

Ingestion leftovers of vegetables in schools of Carapicuíba, São Paulo**Resto ingestão de hortaliças em escolas de Carapicuíba-SP****Resto ingestión de hortalizas en escuelas de Carapicuíba-SP****Received: 21/05/2016****Approved: 03/10/2016****Published: 15/02/2017****Quétlin Soares Silva¹****Rosidalma Moreira Andrade²****Cristina Etosi Ricardo Azevedo³****Sabrina Daniela Lopes Viana⁴****Nyvian Alexandre Kutz⁵****Marcia Maria Hernandes de Abreu de Oliveira Salgueiro⁶**

This study aims to check the intake leftovers of vegetables served to public school students before and after a Nutritional Intervention. It is an intervention study focused on evaluating the consumption of vegetables in five public schools in Carapicuíba, São Paulo, Brazil. The participants were 5630 students from elementary school, aged between 6 and 10 years old. Food preparation and distribution of foods served as school meals were accompanied. The best results of ingestion leftovers after the nutritional intervention in the morning and afternoon were obtained in school 3, followed by school 5. Ingestion leftovers was reduced in most schools in both periods, including an increase in the portions offered in some schools after the nutritional intervention.

Descriptors: School health; School feeding; Public policies.

Este estudo tem como objetivo verificar o resto ingestão de hortaliças servidas aos alunos de escolas públicas antes e após uma intervenção nutricional. É um estudo de intervenção com foco na avaliação do consumo de hortaliças realizada em cinco escolas municipais de Carapicuíba, São Paulo. Participaram da pesquisa 5630 alunos do ensino fundamental I, com idade entre 6 e 10 anos. Foram acompanhadas as etapas de preparo e distribuição dos alimentos oferecidos na merenda escolar. Os melhores resultados de resto ingestão após a intervenção nutricional nos períodos matutino e vespertino foram obtidos na escola 3, seguido pela 5. O resto ingestão reduziu na maioria das escolas nos dois períodos com o aumento na porção oferecida em algumas escolas após a intervenção nutricional.

Descritores: Saúde escolar; Alimentação escolar; Políticas públicas.

Este estudio tiene objetivo verificar el resto ingestión de hortalizas servidas a los alumnos de escuelas públicas antes y después de una intervención nutricional. Estudio de intervención con foco en la evaluación del consumo de hortalizas realizada en cinco escuelas municipales de Carapicuíba, São Paulo. Participaron de la investigación 5630 alumnos de enseñanza fundamental I, con edad entre 6 y 10 años. Fueron acompañadas las etapas de preparación y distribución de los alimentos ofrecidos en la merienda escolar. Los mejores resultados de resto ingestión después de la intervención nutricional en los turnos mañana y tarde fueron obtenidos en la escuela 3, seguida por la 5. El resto ingestión redujo en la mayoría de las escuelas en los dos turnos con el aumento en la porción ofrecida en algunas escuelas después de la intervención nutricional.

Descriptores: Salud escolar; Alimentación escolar; Políticas públicas.

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INTRODUCTION

Eating habits are directly connected to the health of the individual and of the population. According to the Food Guide for the Brazilian People, vegetables are healthy foods, and are excellent sources of several vitamins and minerals. A healthy diet containing vegetables is considered to be an effective method in the prevention of several types of diseases and complications in health, such as: weight excess, cardiovascular diseases, cancer, diabetes and other kinds of non-transmissible chronic diseases¹.

Bertin *et al*² state that health eating habits must be acquired during childhood, as they are a great beneficial influence for their whole life. Lazari *et al*.³ suggest that the greatest difficulty in the changing of eating habits is due to neophobia, which is the fear of trying new foods and flavors. Due to it, the child does not want to try any type of food that is different or is not already one of their preferences⁴.

Providing food for children in schools is a policy implemented in March, 31, 1955, through the Decree nº 37,106 - the National Program of School Nutrition (PNAE), also known as school lunch. Since then, it has been improved through Regulatory Ordinances and Decrees, to become more adequate to the contemporary reality⁵.

The PNAE states that the offer of adequate foods must happen in school, as this is a period in which the main eating habits of children are created⁶.

Therefore, the objective of this work was to verify the leftovers from the ingestion of vegetables served to students of public schools in a city in the greater São Paulo, before and after a nutritional intervention (NI).

METHOD

It is interventionist studies that focus on the evaluation of vegetable intake measured through the ingestion leftovers (IL) before and after a NI. This was considered to be a field research, as it was an empirical investigation, conducted on the place where the phenomenon occurs⁵.

