

## **2014 WHO Growth Charts for Canada, based on revisions by the Canadian Pediatric Endocrinology Group:**

In March 2014, the Public Health Agency of Canada (PHAC) released the new 2014 WHO Growth Charts for Canada (Set 1), based on re-analysis of core WHO data by the Canadian Pediatric Endocrine Group (CPEG). For details regarding data sources and curve-fitting methods, please see <http://www.biomedcentral.com/1471-2431/14/32#>:

*Celia Rodd, Dan Metzger and Atul Sharma for the Canadian Pediatric Endocrine Group working committee for national growth charts: Extending World Health Organization weight-for-age reference curves to older children. BMC Pediatrics 2014, 14:32*

Based on this re-analysis, weight-for-age reference curves were extended from 10-19 years of age and extreme centiles (0.1 and 99.9%) were eliminated or de-emphasized to reduce misclassification errors. In September 2014, PHAC released a second set of 2014 WHO Growth Charts for Canada (Set 2), with restoration of 7 centiles in the normal range familiar to long-time users of CDC charts. Set 2 displays centiles 3, 10, 25, 50, 75, 90, 97 on all charts, substituting the 85th for the 90th centile and retaining the 99.9th centile on the weight-for-length (0–24 months) and BMI-for-age (2–19 years) charts. The 85th centile was used on the weight-for-length and BMI charts to better correspond to adult definitions of obesity. In contrast, Set 1 uses “WHO centiles” 3, 15, 50, 85, 97 (roughly –2, –1, 0, +1, +2 standard deviations) on all charts and in addition includes the 99.9th centile (+3 SD) on the weight-for-length (0–24 months) and BMI-for-age (2–19 years) charts.

Both sets of 2014 growth charts align with the recommendations in the 2010 collaborative statement. Resources that support implementation of the WHO Growth Charts for Canada have been updated to reflect the redesigned charts. CPEG believes that the increased granularity and more familiar CDC centile selection in Set 2 will allow these charts to be more easily applied to identify growth aberrations, the diagnosis of failure-to-thrive, and in the interpretation of blood pressure norms. Both sets are available at [www.whogrowthcharts.ca](http://www.whogrowthcharts.ca). CPEG also believes that it is optimal to have a single source for growth charts nationally and have therefore officially endorsed the 2014 revision to the WHO Growth Chart for Canada, with a preference for the use of Set 2. The CPEG charts that formed the basis for Set 2 have therefore been archived. They are available in the members-only section of the CPEG website.

We are happy to share these data with other agencies wanting to include our revised weight-for-age curves in their own charts. To avoid confusion over the large number of alternate charts currently in circulation, we ask that these charts be identified as the '2014 WHO Growth Charts for Canada with revisions based on re-analysis by the Canadian Pediatric Endocrine Group'. For consistency, you may wish to follow the lead of the Public Health Agency of Canada, whose charts identify the extension to weight-for-age beyond age 10 years using dotted lines and recommend regular monitoring of BMI for all children aged 2-19 years.

To assist in the development of electronic medical records based on the 2014 WHO Growth Charts for Canada, we have compiled a collection of spreadsheets in comma separated variable (.csv) format. They contain age (months), LMS parameters, and a choice of pre-calculated percentiles for plotting both Set 1 and 2 growth charts. For those needing to do so, the LMS parameters may be used to calculate any centiles or z-scores by age, gender, and physical measure using standard formulae, which may be found in either the CPEG or WHO statistical methods manuals on their respective websites.

Except for the weight-for-age re-analysis (10-19y), all of the spreadsheets are created from publicly available WHO LMS posting. These were compiled from multiple official WHO sources, including text, html, pdf, and SAS data files. Percentile values were then calculated using standard formulae as described in both the WHO and CPEG methods manuals.

Please note that the infant curves contain weekly data (0-13 weeks), followed by the usual monthly data, the result of merging WHO datasets. The 'official' conversion factor recommended by the WHO is 30.4375 days per month, to ensure continuity at 3 months.

When you plot the raw infant weight-for-length data (0-24 mo), the results looks "wavy". To get "smooth curves", we simply took raw data at 0.5 cm intervals and omitted intermediate points (i.e. keeping only the 45 and 50 cm points in 45, 45.5, 46, 46.5, ..., 49.5, 50, etc.). You might save your database programmers some grief by warning them in advance. I have provided the raw data at 0.5 cm intervals so that it can be used for calculating SD scores or more precise percentiles values rather than just plotting visually attractive curves.

- wfl\_girls\_p\_0\_2.csv - girls weight-for-length 0-2 years
- wfl\_boys\_p\_0\_2.csv - boys weight-for-length 0-2 years
- wfh\_girls\_p\_0\_2.csv - girls weight-for-height 2-5 years
- wfh\_boys\_p\_0\_2.csv - boys weight-for-height 2-5 years
- wfa\_girls\_p\_0-19.csv - girls weight-for-age 0-19 years
- wfa\_boys\_p\_0-19.csv - boys weight-for-length 0-19 years
- wfa\_girls\_p\_0\_19.csv - girls weight-for-age 0-19 years
- wfa\_boys\_p\_0\_19.csv - boys weight-for-age 0-19 years
- lfa\_girls\_p\_13\_0\_5.csv – girls length-for-age 0-5 years
- lfa\_boys\_p\_0\_13\_5.csv – boys length-for-age 0-5 years
- hfa\_girls\_p\_0\_19.csv - girls height-for-age 0-19 years
- hfa\_boys\_p\_0\_19.csv - boys height-for-age 0-19 years
- hcfa\_girls\_p\_0\_13\_5.csv - girls head circumference 0-5 years
- hcfa\_boys\_p\_0\_13\_5.csv - boys head circumference 0-5 years
- bfa\_girls\_p\_0\_19.csv - girls bmi-for-age 0-19 years
- bfa\_boys\_p\_0\_19.csv - boys bmi-for-age 0-19 years

### Centiles displayed

0-24 months weight- and length-for-age

0-24 months head circumference

2-19 years weight- and height-for-age

	3	10	15	25	50	75	85	90	97	99.9
Set 1	x		x		x		x		x	
Set 2	x	x		x	x	x		x	x	

0-24 months weight-for-length

2-19 years BMI

	3	10	15	25	50	75	85	90	97	99.9
Set 1	x		x		x		x		x	x
Set 2	x	x		x	x	x	x		x	

## **Instructions for Viewing and Printing Growth Charts**

All clinical growth charts may be viewed, downloaded, and printed in Adobe Acrobat from [www.whogrowthcharts.ca](http://www.whogrowthcharts.ca).

The recommended ink colors for printing are Pantone **226 C** red (for girls) and Pantone **299 C** blue (for boys). The recommended paper weight is 80#. Charts should be printed as two-sided copies, in the following combinations for each sex:

### **Birth -24 Months Charts:**

Side 1: Length-for-age and weight-for-age on one side

Side 2: Head circumference and weight-for-stature on the other side

### **2-19 Year Charts:**

Side 1: Weight-for-age and height-for-age on one

side Side 2: BMI-for-age on the other side.