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RESEARCH

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LA Sprouts: A Gardening, Nutrition, and Cooking Intervention for Latino Youth Improves Diet and Reduces Obesity

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ABSTRACT

Evidence demonstrates that a gardening and nutrition intervention improves dietary intake in children, although no study has evaluated the effect of this type of intervention on obesity measures. The objective of this pilot study was to develop and test the effects of a 12-week, after-school gardening, nutrition, and cooking program (called LA Sprouts) on dietary intake and obesity risk in Latino fourth- and fifth-grade students in Los Angeles, CA. One hundred four primarily Latino children (mean age 9.8±0.7 years), 52% boys and 59% overweight, completed the program (n=70 controls, n=34 LA Sprouts participants). Weight, height, body mass index, waist circumference, body fat (via bioelectrical impendence), blood pressure, and dietary intake (via food frequency screener) were obtained at baseline and postintervention. LA Sprouts participants received weekly 90-minute, culturally tailored, interactive classes for 12 consecutive weeks during spring 2010 at a nearby community garden, whereas control participants received an abbreviated delayed intervention. Compared to subjects in the control group, LA Sprouts participants had increased dietary fiber intake (+22% vs −12%; P=0.04) and decreased diastolic blood pressure (−5% vs −3%; P=0.04). For the overweight subsample, LA Sprouts participants had a significant change in dietary fiber intake (0% vs −29%; P=0.01), reduction in body mass index (−1% vs +1%; P=0.04) and less weight gain (+1% vs +4%; P=0.03) compared to those in the control group. We conclude that a gardening, nutrition, and cooking intervention is a promising approach to improve dietary intake and attenuate weight gain in Latino children, particularly in those who are overweight.

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Recently, the first-ever federal task force to address the epidemic of childhood obesity in the United States was formed, with one of the key pillars being making healthy foods more affordable and accessible for families. Although promoting gardening and farmer's markets are key vehicles of this initiative, to date, no gardening and nutrition intervention study has assessed whether such innovative approaches are in fact effective at reducing obesity and related risk factors. Given the growing momentum for gardening and cooking programs, there is an obvious research requisite to evaluate how a gardening and cooking intervention affects dietary behaviors and subsequent obesity risk.

Los Angeles is one of the few cities in the United States where foreign-born people constitute a majority, with 40% to 50% of residents being of Latino descent (1). The prevalence of obesity in Los Angeles varies markedly by ethnic/racial group, with Latinos having among the highest rates (2), which puts them at elevated risk for associated chronic diseases. Overweight Latino youth (aged 8 to 18 years) in Los Angeles have excessive visceral adiposity, are insulin resistant, and more than 30% have prediabetes and the metabolic syndrome (3-5). All these conditions are associated with increases in risk for type 2 diabetes and cardiovascular disease. Low intakes of dietary fiber, specifically from fruits and vegetables, coupled with high consumption of refined grains and added sugar (6-8), have been linked to obesity and related disorders in Latino populations.

A lack of access to healthy, affordable, high-quality foods characterizes so-called food desert areas of inner cities. A recent study in East Los Angeles, where the majority of residents were Latino and of low socioeconomic status (SES), reported that only 18% of grocery stores sold fresh fruits and vegetables of good quality (ie, not over-ripe or rotting) (9). Consequently, these geographic and financial barriers pose great challenges for low-income Latino families living in Los Angeles to maintain a healthy and balanced diet (10). Growing food in home, school, or community gardens is a means by which low-income families can increase access to nutritionally rich foods that may otherwise be unavailable to them (11).

During the past 2 decades, school gardens have contributed to improved dietary intake and eating behaviors among children (12-16). However, to date, no study has assessed the effects of school gardens on childhood obesity measures, especially those in high-risk Latino youth. Thus, the overall goal of this project was to develop and test the effects of 12-week after-school, gardening, nutrition, and cooking program (LA Sprouts) on dietary intake, obesity parameters (ie, body mass index [BMI], waist circumference, percent body fat), and blood pressure in Latino fourth- and fifth-grade students living in Los Angeles. Researchers hypothesize that participants who complete the LA Sprouts program would increase their intake of dietary fiber, fruit, and vegetables and experience a reduction in clinical indicators for obesity.

