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Qualitative evaluation of the menu and plate waste in public day care centers in São Paulo city, Brazil

Avaliação qualitativa do cardápio e desperdício de alimentos em creches públicas do município de São Paulo

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ABSTRACT

Objective

This study assessed menu quality and plate waste in public day care centers of São Paulo (SP), Brazil.

Methods

This cross-sectional study collected data from the nurseries of seven day care centers, totaling 366 children aged 12 to 36 months. Each day care center was assessed for three days, totaling 42 days and 210 meals. Menu quality was assessed by the Qualitative Analysis of Menu Preparations method (*Análise Qualitativa das Preparações do Cardápio*), adapted for day care centers, which provides nutritional and sensory criteria. Food waste was determined by the Plate Waste-Ingestion Index.

Results

The supply of vegetables was inadequate in more than 90% of the days, and the amount of leafy vegetables and high-sulfur foods met the recommended amounts on 50% of the days. The supply of sweets and foods containing trans fatty acids was considerable. The Plate Waste-Ingestion Index for daycare centers varied from 25% to 43%, and the Plate Waste-Ingestion Index for food items varied from 11% to 47%.

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Conclusion

The preparations served and serving sizes clearly need to be reviewed, and new menu creation strategies are needed to control food waste.

Indexing terms: Child day care centers. Food quality. Menu planning. School feeding. Waste of water.

RESUMO

Objetivo

Avaliar qualitativamente o cardápio e o desperdício de alimentos em creches públicas de São Paulo (SP).

Métodos

Este estudo é transversal e os dados foram coletados nos berçários de 7 creches, que atendiam 366 crianças entre 12 e 36 meses. Cada creche foi avaliada durante 3 dias, totalizando 42 dias e 210 refeições. A qualidade do cardápio foi avaliada segundo o método Análise Qualitativa das Preparações do Cardápio, adaptado à realidade de creches, que estabelece critérios nutricionais e sensoriais. Foi avaliado o desperdício de alimentos pelo Índice de Resto-Ingestão.

Resultados

Os resultados refletiram que a oferta de legumes e verduras foi insuficiente em mais de 90% dos dias e, a quantidade de folhosos e alimentos ricos em enxofre foi compatível com o recomendado em metade dos dias, sendo expressiva a oferta de doces e alimentos contendo ácidos graxos trans. O Índice de Resto - Ingestão variou de 25% a 43% nas creches e de 11% a 47% nos alimentos analisados.

Conclusão

Evidencia-se a importância de revisão das preparações servidas e porcionamento dos alimentos, sendo necessária a adoção de novas estratégias na elaboração dos cardápios, visando o controle do desperdício alimentar.

Termos de indexação: Creches. Qualidade dos alimentos. Planejamento de cardápio. Alimentação escolar. Desperdício de alimentos.

INTRODUCTION

Children's growth and development are not only influenced by appropriate nutrition but also by the establishment of healthy food preferences and eating behaviors, built daily at home and day care centers, in the context of food selection, preparation and supply¹.

In Brazil, more than two million children are enrolled in day care centers, also known as Child Education Centers (*Centro de Educação Infantil* - CEI), where they stay from 10 to 12 hours a day and receive five meals a day². All CEI children are covered by the National School Food Program (*Programa Nacional de Alimentação Escolar* - PNAE) which establishes that menus should provide 70% of the nutritional requirements of the children who stay at CEI full time³. A social investment of R\$150 million is needed to feed the two million children enrolled in day care centers⁴.

Despite the numerous programs and guidelines that aim to protect children at school, studies around the world show that it is very challenging to meet the proposed norms, often resulting in inadequate nutritional supply^{5,6}.

Given the multimillionaire PNAE investment, it is important to investigate and quantify plate waste, since it affects the cost-benefit of the served meals and calls attention to possible failures in menu creation, food selection and preparation, and the individual portion size used in the facility⁷.

Brazil is one of the ten countries that most waste food, discarding annually the equivalent of R\$12 billion, which is enough to feed roughly R\$30 million people, or eight million families⁸.

