



Optimizing Pediatric Nutrition & Growth in Practice

Part 1 (of 2)



Dana B. Steien, MD

Pediatric Gastroenterology, Hepatology & Nutrition

July 2020

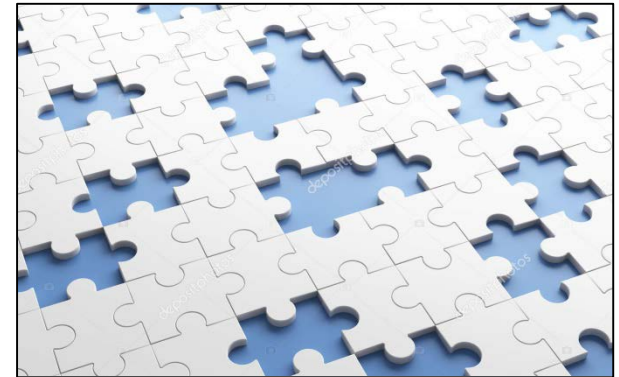
- I have no disclosures.



Overview

The Tools (part 1)

- Fluids
- Calories
- Growth, (wt)Gain & Malnutrition



Practice Friday (part 2)

- Cases



Mayo Clinic Children's Center





Cases- dbsteien@gmail.com

- <3yo
 - Age, CGA,
 - Screen shot of growth curves: Wt, Length, wt-for-length, HC (WHO or others)
 - Clinical scenario, relevant hx, and question
- >3yo
 - Age,
 - Screen shot of growth curves: Wt, Ht, BMI
 - WHO + CDC if < 5yo; CDC or others
 - Clinical Scenario, relevant hx, and question



Handouts

- Green Nutrition Sheet
 - Reference sheet
 - Outlines this talk
- Worksheet: fill in the blank
 - Questions from this talk

- rgtubon@anthc.com





Pre-Quiz

1. 2.5 yo patient (pre-term IUGR) is getting formula via a GT. Weight is at the 50th% on the WHO curve. This patient:

- a. Is getting sufficient calories and free water
- b. Should be charted on CDC curve
- c. Is at an optimal weight
- d. None of the above
- e. All the above

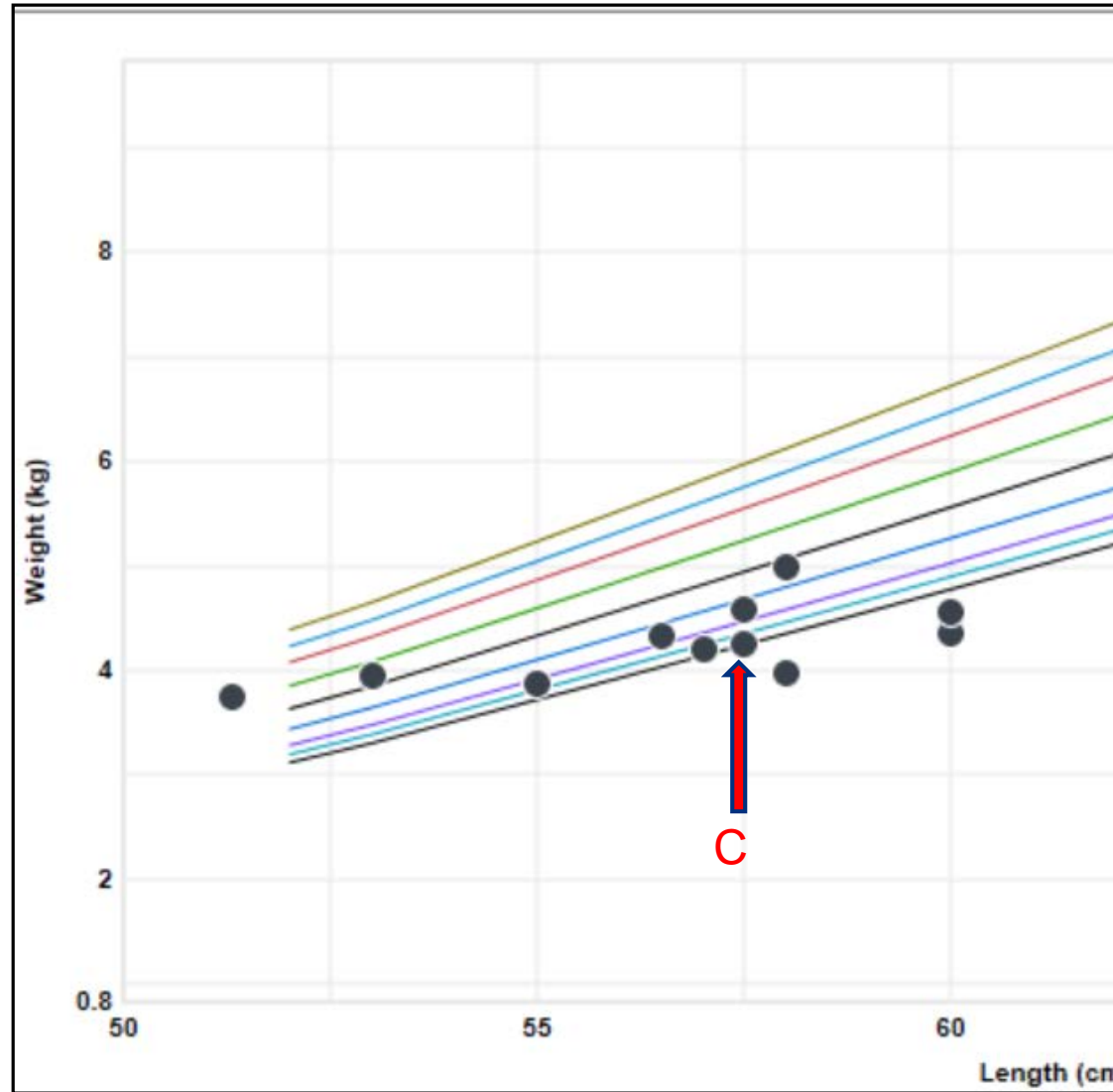
2. 1.5 Pediatric formula is

- a. 1 & 1/2 x the amount of calories as a standard infant formula
- b. 1 & 1/2 x the amount of fluid as a standard pediatric formula
- c. Similar content as 1 scoop of standard pediatric formula + 1 oz water
- d. None of the above
- e. All the above

Pre Quiz

3. “Ideal Body Weight” for “C” is thought to be:

