality, Eating habits, Adolescents*

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## Introduction

Eating habits during adolescence have been characterized by the high consumption of unhealthy food markers, such as sugar-added beverages, processed foods, rich in saturated fats, added sugar and sodium, as well as low intake of fruits and vegetables<sup>1,2</sup>. These habits are typical of contemporary nutritional transition<sup>2</sup> and are associated with an increased risk of obesity, cardiovascular diseases and diabetes<sup>3,4</sup>.

Considering that childhood and adolescence obesity is one of the main problems of public health in the world<sup>5</sup>, it is necessary to implement simplified indicators to monitor this condition and its main determinants, among them food intake, since it is known that adolescent food habits include unhealthy and high energy density food<sup>6</sup>.

Similar to what happens with self-perception of health status, an attribute for which studies reveal a significant association between self-perception of good health and healthy behaviors related to the lifestyle of adolescents<sup>7,8</sup>, the perception regarding diet quality can be a useful tool in epidemiological surveys, providing, through a simple question, a subjective assessment and a summary measure of diet quality. This assumption is based on the fact that theoretical models for food choices suggest that individual characteristics such as food knowledge and perception are key determinants for food selection<sup>1,9</sup>.

Diet quality perception may be related to knowledge about nutrition, for which a significant association with diet quality was observed<sup>10-12</sup>. However, diet quality self-perception has still been an underexplored indicator, despite its potential to identify intervention-targeted groups, aiming at promoting a healthy lifestyle, similarly to what occurs with the self-perceived health indicator.

This study aimed to evaluate the applicability of a simplified question to assess the diet quality of adolescents, exploring the association between diet quality self-perceived and eating habits indicators.

## Methodology

This is a cross-sectional, school-based study with adolescents of both sexes, aged 14 to 19 years, regularly enrolled in the public and private high schools in the urban area of Cuiabá, Mato Grosso, in 2008, which initially aimed to evaluate eating disorders risk behaviors.

For the calculation of the sample size, we considered a 95% confidence level, a sample error of 3%, and since specific studies on adolescent eating disorders risk behaviors in the municipality studied were unknown for calculating the sample, we considered a prevalence of 0.50. The sample size was estimated at 1,067 adolescents, corrected at 20% to cater for the effect of sample design in clusters ( $deff = 1.2$ ), totaling 1,280 adolescents. Further details are described in Rodrigues *et al.*<sup>13</sup>.

The Research Ethics Committee, Júlio Muller University Hospital, Federal University of Mato Grosso approved the research under protocol N° 459/CEP-HUJM/07. All adolescents and/or their parents/guardians signed the Informed Consent Form in agreement to participate in the survey, and school principals authorized data collection.

## Data collection

A standardized training was performed for data collection, which included the implementation of a self-responded pre-tested questionnaire containing questions on demographic and socio-economic characteristics, lifestyle, eating habits, and a semi-quantitative Food Frequency Questionnaire (FFQ). We conducted at least three visits to schools to reduce the non-response rate, in order to find students missed in previous visits.

## Diet quality self-perceived

Diet quality self-perception was obtained through the question: "In your opinion, the quality of your diet is...?" Having as answer options: "Excellent", "Good", "Fair", "Bad" or "Poor". In the statistical analysis, answers were grouped in: 1) Diet quality perceived as "Good" ("Excellent" and "Good") and 2) Diet quality perceived as "Bad" ("Fair", "Bad" and "Poor").

## Information on eating habits and knowledge about healthy eating

We applied the modified FFQ for adolescents<sup>13</sup> to evaluate food consumption, consisting of 76 food items, eight-response options for reporting consumption frequency, ranging from more than 3 times a day to never or almost never and up to three portions.

We assessed the habit of regularly consuming fruits and vegetables by asking: "Do you usually eat fruit at least 5 times a week?" (Not considering juices and refreshments) and "Do you usu-

ally eat vegetables at least 5 times a week?” (Not considering potato, yam, cassava...), both with answer options: “Yes” or “No”.

Similarly, we evaluated the habit of consuming chicken skin and meat visible fat using the questions: “When you eat chicken, how often do you eat the skin?” and “When you eat meat, how often do you eat visible fat?” Both of which had answer options: “Never”, “Sometimes” and “Always”, with analyses grouped in “Yes” (“Always” and “Sometimes”) and “No” (Never).

We assessed knowledge about healthy eating by asking: “Do you have knowledge about healthy eating?” with “Yes” or “No” as answer choices.

It should be noted that both questions about healthy eating and diet quality self-perception were located in the questionnaire applied in the research after the FFQ, so as not to influence the consumption report.

