

The Importance of Screening for Healthy Weight and Recommending Healthy Lifestyles in Pediatric Patients

Eliana M. Perrin, Asheley Cockrell Skinner

Regular pediatric care should focus on early obesity prevention and healthy lifestyles and should include obesity screening with sensitive and culturally appropriate communication, beginning at age 2 years. North Carolina is a leader with its Eat Smart, Move More campaign and tools that can help pediatric care providers achieve greater self-efficacy.

The National Health and Nutrition Examination Survey (NHANES) for 2009-2010 found that 15% of children and adolescents in the United States aged 2-19 years were overweight, and an additional 17% were obese. Rates were significantly higher among nonwhite children: 39% of black and Hispanic children were overweight or obese, compared with 28% of white children [1].

North Carolina lacks a surveillance system that collects data on measured overweight and obesity among a sample of people representative of the state's population as a whole, so it is difficult to compare our state with the rest of the nation. However, we do know that among low-income children in North Carolina, the rates of overweight (16.4%) and obesity (17.5%) are higher than among children in the nation as a whole, and that in some counties in North Carolina the proportion of low-income children who are either overweight or obese approaches or even exceeds 50% [2]. Results of the North Carolina Child Health Assessment and Monitoring Program (CHAMP) survey show that a disparity between white children and minority children also exists in the state: In 2011, 25% of white children aged 10-17 years were overweight or obese, compared with 39% of nonwhite children [3].

Why It Is Important to Address Childhood Overweight

Childhood obesity is stigmatized, and it increases the risk of having many health problems including type 2 diabetes, depression, metabolic syndrome, hyperlipidemia, hepatic steatosis (fatty liver), hypertension, sleep apnea, orthopedic problems, and adult obesity [4]. Fortunately, childhood also represents a window of opportunity during which overcoming obesity eliminates those increased risks. Although those who were obese in childhood and remain obese in adulthood have a 5.4 times greater risk of type 2 diabetes than do those

who have never been obese, those who reverse their obesity by adulthood have a risk level similar to that of those who have never been obese [5].

Excess body mass index (BMI)-years, which measures the extent and duration of excess weight, are comparable to pack-years in smoking. The higher the level of excess BMI-years, the greater the self-reported incidence of diabetes [6]. It is important for clinicians to know that younger children are more likely than older children to change their behavior if advised to do so by a clinician [7]. A recent study of intense obesity interventions in young children [8] showed that such interventions improved weight. All of these studies suggest the importance of addressing obesity early.

Weight Screening

Pediatricians are on the front lines of obesity prevention. An expert committee composed of representatives from 15 professional organizations has called for pediatricians to assess obesity risk and to conduct BMI screening annually, providing obesity prevention messages for children who are not overweight and suggesting healthy lifestyle interventions for those who are [9]. These recommendations have been echoed by First Lady Michelle Obama's "Let's Move!" campaign. Even the usually conservative US Preventive Services Task Force recommended in 2010 (reinforcing their 2005 recommendation) that all children aged 6-18 years be screened for obesity [10].

Recommendations follow the standard definitions of what constitutes overweight and obesity in children [9]—definitions that are based on age- and sex-specific percentiles for BMI. A child whose BMI is below the 5th percentile for children of the same age and sex is considered to be underweight; one whose BMI is at or above the 5th percentile and below the 85th percentile is considered to be a healthy weight; one whose BMI is at or above the 85th

Electronically published February 8, 2013.

Address correspondence to Dr. Eliana M. Perrin, University of North Carolina, 231 MacNider, CB#7225, Chapel Hill, NC 27599-7225 (eli-ana_perrin@med.unc.edu).