- a. Cannot be determined
- b. 6 kg
- c. 5.5 kg
- d. 5kg
- e. 4kg



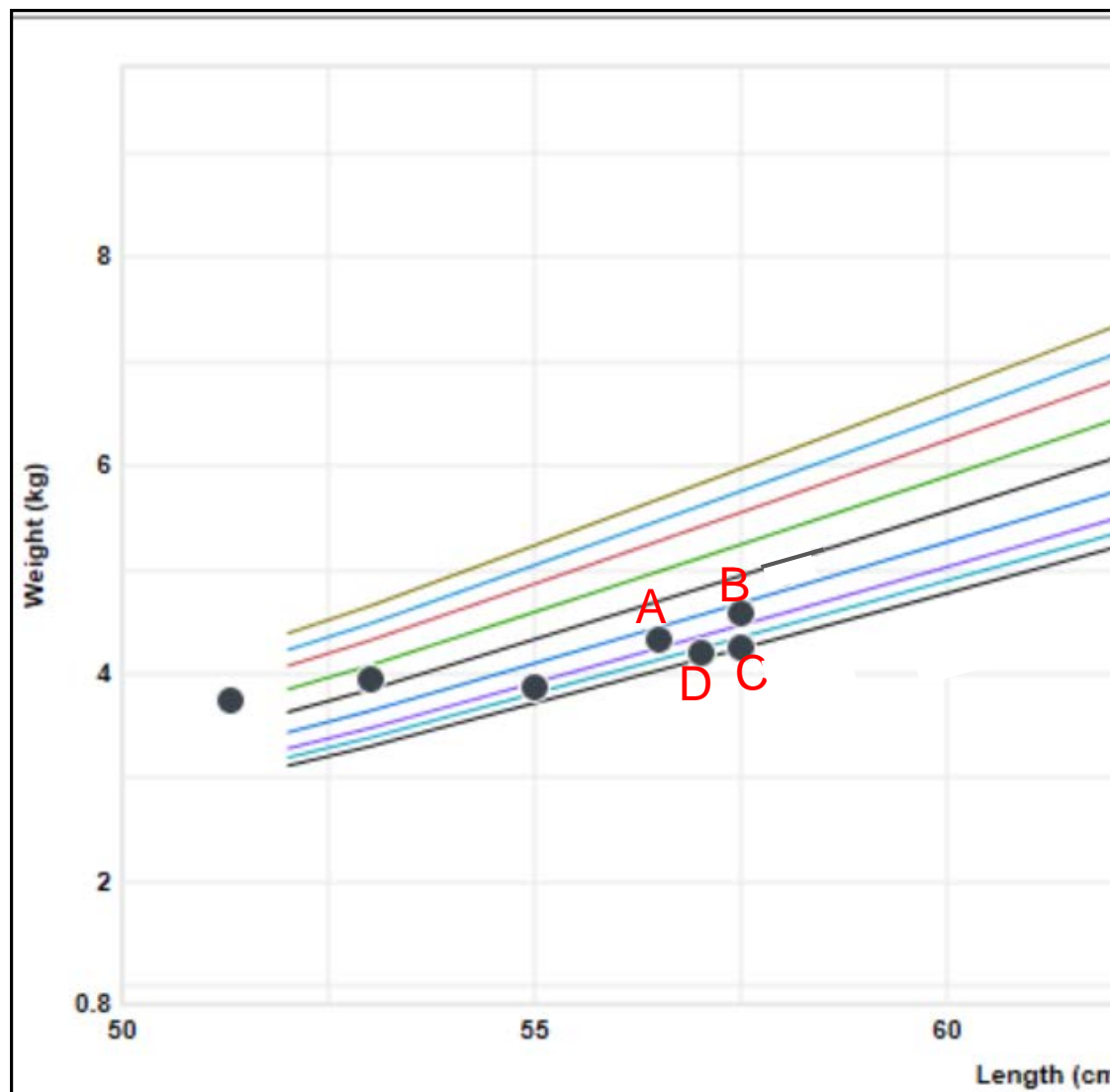
Mayo Clinic Children's Center



Pre Quiz

4. Most recent wt-for-length is likely:

- a. A
- b. B
- c. C
- d. Cannot be determined
- e. D





Survival

- ✓ Air
- ✓ Water
- ✓ Food
- ✓ Shelter





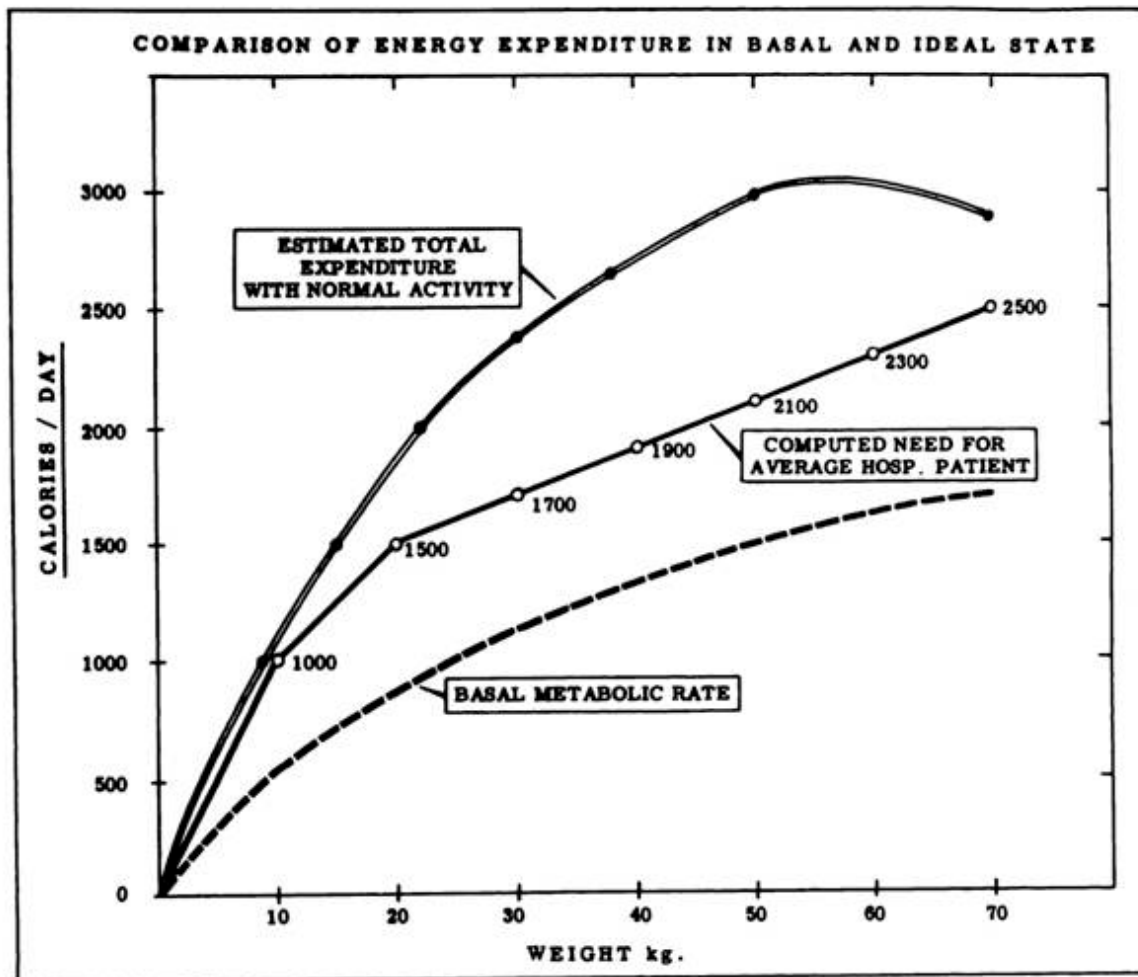
Thriving

- ✓ Air
- ✓ **Water**
- ✓ **Food**
- ✓ Shelter



Optimizing Nutrition

Fluids



Holliday MA and Segar WE. p. 823-8232, Pediatrics 1957

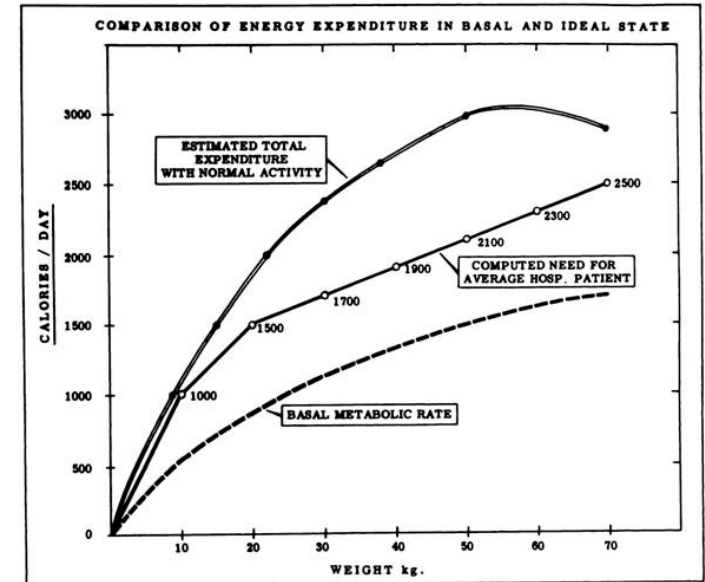
Mayo Clinic Children's Center

Water Requirements

824

HOLLIDAY – WATER IN PARENTERAL FLUID THERAPY

Weight	mL/kg/h	mL/hr	mL/kg/day	mL/day Total
1-10 kg	4 mL/kg	Up to 40ml/h	100 ml/kg	Up to 1000 mL
10-20kg	2 mL/kg	Up to 20ml/h	50 mL/kg	Up to 1500 mL
> 20kg	1 mL/kg		20 mL/kg	



