

Self-reported physical activity and food intake patterns in schoolchildren aged 7-10 from public and private schools

Perfil de atividade física e consumo alimentar autorrelatado de escolares de 7 a 10 anos da rede pública e privada

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Abstract – Physical activity and diet are related to several health outcomes. The aim of this study was to analyze physical activity (PA) and diet patterns among Brazilian schoolchildren attending private or public schools. A cross-sectional, school-based study of elementary schoolchildren aged 7-10 years old ($n = 2,936$) was carried out in Florianópolis (southern Brazil). Self-reported food consumption and PA patterns were assessed by means of a questionnaire. A higher percentage of girls than boys met the recommendations for consumption of fruits and vegetables and limited their consumption of sweets and soft drinks. Boys reported higher PA levels than girls ($P < 0.001$). Children attending private schools were more likely to be in the highest tertile of PA (odds ratio = 1.53, 1.14-2.05) and 80% less likely to be active in commuting to school compared to public school students. Private schoolchildren were more likely to meet recommendations for fruits and vegetables, limit sweet consumption, report adequate meal frequency and no consumption of fast food or soft drinks. In summary, girls and private schoolchildren reported better eating patterns, while boys and private schoolchildren reported higher PA levels. Such results highlight the public school setting as a target for health promotion initiatives, along with other strategies, in developing countries.

Key words: Child; Diet; Health behavior; Health promotion; Physical activity.

Resumo – A atividade física e o consumo alimentar estão associados a vários desfechos de saúde. O objetivo do presente estudo foi investigar as diferenças no comportamento alimentar e na atividade física de escolares brasileiros da rede pública e privada. Um estudo transversal de base escolar, com crianças entre 7 e 10 anos, foi realizado em Florianópolis, SC, Brasil ($n = 2.936$). As informações foram obtidas por meio de um questionário respondido pelas próprias crianças. Maior proporção de meninas alcançaram as recomendações para o consumo de frutas e vegetais e limitaram o consumo de doces e refrigerantes. Os meninos relataram maiores níveis de atividade física ($P < 0,001$). Escolares da rede privada tiveram maior chance de serem mais ativos (Odds Ratio = 1,53, 1,14-2,05) e 80% menos chance de serem ativos no deslocamento para a escola; além disso, tiveram maior chance de atender as recomendações para o consumo de frutas e verduras, limitar o consumo de doces, apresentar número adequado de refeições e não consumir fast food e refrigerantes. Resumindo, as meninas e os escolares da rede privada relataram melhores padrões de consumo alimentar, enquanto os meninos e os escolares da rede privada foram mais ativos. Tais resultados apontam a escola pública como um alvo para iniciativas de promoção da saúde.

Palavras-chave: Atividade física; Conduta de saúde; Criança; Dieta; Promoção da saúde.

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INTRODUCTION

Physical activity (PA) and eating behaviors are of particular public and research interest because they encompass common daily activities. In addition, these behaviors have the potential to be modified, thereby decreasing health care costs, improving health and well-being, and reducing the risk of chronic diseases such as obesity and related metabolic disorders. Although obesity has a multifactorial origin, physical inactivity and unhealthy diet have been postulated as important determinants of obesity in both adults and youths¹, given that its increased prevalence has paralleled the rapid lifestyle changes of the population in the modern world. Furthermore, they are considered target behaviors for youth health promotion aimed at preventing obesity, diabetes and other cardiovascular risk factors^{2,3}.

Several studies have examined children's and adolescents' compliance with recommended patterns of food intake and PA^{4,5}. Correlates of diet and PA patterns (e.g. age, gender, socioeconomic status) have been investigated to support public health policies⁵⁻⁹. There is evidence that higher PA levels and better eating patterns are related to higher socioeconomic and educational levels in adults^{10,11}; however, this subject has not been extensively addressed in pediatric populations in developing countries. Further, few studies have assessed differences in food habits and PA levels according to type of school¹²⁻¹⁴. This topic is of utmost interest, given that type of school (private vs. public) is related to socioeconomic level in developing countries and that government policies primarily target economically disadvantaged individuals.

The aim of this study was to present data on PA and eating patterns in a representative sample of 7 to 10-year-old children attending public or private schools, in order to improve knowledge about differences in children's health behaviors according to type of school, and to discuss health policies to tackle obesity-related behaviors.

