Interpreting the WHO Growth Charts for Canada

MODULE 3
Objectives:

1) Determine which WHO growth chart to use for plotting growth of infants, children and teens

2) Properly plot accurate measurements on the appropriate growth charts

3) Describe the importance of serial measurements versus single measurement in time
Objectives

4) Identify the recommended cut off criteria for normal growth and growth concerns

5) Recognize healthy weight gain at different ages

6) Assess for growth concerns and identify those who may require further assessment and/or referral
1. Which of the following is NOT one of the WHO growth charts for Canada.
   a) 0-24 months weight-for-age and length-for-age
   b) 0-24 months BMI-for-age
   c) 2-19 years BMI-for-age

2. True or False. The WHO growth charts for Canada can be used for children with special health care needs.

3. True or False. A single measurement in time or serial measurements can be used as a differential diagnosis relating to a child’s growth
1. **The correct answer is (b).** BMI is not used for children less than 2 years of age in the WHO Growth Charts for Canada.

2. **TRUE.** The WHO Growth Charts for Canada can be used in monitoring the growth of children with special health care needs.

3. **FALSE.** Whether it is a single measurement in time or serial measurements, they should not be used as a diagnostic tool.
0 – 24 months of age

Length for Age

Head Circumference

Weight for Age

Weight for Length
2 – 19 years of age

Height for Age

Weight for Age

BMI for Age
Growth Charts for Pre-term Infants (<37 weeks gestation)

- Same growth charts, but measurements should be plotted using corrected age.
- Growth of low birth weight and very low birth weight preterm infants differ from term infants, such that they may not catch up during early childhood.
“Special” Cases

WHO growth chart
(+ disease specific if available)

e.g. Turner’s or Down’s Syndrome

(Cronk et al., 2009; Scott et al., 1997; Krick et al., 1996; Lyon et al., 1985)
Plot Accurately!!!
Steps to plotting accurately...

Assuming you have the appropriate chart with respect to age and gender:

1) For anthropometrics and BMI plotting against age, determine child’s age based on gestation and chronological age.

2) On the horizontal axis, identify the child’s age to the nearest completed week/month for <2yr and to the nearest completed month for 2-19yr.

3) Use a straight edge to draw a vertical line up from that point.
4) Find the appropriate measurement (weight, length, height, head circumference or BMI) on the vertical axis – note “unit of measure”

5) Use a straight edge to draw a horizontal line across from that point until it intersects the vertical line that you drew for age

6) Make a small dot where the 2 lines intersect.

Similarly, when plotting weight-for-length, identify weight on the horizontal axis and length on the vertical axis
PERCENTILES...What do they mean?

e.g. Weight-for-age at 97%

Means

• 97 / 100 children weigh less

Or

• 3 / 100 children weigh more
Single measurement

- Used for screening purposes
- NOT a diagnostic criteria
## 0 – 24 months cut-offs

<table>
<thead>
<tr>
<th>Growth Status</th>
<th>Indicator</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>Weight-for-age</td>
<td>&lt;3rd</td>
</tr>
<tr>
<td>Stunted</td>
<td>Length-for-age</td>
<td>&lt;3rd</td>
</tr>
<tr>
<td>Wasted</td>
<td>Weight-for-length</td>
<td>&lt;3rd or &lt;89% IBW</td>
</tr>
<tr>
<td>Risk of Overweight</td>
<td>Weight-for-length</td>
<td>&gt;85th</td>
</tr>
<tr>
<td>Overweight</td>
<td>Weight-for-length</td>
<td>&gt;97th</td>
</tr>
<tr>
<td>Obese</td>
<td>Weight-for-length</td>
<td>&gt;99.9th</td>
</tr>
<tr>
<td>Head Circumference</td>
<td>Head circumference-for-age</td>
<td>&lt;3rd or &gt; 97th</td>
</tr>
</tbody>
</table>
2 – 19 years cut-offs

<table>
<thead>
<tr>
<th>Growth Status</th>
<th>Indicator</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2-5 years</td>
</tr>
<tr>
<td>Underweight</td>
<td>Weight-for-age</td>
<td>&lt;3rd</td>
</tr>
<tr>
<td>Stunted</td>
<td>Length-for-age</td>
<td>&lt;3rd</td>
</tr>
<tr>
<td>Wasted</td>
<td>BMI-for-age</td>
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</tr>
<tr>
<td>Obese</td>
<td>BMI-for-age</td>
<td>&gt;99.9th</td>
</tr>
<tr>
<td>Severely obese</td>
<td>BMI-for-age</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Serial Measurements
Normal growth pattern

Growth usually:

- follows the same growth curve over time
- falls between the 3rd and 85th percentile
- is proportional (weight and length / height)
IMPORTANT:

50\textsuperscript{th} percentile is NOT the goal for each child.