Holliday MA and Segar WE. p. 823-8232, Pediatrics 1957

Mayo Clinic Children's Center



1. How much "water" per DAY is needed for ...

Weight	mL/kg/h	mL/hr	mL/kg/day	mL/day Total
1-10 kg	4 mL/kg	Up to 40ml/h	100 mL/kg	Up to 1000 mL
10-20kg	2 mL/kg	Up to 20ml/h	50 mL/kg	Up to 1500 mL
> 20kg	1 mL/kg		20 mL/kg	

a. 10 kg child? $10 \text{ kg} \times 100 \text{ mL/kg} = \boxed{} \text{ mL}$

b. 20 kg child? $1000 \text{ mL} + (10 \times 50 \text{ mL/kg}) = \boxed{} \text{ mL}$





2. How much water per DAY is needed for ...

a. 5 kg baby (total)? mL

b. 15 kg toddler? $1000\text{mL} + (5 \times 50\text{mL}) =$ mL

c. 30 kg child? $1500\text{ mL} + (10 \times 20\text{mL}) =$ mL

d. 50 kg adolescent? $1500\text{mL} + (30 \times 20\text{mL}) =$ mL





Fluids

- 0-6mo Breast Milk

How Much Juice Should Children Drink? The ...

DAILY JUICE RECOMMENDATIONS

Age:	Recommendation:
Under age 1	No juice
1 to 3 years	Up to ½ cup per day (4 oz)
4 to 6 years	Up to ¾ cup per day (6 oz)
7 to 18 years	Up to 1 cup per day (8 oz)





Fluids



- 0-6mo Breast Milk

Age	AAP Recommended juice intake
Under 1 y	none
1-3 y	none – 4oz
4-6 y	none – 6oz
7-18y	none – 8oz





Water ↔ Fluids ↔ Calories

- Breast Milk
- Formulas



Formula Tip

0-12 months

- Infant Formula (standard) & Breast Milk
 - 20 calories per ounce (1 ounce=30 mL)
 - 20 calories per 30 mL
 - 0.67 calories per 1 mL

1-12 years old

- Standard (1.0) Pediatric Formulas
 - 30 calories per ounce (1 ounce=30 mL)
 - 30 calories per 30mL
 - 1.0 calorie per 1 mL





Formula Tip

0-12 months

- Infant Formula (standard) & Breast Milk
 - 20 calories per ounce (1 ounce=30 mL)
 - 20 calories per 30 mL
 - 0.67 calories per 1 mL

1-12 years old

- Standard (1.0) Pediatric Formulas
 - 30 calories per ounce (1 ounce=30 mL)
 - 30 calories per 30mL
 - 1.0 calorie per 1 mL



Formula Calories Tip

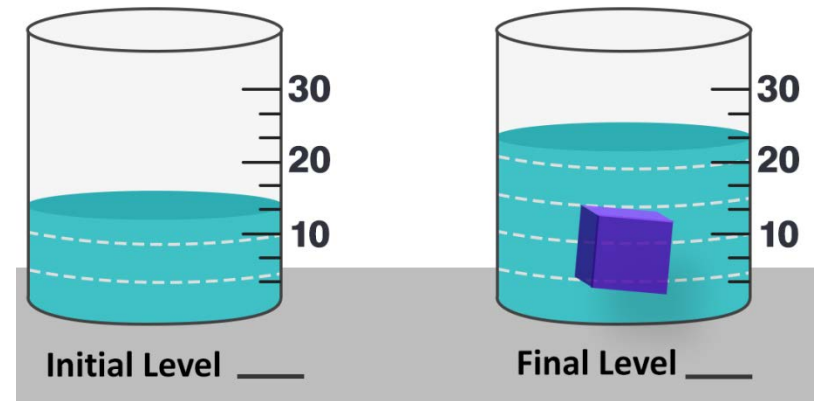
1-12 years old

- Standard (1.0) Pediatric Formulas
 - 30 calories per ounce
 - 30 calories per 30mL
 - 1.0 calorie per 1 mL
- 1.5 Pediatric Formula
 - 45 calories per ounce
 - 45 calories per 30mL
 - 1.5 calories per 1 mL
- 2.0 Pediatric Formula
 - 2.0 calories per 1 mL
 - 60 calories per ounce or per 30mL



Displacement & Free Water

- Commercial Formulas
 - Not 100% free water
- Breast Milk (20 kcal/oz)
 - 87% free water
- Standard 1.0 Pediatric Formula (30kcal/oz)
 - ~85% free water
- Standard 1.5 Pediatric Formula (45kcal/oz)
 - ~75% free water





Case 1

- 2.5yo, Neurologically impaired, wheel-chair/stroller bound
 - Due to spitting up easily, the patient is on:
 - GT: Formula (1.5) @ 20mL/hr x 24 hr
 - Wt: 10kg
- a. What are this child's free water needs?
- b. How much free water is this child receiving daily?



Case 1-Answers

- 2.5yo, Neurologically impaired, wheel-chair/stroller bound
- Due to spitting up easily, the patient is on:
 - GT: Formula (1.5) @ 20mL/hr x 24 hr
- Wt: 10kg

a. What are this child's free water needs?

$$10\text{kg} \times 100 = 1000\text{mL}$$

b. How much free water is this child getting?

$$20\text{mL/hr} \times 24 \text{ hr} = 480\text{mL of formula.}$$

$$75\% \text{ is free water} = 360\text{mL free water}$$



Calories



Mayo Clinic Children's Center





Calorie Estimation Equations

- Green Sheet

2. Calories-Enteral (Parenteral 10-15% less)
a.RDA*

Age	Kcal/kg	gm pro/kg
0-6 months	108	1.52 (AI)
7-12 months	98	1.2 (RDA)
1-3yo	102	1.05 (RDA)
4-6 yo	90	(4-8yo) 0.95 (RDA)
7-10 yo	70	(9-13yo) 0.95 (RDA)
Males		
11-14 yo	55	(14-18yo) 0.85 (RDA)
15-18 yo	45	
Females		
11-14 yo	47	(14-18yo) 0.85 (RDA)
15-18 yo	40	

- **RDA** (Recommended Dietary Allowance)

- the average daily level of intake sufficient to meet the nutrient requirement of nearly 97% of all HEALTHY people





Calories (using RDA—ok to round)

- a. Newborn needs now many calories/kg? ~ kcal/kg
- b. 12yo MALE needs how many calories/kg? kcal/kg
- c. 16yo FEMALE need how many calories/kg? kcal/kg

- d. 3 kg, 2mo needs how many calories/day? kcal/day
- e. 6 kg 3mo needs how many calories/day? kcal/day





Calorie Estimation Equations

- **WHO Equation** (World Health Organization) Equation
 - **REE** = Resting Energy Expenditure
 - Calories used in 24 hours, when body is in a complete restful state
 - —essentially asleep, without movement, activity, not eating, digesting, walking, talking, and not fighting off infection, not healing any wounds
 - REE x Stress Factor or Activity Factor
 - REE x 1.3-1.5 = CALORIES for a typical kid in school who goes outside for recess



Calorie Equations (Many)

- Estimate the number of calories a child needs
- To maintain growth (weight and height) percentiles at the current percentile

- Catch up growth or increased needs
 - Maximum calorie recommendation: 150 kcal/kg
 - Maximum stress factor x 3.5 for a short period of time

Prematurity



Correct for Prematurity: Everything (wt, ht, HC, formula) except imms, until 24 mo of age; if SGA or IUGR consider correcting until 3yo.