The waste chain extends from harvest to the consumer's table, where waste plate-ingestion is the ratio between the food left on the plate by

the consumer and the amount of food offered. In healthy populations, the acceptable plate waste limit is 10%⁹.

Poulain & Proença¹⁰ argue that for a food to sustain life, it needs not only nutritional quality, expressed by its carbohydrate, protein, fat, vitamin and mineral contents, but also familiarity and acceptance by the individual and social group. Food should have four essential functions: nutritional, hygienic, hedonic and social. Hence, aspects such as taste, color, shape, aroma, texture, temperature, serving time, and eating environment, among others, are components that need to be taken into account by nutritional approaches and assessments of meal acceptance.

Therefore, Veiros & Proença¹¹ developed the method (*Avaliação Qualitativa das Preparações do Cardápio* - AQPC) for analyzing menu quality in terms of menu items and their nutritional and sensory aspects. The method was adapted by Menegazzo *et al.*¹² to the CEI reality according to the PNAE and *Guia Alimentar para a População Brasileira*^{3,13}.

With this context in mind, the objective of the present study was to make a qualitative assessment of the nutritional and sensory aspects of day care center menu preparations and quantify the plate waste of children that attend public day care centers in the municipality of São Paulo (SP), Brazil.

METHODS

This study is part of the project "Efficient Day care Center Project (*Projeto Creche Eficiente*): Impact of training public/philanthropic day care center educators on hygiene and dietary practices and on suckling infants' health and nutrition", which aimed to train, improve and update daycare center educators on the health and nutrition care given to suckling infants and assess the knowledge they gained with respect to their work. Day care center selection and the assessment

criteria are described in another publication¹⁴. Of the eight selected day care centers, one was excluded because it was not interested in participating in the study during the collection period of the data presented here.

The present study is a cross-sectional study done in the 14 nurseries of the selected day care centers. Data were collected from September to December 2010 by four graduate nutrition students of the *Universidade Federal de São Paulo* (Unifesp).

All day care centers that participated in this study has two nurseries (Nursery I and II) that run full time from Monday to Friday and serve five meals a day, namely breakfast, mid-morning snack, lunch, mid-afternoon snack and supper.

The menus of the meals served in the 14 nurseries of the selected day care centers were assessed on three nonconsecutive weekdays, corresponding to 42 assessed days and 210 meals.

Menu quality was assessed by the AQPC method adapted to CEI reality¹², which considers eight assessment criteria:

1. *Presence of fruits and fruit juices*: according to the recommendations, at least three fruit servings should be consumed per day^{13,15}. Since children are also recommended to have one full meal at home³, two fruit and/or natural fruit juice servings was considered adequate.

2. *Presence of vegetables*: analyzed in the same way as fruits since at least three vegetable servings should be consumed per day^{13,15}. Two servings was considered adequate since that the child should have a third serving at home. Soups, chicken soup, pies and cakes, among others, that did not have a vegetable as the main ingredient were not counted.

3. *Presence of raw leafy vegetables*: at least one serving of raw leafy greens was considered adequate¹².

4. *Color monotony*: only lunch and supper were assessed since the other meals consisted of only two preparations with no variations. This

criterion was considered appropriate when at least 50% of the foods or preparations had different colors.

5. *Presence of high-sulfur foods*: since high-sulfur foods produce flatulence that may cause gastrointestinal discomfort and nuisance in the child¹⁶, side dishes and salads were analyzed. This item was considered adequate when there was at most one high-sulfur food or preparation in the meal. The foods included in this assessment were avocado, chard, celery, peanuts, sweet potato, garlic, onion, walnut, broccoli, Brussels sprouts, cauliflower, peas, ginger, guava, jackfruit, lentils, apple, watermelon, corn, melon, mustard, turnip, nuts, egg, radish, cabbage and grapes. Beans were not included in this assessment since it should be consumed daily^{13,15}.

6. *Presence of sweets*: considering that the maximum recommended intake of sugars and sweets is one serving a day^{13,15}, a maximum of one serving was considered appropriate. This assessment included ready-to-eat preparations, such as chocolate milk, jelly, pudding, *dulce de leche*, cakes, and powdered fruit drinks with sugar as main ingredient.