METHODS

Participants

All fourth- and fifth-grade students at a local elementary school (approximately 135 children) were invited to participate in this pilot study, and a total of 104 agreed to participate. Thirty-four students enrolled in an existing after-school care program (LA's BEST) completed the 12-week LA Sprouts program (ie, attended at least 10 of the 12 sessions and completed all testing), whereas 70 fourth- and fifth-grade students who were not enrolled in LA's BEST served as the control group. The ethnic background and SES of students participating in the LA's BEST after-school care program reflects that of the entire school. The Institutional Review Board of the University of Southern California, Health Sciences Campus, and the Los Angeles Unified School District approved this study. Informed written consent from parents and assent from children were obtained before the study.

Description of the Intervention Program

The LA Sprouts program was taught at the Milagro Allegro Community Garden located approximately 2 miles from the elementary school. The 10,000-sq ft garden includes 32 raised bed garden plots for cultivating fruits and vegetables, two of which were specifically devoted to LA Sprouts. The garden also has a central community gathering space with seating, a mobile cooking/grilling island, and room for tables needed to teach classes. Students were transported on the Metro light rail to and from the class each week, given the proximity of the Metro stations to both the garden and school (two blocks away at either end).

An overview of 12-week LA Sprouts intervention curriculum is presented in the Figure. LA Sprouts intervention classes were taught during 90-minute sessions once a week for 12 weeks during spring 2010. Sessions began with participants receiving a 45-minute interactive cooking and nutrition education lesson taught in English and led by a study staff member or graduate student trained in nutrition and supervised by a registered dietitian. Nutrition lessons focused on increasing fruit and vegetable intake, including culturally relevant foods such as cilantro, nopales, beans, corn, and squash. Preparation, cooking, and eating occurred outdoors in the garden. Students worked in small teams of five led by a teacher to cook/prepare the sample recipe each week, which emphasized fruit and/or vegetable ingredients. The snack was eaten in a family-style manner (ie, together at a table, with a tablecloth and nondisposable plates and silverware). Following the cooking and nutrition component, participants received a 45-minute interactive gardening lesson, taught by a Latina Master Gardener from the University of California Cooperative Extension Common Ground Garden Program. The gardening curriculum used a hands-on approach where children learned and participated in planting, growing, maintaining, and harvesting organic fruits and vegetables. Gardening lessons also included identification of plants, square foot gardening, seasonal crops, transplanting, recycling, composting, irrigation, and mulching. Monthly visits to a local farmers market were integrated into the LA Sprouts program, and a five-to-one student:teacher ratio was maintained at all times.

Parents of LA Sprouts participants also received three separate 60-minute parental nutrition and gardening classes during the 12-week intervention that were held at the elementary school and timed for when parents typically picked up their children. The material covered in the parent classes essentially mirrored that in the student classes, but was taught primarily in Spanish. Parent classes were optional and not well attended (about 25% of parents participated).

Description of the Control Group

Although not a randomized trial, all fourth- and fifth-grade students who were not enrolled in LA's BEST served as the control group. Control participants did not receive any nutrition, gardening, or cooking information between pre- and post-testing. After the post-testing was completed, the school hosted gardening/nutrition/cooking workshops for all fourth and fifth graders and their parents as a delayed intervention.

Testing

Testing was performed by research faculty and staff 1 week before and 1 week after the 12-week intervention at the elementary school during the school day on all consented fourth and fifth grade students (both LA Sprouts and Control participants). Specific details of the testing measures are described below.

Demographics. Participants were asked basic demographic information, including their age and ethnicity. To ascertain family SES, participants were asked questions on whether their family uses a computer at home and whether their mother has her own car (17).

