**Objective:** To determine whether pediatricians and dietitians can implement an office-based obesity prevention program using motivational interviewing as the primary intervention.

**Design:** Nonrandomized clinical trial. Fifteen pediatricians belonging to Pediatric Research in Office Settings, a national practice-based research network, and 5 registered dietitians were assigned to 1 of 3 groups: (1) control; (2) minimal intervention (pediatrician only); or (3) intensive intervention (pediatrician and registered dietitian).

**Setting:** Primary care pediatric offices.

**Participants:** Ninety-one children presenting for well-child care visits met eligibility criteria of being aged 3 to 7 years and having a body mass index (calculated as the weight in kilograms divided by the height in meters squared) at the 85th percentile or greater but lower than the 95th percentile for the age or having a normal weight and a parent with a body mass index of 30 or greater.

**Interventions:** Pediatricians and registered dietitians in the intervention groups received motivational interviewing training. Parents of children in the minimal intervention group received 1 motivational interviewing session from the pediatrician, and parents of children in the intensive intervention group received 2 motivational interviewing sessions each from the pediatrician and the registered dietitian.

**Main Outcome Measure:** Change in the body mass index–for-age percentile.

**Results:** At 6 months’ follow-up, there was a decrease of 0.6, 1.9, and 2.6 body mass index percentiles in the control, minimal, and intensive groups, respectively. The differences in body mass index percentile change between the 3 groups were nonsignificant (P = .85). The patient dropout rates were 2 (10%), 13 (32%), and 15 (50%) for the control, minimal, and intensive groups, respectively. Fifteen (94%) of the parents reported that the intervention helped them think about changing their family’s eating habits.

**Conclusions:** Motivational interviewing by pediatricians and dietitians is a promising office-based strategy for preventing childhood obesity. However, additional studies are needed to demonstrate the efficacy of this intervention in practice settings.

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Given physicians’ longitudinal relationships with families and their regular monitoring of patients’ weight and height, the pediatric primary care office represents an important setting for the prevention or treatment of childhood obesity. Nevertheless, almost 80% of pediatricians report frustration with their ability to make an impact on pediatric obesity. An important barrier may be pediatricians’ real or perceived deficiencies in motivational and behavioral counseling skills for obesity management. Enhancing pediatricians’ ability to motivate their patients might improve confidence in their counseling, alter their feelings about their patients’ willingness to change, and ultimately improve clinical outcomes.

Motivational interviewing (MI) is a patient-centered method of counseling that seeks to elicit intrinsic motivation for changing behavior and encourages patients to understand and resolve their ambivalence to such change. Motivational interviewing appears to be particularly effective for individuals who are initially resistant to changing their behavior. The goal of MI is to help individuals express their own reasons for changing or maintaining the status quo and understand how their current behavior might affect their ability to achieve their life goals. The tone...
of MI is nonjudgmental, empathetic, and encouraging.4,6

Motivational interviewing counselors rely heavily on reflective listening and encourage patients to find their own meanings for change as well as their own solutions.6 Although MI has been used to modify diet and physical activity in adults, the evidence base for its use in children is just beginning to emerge.7,9

This feasibility study had 4 objectives: (1) to determine whether physicians and registered dietitians (RDs) can successfully implement an office-based obesity prevention program using MI as the primary intervention; (2) to examine the feasibility of integrating RDs into a primary care office-based obesity prevention program; (3) to refine the study protocol and logistics in anticipation of a larger clinical trial; and (4) to examine, in the context of a short-term, nonrandomized study design, the impact of MI on patient body mass index (BMI) (calculated as the weight in kilograms divided by the height in meters squared).

We recruited 15 pediatricians from separate practices belonging to Pediatric Research in Office Settings, the national practice-based research network of the American Academy of Pediatrics. At the time of the study, Pediatric Research in Office Settings comprised 1963 practitioners from 725 pediatric practices in the 50 states and Puerto Rico. The RDs were recruited through the Pediatric Nutrition Practice Group of the American Dietetic Association.