7. *Presence of high-fat meats or deep-fried foods*: here, lunch and supper were assessed separately. This criterion was classified as appropriate when a maximum of 25% of the meats and hot side dishes offered during the day consisted of high-fat meats and deep-fried foods. High-fat meats were defined as meats with 50% of their energy contents coming from fats, namely filet steak, flank, sparerib, cover steak, rib, organ meats, tenderloin, beef clod and short plate¹⁷.

8. *Presence of foods and/or preparations with trans fatty acids*: since there are no established upper safe limits for this nutrient¹⁸, the absence of foods and preparations with this type of fatty acid was considered appropriate.

All preparations in the menu were first classified according to each of the criteria above. For this purpose, the Brazilian Food Composition Table (*Tabela Brasileira de Composição de Ali-*

mentos - TACO)¹⁹ and the nutrition facts labels of the processed foods were used. Next, the frequency of occurrence of the criteria expressed as percentage was determined for each day care center, considering the percentage adequacy of each one.

Food waste was quantified by the Plate Waste-Ingestion Index (PWI) given by the relationship between the Weight of the Plate Waste (WPW) and Weight of the Distributed Meal (WDM), and represented by the formula $\%PWI = WPW \times 100 / WDM$ ⁷.

The weight of the distributed meals was determined by randomly collecting three servings of each food and/or preparation during distribution and calculating the mean amount served to each child. Next, the mean amount was multiplied by the number of children in each group. Second helpings were included in the calculations, thus giving the final weight of the distributed meals⁷.

The weights and/or measurements of each food and/or preparation was obtained, corresponding to the WPW served during breakfast, mid-morning snack, mid-afternoon snack and supper, when it consisted of soup only. However, for lunch and occasionally supper, the analysis considered the %PWI per meal, because the foods and preparations were mixed on the plate⁷.

The socioeconomic profiles of the children of the study institutions were determined by administering a questionnaire to their parents to determine the household income, which was determined by adding wages and other sources of income of all household members. The sum was expressed in *Reais* and converted to minimum salary units. The simple and percentage frequency distributions of the children's age, gender and socioeconomic class are described.

All data were input twice, and validated and analyzed by the statistical software Epi-Info 2000, version 3.4.3.

The project was approved by *Universidade Federal de São Paulo's* Research Ethics Committee under protocol number 0442/10.

RESULTS

The socioeconomic characterization of the children enrolled in the study day care centers is shown in Table 1. Table 1 also shows that the gender distribution of the 366 children aged 12 to 36 months of the seven study day care centers was homogeneous. The household income of 62.8% of the families that use this service varies from one to three minimum salaries.

The meals were as follows: breakfast consisted of milk (pure, chocolate milk, cocoa composite milk or coffee composite milk) and bread (with margarine or jam or cream cheese (*requeijão*) alternating with plain cookies. The mid-morning snack consisted of a natural fruit juice with added sugar. Lunch consisted of rice and beans or pasta with beef, chicken or egg along with a raw salad and/or cooked vegetables, plus dessert (a fruit or sweet). The mid-afternoon snack consisted of only milk (pure, chocolate milk, cocoa milk composite or coffee milk composite). Supper was identical to lunch or consisted exclusively of soup and dessert (a fruit or sweet).

Table 1. Socioeconomic and demographic characteristics of the children attending public day care centers. *São Paulo* (SP), Brazil, 2010.

