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Promoting Weight Maintenance among Overweight and Obese Hispanic Children in a Rural Practice

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Abstract

Background: US Hispanic children experience a disproportionate burden of overweight and obesity. Comprehensive high-intensity behavioral programs have demonstrated effectiveness in improving weight status among obese children. However, there remains a need to develop more efficient interventions that are feasible in primary care and demonstrate effectiveness in Hispanic children.

Methods: The pilot study used a two-group randomized design. Eligible overweight (BMI between the 85th and 94th percentile for age and gender) or obese (BMI $\geq$95th percentile) Hispanic children and their parents ($N=118$ child/parent dyads) were recruited from a rural pediatric clinic and randomized to: standard care (SC; $n=61$ dyads) or behavioral intervention (INT; $n=57$ dyads). The primary outcomes—weight, waist circumference, and *z*BMI—were measured at baseline, 2, 6, and 18 weeks. Multivariate logistic regression was used to examine the effect of INT on the likelihood of weight maintenance adjusting for potential confounding variables.

Results: Significantly fewer INT children (68.5%) experienced weight gain, compared to SC children (89.7%; $p=0.009$). The same pattern was observed for waist circumference, where fewer INT children (44%) experienced an increase in waist circumference, compared to SC children (68.6%; $p=0.02$). Although a trend of improvement in favor of the INT was observed for *z*BMI, it was not significant.

Conclusions: This study provides preliminary evidence for the feasibility of a primary-care–based approach to promoting weight maintenance among a high-risk population.

Introduction

Significant ethnic disparities in obesity prevalence exist among US children. Hispanic children, specifically Mexican Americans, are more likely to be obese than other racial/ethnic groups.[1,2] A recent review of childhood obesity prevention interventions targeting Hispanic children identified only two interventions with positive outcomes, both of which were school based.[3–5] Home/family and healthcare settings have been increasingly recognized as important settings in obesity prevention.[6] The primary care setting, in particular, provides the opportunity for incorporating health promotion and prevention counseling into routine well-child visits.[7] Currently, the US Preventive Services Task Force (USPSTF) recommends that clinicians screen children ages 6 and older for obesity and offer or refer them to comprehensive, intensive behavioral interventions to promote improvement in weight status.[8] However, pediatric obesity prevention programs have not been routinely implemented in primary care settings.[9,10] Primary care providers often face many barriers, such as lack of time,[11,12] lack of reimbursement,[9] lack of awareness of community resources, and lack of training or insufficient knowledge and skills on behavioral management strategies.[11,12] Further, few obesity prevention studies conducted in pediatric clinics have targeted minorities or overweight versus obese populations.

In response to these evidence gaps, the Nutrition and Exercise Start Today (NEST) pilot study evaluated an evidence-based pediatric obesity management intervention

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for Hispanic children (ages 5–14) and their parent(s) that could be efficiently delivered in a rural pediatric clinical practice.

Methods

NEST is a two-group randomized study designed to assess the effectiveness of a pediatric obesity management intervention among Hispanic children in pediatric clinics. Pediatric health care providers and their clinical staff were trained to implement a standard care intervention—consistent with the American Academy of Pediatrics (AAP) established guidelines[9]—for each participant during a routine clinic visit. After implementing the standard care intervention, the eligible children were randomized to receive either additional behavioral intervention components (intervention; INT) or no additional intervention (standard care; SC). The primary study outcomes were weight, waist circumference, and *z*BMI. Secondary outcomes were sedentary behavior, sugar-sweetened beverage (SSB) consumption, and fasting glucose and insulin, which were not the focus of this article. The study was funded by the Centers for Medicare and Medicaid Services (CMS030457). The study protocol was approved by The University of Texas Health Science Center at San Antonio (UTHSCSA; San Antonio, TX) Institutional Review Board before participant recruitment. Participants were enrolled from March 2010 to April 2011.

Research Setting and Recruitment

Participants were recruited from a federally funded rural health clinic in New Braunfels in Comal County, Texas. New Braunfels has an estimated population of 51,000, with 85% white, 2% black, and 10% Asian, American Indian, or some other race. Approximately 33% are Hispanic (of any race)[13] and 13% of the population lives below the federal poverty level.