The study had 3 arms: (1) control (standard care); (2) minimal intervention (physician only); and (3) intensive intervention (physician and RD) (Table 1). The 15 pediatricians were chosen in nonrandom fashion to achieve geographical dispersion, ethnic and racial diversity of patients, and an urban-rural balance. The assignment of 5 practices to each arm was also nonrandom, including geographic proximity to 1 or more of the investigators, which afforded the ability to closely monitor study progress and access to participating RDs. Sites were assigned to intervention and control groups in a cluster trial scheme. Only 1 pediatrician in each practice participated in the study. The study was approved by the institutional review boards of the American Academy of Pediatrics, the Centers for Disease Control and Prevention (CDC), Morehouse School of Medicine, the Indian Health Service, and Wake Forest University School of Medicine.

Using a validated scale and stadiometer, staff from each pediatric office measured and recorded the height (to fractions of an inch) and weight (in pounds) of each child while also recording the date of measurement, date of birth, and sex. For parents, height and weight were self-reported after informed consent; the BMIs of children and parents were calculated to determine eligibility for the study. Criteria included the child being aged 3 to 7 years, being a patient seen at a well-child care visit with a BMI for age and sex at the 85th percentile or greater but below the 95th percentile or at the 50th percentile or greater but below the 85th percentile with at least 1 parent’s BMI being 30 or greater. Patients and families were required to speak the English language and have a working telephone. Children in foster care, institutions, or group care were excluded, as were children with chronic medical disorders. Recruitment began April 1, 2004, and the study was completed by June 30, 2005.

Each practice was asked to recruit 10 patients.

The intervention phase lasted 6 months. Pediatricians and RDs in the minimal and intensive groups attended a study orientation and completed a 2-day MI training session before the intervention. Another 2-day training session 1 year later was needed because of the prolonged time between the initial MI training and the start of recruitment required to gain approval from all of the institutional review boards. During the training, which was conducted by one of us (K.A.R.) and his staff, the pediatricians and RDs were provided a didactic overview of the essential principles and techniques of MI. Key strategies such as asking open-ended questions, using reflective listening, considering the pros and cons of change, decreasing resistance, and assessing the patient’s interest and confidence in making change were modeled by the trainers and practiced in small groups by the physicians and RDs. Simulated encounters were observed and rated by the training staff. The training sessions included instruction in anthropometry with practice in measurement and validation of the scale and stadiometer according to a protocol (available on the CDC Web site, http://www.cdc.gov/growthcharts). The pediatricians in the control group did not attend the study orientation session or the MI training. They received instruction in the protocol, including measurement technique, through a telephone conference with study staff. A log and all study forms and documents were kept in a folder separate from the patient’s record to ensure confidentiality in all of the study groups.

Study parents in all of the 3 groups were given the Youth/Adolescent Food Frequency Questionnaire (YAQ),10 which was modified to include questions on activity, dining at restaurants, and watching television. The YAQ was returned to the pediatric office at the 1-month visit (described later) or by mail (control group). Completed questionnaires were mailed to the Channing Laboratory, Boston, Mass, for analysis. In place of an obesity-oriented intervention, the parents in the control group received 2 safety handouts provided by the American Academy of Pediatrics. Parents in all of the groups completing the YAQ received a $10 gift certificate.

The modified YAQ (the standard YAQ is a reproducible and valid questionnaire)10 included food groups and sets of ques-

### Table 1. Study Design

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Control Group</th>
<th>Minimal Intervention Group</th>
<th>Intensive Intervention Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study orientation and MI training</td>
<td>MD only</td>
<td>MD only</td>
<td>MD and RD</td>
</tr>
<tr>
<td>Initial measurements and BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YAQ†</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Video and tip sheets‡</td>
<td></td>
<td>Safety</td>
<td>Handouts</td>
</tr>
<tr>
<td>MI sessions (1 mo with MD only)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6-mo Measurements, BMI, and YAQ</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); MD, physician; MI, motivational interviewing; RD, registered dietitian; YAQ, Youth/Adolescent Food Frequency Questionnaire.