BMI-Pediatrics

Underweight = < 5th%ile

Healthy weight = 5th%ile to < 85th%ile

Overweight = 85th%ile to < 95th%ile

Obese = equal to or > 95th%ile

Adult

Underweight: BMI < 18.5

Normal weight: BMI 18.5 – 24.9

Overweight: BMI 25 – 29.9

Obese: BMI > 30

Weight and length gain recommendations...for HEALTHY children

	Weight (g/day)	Length (cm/mo)
< 3 mo	25-35	2.6-3.5
3-6 mo	15-21	1.6-2.5
6-12 mo	10-13	1.2-1.7
1-3 yo	4-10	0.7-1.1
4-6 yo	5-8	0.5-0.8
7-10 yo	5-12	0.4-0.6

Adopted from Fomon SJ, Haschke F, et al.: Body Composition of reference children from birth to age 10 years. Am J Clin Nutr 1982;35:1169.

Mayo Clinic Children's Center



Prematurity

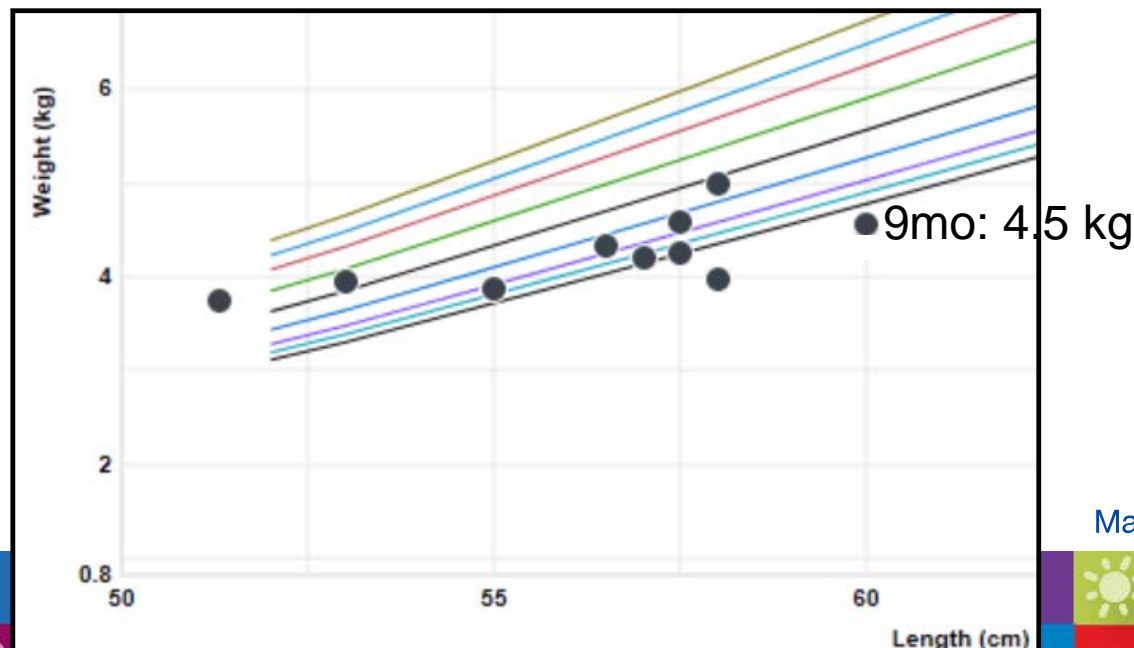
- Correct for prematurity in all aspects
 - Except vaccines (immunizations)
- If child is IUGR or SGA, correct growth until child reaches 36 months chronological age
- If AGA, correct growth until child reaches 24 months chronological age





Calories for Malnourished Child (or FTT)

- Consider using Ideal Body Weight (IBW)
- 0-2yo
 - IBW : “weight” that would place wt-for-length at 50%ile



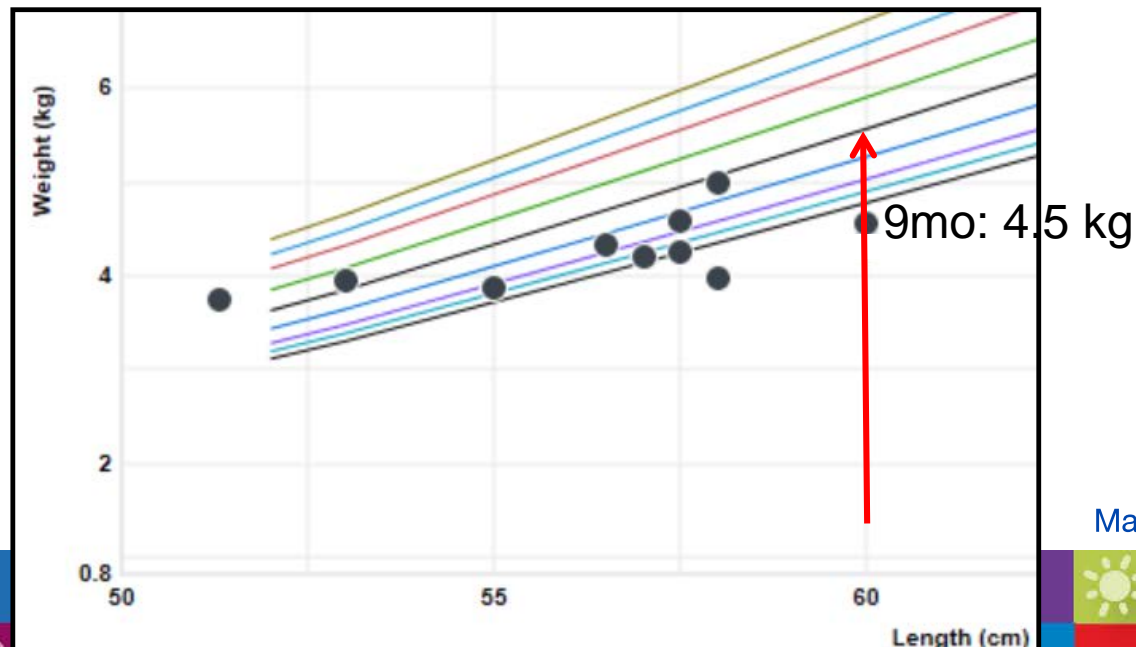
Mayo Clinic Children's Center





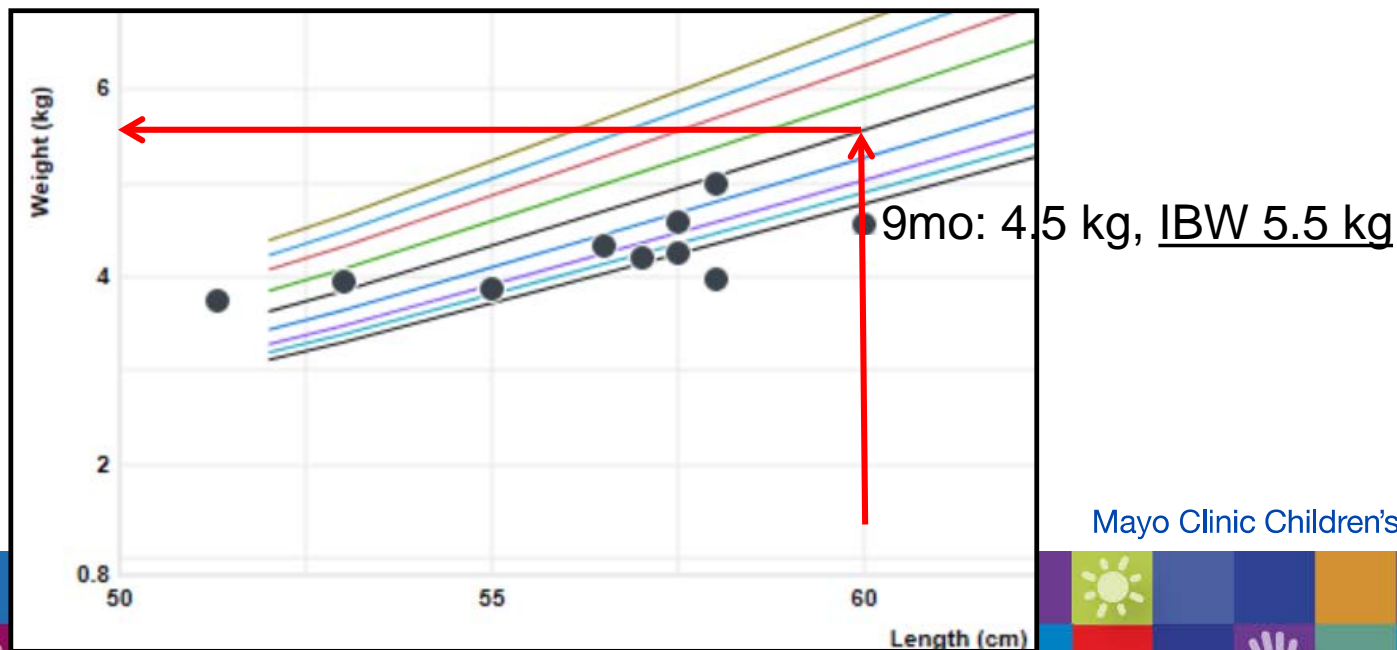
Calories for Malnourished Child (or FTT)