N C Med J. 2013;74(1):34-38. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74104

School-Based Obesity Treatment: The MATCH Program

Suzanne Lazorick, Yancey Crawford, George T. Hardison

Motivating Adolescents with Technology to Choose Health (MATCH) is a curriculum for middle school students developed by one of the authors (G.T.H.) when he was a science teacher in Martin County, North Carolina, where obesity rates are extremely high. The program is based on insights gained from studies of school-based interventions [1, 2]. It adopts a behavioral approach widely applied in health promotion, one that is based upon the social cognitive theory of self-regulation [3]. MATCH combines what is known about how children learn best in a classroom setting with strategies for promoting behavior change. The curriculum has 4 essential elements: It provides students with information about the unhealthy effects of overweight, teaches them specific self-regulation health skills, gives them individualized tasks that require them to apply those skills, and reinforces the skills with age-appropriate external motivational strategies.

MATCH takes an interdisciplinary approach to student wellness: The curriculum includes lessons on nutrition, physical activity, and technology, and the program provides teachers with a Web-based resource system that allows them to meet educational and wellness objectives simultaneously. The lessons, which are delivered over a 16-week intervention period, are aligned with National Common Core Curriculum Standards. They are designed to parallel the North Carolina Standard Course of Study for seventh grade and are taught embedded within existing curriculum rather than requiring additional instructional time.

When MATCH is implemented in a school, all seventh-grade teachers are trained to deliver MATCH lessons within their subject area, and one teacher serves as the coordinator. All materials are available for download from a secure Web site, and students complete lessons in a student-friendly workbook. Students learn about the body system by system (eg, cardiovascular system, endocrine system) as a structure for the sequenced series of inter-

disciplinary lessons and receive intermittent rewards for completion of MATCH-related activities. All students receive the same intervention regardless of weight category; the only time weight status is noted is during the student's self-categorization, which is completed privately.

Because the program lasts 16 weeks and is integrated across subjects, students are able to acquire the knowledge and skills they need to begin internalizing positive health behaviors. Lessons are taught in health, science, math, language arts, and technology classes, and cover such topics as energy balance, peer accountability contracts, body mass index (BMI) calculation, and persuasive writing. At the beginning and end of the program, height, weight, fitness level, and health behaviors are measured. All results are entered into the Web-based system by teachers, and key data are shared with the students, who use this information to establish health-related goals and to develop action plans for weight management.

The program's objectives are aligned with those of the Coordinated School Health program of the Centers for Disease Control and Prevention, and it follows recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity outlined in the report of an expert committee consisting of representatives from 15 professional organizations [4]. First offered in 2006, the MATCH program is now being implemented in 15 public schools in eastern North Carolina during the 2012-2013 school year. More information is available at www.MATCHwellness.org.

MATCH is now a community-academic partnership led by 2 of the authors—G.T.H. and S.L.; the latter is an obesity-focused preventive medicine pediatrician at East Carolina University (ECU). In 2008, the North Carolina State Board of Education selected MATCH for pilot expansion as a promising school-based obesity intervention. Through funding from the Blue Cross and Blue Shield of North Carolina Foundation and the Kate B. Reynolds

percentile and below the 95th percentile is considered to be overweight; and one whose BMI is at or above the 95th percentile is considered to be obese. Because BMI is based on height and weight, which are regularly measured during primary care visits, obesity screening can occur at the same intervals as standard well-child care beginning at age 2 years. For children younger than 2 years, the ratio of weight to length can be used rather than the ratio of weight to height, and those whose ratio puts them at or above the 95th percentile for children of the same age and sex are considered to be overweight.

Pediatric primary care providers who screen for and document overweight and obesity are more likely to counsel patients and their parents about diet and exercise [11]

and to screen and refer for comorbidities of overweight [12]. Use of toolkits encouraging screening and communication is associated with change in parental perception of overweight and positive dietary and physical activity changes [13]. Parents with accurate perception of weight status are more likely to be ready to make weight-related behavioral changes [14]. Lack of communication with families about weight status of overweight children is the strongest predictor of parental misclassification of a child, and pediatricians need to remember that their opinions are highly valued by patients [15].

