Original article

Actions of the School Health Program and school meals in the prevention of childhood overweight: experience in the municipality of Itapevi, São Paulo State, Brazil, 2014*

doi: 10.5123/S1679-49742017000300014

Mariangela da Silva Alves Batista[1]
Lenise Mondini[2]
Patrícia Constante Jaime[3]

[1]Secretaria Municipal de Saúde de Itapevi, Unidade Básica de Saúde Cohab 1, Itapevi-SP, Brasil
[2]Instituto de Saúde de São Paulo, Núcleo de Fomento e Gestão de Tecnologias de Saúde, São Paulo-SP, Brasil
[3]Universidade de São Paulo, Faculdade de Saúde Pública, São Paulo-SP, Brasil

Abstract

Objective: to describe the experience in the municipality of Itapevi-SP, Brazil, within the framework of School Health Program and school meals related to overweight prevention. **Methods**: this cross-sectional study comprised 21 public schools of the first cycle of Primary School who adhered to the School Health Program; the diagnoses, based on 2014 data, included the students' nutritional status, qualitative analysis of school meals, and inclusion of themes related to nutrition and physical activities in curricular and extracurricular activities. **Results**: overweight was present in 30.6% of the 7,017 students; ultra-processed foods represented 68.4% of the breakfast and afternoon snacks, whilst unprocessed and minimally processed foods were more present in lunch meals (92.4%); themes related to nutrition and the practice of physical activities were present in the curricular activities of 14 schools. **Conclusion**: the assessment of the actions of the School Health Program and school meals shows the need for adjustments on school menus.

Keywords: Childhood Obesity; Education; School Feeding; School Health; Epidemiology, Descriptive.

*Article elaborated from the dissertation of Mariangela da Silva Alves Batista, defended as a requirement of the Professional Master's Degree Program in Collective Health from the Human Resources Coordination from the State Health Department of São Paulo (CRH/SES-SP) in 2016.

Correspondence:
Mariangela da Silva Alves Batista – Rua Ana Clélia Rodrigues, No. 384, Vila Isabel, Osasco-SP, Brazil
E-mail: maribatista.nutri@gmail.com

Introduction

The increased prevalence of overweight and obesity has been considered a pandemic. In approximatelly 30 years (1975 to 2009), this prevalence advanced among adults and the younger population of various countries, especially in the developing ones, where there was an increase of about 50% in children and adolescents (2-19 years of age).[1] In Brazil, of the mid-1970 and late 2000, the increased prevalence of overweight in children population was even more expressive. Amidst boys and girls from 5 to 9 years of age, overweight rose from 8.6 to 32% and 10.9 to 34%, respectively. Considering adolescents, the growth of this prevalence was from 7.6 to 19.4% in females, and 3.7 to 21.7% in males.[2]

The determination of childhood obesity is complex and involves, primarily, factors related to lifestyle, such as diet and physical activity, as well as socio-economic, cultural and demographic conditions, in addition to secondary factors, less frequent, as the genetic and hormonal disorders.[3] In this context, the fight against childhood obesity should be based on public policies, including those aimed at the school environment, able to act as key role in promoting health, physical activity and food and nutritional education.[4]

> *The fight against childhood obesity should be based on public policies, including those aimed at the school environment.*

A systematic review study, conducted by Jaime and Lock,[5] about food and nutrition developed actions in American and European schools found evidence of good quality, concerning the impact of adoption of food guides in school menus, especially in reducing total and saturated fats and increasing fruits and vegetables offered.

In Brazil, a systematic review on interventions to promote the practice of physical activity and healthy eating in school found, as the main results, the reduction of consumption of high-calorie foods (soda, sandwich cookies and artificial juice), and an increased consumption of fruits and vegetables.[6]

In the scope of Brazilian public policies aimed at promoting the health of school population, it is important to point out the School Health Program (PSE), released in 2007 by the ministries of Health and Education, with the aim to contribute to the formation of public school students through integrated actions, and articulated amongst schools and health teams, within the framework of primary health care.[7]