Participant eligibility. Participants were eligible for the trial if they met the following criteria: (1) were Hispanic based on parent self-report; (2) 5–14 years of age; (3) overweight (BMI between the 85th and 95th percentile for age and gender) or obese (BMI ≥95th percentile for age and gender); (4) one parent or adult caregiver who resided with the participant had to agree to participate in intervention and evaluation activities; and (5) parent had access to a telephone. A participant was excluded if he or she had any of the following: (1) a mental, emotional, or physical handicap identified by a parent or provider that may interfere with study participation; (2) a diagnosis of cardiovascular, pulmonary, or digestive disease; or (3) planning to move from the local area within the time span of the study.

Recruitment. A clinic-based licensed vocational nurse trained on the protection of human subjects (*e.g.*, Collaborative Institutional Training Initiative) facilitated recruitment (*e.g.*, managed the referral process and helped schedule clinic appointments). Each week, the nurse used the electronic medical record (EMR) system and/or scheduling database to identify children that met the eligibility criteria and had nonurgent medical appointments scheduled. The nurse generated an EMR point-of-care alert for clinic staff and healthcare providers to consider referring the child to the NEST study. At the nonurgent medical appointment, the nurse explained the study to parents, provided a recruitment brochure, and obtained a signed referral from interested parents allowing UTHSCSA research staff, a trained graduate research assistant, to contact them by telephone to explain the study in more detail. Research staff contacted referred parents by telephone to obtain verbal consent to conduct eligibility screening, complete a baseline survey, and schedule the child for their first visit (visit 1; participants also have three additional follow-up visits) with the study clinical provider (*e.g.*, a pediatrician or nurse practitioner trained on the standard care protocol). During visit 1, the nurse obtained signed informed consent from the parent and assent from the child. Vitals (*i.e.*, blood pressure, height, weight, and waist circumference) were assessed by a trained nurse and lab work requested (fasting glucose, insulin, and cholesterol). In addition, the clinical provider delivered the standard care intervention (brief behavioral counseling and goal setting to the child and parent). Immediately after visit 1, children were randomized to SC only or behavioral intervention (INT). The SC group received brief behavioral counseling and goal setting from the healthcare provider only. The INT group received all elements of SC plus a face-to-face counseling session with a health educator (immediately after visit 1) and monthly telephone counseling calls and newsletters through the end of the study. Participants were randomized using a sequence of 200 random Bernoulli values generated using Excel without any restriction by the study statistician (Y.L.), and primary care providers (PCPs), nurses, and research assistants responsible for data collection were blind to treatment assignment. The sequence was concealed until interventions were assigned. Study participants were notified of their treatment assignment in person by an intervention research staff member.

During recruitment, we screened 192 parent/child dyads for eligibility. Of these, 20% were ineligible ($n=38$), 2% refused participation ($n=4$), and 16% did not show up for visit 1 ($n=32$); the remaining 61% were randomized ($N=118$ child/adult dyads or 236 individual participants). All study participants were scheduled to receive three follow-up visits with their clinical provider: at 2 (visit 2), 6 (visit 3), and 18 weeks (visit 4). After completing visit 4, parents from both groups were contacted by research staff for a follow-up telephone interview. Six were lost to follow-up resulting in a retention rate of 95% (6 of 118).

Research Methods

The NEST intervention was based on a Pediatric Obesity Clinical Toolkit for Healthcare Providers from the Texas Pediatric Society,[14] that is consistent with Stage 1: Prevention Plus (healthy lifestyle change) of the AAP established

guidelines for the prevention and treatment of childhood obesity.[9] The prevention plus stage is appropriate initial treatment intervention for all overweight and obese children 2–18 years of age.[9] Specific behavioral strategies in the prevention plus stage include: (1) consumption of five or more servings of fruits and vegetables per day; (2) decreasing or eliminating SSBs; (3) limiting screen time to 2 hours or less a day; and (4) engaging in one or more hours of physical activity (PA) a day. Additional strategies include: (1) eating breakfast daily; (2) limiting meals outside the home; (3) eating family meals at least five times a week; and (4) allowing child to self-regulate his or her meals and (5) avoiding overly restrictive behaviors. The prevention plus stage requires close follow-up monitoring and can be implemented by physicians or allied healthcare providers with training in pediatric weight management or behavioral counseling.