We used Nutwin software to evaluate adolescent food intake in relation to its nutrient content<sup>14</sup>. Food was grouped as per the Food Guide for the Brazilian Population<sup>15</sup>. Preparations involving more than one food group, such as sandwiches, pizzas, stuffed pasta and other mixtures were broken up into their ingredients and classified into the corresponding groups. Regarding food not available in the program database, information was obtained from the Nutrition Data System for Research - NDSR<sup>16</sup> and from the Brazilian Food Composition Table - TACO<sup>17</sup>.

### Diet quality evaluation

The Brazilian Healthy Eating Index – Revised (BHEI-R)<sup>18</sup> was used to evaluate the diet quality of adolescents. This index is based on recommendations related to food, protective aspects, especially in the Food Guide for the Brazilian Population<sup>15</sup>, and is estimated by 12 components that characterize different dietary aspects, such as consumption of vegetables, beneficial fats and calories provided by “solid fats, alcoholic beverages, and added sugars” (“SoFAAS” component).

BHEI-R components are based on food groups (total fruits, whole fruits, total vegetables, dark green and orange vegetables and legumes, total grains, whole grains, meats, eggs and vegetables, milk and dairy products, oils and fish fat), nutrients (saturated fat and sodium) and nutrients combined with food (“SoFAAS” component). The score assigned to each component is expressed in three levels: maximum, intermediate and minimum. BHEI-R total score is 100 points, and high scores indicate a diet that is

closer to the ideal level, while low scores characterize a diet that is far from ideal. In this study, the BHEI-R included only 11 components, due to the lack of specifications on the type of cereals in the FFQ; thus, scores assigned to the “whole grains” component were added to the “total cereals” component. The detailed description of the criteria for minimum, intermediate and maximum score of each component can be found in Previdelli et al.<sup>18</sup>.

In this study, the total BHEI-R score and its components were dichotomized at above and below the 75<sup>th</sup> percentile (P75). Values equal to or higher than P75 were considered high because they represent the quartile with the highest score, indicating a better diet quality, since the BHEI-R evaluates the level of adherence of the diet to nutritional recommendations.

### Meal habits

The usual frequency of meal consumption (i.e., breakfast, morning snack, lunch, afternoon snack, and dinner) was ascertained by the question, “On average, how often did you have these meals in the past 6 months?” The response options were as follows: *every day, three to six times per week, one to two times per week, or never*.

Each subject was categorized according to the frequency of consumption of a meal into: Satisfactory ( $\geq 3$  main meals a day); Irregular (1 or 2 of the three main meals a day) or Unsatisfactory (none of the three main meals a day)<sup>15</sup>. Adolescents with satisfactory and irregular meal profiles may or may not include one or more snacks daily, while adolescents with unsatisfactory meal profile, who did not have any of the main meals on a regular basis, usually consumed snacks frequently.

### Identification of dietary patterns

The identification of dietary patterns is described in Rodrigues et al.<sup>13</sup>, but was based in short on the frequency of consumption of 22 food groups, using the exploratory factorial analysis, and for the extraction of the factors, we proceeded with the principal components analysis, followed by the Varimax rotation. The determination of the number of factors to be extracted was based on Cattell’s scree plot test, where the identified patterns were named based on the interpretability and characteristics of the items retained in each pattern.

The three patterns identified were classified as: “Western”, including cakes and biscuits,

processed products, dairy products, preserved meats, sweetened beverages, fast food, fried plantains and sweets; “Traditional”, consisting of rice, beans, breads, milk, beef, coffee, butter and margarine; and “Mixed”, consisting of noodles, tubers and roots, other meats, fish, eggs, vegetables and greens.

### Demographic and socioeconomic data

The socioeconomic level of the families was evaluated using the criteria of the *Brazilian Association of Research Companies*<sup>19</sup>, which considers the schooling of the head of the family, household assets and cars and household monthly wage earner domestic servants, with families classified into categories ranging from A (highest level) to E (lowest level).

Age was obtained by calculating the difference between the questionnaire implementation date and the date of birth, the result being expressed in complete years of life and classified into two categories: 14-15 years and 16-19 years. We also evaluated school characteristic by type of school (private and state/federal public).

### Information on lifestyle and weight status

Physical activity was investigated as to the type, frequency and duration of each practiced activity. To classify the level of physical activity, we estimated the weekly time dedicated to physical activities, multiplying daily time (in minutes) by the weekly frequency with which activities were performed. The categorization suggested by Currie et al.<sup>20</sup>, which defines as physically inactive the adolescent who reports the lack physical activity, as insufficiently active the one who practices up to 299 minutes of physical activity per week and active the adolescent who practices at least 300 minutes of physical activity weekly.