* X denotes that the item was done or completed. No entry indicates that the item was not done.
† The YAQ was modified for this study.
‡ Tip sheets included information on healthy eating and activity.
§ Parents of children in the intensive intervention group received 2 MD and 2 RD MI sessions.

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The BMI percentile for age was determined with the CDC Statistical Analysis System code to match the combination of the calculated BMI, date of birth, and sex of each child to the 2000 CDC growth chart (http://www.cdc.gov/growthcharts). The parents in the minimal and intensive intervention groups returned for a 1-month visit to receive MI counseling (Table 1). Review of a 2-page checklist assessing eating and television viewing behaviors helped the pediatricians and RDs identify topics for MI at that visit. In the minimal study arm, the pediatrician met with the parent for a scheduled 10- to 15-minute MI session; the MI intervention was also scheduled for 10 to 15 minutes in the intensive group but was followed by a 45- to 50-minute MI session with the RD. The parents in the minimal and intensive groups were given tip sheets on healthy eating and activity as well as a video that modeled parental behavior around feeding issues, both of which were produced by the CDC and tested for quality control. A trained psychologist (Santhi Periasamy, PhD) analyzed the audiotapes and provided telephone feedback and coaching in MI to the pediatricians and RDs. After an audio-taped MI session, parents were requested to complete an evaluation form to assess their perceptions of counseling by the physician and RD. Parents of children in the intensive group returned for a 3-month visit in which they received additional MI sessions with the pediatrician and the RD. Children from all of the 3 study arms returned for a 6-month visit in which they were weighed and measured. Parents completed a second Y AQ at this time and received an additional $10 gift certificate.

Analysis of variance was used to examine within- and between-group changes in BMI. Change in BMI percentile was adjusted for the number of days between the baseline and follow-up visits, as the average time to follow-up was approxi-
Table 3. Baseline and 6-Month Body Mass Index–for-Age Percentile by Group

<table>
<thead>
<tr>
<th>Visit</th>
<th>Patients, No.</th>
<th>BMI Percentile, Mean (SD)</th>
<th>Change in BMI Percentile, Mean (SE)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>19</td>
<td>84.4 (11.3)</td>
<td>−0.6 (2.4)</td>
</tr>
<tr>
<td>6-mo</td>
<td>19</td>
<td>84.0 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Minimal group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>27</td>
<td>83.2 (10.7)</td>
<td>−1.9 (2.0)</td>
</tr>
<tr>
<td>6-mo</td>
<td>27</td>
<td>81.4 (12.6)</td>
<td></td>
</tr>
<tr>
<td>Intensive group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>15</td>
<td>81.8 (12.5)</td>
<td>−2.6 (2.8)</td>
</tr>
<tr>
<td>6-mo</td>
<td>15</td>
<td>78.7 (18.1)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: BMI, body mass index (calculated as the weight in kilograms divided by the height in meters squared).

*Adjusted for time to follow-up.

(P = .37), baseline BMI (P = .81), or baseline BMI percentile (P = .96). Thus, there was no evidence of selective attrition in the study.

**BMI OUTCOMES**

At the 6-month follow-up, there were mean decreases in BMI of 0.6, 1.9, and 2.6 percentiles in the control, minimal, and intensive intervention groups, respectively (Table 3). Adjusting for days from follow-up, the differences between the groups were not statistically significant (P = .85).

**CHANGES IN BEHAVIOR PATTERNS**

Fifty-six (62%) of the 91 patients completed the YAQ at the beginning and end (6-month visit) of the study. Two patients in the minimal group and 3 in the intensive group were measured and weighed at 6 months but did not have a follow-up survey completed by their parents.