METHODS

Subjects were participants in the study entitled "Prevalence of overweight and lifestyle factors associated with nutritional status in schoolchildren", a cross-sectional survey conducted in Florianopolis (southern Brazil). Details of the study design have been described elsewhere¹⁵. In brief, a representative sample of 7-10-year-old schoolchildren from public and private elementary schools in the city was selected, using a stratified two-stage cluster sampling design. Sampling weights were calculated taking into account the unequal probabilities of selection between private and public schoolchildren resulting from the stratified sample design. Of the 3,522 children attending the first four grades in the selected schools, 209 were eliminated because they were not in the protocol age range, and 377 because of missing data (child absent or ill; child refused to participate). Data was collected from September to November 2002.

Informed written consent was obtained from the parents and informed oral assent from the children. The study protocol was approved by the ethics committee of the Federal University of Santa Catarina (Protocol 037/02).

Physical activity and food intake habits were assessed by a structured and illustrated tool designed for children aged between seven and ten¹⁶. The questionnaire was previously validated with a sample of Brazilian children and can be used for ranking participants on usual PA, as well as food and meal patterns¹⁶. Test-retest analysis showed moderate agreement among children from other Brazilian region¹⁷. In the present study, the questionnaire was administered as a classroom activity. Two researchers, with the assistance of the classroom teacher, asked the children to provide information on physical activity and food choices on a typical day of the week. Instructions were read aloud to the entire class and cues (e.g. definition of a typical day of the week) were given to prepare children for the assignment.

In the physical activity section of the questionnaire¹⁶, children were asked to report how they commuted to school, based on five options (on foot, by bicycle, motorcycle, car or bus), and their physical activities, according to 11 predefined drawings of common daily activities (walking/running, playing with a dog, cycling, swimming, playing ball games, jumping rope, athletics, climbing stairs, roller skating/blading, dancing and helping with household chores), displayed in three categories of intensity (low, moderate or intense). Commuting to school was dichotomized into active (on foot and/or by bicycle) or passive (by car and/or bus and/or motorcycle). Weights were assigned to obtain an overall PA score, as follows: one for light, three for moderate and nine for vigorous activities (maximum score = 143 points), similar to another study conducted with 4th grade children¹⁸.

In the food intake section of the questionnaire¹⁶, children were asked to detail their habitual food consumption at five daily eating occasions that were chronologically ordered (breakfast, mid-morning snack, lunch, afternoon snack, and dinner), based on 21 drawings of selected foods or food groups. The 21 selected foods or food groups consisted of dried beans, rice, milk, chocolate milk, yoghurt, cheese, beef, poultry, pasta, crackers, bread, French fries, pizza, hamburger, eggs, fruits, fruit juices, vegetables, sweets, fish/sea foods, and soft drinks.

For each food, food group, and beverage, the frequency of consumption (times per day) was calculated by adding reported consumption over five daily eating occasions. The foods and beverages illustrated in the questionnaire were categorized into eight groups in order to assess compliance with Brazilian Food Guidelines (BFG)¹⁹ for the recommended daily consumption of: a) foods that are positive indicators of a healthy diet: milk and dairy products (milk, chocolate flavoured milk, cheese, yoghurt): ≥ 3 times/day; cereals (bread or crackers, rice, pasta): ≥ 6 times/day; dry beans: ≥ 1 time/day; beef/poultry or fish/sea foods: ≥ 1 time/day; fruits, fruit juices, and vegetables (starchy and leafy vegetables): ≥ 5 times/day; b) foods recommended in small amounts: sweets (lollipops, ice cream, cakes, biscuits): ≤ 1 time/day; and c) foods that are discouraged, i.e. those considered negative indicators

of a healthy diet: fast food (French fries, hamburger/pizza) and soft drinks: = 0 time/day. Since food recommendation guidelines are stated in servings per day, it was assumed that each food reported consisted of one serving.

