BMI Measurement in Schools

BACKGROUND AND OBJECTIVE: School-based BMI measurement has attracted attention across the nation as a potential approach to address obesity among youth. However, little is known about its impact or effectiveness in changing obesity rates or related physical activity and dietary behaviors that influence obesity. This article describes current BMI-measurement programs and practices, research, and expert recommendations and provides guidance on implementing such an approach.

METHODS: An extensive search for scientific articles, position statements, and current state legislation related to BMI-measurement programs was conducted. A literature and policy review was written and presented to a panel of experts. This panel, comprising experts in public health, education, school counseling, school medical care, and parenting, reviewed and provided expertise on this article.

RESULTS: School-based BMI-measurement programs are conducted for surveillance or screening purposes. Thirteen states are implementing school-based BMI-measurement programs as required by legislation. Few studies exist that assess the utility of these programs in preventing increases in obesity or the effects these programs may have on weight-related knowledge, attitudes, and behaviors of youth and their families. Typically, expert organizations support school-based BMI surveillance; however, controversy exists over screening. BMI screening does not currently meet all of the American Academy of Pediatrics’ criteria for determining whether screening for specific health conditions should be implemented in schools.

CONCLUSION: Schools initiating BMI-measurement programs should adhere to safeguards to minimize potential harms and maximize benefits, establish a safe and supportive environment for students of all body sizes, and implement science-based strategies to promote physical activity and healthy eating. Pediatrics 2009;124:S89–S97
Obesity among youth has become 1 of the most critical public health problems in the United States. Schools can play an important role in preventing obesity because ≥95% of young people are enrolled in schools, and schools have historically promoted physical activity and healthy eating. Research has shown that well-designed, well-implemented school-based programs can effectively promote these behaviors, and the Centers for Disease Control and Prevention (CDC) has identified strategies that schools can use to prevent obesity. Measuring the BMI of students in schools is an approach to addressing obesity that is attracting attention across the nation from researchers, school officials, legislators, and the media. Because little research has been conducted on the impact of this approach, it is not included in the CDC’s recommended strategies. However, some states, cities, and communities have established school-based BMI-measurement programs in recent years, and many others are considering the merits of initiating such programs.

In 2005, the Institute of Medicine (IOM) called on the federal government to develop guidance for BMI-measurement programs in schools. The CDC conducted an extensive search for scientific studies that evaluated school-based BMI-measurement programs; collected related position statements published by expert organizations from public health, medicine, and education; and reviewed sources to identify state legislation on these programs including policy-tracking services, state general assembly legislative databases, and staff in state education or health departments. An expert panel, convened by the CDC in 2005, provided input on an earlier version of this article. The panel comprised experts in public health, education, school counseling, school medical care, and parenting. This article presents an overview of the CDC’s guidance on this topic; it describes the purposes of BMI-measurement programs, examines current practices, reviews existing research, summarizes expert recommendations, identifies research gaps, and provides guidance and safeguards for implementing BMI-measurement programs.

**PURPOSES OF COLLECTING BMI DATA**

BMI is the ratio of an individual’s weight to height squared (kg/m²) and is used to estimate a person’s risk of weight-related health problems. It is often used to assess weight status, because it is relatively easy to measure and correlates with body fat. After BMI is calculated for a child or adolescent, it is plotted by age on a gender-specific growth chart (see www.cdc.gov/growthcharts for the CDC’s BMI-for-age growth charts for girls and boys aged 2–20 years). BMI measurement in schools may be conducted for surveillance and screening purposes.

**Surveillance**

Surveillance refers to the systematic collection, analysis, and interpretation of data from a census or representative sample (ie, a sample that has been scientifically selected to represent a specified population). Typically, the data are collected anonymously. The purpose of BMI surveillance in schools is to identify the percentages of students in the population who are obese, overweight, normal weight, and underweight; surveillance does not involve informing parents of their child’s weight status. School-based BMI-surveillance data can be used to:

- describe trends in weight status over time among populations and/or subpopulations in a school, school district, state, or nation;
- identify demographic or geographic subgroups at greatest risk of obesity to target prevention and treatment programs;
- create awareness among school and health personnel, community members, and policy makers of the extent of obesity among the youth they serve;
- provide an impetus to improve policies, practices, and services to prevent and treat obesity among youth;
- monitor the effects of school-based physical activity and nutrition programs and policies; and
- monitor progress toward achieving health objectives (eg, US Healthy People 2010 objectives) related to childhood obesity.

