Feasibility and Preliminary Outcomes of a Scalable, Community-based Treatment of Childhood Obesity

WHAT’S KNOWN ON THIS SUBJECT: Pediatric obesity is a prevalent public health issue that is associated with medical and physical consequences. Clinic-based interventions for pediatric obesity are effective, but they have limited reach and are costly.

WHAT THIS STUDY ADDS: This is the first examination of an empirically informed, scalable treatment of pediatric overweight and obesity delivered in YMCAs. The results indicate that a scalable, community-based pediatric obesity intervention can produce clinically meaningful changes in weight and quality of life.

abstract

OBJECTIVE: Clinic-based treatments of childhood obesity are effective but typically have limited reach and are costly. In this study, we evaluated the effects of a scalable weight management program for children and teenagers.

METHODS: Participants were 155 children and their parent/guardian. Children had a mean ± SD age of 11.3 ± 2.8 years, BMI z score of 2.23 ± 0.41, and a percentage overweight of 72.5 ± 34.0. Most (92%) were obese, and nearly half (46.5%) were ≥99th percentile for BMI. The primary outcome was change in percentage overweight from baseline to 6 months.

RESULTS: At 6 months, children experienced a 3.4 percentage point reduction in percentage overweight (P = .001). Children <13 years had a 4.3 percentage point reduction in percentage overweight, whereas those ≥13 years had a 1.0 percentage point reduction. Those who attended a greater number of face-to-face group sessions experienced greater changes in percentage overweight. There were significant improvements in child health-related quality of life as reported by both children and their parents.

CONCLUSIONS: These data suggest that a scalable, community-based pediatric obesity intervention can result in clinically significant reductions in percentage overweight, as well as improvements in health-related quality of life. Pediatrics 2012;130:652–659

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KEY WORDS childhood obesity, community pediatrics

ABBREVIATIONS

HRQoL—health-related quality of life
ITT—intention-to-treat
PedsQL—Pediatric Quality of Life Inventory

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FUNDING: Funded by the United Health Group. The YMCA of Greater Providence received funds for space and personnel to conduct treatment.
The rates of childhood obesity have tripled over the last 30 years. As a result, millions of children suffer from a host of significant medical and psychosocial consequences. Moreover, childhood obesity often persists in adulthood, leading to an even greater number of obese adults who are subject to increased morbidity and mortality and higher health care costs.

The family-based behavioral treatment of childhood obesity is effective with impressive results up to 10 years after treatment. In 2010, the US Preventive Services Task Force provided a Grade B recommendation that clinicians screen children aged 6 to 17 years for obesity and, if appropriate, offer or refer them to behavioral interventions that promote improvement in weight status. This was similar to previous recommendations for screening and comprehensive treatment by the American Academy of Pediatrics. The dilemma for practicing pediatricians is that, despite their well-established efficacy, few childhood obesity programs are available to the public. Most existing programs are limited to tertiary care centers, available only to research participants, or have costs or access barriers that are prohibitive. Thus, a critical need exists to develop effective and accessible treatments of childhood obesity.

The purpose of this study was to assess the effects of a scalable weight management program for overweight and obese children and teenagers. This initial assessment of feasibility and efficacy was conducted among 155 youth ages 6 to 17 and their parents/guardians across 8 YMCAs.

**METHODS**

**Design**

The design was a single arm, prepost, 6-month study. This design was chosen given the novel treatment had never been evaluated and the low probability that untreated obese children would improve their relative weight status over a 6-month period.

**Recruitment**

Participants were recruited through local pediatric practices, e-mail announcements to YMCA members, flyers posted in the YMCA, school nurse referrals, and through information in local news stories. Participants did not have to be YMCA members or be insured by United Health Group. Inclusion criteria were as follows: child’s BMI ≥ the 85th percentile; child’s age of 6 to 17 years; and the parent willing to participate in treatment sessions. Major exclusion criteria were as follows: medications that would affect weight or appetite; physical conditions that would prevent physical activity or affect weight or appetite; or unwillingness or unsuitability to participate in group treatment. Interested participants were screened by telephone by using a standardized script and, if eligible, were enrolled. Among the 212 who called, 21 were ineligible and 36 were not interested, leaving 155 who enrolled (Fig 1). Immediately before the first treatment session, informed written consent and assent were obtained. The study was approved by the New England Institutional Review Board.