This research is part of a project entitled "Assessment of nutritional status of students in the elementary school I do município de Carapicuíba", which was approved by the Research Ethics Committee of the Centro Universitário Adventista de São Paulo under the 393,444 Protocol and by the Secretary of Education of Carapicuíba. The investigation was motivated by the cities in terest in dimishing food waste and improving the offer of nutrients to the students under the PNAE.

The research was conducted in five municipal Carapicuíba schools, located in the metropolitan region of São Paulo, between August and November of 2014. 5630 students from basic school, aged between 6 and 10 years old, participated.

The first data collection of the IL was conducted before the NI. The IL is defined by the Federal Council of Nutritionists (CFN) as the ratio of the leftovers in the trays and dishes left by the clients to the amount of food offered, expressed in a percentage; rates under 10% are considered to be acceptable⁷.

A NI involving recreational activities with the students in all classrooms in the morning and afternoon periods was conducted. The researchers were trained and divided into pairs and trios, each of them performing the educational action in a certain number of classrooms. The NI was divided in three steps: theater moment, dynamic moment and picture collage.

Two months after the NI, a second IL was conducted, to verify the impact of the educational action.

In this study, not every student could serve themselves with vegetables. In this cases, they could serve rice and beans as they wanted, but the vegetables and the main dish (meat, fish, and eggs) was distributed by the servers.

The IL was not measured in Mondays, due to the difficulty of receiving the food at school, or in dates that could compromise school attendance.

The second data collection happened in the same day of the week of the first one - an attempt to analyze a day in which the same

vegetables are served, according to the planned menu of the city.

The vegetable consumption of the students was evaluated during the meal served in one day, in the lunch break between the classes in every school.

The vegetables were weighted before distribution, as was the amount regularly served to the students. At the end of distribution, the clean leftovers (food prepared but not distributed)⁸ was verified, as well as the IL of the vegetables.

One of the researchers was responsible for verifying the distribution conducted by the servers; another helped the students to discard the leftover food in each trash bin, one for vegetables and another for the rest of the food in their plates; a third one helped by counting how many students were present in each period, per meal. During distribution, portioned plates were weighted at random, to verify if the portion initially established was being served.

All data were noted in a worksheet, and the software Microsoft Excel was used to perform the necessary calculations and determine the IL for each period in each school.

To calculate the amount of food consumed and the IL, the formulas recommended by Vaz⁹ were used, considering: weight of the meal distributed (Kg) = total amount produced - leftovers ready after the meals are served.

Disposable material, including fruit and vegetable peels, was discarded with the aid of collaborators, in separate food containers, so as not to influence the IL calculations. The weight of the portions was calculated using the formula: consumption *per capita* per meal (Kg) = weight of the meal distributed / number of meals consumed.

To calculate the IL rate, the following formula was used: % of IL = weight of the

leftovers x 100 / weight of the meal distributed. For the IL *per capita*, the following equation was used: IL *per capita* (Kg) = weight of leftovers / number of meals served.

RESULTS

The results shown in Tables 1 and 2 show the IL differences before and after the NI. In Table 1 are the results found in the morning period, in which school 1 presented, initially 19.68% IL from a portion which was composed on average of 63g of vegetables (chard and carrots). After the NI, the IL was of 17% in an average portion of 30g.

School 2 presented the smallest IL before the NI, 4.52% in a 44g portion (beetroot). After the NI, the IL increased to 22% (collard greens and tomato) with practically the same portion served, 40g.

The best result in the period was found in School 3, followed by School 5. Their percentile reduction of IL was from 17.4% to 13% (beetroot) and from 9.5% to 1% (zucchini), even including an increase in the average portion from 30g to 68g in school 3 and from 18g to 34g in school 5.

School 4 kept the IL percentile before and after the NI with an increase in the average vegetable portion offered by the school from 29g to 59g (carrots and zucchini) due to a diminished number of meals distributed.

In Table 2, the results in the afternoon period can be found, and they show that in School 1 there was a decrease in the IL from 19.46% to 12% (chard and carrots), with a reduction in the average portion served from 78g to 12.5g.

In School 2, there was a reduction in the IL from 30.7% (beetroot) to 8.15% (collard green and tomato), and an increase in the average portion from 22g to 47g, in spite of a smaller number of meals served.

Table 1 - Ingestion leftovers before and after a nutritional intervention in 5 public schools of the city of Carpicuíba, SP/Brazil in the morning period, 2014.

