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Comparison of Program costs for Parent-Only and Family-Based Interventions for Pediatric Obesity in Medically Underserved Rural settings

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Abstract

Purpose—To compare the costs of parent-only and family-based group interventions for childhood obesity delivered through Cooperative Extension Services in rural communities.

Methods—Ninety-three overweight or obese children (aged 8 to 14 years) and their parent(s) participated in this randomized controlled trial, which included a 4-month intervention and 6-month follow-up. Families were randomized to either a behavioral family-based intervention (n = 33), a behavioral parent-only intervention (n = 34), or a waitlist control condition (n = 26). Only program costs data for the parent-only and family-based programs are reported here (n = 67). Assessments were completed at baseline, post-treatment (month 4) and follow-up (month 10). The primary outcome measures were total program costs and cost per child for the parent-only and family interventions.

Findings—Twenty-six families in the parent-only intervention and 24 families in the family intervention completed all 3 assessments. As reported previously, both intervention programs led to significantly greater decreases in weight status relative to the control condition at month 10 follow-up. There was no significant difference in weight status change between the parent-only and family interventions. Total program costs for the parent-only and family interventions were \$13,546 and \$20,928, respectively. Total cost per child for the parent-only and family interventions were \$521 and \$872, respectively.

Conclusions—Parent-only interventions may be a cost-effective alternative treatment for pediatric obesity, especially for families in medically underserved settings.

The dissemination of effective interventions to address the pediatric obesity epidemic is critical. There is also a growing recognition of the need for health investments to be informed by the best available cost and outcome data.¹ Such data are essential as researchers, policy makers, and public health officials attempt to implement interventions that yield the greatest gains for the dollars spent.²

Behavioral interventions for overweight children lead to significant improvements in weight and health status.³ Most group interventions utilize a family-based approach including both children and their parents in group treatment sessions.^{4,5} However, research has demonstrated that parent-only group interventions may lead to similar improvements in weight status compared to family-based models.⁶ Recently, we reported that both parent-only and family-based group interventions for overweight and obese children in medically underserved rural counties led to greater improvements in weight status than a control condition.⁷ While data are accumulating on the relative effectiveness of these 2 models, little attention has been paid to the differential costs of these interventions.

Children in medically underserved rural areas are at greater risk for obesity than their non-rural peers.^{8,9} To our knowledge, there is only 1 published randomized clinical trial⁷ addressing weight management for children in rural settings. This is a significant concern, as one of the greatest challenges facing health promotion is translating research into evidence-based public health and clinical practices that are actively disseminated and widely adopted.¹⁰ Given the limited resources (eg, health care resources, health promotion programs, funds for community health programs) often experienced in rural areas,¹¹⁻¹⁴ examining the costs of interventions that can be disseminated to medically underserved areas has vital public health implications.^{10,15} The aim of this study was to compare the costs of parent-only and family-based group interventions for overweight and obese children in medically underserved rural communities. We hypothesized that parent-only group interventions would demonstrate lower costs and greater change in weight per dollar spent to conduct the treatment than family-based interventions.

Methods

Participants

Ninety-three children (aged 8 to 14 years) and their parent(s) were randomized to a family-based intervention, a parent-only, or a waitlist control. (Details on the study design have been reported previously.^{7,16}) All families were from 1 of 4 rural counties designated as a "Health Professional Shortage Areas."¹¹ The counties were classified as nonmetropolitan by the Office of Management and Budget (OMB), which categorizes counties based on population size and integration with large cities.¹⁷ All children had a body mass index above the 85th percentile. Children and adults were required to obtain physician approval to participate in the study. For families that were not able to access a physician, we arranged for a physician assessment at no cost; only 4 families required this assistance. Families were excluded if the child had a medical condition that contraindicated mild energy restriction or moderate physical activity, was using weight-loss drugs, or was enrolled in another weight loss program. The study was completed between 2005 and 2007.

Procedures

This study was approved by the governing institutional review board. Families were recruited through direct mailings, distribution of brochures through local schools, and community presentations. Each family participated in a phone and in-person screening to determine eligibility and complete informed consent. Families that met eligibility criteria completed a baseline assessment 2 weeks prior to the start of the intervention. Children and parents were measured for height and weight at baseline, post-treatment, and 6 months following completion of the intervention.

This study reports on the 67 children randomized to the family-based or parent-only interventions. Information on participant attrition was reported in a previous article.¹⁶ Of the

67 children randomized to the family-based ($n = 33$) or parent-only ($n = 34$) conditions, a total of 50 (family-based = 24; parent-only = 26) completed all assessments.

All evaluation and intervention sessions took place at the Cooperative Extension Service office in participating counties. The Cooperative Extension network is a partnership among the US Department of Agriculture, land-grant universities and local governments, and provides services to residents in almost every county in the US. Cooperative Extension programs include nutrition education,^{8,19} gardening, livestock, farming, and “4-H.”

