
Percentile Data Files with LMS Values

Data used to produce the United States Growth Charts smoothed percentile curves are contained in 8 Excel data files representing the 8 different growth curves for infants (weight-for-age; length-for-age, weight-for-recumbent length; head circumference-for-age) and older children (weight-for-stature; weight-for-age; stature-for-age; and BMI-for-age). The file and corresponding chart names are below. These data remain unchanged from the initial release on May 30, 2000 of the growth charts.

1. [WTAGEINF](#) [XLS - 34 KB] [WTAGEINF](#) [CSV - 12 KB]

Weight-for-age charts, birth to 36 months, LMS parameters and selected smoothed weight percentiles in kilograms, by sex and age

2. [LENAGEINF](#) [XLS - 67 KB] [LENAGEINF](#) [CSV - 27 KB]

Length-for-age charts, birth to 36 months, LMS parameters and selected smoothed recumbent length percentiles in centimeters, by sex and age

Errata: The selected percentile values for length for age have been updated to correspond exactly to the published LMS values. The 50th percentile values have not changed and the outer percentiles differ only at or beyond the second decimal place. There is no visibly perceptible difference in the graphs of the growth curves compared to those published in 2000. Thus, no changes to printed graphical growth charts are needed.

3. [WTLENINF](#) [XLS - 46 KB] [WTLENINF](#) [CSV - 18 KB]

Weight-for-recumbent length charts, birth to 36 months, LMS parameters and selected smoothed weight percentiles in kilograms, by sex and recumbent length (in centimeters)

4. [HCAGEINF](#) [XLS - 34 KB] [HCAGEINF](#) [CSV - 12 KB]

Head circumference-for-age charts, birth to 36 months, LMS parameters and selected smoothed head circumference percentiles in centimeters, by sex and age

5. [WTSTAT](#) [XLS - 39 KB] [WTSTAT](#) [CSV - 15 KB]

Weight-for-stature charts, LMS parameters and selected smoothed weight percentiles in kilograms, by sex and stature (in centimeters)

6. [WTAGE](#) [XLS - 125 KB] [WTAGE](#) [CSV - 65 KB]

Weight-for-age charts, 2 to 20 years, LMS parameters and selected smoothed weight percentiles in kilograms, by sex and age

7. [STATAGE](#) [XLS - 125 KB] [STATAGE](#) [CSV - 65 KB]

Stature-for-age charts, 2 to 20 years, LMS parameters and selected smoothed stature percentiles in centimeters, by sex and age

8. [BMIAGE](#) [XLS - 135 KB] [BMIAGE](#) [CSV - 71 KB]

BMI-for-age charts, 2 to 20 years, LMS parameters and selected smoothed BMI (kilograms/meters squared) percentiles, by sex and age

These files contain the L, M, and S parameters needed to generate exact percentiles and z-scores along with the percentile values for the 3rd, 5th, 10th, 25th, 50th, 75th, 90th, 95th, and 97th percentiles by sex (1=male; 2=female) and single month of age. The smoothed 85th percentile values are included in the BMI-for-age and weight-for-stature tables. Age is listed at the half month point for the entire month; for example, 1.5 months represents 1.0-1.99 months or 1.0 month up to but not including 2.0 months of age. The only exception is birth, which represents the point at birth. To obtain L, M, and S values at finer age or length/stature intervals interpolation could be used.

The LMS parameters are the median (M), the generalized coefficient of variation (S), and the power in the Box-Cox transformation (L). To obtain the value (X) of a given physical measurement at a particular z-score or percentile, use the following equation:

$$X = M (1 + LSZ)^{(1/L)}, L \neq 0$$

Or

$$X = M \exp(SZ), L = 0$$

where the L, M, and S are the values from the appropriate table corresponding to the age in months of the child (** indicates an exponent, such that $M(1+LSZ)^{(1/L)}$ means raising $(1+LSZ)$ to the $(1/L)$ th power and then multiplying the M; $\exp(X)$ is the exponentiation function, e to the power X). Z is the z-score that corresponds to the percentile. z-scores correspond exactly to percentiles, e.g., z-scores of -1.881, -1.645, -1.282, -0.674, 0, 0.674, 1.036, 1.282, 1.645, and 1.881 correspond to the 3rd, 5th, 10th, 25th, 50th, 75th, 85th, 90th, 95th, and 97th percentiles, respectively.

For example, to obtain the 5th percentile of weight-for-age for a 9-month-old male, we would look up the L, M and S values from the WTAGEINF table, which are $L=-0.1600954$, $M=9.476500305$, and $S=0.11218624$. For the 5th percentile, we would use $Z=-1.645$. Using the equation above, we calculate that the 5th percentile is 7.90 kg.

To obtain the z-score (Z) and corresponding percentile for a given measurement (X), use the following equation:

$$Z = \frac{((X/M)^L) - 1}{LS}, L \neq 0$$

or

$$Z = \ln(X/M)/S, L=0$$

where X is the physical measurement (e.g. weight, length, head circumference, stature or calculated BMI value) and L, M and S are the values from the appropriate table corresponding to the age in months of the child (or length/stature). $(X/M)^L$ means raising the quantity (X/M) to the Lth power.

For example, to obtain the weight-for-age z-score of a 9-month-old male who weighs 9.7 kg, we would look up the L, M and S values from the WTAGEINF table, which are $L=-0.1600954$, $M=9.476500305$, and $S=0.11218624$. Using the equation above, we calculate that the z-score for this child is 0.207. This z-score corresponds to the 58th percentile.

Z-scores and corresponding percentiles can be obtained from standard normal distribution tables found in statistics text books. Standard normal tables can also be found on the internet by doing a search on a "standard normal table." In addition, many computer programs have pre-existing functions that convert Z-scores to percentiles and vice versa.

A modified LMS approach was used to develop these growth charts, see:

Flegal KM, Cole TJ. Construction of LMS parameters for the Centers for Disease Control and Prevention 2000 growth chart [PDF - 88 KB] (<http://www.cdc.gov/nchs/data/nhsr/nhsr063.pdf>). National health statistics reports; no 63. Hyattsville, MD: National Center for Health Statistics. 2013.

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Page last reviewed: August 4, 2009

Page last updated: August 4, 2009

Content source: Centers for Disease Control and Prevention (<http://www.cdc.gov/>), National Center for Health Statistics (<http://www.cdc.gov/nchs/>)