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ARTÍCULO

IMPACT OF A COMMUNITY-BASED INTERVENTION TO INCREASE FRUIT AND VEGETABLE CONSUMPTION AMONG LOW-INCOME FAMILIES FROM SAO PAULO, BRASIL

IMPACTO DE UNA INTERVENCIÓN BASADA EN LA COMUNIDAD, EN EL MAYOR CONSUMO DE FRUTAS Y VEGETALES EN FAMILIAS DE BAJOS INGRESOS, SAO PAULO, BRASIL

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ABSTRACT

The aim of the present study was to evaluate the immediate impact of a community-based intervention intended to increase the participation of fruit and vegetables in the diet of families living in an extremely low-income community in the city of Sao Paulo. We carried out a non-controlled community-based intervention study with a sample of 36 families. The intervention included a nutritional education component and actions on the environment to improve the availability of fruit and vegetables. The immediate impact of the intervention was evaluated by comparing the participation of fruits and vegetables in the total food energy purchased in the months before and after the intervention. The intervention was effective, increasing household availability of fruit and vegetables by 2.5 percentage points (95%CI: 0.45 - 4.71).

Key words: *Intervention studies, food and nutrition education, food consumption, community trials, fruit, vegetables.*

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RESUMEN

El objetivo del presente estudio fue evaluar el impacto inmediato de una intervención comunitaria que buscó aumentar la participación de frutas y verduras en la alimentación de familias residentes en un barrio extremamente pobre de la ciudad de São Paulo. Se trata de un estudio de intervención del tipo ensayo comunitario no controlado, en una muestra de 36 familias. La intervención comprendió acciones de educación nutricional de los individuos y acciones sobre el ambiente visando a la mejoría en la accesibilidad a frutas y verduras. El impacto inmediato de la intervención fue evaluado por medio de la comparación de la participación de frutas y verduras en el valor energético total de los alimentos adquiridos por las familias en los meses anteriores y posteriores a la intervención. La intervención se demostró efectiva, aumentando la disponibilidad relativa de frutas y verduras en 2,58 puntos porcentuales (IC95%: 0,45 - 4,71).

Palabras claves: estudios de intervención, educación nutricional, consumo de alimentos, ensayo comunitario, frutas, verduras.

INTRODUCTION

Inadequate fruit and vegetable intake is one of the most important risk factors for the global burden of disease and is associated with greater risk of cardiovascular conditions and certain types of cancer (1). Fruit and vegetables are an important part of a healthy diet. In addition to being rich in nutrients, fibers, and bioactive compounds with functional properties, fruit and vegetables have low energetic density. The adequate consumption of fruit and vegetables is associated with the maintenance and control of a healthy body weight (2, 3).

If, on one hand, increasing fruit and vegetable intake is a priority in the Global Strategy on Diet agenda (4), accomplishing such a task is a great challenge, since, even in developed countries, current intake among the population falls far below recommended levels (5).

The weight of fruit and vegetables the total cost of food is indicated as a major obstacle to increasing the participation of fruit and vegetables in the dietary pattern, especially among lower-income families (6). In a prior study, in which we evaluated the determinants of fruit and vegetable consumption patterns among the adult population of Brazil, both sociodemographic indicators evaluated - schooling and household assets - independently increased the odds of adequate consumption of these items (7). In addition to financial restrictions, other factors have been found to be associated with low intake of fruit and vegetables in low-income communities. These include difficulty finding these items in local commerce due to inefficient production, distribution, and commercialization; lack of habit or motivation for consuming these items; unawareness of their importance to health; and lack of culinary ability for their preparation (8,9).

In order to evaluate the effectiveness of nutritional interventions on the demand for and consumption of fruit and vegetables among families living in the low-income

outskirts of the municipality of Sao Paulo, Southeastern Brazil, we carried out a pilot study targeting both individuals

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(nutritional education) and the environment (improvement in the accessibility of fruit and vegetables).

