

○ ○ ○ | **The What and the Why of the WHO Growth Charts**

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○ ○ ○ | **Objectives**

At the end of this program, participants will be able to

- Understand how the WHO Growth Standards were constructed
- Understand the proper use of the WHO and the CDC Growth Charts
- Monitor the growth of infants and children appropriately

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○ ○ ○ | **Growth standard?**

- The WHO charts are growth standards
  - describe how healthy children should grow under optimal environmental and health conditions
- CDC growth charts are a growth reference
  - describe how certain children grew in a particular place and time (1963-1994)

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○ ○ ○ | **CDC growth charts**

- Numerous sources
  - National Health and Nutrition Examination Surveys (NHANES)
  - National Natality Files
  - Natality Files in Wisconsin and Missouri
  - CDC Pediatric Nutrition Surveillance System
  - Fels Research Institute child growth study

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○ ○ ○ | **The WHO growth charts**

- Based on healthy children living under conditions likely to favor achievement of their full genetic growth potential
  - High socioeconomic status
  - Singleton mothers
  - Breastfeeding
  - No smoking

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○ ○ ○ | **The Multicentre Growth Reference Study (MGRS)**

- MGRS
  - between 1997 and 2003
  - primary growth data from ~ 8500 children from widely different ethnic backgrounds and cultural settings

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○ ○ ○ | Inclusion criteria

- Individual inclusion criteria
  - no known environmental constraints on growth
  - adherence to MGRS feeding recommendations
  - no maternal smoking
  - single term birth
  - no significant morbidity

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○ ○ ○ | Feeding criteria

- Three feeding criteria
  - Exclusively/predominantly breastfeeding for at least 4 months
  - Complementary foods by 6 months of age
  - Partially breastfeeding until at least age 12 months

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○ ○ ○ Compliance with Feeding criteria

<b>Exclusively / predominantly breastfeeding</b>	<b>74.7%</b>
Complementary foods by 6 months	99.5%
Partially breastfeeding until at least age 12 months	68.3%

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○ ○ ○ Breastfeeding

	Ever breastfed	Breastfeeding at 3 months
WHO charts	100%	75%
CDC data set	50%	33%
Present US data*	75%	58%

\*CDC. Breastfeeding among U.S. children born 1999–2007. CDC National Immunization Survey. Available online at [http://www.cdc.gov/breastfeeding/data/NIS\\_data](http://www.cdc.gov/breastfeeding/data/NIS_data). Accessed August 2, 2010.

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○ ○ ○ The WHO growth charts

- Growth curves for children aged <24 months
  - longitudinal measurements from birth through age 23 months
- Growth curves for children aged 24-59 months
  - cross-sectional

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- ○ ○ ○ |
- Longitudinal sample
  - Enrolled at birth and visited 21 times at home until age 24 months
- Predominant reason for ineligibility
  - Low socioeconomic status - Brazil, Ghana, India and Oman
  - Parental refusal - Norway and USA

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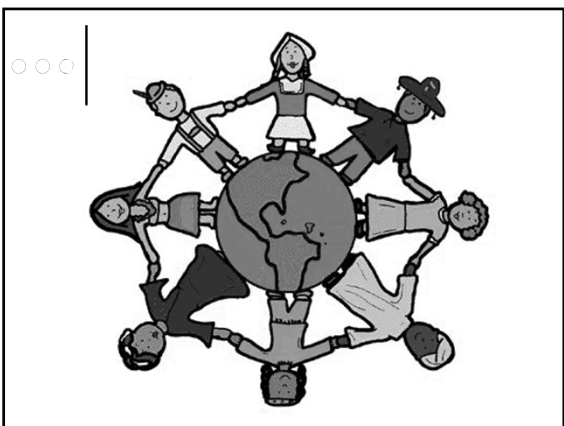
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- ○ ○ ○ | Universal standard
- Lengths
  - Striking similarity in sites
  - 70% of the total variance in length was due to inter-individual differences
  - only 3% was due to intersite differences

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○ ○ ○ | CDC Recommendations

- 0-2 years: use WHO growth standards
- 2 years+: use CDC growth charts

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○ ○ ○ | CDC charts

- Recommended for children 2-19 years
- Methods used to create CDC charts for children this age were similar to WHO methods

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○ ○ ○ | What do you need to know before using the WHO growth standards?

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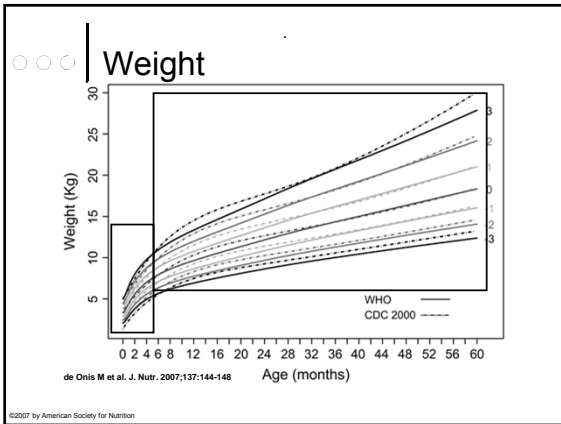
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- ○ ○ WHO versus CDC
- In the first few months of life
    - WHO curves show a faster rate of weight gain than the CDC charts
    - Use of the WHO charts might lead to an increase in the misperception of poor growth in formula-fed infants

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- ○ ○ WHO versus CDC
- After 3 months
    - WHO curves show a slower rate of weight gain than the CDC charts
    - If WHO charts are used, might identify formula-fed infants as gaining weight too quickly