Standard care. Participants in both INT and SC received a Healthy Lifestyle Prescription (HLP) from their clinical provider. The HLP lists 11 healthy lifestyle strategies (*i.e.*, eat breakfast every day, play outside 1 hour a day) that are recommended in the prevention plus stage for the prevention and treatment of childhood obesity.

A computerized algorithm was applied to self-reported behavioral data collected at baseline to identify the most appropriate healthy lifestyle behavioral strategies for each family. For example, if the child did not eat breakfast every day or watched television more than 2 hours daily, then these behaviors would be identified as behaviors the study participant could work on. The recommended behavioral strategies for each study participant were forwarded to their clinical provider before visit 1. Research staff placed the HLP with recommended behavioral strategies in the child's medical chart so that the clinical provider could review it before or during visit 1. Visit 1 consisted of a clinical assessment of vital signs (*i.e.*, height, weight, waist circumference, and blood pressure), a physical exam, ordering lab tests, and provider counseling using the HLP. For this project, checking fasting glucose and fasting insulin levels was part of standard care for children with a new diagnosis of excessive weight gain. Based on the health of the child, the clinical provider ordered additional tests as needed. During visit 1, the pediatrician reviewed the HLP with the parent/child and offered suggestions on making prescribed changes. Participants were prescribed *two* diet strategies and *one* PA strategy. The clinical provider was able to modify the HLP in consultation with the child and parent, as appropriate. During visit 2, the physician reassessed vital signs, discussed laboratory test results and the BMI chart, and reviewed progress on the HLP with the parent/child. During visits 3 and 4, the clinical provider reassessed vital signs, reviewed the HLP with the parent/child, and (at visit 4 only) reordered fasting serum glucose and fasting insulin lab tests.

Behavioral intervention. Parents and children assigned to INT received all elements of SC, plus face-to-face counseling, telephone counseling, and newsletters.

Face-to-face counseling. INT participants received one 30-minute, face-to-face counseling session at the clinic with a masters-level health educator immediately after visit 1. The face-to-face counseling session targeted the family and included at least the child and parent. The health educator discussed the healthy lifestyle prescription, outlined the major intervention goals relative to PA and diet, provided education about PA and diet and current recommendations, and set short- and long-term PA and diet goals with participants. Tips for exercising safely and preventing injury (including warning signs and symptoms) were provided and participants were referred to community resources, as appropriate.

Telephone counseling. INT parents also received monthly telephone counseling calls (approximately 15 minutes each) from the health educator. Calls began after the face-to-face counseling session and continued through visit 4. The calls were designed to assess current PA levels and dietary practices relative to the previous face-to-face meeting or phone call. The health educator addressed barriers to implementation of healthy lifestyle goals, provided encouragement and support, and discussed any topics raised by the parents. Topic-specific tip sheets were mailed after the call if the health educator deemed the sheets useful.

Newsletters. INT parents and children also received four monthly bilingual (English and Spanish) newsletters. Newsletters, developed by the UTHSCA research team (D.P.M. and C.M.) using evidence-based health information sources (*i.e.*, CDC website), were designed to provide parents with age-appropriate tips on how to encourage their child and family to continue following their healthy lifestyle prescription, such as eating meals together and engaging in more PA. The newsletters also featured age-appropriate examples of fun, interactive family activities, and healthy food and snack recipes.

Measures

Waist circumference, weight, and height were assessed at baseline, two, six and 18 weeks, concurrent with standard clinic visits. Self-reported behavior (family/child nutrition and physical activity) and labs (fasting glucose, insulin and cholesterol) were assessed at baseline and immediately post-intervention (18 weeks). To minimize subject burden, demographic data was assessed at baseline since it was unlikely to change during the brief study period.