**Screening**

BMI-screening programs in schools are designed to assess the weight status of individual students to detect those who are at risk for weight-related health problems. Screening programs provide parents with personalized health information about their child. Screening results are sent to parents and typically include the child’s BMI-for-age percentile; an explanation of the results; recommended follow-up actions, if any; and tips on healthy eating, physical activity, and healthy weight management. Results from screening programs also can be used to develop reports similar to those developed by surveillance programs. Goals of BMI-screening programs in schools include:

- preventing and reducing obesity in a population;
- correcting misperceptions of parents and children about the children’s weight;
motivating parents and their children to make healthy and safe lifestyle changes;

• motivating parents to take children at risk to medical care providers for further evaluation and, if needed, guidance and treatment; and

• increasing awareness of school administrators and school staff of the importance of addressing obesity.

Schools sometimes include BMI results with results from other health screening examinations, such as vision or hearing tests, in reports to parents.30

CURRENT PRACTICES

The CDC’s 2006 school health policies and programs study found that 22% of states required schools or school districts to measure or assess students’ height and weight or body mass, and 73% of those states required parent notification of the results.31 Nationwide, >40% of schools reported that they measure the height and weight or body mass of their students.31 The study did not determine how frequently students are assessed, whether BMIs are calculated from the height and weight data, or the purpose of the data collections.

At least 13 states have legislation and are implementing school-based BMI-measurement programs (Arkansas, California, Delaware, Florida, Illinois, Louisiana, New York, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, and West Virginia). Arkansas implemented a statewide BMI-screening and -surveillance program in 2003 (State of Arkansas, 84th General Assembly, regular session, Act 1220 of 2003, HB 1583). Pennsylvania began to phase in a BMI-screening and -surveillance program (28 Pennsylvania Code §23.7) for all students in the 2005–2006 school year (Commonwealth of Pennsylvania, Height and Weight Measurements, 28 Pennsylvania Code §23.21, 2004). In 1995, California initiated statewide surveillance of student physical fitness levels, which includes BMI assessments and tests of aerobic capacity, flexibility, and muscle strength.32 In Illinois, the Department of Public Health is in the process of developing a child health examination surveillance system. This system will aggregate BMI and possibly other health information collected during students’ school physical examinations by their medical care providers (Illinois 93rd General Assembly, Public Act 93–0966, SB 2940, 2004).

CONCERNS

A number of concerns have been expressed about school-based BMI-screening programs, including that they might intensify the stigmatization already experienced by many obese youth, increase dissatisfaction with body image, and intensify pressures to engage in harmful weight-loss practices that could lead to eating disorders.9,10,12,33–36 Another concern is that parents might respond inappropriately to BMI reports by, for example, placing their child on a restrictive and potentially harmful diet without seeking medical advice. 7,8,12,25 Other concerns are that these programs might be ineffective, waste scarce health-promotion resources, and distract attention from other school-based obesity-prevention activities such as improvements to the school physical activity and nutrition environment.37 More research is needed to assess the validity of these concerns. BMI-surveillance programs are less controversial, because they do not involve the communication of sensitive information to parents and do not require follow-up care.

RESEARCH ON BMI-MEASUREMENT PROGRAMS

Studies have not yet adequately evaluated the utility of school-based BMI-measurement programs in preventing increases in obesity among youth. A few jurisdictions have monitored the prevalence of obesity through childhood obesity interventions that include BMI screening; however, the independent effects of the BMI-screening program on obesity are not clear.9,28,32 Arkansas is evaluating the impact of its multicomponent, childhood obesity program that includes a statewide BMI-screening and -surveillance program. The percentage of Arkansas students classified as obese was 20.8% in 2003–2004, the first year of implementation, 20.7% in 2004–2005, 20.4% in 2005–2006 and 20.4% in 2006–2007, and 20.5% in 2007–2008.38 A small body of research has addressed issues related to school-based BMI-measurement programs including perceptions of weight status, parental perceptions of BMI-screening programs, and student and parental responses to the results. Additional research is needed on possible psychosocial effects of BMI screening on students.

PERCEPTIONS OF WEIGHT STATUS

Several studies have found that parents and children commonly misclassify children’s weight status.29,38–44 A study of 742 mothers of adolescents found that 35% underestimated their child’s weight status and 5% overestimated it; 86% of mothers whose child had a BMI at ≥95th percentile did not identify their child as overweight.40 A study of 2032 high school students found that 26% of obese students perceived themselves as underweight, and another 20% perceived themselves as “about the right weight” only 6% of normal-weight students perceived themselves as overweight.41 The evaluation of the Arkansas statewide BMI-screening program found that the percentage of parents who classified their child accurately as overweight or

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at risk of overweight increased from 40% at baseline to 53% after the first year of screening.29