The majority of parents with overweight children do not recognize that their overweight child weighs too much [16], and even fewer have ever been told by a clinician that their

Charitable Trust, G.T.H. now directs MATCH as an ECU employee. The program has maintained its long-standing relationships with several school districts that were part of the original expansion, including those in Martin, Washington, and Pitt counties. Districts in Pamlico, Hyde, Halifax, Edgecombe, and Chowan counties are also now participating. Since 2006, approximately 2,500 students have completed MATCH.

Using data from 2006 and 2007, we conducted a single-site study (using pre-post design) during the first 2 years of MATCH in 2 cohorts. Both cohorts received the same intervention and represented 2 sequential school years of 7th graders. One year after completion of MATCH, the proportion of students in cohort 1 ($n = 92$) with a BMI indicating a healthy weight increased from 45% to 53%, and the proportion of students in cohort 2 ($n = 106$) with a BMI indicating a healthy weight increased from 53% to 59% [5]. In no other study of a school-based intervention of this sort have such substantial and sustained improvements been found. In 2011-2012, with different teachers delivering the intervention in the same school and in 6 additional schools, the number of lessons taught varied widely, from 14 to 50. Decreases in BMI Z-scores similar to those seen in the original pilot program were achieved in 2 of the 7 schools. In addition, in nearly all schools there was improvement in fitness as measured by the validated Progressive Aerobic Capacity Endurance Run (PACER) test, which is a component of Fitnessgram, a standardized fitness test [6]. Variations in the number of lessons taught and in outcome measures are notable. The focus in further expansion will be to improve program fidelity and attain more consistent results at all participating schools, using a more rigorous study design. Evaluation is ongoing in the 15 schools currently participating.

Although nutrition and physical activity policy and environmental changes are needed to prevent obesity, an entire generation lives in an obesogenic environment now, characterized by cultural trends that decrease opportunities for physical activity and increase access to energy dense foods. MATCH offers an intense, theory-based, individual-focused, school-based model to counteract this environment while simultaneously meeting educational objectives. Because MATCH has been intentionally de-

veloped for widespread expansion, it offers a promising opportunity for merging public health missions with educational ones. **NCMJ**

Suzanne Lazorick, MD, MPH associate professor, Department of Pediatrics and Public Health, Brody School of Medicine, East Carolina University, Greenville, North Carolina.

Yancey Crawford, MPH program coordinator, Department of Pediatrics, Brody School of Medicine, East Carolina University, Greenville, North Carolina.

George T. Hardison, Jr, MA program director of MATCH, Department of Pediatrics, Brody School of Medicine, East Carolina University, Greenville, North Carolina.

Acknowledgments

Financial support. Funding for MATCH is provided by the North Carolina State Board of Education, the Blue Cross and Blue Shield of North Carolina Foundation, and the Kate B. Reynolds Charitable Trust.

Potential conflicts of interest. All authors have no relevant conflicts of interest.

References

1. Franks A, Kelder SH, Dino GA, et al. School-based programs: lessons learned from CATCH, Planet Health, and Not-On-Tobacco. *Prev Chronic Dis*. 2007;4(2):A33.
2. Budd GM, Volpe SL. School-based obesity prevention: research, challenges, and recommendations. *J Sch Health*. 2006;76(10):485-495.
3. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs: Prentice-Hall; 1986.
4. Barlow SE; Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;120(suppl 4):S164-S192.
5. Lazorick S, Hardison GT, Esserman DA, Perrin EM. Sustained body mass index changes one and two years post MATCH: A school-based wellness intervention in adolescents. *Childhood Obesity*. 2011;7(5):372-378.
6. Welk GJ, Meredith MD, eds. *Fitnessgram/Activitygram Reference Guide*. Dallas, TX: The Cooper Institute; 2008.

Electronically published February 8, 2013.

Address correspondence to Dr. Suzanne Lazorick, East Carolina University, Brody School of Medicine, Warren Life Science Building Suite 174, 600 Moye Blvd, Mail Stop 680, Greenville, NC 27834 (lazoricks@ecu.edu).