Data on the consumption of alcoholic beverages (beer, wine and/or distillates) were obtained through a food frequency questionnaire and were related to the six months prior to the survey, and the adolescents were classified according to the intake of alcoholic beverage or not, regardless of quantity, frequency and type of drink reported. Smoking was assessed according to World Health Organization criteria<sup>21</sup>, which considers a smoker as the individual who reported smoking at least one day in the last 30 days

Body Mass Index (BMI = kg/m<sup>2</sup>) was estimated to classify the weight status of adolescents using the Z-scores of the BMI<sup>22</sup>, were adolescents

with BMI/age  $\leq +1$  Z-score were categorized as normal weight; and those with BMI/age  $> +1$  Z-score as having excess weight, including overweight and obesity in this category. It should be noted that the BMI was calculated based on measures of weight and height self-referred by adolescents and that the report of these measures was validated by Rodrigues et al.<sup>23</sup> for use in epidemiological studies with adolescents of the municipality evaluated in this study.

### Data analysis

Statistical analyzes were developed considering weighting factors and sample design, using command “weight cases” of the statistical program Statistical Package for Social Science version 17.0 (SPSS Inc., Chicago, IL, USA) and software WIN PEPI Version 11.7.

The analyses were conducted separately by gender due to significant differences in diet quality self-perceived reporting between boys and girls. The chi-square test was used in the univariate analysis to evaluate the relationship between diet quality self-perception and demographic, socioeconomic, lifestyle, weight status, knowledge about healthy eating, eating habits and diet quality indicators variables.

Multivariate logistic regression models were developed using Odds Ratio (OR) and respective Confidence Intervals of 95% (95% CI) as a measure of association, considering as outcome variable the diet quality self-perception as “good” and testing as predictive factors the independent variables with p-value  $< 0.20$  in the univariate analysis. Firstly, crude models were developed, that is, each independent variable was separately included and later a model adjusted for age, physical activity level and school type was developed.

Additionally, we performed a sensitivity, specificity and accuracy analysis of the question evaluated in the classification of the quality of adolescents’ diet, considering the total BHEI-R above the 75<sup>th</sup> percentile as the reference of the best diet quality.

### Results

Of the adolescents eligible to participate in the study (n = 1,344), 1,296 (96.4%) were interviewed, of whom 87 were not included in the analysis due to incomplete information and 70 adolescents who reported a usual energy intake

2 standard deviations below or above the mean were excluded from the analysis because these values were considered biologically implausible as usual intake. Thus, the analyses were conducted with 1,139 adolescents (84.7% of the total eligible adolescents).

Among the adolescents evaluated, 56% were female, 66% were in the age group 16-19 years, 77% were students of schools in the state and federal public schools and 53% belonged to the most favored social classes (Table 1).

Diet quality self-perception as “good” was reported by 56% of adolescents (64% of boys and 50% of girls,  $p < 0.01$ ). Students in private schools and state schools reported a good quality diet in a higher proportion when compared to students in the federal public school ( $p = 0.06$ ). Diet quality self-perception was also associated with physical activity, since of the active adolescents, 64% considered their diet of good quality, while among the insufficiently active, 53% reported good quality diet, and among the physically inactive, this proportion was 47% ( $p < 0.01$ ) (Table 1).

We found that among adolescents who reported fruit consumption  $\geq 5$  times a week, diet quality self-perception as “good” was observed in 63% of adolescents ( $p < 0.01$ ) and in the consumption of vegetables  $\geq 5$  times/week, this proportion was 62% ( $p < 0.01$ ). Among adolescents who reported having knowledge about healthy eating, 59% reported as having good quality diet ( $p < 0.01$ ). Diet self-perceived as “good” was observed in 69% of adolescents with a satisfactory meal profile, in 56% of those with an irregular eating profile and in 31% of those with an unsatisfactory meal profile ( $p < 0.01$ ). Diet quality self-perception was also associated with the “Mixed” dietary pattern ( $p < 0.01$ ) (Table 2).

However, no association was observed between diet quality self-perceived with unhealthy food markers, such as chicken skin consumption ( $p = 0.79$ ) and visible meat fat ( $p = 1.00$ ) and neither with “Western” and “Traditional” dietary patterns (Table 2).

Adolescents with diet quality self-perceived as “good” showed higher scores for the following BHEI-R components: “Total Fruits”, “Whole Fruits”, “Total Vegetables” and “Dark Green and Orange Vegetables and Legumes” ( $p \leq 0.01$ ) and for “Milk and dairy products”, “Oils, oilseeds and fish fat” and “Sodium” ( $p < 0.05$ ) (Table 3). However, health-risk markers, such as “saturated fat” and “SoFAAS” were not associated with diet quality self-perceived (Table 3).

