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Home food availability, parents'/caregivers' support, and family meals influence on dietary servings of low-income urban adolescent girls from Brazil

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Abstract

Background: There is a striking lack of evidence about parents'/caregivers' influence on their children's dietary intake across Brazil and other middle- and low-income countries. Therefore, the purpose of this study was to identify the associations between adolescents' dietary intake and home environment, family meals and parental support.

Methods: Cross-sectional study with 14–18 years old adolescent girls was conducted in 10 public schools in the city of São Paulo. Girls' dietary intake, home food environment, parental support, and family meals' frequency were self-reported by 253 adolescents. Brazilian Food Pyramid recommendation was used as reference for the dietary intake. Linear regressions were used to verify the associations between home environmental, parental support, and family meal frequency with dietary intake.

Results: Girls parents' support for healthy eating was positively associated with the fruits group (mean (95%CI) 0.75 (0.66 to 0.84) ß = 0.26, p = 0.003), and the vegetables group (3.40 (3.08 to 3.72), ß = 0.25, p = 0.006) and negatively associated with the meat and eggs group (2.09 (1.93 to 2.25), ß = −0.14, p = 0.041). Home environment was associated with fruits group (0.73 (0.63 to 0.82), ß = 0.35, p = 0.001). The associations between sharing family meals and food groups were not statistically significant. However, girls demonstrated a positive association with dietary intake and sharing family meals.

Conclusion: Parental support and home food environment were associated with dietary intake of the adolescent girls. Future studies—mainly from low- and middle-income countries —are needed to provide additional evidence on these associations and the effects of youth home environment.

Keywords: Adolescents, Girls, Cross-sectional, Dietary intake, Home food environment, Parental support, Family meals

Background

Although the worldwide prevalence of overweight and obesity appears to leveled off in the last years [1], the overall proportion of adolescents under these conditions remains elevated, particularly among youth from lower educated and ethnic minority parents [2, 3]. Brazilian adolescents are not impervious to this global public health crisis, with data showing that 16% of the adolescent girls are overweight [4]. Specifically, the highest rates of obesity and overweight have been observed in the most developed region of the country, i.e., south and southeast areas [5]. The increased prevalence of unhealthy weight gain during this period of life can be attributed to certain behaviors related to diet and physical activity [6].

The home food environment and family members, mainly parents/caregivers, play an important role on the adolescents' dietary intake. In this sense, the family can pass on examples of healthy eating habits and provide a great availability and accessibility to foods at

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home [7]. Evidence has shown associations between availability of nutrient-dense food items (e.g., fruits and vegetables, whole food and fiber products, and reduced/low-fat dairies) at home and youth intake of these foods [7]. Also, when energy-dense, nutrient-poor food items (e.g., high in saturated/trans fat, simple sugars, and sodium—sugar-sweetened beverages, cookies, and packed snacks) have no easy access and are not available at home; there is a decrease in these foods items consumption [8, 9].

Therefore, family meals are considered an important tradition since 1960s [10] and is recognized as one of the key factors of parental influence on their children's health behaviors and weight status [11, 12]. Moreover, family meals are associated with an increase in psychosocial wellbeing, a decrease in the risk for addictive behaviors (e.g., substance abuse and alcohol intake), and eating disorders (e.g., Anorexia Nervosa, Bulimia Nervosa, and eating disorder not-otherwise specified) [13]. Regular family meals, which are three or more times per week, were associated with all health benefits [13]. Moreover, sharing meals together might offer consistency and a venue for checking in with family members and for learning and teaching healthy food attitudes. Sharing meals together is a simple, non-intrusive intervention that can be easily applied to provide healthy family environments [14].