N C Med J. 2013;74(1):35-36. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74105

child is overweight [17]. Many pediatricians are not screening adequately for early weight trends of concern. Or if they do screen, they are not conveying that information to parents and making appropriate follow-up recommendations. Parents want to know their child's weight status, and they find the term "unhealthy weight" quite motivating [18]. Although only 54% of parents believe that it is very important to seek medical attention for overweight children, 94% say that they would seek care for conditions that limit life expectancy [19]. This suggests the need to frame obesity as a health problem. Obesity screening is being attempted in many places including schools and communities, but primary care physicians have been recognized as important communicators of weight-related messages.

Communicating the Results of BMI Screening to Parents

Despite clear definitions for overweight and obesity across all ages, ensuring that parents understand the results of BMI screening remains a challenge. One reason for this is that children, particularly those aged 3-8 years, have a naturally low percentage of body fat, so a child at the 95th percentile for BMI will often appear to parents to be at a healthy weight or even "skinny." Indeed, these children do not appear overweight by adult standards, so one cannot trust visual impressions. These children are at higher risk for their growth trajectories to continue to be overweight throughout childhood and into adulthood [20].

One approach to BMI communication that has been studied is the use of color-coded BMI charts [21]. These charts use a spotlight motif of increasing risk zones, with green representing healthy weight, yellow representing overweight, and red representing obesity. Using these charts in place of standard black-and-white charts significantly improves understanding of BMI screening results, particularly for parents with a low level of literacy or numeracy.

Primary Care Efforts to Prevent and Treat Obesity

Perhaps the biggest challenge in primary care BMI screening is deciding what action to take when a child is found to be overweight or obese. Moderate- and high-intensity interventions are the most promising, but are costly and are often difficult for families and health systems to carry out. The most effective treatment interventions include multiple components of lifestyle change, focusing on increasing physical activity and improving diet [10]. Our own research showed that environmental considerations such as the availability of fast food and soft drinks are top concerns for North Carolina pediatricians. However, the barriers most related to low self-efficacy (belief in their own capabilities) among providers were practice-based and include lack of reimbursement for non-MD staff, lack of an on-site dietitian, and lack of materials and resources for patient education [22]. Toolkits and brief training can improve pediatrician self-efficacy and lead to healthier patient behaviors [13].

Growing evidence points to prevention as critical in addressing obesity, particularly on a large scale. Interventions to prevent obesity, compared with those aimed at treating obesity that already exist, have demonstrated better success, particularly among children aged 6-12 years [23]. The importance of preventing obesity in the first year of life is being increasingly emphasized. Pediatricians' frequent visits with parents during this important period allow them to promote breastfeeding and to encourage early playtime. They can also teach parents to respect satiety, to avoid offering children juice or cereal in a bottle, and to avoid offering children fast food.

Encouraging healthy lifestyle behaviors is the most critical component of helping children to maintain a healthy weight and of promoting overall health for children. Promotion of healthy weight and healthy lifestyles can occur in many venues, but primary care physicians have the opportunity to play a unique role in children's weight-related health. Although the factors that influence obesity in children are many, ranging from genetics to the environment, the mainstays of obesity prevention and treatment are healthy behaviors—primarily physical activity and healthy dietary behaviors.

Recommendations are that children engage in at least 60 minutes of physical activity every day. In North Carolina, only 30% of parents report that their children aged 6-17 years are active for 60 minutes 6-7 days per week [3]. The proportion of children participating in daily physical activity declines throughout childhood and into adolescence. Although the

families and children being surveyed may not be representative of the population of the state as a whole, North Carolina children appear to be somewhat less likely to meet physical activity recommendations than are children in the rest of the nation. In 2011, 50% of high school students across the United States reported engaging in 60 minutes of physical activity at least 5 times per week, and 30% reported doing so every day [24]. In contrast, more than 32% of US high school students reported watching 3 or more hours of television each day, whereas only 26% of North Carolina children reported watching more than 2 hours of television each day [3,24].