Measures

Height without shoes was measured to the nearest 0.1 cm using a Harpendon stadiometer (Holtain Ltd., Crosswell, UK). Weight was measured to the nearest 0.1 kg with 1 layer of clothing on and without shoes using a calibrated balance beam scale.

Intervention

For both the family-based and parent-only interventions, weekly 90-minute group sessions were held for the first 8 weeks, then bi-weekly for the next 8 weeks. Child and parent participants in both treatments monitored dietary intake and physical activity. Families were taught to categorize foods as red, yellow, and green based on a modified version of the Stoplight program.²⁰ Increased physical activity was promoted through a pedometer-based step program. Families and group leaders worked together to set daily dietary and physical activity goals at the end of each group session.

Interventions were delivered by Family and Consumer Sciences (FCS) agents in collaboration with a post-doctoral psychologist and graduate students in clinical psychology. FCS agents have a bachelor's or master's degree, often with a concentration in nutrition. All interventionists received 12 hours of training prior to the intervention, 6 hours of booster training midway through the intervention, and weekly supervision.

In the family-based intervention, parent and child dyads participated in simultaneous, but separate groups. The child group sessions included a group-based physical activity, the chance to sample a healthy snack and an educational topic. The parent group included a discussion of the progress made and challenges encountered over the past week, as well as knowledge and skills training related to nutrition, physical activity, and behavior management strategies.

In the parent-only intervention, only the participating parent(s) attended group meetings. The parents discussed the progress over the past week and received knowledge and skills training related to healthy habits and behavior management strategies. Parents were encouraged to meet with their children following the group session to set goals within a range suggested by group leaders.

Total Program Costs

Program costs were determined by summing costs for personnel serving as trainers, group leaders, weekly supervision, materials (ie, manuals, materials to measure energy consumption, pedometers), incentives, food, and travel.

Costs for Personnel

Costs for personnel included time in training, provision of treatment group sessions, and weekly group supervision. Personnel costs were based on hourly salary rate multiplied by the number of hours spent in the specific intervention-related activities.

Training costs included the time for the primary investigator (salary = \$33.65/h) who led all training and supervision sessions, as well as the time for group leaders who received training. The family-based intervention included 4 leaders per group (2 each for the parent and child group). The parent-only intervention included 2 leaders per group. Each intervention team had 1 designated team leader (the post-doctoral psychologist) whose salary was \$20/h. The salary for the other group leaders was \$14.91/h. All group leaders spent 18 hours in training for each intervention group. Costs for travel time were included for group leaders who were required to travel to the training sessions.

Two hours per week were dedicated to conducting group intervention for each group leader (30 minutes for preparation and 90 minutes for conducting the group). Costs for travel time were included for group leaders who were required to travel to the intervention sessions. Each group leader also participated in 30 minutes of group supervision per week.

Costs for Materials, Incentives, and Food

A number of materials were distributed to families including pedometers, equipment to measure energy consumption, and participant manuals. Although not all families ultimately completed the month 10 assessment, the materials costs for those that “dropped out” were included in the calculation of total costs as participant attrition is an element of all programs. Costs for incentives (Wal-Mart gift cards) and equipment (frisbees, sponges, and buckets for relays) for the child group were only allocated to the family-based intervention. Food costs for the family-based intervention included the purchase of food for the children to sample healthy snacks and food for the “end of treatment” celebration. Food costs of the parent-only intervention included food for the “end of treatment” celebration. Each family also received \$5 per session as incentive for participation.

Costs for Travel

Ten dollars per session was allocated for costs incurred by the intervention team for travel to and from the intervention site.

Cost Per Child

For each treatment condition, costs per child were calculated by dividing the total program costs for the treatment condition by the total number of children completing the follow-up assessment in that condition.

Cost Per Unit Change in Weight Status

As a metric for comparing costs, we calculated the cost per 0.1 decrease in body mass index (BMI) z-score for each treatment condition. The cost per 0.1 change in BMI z-score for each treatment condition was calculated using the following formula:

$$(\text{Cost per child} \times 0.1) / \text{Average decrease in BMI z-score}$$

Data Analysis

We calculated total costs and average costs per child for both the family-based and parent-only interventions. As all children were credited with the same average cost within each condition, there was no variability in these figures. As variability is necessary for inferential statistics, statistical analyses to assess for significant differences in mean costs were not used in this article. Rather, we used descriptive statistics and reported the actual total programs costs and average costs per child for both conditions.

Results

Demographic and baseline data are displayed in Table 1. Independent samples *t* tests found no significant differences at baseline across conditions in child and parent age and weight status. Chi-square analyses found no significant difference at baseline on child gender and race, and family income. As noted previously,⁷ children assigned to both the parent-only and family-based interventions exhibited a significant *decrease* in weight status at month 10 follow-up relative to children in the waitlist control (0.090 and 0.115 BMI z-score units, respectively). Children in the waitlist control exhibited an *increase* of 0.022 BMI z-score units. The difference in weight status change at follow-up between the parent-only and family-based interventions was not statistically significant. The effectiveness of the interventions did not differ by child gender or race, although power to detect differences by race was limited by sample size.