Variable	Day care centers															
	1		2		3		4		5		6		7		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<i>Age (months)</i>																
12-24	38	49.4	24	54.5	30	50.8	28	43.1	7	31.8	25	46.3	8	17.8	160	43.7
24-36	39	50.6	20	45.5	29	49.2	37	56.9	15	68.2	29	53.7	37	82.2	206	56.3
<i>Gender</i>																
Female	35	45.5	20	45.5	23	39.0	24	36.9	10	45.5	22	40.7	21	46.7	155	42.3
Male	42	54.5	24	54.5	36	61.0	41	63.1	12	54.5	32	59.3	24	53.3	211	57.7
<i>Household income (MS)¹</i>																
<1.0	1	1.3	6	13.6	7	12.1	5	7.8	1	4.5	2	3.8	3	6.7	25	6.9
1.0-2.0	23	29.9	26	59.1	19	32.8	21	32.8	7	31.8	21	39.6	19	42.2	136	37.5
2.0-3.0	26	33.8	5	11.4	18	31.0	18	28.1	2	9.1	10	18.9	13	28.9	92	25.3
>3.0	27	35.1	7	15.9	14	24.1	20	31.3	12	54.5	20	37.7	10	22.2	110	30.3

Note: ¹Minimum salary at the time of the study: R\$510.00.

Table 2. Analysis of the menu offered in public day care centers: number of days in which each study criterion was appropriate. *São Paulo* (SP), Brazil, 2010.

Day care center	Menu days (n)	Fruits	Vegetables	Leafy vegetables	Colors (lunch/supper)	Sulfur	Sweets	Meats	Trans fatty acids	Adequacy by center	
										n	%
1	6	6	2	0	4	4	0	4	0	20	41.7
2	6	5	0	2	3	4	0	3	0	20	41.7
3	6	6	0	2	3	5	0	5	0	21	43.8
4	6	6	0	5	0	0	0	6	0	17	35.4
5	6	6	0	4	1	2	0	6	0	19	39.6
6	6	6	0	6	0	4	0	6	0	26	54.2
7	6	6	2	2	4	4	0	2	0	20	41.7
Adequacy n by	42	41	4	21	15	23	0	32	0	143	
Criterion %	100.0	97.6	9.5	50.0	35.7	54.8	0.0	76.2	0.0		42.6

Table 3. Plate Waste-Ingestion Index (PWI)^a of the different foods or preparations offered in public day care centers. São Paulo (SP), Brazil, 2010.

Day care	Plate waste-ingestion index (PWI) (%)									
	Milk ¹	Bread	Cookies	Fruit juices	Full meal ²	Fruits	Sweets ³	Milk ⁴	Soup	Total Mean
1	37	42	23	10	35	33	11	21	17	25
2	49	62	51	4	35	26	19	21	15	34
3	57	66	39	36	58	39	9	31	no	43
4	37	24	50	19	49	51	11	28	35	34
5	50	18	50	16	48	44	5	57	no	37
6	77	33	59	17	31	27	no	41	no	41
7	24	35	18	22	29	22	no	30	39	28
Total Mean	47	40	41	17	41	35	11	33	27	34

Note: ¹%IR= Weight of the Plate Waste (WPW) x 100/Weight of the Distributed Food (WDF); ¹Milk offered at breakfast, being either pure, chocolate milk, cocoa milk composite or coffee milk composite; ²Lunch and supper; ³Jelly, pudding, rice pudding, cake and processed sweet; ⁴Milk offered at the mid-afternoon snack, being either pure, chocolate milk, cocoa composite milk or coffee composite milk; no - food not offered on the study days.

The soups offered on the study days were vegetable, bean, chicken and vegetable, and pasta soups.

Table 2 shows the number of days in which each of the analyzed criteria occurred. The supply of fruits was adequate in nearly all study days. On the other hand, the supply of vegetables was inadequate in more than 90% of the days, and the amounts of leafy vegetables and high-sulfur foods met the expectations in only 50% of the study days. The supply of sweets and foods containing *trans* fatty acids in the menu was considerable.

Food waste, expressed as percentage of plate waste-ingestion, is shown in Table 3, showing that in all institutions and for all study foods, the amount of plate waste exceeded the acceptable limit of 10%.

DISCUSSION

The supply of fruits was adequate because it was not in the menu of only one of the study days. Discordant results were found by Menegazzo *et al.*¹², who found that fruits were offered in the menus of CEI for children aged two to six years in only 4,0% of the study days and by Neelon *et al.*²⁰, who found that fruits were listed in the menus planned for children aged up to six

years but were offered on only 14.4% of the study days.

