MODULE 1: Growth Assessment

LEARNING OBJECTIVES

After completing this module, you will have the skills and resources to:

- Describe techniques to obtain accurate anthropometric data for children with special health care needs
- Identify tools used for growth assessment and understand the origin of these tools
- Describe the influence of special conditions on growth
- Use appropriate reference data and published information to interpret growth data

RESOURCES

Measurement Techniques


**CDC/MCHB Growth Chart Tutorials: Measurement Techniques.** Centers for Disease Control and Prevention and the Maternal and Child Health Bureau. *Growth Charts Training.* 2001. The CDC and MCHB have developed tutorials to accompany the 2000 CDC Growth Charts. These tutorials are aimed at health care professionals. Modules cover equipment, measurement technique, and developing and rating your technique. For information about accessing the tutorials, visit [http://depts.washington.edu/growth](http://depts.washington.edu/growth).

Tools for Assessment

**CDC Growth Charts.** Centers for Disease Control and Prevention (CDC). Information about the 2000 CDC Growth Charts, and downloadable versions of the charts are available on the CDC website: [http://www.cdc.gov/growthcharts](http://www.cdc.gov/growthcharts).


CDC/MCHB Growth Chart Tutorials: Growth Assessment. Centers for Disease Control and Prevention and the Maternal and Child Health Bureau. Growth Charts Training. 2001. The CDC and MCHB have developed tutorials to accompany the 2000 CDC Growth Charts. These tutorials are aimed at health care professionals. Modules cover use and interpretation of the charts, including BMI. For information about accessing the tutorials, visit http://depts.washington.edu/growth.

Other Growth Charts. Charts with data for secondary measurements and alternatives to height and length are available.


- Prediction of Stature from Knee Height. Chumlea WC, Guo SS, Steinbaugh ML. Prediction of stature from knee height for black and white adults and children with applications to mobility-impaired of handicapped persons. J Am Diet Assoc. 1994; 94(12): 1385-1388. This article presents data collected during 1960-1970 from children 6-12 years of age. The population was 85% Caucasian.


- Triceps Skinfold and Upper Arm Circumference. Frisancho AR. New norms of upper limb fat and muscle areas for assessment of nutritional status. Am J Clin Nutr. 34: 2540-2545, 1981. This article provides age- and sex-specific percentiles for triceps skinfold, upper arm circumference, arm muscle area, and arm fat area based on a cross-sectional sample of 19,097 white subjects age 1 to 74 years.
Influence of Special Health Care Needs

Charts/Tables Used to Monitor Growth of Children with Special Health Care Needs. Reprinted with permission from: Nardella M, et al. Nutrition Interventions for Children with Special Health Care Needs. Washington State Department of Health. 2001. This table describes charts and tables that are often used to monitor the growth of children with special health care needs. It is included at the end of this section. To order a hard copy, contact the Washington State Department of Health, Revenue Section, PO Box 1099, Olympia, WA 98504 or visit the Washington State Nutrition for Children with Special Health Care Needs website: http://depts.washington.edu/cshcnut. This publication can also be downloaded from the WA DOH website: http://www.doh.wa.gov/cfh/mch/CSHCNhome2.htm.


North American Growth in Cerebral Palsy Project. North American Growth in Cerebral Palsy Project website. One activity of this project is to collect data about the growth of persons with cerebral palsy. The project website also lists some resources around growth, measurement technique, and interpretation. Visit: http://www.people.virginia.edu/~mon-grow/.

Using Growth Data to Make Clinical Decisions


### Table 2-2: Charts/Tables Used to Monitor Growth of Children with Special Health Care Needs†

<table>
<thead>
<tr>
<th>Growth Chart</th>
<th>Study sample information</th>
<th>Ages</th>
<th>Parameters</th>
<th>Limitations</th>
<th>Use with CDC</th>
</tr>
</thead>
</table>
| NCHS (1977)  | 20,000 children, 1934-64; NHES and NHANES I; 5th-95th%iles | 0-3 years | • weight/age  
• length/age  
• OFC/age  
• weight/length | Data is longitudinal for infants and cross-sectional for children |                                    |
| NCHS (1977)  | 20,000 children 1934-64; NHES and NHANES I; 5th-95th%iles | 2-18 years | • weight/age  
• height/age  
• weight/height | Data is cross-sectional for children |                                    |
| CDC (2000)   | Previous data plus NHANES III data; 3rd-97th%iles | 0-3 years | • weight/age  
• length/age  
• OFC/age  
• weight/length |                                    |                                    |
| CDC (2000)   | Previous data plus NHANES III data; 3rd-97th%iles | 2-20 years | • weight/age  
• height/age  
• weight/height (2-6 years)  
• BMI/age |                                    |                                    |
| Crown-rump ² | ~75 females, 75 males |        | Longitudinal data | Use with CDC weight/ age |                                    |
| Sitting height ³ | NCHS 1977 population | 1-18 years | • sitting height/age | Caucasian and African American children only | Use with CDC weight/ age |
| Knee height ⁴ | 13,821 ambulatory children NHES I,II,III, 1960-70 | 6-12 years | • knee height/age | Use equation for race (85% Caucasian children); Difficult to do | Use with CDC weight/ age |
| Incremental growth ⁵ | Children who grew “close” to NCHS 1977 | 6-36 mos 2-18 years | • weight/age  
• stature/age | Caucasian children only | Use with CDC for weight/age, length or height/age, weight/length or height |