**Treatment**

The JOIN treatment program was informed by the empirically validated principles of family-based treatment of childhood obesity. To reduce cost and increase scalability beyond a specialized clinic, 4 major modifications were made. First, rather than having separate treatment groups for children and parents, there was a single combined group. Second, the group time (excluding the private weigh-in) was 60 rather than 90 minutes. Third, half of the treatment sessions were home sessions conducted by the parent. Finally, interventions were delivered by YMCA facilitators without any previous experience in treating pediatric obesity.

**FIGURE 1**

Participant flow.
Participants received family-based behavioral treatment in groups of 6 to 12 children/parent dyads. Separate groups were held for children (age <13 years) and teenagers (≥13 years). The 16 groups (12 child groups, 4 teenager groups) were conducted across 8 YMCA facilities in the Providence, Rhode Island area. Nine of the 16 groups were held in urban locations (5 in Providence: 180 000 population; 2 in East Providence: 50 000 population; and 2 in Cranston: 80 000 population). There were 24 sessions over 6 months. There were 12 face-to-face group sessions at the YMCA (weekly for 1 month, biweekly for 3 months, and monthly for 2 months), 12 home sessions, and 12 facilitator telephone calls (36 total contacts). Home sessions lasted 10 to 15 minutes, were conducted by the parent, and included a weigh-in, an assessment of progress with behavioral goals, and an introduction to new content. Instructions for how to complete the home sessions were given within the week 2 (≥13-year-old group) or week 4 (<13-year-old group) group meeting. The home session materials (worksheets with topics and goals) were provided at the previous face-to-face session. The telephone call from the facilitator was a 5- to 10-minute check-in about the previous week’s goals.

The 24 session topics included self-monitoring, stimulus control, LESS and YES! foods, screen time, goal setting, physical activity, sleep hygiene, and relapse management. The energy intake targets were 1200 to 1400 kcal/day for children <68 kg, 1400 to 1600 kcal/day for children 69 to 113 kg, and 1600 to 1800 kcal/day for children >113 kg.17 Key behavioral targets were as follows: self-monitoring of intake, activity, and weight; limiting “LESS” foods (cookies, candy, sugar sweetened beverages, fried foods) to 2 servings per day;13,15 limiting screen time to 2 hours/day;5; attendance at face-to-face sessions; and parental support and modeling. At each session (face-to-face or home), participants were awarded points for achieving weight and behavioral goals. These points were exchanged for prizes that were chosen and implemented by each family. Children also received a “prize” valued at <$1.00 (eg, Frisbees) for attendance at each group session.

The focus of treatment was the child. Treatment materials focused on parents’ roles in supporting the child’s weight management efforts (reinforcement, modeling, and changing the home environment) rather than the parent’s weight control. Children were weighed at each session, whereas parents were weighed at the 3 assessments. Parents of children <13 years attended each group session. Parents of children ≥13 years attended group sessions at weeks 1, 2, 12, and 24.

After a 15-minute check-in and weigh-in, each 1-hour group session was led by facilitators who were employees or independent contractors of the YMCA of Greater Providence. Among the 9 facilitators, 7 had Bachelors degrees and 2 had Masters degrees. All had previous group experience, and 7 had previous behavior coaching experience. Three had previous weight control experience with adults, and none had previous weight control experience with children/teenagers. Facilitators followed a treatment protocol and received 5.5 days of training from experienced clinicians (Drs Jelalian and Foster). 2.5 days before treatment and three 1-day sessions over the next 6 months. In addition, 18 telephonic facilitator meetings were conducted to facilitate adherence to the treatment protocol.

**Outcomes**

The following outcomes were assessed at baseline, 3 months, and 6 months.

**Weight and Height**

Body weight for children and parents was measured on calibrated scales (Detecto Model 6129, Cardinal Scale Manufacturing Company, Webb City, MO) while participants wore light clothing and no shoes. Height was measured by using a stadiometer (Seca 217 Mobile Stadiometer, Seca, Hamburg, Germany). Height was measured 3 times, and weight was measured twice, and the average of the readings was used. BMI was calculated as weight (kilograms) divided by height (meters) squared. Percentage overweight was calculated as the percentage over the median BMI for age and gender. BMI z scores were also calculated as a secondary outcome.