- Consider using Ideal Body Weight (IBW)
- 0-2yo
 - IBW : “weight” that would place wt-for-length to be at 50%



Calories for Malnourished Child (or FTT)

- Consider using Ideal Body Weight (IBW)
- 0-2yo
 - IBW : “weight” that would place wt-for-length to be at 50%





Calories for Malnourished Child (or FTT)

- 9mo: 4.5 kg, IBW 5.5 kg
 - 4.5 kg x 98 = 441 kcal
 - = 22 oz (20 kcal/oz formula)

Using IBW

- 5.5 kg x 98 = **539 kcal**
- = 27 oz (20 kcal/oz formula)

- Or 22 oz (~25 kcal/oz formula)

2. Calories-Enteral (Parenteral 10-15% less) a. RDA* (DRI)

Age	Kcal/kg	gm pro/kg
0-6 months	108	1.52 (AI)
7-12 months	98	1.2 (RDA)
1-3yo	102	1.05 (RDA)
4-6 yo	90	(4-8yo) 0.95 (RDA)
7-10 yo	70	(9-13yo) 0.95 (RDA)
Males		
11-14 yo	55	(14-18yo) 0.85 (RDA)
15-18 yo	45	
Females		
11-14 yo	47	(14-18yo) 0.85 (RDA)
15-18 yo	40	





Definitions

Correct for Prematurity: Everything (wt, ht, HC, formula) except imms, until 24 mo of age; if SGA or IUGR consider correcting until 3yo.



BMI-Pediatrics

Underweight = < 5th%ile
Healthy weight = 5th%ile to < 85th%ile
Overweight = 85th%ile to < 95th%ile
Obese = equal to or > 95th%ile

Adult

Underweight: BMI < 18.5
Normal weight: BMI 18.5 – 24.9
Overweight: BMI 25 – 29.9
Obese: BMI > 30



Weight and length gain recommendations...for HEALTHY children

	Weight (g/day)	Length (cm/mo)
< 3 mo	25-35	2.6-3.5
3-6 mo	15-21	1.6-2.5
6-12 mo	10-13	1.2-1.7
1-3 yo	4-10	0.7-1.1
4-6 yo	5-8	0.5-0.8
7-10 yo	5-12	0.4-0.6

Adopted from Fomon SJ, Haschke F. et al.: Body Composition of reference children from birth to age 10 years. Am J Clin Nutr 1982;35:1169.

Mayo Clinic Children's Center





Growth & (wt)Gain





Growth & Gain: Steps to Assess

1. Assess All Growth Curves
2. Calculate weight gain (grams/day)
3. Physical exam – nutrition focused
4. Other measures if helpful:
 - a. *Mid-upper-arm-circumference (MUAC)
 - b. Knee-heel height (caliper)
 - c. Triceps skin fold

• Infants



Growth Curves (Standard)

- Premature Infants (<37 weeks GA)
 - Fenton 22-50 weeks GA
 - Olson 22-42 weeks GA
- 0-2yo (corrected)
 - WHO growth standards
- 2yo – 20yo
 - CDC growth curves





Growth Curves (Specific Populations)

- Down Syndrome
- Turner Syndrome
 - 2-20yo, Height only
- Noonan Syndrome
 - Height only
- Prader-Willi Syndrome--Non-Growth Hormone
- Achondroplasia
- Others




Growth Curves (Specific Populations)

- Cerebral Palsy or Neurologic Impairment
 - “Life Expectancy Growth Charts” 2yo – 20 yo

The screenshot shows a web browser window with the URL lifeexpectancy.org/articles/GrowthCharts.shtml. The page has a blue sidebar on the left with navigation links under three categories: **Life Expectancy** (Home, Articles, Calculator, Life Expectancies), **Researchers** (David Strauss, PhD, FASA; Robert Shavelle, PhD, FAACPDM; Jordan Brooks, PhD, MPH), and **Conditions** (Autism, Cerebral Palsy, Down Syndrome, Spinal Cord Injury, Traumatic Brain Injury, Hypoxic/Anoxic Brain Injury, Vegetative State, Medical Conditions). The main content area is titled **Growth Charts** and contains the following text:

We strongly advise use of the new and revised growth charts:

 Brooks J, Day SM, Shavelle RM, Strauss DJ (2011). Low weight, morbidity, and mortality in children with cerebral palsy: New clinical growth charts. *Pediatrics*, 128; e299; originally published online July 18, 2011 (DOI 10.1542/peds.2010-2801).

Below are the charts for height, weight, and BMI for boys and girls with cerebral palsy, stratified by GMFCS, with level 5 additionally divided into those requiring a feeding tube (TF) and those not (NT).

All Charts

Boys: [GMFCS 1](#) [GMFCS 2](#) [GMFCS 3](#) [GMFCS 4](#) [GMFCS 5 NT](#) [GMFCS 5 TF](#)

Girls: [GMFCS 1](#) [GMFCS 2](#) [GMFCS 3](#) [GMFCS 4](#) [GMFCS 5 NT](#) [GMFCS 5 TF](#)

The broad definitions of GMFCS (gross motor function classification system) levels 1 to 5 are:



CP and Gross Motor deficits

Boys: GMFCS 1 GMFCS 2 GMFCS 3 GMFCS 4 GMFCS 5 NT GMFCS 5 TF

Girls: GMFCS 1 GMFCS 2 GMFCS 3 GMFCS 4 GMFCS 5 NT GMFCS 5 TF

The broad definitions of GMFCS (gross motor function classification system) levels 1 to 5 are:

- I. Walks without limitations
- II. Walks with limitations
- III. Walks using a hand-held mobility device
- IV. Self-mobility with limitations, may use powered mobility
- V. Transported in a manual wheelchair

The study was based on the Expanded and Revised [definitions](#) for GMFCS, which contain age-specific criteria for each group.

Brooks 2011. Pediatrics, 128; e299

Mayo Clinic Children's Center



Describing growth trends

- “Your growth curve assessment is only as good as your anthropometric measurements”
- 0-3yo corrected
 - Head Circumference
- 0-2yo corrected
 - Weighed nude
 - Length board
- >2yo corrected
 - Clothing
 - Standing height