Additionally, food patterns were assessed in terms of meal composition. Frequency of consumption of a healthy and structured meal at the main eating occasions (breakfast, lunch and dinner) was classified into three categories (none, once, and two or more times per day). Healthy meals were considered to contain three different food groups with high nutrient density [starchy food (rice, dry beans, bread or crackers, pasta), fruits/vegetables, and animal protein (beef/poultry, fish/sea foods, eggs, milk, chocolate flavoured milk, cheese, yoghurt)] but could include other food items. Healthy snacks at mid-morning and mid-afternoon were those that included at least one food group with high nutrient density. This approach is based on the *Food-based classification of eating episodes*²⁰, adapted to the Brazilian context²¹. With regard to meal frequency, compliance with BFG was achieved when the child reported three healthy meals and two healthy snacks.

Parents reported family monthly income, which was classified in six levels of minimum wage ranges for analysis purposes. Since about 20% of the data were missing, we opted to use type of school (public or private) as a proxy of socioeconomic status. Furthermore, this approach can reflect both the socioeconomic status of the family and social and environmental aspects inherent to schools.

The proportion of children meeting the minimum recommendation for a specific food group and the number of healthy meals and snacks was compared between boys and girls and between public and private schools using Pearson's chi-square test. Similarly, active commuting to school and tertiles of the PA score were compared between genders and types of school. Multiple logistic regression analysis was applied to evaluate the extent to which dietary pattern (compliance of eight food groups with BFG – yes/no), the best PA level (highest tertile of PA score vs. lowest plus middle), and active commuting to school (yes/no) – as dependent variables – were associated with type of school (private vs. public), as independent variable. Since the majority of such associations were mediated by gender, PA score, age, and body mass index, models were adjusted for these variables. All estimates took into account the clustering sample design in the complex sample function of SPSS version 15.0. The significance level was set at $P < 0.05$.

RESULTS

A total of 2,936 individuals participated in the study, representing about 10% of schoolchildren in the city at the time the study was conducted. Monthly family income was highly dependent on type of school (data not shown in tables). Approximately 80% of children attending public schools had a family monthly income of up to five minimum monthly wages (minimum wage = R\$ 200.00 in 2002 compared to R\$622.00 in 2012). On

the other hand, 73% of parents with children attending private schools reported earnings of at least ten minimum monthly wages.

Table 1 shows food choices and meal patterns of the schoolchildren according to type of school and gender. As a rule, girls and children from private schools reported healthier eating habits. A significantly higher percentage of private schoolchildren met recommendations for fruits/vegetables and limited consumption of sweets, whereas public schoolchildren reported a higher frequency of eating starchy foods six or more times a day. Fewer public schoolchildren reported no fast food or soft drink consumption compared to children from private schools.

About a quarter of public and 46% of private schoolchildren reported no soft drink consumption. A greater proportion of schoolchildren from private schools reported eating healthy and structured meals twice or more a day compared to public schoolchildren; however, the proportion of children eating a meal lacking one of the basic food groups ranged from 23.1 to 35.6% across all groups. A slightly greater proportion of children from private schools reported eating three healthy and structured meals and two healthy snacks, but overall the frequency was quite low (about 10%). All differences found between types of school were also found when comparing children from the same sex across the different types of schools.

Differences between genders within the same type of school were higher for the consumption of fruits and vegetables, fast foods, and soft drinks ($P < 0.05$). Compared to boys, girls (especially those from public schools) reported more frequent consumption of fruits and vegetables at least five times a day. Further, a higher proportion of girls reported the absence of fast food or soft drink consumption compared to boys.

Table 1. Frequencies (%) of food choices and meals patterns reported by children, according to type of school and gender

Food groups and meal patterns (times/day)	Public schools			Private schools		
	Boys	Girls	All	Boys	Girls	All
Milk and dairy products (≥ 3)	53.9	53.1	53.5	51.5	54.6	53.0
Starchy foods (≥ 6)	45.1	50.5*	47.8	36.3 [†]	39.0 [†]	37.7**
Dry beans (≥ 1)	86.3	85.9	86.1	81.6 [†]	84.9	83.2
Meat and fish (≥ 1)	85.8	83.3	84.6	83.3	80.8	82.1
Fruits and vegetables (≥ 5)	28.6	36.4*	32.4	45.0 [†]	52.1* [†]	48.5**
Sweets (≤ 1)	56.5	61.5*	59.0	67.4 [†]	71.4 [†]	69.4**
Fast foods (hamburger/pizza, French fries) (=0)	28.0	34.2	31.1	32.8 [†]	42.9* [†]	37.8**
Soft drinks (=0)	20.3	28.5	24.3	40.5 [†]	53.0* [†]	46.6**
Complete meal						
None	35.6	27.5*	31.6	23.7 [†]	23.1	23.4**
Once	30.2	33.1	31.6	29.8	32.9	31.3
Twice or more	34.2	39.5	36.8	46.5	44.0	45.3
Snack (morning and afternoon)						
None	7.3	5.5	6.4	8.2	4.0*	6.2
Once	34.6	30.9	32.8	33.8	27.6	30.8
Twice	58.1	63.6	60.8	57.9	68.4	63.1
Three complete meals plus two healthy snacks	7.9	8.5	8.2	11.3 [†]	12.2 [†]	11.8**