Investigations in low-income parent-child dyads found that non-core food items' availability at home was a strong influencing factor for the children's diet intake [15–17], so, parents are found as monitors for the family food environment. However, little is known about the parents/caregivers influence on their children's dietary intake and home access and availability of food items across Brazil and other middle- and low-income countries. The previous literature investigated parental influence on the children's intake of the "Brazilian Food Pyramid" groups: core- and non-core food items [18]. Therefore, it was aimed to add knowledge on the influence of the parental support on the children's intake. Likewise, parents'/caregivers' dietary intake, home access, and availability also have been demonstrated to envision kids' intake of food pyramid groups. Hence, the purpose of this study was to identify the associations between the adolescents' dietary intake and home food environment (i.e., frequency of family meals, availability of core- and non-core food items, and parents'/caregivers' support on healthy eating). Comprehending in what extent the family food environment, together with parents/caregivers dietary behaviors, the impact on children's dietary behavior has significant public health implications since youth mostly live with their parents and potentially eat up to one meal a day at home.

Methods

This report describes a secondary analysis of data from the "Healthy Habits, Healthy Girls—Brazil," a school-based randomized control trial designed to prevent unhealthy weight gain among adolescent girls from a low-income, urban population in Brazil. Briefly, the study involved detailed assessments of the girls' dietary intake and the adolescents' reports of their parents/caregivers influence in their home environment of core- and non-core food items. Other variables assessed included family meal frequency and adolescents' weight status. All the assessments were conducted by trained research assistance. The current study design was a cross-sectional study, and so rigorous followed the STROBE standard [19]. Ethics approval for the study was obtained from the Ethic Research Committee of the School of Public Health, University of São Paulo, Brazil (process number 01658112.6.0000.5421). Written informed consent to participate in the study was obtained from the school principals, parents/caregivers, and students.

Subjects

Governmental public technical high schools were eligible to participate. The ages of the adolescents range between 14 and 18 years old, and the students spend the whole day at school. In this sense, part of the day is allocated to regular high school and the other to technical education in several different areas (e.g., chemistry, environmental science, visual communication, health, and business and management). Government schools that offer nutrition and dietetics technical course (13 of 43 schools) in the city of São Paulo were selected for the current study because they provided opportunities for partnership with accredited dietitians teachers and allowed their students to work as research assistants.

Girls reported their parents/caregivers school level of education and the neighborhood they live. In Brazil, parents' education level is considered an income proxy. In agreement with the social economic of the city of São Paulo, the schools and neighborhoods are area of high vulnerability (e.g., government housing and slums demonstrating areas of low-socioeconomic position). Once schools agreed to participate in the study, teachers invited the girls to voluntarily participate in this study. Eligible girls were not enrolled in any nutrition and dietetics or other health-related course and were attending the first, second, and third high school year. Adolescent girls were attending, instead the following technical courses: building trades, business and management, chemistry, environmental sciences, and visual communication. Therefore, 10 schools were successfully recruited with an average of 25 students per school. On total, 253 adolescent girls participated on this cross-sectional study.

Measures

Dietary intake

Dietary intake was assessed using a validated and reproduced Food Frequency Questionnaire (FFQ) [20]. The girls were asked to report the frequency and usual intake of a list of 50 food and beverages items. Their dietary frequency reported the intake over a period of 12 months, and it ranged from "2 or more times/day" to "never." Research assistances (RA) were trained to check if all the FFQ were adequately filled. In case of inadequacy, the FFQ were returned to the girls until all questions were completed and/or no discrepancies were found. Moreover, the RA provided a briefly explanation of how to fill the instrument, and the girls received a standardized sheet of paper with accurate estimation of portion size (e.g., a knife point of cream cheese = ¼ of table spoon of cream cheese; a dash of olive oil = 1 tablespoon of olive oil). The portion sizes of the FFQ were provided with usual measures, such as tablespoon, units, knifepoints, and glasses. In a previous pre-test study, it was found that the adolescents misunderstood these measurements.

Different foods items were added in the eight pyramid groups [18], which were divided into four levels according to their main nutrient composition [21–24]. The daily servings and calories of each group were estimated. Thus, the number of servings from the food groups were calculated and used as the dependent variables in the analyses. Energy intake ≤500 kcal and ≥5000 kcal were removed from database (57 from baseline) [25].

Family meal frequency

The frequency of family meals was assessed using a survey adapted from the "Project Adolescents Food Attitudes," a cross-sectional study with 1280 adolescents from technical public schools [26, 27]. "During the past seven days, how many times did all, or most, of your family eat a meal together?" The item had a six response categories ranging from "never" to "more than 7 times".

