

Patricia Constante Jaime^I
Flavia Mori Sarti Machado^{II}
Márcia Faria Westphal^{III}
Carlos Augusto Monteiro^I

Nutritional education and fruit and vegetable intake: a randomized community trial

ABSTRACT

We conducted a community trial-type intervention including a sample of 80 families living in a low income neighborhood in the municipality of Sao Paulo, Brazil, in 2004. The intervention relied on nutritional education to increase the participation of fruit and vegetables in the family diet, and was administered in the form of three two-hour meetings during three consecutive weeks. To evaluate the immediate impact of this educational intervention, families were randomly divided into two groups (intervention and control). Only the immediate impact of the intervention was evaluated, based on the participation of fruit and vegetables in the family's total food purchases in the months prior to and following the intervention. The comparison, which was favorable to the intervention group, showed a 2.9 percentage point increase (95% CI: 0.32; 5.39) in the proportion of total calories derived from fruit and vegetables.

KEYWORDS: Food consumption. Fruit. Vegetables. Food and nutrition education. Intervention studies.

^I Departamento de Nutrição. Faculdade de Saúde Pública (FSP). Universidade de São Paulo (USP). São Paulo, SP, Brasil

^{II} Escola de Artes, Ciências e Humanidades. USP- Leste. São Paulo, SP, Brasil

^{III} Departamento de Prática de Saúde Pública. FSP-USP. São Paulo, SP, Brasil

Correspondence:

Patricia Constante Jaime
Departamento de Nutrição
Faculdade de Saúde Pública da USP
Av. Dr. Arnaldo, 715
01246-904 São Paulo, SP, Brasil
E-mail: constant@usp.br

Received: 5/24/2006 Reviewed: 8/9/2006
Approved: 9/19/2006

INTRODUCTION

Insufficient fruit and vegetable intake increases the risk of chronic non-communicable diseases such as heart disease and certain types of cancer and is one of the 10 major risk factors for death and disease worldwide.⁴ Insufficient intake is defined as less than 400 g per day, or about 7-8% of the caloric value of a 2,200 kcal/day diet.

It is estimated that fruit and vegetable intake in Brazil is currently less than half the recommended level, and is even more deficient among low-income families.³ We were unable to find studies in the literature that investigated such consumption. However, a study⁵ carried out in another developing country highlights the following factors as contributing to the low consumption of fruit and vegetables: high prices (compared to other food items and in the context of the family's income); inefficient production, distribution, and retail systems; and lack of knowledge among the population of the importance of these foods to health, especially in the case of vegetables.

The present communication reports on the results of a pilot intervention study, designed to evaluate the effect of interventions restricted to nutritional education on the consumption of fruit and vegetables among low-income families. This study is part of a large-scale research program aimed to investigate the reasons for low fruit and vegetable intake in Brazil.

METHODS

We carried out a pilot intervention study of the randomized community trial type, including a sample of 80 families living in two neighborhoods of the Grajaú district, in the Municipality of Sao Paulo, Brazil, in 2004. Grajaú, located at the extreme south of the Municipality, is the most populous (about 330,000 inhabitants) and one of the poorest among Sao Paulo's 96 districts,* with the ninth lowest human development index in the municipality (HDI: 0.419). The two neighborhoods in which the study was conducted – Jardim Noronha and Jardim Moraes Prado – are in the extreme south of the Grajaú district, and were selected because they are particularly deficient in urban infrastructure. Noteworthy in this sense is the precariousness of the fruit and vegetable retail system, which includes farmer's markets and grocery stores characterized by irregularity of supplies, poor quality of products, and distance from the families' homes.

The 80 households studied were randomly selected

from a registry compiled by a social assistance non-governmental organization active in the area. These households were randomly allocated to two study groups of equal size (control and intervention). Sample size was calculated assuming the desire to identify, with 95% confidence and 90% statistical power, differences of at least 50% between groups in terms of the variation in fruit and vegetable intake before and after the intervention. Calculations were based on an estimated mean household availability of fruit and vegetables among the Brazilian population of 2.3% of total calories.³ Five families refused to participate in the study, leading to a total of 36 families in the intervention group and 39 in the control group.