Child waist circumference (minimum waist girth) was measured to the nearest 0.5 cm using a Seca© tape measure midway between the right iliac crests and the lower ribs when the subject is standing erect with feet together.[15] Child weight was measured (to the nearest 0.1 kg) using a Seca© digital scale following standard protocol.[16] Child height (measured to the nearest 0.1 cm) was obtained using a stadiometer without shoes. We converted BMI (weight

Table 1. Participants' Demographic Characteristics

	Standard care *n*=61	Intervention *n*=57	Total *N*=118	*p* value
Child				
Age				0.30[a]
Mean (SD)	9.92 (2.7)	9.4 (2.7)	9.67 (2.7)	
Gender, *N* (%)				0.19[c]
Male	28 (45.9)	19 (33.3)	47 (39.8)	
Female	33 (54.1)	38 (66.7)	71 (60.2)	
Health insurance, *N* (%)				0.65[c]
Medicaid/CHIP	51 (83.6)	44 (78.6)	95 (81.2)	
Private	9 (14.8)	10 (17.9)	19 (16.2)	
Other	1 (1.6)	2 (3.6)	3 (2.6)	
Adult				
Age				0.76[b]
Mean (SD)	36.5 (13.3)	35.8 (8.5)	36.2 (11.2)	
Gender, *N* (%)				1.00[c]
Male	5 (8.2)	4 (7.1)	9 (7.7)	
Female	56 (91.8)	52 (92.9)	108 (92.3)	
Marital status				0.71[c]
Married/living as married	43 (72.9)	43 (76.8)	86 (74.8)	
Single	8 (13.6)	9 (16.1)	17 (14.8)	
Divorced/separated	7 (11.9)	4 (17.1)	11 (9.6)	
Other/widowed	1 (1.7)	0 (0)	1 (0.9)	
Education				0.32[d]
Less than high school	29 (47.5)	26 (46.4)	55 (47.0)	
High school graduate/GED	21 (34.4)	14 (25.0)	35 (29.9)	
More than high school	11 (18.0)	16 (28.6)	27 (23.1)	
Annual family income				0.42[c]
<$10,000	8 (13.1)	8 (14.3)	16 (13.7)	
$10,001–$20,000	12 (19.7)	17 (30.4)	29 (24.8)	
$20,001–$30,000	16 (26.2)	7 (12.5)	23 (19.7)	
$30,001–$40,000	7 (11.5)	9 (16.1)	16 (13.7)	
>$40,000	10 (16.4)	7 (12.5)	17 (14.5)	
Unknown	8 (13.1)	8 (14.3)	16 (13.7)	
Country of origin				0.99[d]
United States	31 (50.8)	28 (50.9)	59 (50.9)	
Mexico	29 (47.5)	26 (47.3)	55 (47.4)	
Guatemala	1 (1.6)	1 (1.8)	2 (1.7)	
Years living in United States among foreign born				
Mean (SD)	15.9 (8.2)	15.37 (7.7)	15.6 (7.9)	0.82[a]

[a]*t*-test.

[b]Mann-Whitney's U test.

[c]Fisher's exact test.

[d]Chi-square test.

SD, standard deviation; CHIP, Children's Health Insurance Program; GED, General Educational Development.

[kg]/[height {m}^{2}]) to standard deviation (SD) scores (or z scores) and to percentile values using growth charts from the CDC.

Demographic data were collected from the parent on parental acculturation (*i.e.*, language preference for reading and speaking, country of birth, and years in the United States) and socioeconomic status (*i.e.*, parental education, family income, and child's health insurance).

Statistical Analysis

The primary hypothesis was that children assigned to the INT group (compared to the SC group) would demonstrate a greater proportion of weight maintenance (*i.e.*, a smaller proportion of weight gain). Descriptive statistics were used to summarize demographic data collected at baseline. To determine the effect of the INT on a child's weight maintenance, we used summary statistics to evaluate and compare these outcomes (or changes) between the INT and SC based on intention-to-treat analysis. For categorical outcomes, Fisher's exact test and/or the chi-square test were used to examine the differences between the two groups. For continuous outcomes, the *t*-test or Mann-Whitney's U test was used, depending on the distributions of the outcomes.