*Difference between sexes within the same type of school. **Difference between schools. [†]Differences between children from the same sex over schools. Difference was set at $P < 0.05$.

Children attending private schools were associated with a significantly decreased likelihood of eating starchy food ≥ 6 times per day compared to public schoolchildren. Reported intake of fruits and vegetables ≥ 5 times per day, sweets ≤ 1 time per day, and absence of fast food and soft drinks were more common among schoolchildren from private schools. Students attending private schools were three times more likely to report no soft drink consumption. (Table 2).

Table 2. Effect of attending private school* on recommended food and physical activity patterns

Dependent variables	Crude		Adjusted†	
	OR	95% CI	OR	95% CI
Food pattern (times/day)				
Milk and dairy products (≥ 3)	0.98	0.71-1.36	0.90	0.63-1.28
Starchy foods (≥ 6)	0.66	0.44-0.99	0.63	0.42-0.95
Dry beans (≥ 1)	0.80	0.56-1.14	0.80	0.57-1.13
Meat and fish (≥ 1)	0.84	0.62-1.13	0.81	0.60-1.08
Fruits and vegetables (≥ 5)	1.96	1.44-2.67	1.77	1.28-2.45
Sweets (≤ 1)	1.57	1.13-2.20	1.50	1.06-2.13
Soft drinks (=0)	2.72	1.71-4.32	3.08	1.95-4.86
Fast foods (=0)	1.34	1.10-1.64	1.55	1.25-1.91
Three complete meals plus two healthy snacks	1.50	1.22-1.85	1.30	1.07-1.58
Physical activity pattern				
Walk or cycle to school	0.20	0.09-0.42	0.20	0.09-0.42
Highest physical activity score‡	1.95	1.50-2.54	1.53	1.14-2.05

*Reference category: public school. †Food pattern: adjusted for gender, physical activity score, age and body mass index (BMI) as covariates; Physical activity pattern: adjusted for gender, age and BMI as covariates.

‡Reference category: lowest plus middle tertile of physical activity score

Active commuting to school was more common among children from public than from private schools. However, about 40% of children from private schools were in the highest tertile of PA compared to 30.3% of those from public schools. Boys were more active than girls in both types of school, with greater differences in public schools. Over half of the girls from public schools were categorized in the lowest tertile of the PA score compared to only 23.8% of boys (Table 3). Children attending private schools were 80% less likely to be active in commuting to school compared to children from public schools, but they were 53% more likely to be in the highest tertile of the PA score compared to public schoolchildren (Table 2).

Table 3. Physical activity patterns reported by children according to type of school and gender

Physical activity patterns	Public schools			Private schools		
	Boys	Girls*	All	Boys	Girls*	All†
Active commuting (%)	62.4	62.0	62.2	22.9	26.0	24.4‡
Physical activity score (%)						
Lowest	23.8	53.8‡	38.6	19.1	28.7‡	23.8‡
Middle	34.0	28.2	31.1	32.6	40.9	36.7
Highest	42.2	18.0	30.3	48.3	30.4	39.5

*Differences between genders; †Differences between type of school; ‡ $P < 0.001$

DISCUSSION

In the present study, we compared data on food consumption, meal patterns, and PA levels between schoolchildren from public and private schools. Children from private schools had better overall eating habits and higher PA levels than public schoolchildren, whereas public schoolchildren were more active in commuting to school. Although not directly comparable to other studies, due to the nature of assessment and categorization of PA and eating behavior, our results corroborate previous studies carried out with Brazilian adults^{10,11} and the few investigations that compared health behavior across type of school^{4,5,13}.