**Pediatric Quality of Life**

Pediatric health-related quality of life (HRQoL) was assessed by using the 23-item Pediatric Quality of Life Inventory (PedsQL). The PedsQL was administered to both children and parent proxies. Higher scores indicate better HRQoL.

**Statistical Analyses**

The primary outcome was change in percentage overweight in children at 6 months. Although there is no gold-standard metric for change in weight status in children, most intervention studies have used percentage overweight as the primary outcome, and change in percentage overweight is recommended for reporting results of intervention studies. The BMI z score was a secondary outcome.

Because this was a pilot/feasibility study of a novel treatment, no a priori power calculations were conducted. Significance levels were set at $P < .05$. The enrollment target was 150 children/parent dyads. Analyses were based on a within-subjects, repeated measures model. Differences between...
completers and noncompleters at baseline were assessed by using independent samples t tests or Wilcoxon rank sum tests and \( \chi^2 \) tests for categorical variables.

The primary analysis for weight-related variables was an intention-to-treat (ITT; using multiple imputation for missing values) paired t test at 6 months. When assumptions for parametric statistics were not met, data were analyzed by using nonparametric statistics (Wilcoxon matched-pair signed rank test). An ITT analysis (using baseline values carried forward) and a completers analysis were conducted as sensitivity analyses for percentage overweight and BMI z score at 6 months.

RESULTS

Participants

Three hundred ten participants enrolled in the study. Baseline characteristics of the 155 children and 155 parents are listed in Table 1.

Attrition

Retention rates were 88% (\( n = 137 \)) at 3 months and 84% (\( n = 130 \)) at 6 months. There were no statistically significant differences between completers (\( n = 130 \)) and noncompleters (\( n = 25 \)) on baseline variables.

Weight

Children

The overall sample experienced significant reductions in percentage overweight after 6 months (both \( P = .001 \); Table 2). This reduction in percentage overweight was achieved by a 2.3 \( \pm \) 2.8 cm increase in height and a 1.7 \( \pm \) 4.3 kg increase in weight. Children \(<\)13 years showed significant reductions in percentage overweight at 6 months, whereas children \(\geqslant\)13 years did not. Both sensitivity analyses revealed similar changes in percentage overweight when compared with the

<table>
<thead>
<tr>
<th>TABLE 1 Baseline Characteristics of Participants</th>
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<tbody>
<tr>
<td>Children (( N = 155 )) Value</td>
</tr>
<tr>
<td>Girl, %                                       54.8</td>
</tr>
<tr>
<td>Race, %                                       239.7</td>
</tr>
<tr>
<td>American Indian/Alaska Native                 0.6</td>
</tr>
<tr>
<td>Asian                                         1.3</td>
</tr>
<tr>
<td>Black or African American                     3.2</td>
</tr>
<tr>
<td>Hispanic or Latino                            10.3</td>
</tr>
<tr>
<td>White                                         65.8</td>
</tr>
<tr>
<td>Mixed                                         12.9</td>
</tr>
<tr>
<td>Unknown                                       5.8</td>
</tr>
<tr>
<td>Age (y)                                       11.3 GIS 2.8</td>
</tr>
<tr>
<td>(&lt;)13, %                                     74.2</td>
</tr>
<tr>
<td>(\geqslant)13, %                              25.8</td>
</tr>
<tr>
<td>Weight (kg)                                   70.9 GIS 26.9</td>
</tr>
<tr>
<td>Height (cm)                                   149.9 GIS 13.7</td>
</tr>
<tr>
<td>BMI                                           30.5 GIS 7.3</td>
</tr>
<tr>
<td>BMI percentile                                98.0 GIS 2.1</td>
</tr>
<tr>
<td>BMI z score                                   2.23 GIS 0.41</td>
</tr>
<tr>
<td>% Overweight                                  72.5 GIS 34.0</td>
</tr>
<tr>
<td>Weight category, %                            8.4</td>
</tr>
<tr>
<td>Overweight (85th–94.9th BMI percentile)       8.4</td>
</tr>
<tr>
<td>Obese ((\geqslant)99th BMI percentile)       91.6</td>
</tr>
</tbody>
</table>