MATERIALS AND METHOD

We carried out a non-controlled community-based intervention study including a sample of 40 families living in two different neighborhoods of the Grajaú district, in the municipality of Sao Paulo. Grajaú, in the very south of the municipality, is Sao Paulo's most populous district (c. 330 000 inhabitants), and one of the poorest in the city, with the ninth lowest Human Development Index - HDI (0,419) among the 96 districts in Sao Paulo (10). The two neighborhoods in which the study was conducted - Jardim Noronha and Jardim Moraes Prado - are located at the very South of the Grajaú district, and were selected due to their extremely poor urban infrastructure, especially with respect to the commercialization of fruit and vegetables.

The families studied were randomly selected from a registry compiled by a non-governmental organization performing social work in the area. Sample size was calculated assuming the intention to identify, with 95% confidence and 90% power, differences of 50% in the participation of fruit and vegetable in the diet between baseline and the post-intervention evaluations. Four of the 40 families refused to participate in the study, leading to a final sample size of 36 families.

Nutritional intervention in the community lasted for five months, including an initial one-month diagnosis period. Intervention was based on two major approaches: an initial educational approach aimed at preparing and motivating families and a subsequent environmental modification that sought to improve access to fruit and vegetables in the community.

In the educational intervention, one member of each family - the one responsible for purchasing and preparing food in the household - was invited to attend three meetings held in the community during successive weeks, each of which lasted for approximately two hours. The first meeting employed a focus group technique, was diagnostic in character, and sought to identify limitations and/or obstacles to the consumption of fruit and vegetables in the community. The second meeting was motivational in character and included a culinary workshop designed to promote the contact of subjects with different types of fruit and vegetables, and to provide access to the preparation and degustation of fruit and vegetable-based dishes. The third meeting was essentially informative in character. This session was intended to increase subjects' awareness of the «5-a-day» program, offering the necessary elements for subjects to reconsider their habits with respect to the consumption of fruit and veg etables within their community. The aim of the «5-a-day» program is to promote the daily consumption of at least five servings of fruit and vegetables, in order to contribute to the prevention of diet-related diseases. The following messages were addressed in the present study: benefits to health related to the consumption of these foods; replacement of less healthy foods with fruit and vegetables; and the relationship between season, price, and fruit and vegetable quality.

The strategy for improving accessibility to fruit and vegetables was based on the allocation of a cargo vehicle termed the grocery store on wheels which circulated on streets in the vicinity of selected households. This strategy was adopted one month after the end of the educational intervention. The grocery store on wheels supplied quality fruit and vegetables, purchased at

the in natura food supply center of the municipality of Sao Paulo (CEAGESP), and operated three times a week during the final eight weeks of the study.

Impact evaluation was based on family indicators of food purchasing before and after the intervention. The participation of fruit and vegetables in the family diet was characterized based on the percentage of calories coming from these foods over the total calories purchased for family consumption during a one-month period. To this end, during the months prior to and following the implementation of the environmental intervention, families were invited to fill a questionnaire containing questions on food acquisition, both through purchase and donation, similar to the questionnaires used in Household Budget Surveys (HBSs). In these questionnaires, which were constructed as expense notebooks, the household member responsible for food purchasing, after training and orientation, recorded, on a day-to-day basis, all food purchases (including beverages) carried out during the one-month reference period. On a weekly schedule, a member of the fieldwork would visit the household and supervise notebook completion. After correction using factors that exclude the non-edible portions of foods, and using the Virtual Nutri software (Department of Nutrition, University of Sao Paulo School of Public Health), we calculated, for each family, the total calories purchased in the one-month period and the fraction of this total corresponding to fruit and vegetables (percentage of total calories contributed by fruit and vegetables).