In adjusted multivariate logistic regression models for boys, the probability of diet quality self-perceived as “good” was higher for adolescents who were physically active (OR = 2.38), those reporting consumption of vegetables  $\geq 5$  times/week (OR = 1.94), those with knowledge about healthy food (OR = 4.87), those with a satisfactory meal profile (OR = 5.15) and irregular meal profile (OR = 2.92) and those who had scores above the 75<sup>th</sup> percentile for total BHEI-R (OR = 1.59) (Table 4).

For girls, the likelihood of diet quality self-perceived as “good” was also higher for those who consumed fruits (OR = 1.94) and vegetables (OR = 1.74)  $\geq 5$  times/week, had knowledge about healthy food (OR = 1.78), with satisfactory meal profile (OR = 4.10) and irregular meal profile (OR = 2.73) and factorial scores above the 75<sup>th</sup> percentile for the “Western” (OR = 1.47) and “Mixed” (OR = 1.79) dietary pattern. In addition, the probability of diet quality self-perceived as “good” was higher for those who had scores above the 75<sup>th</sup> percentile for various BHEI-R components: Total fruits (OR = 1.55), Whole fruits (OR = 1.77), Total vegetables (OR = 1.71), Dark green and orange vegetables and legumes (OR = 1.71), Meat, eggs and legumes (OR = 1.55), Milk and dairy products (OR = 1.80) and oils, oilseeds and fish fat (OR = 1.55) (Table 5).

In order to detect good quality diets considering the 75<sup>th</sup> percentile of the BHEI-R as a reference, the simplified question showed a sensitivity of 28.1% (Confidence Interval of 95% [95% CI] = 24.9;31.7) and specificity of 79.2% (95% CI = 75.4;82.5). Subtle differences in sensitivity and specificity for boys and girls were not statistically significant (Table 6).

## Discussion

Among the adolescents studied, diet quality self-perception was associated with eating habits, meal profile and various aspects of diet quality, especially among girls. The report of having knowledge about healthy eating was strongly associated with self-reported good diet quality. Adolescents who considered their diet quality as “good” had higher consumption of fruits and vegetables, regular consumption of main meals and better quality of diet evaluated according to different components of the BHEI-R. On the other hand, consumption of saturated fat, chicken skin, visible fat from the meat, “SoFAAS” and food such as cakes and biscuits, industrialized

**Table 1.** Diet quality self-perception according to demographic, socioeconomic, lifestyle, and weight status characteristics of adolescents (n = 1,139). Cuiabá, Mato Grosso, 2008.

Variables	Total N (%)	Diet quality self-perception		P-value*
		Good (n = 640)	Bad (n = 499)	
		%		
Sex				< 0.01
Boys	501 (44)	64	36	
Girls	638 (56)	50	50	
Age (in years)				0.48
14 - 15	389 (34)	55	45	
16 - 19	750 (66)	57	43	
Type of school				0.06
Federal public	53 (5)	40	60	
Private	266 (23)	57	43	
State public	821 (72)	57	43	
Socioeconomic level				0.92
A + B	603 (53)	56	44	
C + D	536 (47)	56	44	
Smoking				0.59
Yes	67 (6)	53	47	
No	1072 (94)	56	44	
Consumption of alcoholic beverages				0.50
Yes	442 (39)	58	42	
No	697 (61)	55	45	
Physical activity				< 0.01
Physically inactive	246 (22)	47	53	
Insufficiently active	427 (37)	53	47	
Physical activity	467 (41)	64	36	
Weight status				0.40
Normal weight	949 (83)	57	43	
Excess weight	190 (17)	53	47	

\*Chi-square test.

products, sweetened drinks, sweets and fast-food, represented by the “Western” food standard was not perceived by adolescents as a characteristic of low quality diets. Additionally, we observed that the evaluated question had high specificity to detect adolescents with low quality diets, facilitating the screening for inclusion of adolescents in nutritional intervention proposals. However, the low sensitivity shown by the question to detect good quality diets indicates that a high proportion of adolescents who reported having good quality diets actually had inadequate food intake, incompatible with perception of their diet.

In general, despite the limited number of studies evaluating the self-perceived quality of diet in adolescents, the association between fruit and vegetable consumption and the perception of good food intake has been consistently report-

ed and was verified in American<sup>6,24</sup>, Irish<sup>25</sup> and Brazilian<sup>1</sup> children and adolescents.