Parents (\( N = 155 \))

| Age (y)                                       43.3 GIS 6.9 |
| Female, %                                     85.2 |
| Race, %                                       239.7 |
| American Indian/Alaska Native                 0.6 |
| Asian                                         0.6 |
| Black or African American                     4.5 |
| Hispanic or Latino                            12.3 |
| White                                         68.4 |
| Mixed                                         7.1 |
| Other                                         0.6 |
| Unknown                                       5.8 |
| Weight (kg)                                   92.4 GIS 24.1 |
| Height (cm)                                   163.6 GIS 6.9 |
| BMI                                           34.3 GIS 8.1 |
| Income, %                                     239.7 |
| \$10 000–\$25 000                             15.5 |
| \$25 000–\$50 000                             22.6 |
| \$50 000–\$75 000                             21.9 |
| \$75 000–\$100 000                            12.9 |
| Above \$100 000                               21.3 |
| Unknown                                       5.8 |
| Education, %                                  239.7 |
| Elementary                                    3.2 |
| High school                                   18.7 |
| College                                       55.5 |
| Doctor                                        1.3 |
| Post graduate                                 12.9 |
| Other                                         2.6 |
| Unknown                                       5.8 |
| Health insurance carrier, %                   239.7 |
| Employer-sponsored health insurance           56.1 |
| Medicaid/Rite Care                            21.3 |
| Medicare                                      1.3 |
| Self-insured                                  3.9 |
| Uninsured                                     2.6 |
| Unknown                                       14.8 |

Values are expressed as mean \( \pm \) SD unless otherwise noted.

\( ^a \) Nearly all child participants were obese, and nearly half were \(\geqslant\)99th percentile for BMI.

\( ^b \) Among the 155 parents, 134 (86.4%) were mothers, 14 (9.0%) were fathers, and 7 (4.5%) were “other” (grandparent, teacher).

\( ^c \) Weight data for 1 parent was not attainable, so this participant was excluded in weight analyses.
primary ITT (multiple imputation) analysis. There were no gender effects on changes in percentage overweight at 6 months. Children <13 and ≥13 years experienced significant reductions in BMI z score at 6 months (P < .001 for both groups). Compared with baseline (46.5%), 8% fewer children were at ≥99th BMI percentile at 24 weeks (38.3%). Similarly, 10% fewer children were in the obese category at 24 weeks (91.6% vs 81.5%) than at baseline.

Parents
Overall, parents experienced small (1.0% ± 2.9%) but statistically significant reductions in weight at 6 months (P = .04). Healthy weight (BMI <25) parents (n = 14) reduced body weight by 3.1% ± 21.2% (P = .03), overweight parents (n = 30) were weight stable (0.0% ± 3.3%, P = .99), and obese parents (n = 80) reduced body weight by 1.0% ± 5.3% (P = .11). Although healthy weight parents showed a mean reduction in body weight, there was substantial variability, and 21% of this group gained weight.

Correlates of Weight Change
No baseline variable was significantly correlated with change in percentage overweight. Weight change in parents was not related to change in percentage overweight in children (r = −0.03, P = .80).

Pediatric HRQoL
Whether based on child or parent report, children experienced significant improvements in HRQoL at 6 months (Table 3). Improvements in child ratings of HRQoL were observed for the total scores and all subscales of the PedsQL. Improvements were greater among the younger age group but significant in both groups. The most substantial change, as rated by children, was in emotional functioning, whereas parents reported the biggest improvements in physical health. Change in percentage overweight was not associated with change in child ratings of HRQoL.

Attendance
Children attended 73.3% of the group sessions (8.8 ± 2.5) and 71.6% of between-session telephone calls (8.6 ± 2.9). Children who attended over 75% of face-to-face sessions displayed greater reductions in percentage overweight than children who attended fewer sessions (P < .001). Group session attendance significantly correlated with changes in percentage overweight (r = −0.35, P < .001), whereas between-session calls did not. The first 4 group sessions covered the most essential program components. Children who attended all of the first 6 group sessions experienced greater reductions in percentage overweight than children who missed any of the first 6 group sessions (P = .003).

Program Satisfaction
Among 5 possible responses ranging from “dissatisfied” to “very satisfied,” nearly two-thirds of children (61.2%) and parents (66.6%) were very satisfied with the program. Nearly all (94.7%) parents would recommend the program.