For waist circumference, weight, *z*BMI, and BMI percentile—measured repeatedly over four time points (baseline, 2, 6, and 18 weeks)—the trend of change was defined as a dichotomous variable and measured as follows. For each child, a linear regression line was fitted using all available measurements at the four time points. The trend of change was coded as 1 if the slope of the fitted regression line was positive in sign and 0 otherwise. The NEST research team's clinical experience suggests a 10–20% dropout for this 18-week study. In this pilot study, no effect-size estimates were available; we conducted power analysis assuming that children would continue to gain weight without treatment. Growth data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development[17] showed that 80% of children who are overweight at any time during the elementary school period (ages 7, 9, and 11 years) will be overweight at age 12 years. So, without any intervention, we assumed that most overweight children would continue to gain excess weight as they grow. We estimated that 80% of children in the SC group would have a positive slope, indicating weight gain or a failure of weight maintenance.[17] With this assumption, a sample of 160 (80 children per group) would achieve 80% power to detect a minimum 20% difference with a significance level of 0.05 using a two-sided Z test with pooled variance. We would need to increase the estimate, of weight gain to 90% of children in the SC group, to detect the same difference with a sample of 118 (59 children per group).

Multivariate logistic regression was used to examine the effect of INT on the likelihood of weight maintenance after adjusting for potential confounding variables (child age, child gender, annual family income, parent education, and parent country of origin). Sensitivity analyses were conducted for children with less than two measures of waist circumference, weight, or *z*BMI (*i.e.*, missing slope). Two different imputation approaches were applied: (1) assuming that all missing slopes were positive (*i.e.*, a failure of

Table 2. Participants' Clinical Characteristics

	Standard care *n*=61	Intervention *n*=57	Total *N*=118	*p* value
Waist (cm)				0.77[a]
Mean (SD)	85.85 (15.97)	84.99 (14.83)	85.44 (15.37)	
Waist abnormal, *N* (%)				0.12[c]
No	17 (29.3)	9 (16.7)	26 (23.2)	
Yes	41 (70.7)	45 (83.3)	86 (76.8)	
BMI				0.65[b]
Mean (SD)	26.64 (5.53)	27.15 (5.6)	26.89 (5.55)	
BMI percentile				0.1[b]
Mean (SD)	97.51 (2.37)	97.89 (2.62)	97.7 (2.49)	
BMI percentile abnormal, *N* (%)				0.40[c]
Overweight	9 (14.8)	5 (18.9)	14 (12.0)	
Obese	52 (85.2)	51 (91.1)	103 (88)	

[a]*t*-test.

[b]Mann-Whitney's U test.

[c]Fisher's exact test.

SD, standard deviation.

weight maintenance) and (2) assuming that all missing slopes were negative or zero (*i.e.*, a success of weight maintenance). Analyses were performed by a doctoral-level statistician (Y.L.) and masters-level data analyst (Y.O.) using SAS software (version 9, 2008; SAS Institute Inc., Cary, NC).

Results

Participant demographic characteristics, by study group, are shown in Table 1. Most children were female (60%), with a mean age of 9.67 years and on Medicaid/Children's Health Insurance Program (CHIP) (81.2%). Adult caregivers were mostly female (92.3%), US born (50.9%), low income (58.2% had ≤$30,000 annual family income), and married (74.8%), with a mean age of 36.2 (SD = 11.2). Clinical characteristics of children at baseline (Table 2) showed that 88% were obese, mean BMI percentile was 97.7 (SD = 2.5), and 76.8% had abnormal waist circumference. There were no significant differences in demographic or clinical characteristics observed at baseline by study group