Home food environment

Home food environment was assessed with an adapted, validated, and reproduced questionnaire for adolescents [28]. The reliability and factorial validity are appropriate, suggesting for each scale values between adequate and exact; internal consistency from acceptable to excellent (α=0.66 to 0.94); and rank order repeatability from adequate to strong (ICC = 0.65 to 0.93). The food environment was divided into two categories: (i) situation; and (ii) parents/caregivers support for healthy eating. In the situation, there was a 6-item scale assessing the individual's mental representation of the food available in their home environment. For example, the presence of fruit and vegetables, healthy snacks (e.g., muesli bar, dried fruits, yogurts, and fruits), and drinks (e.g., purifier water, coconut water, and homemade natural fruit juices), such as "At home vegetables are often served at meals?" The 6-point Likert-type scale examined the respondents' level of agreement/disagreement with each item. Thus, the parents/caregivers support were assessed by five items, and it was used a 5-point Likert-scale (1 = never to 5 = always). A time referent was provided to motivate consideration of supportive behaviors received at the previous 3 months. For instance, "Do your parents/caregivers sometimes prepare a healthy dinner with homemade preparations, such as rice, beans, vegetables, salads and meats in general?" and "Do your parents/caregivers encourage you to eat fruits and vegetables?" For both scales, higher scores indicate greater levels of home food environment.

Analysis

Descriptive statistics were calculated for independent variables. Univariate linear regression models were used to evaluate the relationships between adolescents' servings of the food groups, food access, and availability at home, parental support to healthy eating and frequency of family meals. For continuous variables, linear models were used to compare the adolescents' dietary intake across the reported availability of foods at home and parental support. Associations between numbers of servings of the food groups reported by the girls with parental support, food home environment, and family meals were assessed. Regression models were adjusted for adolescents' school level. All analyses were conducted in April of 2017 by using SPSS for MAC version 21.0 (IBM SPSS Statistics, IBM Corporation, Armonk, NY; 2010), with α level set at $P < 0.05$.

Results

The final sample for the present study consisted of 253 Brazilian adolescent girls 14–18 years of age. In this sample, 70.4% have healthy weight, 18.3% were overweight, and 8.3% were obese. The average of total energy intake was 3,278.72 (standard error 54.22) kcal/day and for the "fruits", "oils and fats", and "sugar and sweets" pyramid groups were below and above, respectively, the number of servings/day recommended (Table 1), reflecting dietary patterns failing to meet the current guidelines. Girls in this study obtained an adequate average intake for the "Rice, Bread, Pasta, Potato and Cassava" (mean = 7.42, standard error 0.18 serving/day), "milk, yogurt, and cheese" (mean = 1.90, standard error 0.05 serving/day) and "beans and nuts" (mean = 1.55, standard error 0.05 serving/day) groups. Adolescents reported to realize an average of 4.47 (standard error 0.15) family meals per week. In terms of frequency of family meals, the most reported one was 1–2×/week (*n* = 61, 23.7%),

Table 1 Food groups, total energy intake, parental support, home environment, and family frequency. Healthy habits, healthy girls—São Paulo, Brazil, 2017

	Mean (SE)	Median (interquartile range)
Rice group (serving/day)	7.42 (0.18)	9.00 (6.01 to 9.61)
Vegetable group (serving/day)	3.18 (0.14)	3.01 (1.00 to 5.02)
Fruit group (serving/day)	0.76 (0.39)	0.75 (0.43 to 1.00)
Milk group (serving/day)	1.90 (0.05)	2.14 (1.32 to 2.46)
Meat group (serving/day)	2.09 (0.06)	2.15 (1.34 to 2.47)
Beans group (serving/day)	1.55 (0.05)	1.77 (1.00 to 2.00)
Oil group (serving/day)	4.54 (0.13)	4.76 (2.91 to 5.18)
Sugar group (serving/day)	5.26 (0.14	5.45 (3.81 to 6.57)
Total energy intake (kcal/day)	3228.14 (54.22)	3.278,72 (2727.20 to 3628.58)
Parental support	4.11 (0.03)	4.25 (3.75 to 4.50)
Home environment	4.78 (0.06	4.83 (4.29 to 5.50)
Family meals (days/week)	4.47 (0.15)	5.50 (1.50 to 7.00)
Family meals	*n*	%
Never	13	5.1
1–2×/week	61	23.7
3–4×/week	47	18.3
5–6×/week	55	21.4
7×/week	31	12.1
>7×/week	50	19.5