The PSE is part of the axis of health promotion, which compounds the Strategic Action Plan to Combat Non-Communicable Diseases (NCD) in Brazil – 2011-2022. One of the objectives of the Plan is the reduction of the prevalence of obesity in children.[8] The PSE, on the other hand, is configured in different components and respective actions, including anthropometric assessment, promotion of food security, healthy eating, physical activity, and body practices beyond those related to monitoring and evaluation of students' health and of the program itself.[7,9] The municipality, while adhering to the PSE, must perform at least certain mandatory actions. It is up to schools to prepare themselves, so that the activities in health to be developed become part of the school's Political-Pedagogic Project (PPP), and become linked to the health teams responsible for their coverage.[7,9]

The PSE has a fundamental role in strengthening actions that link health, education and other social services networks to the combat of vulnerabilities - as obesity – that compromise the children's and adolescents' health of school age.[8] It is important to emphasize, moreover, that there is a relevant gap in the publication of studies on the Program.

The present study aimed to describe the experience in the development of the School Health Program – PSE – actions, and of school meals related to the prevention of overweight agenda in the city of Itapevi, São Paulo state, Brazil.

Methods

It was carried out a descriptive study of the actions of the School Health Program and school meals in the city of Itapevi. This municipality is located in the greater São Paulo (Metropolitan Region), with a population of 200,796,000 inhabitants in 2010. Itapevi presented, in the same year, 0.735 for Human Development Index (HDI). Itapevi's school network had 70 municipal schools, 41 of them which offered the cycle 1 of primary education (1st to 5th year). In 2013, Itapevi adhered to the PSE when it agreed to its compulsory actions, to be carried out in 41 municipal schools, 21

of them offered the cycle 1 of elementary school. The initial criterion of choice of schools for adherence to PSE was defined by the epidemiological surveillance sector, considering the trachoma screening and areas of greater vulnerability to the disease.

The data to be analyzed refers to actions of the components I and II of the PSE (nutritional status, curricular and extracurricular activities that deal with the subjects 'Healthy Eating and Nutrition' and 'Physical Activity') performed in 2014, in the 21 schools which offered the cycle 1 of the elementary school attached to the PSE. It was also analyzed the evaluation of the food provided in these schools.

Component I of the PSE:

Nutritional status of schoolchildren

All children were included (n = 7,124) from cycle 1 of primary education from the 21 schools.

The anthropometric data were collected by the Physical Education teachers, who were properly trained according to the technical standards recommended by the Ministry of Health.[11] Children's weight was assessed in Welmy mechanical scales, with 100 grams precision and maximum weight of 150 kg. For measure the height, it were built 43 stadiometers with 220x5x2 centimeters equipped boards, straightener and measuring tape, fixed on a wall of each school, on a flat surface without skirting boards. For the calculation of the age in years and months, it was subtracted the date of birth from the date of collect, and the difference was splitted in days by 365.25.

For the diagnosis of the nutritional status, it was calculated the Body Mass Index (BMI) from the division of weight, in kilograms, by the square of height, in meters (kg/m^2), considering the values of BMI, according to sex and age, proposed by the World Health Organization (WHO).[12] The classification of children's nutritional status was held in three categories: underweight (<; -2 z-scores), normal (≥ -2 and <;1 z-scores) and overweight (≥ 1 z-score). The age groups considered for analysis were from 5 to 9 and from 10 to 14 years old.

For the calculation and analysis of the data, we used the software AnthroPlus version 1.0.4. The existence of association between nutritional status, sex and age was verified by the Chi-square statistical test ($p < 0.05$).

Component II of the PSE:

Curriculum and extracurricular activities related to the themes 'Healthy Eating and Nutrition' and 'Physical Activity'

Information on curricular and extracurricular activities, related to the themes 'Healthy Eating and Nutrition' and 'Physical Activity' developed in schools, were obtained through questionnaires about the insertion of these topics in the planning and implementation of educational activities. The questionnaire were sent to the directors and/or pedagogical coordinators (and/or teachers, if designated by the directors) of the 21 municipal schools which were committed to PSE's implementation and offered cycle 1 of elementary school. The questionnaire was previously tested in a school that did not adhere to the PES, including the following items and related variables:

a) Theme 'Healthy Food and Nutrition'

