Ideal Body Weight (IBW), Growth Charts, and Body Mass Index (BMI)

Ideal Body Weight (IBW) Formulas

Various equations for calculating ideal body weight (IBW), sometimes referred to as "expected" body weight or "desirable" body weight, have been derived from height-weight tables developed by life insurance companies in the United States. IBW has been defined as the "level that is consistent with optimal health or that correlates with lowest mortality and longest longevity" (Shah et al., 2006).

The inability to maintain a normal weight for age and height is a criterion for the diagnosis of anorexia nervosa (AN) (Le Grange et al., 2012). A patient with AN has a body weight significantly less than IBW. The calculation of the IBW is important in the diagnosis of AN, determining medical stability in patients with eating disorders, and in justification for various levels of treatment.

Magellan uses the *Hamwi formula* (1964), mostly utilized in healthcare, to calculate the IBW that is included in the criteria for admission to intensive outpatient treatment, residential treatment, partial hospitalization or hospitalization (inpatient) for patients with eating disorders. Computation of the IBW using the Hamwi formula is based on inches and pounds as follows:

<u>For males</u>: IBW = 106 pounds for the first 5 feet of height (60 inches) plus 6 pounds for each additional inch above 5 feet.
Example: Male patient is 5 feet and 11 inches tall. IBW = 106 + (6 x 11) = 172

<u>For females</u>: IBW = 100 pounds for the first 5 feet of height (60 inches) plus 5 pounds for each additional inch above 5 feet.
Example: Female patient is 5 feet and 7 inches tall. IBW = 100 + (5 x 7) = 135.

Growth Charts

The Centers for Disease Control and Prevention (CDC) recommends use of growth charts in clinical practice to assess size and growth in U.S. infants, children, and adolescents (CDC, 2002). The growth charts for children and adolescents (from age 2 to 20 years) include weight-for-age, stature-for-age, and body mass index (BMI) for age growth curves. The growth curves for the United States were developed with data collected in nationally representative health examination surveys by the National Center for Health Statistics (NCHS).

Pediatricians monitor a child's growth with charts to determine whether a child's height and weight measurements are "normal" and whether development is "on track." Percentiles are measurements (lines drawn in curved patterns) that allow the comparison of a child or adolescent's growth with others of the same sex and age. Additionally, the charts provide a pattern of height and weight gain over time.

Commonly used CDC growth charts for children and adolescents aged 2 to 20 include:

- 2 to 20 years: Boys stature-for-age and weight-for-age percentiles
- 2 to 20 years: Girls stature-for-age and weight-for-age percentiles
- 2 to 20 years: Boys body mass index-for-age percentiles
- 2 to 20 years: Girls body mass index-for-age percentiles

The above charts may be found at http://www.cdc.gov/growthcharts/clinical_charts.htm. Additional information related to the methods and development of the CDC growth charts is online at http://www.cdc.gov/nchs/data/series/sr_11/sr11_246.pdf.

Measurements of height, weight, and BMI are plotted on the appropriate CDC growth chart. First, the child or adolescent's age is found on the horizontal axis (at the bottom of the chart). Weight, length, or BMI are plotted with a dot on the vertical axis (corresponding to the child's age). The dot where the age and weight, age and length, or age and BMI intersect is directly on a percentile curve or between two curves showing selected percentiles indicating the rank of the child's measurement. As an example, when the dot is plotted on the 90th percentile line on the CDC weight-for-age chart for boys, this result shows that 10 percent of boys of the same age have a higher weight-for-age. More examples with practice calculations may be found at http://pediatrics.about.com/cs/growthcharts2/l/aa050802a.htm.

The following growth chart is an example of the plotting for a 24 month-old boy weighing 30 pounds. Note the vertical line drawn through 24 months and the horizontal line through 30 pounds. The curve closest to the spot where the two lines intersect is the 75th percentile, reflecting that the boy weighs more than approximately 75 percent of the boys that are his age.

(http://pediatrics.about.com/cs/growthcharts2/l/aa050802a.htm)
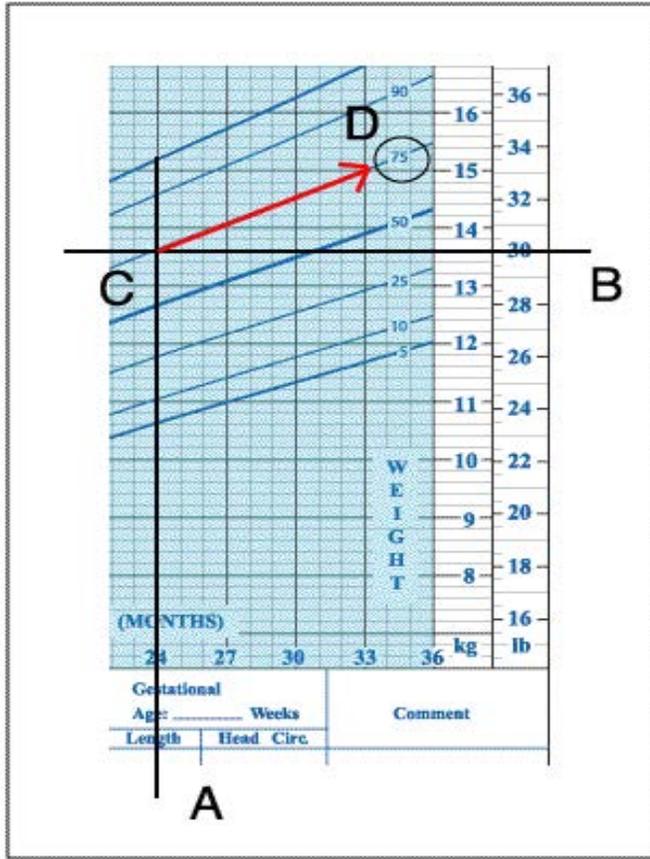
Body Mass Index (MBI) Calculator

BMI is calculated by dividing a person's weight in kilograms by the square of height in meters. It is an easy to perform method of screening for normal weight as well as for underweight and overweight (CDC, 2015).

The formula is as follows:
$$BMI = \text{weight in kg} / (\text{height in meters})^2$$

To calculate using pounds and inches, use the following formula:
$$BMI = \text{weight (lbs)} \times 0.453592 / (\text{height in inches} \times 0.0254)^2$$

An example using the formula:

Weight = 140 lbs; Height 68 inches
BMI = 140 x 0.453592 / (68 x 0.0254)^2 = 63.50288/2.98321984 = 21.28

The calculation of BMI is the same for both children and adults; however, it is interpreted differently for children and teens. BMI should be age- and sex-specific for children and teens because the amount of body fat differs between girls and boys and changes with age. The CDC BMI-for-age growth charts consider these differences and show BMI as a percentile ranking.

Additional information including the **BMI calculator** for adults and for children/adolescents can be found at:

http://www.cdc.gov/healthyweight/assessing/bmi/.

An *illustrative* conversion table for IBW and *estimated* BMI is presented below:

Ideal Body Weight	Body Mass Index
100%	20.1
85%	17.1
80%	16.1
75%	15.1

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