PARENTAL PERCEPTIONS OF BMI SCREENING IN SCHOOLS

Five studies included parent interviews and found that most parents support and respond positively to BMI screening in their children’s schools.25,29,35,45,46 One of these studies analyzed focus-group discussions with parents of elementary school children in Minnesota. The investigators concluded that parents in this study were receptive to BMI screening in schools provided it is done with care and parents are involved in developing the program.35 Parents would support programs if they receive advanced notice about the BMI measurement, have the opportunity to decline consent, receive assurance that the measurements would be collected in a private and respectful manner that minimizes weight-related teasing, and receive the results in a letter mailed to all parents that uses a neutral tone and does not assign blame.25 A pilot BMI-screening program was developed on the basis of the findings of these focus groups; 4 elementary schools were recruited to examine parental reaction to BMI measurement.45 All 4 schools conducted height and weight measurements; however, the 2 intervention schools mailed BMI results to parents, whereas the remaining 2 schools did not mail results to the home. A follow-up survey found that 78% of parents in all 4 schools believed it was important for schools to assess and mail BMI results to the home as part of annual student health-screening reports. Parents of girls and older children were less likely than parents of boys and younger children to want annual BMI-screening information.45

A study conducted in Ohio examined parents’ perceptions on the role of elementary schools in preventing childhood obesity and found that parents were least likely to support BMI-related activities. Parents rated the importance of 37 actions schools can take to address obesity through health education, food services, and physical education. Using a Likert-type scale (eg, not important to very important), the lowest-rated actions were collecting height and weight measurements and informing parents of their child’s height and weight.47

STUDENT AND PARENTAL RESPONSES TO BMI SCREENINGS

Arkansas evaluated its statewide program for any negative psychosocial consequences that may have been experienced by the students. After 4 years of BMI screenings, Arkansas students reported no increases in weight-related teasing, no increases in concerns about weight, and no increases in dieting or using diet pills.48 However, obese students were significantly more likely to be embarrassed by BMI measurement.

Three school-based screening programs that evaluated parental responses observed that parents do not consistently follow-up with a medical care provider after receiving their child’s screening results.25,29,48 An evaluation of a school-based health “report card” revealed that the parents who received their child’s BMI results were more likely than parents who did not receive the results to report that they had initiated or intended to initiate clinical services, dieting, or physical activity as weight control for their children. However, 7 of the 19 families planning to initiate dieting reported that they planned to do so without seeking medical counsel despite strong recommendations against such actions.25 The evaluation of Arkansas’ statewide screening program revealed that parents did not consult school nurses about their child’s BMI, and most family practitioners and pediatricians surveyed reported that they were not contacted by a substantial number of parents wanting to discuss their child’s weight status.29 However, parents did not put students on diets with a greater frequency than they did before the program.48

RECOMMENDATIONS FROM EXPERT ORGANIZATIONS

The use of BMI measurement for surveillance purposes, regardless of setting, has been endorsed by the American Public Health Association, The American Heart Association and the IOM.13,50,51 However, views on BMI screening vary. The US Preventive Services Task Force concluded that insufficient evidence exists to recommend for or against BMI-screening programs for youth in clinical settings as a means to prevent adverse health outcomes such as adult cardiovascular disease risk.52 However, authors of the 2007 report of an expert committee on childhood obesity convened by the American Medical Association recommended that primary care providers calculate and plot BMI at least annually; this has been endorsed by 12 organizations.53-56 For school-based programs, the IOM recommends annual BMI screening;13 whereas other organizations encourage schools to exercise caution before adopting BMI-measurement programs.55,50,57

The American Academy of Pediatrics (AAP) developed criteria to guide decisions on whether schools should implement a screening program for any pediatric health problem (Table 1).58 BMI screening meets some of the criteria: obesity is an important and highly prevalent condition58,60; BMI is an acceptable measure60,22; and schools are a logical measurement site, because they reach virtually all youth.1 However, BMI-screening pro-
grams typically do not meet other AAP criteria: effective treatments for obesity are not available, research has not established the effectiveness and cost-effectiveness of these programs, and communities typically do not have resources in place to help individuals at risk access treatment. The AAP specifies that schools should not implement screening if resources for follow-up do not exist.

GUIDANCE ON MEASURING BMI IN SCHOOLS

Before launching a BMI-measurement program for surveillance or screening, decision-makers need to consider whether the anticipated benefits (eg, preventing obesity, correcting misperceptions of weight) outweigh the expected costs (eg, monetary, psychosocial consequences). To minimize potential harm and maximize benefits, schools should not launch a BMI-measurement program unless they have established a safe and supportive environment for students of all body sizes; are implementing comprehensive strategies to address obesity; and have put in place safeguards that address the concerns raised about such programs.

The following are some key characteristics of a safe and supportive environment for students of all body sizes:

- There is a universal bullying-prevention program that addresses weight discrimination.
- Curricula foster acceptance of healthy weight by countering social pressures for excessive thinness.
- Teachers, school counselors, school nurses, coaches, and other staff receive the professional development and resources they need to provide useful guidance to students with weight-related concerns.