DISCUSSION
There are several principal findings from this study. The first is that a scalable program for childhood obesity produced significant reductions in percentage overweight at 6 months, which were approximately half of the reductions seen in tertiary care, intensive, family-based intervention studies (7.6%–8.9%). Our less robust findings are likely due to the lower intensity of the intervention (fewer in-person sessions, no face-to-face screening before treatment, the lack of specialized clinicians). Although all of these factors may have diluted the treatment effects seen in specialized clinics, they greatly enhance the scalability of treatment. Although no formal cost analysis was conducted, there are significant cost savings associated with running 1 group for children and parents instead of 2 separate groups, having fewer face-to-face sessions, and utilizing health promotion staff in lieu of specialists who are more expensive and fewer in number. Moreover, the 10% reduction in the prevalence of obesity post-treatment, if maintained, has significant health and economic consequences from a public health perspective. Moving the treatment to community settings, such as the YMCA, also enhances the scalability and increases access for the millions of families whose children struggle with excess weight. Though treatment focused on pediatric behavior change, parents experienced a small (1.0%) but significant reduction in weight at 6 months, suggesting a collateral benefit of this intervention. The reason for the differential change in parental body weight by group is unknown. These data may signal a need to focus on
Parents' weights in future iterations of the program.

Currently, there are few, if any, scalable and evidence-informed childhood obesity treatment programs even for those who can afford them. To our knowledge, there are 2 studies documenting outcomes from pediatric obesity interventions offered in community settings. Project STORY (Sensible Treatment of Obesity. Rural Youth.) targeted children in rural settings, with interventions delivered through the Cooperative Extension Service by a Family Consumer Services agent in collaboration with a postdoctoral psychology fellow. The intervention produced significant decreases in BMI z score at 4- and 10-month assessments. Similarly, results from Mind, Exercise, Nutrition, Do it (MEND) Program demonstrated a significant decrease in BMI z score for children randomly assigned to a multicomponent community-based intervention compared with a delayed treatment condition. Both of these community interventions were more intensive than the JOIN program, either with regard to staff credentials or the frequency/duration of sessions, and resulted in greater BMI z score reductions than our program.

Our data also suggest that program participation in a community setting was feasible, acceptable, and attracted children at high risk. Attendance was high overall (76%), and attrition was low (16%) at 6 months. Child weight outcomes were related to attendance at face-to-face sessions but not facilitator telephone calls, suggesting that telephone calls were not as clinically useful. Program satisfaction was generally high among children and parents. Most of the participants were obese (92%), suggesting that children/parents may not be willing to seek treatment until children are obese. The fact that 46.5% of children were at ≥99th percentile for BMI suggests that many children who are already “off the chart” seek treatment and/or that few treatment programs led to an overrepresentation of children with severe obesity in this sample.

Children reduced percentage overweight by 4.3 percentage points compared with a 1.0 reduction in teenagers. It is also noteworthy that more children (74%) than teenagers (26%) enrolled, making it likely that changes in parental weights in future iterations of the program.
targeting adolescents and suggest that, given limited resources, efforts may be best placed in children <13 years. We required less parent engagement for teenagers, which may have contributed to differences in outcomes between age groups. Future adolescent obesity intervention studies should consider additional strategies including greater parent involvement, text messaging, or gender-specific interventions.

A third finding was that treatment was associated with significant changes in children’s HRQoL. Although both age groups experienced significant improvements in HRQoL, the greater change in <13-year-old group may be attributable to the greater changes in percentage overweight in that group. However, the lack of a relationship between child ratings of changes in HRQoL and changes in percentage overweight suggest that the improvements were more likely due to other program factors (ie, session topics, social engagement). Before treatment, child-report of HRQoL across multiple domains was lower (worse) than in healthy children and adolescents and comparable to pediatric oncology populations. Parents rated child HRQoL as lower than children rated their own HRQoL, with the exception of school functioning. Children reported the biggest improvements in emotional functioning, whereas parents reported the most significant improvements in physical health.

Although participants experienced modest but significant reductions in percentage overweight and BMI zscore, the clinical significance of these changes is underscored by 10% fewer children being obese after the intervention. Recent data reveal that leaving the obese category confers significant improvements across multiple cardiovascular disease risk factors. The substantial improvements in quality of life also underscore the clinical significance of our findings.