Note: *SE* standard error

followed by 5–6×/week (*n* = 55, 21.4%). The girls reported an average of parents/caregivers support for healthy eating of 4.11 (standard error 0.36) on a scale of 1 to 5. The home environment for healthy eating, i.e., access and availability of core- and non-core food items at home, was reported in average scale of 4.78 (standard error 0.56) (scale ranged from 1 to 6).

The results for parents/caregivers support for healthy eating, home food environment, and family meals associations with children's food pyramid groups' servings/day are presented in Table 2. Parents/caregiver support for healthy eating was positively associated with the intake of fruits group [mean (95%CI) 0.75 (0.66 to 0.84) serving/day, ß = 0.26, *p* = 0.03] and vegetables group [3.40 (3.08 to 3.72) serving/day, ß = 0.25, *p* = 0.006] and negatively associated with meat and eggs [2.09 (1.93 to 2.25) servings/day, ß = − 0.14 *p* = 0.041. The intake of the fruits [0.73 (0.63 to 0.82) serving/day, ß = 0.35, *p* = 0.001]

was positively associated with home environment. The other food groups' variables were not associated with home food environment and parent's support. Sharing family meals were neither positive nor negative statistically significant with dietary intake (Table 2).

Discussion

The dietary intake of the Brazilian adolescent girls in this study was in need of improvement. This is comparable to recent data among US youth, where older adolescent girls reported a diet that are rich in sodium, empty calories, and refined grains that should be consumed in a moderate way [29]. Demonstration of dietary intakes in the present study revealed a lack of adherence to the Food Pyramid recommendations for the fruits, vegetables (FV—core food), oils and fats and Sugars and Sweets (non-core food) groups [30]. Parents/caregivers support for healthy eating was found to be associated with the food pyramid group intake of the Brazilian adolescent girls. Although no significant associations for home food environment and frequency of family meals with the food groups' intake, the dietary intake was better with those adolescents that had reported healthy food items at home and share regular family meals per week (i.e., at least 3×/week) [9]. To the authors' knowledge, this is the first study to report the associations between parents/caregivers support for healthy eating, home food environment, and family meals with the Brazilian Food Pyramid groups' intake in a sample of under-served girls in Brazil. Further studies should be able to describe how the home food environment (operationalized as the number of shared meals, the availability of core and non-core food items at home, and parents/caregivers support for healthy eating) mediates the association between adolescents dietary intake [31].

The current study demonstrates a perceived behavioral dynamic and trade-off between social environmental behavior and food parenting among low-income adolescent girls in Brazil. Therefore, this suggests an increasing need to include parents/caregivers in pediatric obesity prevention programs. In general, mothers are more likely to prefer for adequate behavior at the expense of healthier food choices. For that reason, the results reinforce social-cognitive processing concepts of behavioral decision research that individuals most of the times present adverse goals and values, demonstrating an increased value to social behavior than food choices during the process of decision-making. In the case healthy choices were the standard choice, mothers might have a less likelihood for reduced nutritional expectations in favor of the social and environmental expectations [32].

Although results were not significant for influence at home, the role of parental dietary habits might influence on the access, availability, and children's food choices for

Table 2 Associations between parents' support, home environment, and family meals with food groups' consumption. São Paulo, Brazil, 2017