In this study, the satisfactory meal profile was positively associated with diet quality self-perceived as good. However, adherence to the “Traditional” dietary pattern, characterized by the consumption of rice and beans, a typical combination of Brazilian meals, was not associated with the perception of good quality diet, evidencing that, possibly, the consumption of this basic food is not perceived as a healthy eating component. Consumption of this pattern has been associated with positive outcomes in observational and interventional studies with adults<sup>26,27</sup> and adolescents<sup>13</sup>, however, it is possible that adolescents do not associate their consumption with healthy food.

In addition, there is no association between the diet quality self-perception and the excessive

**Table 2.** Diet quality self-perception according to eating habits and knowledge about healthy eating of adolescents (n = 1,139). Cuiabá, Mato Grosso, 2008.

Variables	Total N (%)	Diet quality self-perception		P-value*
		Good (n = 640) %	Bad (n = 499) %	
Consumption of fruit at least 5 x / week				< 0.01
Yes	585 (51)	63	37	
No	554 (49)	49	51	
Consumption of vegetables at least 5 x / week				< 0.01
Yes	652 (57)	62	38	
No	487 (43)	48	52	
Consumption of chicken skin				0.79
Yes	657 (58)	57	43	
No	482 (42)	56	44	
Consumption of meat visible fat				1.00
Yes	687 (60)	56	44	
No	452 (40)	56	44	
Knowledge about healthy eating				< 0.01
Yes	1000 (88)	59	41	
No	139 (12)	34	66	
Meal profile				< 0.01
Satisfactory	322 (28)	69	31	
Irregular	653 (57)	56	44	
Unsatisfactory	164 (15)	31	69	
Dietary pattern "Western"				0.17
Above P75	291 (25)	60	40	
Below P75	848 (75)	55	45	
Dietary pattern "Traditional"				0.24
Above P75	280 (25)	59	41	
Below P75	859 (75)	55	45	
Dietary pattern "Mixed"				0.01
Above P75	294 (25)	63	37	
Below P75	845 (75)	54	46	

\* Chi-square test.

P75 = 75<sup>th</sup> percentile.

intake of risk components, such as saturated fats, sugar and sodium. It should be emphasized that such components are found in preparations that are not always identified as "unhealthy" and are not intuitively associated with deleterious effects on health. Regarding processed foods, it is necessary to read the information on products' labels, which is not always the habit of many adolescents; moreover, the understanding of information contained therein is not simple<sup>28</sup>. Thus, it is understandable that adolescents no longer associate the consumption of food with excess saturated fat, sugar and sodium and diet quality. However, this finding indicates the need to rein-

force these aspects in the proposals to promote healthy eating and nutrition education activities, in order to restrict the intake of these foods.

Similar to that observed among adolescents in this study, Velazquez et al.<sup>6</sup>, when evaluating Texas adolescents with a mean age of 15 years, found that adolescents with self-perception of healthy eating habits were more likely to report higher food consumption such as grains, fruits, vegetables and legumes. On the other hand, the group that reported having knowledge about the fat content of food did not reflect this knowledge in food choices, with preference for less healthy food<sup>6</sup>.

**Table 3.** Diet quality self-perception according to the Brazilian Healthy Eating Index – Revised (BHEI-R) and its components of adolescents (n = 1,139). Cuiabá, Mato Grosso, 2008.

Components	Total N (%)	Diet quality self-perception		P-value*
		Good (n = 640) %	Bad (n = 499) %	
BHEI - R				0.01
Above P75	284 (25)	63	37	
Below P75	855 (75)	54	46	
Total fruits				< 0.01
Above P75	293 (26)	64	36	
Below P75	846 (74)	54	46	
Whole fruits				< 0.01
Above P75	295 (26)	65	35	
Below P75	844 (74)	53	47	
Total vegetables				< 0.01
Above P75	281 (25)	64	36	
Below P75	858 (75)	54	46	
DGVL**				0.01
Above P75	282 (25)	63	37	
Below P75	857 (75)	54	46	
Total cereals				0.59
Above P75	289 (25)	58	42	
Below P75	850 (75)	56	44	
Meat, eggs and legumes				0.09
Above P75	291 (26)	61	39	
Below P75	848 (74)	55	45	
Milk and dairy products				0.03
Above P75	291 (25)	62	38	
Below P75	848 (75)	54	46	
Oils, oilseeds and fish fat				0.02
Above P75	290 (25)	62	38	
Below P75	849 (75)	54	46	
Saturated fat				0.17
Above P75	295 (26)	60	40	
Below P75	844 (74)	55	45	
Sodium				0.04
Above P75	291 (26)	62	38	
Below P75	848 (74)	54	46	
SoFAAS***				0.62
Above P75	292 (26)	58	42	
Below P75	847 (74)	56	44	

\* Chi-square test.