In developing countries such as Brazil, attending private schools is a privilege of the wealthy rather than a choice made by parents. It is therefore not surprising that most food guideline recommendations were met more frequently among private schoolchildren. Both parents' education levels and the availability of wholesome foods at home are important correlates of healthy eating habits, and could therefore explain the better eating pattern among this group^{6,7}. Since interventions in the family setting would be more costly and require a broad strategy, several Brazilian government initiatives have targeted the school environment in order to promote healthy eating among youths.

The present study showed that boys reported lower habitual consumption of healthy foods such as fruits and vegetables and higher consumption of 'unhealthy' food items such as sweets, fast foods, and soft drinks in comparison with girls. There is no Brazilian data available for the age range of our study, and the only national survey of adolescent (13 to 15 yr-old) health showed contrasting results, since girls reported worse eating habits than boys²². Similarly, Olivares et al.²³ found that 8-9-yr-old Chilean girls reported higher intake of fruits and vegetables compared to boys, while boys consumed higher levels of dairy products and fruits and vegetables at older ages. On the other hand, studies based on the *Health Behavior in School Aged Children* (HBSC) survey have consistently found that adolescent girls (11, 13 and 15 yrs old) exhibit better eating habits than boys²⁴. Differences in food choices among young adults are partially explained by dieting status and health beliefs²⁵.

In the present study, the frequency of healthy and structured meals was quite low overall, and only a few subjects (10%) simultaneously reported eating a structured meal at breakfast, lunch and dinner, as well as two healthy snacks. This result claims for studies on frequency and composition of meals along with food choice investigations, since it could add to the understanding of eating behavior and health-related outcomes among youths.

With regard to PA, there were a higher proportion of boys and children attending private school at the highest activity level. This finding corroborates a number of studies carried out in developed and developing countries, which have consistently shown higher PA levels among boys²⁶ and the wealthiest subjects^{5,13}. Although not directly comparable,

these results are in line with a large study involving adolescents from 32 countries in the HBSC survey, in which lower socioeconomic levels, based on family resources, were associated with not meeting 60 minutes of moderate-to-vigorous PA at least five days per week⁵. A study among young Brazilian adolescents found that leisure-time physical activities and in-school and out-of-school activities were associated with higher socioeconomic levels¹³.

On the other hand, children from public schools were twice as active in commuting to school compared to private school children. Rather than a choice based on health concerns, it is believed that active commuting at lower socioeconomic levels is related to the lower access to motorized vehicles in these families. Furthermore, parental concerns regarding crime and traffic safety in Brazil could partially explain the higher rates of passive motorized commuting among private schoolchildren. Other studies using the school type as a proxy of socioeconomic level showed higher active commuting to school among public students and higher participation in leisure-time PA among private schoolchildren^{13,23}. We hypothesize that Brazilian children with higher socioeconomic levels have more facilities and opportunities to be physically active either in school-based activities or out-of-school leisure activities.

The strengths of the present study include its representative and large sample size and the use of a validated questionnaire to obtain data on food consumption and PA. Some limitations can be pointed out in our study. Because food intake frequency was estimated as times per day rather than by number of servings, as stated in BFG, the questionnaire may underestimate or overestimate the proportion of children meeting the guidelines, since we cannot know if items were eaten more than once at each eating episode. In other words, the instrument assumes that only one serving is consumed on each eating occasion for all food items. Although the instrument illustrates 21 foods or food groups commonly present in the diet of 7-10-year-old children, predefined options for food items may also underestimate the proportion of children meeting the guidelines. In addition, it was not possible to determine the extent to which active commuting adds to the total PA level of public schoolchildren. This question would be addressed with the use of an accelerometer in future investigations.

CONCLUSION

To conclude, the results of the present study revealed better eating patterns, such as higher fruit and vegetable consumption and limited consumption of unhealthy foods, among girls and private schoolchildren. PA levels were higher among boys and children attending private schools. Data collection took place in a city with better overall social indicators than some other Brazilian state capitals²⁷, suggesting that health behavior differences between children enrolled in private and public schools may be even greater across the country. Although Brazil has experienced rapid socioeconomic

improvements in the last decade, our results suggest the public school setting as a target for health promotion initiatives.

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