Anthropometrics, Body Composition, and Blood Pressure. Height was measured to the nearest 0.1 cm using a wall-mounted stadiometer (Perspective Enterprises, Portage, MI). Weight (in kilograms) and total body fat (%, via bioelectrical impedance) were measured with the Tanita Body Fat Analyzer (model TBF 300, Arlington Heights, IL). BMI and Centers for Disease Control and Prevention age and sex-specific BMI percentiles were determined using EpiInfo version 3.2 (2005, Centers for Disease Control and Prevention, Atlanta, GA). Students with a BMI percentage ≥85th percentile were classified as being

Session	Nutrition topics	Recipe	Gardening topics
1	Introduction to LA Sprouts Kitchen and knife safety	Winter garden salad	Materials needed for gardening Sowing seeds
2	Types of fruits, colors, seasonality Fruit health benefits and serving size Adding fruit to your diet	Fruit rainbows	Introduction to documenting garden progress Sowing seeds
3	Types of vegetables, colors, seasonality Vegetable health benefits and serving size Adding vegetables to your diet	Quinoa salad	Visit to farmers market
4	Real food vs packaged food Reading ingredient lists	Vegetable quesadillas with salsa	Transplanting
5	Healthy family dining habits Conversation starters	Migas with salsa	Using recycled materials for gardening
6	Health benefits of fiber Sources of fiber and serving size Finding fiber on a nutrition label High-fiber foods taste test	Whole-grain pasta with vegetables	Composting
7	Natural vs added sugar Finding sugar on a nutrition label Low-sugar drinks taste test	Apples and bananas with peanut butter Cucumber lemon water Agua de jamaica	Visit to farmers' market
8	Role of vitamins A and C in the body Sources of vitamins A and C	Beet, carrot, and avocado salad	Composting Mulching
9	Importance of eating breakfast Ways to eat a healthier breakfast Shortcuts to make time for breakfast	Yogurt parfait	Identifying fruit and vegetable plants
10	Importance of a healthy lunch Selecting a healthy school lunch	Ultimate sandwich	Watering
11	Choosing healthy options at holidays and parties	Corn and bean dip with pita chips	Visit to farmers' market
12	Review of nutrition topics	Strawberry balsamic salad	Harvesting fruit and vegetables

Figure. Session overview of the 12-week LA Sprouts gardening after-school program for Latino fourth- and fifth-grade students.

overweight (18). Waist circumference was measured using a tape measure and recorded to the nearest 0.1 cm. Blood pressure (Welch Allyn Inc, Skaneateles Falls, NY) was obtained according to recommendations of the American Heart Association (19). All measures were collected by research faculty and staff.

Dietary Intake. Dietary intake was assessed by the 2007 Block Food Screeners for Ages 2-17 (20). This 41-item screener asks about food eaten yesterday and was designed to assess children's intake by food group with outcomes measured in number of servings. The focus of this screener is on intake of fruit and fruit juices, vegetables, potatoes (including french fries), whole grains, meat/poultry/fish, dairy, legumes, saturated fat, and added sugars (in sweetened cereals, soft drinks, and sweets). This screener was designed for self-administration by children with the assistance of a parent or teacher as needed, and takes about 10 to 12 minutes to complete. National dietary surveys such as the National Health and Nutrition Examination Survey were used to inform the selection of the foods to query, as well as to identify appropriate portion sizes and nutrient composition to apply. This screener was developed and adapted from the Block Kids 2004 Food Frequency Questionnaire (21). A validation study comparing the screener to three 24-hour diet recalls is currently underway in 60 obese children aged 4 to 9 years.

Statistical Procedures. Data were examined for normality and transformations were made if data were found to be significantly different from normal. Diastolic blood pressure and waist circumference were non-normally distributed, and analyses were conducted on the log-transformed values. Dietary data were screened for plausibility of energy intake by assessing the distribution of the residuals of the linear regression of energy intake by body weight at baseline. Six participants had a residual that was more than three standard deviations from the mean, thus only 98 participants (65 controls and 33 LA Sprouts participants) were included in dietary analyses.

