

Methods of Determining Weight Status in Children and Approaches to Maximize Long-term Weight Control: A Perspective for Consideration by Pfizer Health Solutions

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The information presented here pertaining to determining weight status in children is fairly straightforward. Most experts would agree with the perspective offered. However, many ostensible authorities view approaches to treating obesity in young people as if they were blindly assessing different parts of the proverbial elephant. The author can only reveal his perception of methods to produce long-term change, with the caveat that each method has considerable empirical support.

Methods of Determining Weight Status in Children

Many decades ago a bright life insurance actuary realized that his (or her – unlikely at that time, sorry to say) company was paying out lots of money to the families of overweight people who died prematurely. That led to the creation of the first widely used tables of recommended weights. These recommendations were based on data that had been gathered somewhat haphazardly on millions of insured customers, mostly middle and upper income Caucasians. Nevertheless, those who died prematurely were often classified as overweight based on those tables (particularly the widely used 1959 Metropolitan Life Tables).

About 100 years prior to the publication of the 1959 Metropolitan Life Tables, a Belgian intellectual, Adolphe Quetelet, decided that he needed a measure of weight that adjusted for variations in height for the study of “social physics.” Federal researchers in the USA used Quetelet’s creation (the Quetelet Index, now known as BMI) when they decided that it would promote better health for Americans to know their weight statuses; they wanted to make the data more representative and collect it more systematically than the data gathered by the insurance industry. The U.S. National Health and Nutrition Examination Surveys (NHANES) began weighing and measuring nationally representative samples of people of all ages in the early 1960s.

BMI Basics

Calculation of BMIs uses one of the following formulae:

Weight (kg)/ Height² (m²) or 703 X Weight (lbs)/Height² (inches²)

Some useful things to know about BMIs:

- A BMI of 30 in adults, generally used as the lower cut-off to define obesity, translates to about 30% overweight. This correspondence between BMI and percentage overweight doesn't work for higher or lower BMIs (e.g., a BMI of 40 generally corresponds to 100 lbs or more of excess weight, 60% or more overweight – not 40%).
- BMIs assume that all of our bodies are perfectly uniform cylinders, with similar masses for each slice from head to toe. This produces some inherent inaccuracies. Some people of given heights obviously are much broader (greater bone mass) than others and some have far more muscle than others. Muscle weighs more than fat for a specific volume, as does bone. Therefore, almost all professional athletes, particular those in the NFL and body builders, will have BMIs that suggest they are overweight – when the vast majority actually have low percentages of body fat. This principle applies to children, albeit much less dramatically so.

BMI-based and Other Measures Used to Determine Weight Status in Children

The International Association for the Study of Obesity's International Obesity Task Force (IOTF) in 2004 published the best single review of the various measures used to determine children's weight status.¹ Although the IOTF acknowledged that no one approach has received consensus among researchers in the world (verified in more current papers, as well²), they presented several that remain widely used and respected in scientific journals.

The IOTF distinguished between direct and indirect measures of the amount of fat in the body. (Overweight, from a biological perspective, means over-fat or more fat on the body relative to lean body tissues than usual or healthy levels.)

The direct measures include:

- Hydro-densitometry (underwater weighing)
- Magnetic Resonance Imaging (MRI)
- Computerized Tomography (CT)
- Dual Energy X-ray Absorptiometry (DEXA)

The underwater weighing procedure, although common and relatively cheap to administer, has some problems with validity. It requires certain assumptions about the density of lean versus fat tissues that may not apply well to children and elderly people. The remaining three direct procedures can all very precisely measure amount of body fat (i.e., percentage of weight due to adipose tissue versus lean tissues), but all are quite expensive and challenging to administer. DEXA is preferred for children because it involves less exposure to radiation than CT scans and is less expensive than MRIs. From a practical standpoint, DEXA

would only be used in well-funded research projects; it still requires 20 minutes per person to administer in a qualified medical facility and is expensive.

The far more practical and widely used indirect measures include:

- Weight and Growth Charts
- BMI
- Waist Circumference and Waist to Hip Ratio (WHR)
- Skin-fold Thickness

Weight fails to take into account normative information or correct for growth. The widely used growth charts are inaccurate for children over 10 or 11. Skin-fold thickness requires training to administer, is unpleasant to experience and has validity problems (e.g., great variations based on age, gender and race make it difficult to develop norms). WHR correlates well in studies against the gold standard of direct measurement, DEXA. However, cut-offs for determining weight status and norms more generally haven't been developed. It is also unclear the extent to which high waist to hip ratios predict health problems.

BMI, like WHR, correlated well with DEXA measures in several studies. Generally, BMI correctly classifies truly overweight children as overweight about 67 -83% of the time (depending on age, study). It falsely classifies normal weight children as overweight about 3-13% of the time (with most findings well under 10%). Amount of muscle development and bone structure probably accounts for most of these variations.