- Insertion of the subject in disciplines (yes; no);
- Disciplines which covered the subjects (Portuguese, Mathematics, History, Science, Physical Education, Arts, Geography, other);
- Grades that worked the theme (1st, 2nd, 3rd, 4th and/or 5th year);
- Topics covered in the disciplines (food hygiene, food and nutrition security and, feeding Dietary Guidelines for the Brazilian population , nutrition processes – absorption, digestion, etc. - food pyramid, healthy eating, others);
- Collective activities carried out related to the theme (yes; no);
- Types of collective activities (day/week of eating healthy, food tasting, school garden, workshop, lecture, other);
- Professional responsible for the organization of the activity (teacher, nutritionist, school lunch cooks, multidisciplinary team, educational coordinator, other);
- Grades that performed the activity (1st, 2nd, 3rd, 4th and/or 5th year);
- participation of parents (yes;no);
- Inclusion of the activity in the Political-Pedagogic Project (yes;no);
- Factors that facilitate and limit the inclusion of the topic in the Political-Pedagogic Project (internal and external to the school).

b) Theme 'Physical Activity'

- Presence of the discipline of Physical Education in the curriculum, and presence of physical activity and extracurricular sport (yes; no);

- Weekly frequency of lessons (1 lesson/week, 2 lessons/week, more than 2 lessons/week, other);
- Duration of lessons (50 to 60 minutes, 60 to 120 minutes, other)
- Types of activities and sports developed (ball sports, miscellaneous sports, gymnastics, games, athletics, games, other activities).

The data was tabulated in a spreadsheet prepared in Microsoft Excel Starter 2010.

School feeding

The food provided in schools was evaluated by the menus for breakfast/afternoon snack (breakfast menu, served for the morning classes, is the same served at the afternoon snack for the afternoon classes), and for lunch, offered in the first semester of the year 2014 (February to June: the selection of this period is due to data availability, when the project began). We also analyzed the document containing the description of foods and preparations. It is important to emphasize that the menu is the same for all schools, there are not canteens available, and kids can't bring snacks from home to school.

The qualitative analysis of menus was based on the NOVA Classification, that groups the foods into four categories, depending on the extent and purpose of the processing to which they are subjected[13] (Figure 1).

In the evaluation accomplished, the foods were grouped only in three categories: unprocessed or minimally processed; processed; and ultra-processed. Foods that are not part of the group 'processed culinary ingredients' are already present in preparations of the other food categories.

The total number of food items served at the monthly menus were accounted, and throughout the semester, their absolute and relative participation, according to the proposed categories.

The research project was approved by the Ethics Research Committee of the Institute of Health/ Department of Health of São Paulo state: Protocol No. 983,048, from the 12th of March, 2015.

Results

Nutritional status

After the exclusion of 107 (1.5%) children who had presented inconsistent data of weight and/or height or incorrect date of birth registry, was obtained a total of 7,017 children: 3,406 girls (48.5%) and 3,611 boys (51.5%), aged from 5 to 14 years old (Table 1). The average age of girls was of 8.2 years (standard deviation = 1.33 years), and for the boys it was of 8.3 years (standard deviation = 1.35 years).

It was found that underweight was present in 1.9% of schoolchildren, and the overweight in 30.6% of them, regardless of sex (Table 2).

Unprocessed or minimally processed foods	**Unprocessed foods are part of eatable (seeds, fruits, leaves, stems, roots) or of animals (muscle, offal, eggs, milk); and also fungi and algae, immediately after their separation from nature. Minimally processed foods are natural foods altered by processes such as removal of inedible or unwanted parts, drying, dehydration, crushing or grinding, fractioning, roasting, boiling solely with water, pasteurization, refrigeration or freezing, placing in containers, vacuum packaging, non-alcoholic fermentation and other processes that do not involve the addition of salt, sugar, oils or fats to the original food.**
Processed culinary ingredients	**Products obtained directly from unprocessed foods or from minimally processed or nature. These foods are consumed in culinary preparations. Examples of this category are the following: oils, fats, salt and sugar.**
Processed foods	**Products made by adding salt or sugar, and eventually oil, vinegar or other culinary ingredient, to an unprocessed or minimally processed food. Most processed foods have two or three ingredients. Examples of this category are the following: bottled legumes and fruits, cheese and bread.**
Ultra-processed foods	**Products in which are employed several industrial processes and technics, and a variety of ingredients, most of them only found in ultra-processed products such as food additives. Examples of this category are the following: soft drinks and stuffed cookies**

a) NOVA classification groups foods into four categories, according to the extension and purpose of processing they undergo. [13]