	BEFORE INTERVENTION			AFTER INTERVENTION		
	nM	IL (%)	AP (g)	nM	IL (%)	AP (g)
School 1	94	19.68	63	226	17	30

School 2	124	4.52	44	76	22	40
School 3	123	17.4	30	153	13	68
School 4	219	32.0	29	107	33	50
School 5	148	9.5	18	163	1	34

nM: number of meals; IL: ingestion leftovers; AP: average portion

The best result in the afternoon period was in School 3, followed by School 5, with a respective reduction of IL from 50% to 19% (beetroot), and from 15% to 1% (zucchini), and an increase in the portions from 16g to 34g in

School 3, and from 18 g to 33g in School 5. School 4 had similar results in the morning period, remaining stable in its IL percentile and in its average portion of vegetables (carrots and zucchini).

Table 2 - Ingestion leftovers before and after a nutritional intervention in 5 public schools of the city of Carpicuiba, SP/Brazil in the afternoon period, 2014.

	BEFORE INTERVENTION			AFTER INTERVENTION		
	nM	IL (%)	AP (g)	nM	IL (%)	AP (g)
School 1	103	19.46	78	152	12	12.5
School 2	139	30.7	22	89	8.15	47
School 3	130	50	16	166	19	34
School 4	230	24	31	131	27	49
School 5	131	15	18	124	1	33

nM: number of meals; IL: ingestion leftovers; AP: average portion

DISCUSSION

The IL varied from 1 to 50%. A comparison could not be done in Schools 1 and 2 due to a lack of standardization in the portions served before and after the NI. School 4 kept the same percentile of IL before and after the NI. That was possible due to the standardization of the portions offered by the servers of the school and to the increase of the average portion offered after the NI.

Schools 3 and 5, when compared to the others, presented the best results. After the NI, two of the five evaluated schools, achieved the recommended IL results. In addition, three of them increased the portion of vegetables offered. It was noted that the involvement, support, incentive and participation of the school community contributed for the students to start consuming more vegetables. The participation of teachers in the discussion of subjects regarding the promotion of a healthy diet contributes to the improvement of the eating habits of the students. However, for it to

be effective, the teacher must talk about this theme in their lesson plans¹⁰.

In a study conducted by Zanirati *et al.*¹¹ in public schools of the city Belo Horizonte, the IL was higher than 10% both before and after the NI - numbers considered unsatisfactory. Gomes *et al.*¹² found, in their study, an IL percentile that varied from 10.56% to 19.52%. In these studies, the values were superior to those recommended. The high IL values are similar to those found in this study.

A study by Marchi, Hautrive and Cembranel¹³, who also evaluated the IL levels before and after NI measures, verified that the IL level went from 4.77% to 3.39% after the NI, showing that satisfactory IL levels can be even further reduced through educational actions.

The ingestion leftover (IL) or hedonic scale methodologies are used to apply the acceptability test, taking into account recognized technical, scientific and sensory parameters¹⁴. These activities aim at evaluating the amounts of food wasted for reasons such as

menu acceptance and inadequate portion sizes, regarding the amount of food produced. The highest the IL, the smaller the consumer satisfaction¹⁵.

Today, it is widely known that the media influences the consumption of industrialized foods high in fats, sodium and sugar, such as sandwich cookies, chips, sweets and sodas. It was noted that many students bring that kind of food to the school environment. Incorrect eating habits in a precocious age can affect the bodily composition of a child, increasing the risks of chronic diseases in their adult age, and increasing expenses with health care: medicines, physician fees, medical service auxiliaries, as well as costs associated to hospitalization and treatments. Therefore, regular nutritional education programs for the consumption of healthy food should be included in the school curriculum of the students^{16,17}.

The Government establishes that from the resources allocated to the National Fund for Education Development (FNDE), in the scope of the PNAE, at least 30% must be used to acquire fresh foods, such as fruit and vegetables, directly from family agriculture¹⁸.

The presence of industrialized foods in the school lunch breaks may have contributed to a reduction of the consumption of vegetables offered in school lunches. Elevated IL levels may be occasioned by the irregular frequency of students in school, the inadequate amount of food prepared, and the presence of neophobia¹⁹. Ferreira²⁰ also states that the control of IL can be useful for waste and cost reduction, and also as an indicator of the quality of the meal that is served, helping to determine the profile of the students served, as well as the acceptance of the chosen menu.

The Resolution CD/FNDE n^o 26, from June 17, 2013¹⁴, recommends that at least 3 portions of fruits and vegetables (200g per student every week) should be offered in schools¹⁰. The number recommended by the Food Guide for the Brazilian population for the average fruit and vegetable consumption is still low and remained stable in the last decade,

while ultra-processed foods present an increase in consumption every year⁵.

According to the PNAN, constant NI programs should be adopted to encourage vegetable consumption at schools. Such a practice should be a part of daily life, involving the planning and organization of menus, and aiming at results which indicate satisfactory eating habits. The main strategy is the permanent health education, including management and the participation of population in the school environment⁵.