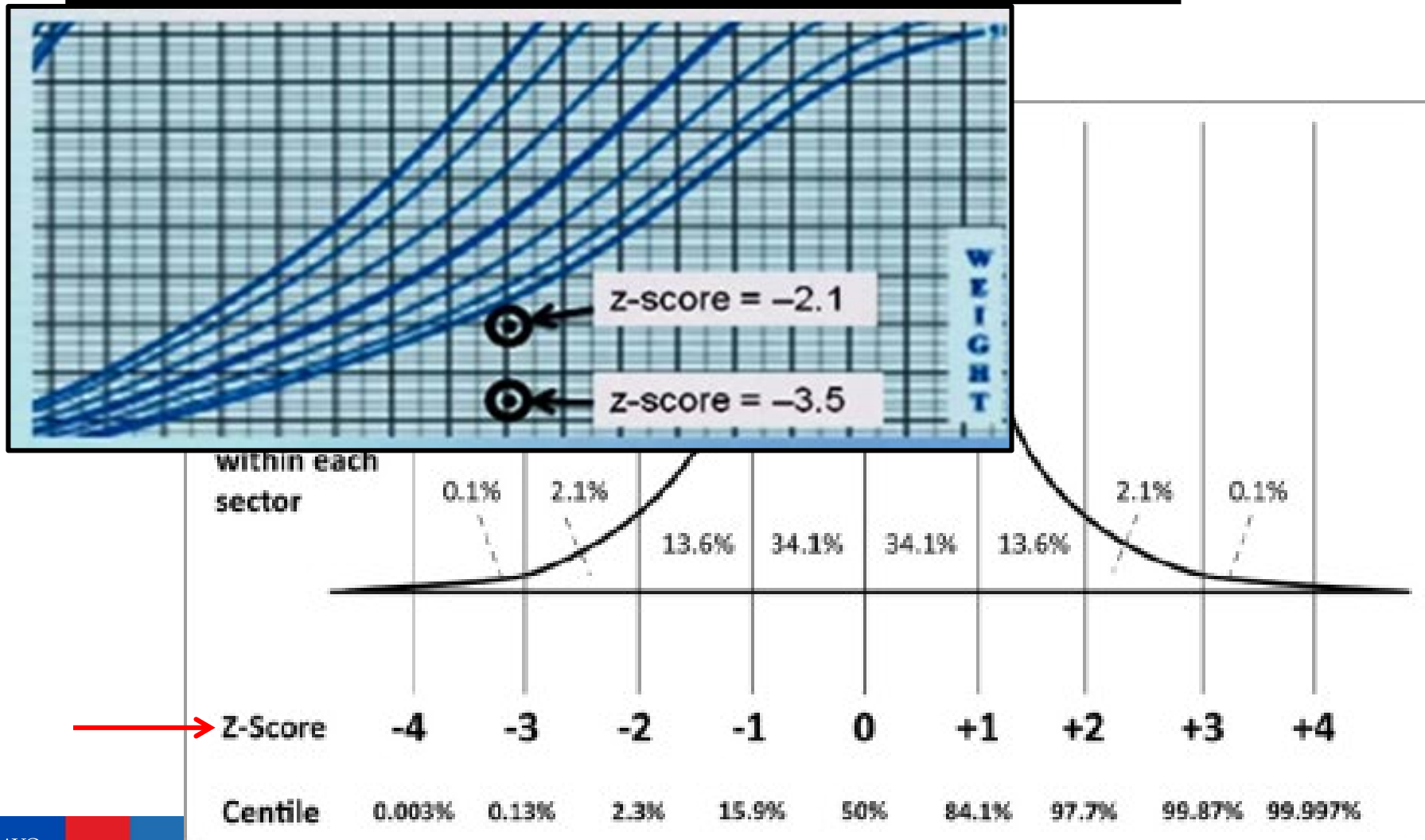




Describing Growth Trends 0-3yo (corrected)

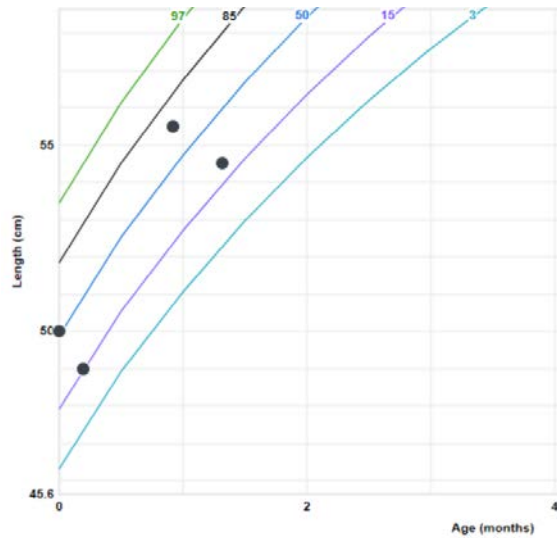
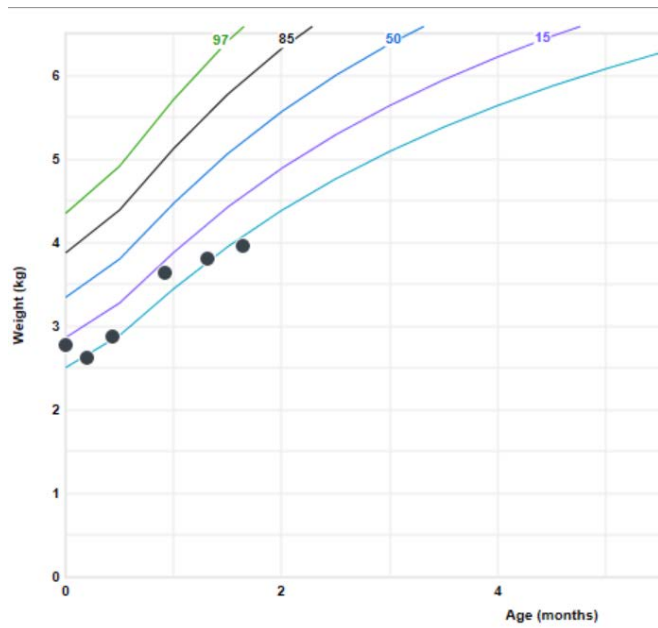
- **Birth—where did the patient begin?**
 - Birth Weight, % and/or Z-score
 - Birth Length, % and/or Z-score
 - Birth HC, % and/or Z-score
- SGA, BW <10%
- IUGR (symmetric) BW, BL, and BHC <10%