Crossing of BOTH weight and length/height up to 2 percentile curves may be normal for the first 2-3 years and at puberty.
1. What percent of healthy children have weights greater than or equal to the 50\textsuperscript{th} percentile?
   a) About 40 percent
   b) About 50 percent
   c) About 5 percent

2. What percent of healthy children have weights less than or equal to the 3\textsuperscript{rd} percentile?
   a) About 47 percent
   b) About 97 percent
   c) About 3 percent

3. An eight year-old-boy has had consistent height at the 5\textsuperscript{th} percentile. He weighs less than the 3\textsuperscript{rd} percentile and his BMI is at the 10\textsuperscript{th} percentile for the past few years. His parents are 155 cm (5 feet 1 inch) and 167.5 cm (5 feet 6 inches) in height. Are you concerned about his size?
   a) Yes  b) No
1. The correct answer is (b) – about 50 percent

2. The correct answer is (c) – about 3 percent

3. The correct answer is (b). His weight, height and BMI have all been consistent over the past few years. In addition his weight status for this height (BMI) and his height are in the normal range and based on this parents’ heights, his height is not unexpected.
CDC vs WHO
Breastfed vs. non-breastfed infants

<table>
<thead>
<tr>
<th></th>
<th>Breastfed</th>
<th>Non-breastfed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 6 months</td>
<td>More rapid growth</td>
<td>Slower growth</td>
</tr>
<tr>
<td>6 – 12 months</td>
<td>Slower growth</td>
<td>More rapid growth</td>
</tr>
</tbody>
</table>

WHO growth charts applicable for BOTH breastfed and non-breastfed babies 0-6 months
WHO growth charts reflect….

A lighter, somewhat taller sample population
Therefore,

LOWER rates of under-nutrition, except during 0-6months

HIGHER rates of stunting and over-nutrition
CASE STUDY

CDC vs WHO

Growth Charts
• **Weight-for-age >10yr?**

• **Still measure weight, but use it for calculating BMI!**
Identifying Problems with Growth Patterns

• Crossing two percentile curves on the growth chart has NOT been validated as an indicator of a growth problem

• Shifts or no change in height/length-for weight and BMI-for age should always be assessed further
Problematic patterns

- Sharp decline or incline
- Flat line
- Surfing away from 50th percentile
Flat Growth Line

Weight for Age
Sharp decline

Weight for Age
Gradual shift away from 50$^{th}$ percentile – weight for age
A sharp incline

BMI-for-age
A gradual incline

BMI-for-age
BMI-for-age ≥ 2 yr

• Best for assessing weight in relation to height
• Age- and gender-specific up to 19 yr
• Trend is more important than a single value
• Lack of convincing evidence that BMI for age is better than weight for length at assessing adequacy of feeding and under/overweight in infants and toddlers <2 years of age
Factors to consider in evaluating growth that does not follow a healthy pattern

- Parental height
- Nutritional intake
- Presence of chronic illness
- Special health care needs (e.g. Downs syndrome, cerebral palsy, cystic fibrosis)
- Gestational age, birth weight and feeding method (breast/formula) for infants
CASE STUDY
Failure to Thrive
CASE STUDY
Precocious Puberty
Summary – Key Practice Points

1) It is important to know how to plot measurements accurately using the appropriate plotting age
2) Single measurements can be used for screening need for further assessment while serial measurements will provide information on growth pattern and trends
3) The WHO growth charts are appropriate for BOTH breastfed and non-breastfed infants and children
4) Cut-off points cannot be used as a diagnostic criteria
1. True or False. The 50th percentile is the goal for each child.
   a) True
   b) False

2. True or False. Crossing two percentiles on the growth curve is a good way to identify growth failure or excessive weight gain.
   a) True
   b) False

3. True or False. The WHO growth charts adapted for Canada can be used for both breastfed and non-breastfed babies.
   a) True
   b) False
1. **FALSE.** It is important to understand and remind parents that the 50 percentile is NOT the goal for each child.

2. **FALSE.** Although historically that has been common practice using the CDC growth charts, this technique for identifying a growth problems has not been validated.

3. **TRUE.** Although the Who Growth Charts were based on a primarily breastfed population, they are growth standards, indicating how a child should grow, whether they are breastfed or not. Therefore the WHO growth charts can and should be used for both breastfed and non-breastfed babies.
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