Parents in the minimal group reported a significant within-group decrease in their child’s intake of snacks, a change that was significantly greater (P = .01) than the experience in the control group (Table 4). Parents in the intensive group reported a significant net decrease (P = .04) in dining out compared with the minimal group. For sweetened drinks, intake of fruits and vegetables, and television viewing, no significant within- or between-group differences were observed (P > .05).

**PARENT EVALUATION OF COUNSELING SESSIONS**

Eight parents from the minimal group and 8 from the intensive group who completed the evaluation form (after an audiotaped MI session at 1 month) rated their reactions to the counseling sessions with the physician (minimal and intensive groups) and the RD (intensive group only) (Table 5). Fifteen (94%) of the parents reported being very satisfied with the pediatrician visit, and all were very satisfied with the RD visit. Fifteen (94%) of the parents reported that the pediatrician and RD helped them think about changing their family’s eating habits.

**COMMENT**

The main objective of this pilot study was to determine the feasibility of primary care pediatricians and RDs implementing an office-based obesity prevention program using MI as the chief intervention strategy. We wished to examine methodological and logistic issues such as recruitment of practices and patients, training of the pediatricians and RDs, retention of participants, anthropometric measurements, and collection of data. Because of the short study duration (6 months) and methodological problems caused by nonrandom assignment of patients and physicians to intervention and control groups, we did not expect that the observed changes in BMI (nonstatistically significant decreases of 0.6, 1.9, and 2.6 BMI percentiles in the control, minimal, and intensive groups, respectively) would form the basis for judgment regarding effectiveness of the intervention. Important factors compromising data collection included recruitment problems (especially in the control group) and a high dropout rate (intensive group). Changes in eating behaviors and television viewing generally did not correlate with BMI changes (data not shown). However, parental, physician, and RD satisfaction with the MI intervention was high, and more than 90% of the parents reported that the pediatrician and RD helped them think about changing their family’s eating habits.

Feedback obtained from the pediatricians, RDs, parents, and office staff suggested significant changes for a future expanded clinical trial. We outline here the lessons derived from our experience that are applicable for future obesity research in practice settings.

**IMPROVING RECRUITMENT**

Our study protocol stipulated eligibility for 2 groups of children aged 3 to 7 years: (1) those with a BMI for age and sex at the 85th percentile or greater but below the 95th percentile; and (2) those with a BMI at the 50th percentile or greater but below the 85th percentile for whom 1 parent’s BMI was 30 or greater. This requirement meant that a parent had to report his or her own height and weight (after consent was obtained) before study entry. Physicians were frustrated when they spent time in recruitment but the child did not qualify for the study owing to the parent’s BMI. For a future study, we plan to eliminate parents’ BMI from the eligibility criteria, expand the age group to ages 2 to 8 years, and expand the BMI criteria to the 85th percentile or greater but below the 97th percentile to accommodate the pediatricians’ desire to enroll younger children and children who are heavier but not morbidly obese.

In our feasibility pilot study, we restricted recruitment to well-child care visits. The pediatricians told us that there were missed opportunities when children who might have qualified for the study were seen at sick care visits. We therefore recommend recruitment at sick and well care visits for future studies.

Physicians expressed dissatisfaction with excessive paperwork and the time required to fill out recruitment and other forms. In addition to minimizing the number of
forms, we will require that each practice identify a specific member of the office staff (nurse or medical assistant) to oversee study operations. This individual would attend the protocol training with the pediatrician and be the on-site study coordinator.

Enrollment of patients was lowest in the control group. The control pediatricians may have felt less ownership in the study because they did not attend the orientation session and received their protocol instruction through a telephone conference with study staff. For a future study, the control pediatricians will attend a half-day study orientation and continuing medical education workshop on pediatric obesity. At the conclusion of the study, the control pediatricians will be offered full training in MI.

