Assessing Childhood Obesity: A New Guide to Help Facilitate Choosing the Most Appropriate Measure

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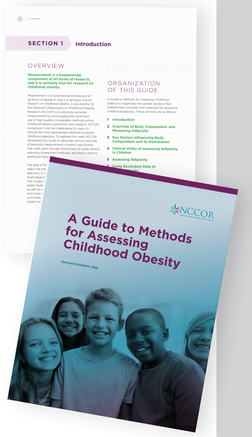
The National Collaborative on Childhood Obesity Research (NCCOR) is a partnership of the four leading funders of childhood obesity research: the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), the Robert Wood Johnson Foundation (RWJF), and the U.S. Department of Agriculture (USDA). For more information about NCCOR, visit www.nccor.org.

BACKGROUND

A top priority for the National Collaborative on Childhood Obesity Research (NCCOR) is to promote accurate assessment by encouraging the consistent use of high-quality, comparable methods across childhood obesity research. Standardized measures are needed to improve population health. However, selecting appropriate methods to assess childhood obesity remains a challenge because of a limited understanding of when a measure is appropriate based on population, setting, and other considerations.

METHODS

To help users choose an appropriate method to measure adiposity, NCCOR formed a working group to develop the guide, which was led by Voula Osganian, MD, ScD, MPH and Brook Belay, MD, MPH with support from Rachel Ballard, MD, MPH; Laura Kettel Khan, PhD; Sohyun Park, PhD; Cynthia Ogden, PhD; Sarah Sliwa, PhD; and Susan Yanovski, MD. Together they worked with Dympna Gallagher, EdD, a renowned expert in the assessment of body composition, to develop *A Guide to Methods for Assessing Childhood Obesity.* An expert panel consisting of Sarah Barlow, MD; Nancy Butte, PhD, MPH; Katherine Flegal, PhD; Deanna Hoelscher, PhD, RD, LD; and Thomas Robinson, MD, MPH was formed to review the guide.



RESULTS

The Guide describes six methods commonly used to assess body composition in children, including **three anthropometric methods (stature/recumbent length and weight; skinfold thickness, waist circumference), bioelectrical impedance analysis (BIA), air displacement plethysmography (ADP), and dual energy X-ray absorptiometry (DXA).** *See waist circumference figure (on the right) for an example.*

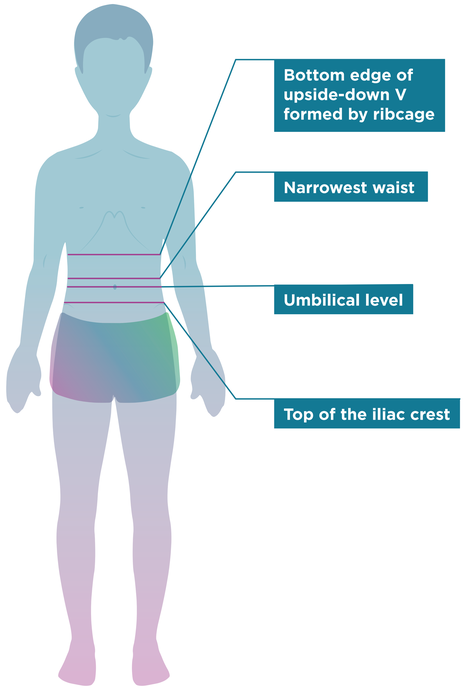
The Guide presents case studies that walk users through the process of using various assessment methods, and directs users to additional resources.

For each method, the Guide highlights procedures, validity and reliability, reference data, accessibility, cost, and participant burden and risk.

The Guide is available to researchers, public health practitioners, clinicians, students, and other professionals with an interest in researching or evaluating weight-related outcomes.

Early findings from promotion efforts indicate that a wide variety of audiences are interested in using this guide, and many potential users indicate they are likely to use the guide for their work.

In the first month since the guide was launched, there have been more than 60,000 views on the NCCOR webpage.