Table 3. Unadjusted Analysis for Waist Circumference, Weight, and zBMI

Part I: before imputation		**Standard care *N* (%)**	**Intervention *N* (%)**	**Total *N* (%)**	***p* value[a]**
Waist circumference	Negative or zero	16 (31.4)	28 (56)	44 (43.6)	0.02
	Positive	35 (68.6)	22 (44)	57 (56.4)	
	Total	51	50	101	
Weight	Negative or zero	6 (10.3)	17 (31.5)	23 (20.5)	0.009
	Positive	52 (89.7)	37 (68.5)	89 (79.5)	
	Total	58	54	112	
zBMI	Negative or zero	34 (58.6)	36 (67.9)	70 (63.1)	0.33
	Positive	24 (41.4)	17 (32.1)	41 (36.9)	
	Total	58	53	111	
Part II: imputation method I[b]		**Standard care *N* (%)**	**Intervention *N* (%)**	**Total *N* (%)**	***p* value[a]**
Waist circumference	Negative or zero	16 (26.2)	28 (49.1)	44 (37.3)	0.01
	Positive	45 (73.8)	29 (50.9)	74 (62.7)	
	Total	61	57	118	
Weight	Negative or zero	6 (9.8)	17 (29.8)	23 (19.5)	0.01
	Positive	55 (90.2)	40 (70.2)	95 (80.5)	
	Total	61	57	118	
zBMI	Negative or zero	34 (55.7)	36 (63.2)	70 (59.3)	0.46
	Positive	27 (44.3)	21 (36.8)	48 (40.7)	
	Total	61	57	118	
Part III: imputation method II[c]		**Standard care *N* (%)**	**Intervention *N* (%)**	**Total *N* (%)**	***p* value[a]**
Waist circumference	Negative or zero	26 (42.6)	35 (61.4)	61 (51.7)	0.045
	Positive	35 (57.4)	22 (38.6)	57 (48.3)	
	Total	61	57	118	
Weight	Negative or zero	9 (14.8)	20 (35.1)	29 (24.6)	0.018
	Positive	52 (85.2)	37 (64.9)	89 (75.4)	
	Total	61	57	118	
zBMI	Negative or zero	37 (60.7)	40 (70.2)	77 (65.3)	0.335
	Positive	24 (39.3)	17 (29.8)	41 (34.7)	
	Total	61	57	118	

[a]Fisher's exact test.

[b]All children with missing data experienced weight gain.

[c]All children with missing data did not experience weight gain.

Table 4. Summary of Logistic Regression Analysis

Covariate		Waist circumference OR (95% CI)	*p* value	Weight OR (95% CI)	*p* value	zBMI OR (95% CI)	*p* value
Group	Standard care	1.00	0.007	1.00	0.013	1.00	0.573
	Intervention	0.25 (0.09, 0.66)		0.25 (0.08, 0.75)		0.78 (0.33, 1.84)	
Age		1.13 (0.95, 1.37)	0.205	0.98 (0.80, 1.19)	0.823	—	—
Gender	Female	1.00	0.025	1.00	0.909	—	—
	Male	0.30 (0.11, 0.86)		1.07 (0.34, 3.36)		—	
Income	<$10k	0.08 (0.01, 0.60)	0.139	0.19 (0.02, 2.42)	0.415	0.60 (0.13, 2.68)	0.264
	$10k ~ 20k	0.12 (0.02, 0.71)		0.27 (0.03, 2.73)		0.56 (0.15, 2.11)	
	$20k ~ 30k	0.08 (0.01, 0.54)		0.49 (0.04, 6.55)		0.82 (0.21, 3.18)	
	$30k ~ 40k	0.12 (0.02, 0.91)		0.11 (0.01, 1.22)		0.12 (0.02, 0.80)	
	>$40k	0.06 (0.01, 0.49)		0.13 (0.01, 1.74)		0.25 (0.04, 1.48)	
	Unknown	1.00		1.00		1.00	
Education	<High school	1.00	0.479	1.00	0.752	1.00	0.855
	HS/GED	0.47 (0.14, 1.60)		1.62 (0.42, 6.28)		1.32 (0.46, 3.78)	
	>High school	0.64 (0.16, 2.52)		1.04 (0.24, 4.44)		1.02 (0.26, 4.02)	
Country of origin	United States	1.00	0.378	1.00	0.742	1.00	0.469
	Other	0.62 (0.21, 1.81)		1.21 (0.38, 3.85)		0.70 (0.26, 1.86)	

OR, odds ratio; CI, confidence interval; HS, high school; GED, General Educational Development.

Without adjusting for other confounding variables, there was strong evidence of weight maintenance in favor of the INT group (see Table 3). Particularly (Table 3: Part I), 44% of children in the INT group experienced an increase in waist circumference, compared to 68.6% in the SC group ($p = 0.02$), and 68.5% of children in the INT group experienced weight gain, compared to 89.7% in the SC group ($p = 0.009$). In addition, 32.1% of children in INT group experienced increase in *z*BMI, compared to 41.4% in the SC group ($p = 0.33$), indicating a trend of improvement in favor of the INT group. After imputing missing data under the assumption that all children experienced weight gain (Table 3: Part II), 50.9% of children in the INT group experienced an increase in waist circumference, compared to 73.8% in the SC group ($p = 0.01$); 70.2% of children in the INT group experienced weight gain, compared to 90.2% in the SC group ($p = 0.01$), and 36.8% of children in the INT group experienced increase *z*BMI, compared to 44.3% in the SC group ($p = 0.46$). Similar trends were observed after imputing missing data under the alternative assumption that all children did not experience weight gain ($p = 0.045$, $p = 0.018$, and $p = 0.335$ for waist circumference, weight, and *z*BMI, respectively; Table 3: Part III).