For baseline comparisons, analysis of variance and χ^2 test (for sex and ethnicity only) were employed to assess

Table 1. Baseline (pre) and postintervention (post) demographic and physical characteristics of LA Sprouts gardening program participants

	All Subjects					Overweight/Obese Subjects				
	Intervention (n=34)		Control (n=70)			Intervention (n=18)		Control (n=43)		
Characteristic	Pre	Post	Pre	Post	*P* value[a]	Pre	Post	Pre	Post	*P* value
Sex (n)										
Boy	13	—	41	—		7	—	29	—	
Girl	21	—	29	—		11	—	14	—	
Race/ethnicity (%)										
Latino	97		93			100		93		
White	0		4			0		5		
Asian	3		3			0		2		
Computer at home, yes										
n	28		44			14		26		
%	82.4		66.7			77.8		63.4		
Mother has own car, yes										
n	22		36			12		19		
%	64.7		54.6			66.7		46.3		
	← *mean± standard deviation* →					← *mean± standard deviation* →				
Age (y)	9.7±0.7	—	9.9±0.7	—		9.8±0.7	—	9.9±0.7	—	
Height (cm)	140.6±6.1	142.2±6.3	142.4±7.2	144.2±7.4	0.41	142.9±5.6	144.3±5.6	144.3±6.9	156.1±7.3	0.60
Weight (kg)	40.7±10.9	41.8±11.0	44.8±13.2	46.3±13.7	0.07	50.9±11.3	51.5±11.4	51.6±11.9	53.4±12.3	0.03
Body mass index	20.4±4.2	20.4±4.0	21.8±5.1	22.0±5.2	0.14	24.9±5.2	24.7±5.5	24.6±4.3	24.8±4.4	0.04
Body mass index percentile	74.5±80.1	74.9±25.7	80.1±24.4	80.0±24.2	0.93	95.2±4.0	94.7±4.0	95.2±3.9	94.8±4.8	0.70
Body mass index *z* score	0.9±1.0	0.9±1.0	1.2±1.0	1.2±1.0	0.77	1.8±0.5	1.7±0.5	1.8±0.5	1.8±0.5	0.42
Waist (cm)	73.9±13.3	74.9±13.6	75.7±13.2	77.3±13.9	0.67	83.5±10.8	83.3±11.7	83.0±11.1	84.6±11.7	0.46
Total fat (%)	28.2±12.6	26.8±12.4	29.0±9.8	27.6±10.3	0.59	35.8±12.3	34.0±12.1	34.1±8.6	33.0±9.1	0.56
Systolic blood pressure (mm Hg)	105.9±8.20	101.9±10.4	108.9±8.9	104.5±9.8	0.53	107.6±8.2	105.3±9.3	110.0±8.5	105.9±10.4	0.71
Diastolic blood pressure (mm Hg)	59.6±8.4	56.5±5.6	60.8±8.0	58.7±6.2	0.04	60.0±8.0	58.2±5.6	61.9±7.6	60.0±5.9	0.43

[a]Analysis of covariance used to assess if changes in demographic and physical characteristics over the 12-week intervention period differed between intervention and control groups for the entire sample and for the overweight subgroup; the following a priori covariates were included: baseline value, sex, and age.

differences in demographic and physical measures between intervention and control groups for the entire sample and for the subgroup of overweight/obese subjects. An analysis of covariance was used to assess whether changes in health outcomes across the 12-week intervention period (ie, anthropometrics, body composition, blood pressure, and dietary variables) differed between intervention and control groups for the entire sample and for the overweight subgroup, including the following a priori covariates: baseline health outcome of interest, sex, age, and energy intake (for all dietary variables). All analyses were performed using the standard SPSS version 16.0 for Mac (2007, SPSS Inc, Chicago, IL), with significance level set at $P<0.05$.