Figure 1 – Categories of foods – NOVA Classification[a]

Table 1 – Characterization of schoolchildren, according to sex and age group, Itapevi-SP, 2014

Variables	(n)	(%)
Sex		
Female	3,406	48.5
Male	3,611	51.5
Age group (in years)		
Girls		
5|–|9	3,081	90.5
10|–|14	325	9.5
Boys		
5|–|9	3,204	88.7
10|–|14	407	11.3
Total	7,017	100.0

Curricular and extracurricular activities:

The theme of 'Healthy Food and Nutrition' and 'Physical Activity'

For the analysis of curriculum and extracurricular activities, 14 of 21 schools answered the questionnaire.

In 2014, the theme 'Healthy Eating and Nutrition' consisted, mainly, of activities in all classes (1st to 5th year), in the 14 schools, in the disciplines of Science and Physical Education. The themes most frequently worked were 'Healthy Food', 'Food Pyramid' and 'Food Hygiene', and the more developed activities in the schools were 'Day/Week of Eating Healthy Food', 'Food Tasting', and 'Cooking Workshop'. The cultivation of vegetable-garden was present in 5 of the 14 schools; however, these activities were included in the Political-Pedagogic Project (PPP) of 10 schools and, in most of them, teachers and pedagogical coordinators were the professionals responsible for the accomplishment of this activity. The directors and/or pedagogical coordinators of schools answered that the facilitators for the inclusion of the theme 'Healthy Eating and Nutrition' in the PPP were the support of the Municipal Education Department and teachers, the presence of nutritionist and the planning of the menus, the annual routine of evaluation of the students' anthropometric data and the fact of the theme being considered pleasant to work. Although 7 schools did not identified factors that would jeorpadize the inclusion of the topic in the PPP, it was mentioned mainly the following ones: lack of support from the family – and financial resources – to follow the guidelines given at school in their homes, in spite of half the school units had invited parents to participate in these activities.

Concerning the theme 'Physical Activity', it was found that the 14 schools offered the discipline of Physical Education in the curriculum, with a frequency of two weekly classes from 50 to 60 minutes. The activities mostly offered were varied sports (Frisbee, Boomerang, slacklining, and capoeira), followed by ball sports (football, basketball, volleyball, handball, paddleball, and dodgeball), gymnastics, games and athletics. Sports and extracurricular activities (including on the weekends) were available for 86% of schools, often one or two weekly classes from 50 to 60 minutes, with the ball sports being the most offered, followed by gymnastics, games, sports and other activities, like dance.

School feeding

When analyzed the menus of breakfast and afternoon snack adopted during the semester (Table 3), it was found that the ultra-processed food compounded 68.4% of the menu, followed by 22.5% of unprocessed foods or minimally processed, and 9.1% of processed foods.

The ultra-processed food category was composed of chocolate, strawberry enriching, milk drink, cookies, soy-based drinks, corn flakes, cookies, bread, margarine and cream cheese. Processed foods were represented by bread and fruit jelly without preservatives. The unprocessed or minimally processed foods were represented by milk and fruit yogurt. The latter is part of the descriptive memorial as food without added sugar and artificial colors, added fruit pulp to it.

Concerning the lunch menu during the semester (Table 4), unprocessed or minimally processed foods were the basis of the meal (92.4%), followed by 5.7% and 1.9% of processed and ultra-processed foods. The first category consisted of rice, beans, flour, vegetables, legume, fruits, natural juice without added sugar, meat, fish, chicken, pasta and egg. The second category is comprised of extract and/or tomato puree, in its descriptive memorial this product was presented as an item obtained from ripe fruits, added sugar and sodium chloride, and free of artificial dyes. The third category consisted of frankfurter and sausage.