† All charts have sex-specific versions for male and female children (except for Turner syndrome charts).
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</table>
| Triceps skinfold thickness, upper arm circumference | NCHS 1977 population                | 2-18 years    | • triceps skinfold/age  
 • upper arm circumference/ age  
 • upper arm fat area/age  | Use after age 2 years, Caucasian children only                  | Use with CDC weight/age, length or height/age, weight/length or height, or BMI/age |
| Mid-arm circumference; triceps skinfold; subscapular skinfold thicknesses | NCHS 1977 population               | 2-18 years    |                                                                            | Use after age 2 years                                                      | Use with CDC weight/age, length or height/age, weight/length or height, or BMI/age |
| Parent-specific adjustment for length/stature     | 586 parent-child pairs (Fels data) and 16,000 serial length and height measurements | 0-36 mos, 3-18 years | Note parent height on chart                                                |                                                                            | Use with CDC weight/age, length or height/age, weight/length or height, or BMI/age |
| **Achondroplasia**                               | 189 males, 214 females              | 0-18 years    | • height/age  
 • height velocity/age  
 • upper, lower segment lengths/age  
 • OFC/age  | Small sample size, especially children over 10 years              | Compare to CDC weight/age, length or height/age; use with CDC for weight/length or height or BMI/age |
| **Cerebral palsy**                               | 360 children (males and females), 0-120 months with quadriplegia | 0-10 years    | • length/age  
 • weight/age  
 • weight/length  | Both longitudinal and cross-sectional data, small sample size, for spastic quadriplegia only‡ | Use with CDC weight/age, length or height/age, weight/length or height or BMI/age |
| **Down syndrome**                                | Longitudinal data; 400 males, 300 females; 1960-1986 | 1-36 mo, 2-18 years | • weight/age  
 • length or height/age  | Included children with congenital heart disease, reflects tendency to be overweight | Use with CDC weight/age, length or height/age, weight/length or height, BMI/age |

‡ These growth charts should be used only with children who have cerebral palsy with spastic quadriplegia and may underestimate the growth for a child with mild cerebral palsy or without spastic quadriplegia. More information about growth and children with cerebral palsy can be found at the North American Growth in Cerebral Palsy Project website: [http://www.people.virginia.edu/~mon-grow/healthcare/home.html](http://www.people.virginia.edu/~mon-grow/healthcare/home.html)
### Growth Chart Study Sample Information

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</tr>
</thead>
<tbody>
<tr>
<td>Noonan syndrome</td>
<td>64 males, 48 females</td>
<td>0-20 years</td>
<td>height/age</td>
<td>Small sample size</td>
<td>Compare to CDC; use CDC for weight/age, length or height/age, weight/length or height or BMI/age</td>
</tr>
<tr>
<td>Prader Willi syndrome</td>
<td>56 males, 36 females</td>
<td>3-24 years</td>
<td>height/age</td>
<td>Longitudinal and cross-sectional data, small sample size</td>
<td>Compare to CDC; use CDC for weight/age, weight/height, BMI/age</td>
</tr>
<tr>
<td>Turner syndrome</td>
<td>366 females; pooled data</td>
<td>2-19 years</td>
<td>height/age</td>
<td>Small sample size, unequal age distribution</td>
<td>Use with CDC for weight/age, height/age, weight/height, BMI/age</td>
</tr>
<tr>
<td>Williams syndrome</td>
<td>61 females, 47 males</td>
<td>0 to 18 years</td>
<td>weight/age, height/age, OFC/age</td>
<td>Retrospective and cross-sectional data, small sample size</td>
<td>Use with CDC for weight/length or height, BMI/age</td>
</tr>
</tbody>
</table>
Chapter 2 - Anthropometrics