RESULTS

Baseline Comparisons

The physical characteristics at baseline and postintervention between intervention (LA Sprouts) and control group members for the entire sample (N=104) and the overweight subsample (n=61) are shown in Table 1. There were no significant differences in ethnicity, SES, or physical characteristics between the intervention and control group as a whole or for the overweight subsample. Fifty-nine percent of children who participated in the study were overweight or obese, with 61% overweight children in the control group vs 53% overweight children in the LA Sprouts group. In the overweight subsample, the control group was 67% boys vs 39% boys in the LA Sprouts group ($P=0.04$).

Dietary variables at baseline and postintervention between intervention groups for the entire sample and the overweight subsample are shown in Table 2. For all participants, those in the control group reported consuming 23% more dietary fiber (grams/1,000 kcal/day) at baseline compared to the LA Sprouts participants ($P=0.03$). No other dietary variables were significantly different between groups for the entire sample or for overweight participants.

Changes in Dietary Outcomes

For the entire sample, there was a significant difference in change in dietary fiber intake (grams per day and grams/1,000 kcal/day) between groups, with LA Sprouts participants increasing fiber intake by 22% compared to a 12% decrease in control group members ($P=0.04$). For the overweight subsample, there was a significant difference in the change in dietary fiber (grams/day) between groups, with overweight LA Sprouts participants having no change vs a 29% decrease in overweight controls ($P=0.01$). There were no other significant changes in dietary outcomes.

Changes in Health Outcomes

In the entire sample, there was a significant difference in the change in diastolic blood pressure between groups, with LA Sprouts participants decreasing by 5% compared to a 3% decrease in controls ($P=0.04$). For the overweight subsample, there was a significant difference in the

Table 2. Baseline (pre) and postintervention (post) dietary characteristics of LA Sprouts gardening program participants[a]

Characteristic Nutrients[b]	All Subjects					Overweight/Obese Subjects				
	LA Sprouts (n=34)		Controls (n=70)		*P* value[e]	LA Sprouts (n=18)		Controls (n=43)		*P* value[e]
	Pre	Post	Pre	Post		Pre	Post	Pre	Post	
	← *mean±standard deviation* →					← *mean±standard deviation* →				
Energy (kcal)	2,011.0±1,410.4	1,639.5±1,046.5	1,961.0±1,077.5	1,535.2±902.9	0.85	2,037.4±1,455.4	1,643.3±1,121.5	1,950.4±1,185.7	1,553.3±1,040.3	0.76
Protein (g/d)	85.4±67.7	65.1±43.0	81.6±49.0	58.3±38.3	0.59	86.2±61.0	66.8±43.9	82.6±53.1	60.9±42.1	0.71
Protein (% kcal)	16.3±3.7	15.7±4.0	16.4±3.3	15.0±4.3	0.33	16.8±3.2	16.4±3.5	16.6±3.2	15.7±4.6	0.44
Fat (g/d)	79.8±67.6	62.6±49.6	73.3±52.4	57.8±41.4	0.92	80.0±65.6	63.5±51.0	72.7±56.0	59.9±47.7	0.96
Fat (% kcal)	33.6±5.8	32.4±9.6	31.5±7.8	32.0±7.8	0.87	33.0±6.7	33.6±9.5	30.9±8.0	32.3±8.6	0.43
Carbohydrates (g/d)	244.2±145.7	211.3±122.8	252.2±119.6	202.8±109.1	0.94	250.2±162.8	208.1±135.4	249.8±127.4	199.5±123.4	0.89
Carbohydrates (% kcal)	51.6±8.6	54.0±12.9	54.1±10.9	55.2±11.1	0.59	51.6±8.7	51.7±11.9	54.6±11.0	54.0±12.1	0.29
Added sugar (tsp/d)	11.8±10.2	9.9±9.4	11.5±7.6	11.2±9.7	0.15	12.1±11.5	8.4±8.5	12.1±8.9	11.0±10.7	0.12
Dietary fiber (g/d)	16.1±11.5	16.1±8.6	18.7±10.3	13.3±7.5	0.01	16.3±12.7	16.3±9.0	18.5±10.6	13.1±8.6	0.01
Dietary fiber (g/1,000 kcal)	8.3±2.4	10.1±3.8	10.2±4.5	9.0±2.5	0.03	8.3±2.7	10.3±3.5	10.4±5.5	8.8±2.7	0.09
Food group										
Meat (servings/d)	2.1±2.4	2.8±2.5	2.0±1.7	2.5±3.4	0.68	2.1±1.9	3.0±2.4	2.2±1.9	2.8±2.6	0.89
Dairy (servings/d)	2.1±1.3	1.7±1.2	2.1±1.1	1.7±1.0	0.97	2.0±1.2	1.7±1.3	2.0±1.1	1.8±1.1	0.80
Vegetables (servings/d)[c]	1.6±1.0	1.6±1.0	1.9±1.3	1.3±1.0	0.11	1.7±1.2	1.7±1.0	1.8±1.3	1.3±1.2	0.07
Fruit (servings/d)[d]	4.0±0.7	3.9±0.8	4.1±0.9	4.2±0.8	0.83	3.9±0.7	3.8±1.0	4.0±1.0	4.3±0.8	0.09
Whole grains (oz/d)	0.8±0.9	0.9±0.7	0.7±0.7	0.6±0.6	0.13	0.7±0.8	0.9±0.8	0.7±0.7	0.6±0.7	0.17