Although the supply frequency was adequate, the amount of fruits offered may be inadequate, since PWI was 35%, emphasizing the importance of encouraging fruit intake through nutrition education measures starting in early childhood. Meanwhile, fruit juices had a lower PWI (17%). The ease with which juice can be consumed when compared with fruit, since it does not require chewing, may contribute to its better acceptance. On the other hand, juices contain fewer fibers and nutrients²¹.

The supply of vegetables (9.5%) and raw leafy vegetables (50.0%) was inadequate. This is worrisome since the intake of these foods in Brazil has been declining, with a reduction of 5.0 to 8.0% between the years of 2003 and 2008, which is even more pronounced in lower-income families²², the ones to which the study children belong.

The presence of vegetables, including raw leafy vegetables, varied from 0 to 100%, emphasizing the absence of standardization or compliance with the menu. Hence, some institutions offer vegetables daily while others do not.

Meals were considered adequately colorful on 35.7% of the study days and color-

monotonous meals were observed in the different day care centers 33.0% to 100.0% of the time. This variation may reflect the cook's creativity for preparing different foods and the need of training these professionals so that they may increase the attractiveness of a dish without changing the menu composition. The lunch and supper PWI was 41.0%; although this datum is multicausal, it may be affected by meal appearance, which may prevent acceptance by the children¹⁵.

On 45.2% of the study days, too many high-sulfur foods were offered. Food with a high content of sulfur-containing amino acids increases the sensation of gastric discomfort because of gas production after the meals¹⁶.

Sweets were offered on all study days and institutions. This is worrisome because sugar intake is associated with a general reduction in diet quality, early-onset overweight and obesity²³ and development of Non-Communicable Chronic Diseases (NCCD) and respective risk factors²⁴. Additionally, excessive and frequent sugar intake promotes dental caries²⁵, which is aggravated by the absence of tooth-brushing in the CEI routine.

This criterion includes processed foods, such as sweets, chocolate milk, pudding and jelly, and the literature shows that this situation is also seen at home. While studying the ages in which foods are introduced to children that attend day care centers, Toloni *et al.*²⁶ found that more than 70% of the parents had offered sandwich cookies, candies, lollipops, chocolate and jelly before the child's first year of age. Hence, children should be discouraged from consuming excess sweets and added sugar.

Processed foods contain too much sodium and chronic sodium intake is associated with high blood pressure and mortality from cardiovascular diseases. Epidemiological studies offer consistent evidence that adult high blood pressure begins during childhood²⁷.

The familiarity and appreciation of sweets by children is reflected by the lower PWI observed in this study, corresponding to only 11%.

The supply of meats was appropriate in 76.2% of the days. On the other days, fat meats were offered. Fried foods were not offered, since the Department of School Food (DME) of the municipality of *São Paulo* recommends that this type of preparation should only be offered to children aged two years or more and at most, once every 15 days. A different reality is seen in Portuguese kindergartens: according to Lopes & Rocha²⁸, 21% of the monthly menus contain meals with some deep-fried component, and as many as 45.0% of the meals of some cafeterias contained deep-fried items. Concordantly, Erinsho *et al.*⁶ studied 40 day care centers in New York during one day and found that 6.7% of the study institutions served French fries.

Foods containing *trans* fatty acids were present in all menus, but it must be reemphasized that no safe upper intake limit has been established. The World Health Organization¹⁸ recommends that the maximum daily intake should not exceed 1% of the total energy intake. The present study prioritized the TACO¹⁹ for assessing this criterion since the information contained in nutrition facts labels regarding this substance is unreliable. According to the *Regulamento Técnico de Porções de Alimentos Embalados Para Fins de Rotulagem Nutricional*²⁹, the content of a nutrient can be expressed as "zero" or "absent" if the food contains less than or equal the amounts deemed insignificant. Hence, if a serving of a food contains 0.2g or less of *trans* fatty acids, the manufacturer may omit it.

Regarding food waste, the mean PWI for day care centers varied from 25% to 43%, and for foods and preparations from 11% to 47%.