After adjusting for age, gender, income, education, and country of origin (see Table 4), the odds of weight (or waist circumference) gain was markedly reduced by 75% for children in the INT group, compared to children in the SC group (weight: odds ratio [OR] = 0.25; 95% confidence interval [CI] = 0.08, 0.75; waist circumference: OR = 0.25; 95% CI = 0.09, 0.66). After adjusting for income, education, and country of origin, the odds of BMI *z*-score increase was reduced by 22% for children in the INT group, compared to children in the SC group (OR = 0.78; 95% CI, 0.33–1.84), although it was not statistically significant ($p = 0.573$). After imputation, similar results were observed hence not reported.

Discussion and Conclusion

Compared to children in SC, children in the INT group were more likely to experience weight maintenance. Successfully maintaining weight of children as they grow will improve their weight status and can lower their risk for obesity-related complications, such as high blood pressure and metabolic syndrome.

The NEST behavioral intervention was designed to meet current guidelines[9] and was offered to participants at no cost. We were able to demonstrate improved weight maintenance among those who received the program using weight and waist circumference, but not *z*BMI. The intervention period, however, was brief, lasting only 18 weeks. The behavioral change literature suggests that a person must engage in a new behavior for 6 months before it becomes habit. Thus, a longer intervention period and follow-up from the provider and health educator may have improved outcomes, maintaining child weight over a

longer period and allowing time for growth and observed shifts in BMI.

PCPs who have regular contact with children and their parents are in an influential position to monitor and modify factors that contribute to unhealthy weight gain. Major barriers for implementation of guidelines, such as lack of time,[11,12] lack of awareness of community resources, and insufficient knowledge and skills on behavioral management strategies,[11,12] persist. Health educators, as a group, have not traditionally focused their efforts on the primary care setting, yet, given their training and skills, are qualified to address many of these barriers. Involvement of health educators in primary care has the potential not only to enhance how primary care is delivered, but also to improve health outcomes.[18] Health educators can provide direct delivery of patient education, such as health coaching, serve as connectors to community resources, and facilitate evidence-based practice and quality improvement.[19] If implemented properly, involvement of health educators has potential to enhance how primary care is delivered, improve the health of people with regard to chronic conditions, and reduce related healthcare costs.[18]

To increase access to effective treatment for childhood obesity, efforts are needed to accelerate implementation of the USPSTF guidelines and translate evidence in practice. New models for delivery of evidence-based preventive services are needed. Our goal is to develop a replicable model that could be adopted in primary care settings to manage their overweight or obese pediatric patients. Results from this pilot study should be treated as preliminary and interpreted with caution. That said, the study provides preliminary evidence for the feasibility of the NEST intervention, including logistical issues, potential effect sizes for behavioral outcomes, and the cultural suitability and reliability of measures and the intervention approach. It is probable that 18 weeks is too short a time to establish the desired behavior without additional support. For future studies, we recommend extending the intervention period to 6 months and adding a maintenance period. The intervention can be strengthened by increasing the frequency and duration and perhaps incorporating other social media (Facebook, YouTube, Twitter, Instagram, and mobile phone text messages) to enhance communication with parents and older youth. Utilizing developmentally appropriate strategies for children is key to success.

The USPSTF recommends that clinicians offer or refer overweight or obese children to intensive counseling and behavioral interventions to promote improvements in weight status. The NEST program was designed to help clinicians offer these clinical preventive services to their patients in a low-cost, flexible approach. This study has limited generalizability because we focus on one specific ethnic group from one clinic. Future studies should include multiple sites and a more diverse sample. Some children in SC were able to maintain their weight. The pilot, as designed, did not have a true control group. It may be that, for some patients, brief provider counseling and goal setting is sufficient to initiate the desired behavior change. Other children and their families may require the additional support provided by the NEST intervention. In addition, there were a substantial proportion of children in INT that did not respond positively. Further exploration of who benefitted from the program and why is needed.

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