P75 = 75<sup>th</sup> percentile. \*\* DGVL = Dark green and orange vegetables & legumes. \*\*\* SoFAAS = Calories from solid fats, alcoholic beverages, and added sugars.

In this context, Fitzgerald *et al.*<sup>12</sup> point out that food preferences, particularly food taste, texture and appearance were more important factors in the choice of food consumed by Irish children and adolescents between 9 and 18 years of age, in replacement of knowledge about healthy eating. In addition, additional barriers were

availability of food at home, friends, school diet, eating out, extracurricular activities, and parents' work schedules<sup>12</sup>.

Paquette<sup>29</sup> points out that the development of nutritional science has made the definition of healthy foods complex, such as determining the type of fat. This complexity may hinder the



**Table 4.** Odds Ratio (OR) and Confidence Interval of 95% [95% CI] between characteristics of adolescents with indicators of diet quality and diet quality self-perception in male adolescents (n = 501). Cuiabá, Mato Grosso, 2008.

Characteristics	Crude	Adjusted <sup>a</sup>
	Odds Ratio (Confidence Interval of 95%)	
Type of school		
Federal public	1.0	1.0
Private	2.22 (0.95; 5.20)	2.21 (0.92; 5.30)
State public	2.06 (0.92; 4.62)	1.87 (0.82; 4.26)
Physical activity		
Physically inactive	1.0	1.0
Insufficiently active	1.26 (0.64; 2.47)	1.39 (0.70; 2.76)
Physical activity	2.26 (1.19; 4.31)**	<b>2.38 (1.25; 4.55)**</b>
Consumption of fruit at least 5 x / week		
No	1.0	1.0
Yes	1.45 (1.00; 2.09)	1.38 (0.95; 2.00)
Consumption of vegetables at least 5 x / week		
No	1.0	1.0
Yes	1.93 (1.33; 2.78)**	<b>1.94 (1.33; 2.83)**</b>
Knowledge about healthy eating		
No	1.0	1.0
Yes	5.28 (2.86; 9.76)**	<b>4.87 (2.60; 9.11)**</b>
Meal profile		
Unsatisfactory	1.0	1.0
Irregular	2.98 (1.52; 5.86)**	<b>2.92 (1.47; 5.82)**</b>
Satisfactory	5.10 (2.50; 10.38)**	<b>5.15 (2.49; 10.65)**</b>
Dietary pattern "Western"		
Below P75	1.0	1.0
Above P75	0.90 (0.58; 1.38)	0.86 (0.55; 1.33)
Dietary pattern "Mixed"		
Below P75	1.0	1.0
Above P75	1.03 (0.69; 1.52)	0.93 (0.62; 1.40)
Brazilian Healthy Eating Index - Revised		
Below P75	1.0	1.0
Above P75	1.64 (1.05; 2.57)*	<b>1.59 (1.01; 2.51)*</b>
Total fruits		
Below P75	1.0	1.0
Above P75	1.43 (0.93; 2.19)	1.32 (0.85; 2.04)
Whole fruits		
Below P75	1.0	1.0
Above P75	1.31 (0.86; 1.99)	1.17 (0.76; 1.80)
Total vegetables		
Below P75	1.0	1.0
Above P75	1.27 (0.82; 1.98)	1.27 (0.81; 1.99)
DGVL <sup>b</sup>		
Below P75	1.0	1.0
Above P75	1.16 (0.74; 1.80)	1.09 (0.69; 1.72)
Meat, eggs and legumes		
Below P75	1.0	1.0
Above P75	0.88 (0.59; 1.30)	0.86 (0.58; 1.29)

it continues

Table 4. continuation

Characteristics	Crude	Adjusted <sup>a</sup>
	Odds Ratio (Confidence Interval of 95%)	
Milk and dairy products		
Below P75	1.0	1.0
Above P75	0.85 (0.57; 1.28)	0.78 (0.51; 1.17)
Oils, oilseeds and fish fat		
Below P75	1.0	1.0
Above P75	1.03 (0.70; 1.51)	0.95 (0.64; 1.41)
Saturated fat		
Below P75	1.0	1.0
Above P75	0.90 (0.60; 1.34)	0.81 (0.54; 1.22)
Sodium		
Below P75	1.0	1.0
Above P75	0.95 (0.65; 1.39)	0.88 (0.59; 1.30)

\* P-value < 0.05; \*\*P-value ≤ 0.01. P75 = 75<sup>th</sup> percentile. <sup>a</sup> Adjusted for age, physical activity level and type of school. <sup>b</sup> DGVL = Dark green and orange vegetables & legumes.

understanding of nutritional recommendations and consequently reflect in the lack of association between what young people perceive as unhealthy and customary consumption.