Z-Scores : Describing Growth Trends





Patient Example

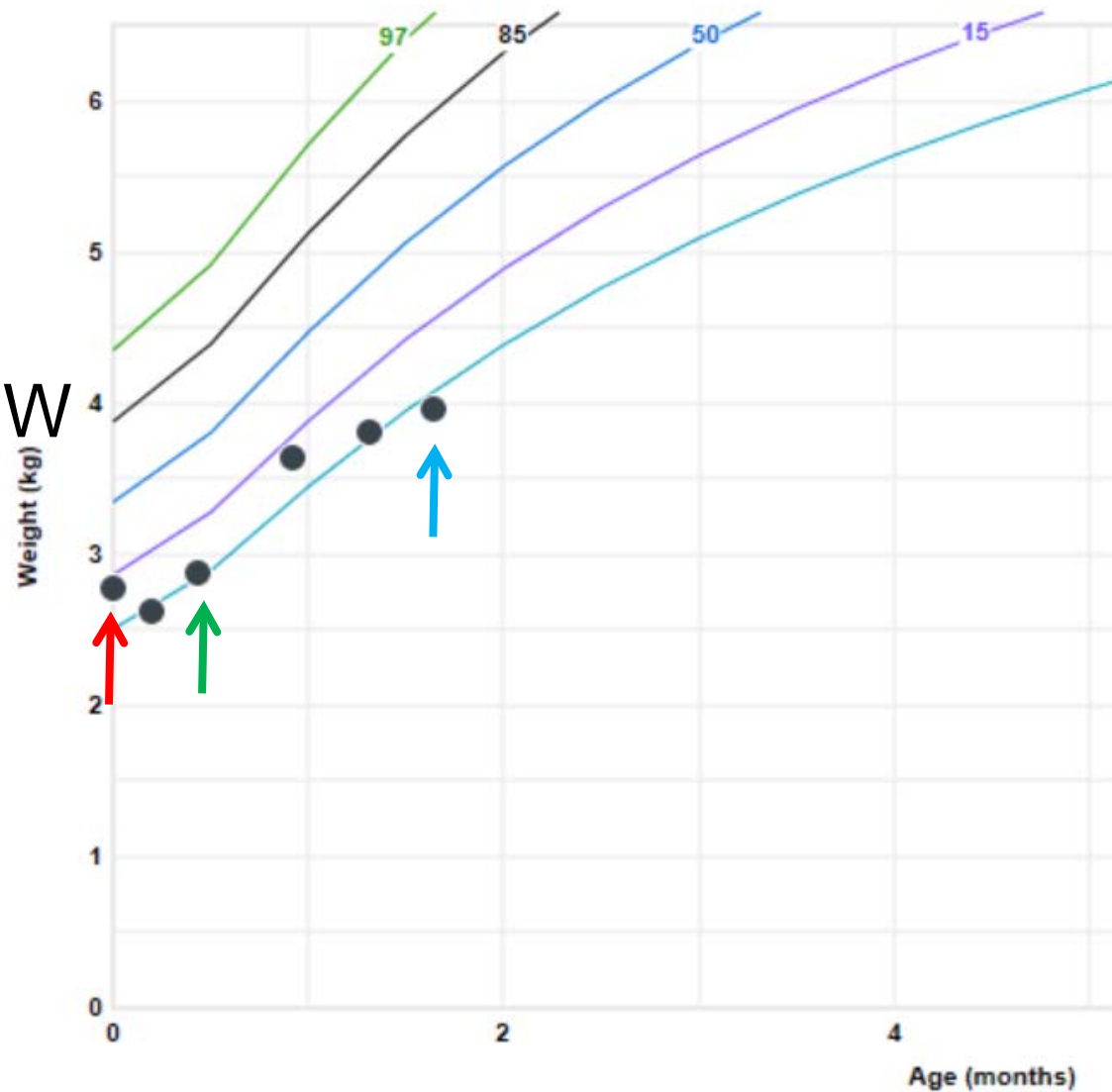




Weight Curve

- BW 11th%
- 2 weeks back to BW
- Seeing him today

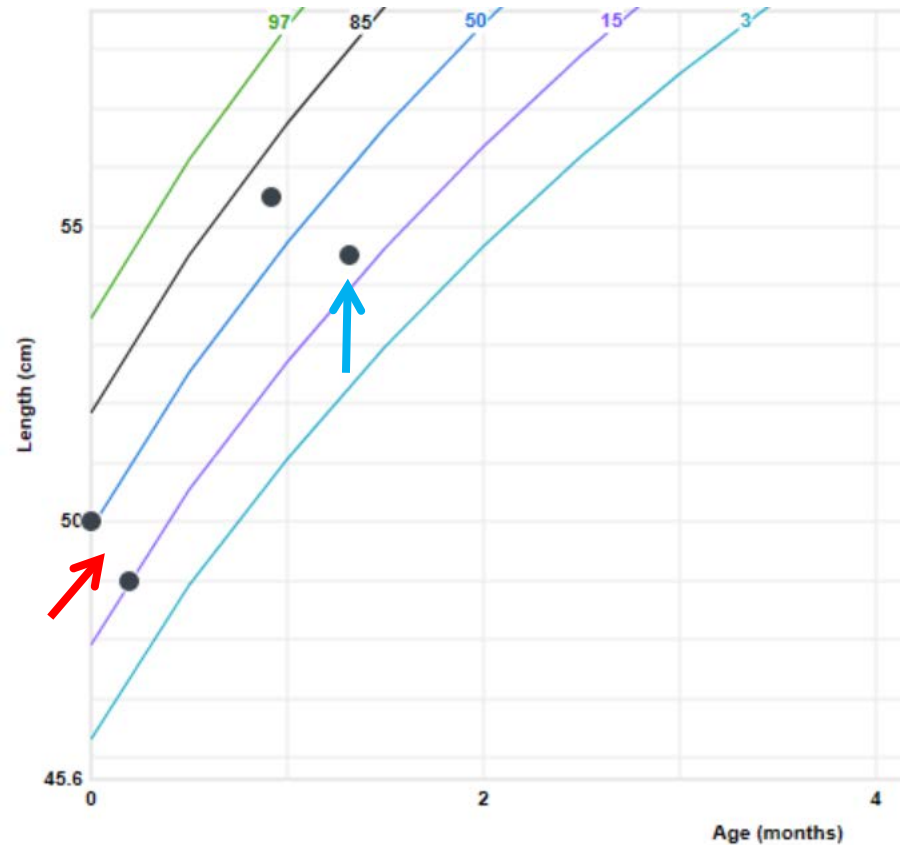
- Wt: 3% - 15%
- Concerned?





Length Curve

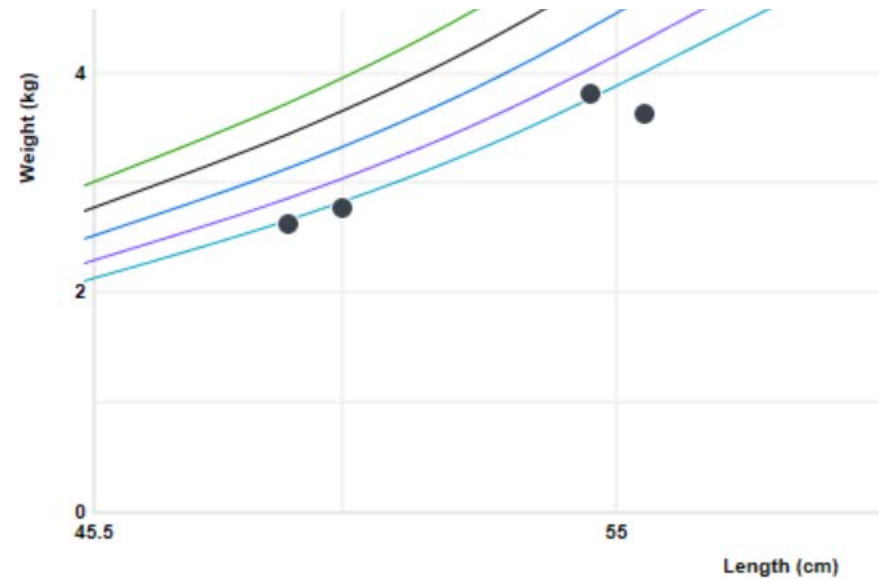
- Today's measure
 - Accurate
- BL and 2nd data point may have been “off”, as they were 1 week apart.
- 3rd data point-error
- Length: 15%-50%





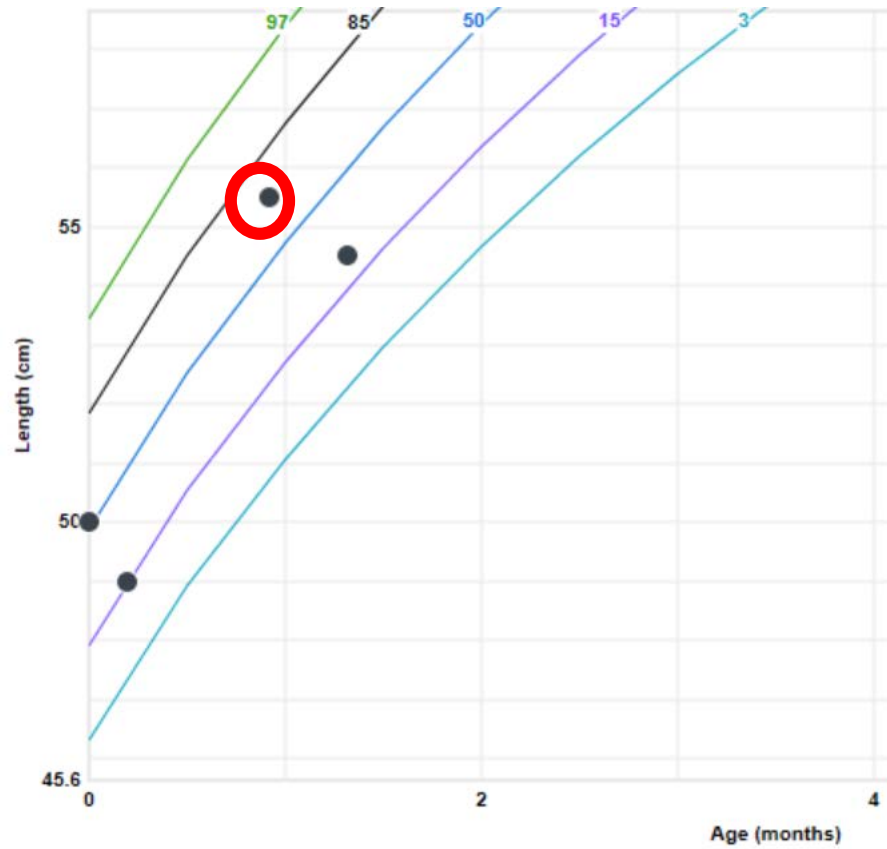
Weight-for-Length

- Which data point is for today?