**IMPROVING PARTICIPANT RETENTION**

The overall patient dropout rate was 33%, but it varied widely by group and was highest in the intensive group. Most departures from the intensive group occurred before the 1-month visit (at 1 month, the dropout rates were 44% in the intensive group vs 20% in the minimal group). This rather large differential suggests that motivation may have differed among patients, physicians, or both in these 2 groups. Several strategies could improve participant retention. Incentives could be given to physicians for patients completing the study. Better incentives could be given to parents for completing the study questionnaires. Because the 1-year gap between the initial orientation and the MI training to obtain clearance from all of the institutional review boards necessitated a second MI training session for the pediatricians and RDs, we will minimize the time between MI training and the first study counseling session in the future. After consent was obtained, the patients were given an appointment for a 1-month counseling visit. As previously noted, the no-show rate for this visit was high. The pediatricians believed that some parents lost their enthusiasm for the study during this time. In the future, we will suggest that the first visit occur as soon as possible after enrollment. Requiring a dedicated office assistant as a study coordinator should facilitate recruitment, retention, and overall study implementation. Difficulties were encountered in coordinating the schedules of the pediatricians and RDs. To alleviate this problem in a future study, we will allow telephone follow-up for the RDs as an alternative to face-to-face contacts after the initial counseling session. Telephone-delivered MI sessions have been shown to be effective in other settings, and we believe that this approach provides a potentially reimbursable model for dissemination if our intervention is proven effective. No-show visits were costly to the pediatricians and RDs, so we recommend reimbursing the pediatricians and RDs for no-show visits not cancelled within 24 hours. Finally, we plan to overpower the study by a few practices to account for practices dropping out or not meeting recruitment goals.

**Table 4. Diet, Dining Out, and Television Viewing Behavior of 56 Children**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group, Mean (SD) (n = 19)</th>
<th>Minimal Group, Mean (SD) (n = 25)</th>
<th>Intensive Group, Mean (SD) (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline Visit 6-mo Visit*</td>
<td>Baseline Visit 6-mo Visit*</td>
<td>Baseline Visit 6-mo Visit*</td>
</tr>
<tr>
<td>Sweetened drinks, glasses/d†</td>
<td>1.49 (0.92)</td>
<td>1.94 (1.54)</td>
<td>2.36 (1.32)</td>
</tr>
<tr>
<td>Snacks and desserts, servings/d‡</td>
<td>2.07 (1.06)</td>
<td>2.63 (1.95)</td>
<td>2.35 (1.34)</td>
</tr>
<tr>
<td>Dining out, times/wk/i</td>
<td>2.26 (1.48)</td>
<td>2.28 (1.43)</td>
<td>5.67 (5.30)</td>
</tr>
<tr>
<td>Fruits and vegetables, servings/d#</td>
<td>2.92 (1.78)</td>
<td>3.66 (2.04)</td>
<td>3.40 (2.10)</td>
</tr>
<tr>
<td>Television viewing, h/d</td>
<td>1.63 (0.56)</td>
<td>1.83 (0.73)</td>
<td>2.33 (1.18)</td>
</tr>
</tbody>
</table>

*The 6-month (postintervention) values were adjusted for differences between the 3 groups (control, minimal, and intensive) at the baseline visit.
†Includes juice, juice drinks, lemonade, soda, Kool-Aid (Kraft Foods Global, Inc, Northfield, Ill), sweetened tea, and instant breakfast drink.
‡Includes potato and corn chips, nachos, Fruit Roll-Ups (General Mills, Inc, Minneapolis, Minn), crackers, Pop-Tarts (Kellogg Co, Battle Creek, Mich), snack cakes, cake, sweet rolls, doughnuts, cookies, pies, candy, JELL-O (Kraft Foods Global, Inc), pudding, frozen yogurt, ice cream, and milk shakes.
§For snacks and desserts, the minimal intervention group had a significant net decrease (P = .01) between the baseline and 6-month visits as compared with the control group.
¶For dining out, the intensive intervention group had a significant net decrease (P = .04) compared with the minimal intervention group.
#Does not include potatoes, french fries, or tater tots.