[a]Six participants were excluded for dietary assessment because they had implausible energy intake.
[b]Nutrient and food group data came from the 24-hour Block food frequency questionnaire screener (20).
[c]Vegetables include potatoes, but do not include fried vegetables.
[d]Fruit does not include juice.
[e]Analysis of covariance was used to assess whether changes in dietary intake across the 12-week intervention period differed between intervention and control groups for the entire sample and for the overweight subgroup; the following a priori covariates were included: baseline diet variable, energy (for variables expressed in g/d only) sex, and age.

change in weight between groups, with overweight LA Sprouts participants only gaining 1% vs a 4% increase in overweight controls ($P=0.03$). There was a significant change in BMI as well for the overweight subsample, with a 1% decrease in overweight LA Sprouts participants vs a 1% increase in overweight control group participants ($P=0.04$).

DISCUSSION

Results showed that a culturally tailored, 12-week gardening/nutrition/cooking intervention improved dietary intake (by increasing dietary fiber) and reduced blood pressure. When assessing overweight participants, the LA Sprouts program reduced BMI and the rate of weight gain in Latino children.

Prior studies of gardening interventions on dietary intake/behaviors in children (12-16) have found that nutrition lessons in combination with gardening activities improved the willingness of young children (aged 6 and 7 years) to taste vegetables (14). A recent randomized controlled trial showed that fourth and fifth graders most exposed to a school-based nutrition and gardening intervention increased their preference and intake of fruits and vegetables by half a cup a day (15). Another randomized controlled trial found that a 6-month nutrition and gardening program in fourth-grade classrooms resulted in increased preference and willingness to eat a variety of vegetables compared to nutrition only and control groups (22). Previous studies have shown the effects of similar interventions on dietary intake and behaviors linked to intake, such as preference and willingness, but none have gone so far as to directly measure the effects on health outcomes, such as body composition and blood pressure. For this study, although data were collected assessing the effects of the LA Sprouts program on a variety of related dietary behaviors (such as knowledge, preference, self-efficacy, and motivation), this article focuses on the effects on actual dietary intake and health outcomes, and the former will be presented in a separate article.