Pediatricians can also use Eat Smart, Move More North Carolina prescription forms that contain "5-3-2-1-Almost None" prevention messages: Eat 5 or more servings of fruits and vegetables daily; eat 3 structured meals daily, limiting fast food and eating more meals prepared at home; limit television and video games to less than 2 hours per day; engage in 1 hour or more of moderate to vigorous physical activity daily; and limit sugar-sweetened drinks to "almost none." These are the prevention messages that experts think are most important for the primary care setting. The prescription forms are available at <http://www.eatsmartmovemorenc.com/PediatricObesityTools/Texts/PrescripPadColor.pdf>.

Health Consequences of Obesity

The reason we are concerned about BMI starting at age 2 years is that high BMI predicts adult obesity and has immediate health effects as well. Health consequences of obesity may emerge early. For example, inflammation, a measure of cardiovascular risk, increases in very obese children as young as age 3 [25]. Additionally, other health risks associated with obesity in adults also appear in children, including high cholesterol levels, high blood pressure, and type 2 diabetes [4]. Primary care pediatricians should discuss health risks as additional motivation for families who are attempting to make behavior changes.

Conclusion

The North Carolina rates for unhealthy behaviors and overweight and obesity among children are calls to action for those of us on the front lines of this epidemic. We must be sure to have conversations with parents to teach them healthy eating and physical activity patterns for their children. We must let them know through sensitive, health-promoting communication when we see early weight trajectories that cause concern or unhealthy dietary or physical activity patterns, before patterns become entrenched or contribute to health problems. We owe it to our children, our families, and our future. NCMJ

Eliana M. Perrin, MD, MPH associate professor, Division of General Pediatrics and Adolescent Medicine, Department of Pediatrics, School of Medicine, and director, Child Health Program, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Asheley Cockrell Skinner, PhD associate professor, Division of General Pediatrics and Adolescent Medicine, Department of Pediatrics, School of Medicine, and Department of Health Policy and Management, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Acknowledgments

Financial support. E.M.P. is supported with funding from the National Institutes of Health/National Institute of Child Health and Human Development (R01 HD049794). A.C.S. is supported by a National Institutes of Health Building Interdisciplinary Research Careers in Women's Health award (K12 HD001441). Both authors have been supported by a Clinical Translation and Science Award to the University of North Carolina at Chapel Hill (UL1RR025747).

Potential conflicts of interest. E.M.P. and A.C.S. have no relevant conflicts of interest.