In order to describe the relative participation on the total calorie content of other groups of foods, all food items included in the food purchasing questionnaire were classified into 13 groups: fruit; vegetables; cereals and cereal products; roots, tubers, and derivate products; pulses; meats (beef, pork, poultry, and fish); eggs; milk and dairy products; sugar; oils and vegetable fats; animal fats; processed foods of low nutritional value (es sentially caloric foods and sources of sugar and/or fat, especially saturated and trans fats; these include soft drinks and other sweetened artificial drinks, sweets, biscuits and snacks, processed meats, and sauces and dehydrated mixes); and, finally, other foods (including additional groups of foods with less expressive participation in the family diet, such as oleaginous vegetables, condiments, artificial sweeteners, alcoholic beverages, non-sweetened beverages, and ready-made meals).

In addition, at the beginning of the study we administered a socio-economic characterization questionnaire to each selected family. The person responsible for food purchasing in the household responded to a structured questionnaire included questions on schooling and monthly family income, number of household members, and number of household assets.

The effect of the intervention was assessed based on the observed temporal variation (before the intervention and after the introduction of the grocery store on wheels) in the participation of fruit and vegetables in the total calorie content of the monthly family food purchase. As a secondary objective, we evaluated variation in the relative participation of the remaining food groups, in an attempt to identify changes in the families' global dietary pattern. For statistical analysis, we used the paired Student's t-test for differences between means. Data analysis was carried out using SPSS software (version 11), considering 95% confidence intervals and a significance level of 5%. The present study was approved by the Research Ethics Committee of the University of Sao Paulo School of Public Health.

RESULTS

Sociodemographic and economic indicators found among the studied families show evidence of the low purchasing power of the present sample, as does the relatively low level of schooling of the family member who participated in the educational intervention. The food

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purchasing survey conducted at the baseline showed a relative participation of fruit and vegetables of 4.57% of the total calorie content purchased. The availability of fruit was greater than that of vegetables - 3.61% of total calories versus 0.97%, respectively (Table 1).

TABLE 1

Characteristics of the 36 families studied. Grajaú, municipality of São Paulo, Brazil, 2004.

Variable	mean	(SD)
Sociodemographic indicators:		
Per capita family income (R$)	178.50	(178.93)
Number of persons in the household	4.53	(1.89)
Number of household assets	2.44	(1.02)
Number of rooms in the house	4.72	(1.50)
Schooling of household member responsible for purchasing and preparing food (years)	6.19	(3.38)
Diet indicators (% of total calorie content):		
Fruit	3.61	(3.40)
Vegetables	0.97	(0.74)
Fruit and vegetables	4.57	(3.95)

Table 2 shows the immediate impact of the educational and environmental interventions through a description of the participation of fruit and vegetables in the total calorie content of food purchases in the months before and following the interventions. We found an increase of 56.4% in the participation of fruit and vegetables. There was a 2.58 percentage-point increase (95%CI: 0.45 - 4.71) in the percentage of calories contributed by fruit and vegetables, of which 1.76 point was contributed by fruit alone and 0.82, by vegetables alone.

TABLE 2

Temporal variation in the participation (%) of fruit and vegetables in the total calorie content of monthly food purchases in families receiving educational nutritional and environmental interventions. Grajaú, municipality of Sao Paulo, Brazil, 2004.

Food (% of total calorie content)	Before (mean)	After (mean)	Variation in the period (5 months)	
			mean	(IC95%)
Fruit	3.61	5.37	1.76	(-0.16 - 3.69)
Vegetables	0.96	1.78	0.82	(0.41 - 1.23)
Fruit and vegetables	4.57	7.15	2.58	(0.45 - 4.71)

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In the secondary analysis of the general dietary pattern of families, we evaluated the relative participation of different foods and food groups in the diet before and after the intervention. We found a 4.92 percentage point increase in the contribution of cereals and cereal products in the total calorie content of the monthly food purchase of studied families. The remaining foods and food groups did not show statistically significant variation during the five-month period investigated (Table 3).