Thus, it would be important to foster initiatives that provide greater understanding on the part of adolescents on the importance of food and its impacts on health, as demonstrated by Cunha *et al.*<sup>30</sup>, who observed a significant reduced consumption of sweetened drinks and cookies and increased intake of fruits in intervention study on adolescents of public schools of Duque de Caxias, Rio de Janeiro. In addition, adolescents in the Federal District between 10 and 19 years of age reported that educational materials to promote healthy eating should reinforce the immediate benefits, using alarming messages about health risks from inadequate diet<sup>1</sup>.

Some limitations of this study may be highlighted; among them, the instrument used to evaluate food consumption, namely, the FFQ, designed to estimate individuals' usual consumption, which has advantages for epidemiological studies, such as not being subject to intrapersonal variation effect and practicality and low cost in data collection. However, this method also has limitations, especially those related to cognition, memory and individual food preferences<sup>31</sup>.

Another limitation inherent to the FFQ used is that it did not contain questions about the in-

take of whole grains, invalidating the effort to score this component, as predicted by Prevedelli *et al.*<sup>18</sup>. Thus, the "whole grains" component score was redistributed to the "total cereals" component. Moreover, the very complexity and multidimensionality of diet quality construct are factors that may explain the difficulty of observing the association between self-perception and the consumption of certain foods, as well as it influences the adolescent's own perception.

It should be noted that a favorable aspect of this study is that BHEI-R, considered as a reference in the analysis of the diagnostic capacity of the simplified question used to evaluate diet quality is a global indicator that is based on components that characterize different aspects of the diet, both healthy and unhealthy, and is considered a reliable and valid index to assess and monitor the quality of the Brazilian diet<sup>32</sup>.

Studies that provide a better understanding of adolescents' perceptions regarding diet quality, seeking to identify the extent to which the understanding of acquired knowledge is reflected in eating practices can help in the construction and validation of simplified instruments, optimizing their use in food surveys, as a summary measure of diet quality. It is worth noting that further studies are required to understand better the association between adolescents' perception of their eating habits and food consumption.

**Table 5.** Odds Ratio (OR) and Confidence Interval of 95% [95% CI] between characteristics of adolescents with indicators of diet quality and diet quality self-perception in female adolescents (n = 638). Cuiabá, Mato Grosso, 2008.

Characteristics	Crude	Adjusted <sup>a</sup>
	Odds Ratio (Confidence Interval of 95%)	
Type of school		
Federal public	1.0	1.0
Private	1.68 (0.71; 3.99)	1.82 (0.76; 4.35)
State public	1.94 (0.87; 4.37)	2.07 (0.91; 4.69)
Physical activity		
Physically inactive	1.0	1.0
Insufficiently active	1.22 (0.85; 1.76)	1.28 (0.88; 1.85)
Physical activity	1.42 (0.94; 2.15)	1.45 (0.95; 2.20)
Consumption of fruit at least 5 x / week		
No	1.0	1.0
Yes	1.99 (1.46; 2.73)**	<b>1.94 (1.40; 2.70)**</b>
Consumption of vegetables at least 5 x / week		
No	1.0	1.0
Yes	1.74 (1.26; 2.39)**	<b>1.74 (1.26; 2.40)**</b>
Knowledge about healthy eating		
No	1.0	1.0
Yes	1.78 (1.11; 2.86)*	<b>1.78 (1.10; 2.89)*</b>
Meal profile		
Unsatisfactory	1.0	1.0
Irregular	2.69 (1.73; 4.18)**	<b>2.73 (1.75; 4.25)**</b>
Satisfactory	4.10 (2.44; 6.88)**	<b>4.10 (2.43; 6.93)**</b>
Dietary pattern "Western"		
Below P75	1.0	1.0
Above P75	1.54 (1.09; 2.19)*	<b>1.47 (1.03; 2.10)*</b>
Dietary pattern "Mixed"		
Below P75	1.0	1.0
Above P75	1.83 (1.25; 2.68)**	<b>1.79 (1.22; 2.64)**</b>
Brazilian Healthy Eating Index - Revised		
Below P75	1.0	1.0
Above P75	1.45 (1.01; 2.07)*	1.44 (1.00; 2.06)
Total fruits		
Below P75	1.0	1.0
Above P75	1.60 (1.12; 2.30)**	<b>1.55 (1.07; 2.23)*</b>
Whole fruits		
Below P75	1.0	1.0
Above P75	1.86 (1.29; 2.68)**	<b>1.77 (1.21; 2.58)**</b>
Total vegetables		
Below P75	1.0	1.0
Above P75	1.74 (1.21; 2.49)**	<b>1.71 (1.19; 2.46)**</b>
DGVL <sup>b</sup>		
Below P75	1.0	1.0
Above P75	1.74 (1.22; 2.48)**	<b>1.71 (1.19; 2.46)**</b>
Meat, eggs and legumes		
Below P75	1.0	1.0
Above P75	1.62 (1.11; 2.36)**	<b>1.55 (1.06; 2.28)*</b>