One member of each household in the intervention group – the one responsible for acquiring and preparing food for the household – was invited to attend three meetings held at the community in successive weeks, each lasting for approximately two hours. The first meeting used a focal group technique, was diagnostic in character, and was designed to identify limitations and/or barriers to fruit and vegetable consumption in the community. The second meeting was motivational, and was formatted as a culinary workshop, designed to promote contact with different types of fruit and vegetables and which included the preparation and degustation of various recipes containing fruit and vegetables as primary ingredients. The third meeting was essentially informative, addressing issues of nutritional recommendations, health benefits associated with fruit and vegetables, ways to increase consumption of such foods, replacement of less healthy foods by fruit and vegetables, and the relationship between season, price, and quality of fruit and vegetables.

The participation of fruit and vegetables in the household diet was measured based on the percentage of calories from these items in the total calories acquired for household consumption during a one-month period. To this end, households in the intervention and control groups were requested to complete, in the months prior to and following intervention, food acquisition (by purchase or donation) questionnaires, similar to those used in *Pesquisa de Orçamento Familiar* (POF - Household Budget Surveys). In these questionnaires, which were formatted as expense notebooks, the household member responsible for food acquisition, after orientation and training, would enter, on a daily basis, all food acquisitions (including beverages) made during a one-month reference period. Food consumed outside the household was not investigated. A member of our fieldwork team visited

*Prefeitura da Cidade de São Paulo. Secretaria Municipal do Desenvolvimento, Trabalho e Solidariedade. Desigualdade em São Paulo: o IDH. São Paulo; 2002. Available from http://www2.uol.com.br/aprendiz/n_noticias/imprescindivel/id150802.doc [access in 17 Mai 2006]

Table - Temporal variation in the participation (%) of calories from fruit and vegetables in the total calorie content of monthly food acquisition of families exposed or not exposed to a nutritional education intervention. Grajaú, Municipality of Sao Paulo, Brazil, 2004.

Food	Intervention group (N=36 families)			Control group (N=39 families)			Effect of th intervention	
	Month preceding the intervention	Month following the intervention	Variation across the period [a] (95% CI)	Month preceding the intervention	Month following the intervention	Variation across the period [b] (95% CI)	Crude [a-b] (95% CI)	Adjusted* (95% CI)
Fruit	3.61	5.24	1.63 (-0.49; 3.74)	4.56	3.38	-1.18 (-2.50; 0.13)	2.81 (0.41; 5.20)	2.48 (0.16; 4.81)
Vegetables	0.96	1.38	0.41 (0.06; 0.75)	1.21	1.20	-0.01 (-0.28; 0.26)	0.42 (-0.01; 0.84)	0.38 (-0.05; 0.82)
Fruit and vegetables	4.57	6.60	2.03 (-0.03; 4.32)	5.77	4.58	-1.19 (-2.59; 0.20)	3.22 (0.65; 5.80)	2.86 (0.32; 5.39)

*The adjusted effect corresponds to the regression coefficient of the received educational intervention status in a linear regression model

households on a weekly basis to supervise notebook completion. Correction factors were used to exclude the inedible portions of different foods. Subsequently, using the Virtual Nutri* software, we calculated the total calories acquired during the month and the fraction of this total corresponding to fruit and vegetables (percentage of total calories from fruit and vegetables). For the socioeconomic characterization of the two groups, the household member responsible for food acquisition completed a structured questionnaire with questions regarding his or her schooling, monthly family income, and number of members and consumer goods in the household.

To assess the impact of the intervention, we initially determined the mean variation in the percentage of calories from fruit and vegetables between the months before and after the intervention in each group. The between-group difference in this variation (along with its 95% confidence interval) provided the crude effect of the intervention. The effect of the intervention adjusted for differences between groups at the baseline was determined using linear regression models. The outcome variable in these models was the variation in the percentage of total calories supplied by fruit and vegetables; the explanatory variable was having participated or not in the intervention; and the control variable was the percentage of fruit and vegetables among total calories in the month before the intervention. Data analysis was performed using SPSS software, version 11.