References

- Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA*. 2012;307(5):483-490.
- North Carolina Nutrition and Physical activity Surveillance System (NC-NPASS) 2008. Prevalence of Obesity, Overweight, Healthy Weight and Underweight in Children 2-18 Years of Age by County. Eat Smart, Move More Web site. <http://www.eatsmartmove-morenc.com/Data/Texts/2008%20Ages%20to%20to%2018.pdf>. Accessed January 28, 2013.
- North Carolina State Center for Health Statistics. 2011 North Carolina Statewide CHAMP [Child Health Assessment and Monitoring Program] Survey Results: Weight/Height. North Carolina State Center for Health Statistics Web site. http://www.schs.state.nc.us/schs/champ/2011/bmi_cat10all.html. Accessed November 26, 2012.
- Dietz WH. Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics*. Mar 1998;101(3 Pt 2):518-525.
- Juonala M, Magnussen CG, Berenson GS, et al. Childhood adiposity, adult adiposity, and cardiovascular risk factors. *N Engl J Med*. 2011;365(20):1876-1885.
- Lee JM, Gebremariam A, Vijan S, Gurney JG. Excess body mass index-years, a measure of degree and duration of excess weight, and risk for incident diabetes. *Arch Pediatr Adolesc Med*. 2012;166(1):42-48.
- Taveras EM, Sobol AM, Hannon C, Finkelstein D, Wiecha J, Gortmaker SL. Youths' perceptions of overweight-related prevention counseling at a primary care visit. *Obesity (Silver Spring)*. 2007;15(4):831-836.
- Raynor HA, Osterholt KM, Hart CN, Jelalian E, Vivier P, Wing RR. Efficacy of US paediatric obesity primary care guidelines: two randomized trials. *Pediatr Obes*. 2012;7(1):28-38.
- Barlow SE; Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;120(suppl 4):S164-S192.
- US Preventive Services Task Force; Barton M. Screening for obesity in children and adolescents: US Preventive Services Task Force recommendation statement. *Pediatrics*. 2010;125(2):361-367.
- Barlow SE, Bobra SR, Elliott MB, Brownson RC, Haire-Joshu D. Recognition of childhood overweight during health supervision visits: does BMI help pediatricians? *Obesity (Silver Spring)*. 2007;15(1):225-232.
- Dilley KJ, Martin LA, Sullivan C, Seshadri R, Binns HJ; Pediatric Practice Research Group. Identification of overweight status is associated with higher rates of screening for comorbidities of overweight in pediatric primary care practice. *Pediatrics*. 2007;119(1):e148-e155.
- Perrin EM, Jacobson Vann JC, Benjamin JT, Skinner AC, Wegner S, Ammerman AS. Use of a pediatrician toolkit to address parental perception of children's weight status, nutrition, and activity behaviors. *Acad Pediatr*. 2010;10(4):274-281.
- Rhee KE, De Lago CW, Arscott-Mills T, Mehta SD, Davis RK. Factors associated with parental readiness to make changes for overweight children. *Pediatrics*. 2005;116(1):e94-e101.
- Hernandez RG, Cheng TL, Serwint JR. Parents' healthy weight perceptions and preferences regarding obesity counseling in preschoolers: pediatricians matter. *Clin Pediatr (Phila)*. 2010;49(8):790-798.
- Parry LL, Netuveli G, Parry J, Saxena S. A systematic review of parental perception of overweight status in children. *J Ambul Care Manage*. 2008;31(3):253-268.
- Perrin EM, Skinner AC, Steiner MJ. Parental recall of doctor communication of weight status: national trends from 1999 through 2008. *Arch Pediatr Adolesc Med*. 2012;166(4):317-322.
- Puhl RM, Peterson JL, Luedicke J. Parental perceptions of weight terminology that providers use with youth. *Pediatrics*. 2011;128(4):e786-e793.
- Children's Mercy Hospitals and Clinics, Kansas City. Perspectives on Pediatric Obesity: Survey Findings. 2011. Children's Mercy Hospitals and Clinics Web site. <http://www.childrensmc.org/content/uploadedFiles/Headlines/Children's%20Mercy%20Obesity%20Survey%20Results.pdf>. Accessed February 3, 2012.
- Singh AS, Mulder C, Twisk JW, van Mechelen W, Chinapaw MJ. Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obes Rev*. 2008;9(5):474-488.
- Oettinger MD, Finkle JP, Esserman D, et al. Color-coding improves parental understanding of body mass index charting. *Acad Pediatr*. 2009;9(5):330-338.
- Perrin EM, Flower KB, Garrett J, Ammerman AS. Preventing and treating obesity: pediatricians' self-efficacy, barriers, resources, and advocacy. *Ambul Pediatr*. 2005;5(3):150-156.
- Waters E, de Silva-Sanigorski A, Hall BJ, et al. Interventions for preventing obesity in children. *Cochrane Database Syst Rev*. 2011;(12):CD00187.
- Eaton DK, Kann L, Kinchen S, et al; Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2011. *MMWR Surveill Summ*. 2012;61(4):1-162.
- Skinner AC, Steiner MJ, Henderson FW, Perrin EM. Multiple markers of inflammation and weight status: cross-sectional analyses throughout childhood. *Pediatrics*. 2010;125(4):e801-e809.