The foods that composed breakfast, namely milk, bread and cookies, were those with the highest PWI, namely 47%, 40% and 41%, respectively. These percentages may be justified by the fact that, according to the literature, most children have breakfast at home³⁰.

The plate waste associated with full meals (lunch and supper) was worrisome because only

60.0% of the food on the plate was consumed. While studying school meals in Portugal, Campos *et al.*³¹ found a mean PWI of 31.0%, and a minimum PWI of 17.0%. On the other hand, Martins *et al.*³² found that plate waste varied from 1.8 to 7.5% in public schools of *Piracicaba*, SP, Brazil.

Soups (vegetables, beans, chicken with vegetables, and pasta) were better accepted than full meals, with a PWI 34% lower than that of full meals. Analogously, Martins *et al.*³² studied the acceptance of different preparations offered at school and found an acceptability of 90% for pasta soup. Although this is good from the waste viewpoint, the replacement of foods by soup should not be encouraged since soups have less flavor differentiation and taste stimulation, requires less chewing, and contains lower energy density¹⁵.

The sensory characteristics of the menu may be influenced not only by the color monotony of these meals, but also by environmentally-related operational factors. According to the literature, food rejection increases when cafeterias are overcrowded and excessively noisy. In fact, it is known that an unpleasant eating environment affects eating behavior³³. Moreover, food supply dynamics may reflect both the lack of motivation of the employees to improve meal acceptance and the difficulty of feeding young children during the meal period of the institution. It is noteworthy that each educator is responsible for the care and feeding of nine children¹.

Nahikian-Nelms³⁴ proposes important behaviors that educators should display during mealtime as a way to encourage eating and the formation of healthy eating habits, such as sitting at the table with the children, eating the same foods, not rushing the children, encouraging them to try the foods, not forcing them to eat, not using food as a prize, reward or punishment, having a pleasant conversation during the meal and creating opportunities for nutrition education during the meal.

Since the study group is under two years of age, assessing the factors that influence meal acceptance is difficult because during this period, children are beginning to learn the process of verbal communication, so food-related aversions, desires and sensations cannot be fully manifested¹. This may explain the high level of plate waste observed in the present study.

It is noteworthy that plate waste is responsible for unnecessary costs and violates social, ethical and environmental issues. Furthermore, it reflects the poor quality of meals, highlighting possible failures in menu development, determination of serving sizes and definition of nutritional requirements.

Under the light of this premise, the importance of a dietician in the staff is highlighted, since dieticians learned to implement and supervise the periodical assessment of the plate waste-ingestion index and to analyze and identify the causes of food waste, performing regular reviews of serving sizes, developing projects of food and nutrition education, and promoting social, ecological and environmental awareness⁹.

With respect to school food, dieticians should encourage educators to join forces, promote reflections and contribute to the acknowledgment of the school environment as a space for the development of food security, understood as the universal access to food in nutritionally appropriate quantity and quality to ensure health³⁵.

In this sense, to control means to analyze, compare and assess the procedures and performance of food services, aiming to reduce waste and optimize productivity once the production processes are known. The results are productivity gains, guaranteed quality service, less waste and inexpensive meals. To be effective and complete, waste-reduction programs must aggregate behavioral changes, education, and, especially, awareness of food handlers, thereby engaging in a war against hunger and for citizenship.

CONCLUSION

The present study found that the meals given to the children are low in vegetables, including leafy vegetables, and high in sweets, high-sulfur foods, fat meats and foods containing *trans* fatty acids. The meals are also monotonous in terms of colors.

Additionally, the PWI indicated high plate waste, since more than half of the food offered to the children was discarded. Hence, it is necessary to pay attention to the preparations and respective serving sizes, and to adopt new strategies for menu creation and planning, a critical step for controlling food waste.

COLLABORATORS

GL-SILVA helped to conceive, analyze and interpret the data, and write the article. MHA TOLONI helped to analyze and interpret the data. SSP RODRIGUES helped to analyze and interpret the data and in the critical review. AMCN ROCHA helped to analyze and interpret the data and in the critical review. JAAC TADDEI helped in the critical review and approval of the version to be published.

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