Discussion

The results found in the public schools of cycle 1 of primary education of the municipality studied showed that overweight was present in almost one third of children. Such prevalence is similar to that one found for Brazil, in the period 2008-2009, in children from 5 to 9 years old (33.5%).[2] Other studies, conducted with the same diagnostic criterion and similar age groups, found similar prevalence. In 2005, Ribas and Silva[14] assessed children and teenagers from public and private schools of the city of Belém, Pará state, and found an overweight prevalence of 31.4% in children from 6 to 10 years old. In 2011, Souza et al,[15] when assessed 1,187 children and adolescents from 6 to 14 years old enrolled in public schools (rural and urban) of the municipality of Divinópolis, Minas Gerais state, detected that overweight was also present in 31.4% of the population.

The School Health Program, in its scope, covers important issues for the prevention and combat of childhood overweight. Silva,[9] when assessed Brazilian municipalities that had adhered to the PSE, for the period from 2008 to 2013, found that the promotion of healthy eating was the theme most mentioned from

Table 2 – Nutritional status of schoolchildren, according to sex and age group, Itapevi-SP, 2014

Sex and age group (in years)	Underweight		Normal		Overweight		Total
	n	%	n	%	n	%	n
Girls							
5|–|9	57	1.9	2,092	67.9	932	30.2	3,081
10|–|14	9	2.8	206	63.4	110	33.8	325
Subtotal	66	1.9	2,298	67.5	1,042	30.6	3,406
Boys							
5|–|9	58	1.8	2,162	67.5	984	30.7	3,204
10|–|14	11	2.7	275	67,6	121	29.7	407
Subtotal	69	1.9	2,437	67.5	1,105	30.6	3,611
Total	135	1.9	4,735	67.5	2,147	30.6	7,017

Notes:
Test χ^2 for overweight and age group (5 to 9 years old) according to sex = 0.15 (p=0.700)
Test χ^2 for overweight and age group (10 to 14 years old) according to sex = 1.45 (p=0.229)

Table 3 – Monthly distribution of breakfast/snack foods according to the categories of the NOVA[a] Classification in the municipality of Itapevi-SP, 2014

Categories of foods	Feb	Mar	April	May	Jun	Total	
	n	n	n	n	n	n	%
Unprocessed and minimally processed foods	10	11	10	12	9	52	22.5
Processed foods	5	4	3	8	1	21	9.1
Ultra-processed foods	28	34	33	37	26	158	68.4
Total	43	49	46	57	36	231	100.0

a) NOVA classification groups foods into four categories, according to the extension and purpose of processing they undergo.[13]

Table 4 – Monthly distribution of foods at lunch, according to the categories of the NOVA[a], Itapevi-SP, 2014

Categories of foods	Feb		Mar		April		May		June		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Unprocessed and minimally processed foods	100	92.6	115	92.7	118	92.9	125	91.2	92	92.9	550	92.4
Processed foods	6	5.5	7	5.7	7	5.5	9	6.6	5	5.1	34	5.7
Ultra-processed foods	2	1.9	2	1.6	2	1.6	3	2.2	2	2.0	11	1.9
Total	108	100.0	124	100.0	127	100.0	137	100.0	99	100.0	595	100.0

a) NOVA classification groups foods into four categories, according to the extension and purpose of processing they undergo.[13]

component II of the program, with emphasis on the lectures, educative actions in health/groups, and day/week of eating healthy.

In the municipality studied, it was found that the subject of healthy eating was addressed in the 14 schools that responded to the questionnaire, especially in activities such as day/week of eating healthy, food tasting, cookery workshop and vegetable-garden. Emphasis should be given to the vegetable-gardens, which may have a positive influence on preference and consumption of fruits and vegetables by students, their performance in school, social interaction, the development of the sense of responsibility, self-esteem and self-confidence, in addition to the general feeling of well-being.[16]

Concerning the themes healthy eating and nutrition, they were addressed especially in disciplines such as Science and Physical Education. There are, however, vast possibility of insertion of these subjects in disciplines such as History, Geography and Arts, in which the approach can be extended to socio-cultural and environmental aspects of food; this is the situation of the classrooms in the public schools of São Paulo state, where they discuss, within the disciplines of Science, Geography and History, subjects that range from questions about the land and economic crises to globalization and the sustainable use of natural resources.[17]

Concerning physical activity, the recommendation of the World Health Organization for children and teenagers from 5 to 17 years old is to accumulate at least 60 minutes per day of moderate-intensity to vigorous physical activity, the majority being of aerobic nature, and - at least 3 times a week – exercises that allow to strengthen muscles and bones.[18] It is important to stress that interventions that promote physical activity, combined to nutritional education, may prove to be even more significant in reducing body weight.[19] The city studied, by offering two classes of Physical Education in the curriculum, in addition to extracurricular activities and sports, contributes to the accomplishment of the recommendations proposed.