If schools raise awareness about obesity through a BMI-measurement program, they need to have in place an environment that helps students make healthy dietary and physical activity choices. For example, Arkansas required all elementary schools to remove vending machines from schools concurrent with implementing the statewide BMI-measurement program. California’s physical performance tests influenced the adoption of statewide, grade-specific physical education content standards. The CDC has identified 10 comprehensive strategies that schools can implement to prevent obesity by promoting physical activity and healthy eating (www.cdc.gov/healthyyouth/keystrategies).

To ensure respect for student privacy and confidentiality, protect students from potential harm, and increase the likelihood of a positive impact on promoting a healthy weight, all BMI-measurement programs should adhere to the following safeguards:

- Introduce the program to school staff and community members and obtain parental consent.
- Train staff in administering the program (ideally, implementation will be led by a highly qualified staff member such as a school nurse).
- Establish safeguards to protect student privacy.
- Obtain and use accurate equipment.
- Accurately calculate and interpret the data.
- Develop efficient data-collection procedures.
- Avoid using BMI results to evaluate student or teacher performance.
- Evaluate the program regularly for its intended outcomes and unintended consequences.

Those who implement BMI-screening programs should ensure that all parents receive a clear and respectful explanation of the results and appropriate follow-up actions, and that resources are available for safe and effective follow-up. Greater detail of these safeguards are described in the longer version of this article in the December 2007 issue of the Journal of School Health.

### Table 1: AAP Criteria for a Successful Screening Program in Schools

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<thead>
<tr>
<th>Aspect</th>
<th>Criteria for a Successful Screening Program in Schools</th>
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<tr>
<td>Disease</td>
<td>Undetected cases must be common or new cases must occur frequently, and the disease must be associated with adverse consequences.</td>
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<tr>
<td>Treatment</td>
<td>Effective treatment must be available, and early intervention must be beneficial.</td>
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<tr>
<td>Screening test</td>
<td>The test should be sensitive, specific, and reliable.</td>
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<tr>
<td>Screener</td>
<td>The screener must be well trained.</td>
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<tr>
<td>Target population</td>
<td>Screening should focus on groups with high prevalence of the condition/disease in question or in which early intervention will be most beneficial.</td>
</tr>
<tr>
<td>Referral and treatment</td>
<td>Those with a positive screening test result must receive a more definitive evaluation and, if indicated, appropriate treatment.</td>
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<tr>
<td>Cost/benefit ratio</td>
<td>The benefit should outweigh the expenses (ie, costs of conducting the screening and any physical or psychosocial effects on the individual being screened).</td>
</tr>
<tr>
<td>Site</td>
<td>The site should be appropriate for conducting the screening and communicating the results.</td>
</tr>
<tr>
<td>Program maintenance</td>
<td>The program should be reviewed for its value and effectiveness.</td>
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Research is needed to address outstanding issues regarding school-based BMI-surveillance and -screening programs, including:

- program impact on preventing and reducing obesity;
- the types of follow-up actions taken by parents and students;
- the programs’ intended and unintended physical, social, and psychological effects;
- student perceptions of and attitudes toward height and weight measurement in schools;
- the role and capacity of the school or school district nurse to implement and manage the BMI-measurement program;
- the effects of BMI-measurement programs on school-based efforts to promote nutrition and physical activity and link parents with medical services in the community;
- the effectiveness of treatment for youth identified as obese, overweight, or underweight;
- cost/benefit analyses of these programs compared with alternative strategies;
- relative efficiency of using schools as a BMI-measurement site; and
- effectiveness of different methods for communicating BMI results and related risk information to parents and youth.

There is a need for researchers in academia, government, and scientific organizations to develop a research agenda around school-based BMI-measurement programs, document the impact of data collection on obesity-prevention policies, study the data currently being collected, and define safe, effective, and accessible follow-up services.

CONCLUSIONS

School-based BMI-surveillance programs are less controversial than screening programs, but they still must adhere to the safeguards identified. Surveillance programs can provide valuable prevalence and trend data; samples should be selected carefully to ensure representativeness and to minimize program costs.

More research needs to be conducted to evaluate the impact of BMI-screening programs on weight-related behaviors and outcomes. Legitimate concerns have been raised about the potential harm that might be caused by BMI-screening programs; more research is needed to assess whether these harms occur. BMI-screening programs do not yet meet AAP criteria for a successful school screening program. The CDC encourages additional research and evaluation on school-based BMI-screening programs. Before initiating BMI-measurement programs, decision-makers should consider the benefits and disadvantages of these programs in relation to the needs of their jurisdiction and resources available.

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