BMI Reference (Normative) Groups

The most commonly used standard for judging weight status in children in the USA uses the Center for Disease Control normative data, published in 2000 (see Wellspringcamps.com/assessment and click on "What is your BMI" for the most user-friendly BMI calculator). The 2000 CDC norms were created from 5 NHANES surveys (1963-1994), excluding data for children over 6 years old from the 1994 survey. This exclusion was made because of the dramatic increase in obesity observed in older children that year. Percentiles obtained from that data can be used, according to the CDC, to determine if a child is "at risk for becoming overweight" (85th % -94.9%) or "overweight." In scientific journals and other countries more generally, the 85th – 94.9% identifies "overweight children" and the 95%+ identifies 'obese children.'

In 1999 the IOTF determined that although BMI was not an ideal measure of body fat (adiposity), it had been validated against direct measures and may therefore be used to measure overweight and obesity in children.³ The group believed that since it wasn't clear the extent to which BMI adversely impacted health, it would be best to use BMI cut-offs for children that project to the adult cut-offs for overweight (25) and obesity (30). Cole et al.⁴ developed tables for

2-18 year old children and teens based on survey data in six countries (Great Britain, Brazil, the Netherlands, China, Singapore and the USA). These researchers identified cut-offs by gender that the IOTF recommends using to identify children who are overweight and obese (Table 3, p.14 of the IOTF article).

The several studies that compared these methods showed that the IOTF method was somewhat more conservative, identifying fewer young children as overweight than the CDC approach.

Recommendation

The USA has the most virulent form of the childhood obesity epidemic on the planet. The CDC norms are readily accessed in a very user-friendly form and can identify BMI percentiles precisely, using an integer scale instead of a nominal scale (i.e., providing a precise number rather than an all-or-none label such as overweight or not overweight). Therefore, it seems prudent for programs in the USA to use the less conservative CDC BMI norms. Feedback could be provided in the form of percentiles, instead of raw BMI numbers. Qualification of the percentiles could also help ease the starkness of the data.

For example, if a 14 year old girl named Jane was 64” in height and weighed 165 lbs, Jane’s BMI percentile would be 96.2%. Her parents could be provided (by schools or pediatricians) information that places that percentage in an appropriate and useful perspective. That form of communication would include the following: the exact current BMI percentile; the meaning of key benchmark percentiles (85th;95th); the amount of weight loss required to get below the 85th percentile at the current height and age; and, qualifications about the meaning of these numbers.

For example, in this case, the information would look like:

“Jane was weighed and measured in school on 5/10/07. The following information describes how Jane’s current height and weight compare to millions of other children.

Current weight = 165 lbs

Current height = 64”

Jane’s current weight means that she is heavier than **96.2%** of other children of her age and height.

If Jane were to lose **30lbs**, her weight would be below the 85th% for her age and height.

Children who are heavier than 85% of other children of the same age and height are considered by health professionals to be overweight or at least at risk of becoming overweight. Children at the 95% level or higher are considered overweight. Overweight children often suffer socially (become isolated), emotionally, academically (failing to perform up to potential) and physically.

Overweight children usually become obese adults. Obesity can cause many serious illnesses, including diabetes, heart disease, and cancer. Obesity in adults also decreases opportunities in many aspects of life (in relationships, in school, in jobs, and in personal health, happiness and comfort).

Not all children at these high percentiles (even at the 95th%) are overweight. About 10% of the time, children weigh more than most for their height and age because they have much bigger than normal bones (for example, barrel-chested or broad shouldered children) or they have far bigger muscles than usual (extremely athletic children). Bones and muscles weigh more than fat. So, children with big bones and big muscles weigh more than others at the same height even though they don't have more fat in their bodies.

For most children at high percentiles of weight, the ones who are clearly overweight, losing weight or preventing continued gain of excess weight would lead to a healthier and better life. You may want to consider taking some steps to help your child reduce excess weight.

Steps you can take include:

- Reducing the amount of fat in your child's and your entire families' diet.
- Increasing the amount of vegetables and fruits in your child's diet.
- Increasing opportunities for your child to engage in physical activities of any and all types.
- Decreasing the amount of screen time (TV, computer, telephone) to no more than 2 hours per day.

To get help to implement these major changes, you could consult your health care providers about finding appropriate programs. These could include weight control programs provided at hospitals and university clinics; scientifically based weight loss programs that immerse children and teens in an alternative lifestyle and provide consultation for families (see healthylivingacademies.com for example); consultation from cognitive-behavior therapists who specialize in weight loss (see abct.org, "find a therapist"); and nutritional counseling.

Suggested Reading

- Borushek, A. (2006). Calorie, Fat and Carbohydrate Counter. Calorie King.
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- Rolls, B. Volumetrics.

Maximizing Long-term Weight Control for Overweight Children

Let's consider first the nature of scientifically grounded elements of interventions that can help overweight children lose weight. This presentation will help place suggestions to maximize long-term change in an appropriate perspective.