	Parents' support			Home environment			Family meals		
	Mean (95%CI)[a]	ß (standardized coefficient)	p value	Mean (95%CI)[a]	ß (standardized coefficient)	p value	Mean (95%CI)[a]	ß (standardized coefficient)	p value
Rice, bread, pasta, potato, and cassava group	8.13 (7.85 to 8.41)	− 0.11 (− 075 to 0.03)	0.200	8.22 (7.95 to 8.49)	− 0.10 (− 0.47 to 0.06)	0.633	7.50 (7.04 to 7.95)	0.09 (− 0.03 to 0.25)	0.904
Fruits group	0.75 (0.66 to 0.84)	0.26 (0.14 to 0.39)	*0.003*	0.73 (0.63 to 0.82)	0.35 (0.16 to 0.33)	*0.001*	0.76 (0.66 to 0.87)	0.10 (− 0.01 to 0.05)	0.198
Vegetables group	3.40 (3.08 to 3.72)	0.25 (0.44 to 1.31)	*0.006*	3.54 (3.24 to 3.84)	0.19 (0.15 to 0.75)	0.120	3.34 (2.99 to 3.69)	0.13 (0.01 to 0.25)	0.472
Milk, yogurt and cheese group	1.82 (1.70 to 1.95)	0.16 (0.05 to 0.40)	0.054	1.90 (1.78 to 2.01)	0.16 (0.03 to 0.27)	0.693	1.84 (1.70 to 1.98)	0.05 (− 0.02 to 0.06)	0.125
Meat and eggs group	2.09 (1.93 to 2.25)	− 0.14 (− 0.49 to 0.03)	*0.041*	2.18 (2.04 to 2.33)	− 0.16 (− 0.35 to − 0.04)	0.205	2.10 (1.93 to 2.27)	− 0.04 (− 0.07 to 0.03)	0.634
Beans and nuts group	1.56 (1.43 to 1.69)	0.05 (− 0.10 to 0.27)	0.848	1.59 (1.44 to 1.68)	0.04 (− 0.08 to 0.17)	0.770	1.58 (1.44 to 1.72)	0.08 (− 0.01 to 0.07)	0.468
Sugar and sweets group	5.26 (4.94 to 5.57)	− 0.17 (− 1.09 to − 0.15)	0.09	5.27 (4.95 to 5.59)	− 0.05 (− 0.45 to 0.20)	0.185	5.18 (4.82 to 5.55)	−0.03 (− 0.14 to 0.08)	0.183
Oils and fat groups	4.56 (4.27 to 4.84)	− 0.17 (− 1.02 to − 0.17)	0.08	4.64 (4.35 to 4.93)	− 0.12 (− 0.57 to 0.01)	0.155	4.62 (4.27 to 4.97)	− 0.01 (− 0.11 to 0.09)	0.261

CI indicates confidence interval
Note: Linear regression statistical test adjusted for school was used
[a]Mean (95%CI) was unstandardized regression coefficient
Significant values are in italic

certain items. For instance, parents that report intakes of FV are positively associated with their kids' nutrient-dense, low-energy items intake, whereas parents that report intake of sugar-sweetened beverages and energy-dense, poor nutrient food items were negatively associated with adolescents' dietary intake. Findings were similar among urban Hispanic adolescents living in the USA. This suggests that not only parents play a role in their children's access and availability to foods and beverages, but at same importance in their preferences for those items, demonstrating that adolescents might mimic their parents'/caregivers' dietary behaviors [33].

The present study did not find a significant association between family meals and girls' dietary intake as hypothesized. However, an increase on the intake of the core food items and a decrease on the intake of the non-core food items were observed, in relation to those that reported sharing at least three family meals per week. On the other hand, Santiago-Torres et al. [33] found no positive associations between family meals and dietary quality of the adolescents. However, they found an inverse association between family meals while watching TV and their children's diet quality. Recently, the results of baseline findings of a Brazilian school-based study found that adolescent girls that watched more than 2 h/day of TV was associated with the intake of soft drinks, hamburgers, pizza, and packaged snacks. Also, there was a tendency for the intake of chocolate, popcorn, and cold cuts. In relation to beverage intake, the majority of the adolescents reported the intake of regular soft drinks and soya drinks vs. the "zero" version. The majority of the girls also reported to drink powder juice mix followed by nectar, pulp, and reduced calories powder juice mix [34].