TABELA 3

Temporal variation in the participation (%) of other foods in the total calorie content of monthly food purchases in families receiving educational nutritional and environmental interventions. Grajaú, municipality of Sao Paulo, Brazil, 2004.

Food groups	Participation (%) in the total calorie content		
	Before	After (5 months)	Variation[1]
Cereals and cereal products	30.76	35.68	4.92 *
Roots, tubers, and derivate products	1.03	1.36	0.33
Pulses	5.87	5.36	-0.51
Meats (beef, pork, poultry, and fish)	8.54	7.28	-1.26
Eggs	0.82	0.81	-0.01
Milk and dairy products	5.65	5.01	-0.64
Sugar	10.45	11.07	0.62
Oils and vegetable fats	16.37	12.58	-3.79
Animal fats	0.98	0.92	-0.06
Processed foods of low nutritional value:	13.50	11.64	1.86
Soft drinks and artificial juices	2.22	1.81	-0.41
Biscuits and snacks	4.59	3.63	-0.96
Sweets	2.15	2.34	0.19
Processed meats	3.56	2.88	-0.68
Sauces and dehydrated mixes	0.98	0.97	-0.01
Other foods[2]	1.46	1.12	-0.34

[1] Significant variation * defined by the descriptive level obtained using Student's paired t-test ($p < 0,05$)
[2] Oleaginous vegetables, condiments, artificial sweeteners, alcoholic beverages, non-sweetened beverages, and ready-made meals.

DISCUSSION

The central paradigm adopted in the present study is that interventions aimed at modifying diet-related behavior and promoting a healthy diet must necessarily focus on the environmental determinants of the problems addressed (11, 12). Environmental interventions may be defined as strategies to reduce barriers against, and increase opportunities for healthy choices, be it by creating healthier choices or by making these choices more

accessible through increased availability and/or lower price (13). The concept of accessibility adopted in the present study may be formulated as the adequate availability of commercial system for fruit and vegetables, which must be regular, of good quality, close to subjects' homes, and provide affordable prices. This may lead to a reduction of barriers and to an increase in opportunities for healthier dietary choices. Prior studies have demonstrated that nutritional education measures, especially those that emphasize social interaction, in combination with environmental interventions, may help low-income consumers to increase fruit and vegetable intake and to follow the guidelines for a healthy diet (14, 15).

In the present study, the initial participation of fruit and vegetables in the total calorie content of the studied families (4.57%) was below the recommendations of the Guia Alimentar para a População Brasileira (Food-based Dietary Guidelines for the Brazilian Population), which is between 9% and 12% of total calorie intake (16). The nutritional intervention adopted, which included both educational and environmental components, was effective, leading to an increase in the availability of fruit and vegetables in the household (a 2.58% percentage point increase, 95%CI 0.45 - 4.71).

The hypothesis of an undesirable change in the consumption of other foods, such as sugar and industrialized sauces, brought about by the greater participation of fruit and vegetables in the diet is gaining in importance in current literature (11). In the secondary analysis of the general dietary pattern of the studied families, we observed a 4.92 percentage point increase in the contribution of cereals and cereal products to the total calorie content, in addition to the increase in the participation of fruit and vegetables. There was no significant variation in the remaining food groups studied. Since the intervention's components, both educational and environmental, were focused exclusively on the fruit and vegetable groups, it is unlikely that the small variation seen in the purchase of cereals is a result of the increased participation of fruit and vegetables in the diet of the studied families.

The food data in this study can present some limitations since it deals with household availability and not directly with food consumption. Even though with limitations, food purchase data can supply useful information to describe families' food patterns, especially when indicators are focused on the relative participation of foods and foods groups and not on absolute amounts purchased, as in the present study. Furthermore, there is evidence that data from household budget surveys can keep a good relation with the individual food consumption (17). Two more important limitations of the present study were the impossibility of evaluating the effect of the intervention in relation to a control group, and the lack of a medium and long-term impact evaluation. These two limitations will be addressed in our next study on the same subject.

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