Total programs costs, costs per child, and cost per 0.10 decrease in BMI z-score for both interventions are displayed in Table 2. Total program costs for the family-based intervention were \$20,928. Total program costs for the parent-only intervention were \$13,546. The total cost per child for the family-based intervention (\$872) was 67% higher than for the parent-only intervention (\$521). When factoring in the average weight status change per group, the cost per 0.10 decrease in BMI z-score for the family-based intervention (\$758) was 31% higher than for the parent-only intervention (\$579).

Discussion

This study addresses an increasingly important area of research given the prevalence of childhood obesity and the challenges associated with delivering cost-effective interventions.²¹ Our previous study, and that by Golan and colleagues,⁶ demonstrated that a parent-only group-based intervention demonstrated comparable effectiveness to a family-based intervention. However, the critical information that policy makers and educators lack is how to achieve the biggest reduction in obesity for the budget available.² Results from this pilot study suggest that a group-based intervention for childhood obesity including only the parent may be more cost-effective than a family-based intervention including the parent and child.

A unique strength of this study is the focus on translation and dissemination to a medically underserved community-based setting. In order to meet the objectives of Healthy People 2010, translational research is needed to demonstrate how efficacious interventions might be disseminated to low-income and rural populations, groups that face serious health disparities.¹⁰ Cost comparisons are particularly relevant in translation and dissemination research, as they have significant implications for sustainability.²² While the long-term costs and effectiveness of the current interventions require further investigation, the relatively low costs required for statistically significant weight changes relative to the waitlist control is encouraging. However, determining the costs associated with the weight change necessary for corresponding improvements in metabolic health parameters is essential before conclusion can be drawn.

The interventions in this study were delivered through Cooperative Extension offices in rural counties. The Cooperative Extension network offers a unique setting in that it provides the infrastructure, expertise, and stature within rural communities to support preventive services for families across the country. However, it is important to note that that Cooperative Extension delivers numerous programs to the community. As such, time and space in Cooperative Extension offices is limited. Moreover, our experience is that initial

collaboration between university-based team members and Cooperative Extension personnel is initially required to facilitate ownership of the specific program components.

An important limitation in our study is that we did not include costs related to research (ie, assessment, participant recruitment), costs to participants (ie, travel, purchasing healthier foods), and costs for physician appointments to assess study eligibility. There are also other potential long-term cost savings that could not be included in this analysis, such as reductions in medical expenditures due to improved health status. Finally, our follow-up period was only 6 months. A key aspect of future randomized clinical trials will be to examine the inclusion of longer follow-up that can gauge the sustainability and long-term cost-effectiveness of these programs in community-based settings.

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Table 1

Demographic and Baseline Weight Status Information

Characteristic	Family-Based Condition	Parent-Only Condition
Number completing both assessments	24	26
Child mean age (y) (SD)	11.44 (1.4)	11.01 (1.5)
Boys/girls (n)	9/15	14/12
Parent mean age (y) (SD)	40.39 (7.0)	41.00 (7.3)
Two-parent households (%)	79.2%	84.6%
Child race		
Caucasian	66.7%	80.8%
African American	12.5%	3.8%
Hispanic	16.7%	3.8%
Bi-racial	4.2%	11.5%
Family income		
Below \$19,999	16.6%	19.2%
\$20,000-\$59,999	45.8%	46.1%
Over \$60,000	29.2%	34.6%
Child mean BMI z-score (SD)	2.133 (0.43)	2.160 (0.35)
Parent mean BMI units (SD)	32.86 (6.7)	35.47 (8.0)

Table 2

Program costs by Intervention condition

	Family Condition	Parent-Only Condition
Costs for training		
Trainers (PI)	\$909	\$909
Trainees-group leaders	\$3,239	\$1,320
Costs for weekly supervision		
Supervisor (PI)	\$808	\$808
Supervisees-group leaders	\$1,553	\$838
Costs for group leaders conducting intervention	\$9,591	\$5,311
Costs for materials, incentives, and food		
Pedometers	\$1,122	\$1,156
Food scales/measuring cups & spoons	\$759	\$782
Participant manuals & monitoring forms	\$363	\$254
Rewards & equipment for child sessions	\$414	\$0
Family incentive for session attendance	\$1,247	\$1,509
Food & utensils for sampling/celebration	\$443	\$179
Group leader travel expenses	\$480	\$480
Total costs	\$20,928	\$13,546
Cost per child	\$872	\$521
Average decrease in BMI z-score *	0.115	0.090
Cost per 0.10 decrease in BMI z-score	\$758	\$579

* Results reported in a previously published article.