Age (years for adults, years and months for <21 years):

Anthropometrics (≥ 21 years of age)

1. Weight:

Pounds  Kilograms

1. Height:

Inches  Centimeters

1. BMI:

BMI categorization:

Anthropometrics (< 21 years of age)

Use these elements for pediatric studies.

1. Weight: %ile:

Pounds  Kilograms

1. Triceps skinfold thickness:
2. Subscapular skinfold thickness:
3. Length (infants < 24 mo) %ile, Z-score, standard used:

Inches  Centimeters

1. Height (children > 2 years) %ile, Z-score, standard used:

Inches  Centimeters

1. Weight/length (infants < 24 mo) %ile, Z-score, standard used:
2. BMI (children > 2 years) %ile, Z-score, standard used:
3. Head circumference %ile, Z-score, standard used:

Inches  Centimeters

1. Tanner Stage (pubic hair):

I II III IV V

1. Tanner Stage (genitalia - males; breasts - females):

I II III IV V

Recorder Signature: Date:

## General Instructions

Height and weight are commonly collected at the baseline visit. Depending on the study population and study intervention it may be appropriate to collect height and weight at subsequent study visits. Because different measurement techniques and standards for assessing height and weight are used in pediatrics as compared to in adults, this form separates data collection into pediatric and adult standards.

Important note: None of the data elements included on this CRF Module are classified as Core (i.e., strongly recommended for all mitochondrial disease clinical studies to collect). All of the data elements are classified as Supplemental – Highly Recommended (i.e., essential information for specified conditions, study types, or designs) and should be collected if studies are focused on growth, nutrition, and endocrine or gastrointestinal disease in children and adults with mitochondrial disease. For other studies, these data elements should be collected if the research team considers them appropriate.

Please see the Data Dictionary for element classifications.

## Specific Instructions

Please see the Data Dictionary for definitions for each of the data elements included in this CRF Module.

Anthropometrics, Adults (≥ 21 years of age)

* Weight – Obtain weight of the participant in light clothing without shoes and record. To be collected at the visit, not self-reported. Also, indicate whether weight was measured in pounds (lb) or kilograms (kg).
* Weight unit of measure – Choose either pounds (lb) or kilograms (kg).
* Height – Measure the height of the participant using a fixed statiometer and record. To be collected at the visit, not self-reported. Also, indicate whether height was measured in inches (in) or centimeters (cm).
* Height unit of measure – Choose either inches (in) or centimeters (cm).
* Body Mass Index (BMI) – calculate BMI [National Heart, Lung and Blood Institute BMI Calculator](http://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm)) –OR-

BMI = weight (lb) / [height (in)]2 x 703

weight (kg) / [height (m)]2

* BMI Categories (kg/m2)

Severe thinness = < 16

Moderate thinness = 16-17

Mild thinness = 17-18.5  
Underweight = <18.5  
Normal weight = 18.5-24.9   
Overweight = 25-29.9   
Obesity = BMI of 30 or greater

30 to 34.99 Obesity (Class 1)

35 to 39.99 Obesity (Class 2)

40 or greater Morbid Obesity (Class 3)

Anthropometrics, Pediatric (< 21 years of age)

* Weight – Obtain weight of the participant in light clothing without shoes and record. Infants should be weighed in a pan scale and children older than 2 years on a beam balance scale. To be collected at the visit, not self-reported. Also, indicate whether weight was measured in pounds (lb) or kilograms (kg).
* Weight unit of measure – Choose either pounds (lb) or kilograms (kg).
* Triceps skinfold thickness – Enter the thickness in millimeters.
* Subscapular skinfold thickness – Enter the thickness in millimeters.
* Length/height – Measure recumbent length (for children < 2 years) using a length board or standing height (for children > 2 years) using a fixed statiometer and record. To be collected at the visit, not self-reported. Also, indicate whether height was measured in inches (in) or centimeters (cm).
* Length/height unit of measure – Choose either inches (in) or centimeters (cm)
* Body Mass Index (BMI, index of adiposity in children ages 2 years and older) – calculate using [National Heart, Lung and Blood Institute BMI Calculator](http://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm)), that is:

BMI = weight (lb) / [height (in)]2 x 703

weight (kg) / [height (m)]2

* Head circumference measurement – Using a flexible, non-stretchable tape, measure over the most prominent part of the occiput and just above the supraorbital ridges (this is the largest part of the head). Record the head circumference of the participant as well as the units for the measurement.
* Head circumference unit of measure – Choose only one unit.