It is well recognized that dietary fiber plays a protective role against excess adiposity and metabolic disorders in both adults (23-25) and children (26,27). However, national data consistently show that children consume less than half of the recommended amount of dietary fiber of 14 g fiber per 1,000 kcal/day (27). Researchers at the University of Southern California have repeatedly verified the protective effect of dietary fiber on metabolic syndrome, waist circumference, and visceral fat in Latino youth (8,28). Secondary analyses from a 16-week nutrition and exercise intervention showed that Latino adolescents with obesity who increased dietary fiber by an average of 5 g/day had a 10% reduction in visceral adiposity (29). Other research studies have also shown that increasing dietary fiber, mainly by substituting fruit and vegetables for foods with higher energy density, is an effective weight-maintenance strategy, primarily by increasing satiety, reducing hunger, and lowering energy intake (30,31). These results suggest that interventions aimed at increasing dietary fiber, by increasing fruits and vegetables, grains, and legumes, may subsequently decrease energy intake, which in turn decreases obesity. However, in our study, there were improvements in dietary fiber intake and reductions in the rate of weight gain, without subsequent energy intake differences. One explanation is that small, albeit significant, increases in daily fiber may have led to acute reductions in energy intake that were simply not captured in post dietary assessment. Another explanation is that dietary fiber, specifically soluble fiber, could have decreased intestinal absorption of fatty acids and cholesterol, which subse-

quently decreases cholesterol synthesis (32) and could affect subsequent weight gain. Regardless of the mechanism, research consistently shows that increased dietary fiber intake leads to reductions in obesity and related metabolic disorders.

In our study, changes in dietary fiber between groups may be attributed to the combination of the slight, nonstatistically significant increase in whole-grain intake in LA Sprouts participants and the slight nonstatistically significant reduction in vegetable and whole-grain intake in control group participants. However, LA Sprouts participants had lower dietary fiber intake compared to control group participants at baseline, also not significant, thus making the improvements in fiber intake in LA Sprouts participants more pronounced. Regardless, the dietary changes seen in this study may have been partly responsible for the improvements in blood pressure. These dietary changes are in line with the dietary goals of the Dietary Approaches to Stop Hypertension diet (ie, increases in whole grains, fruits, and vegetables), which has been routinely shown to lower blood pressure in both adults (33) and children (34).

There are several limitations of this study that should be mentioned. The intervention was not a randomized controlled trial, and participants enrolled in the existing after-school program were compared with other students at the same school. However, baseline demographic and physical characteristics were essentially the same between intervention and control participants. Other limitations are the relatively small sample size and short duration of the program. Another limitation is the use of a food frequency questionnaire screener that assessed dietary intake for the previous 24-hour period, which relies on memory and only captures a relatively short time span. However, recall of the previous day is likely to be better than the prior week (35). Furthermore, this measure of assessment is not as sensitive as a 24-hour dietary recall. In addition, the LA Sprouts program did not significantly reduce BMI percentiles and z scores overall, although there was a decrease, in participants with overweight/obesity. It is possible that with a bigger sample size these reductions would have reached significance. The last limitation is that this study did not include an intensive family or parent program, and literature consistently shows that parental support, parenting styles, and the family environment are important components in the prevention and management of childhood obesity (36-38). Future research is needed to test this program in a large randomized controlled trial lasting 1 to 2 years and including a strong parental and family component.

CONCLUSIONS

This study shows that a 12-week intervention focused on gardening, nutrition, and cooking can lead to dietary improvements and reductions in blood pressure and the rate of weight gain in Latino children. This type of intervention not only addresses key health issues facing high-risk Latino communities, but it is also in accordance with the national priorities established for public health to ensure that families living in food deserts have access to healthy, affordable food (39). Furthermore, teaching gardening and nutrition knowledge and cooking skills in combination with providing children and their families with the resources to grow their own food is a sustainable approach to promoting long-term fruit and vegetable consumption and may ultimately play a key role in combating obesity and related disorders. These results highlight the need for additional research to examine how culturally tailored nutrition interventions incorporating gardening and cooking component can improve dietary intake and health.

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