The study protocol was approved by the ethics committee of the Faculdade de Saúde Pública da USP.

RESULTS

Sociodemographic information confirmed the overall poverty of the studied population. There were no statistically significant differences between intervention and control groups. Monthly per capita income

was R\$178.50 for the intervention group and R\$177.31 for the control group ($p=0.97$); 4.53 vs 4.41 ($p=0.77$), respectively for number of persons per household; 2.44 vs 2.23 ($p=0.38$), respectively, for number of consumer goods in the household; and 6.19 vs 5.79 years ($p=0.61$), respectively, for schooling level of the person responsible for food acquisition and preparation.

The Table presents, for both control and intervention groups, the participation of fruit and vegetables in the total calorie content of food acquired in the months before and after the intervention. Participation increased among intervention households (+1.63% and +0.41%, for fruit and vegetables, respectively) and decreased among controls (-1.18% and -0.01%, for fruits and vegetables, respectively). The crude effect of the intervention was equivalent to a 3.2 percentage point increase (95% CI 0.65; 5.80) in the percentage of calories from fruit and vegetables. The size of the effect decreased slightly after adjustment for differences at the baseline (2.86 percentage points; 95% CI: 0.32; 5.39).

DISCUSSION

The present results indicate that nutritional education interventions combining information and motivation to promote fruit and vegetable intake were successful in extremely poor settings. The interventions evaluated were aimed primarily at providing knowledge of the health benefits associated with fruit and vegetable intake and at increasing skills necessary for their introduction into the daily diet.

The indicative character of our results is due to the limitations which are inherent to the pilot nature of the study, especially the small number of families included, the lack of medium and long-term evaluations, and the indirect evaluation of intake based on food acquisition.

*Virtual Nutrition, versão 1.0 [software em diskettes]. São Paulo: Departamento de Nutrição da Universidade de São Paulo; 1996.

Confounder control was performed primarily through randomization, but also through adjustment for baseline household availability of fruit and vegetables. Potential confounders such as schooling and income were not included in the multiple regression analysis given that no substantial differences in sociodemographic characteristics was detected between the two groups.

Notwithstanding, the present results, despite their indicative character, contradict the notion that high prices and inefficient retail systems would be insurmountable obstacles for the promotion of fruit and vegetable consumption in impoverished settings, even within developed countries.² A point in favor of the consistency of results is the fact that the intervention evaluated included not only cognitive elements,

but behavioral elements as well, which could increase its chance of success.¹

Future studies within the research program from which the present communication results will address the influence of family income and food price and supply on fruit and vegetable consumption in Brazil.

ACKNOWLEDGEMENTS

To Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) trainee Carina Weishaupt Vieira Lima and technical support grant recipients Danira Passos and Mariana Ferraz Duarte for their help with the focal groups, culinary workshops, and educational lectures administered to study participants.

REFERÊNCIAS

1. Devine CM, Farrell TJ, Hartman R. Sisters in health: experiential program emphasizing social interaction increases fruit and vegetable intake among low-income adults. *J Nutr Educ Behav*. 2005;37:265-70.
2. Drewnowski A, Darmon N, Briend A. Replacing fats and sweets with vegetables and fruits – a question of cost. *Am J Public Health*. 2004;94:1555-9.
3. Levy-Costa RB, Sichieri R, Monteiro CA. Disponibilidade domiciliar de alimentos no Brasil: distribuição e evolução (1974-2003). *Rev Saúde Pública*. 2005;39(4):530-40.
4. World Health Organization. The world report 2002: reducing risks, promoting healthy life. Geneva: World Health Organization; 2002.
5. Monteiro CA. Setting up a fruit and vegetable promotion initiative in a developing country. In: WHO. Fruit and vegetable promotion initiative – report of the meeting. Geneva; 2003.

Supported by MCT/MESA/CNPq/CT-Agronegócio 01/2003 grant (Process no. 503039/2003-9).

Study conducted at the Núcleo de Pesquisas Epidemiológicas em Nutrição e Saúde da Universidade de São Paulo (NUPENS/USP).