Diet

The following table suggests seven elements of diets that can help weight controllers lose weight. They are listed in order of greatest to least impact on weight control. The attached article provides part of the rationale for point number 1. Related documentation is available for the remainder. Details of each guideline can be provided. For example, the goal pertaining to fat that seems to have the greatest impact is "to aim for zero fat grams every day." This isn't meant as an achievable goal, but rather as the kind of goal that maximizes behavior change (clear, measurable, stringent, feedback immediately available).

Seven Keys to Eating to Lose Weight

1. Eat very little fat (<20g per day; <10% of total calories).
2. Consume low-density foods (e.g., lots of soups and vegetables).
3. Eat your calories – don't drink them
4. Stay calorie conscious (e.g., maximum Calories for biggest meal of the day = 800).
5. Control consumption of sugar.
6. Eat lean sources of protein, emphasizing plant proteins, frequently throughout the day.
7. Eat at least 30g of fiber per day.

Activity

A few primary principles deserve emphasis:

- Maintaining a high activity level is just as important for weight control as maintaining control of eating.
- Getting immediate feedback on activity via a pedometer is very helpful.
- Establishing an initial goal of 10,000 steps per day can work. Goals can be adjusted based on rate of weight loss, usually adjusted to higher levels to achieve more rapid and better maintained weight losses.

- Frequency of high activity (i.e., daily) and duration of activity are more important for weight control than intensity.

Thinking and Behaving

Several concepts seem especially useful for weight controllers. The process of losing weight proceeds more efficiently and effectively if certain strategies and techniques become well used and mastered.

Some key concepts:

- Biological factors (e.g., fat cell numbers; fat as an active endocrine organ; genetics) resist weight loss and maintenance of reduced weight.
- Biology isn't destiny. For example, all athletes find their bodies resisting training and mastery of physical tasks. These resistances can be overcome with training, commitment, and consistency.
- Most westernized cultures resist weight loss and maintenance of low weights. Becoming a weight controller demands some resilience about culture, being willing to follow a different pathway than others.
- Successful weight control demands consistent self-monitoring and the development of a healthy obsession.
- Despite the challenges, weight control doesn't have to feel like torture and deprivation – with appropriate training and focusing. Making the process as comfortable as possible is incredibly helpful.

Key behaviors:

- Self-monitoring (systematic attention to and recording of target behaviors)
- Journaling
- Stress Management (including Rational Emotive Therapy)
- Goal Setting and Planning
- Problem Solving
- Positive Focusing
- Resilience (optimism, trusting the process)
- Relapse Prevention Training
- Stimulus Control and Environmental Management
- After losing weight, use of a graded system of more structured interventions if and when weight increases (e.g., add increasing level of support from internet monitoring to immediate family to trainers to non-professional groups to professional help)

Social Support

Sustained systematic focusing at least a year seems valuable during active weight loss, even if the weight loss is achieved via bariatric surgery or facilitated with medications. In addition, family support can make a substantial difference. The ideal level of family support includes all family members participating 100% in this alternative lifestyle (e.g., maintaining a household with zero problematic foods; all family members wearing pedometers and valuing activity – seeking out

ways to get steps; maintaining the weight controller's approach to food and activity even when eating out and vacationing).

Maximizing Long-term Change

Several of the elements included in the proposed intervention are likely to help with long-term change. These include:

- ✓ Participation in an immersion program. Immersion programs seem especially promising, based on several studies.⁵⁻⁹ They build momentum for long-term change by showing children that they can do this (> self-efficacy); convincing families that it can be done; establishing the beginnings of a new lifestyle.
- ✓ Establishing a dietary pattern that focuses on minimizing consumption of fat and using low-density foods and related techniques to minimize hunger/maximize comfort.¹⁰
- ✓ Eating in a way that decreases feelings of deprivation ("finding lovable foods that love you back").
- ✓ Maximizing a focus on consistently high levels of activity (monitored on a pedometer).¹¹
- ✓ Developing a healthy obsession (using self-monitoring and journaling).¹²
- ✓ Establishing a family pattern that goes all the way to support this effort (i.e., follows the same program as the child; maintains a fat free home; models use of self-monitoring and high activity levels monitored on pedometers).¹³
- ✓ Uses external supports frequently (e.g., weekly or bi-weekly) focused on weight control for long periods of time (years, not weeks).¹⁴

Although some of the suggestions require time and a certain amount of sophistication (e.g., development of a healthy obsession; creation of the very consistent lifestyle change by the entire family), others are surprisingly simple. The three simple behavioral directives emphasized in the Sierras Weight Loss Solution for Teens and Kids are: eat as little fat as possible (aiming for 0 fat grams, feeling OK at 20 fat grams daily); move enough to record at least 10,000 steps per day monitored on a pedometer; self-monitor very consistently (food, fat, steps). Hundreds of studies on goal-setting show that clear, measurable, goals for which immediate feedback is available maintain target behaviors at high levels.¹⁵ The more challenging suggestions (like developing a healthy obsession) may evolve most efficiently via sustained structure support.

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