Moreover, this study adds to the literature by demonstrating the association between perceived food environment and parents' access and availability of core- and non-core food items in the girls' house. Although no significant results, there was a small increase on the intake of core food items, compared to those who did not report the presence of fresh items at home. The results might be because parents/caregivers' purchase core food items, which is associated with buying fruits and vegetables at local and specialized fresh food markets, the habit of walking to food sources, and perceived availability and variety of natural food items in neighborhood, independently of girls' socioeconomic and demographics features [35]. Evidence from high-income countries, such as USA and some from Europe, demonstrated that the presence of supermarket in an urban neighborhood increased the core food items intake [36]. In the city of São Paulo, besides the supermarkets, parents/caregivers can buy fruits and vegetables and other healthy food items at street markets, and as a consequence, this might play an important role in increasing the access and availability of fresh food items in the houses of low-income families in Brazil [37]. Moreover, buying food items at the street markets can

be less expensive than buying in the supermarkets in Brazil.

However, the lack of associations between home environment and youth dietary intake might reflect their inadequate food choices due to the fact that Brazilian low-income parents/caregivers works full time. Therefore, this suggests that parents, especially the mothers, do not have time to cook a healthy meal for their children and instead provide their children ready-to-eat processed food items and reduced frequency of family meals. Evidence on diet quality and nutritional status relating maternal employment highlighted the risk of unhealthy weight gain; decrease frequency of family meals; and lower intake of nutrient-dense food items, such as the fruits, vegetables groups, and other whole food items among children and adolescents [38].

Economic difficulties in society and psychosocial working conditions can influence workers' health through several ways. São Paulo and Brazil as a whole are not impervious to these conditions since the economic and political crises that the country is covering over the past decade [39]. This suggests that workers have to deal with several jobs, in most of the case underemployments, to deal with the lack of money and to be able to pay for their living costs. Therefore, this could affect the employees' eating behaviors and food choices, which suggests that employees are working through their lunches, missing meals, and/or choosing ready-to-eat processed food items because they worked from early in the morning until late in the evening [38]. This point suggests that Brazilian low-income families are more prone to have unhealthy dietary habits, and as a consequence, they can be overweight or obese. In agreement of the current study, parents'/caregivers' support and home food environment are important factors to be considered in the children's dietary intake and weight status.

The major strengths of the present study are a representative sample size obtained from different schools in different areas of the city of São Paulo; the use of a standardized protocol for data collection and data processing followed the STROBE standards, and the validated and reproduced questionnaire used in this study. However, there are also certain limitations. First and foremost, a casual relationship cannot be identified due to the cross-sectional design of the study. For example, it may be that children reported their parents/caregivers support for healthy eating because they were ashamed to report their real life conditions. Second, due to the targeted nature of the study, the results may not be generalizable to other groups (e.g., male subjects, those from other socioeconomic positions). Lastly, dietary intake was based on a food frequency questionnaire and includes potential recall bias as a result of the challenge of remembering the frequency and amount of food eaten over a specified period of time (particularly for foods that are out of season), overestimation of frequency of food intake [30, 40], and social desirability bias [30].

Conclusion

In conclusion, the present study showed that parental support for healthy eating is positively associated with consumption of FV and negatively associated with meats and alternatives. Home food environmental only showed associations for the consumption for the fruits groups. No significant results were found between dietary intake and family meals frequency, but small differences favored the girls that reported a positive environment. On the other hand, future studies—mainly from low- and middle-income countries and community randomized controlled trials—are needed to provide additional evidence on these associations and the effects of youth home environment.

Availability of data and materials
Since the data used in this article is still being analyzed to produce another article as part of the post-doctoral fellowship, the authors decided not share the data at this stage of the research project development.

Author's contributions
All authors truly contributed to the development of this study. AL participated on study concept and design, acquisition of data, analysis, and interpretation of data, drafting the manuscript, critical revision of the manuscript for intellectual content, and statistical analysis. SP senior research of this project, participated on study concept and design, acquisition of data, interpretation of data and critical revision of the manuscript for important intellectual content. All authors read and approved the final manuscript.

Ethics approval and consent to participate
This research received ethical approval from the School of Public Health, University of São Paulo (FSP-USP) ethics committee under the protocol number 01658112.6.0000.5421. The parents/caregivers of the girls and the school principals provided written informed consent, as well as the girls provided assent forms for participation prior to data collection.

Consent for publication
Not applicable

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