Our study had several strengths. To our knowledge, this is the first examination of an empirically-based treatment of pediatric overweight and obesity delivered in YMCAs. It has high dissemination potential given children and parents participated in the same group and groups were led by facilitators who did not have specialized degrees. It also assessed HRQoL from the perspectives of both children and parents. Finally, we recruited a large sample (n = 310 of 155 children/parent dyads). A limitation is the lack of a randomized no-treatment control group. Although that would have been optimal, it is unlikely that children with a mean BMI percentile of 98 would, without treatment, experience favorable changes in relative weight. Untreated obese children in randomized controlled trials increased percentage overweight by 2% over ~6 months. This study was also limited by a 6-month duration precluding an assessment of longer-term effects. Nonetheless, this initial study provides evidence that this newly developed and scalable program can produce clinically meaningful changes in weight and quality of life in a community setting without the use of specialized health care professionals. Future randomized controlled trial studies of the intervention are warranted and would benefit from longer durations, further evaluation of the differential utility of home and telephone sessions, and the inclusion of cardiometabolic outcomes.

CONCLUSIONS

There is a great need for affordable, accessible treatment programs so that pediatricians can be responsive to the current US Preventive Services Task Force recommendations. Without such programs, these recommendations cannot be actionable. Our findings indicate that a scalable pediatric obesity intervention delivered in community-based facilities is feasible and results in clinically significant outcomes, including improvements in weight status, as well as HRQoL. Given that outcomes from school-based pediatric obesity interventions are variable and the most effective programs reside in tertiary care centers, this community-based program has the potential to address a yet unmet need for a feasible, scalable, and effective pediatric obesity treatment that can reach millions of children and teenagers.

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REFERENCES


An error occurred in this article by Hutchinson et al, titled “School-age Outcomes of Extremely Preterm or Extremely Low Birth Weight Children” published in the April 2013 issue of Pediatrics (2013;131[4]:e1053–e1061; originally published online March 18, 2013; doi:10.1542/peds.2012-2311). On page e1053, under Abstract, on line 5 and 6 of the Methods paragraph, this reads: “A term/normal birth weight (T/NBW) cohort was recruited comprising 199 infants with birth weights <2500 g or gestational age <37 weeks.” This should have read: “A term/normal birth weight (T/NBW) cohort was recruited comprising 199 infants with birth weights ≥2500 g or gestational age ≥37 weeks.”

doi:10.1542/peds.2013-1574


An error occurred in the article by Urbina et al, titled “Triglyceride to HDL-C Ratio and Increased Arterial Stiffness in Children, Adolescents, and Young Adults” published in the April 2013 issue of Pediatrics (2013;131[4]:e1082–e1090; originally published online March 4, 2013; doi:10.1542/peds.2012-1726). On pages e1085 and e1086, the legends for Figs 1, 2, and 3 read: “log TG/HDL-C stratified by BMI z-score group (lean = black, overweight/obese = gray).” These should have read: “(lean = blue, overweight/obese = red).” Furthermore, the color-coded legends in the box on the right of the figures was incorrect. They should have had a blue line for the lean subjects and a red line for the obese subjects.

doi:10.1542/peds.2013-1865


An error occurred in this article by Foster et al, titled “Feasibility and Preliminary Outcomes of a Scalable, Community-based Treatment of Childhood Obesity” published in the October 2012 issue of Pediatrics (2012;130[4]:652–659; originally published online September 17, 2012; doi:10.1542/peds.2012-0344). On page 656, in Table 2, this reads: “BMI z score Change at 24 Weeks Overall (n = 155) −0.062 ± 0.003; <13 y (n = 115) −0.068 ± 0.003; ≥13 y (n = 40) −0.042 ± 0.005.” This should have read: “BMI z score Change at 24 Weeks Overall (n = 155) −0.09 ± 0.01; <13 y (n = 115) −0.10 ± 0.03; ≥13 y (n = 40) −0.04 ± 0.05.”


A production error occurred in the print version of the article by Broder-Fingert et al, titled “Racial and Ethnic Differences in Subspecialty Service Use by Children With Autism” published in the July 2013 issue of Pediatrics (2013;132[1]:94–100; originally published online June 17, 2013; doi: 10.1542/2012-3888). On page 97, under Table 4, this reads: “20.32.” This should have read: “20.32.”

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