SUMMARY OF METHODS CHART

METHOD	AGE/WEIGHT LIMITS	INDICATORS OF WEIGHT STATUS AND EXCESS ADIPOSITY/ESTIMATE(S) OF BODY FAT	NATIONAL REFERENCE DATA FOR U.S. POPULATION OF CHILDREN
Anthropometry: Stature/Recumbent Length and Weight	All ages	Weight for length Body Mass Index	YES (birth and older)
Anthropometry: Skinfold Thicknesses	All ages	Site specific and sum of skinfold thicknesses Total body fat predicted by regression equations	YES (ages 2 months and older)
Anthropometry: Waist Circumference	Recommended for ages 8 years and older	Abdominal girth Surrogate for abdominal visceral fat /central fat distribution	YES (ages 8 years and older)
Bioelectrical Impedance Analysis (BIA)	All ages	Measures the impedance or resistance to the flow of an electrical current through the body to estimate TBW Total FM and total FFM predicted by regression equations	NO
Air Displacement Plethysmography (ADP)	Birth to 6 months (up to 8 kg) using PEA POD 6 years and older (35 kg to 200 kg) using BOD POD 2-5 years old using adapter insert made for BOD POD	Measures body volume used to estimate body density Total FM and Total FFM predicted by regression equations	NO
Dual Energy X-Ray Absorptiometry (DXA)	All ages (some instruments have an upper weight limit)	Instrument-specific software algorithms are used to calculate the various values for bone mineral content, "bone-free" lean mass or FFM, and FM	YES (ages 8 years and older)

CASE STUDY: ASSESSING ADIPOSITY IN INFANCY TO PREDICT RISK OF DEVELOPING OVERWEIGHT AND OBESITY

Background

A longitudinal observational study in pediatrician offices and pediatric health clinics where infants receive routine clinical care is designed by a team of investigators to evaluate changes in adiposity in infants and toddlers aged 0–2 years.

Interest in this topic arises from findings that rapid early-life adiposity gain is associated with an increased likelihood of later health problems, including cardiovascular disease, insulin resistance, and overweight and obesity.

The goal of this study is to describe patterns of growth (changes in adiposity) during the first 2 years of life and observe how these patterns relate to developing overweight and obesity at age 2 years.

Considerations

The study team understands that children grow rapidly during the first 2 years of life, and changes in length and weight will vary considerably across children. Because the body composition assessment methods would need to be conducted at multiple time points after baseline, the methods must be sensitive to detecting changes in body composition over time.

The study team will also need to enroll and measure a large sample (n=2,000) of children to model growth-related fat trajectories with sufficient sensitivity to inform on differences in the accumulation of fat.

The study team notes that methods would need to be performed at routine clinical appointments to avoid the need for extra visits, thereby minimizing burden on families.

Study data collection would not need to occur at all these visits but at a minimum of six visits, including at an early and late (2-year) visit. Sufficient time during the clinic visit needs to be allowed for study team members to conduct the additional measurements. Acceptability of the measures to parents who will provide consent is another key consideration.

Method Selection

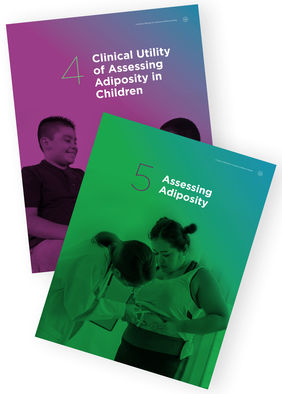
The study team recognizes that length and weight are the most common measurements taken, as they are the least intrusive, generally require little training and equipment, and can be conducted quickly and with minimal costs. However, length and weight and their relative indices such as weight-for-length and weight-for-age percentiles do not provide information on body composition, specifically FM or FFM.

The team considers other potential methods to more specifically assess total body fat. Skinfold thicknesses of the triceps, subscapular, iliac crest, and mid-thigh can be used to monitor changes in subcutaneous fat, which is a very good proxy for total body fat at these ages.

CONCLUSION

Using the Guide

A Guide to Methods for Assessing Childhood Obesity will help users understand the most common anthropometric and body composition methods for assessing infants, children, and adolescents, and which method may be appropriate for a particular research objective. Assessing childhood obesity can be complex, but *A Guide to Methods for Assessing Childhood Obesity* enables users to efficiently identify which methods are appropriate for their projects and understand how to apply these methods.



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