it continues

Table 5. continuation

Characteristics	Crude	Adjusted <sup>a</sup>
	Odds Ratio (Confidence Interval of 95%)	
Milk and dairy products		
Below P75	1.0	1.0
Above P75	1.89 (1.30; 2.75)**	<b>1.80 (1.23; 2.63)**</b>
Oils, oilseeds and fish fat		
Below P75	1.0	1.0
Above P75	1.61 (1.08; 2.39) <sup>*</sup>	<b>1.55 (1.04; 2.33)<sup>*</sup></b>
Saturated fat		
Below P75	1.0	1.0
Above P75	1.45 (1.00; 2.09)	1.37 (0.94; 1.99)
Sodium		
Below P75	1.0	1.0
Above P75	1.56 (1.04; 2.33)	1.48 (0.98; 2.22)

<sup>\*</sup> P-value < 0.05; <sup>\*\*</sup> P-value ≤ 0.01. P75 = 75<sup>th</sup> percentile. <sup>a</sup> Adjusted for age, physical activity level and type of school. <sup>b</sup> DGVL = Dark green and orange vegetables & legumes.

Table 6. Sensitivity and specificity of a simplified question used in assessing the diet quality self-perception. Cuiabá, Mato Grosso, 2008.

	Total BHEI-R score <sup>*</sup>		Sensitivity (95%CI)	Specificity (95%CI)
	≥ P75	< P75		
	N (%)			
	Total			
<b>Diet quality self-perception</b>				
Good	180 (28.1)	460 (71.9)	28.1	79.2
Bad	104 (20.8)	395 (79.2)	(24.9; 31.7)	(75.4; 82.5)
	<b>Boys</b>			
<b>Diet quality self-perception</b>				
Good	86 (27.0)	232 (73.0)	27.0	81.4
Bad	34 (18.6)	149 (81.4)	(22.5; 32.2)	(75.2; 86.4)
	<b>Girls</b>			
<b>Diet quality self-perception</b>				
Good	94 (29.2)	228 (70.8)	29.2	77.9
Bad	70 (22.2)	246 (77.8)	(24.5; 34.4)	(73.0; 82.1)

<sup>\*</sup> BHEI-R = Brazilian Healthy Eating Index – Revised. P75 = 75<sup>th</sup> percentile. 95%CI = Confidence Intervals of 95%.

## Conclusion

In this study, diet quality self-perception as “good” was associated with satisfactory eating habits, high BHEI-R score, and regular consumption of fruits and vegetables in adolescents. However, the consumption of components considered deleterious to health, such as saturated fat intake, adherence to the “Western” pattern and the intake of solid fat-derived calories, alcohol

and added sugar were not perceived by adolescents as habits that characterize poor quality diet. Thus, most adolescents combine healthy foods and those less recommended in their diet, and there seems to be no complete understanding of the deleterious effects of excessive intake of components such as fats, sugar and sodium.

The application of a simplified question to evaluate diet quality provided a high proportion of false positives in the detection of adolescents

with good quality diet. On the other hand, this question was able to diagnose low quality diets. The implementation of this question in dietary surveys with adolescents is limited and should be used with caution since it provides only a partial evaluation of the quality of the diet of this group.

Results suggest that further studies are required to improve simplified instruments that can validly identify the quality of adolescents' diet, including the consumption of healthy foods and those that include components that potentially pose a health risk.

### **Collaborations**

PRM Rodrigues contributed to the design of the study, data collection, statistical analysis and interpretation of the results, conception, writing and final revision of the manuscript. RMV Gonçalves-Silva collaborated in the conception of the study, analysis and interpretation of the results, conception and final revision of the manuscript. MG Ferreira collaborated in the acquisition and statistical analysis of data, writing and critical review of the manuscript. RA Pereira contributed to the design of the study, statistical analysis and interpretation of the results, conception, writing and final revision of the manuscript. All authors read and approved the final version of the manuscript.

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