Application of Growth Standards

Use WHO ([WHO Child Growth Standards](https://www.who.int/tools/child-growth-standards)) and CDC growth charts ([Centers for Disease Control and Prevention Growth Charts](http://www.cdc.gov/growthcharts/)) to determine %iles and Z-scores for age and sex. (In order to allow pooling of observational and clinical trials data across diverse populations, use of international standards is favored over country-specific standards.) Z-scores correspond approximately to standard deviations above or below the median or mean, and may provide additional information, particularly at the extremes of the distributions. Detailed references on the development of WHO standards are provided (Onyango, 2009; deOnis et al., 2011; deOnis et al., 2012).Briefly, for infants under age 2 years, all percentiles should be derived from WHO 2006 standards. There is no “standard” metric to assess overweight in children under age 2 years, but weight-for-length %ile is most frequently used for this purpose (Ogden et al., 2014). For children ages 2 years to < 5 years, there are two options. CDC 2000 continues to be used in most circumstances. WHO 2007 standards (designed to assess children under “optimal environmental conditions”) also exist for this age group, but it remains to be determined when these are most appropriate to use. Additional details are beyond the scope of this guidance, but can be found in the links included and references below.

| Measurement | Under 2 years | 2 - < 5 years | 5 - < 21 years |
| --- | --- | --- | --- |
| Weight-for-age | WHO 2006 | CDC 2000 | CDC 2000 |
| Length-for-age | WHO 2006 | CDC 2000 | CDC 2000 |
| Height-for-age | WHO 2006 | CDC 2000 | CDC 2000 |
| Weight-for-length | WHO 2006 | - | - |
| Body Mass Index | \* | CDC 2000 | CDC 2000 |
| Head circumference | WHO 2006 | CDC 2000 (through age 3 years, then PMID: 20304425)\*\* | PMID: 20304425\*\* |

\*BMI not a currently used metric of adiposity in this group, although these standards exist (WHO 2006).

\*\* Note that an additional reference is cited that can be used for estimating percentiles for head circumference in older children (these are derived from United States standards, and so may not be generalizable to other populations). For adults, head circumference percentiles can be estimated using a different reference (PMID: 1444530), although these are obtained from British centers, and thus may not be generalizable.

Detailed variable descriptions follow for application of anthropometric standards.

Weight

* Weight %ile (under 2 years, adjust for gestational age), standard used
* Weight Z-score (under 2 years, adjust for gestational age), standard used

Length, Height

* Length %ile (under 2 years, adjust for gestational age), standard used
* Length Z-score (under 2 years, adjust for gestational age), standard used
* Height %ile (over 2 years), standard used
* Height Z-score (over 2 years), standard used

Weight-for-length, BMI

* Weight for length %ile (index of adiposity in children < 2 years), standard used
* Weight for length Z-score (index of adiposity in children < 2 years), standard used
* BMI %ile, standard used
* BMI Z-score, standard used

Head Circumference

* Head circumference %ile, standard used
* Head circumference Z-score, standard used

Consider if < 3 years of age, adjust for gestational age

If premature, 22-37 weeks gestation, use growth charts for premature babies.The Fenton Preterm Growth Chart (University of Calgary) is recommended and is the World Health Organization growth standard: <https://live-ucalgary.ucalgary.ca/resource/preterm-growth-chart/preterm-growth-chart>

Sexual Maturation

Noting puberty stage by exam should be strongly considered. If exam is not possible, stage can be collected by self-report.