Decree n^o1010 sets guidelines which favor the development of actions which promote and guarantee eating practice in the environment of public and private schools²¹.

Beyond nutritional educational actions, it is important that the nutritionist, together with the cooks, plan adequate meals to supply a part of the daily nutritional needs of the students, encouraging them to have good eating habits and avoid waste. The nutritionist has an important role to stimulate the reduction of industrialized foods consumption and the use of family agriculture products, as well as to train the cooks in the adoption of creative and nutritional receipts that use vegetables, and raise awareness among students, regarding food waste²².

Pérez-Rodrigo e Aranceta²³ highlight that school meals are valuable opportunities to generate nutritional education. Educational strategies include efforts to increase awareness about health, communication, and skill development. Other characteristics which contribute efficacy are adequate time dedication and NI intensity.

Factors such as the lack of menu acceptability tests, preparation, insufficient number of employees, absence of certain types of food, planning and contribute to the rejection of certain foods and the increase of IL. FNDE states that the nutritionist responsible for school meals must apply the acceptability test to their students whenever they introduce in the menu some new type of food, or when they alter it in any new way, or even to evaluate the acceptance of frequent menus¹⁴.

It was noted that many servers and cooks had stopped offering vegetables to students who refused eating them in the past, losing an important opportunity to encourage this consumption.

It was possible to observe that the portion of vegetables which is served was different among the schools and in the same school over different periods. It also changed in the same school and period, before and after the NI. In many moments, the amounts and types of food prepared depended on the types available in each school.

Data referring to the low consumption of vegetables are worrisome. They indicate not only the need for elaboration, but also for the re-evaluation of strategies and actions in school meals, especially when it comes to NI programs.

The need to aid the city in the implementation of the PNAE guidelines is noted in several aspects, like the training of the cooks, the standardization of menus to answer the nutritional recommendations for each age group, educational and nutritional education policies in the school curricula, the discussion of healthy diets as a cross-sectional theme in schools, among other factors that can improve the consumption of vegetables and reduce the IL¹⁴.

All of the questions and results observed have been shared with the Department of School Meals of the municipality, which seeks, through a continuous education process with the school community, to implement measures that can guarantee an adequate diet in the schools, from the planning of menus to the distribution of meals.

This research had some limitations who can be attributed to the reality of the work in the schools. The NI was conducted in only one day, confirming the need for programs of continual education, so better results can be obtained.

In some schools the children consumed both the food offered by the institution and the lunch they brought from home, often composed from industrialized foods and of low nutritional value. This may have compromised the

acceptance of the vegetables offered at halftime break.

Since this is the first NI study conducted in the public schools of the city of Carapicuíba which considers all these factors of the school daily life, some comparisons could not be established.

This study also sought to value and respect the knowledge and the perception of the cooks regarding the amount and preparation of the food in the moment the IL was measured.

CONCLUSION

The IL was reduced in most schools in both shifts, even with an increase of the portion offered in some schools after the NI - although the numbers found before and after the NI, in most schools, were above the maximum acceptable (10%).

The IL evaluation is very important for the adequacy of the food to the nutritional needs of the students. Continuous, systematic and individualized food education programs, targeted at the different realities found in schools are necessary to effectively promote healthy diets. The actions must be conducted by nutritionists who are willing to train and guide the school community.

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CONTRIBUTIONS

All authors contributed equally to the design of the study, data collection and analysis, and to the critical analysis and final writing of the article.

How to cite this article (Vancouver)

Silva QS, Andrade RM, Azevedo CER, Viana SDL, Kutz NA, Salgueiro MMHAO. Ingestion leftovers of vegetables in schools of Carapicuíba, São Paulo. *REFACS* [Internet]. 2017 [cited in: *insert day, month and year of access*]; 5 (Supl. 1):146-153. Available in: *access link*. DOI: <http://dx.doi.org/10.18554/refacs.v5i0.1999>

How to cite this article (ABNT)

SILVA, Q. S. et al. Ingestion leftovers of vegetables in schools of Carapicuíba, São Paulo. *REFACS*, Uberaba, MG, v. 5, p. 146-153, 2017. Supl. 1. Available in: *access link*. Access in: *insert day, month and year of access*. DOI: <http://dx.doi.org/10.18554/refacs.v5i0.1999>

How to cite this article (APA)

Silva Q. S, Andrade R. M, Azevedo C. E. R, Viana S. D. L, Kutz N. A & Salgueiro M. M. H. A. O. (2017). Ingestion leftovers of vegetables in schools of Carapicuíba, São Paulo. *REFACS*, 5(Supl. 1), 146-153. Recovered in: *insert day, month and year of access*. *Insert access link*. DOI: <http://dx.doi.org/10.18554/refacs.v5i0.1999>