**Table 5. Parental Perceptions of Counseling by 16 Pediatricians and 8 Dietitians**

<table>
<thead>
<tr>
<th>Item on Questionnaire</th>
<th>Parents Agreeing <em>A Lot,</em> No. (%)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>My pediatrician listened to me</td>
<td>16 (100)</td>
</tr>
<tr>
<td>My pediatrician asked my opinion about things</td>
<td>14 (88)</td>
</tr>
<tr>
<td>My pediatrician asked permission before giving information or advice</td>
<td>13 (81)</td>
</tr>
<tr>
<td>My pediatrician helped me think about changing my family’s food habits</td>
<td>15 (94)</td>
</tr>
<tr>
<td>My pediatrician was supportive or encouraging</td>
<td>15 (94)</td>
</tr>
<tr>
<td>My pediatrician discussed values important to me</td>
<td>14 (88)</td>
</tr>
<tr>
<td>My pediatrician helped me think about changing my family’s television habits</td>
<td>10 (63)</td>
</tr>
<tr>
<td>My nutritionist listened to me</td>
<td>8 (100)</td>
</tr>
<tr>
<td>My nutritionist asked my opinion about things</td>
<td>8 (100)</td>
</tr>
<tr>
<td>My nutritionist asked permission before giving information or advice</td>
<td>7 (88)</td>
</tr>
<tr>
<td>My nutritionist helped me think about changing my family’s food habits</td>
<td>8 (100)</td>
</tr>
</tbody>
</table>

*There were 8 pediatricians in the minimal group and 8 pediatricians in the intensive group. They had the same motivational interviewing training. These 2 groups were combined owing to small numbers.
†Possible answers were “not at all,” “a little,” “somewhat,” “a lot,” and “can’t say.”
A limiting factor in our study was the nonrandom assignment of clinics to treatment groups, a process that was based on factors such as availability of collaborating RDs and the willingness of the pediatricians to comply with study procedures. Such nonrandom assignment could have biased the study toward rejection of the null hypothesis. In regard to potential clustering of effects, only 1 physician in each practice participated in the study. However, there may have been a correlation between patients from practices in close geographic proximity. Any future study should be a randomized controlled clinical trial with cluster randomization used to avoid contamination between subjects but with practices separated geographically.

**MI TRAINING**

The pediatricians and RDs felt they needed more role-playing experience using open-ended questions, reflective listening, building motivation, and eliciting change talk. The feedback from the audiotaped MI sessions by the clinical psychologist (Santhi Periasamy, PhD) was positively received and considered valuable. In our next study, we will expand the time for role-playing and provide training for the investigators in behavioral therapy as it relates to pediatric obesity. Finally, we plan to produce an interactive DVD demonstrating clinical scenarios relevant to the study as a supplement and booster to the MI training.

**DIET AND ACTIVITY MEASURES**

In our present study, we used an extensive food and activity questionnaire that required 30 to 40 minutes for completion. Both parents and physicians complained about its length and complexity and a few parents refused to complete the final questionnaire. Prior to the first MI counseling session, parents also filled out a 2-page checklist assessing their child’s eating, activity, and television viewing behaviors. This latter form required only 5 minutes to complete. We believe that a brief dietary and activity patterns approach will be more feasible in a general office setting and can effectively identify potential change opportunities for the child and family. Therefore, for a future study, we plan to use an abbreviated 2- to 3-page survey focusing on 5 priority behaviors associated with pediatric obesity (sugar-sweetened drinks, snacks, dining out, fruit and vegetable intake, and television viewing).

**CONCLUSIONS**

The pediatric primary care office remains a potentially important setting for the prevention or treatment of obesity in children and adolescents. This feasibility study demonstrates that pediatricians and RDs can be taught to use some of the tools and techniques of MI and that this approach is well received by parents. Many challenges remain in designing and implementing research to test the effectiveness of the MI approach in practice settings, but practice-based research networks afford the opportunity to conduct the additional studies needed to make the office setting an effective site for obesity intervention.

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