Tanner Stage Definitions

* Pubic hair (both male and female)
* Tanner I
  + no pubic hair at all (prepubertal Dominic state) [typically age 10 and younger]
* Tanner II
  + small amount of long, downy hair with slight pigmentation at the base of the penis and scrotum (males) or on the labia majora (females) [10–11.5]
* Tanner III
  + hair becomes more coarse and curly, and begins to extend laterally [11.5–13]
* Tanner IV
  + adult-like hair quality, extending across pubis but sparing medial thighs [13–15]
* Tanner V
  + hair extends to medial surface of the thighs [15+]
* Genitals (male) – testicular volumes differ from Tanner Stages by Emmanuel and Bokor: <https://www.ncbi.nlm.nih.gov/books/NBK470280/>
* Tanner I
  + prepubescent (testicular volume less than 1.5 mL; small penis of 3 cm or less) [typically age 9 and younger]
* Tanner II
  + testicular volume between 1.6 and 6 mL; skin on scrotum thins, reddens and enlarges; penis length unchanged [9-11]
* Tanner III
  + testicular volume between 6 and 12 mL; scrotum enlarges further; penis begins to lengthen to about 6 cm [11-12.5]
* Tanner IV
  + testicular volume between 12 and 20 mL; scrotum enlarges further and darkens; penis increases in length to 10 cm and circumference [12.5-14]
* Tanner V
  + testicular volume greater than 20 mL; adult scrotum and penis of 15 cm in length [14+]
* Breasts (female)
* Tanner I
  + no glandular tissue: areola follows the skin contours of the chest (prepubertal) [typically age 10 and younger
* Tanner II
  + breast bud forms, with small area of surrounding glandular tissue; areola begins to widen [10-11.5]
* Tanner III
  + breast begins to become more elevated, and extends beyond the borders of the areola, which continues to widen but remains in contour with surrounding breast [11.5-13]
* Tanner IV
  + increased breast size and elevation; areola and papilla form a secondary mound projecting from the contour of the surrounding breast [13-15]
* Tanner V
  + breast reaches final adult size; areola returns to contour of the surrounding breast, with a projecting central papilla. [15+]

## References

1. Fenton Preterm Growth Chart (University of Calgary). Retrieved 18 May 2023 from

<https://live-ucalgary.ucalgary.ca/resource/preterm-growth-chart/preterm-growth-chart>

1. Emmanuel M, Bokor BR. Tanner Stages. [Updated 2022 Dec 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470280/>
2. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. JAMA. 2014 Feb 26;311(8):806-14.
3. de Onis M, Siyam A, Borghi E, Onyango AW, Piwoz E, Garza C. Comparison of the World Health Organization growth velocity standards with existing US reference data. Pediatrics. 2011 Jul;128(1):e18-26.
4. de Onis M, Onyango A, Borghi E, Siyam A, Blössner M, Lutter C; WHO Multicentre Growth Reference Study Group. Worldwide implementation of the WHO Child Growth Standards. Public Health Nutr. 2012 Sep;15(9):1603-10.
5. Onyango AW. La méthodologie des standards de croissance de l'Organisation Mondiale de la Santé et les principaux résultats de l'étude << multicentre growth reference >> [World Health Organization child growth standards: background, methodology and main results of the Multicentre Growth Reference Study]. Arch Pediatr. 2009 Jun;16(6):735-6. French.
6. Rasmussen AR, Wohlfahrt-Veje C, Tefre de Renzy-Martin K, Hagen CP, Tinggaard J, Mouritsen A, Mieritz MG, Main KM. Validity of self-assessment of pubertal maturation. Pediatrics. 2015 Jan;135(1):86-93.
7. Slaughter MH, Lohman TG, Boileau RA, Horswill CA, Stillman RJ, Van Loan MD, Bemben DA. Skinfold equations for estimation of body fatness in children and youth. Hum Biol. 1988 Oct;60(5):709-23.
8. Schmitz KE, Hovell MF, Nichols JF, Irvin VL, Keating K, Simon GM, Gehrman C, Jones KL. A Validation Study of Early Adolescents’ Pubertal Self-Assessments. J Early Adolesc. 2004 Nov;24(4):357-84.
9. Walker IV, Smith CR, Davies JH, Inskip HM, Baird J. Methods for determining pubertal status in research studies: literature review and opinions of experts and adolescents. J Dev Orig Health Dis. 2020 Apr;11(2):168-87.
10. Yayah Jones NH, Khoury JC, Xu Y, Newman N, Kalkwarf HJ, Braun JM, Lanphear B, Chen A, Cecil KM, Rose SR, Yolton K. Comparing adolescent self staging of pubertal development with hormone biomarkers. J Pediatr Endocrinol Metab. 2021 Aug 24;34(12):1531-41.