The analysis of school menus by using the reference that deals with the distribution of food and food products in categories according to the type of processing used in their production,[13] exposes the possibility of investigating the quality of food, nutrient intake, and nutritional recommendations.

Thus, it was found high proportion of ultra-processed food in the breakfast/afternoon snack, while in the lunch meal mainly unprocessed and minimally processed food, partially indicating the production conditions of the meals, since the proposed menu for lunch is based in culinary preparations. On the other hand, the breakfast and afternoon snack, probably due to the need of preparation in a briefer period of time, include in their menu ready-to-eat food, such as chocolate, strawberry enriching, milk drink, cookies, soy-based drinks, corn cereal, cookies, bread, margarine and cream cheese. The offer of ultra-processed foods on the menu of the Brazilian schools[20-22] is likely to change, since there is planning and creativity in the development of small meals/snacks, certainly contributing to the adoption of healthier eating habits still during childhood.

Industrial processes employed in the formulation of ultra-processed food make these products highly convenient: they are ready-to-eat foods, profitable due to the low cost and, above all, they are competitive foods compared to the unprocessed, minimally processed and culinary preparations. A diet with a high proportion of ultra-processed food offers, in addition to a high amount of fats and sugars, insufficient amount of fiber, vitamins and minerals.[23] The consumption of these foods should be avoided and limited, due to

their nutritional composition unbalanced, besides their relationship with the development of chronic diseases and negative impact on the environment, culture and social life.[13,24]

As an example of ultra-processed product is the sugar drinks, which feature lower power of satiety and, when compared to solid foods, they contain sugars as only sources of calories, contributing to the increased daily caloric intake and, if not adjusted to the energy expenditure, excessive weight gain throughout life.[25] A cohort study conducted with American children, born in the year of 2001 and longitudinally accompanied – 9 months and 2, 4 and 5 years –, found a higher risk of high BMI among children of 4 and 5 years who had regularly consumed sweetened drinks.[26]

The possible limitations of this study refers to the impossibility of direct observation of the information reported about the curricular and extracurricular activities based on the themes of food, nutrition and physical activity, considering that this information was obtained from responses given to a self-administered questionnaire. Additionally, it should be noted that the information gathered indicates the offer of activities and food, but do not inform about adherence or consumption of schoolchildren. Nor was it possible to measure the impact that the absence of response from seven schools had on the results, or more precisely, if the degree of adherence to the activities to be analyzed interfered in the interest of the institution to participate in the study.

To tackle and control childhood overweight requires efforts from various fields and sectors. The school, through the share of experiences and exchange of knowledge, shows potentially favorable to the creation of healthy lifestyle habits, not only for children, but also for their families and community.[4]

Overweight in the studied schools reach about one in every three children. The evaluation of nutritional status and development of themes related to healthy eating and nutrition, in addition to promoting the practice of physical activity, were present in the Political-Pedagogic Projects of these schools.

There is the need of higher standardization of the various meals' menus of schools considering the supply of healthy foods. The presence of ultra-processed food in breakfast and afternoon snack is considerably meaningful, unlike lunch, in which the participation of unprocessed and minimally processed foods is satisfactory.

Programs and public policies focused on the school environment should be constantly evaluated, monitored and, when necessary, modified, always considering the participation of the various actors involved, so that the actions to be undertaken are designed and built collectively.

Authors' contributions

Batista MSA participated in the conception and design of the study, analysis and interpretation of data and drafting of the manuscript. Mondini L participated in the conception and design of the study, analysis and interpretation of data and critical review of the manuscript. Jaime PC participated in the interpretation of data and critical review of the manuscript. All authors participated in writing the manuscript, approved its final version and declare to be responsible for all aspects of the work, ensuring their accuracy and integrity.

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Received on 18/09/2016
Approved on 10/02/2017