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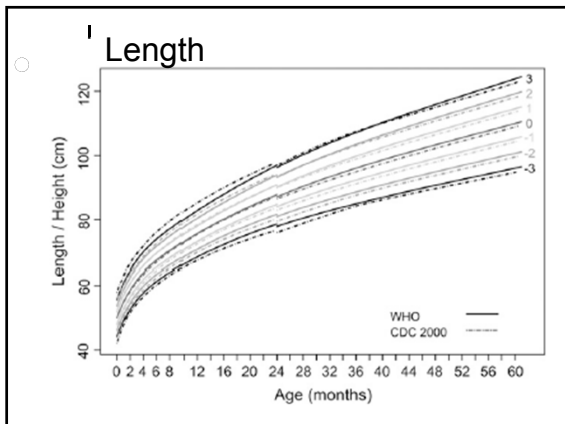
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**Comparison - Weight**

Patient	Weight (kg)	WHO %	CDC %
0-12m male	7.94	3-5%	1%
0-12m male	8.86	<1%	<1%
1 y.o. female	8.23	50%	42%
1 y.o. male	9.9	5-15%	3%
2 y.o. female	10.2	1-3%	<1%
2 y.o. male	10.02	>1%	<1%
3 y.o. male	12.2	3-5%	3%
3 y.o. male	19.1	> 95%	95%
4 y.o. female	17.1	50%	53%
4 y.o. male	12.4	1-3%	1%

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**Comparison - Length/Height**

Patient	Lt/Ht (cm)	WHO %	CDC %
0-12m AA male	70.5	3%	3%
0-12m caucasian male	65.3	<1%	<1%
1 y.o. caucasian female	65.1	3%	5%
1 y.o. AA male	78.2	1%	3%
2 y.o. caucasian female	84.9	3%	4%
2 y.o. caucasian male	83.3	1%	1%
3 y.o. caucasian male	86.7	<1%	<1%
3 y.o. unknown male	103.9	75%	83%
4 y.o. cauc/indian female	99.8	5-15%	15%
4 y.o. hispanic male	95	3-5%	7%

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○○○ | How do we avoid obese children skewing the sample?

- With increasing rates of obesity
  - Skewing of growth charts is a problem

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○○○ | Overweight / obesity

- Children under 24 months
  - Observations falling  $\geq 3$  SD and  $\leq 3$  SD of the sample median were excluded
- Children > 24 months
  - Observations falling  $\geq 2$  SD and  $\leq 2$  SD of the sample median were excluded
  - Sample was exceedingly skewed to the right

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○○○ | The WHO anthro program and its use

- <http://www.who.int/childgrowth/software/en/>

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○ ○ ○ | The CDC website

- <http://cdc.gov/growthcharts>

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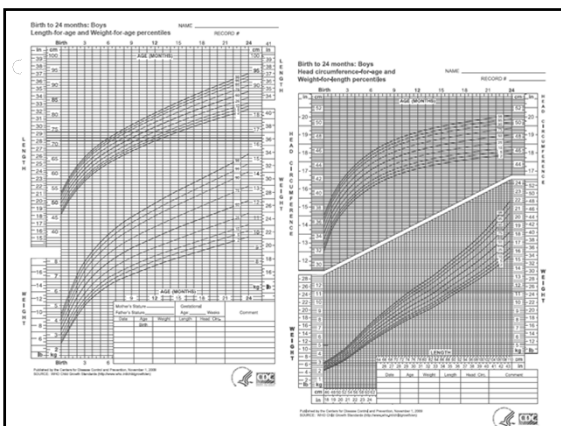
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○○○ | Practical considerations

- Start with all newborns
- Over the next two years
  - Plot all children with possible failure to thrive or overweight
  - Consider replotting all children with growth concerns

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○○○ | Practical considerations

- Work with your Information Services provider to make the WHO charts default for children < 24 months
- Use the CDC site to get charts that look like the 2000 CDC growth charts

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○○○ | Take-home points

- Use WHO growth standard for all children <24 months, regardless of type of feeding
- On the WHO growth charts
  - use the 2.3rd and 97.7th percentiles (labeled as the 2nd and 98th percentiles) to identify children with 'abnormal' growth
- Use CDC growth charts for children aged 24-59 months

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○○○ | **Take-home points**

- Fewer U.S. children will be identified as underweight using the WHO charts
- Slower growth among breastfed infants during ages 3-18 months is normal
- Gaining weight more rapidly than is indicated on the WHO charts might signal early signs of overweight

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○ **True or False.**  
The World Health Organization (WHO) growth charts were developed using predominantly breastfed children from the US and Canada.

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**True or False.** Predominantly breastfed children gain weight better than formula-fed children during the first 3 months of life while formula-fed infants gain more weight after the first 3 months.

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○ **True or False.** Presently in the US, 75% of children have ever been breastfed while approximately 60% continue to be breastfed at 3 months of age.

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○ **True or False.** Studies have shown that children in developing countries are able to grow as well as their counterparts in developed countries and achieve their full genetic growth potential regardless of socioeconomic status.

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The Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP) now recommend:

- the use of the World Health Organization (WHO) growth charts in children from birth to the age of 5 years
- the use of the World Health Organization (WHO) growth charts in children less than 12 months of age who are breastfed
- the use of the World Health Organization (WHO) growth charts in children under the age of 2 and the CDC growth charts beyond that age
- the use of the World Health Organization (WHO) growth charts in children less than 12 months of age and the CDC growth charts beyond that age

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