Length Curve

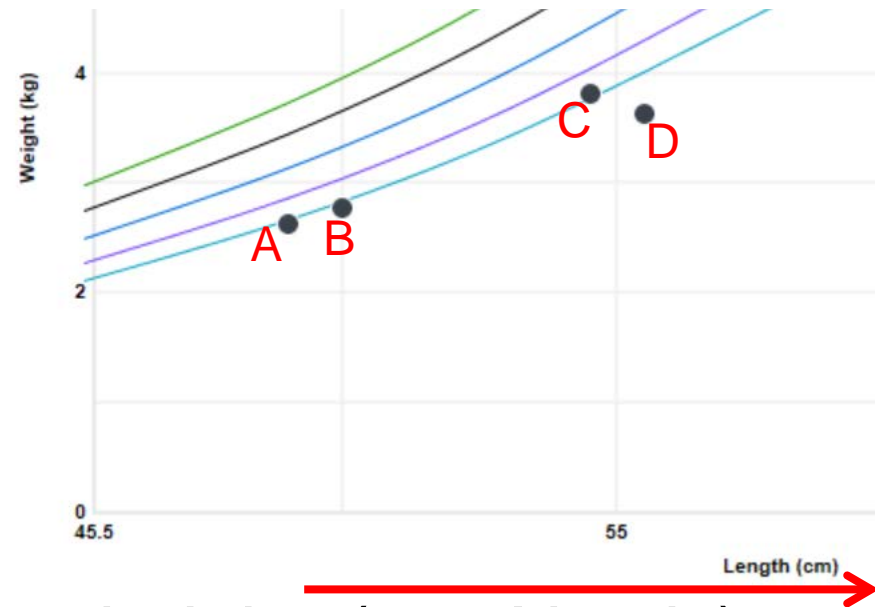




Weight-for-Length

POINTS...

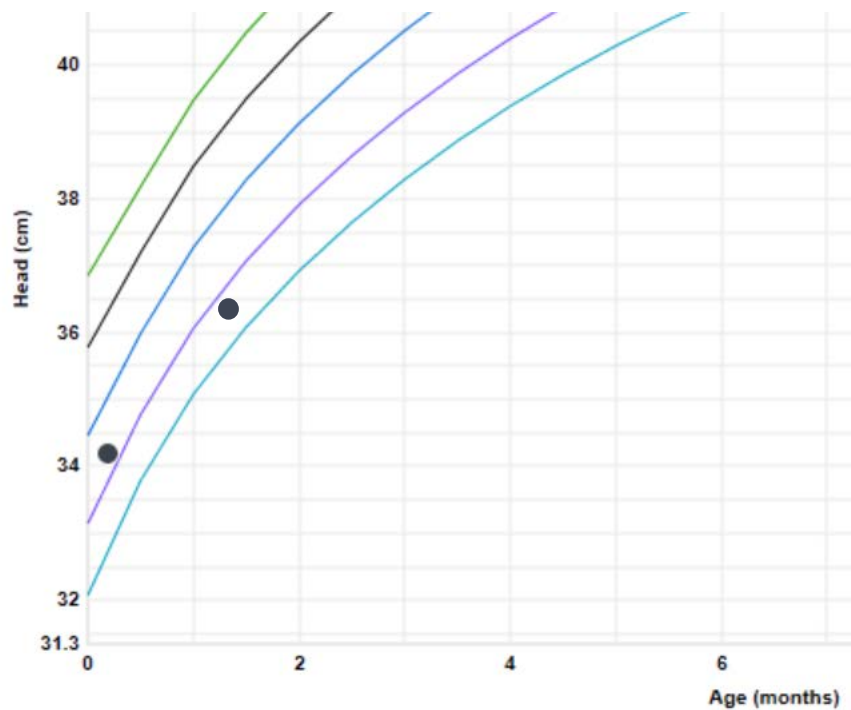
- A is Birth
- B is 2 weeks later
- C is Today!
 - All are about 3%
- D is probably an erroneous height (see X-axis)





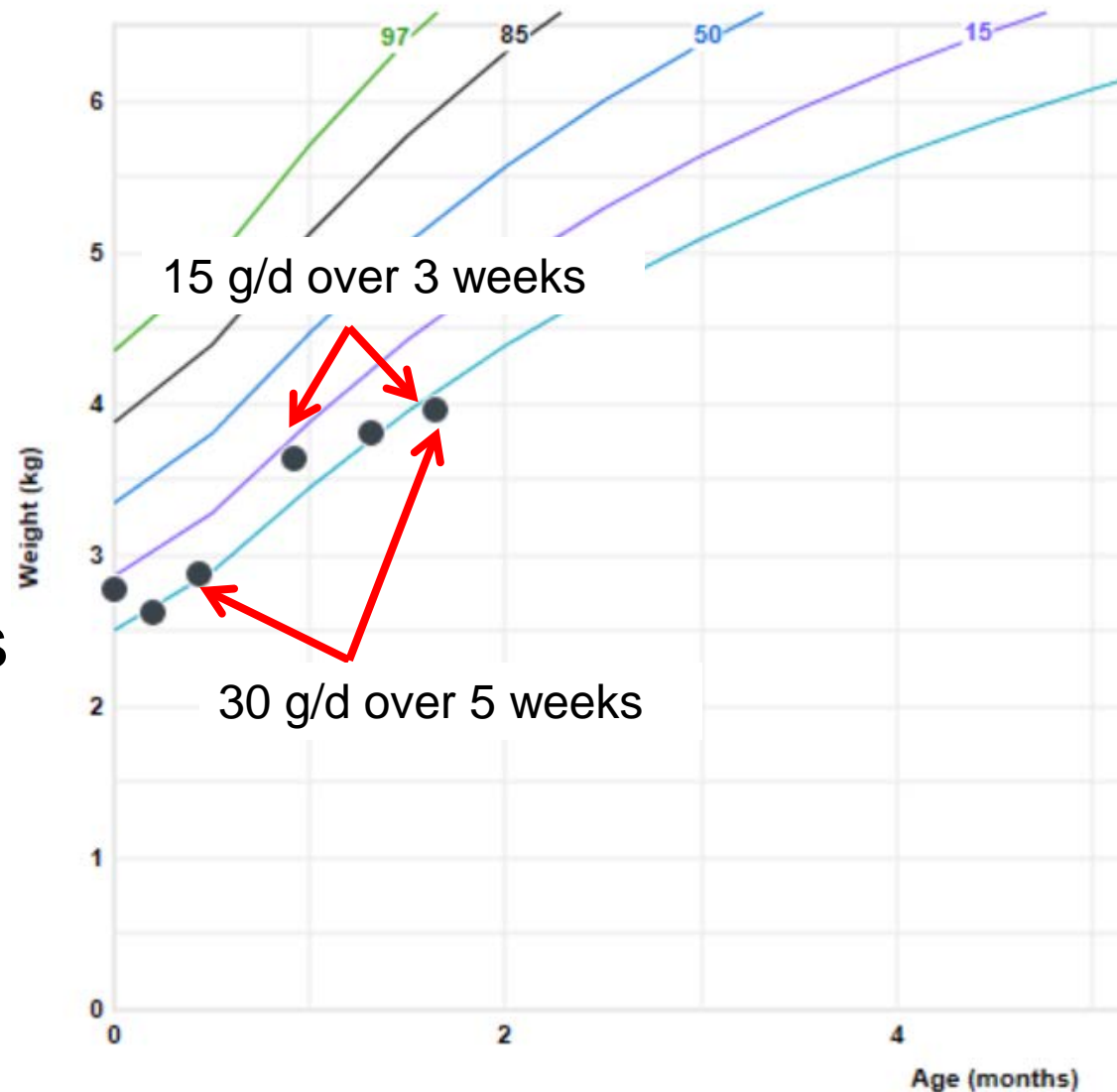
Head Circumference

- Hovering around 15%



Step 2

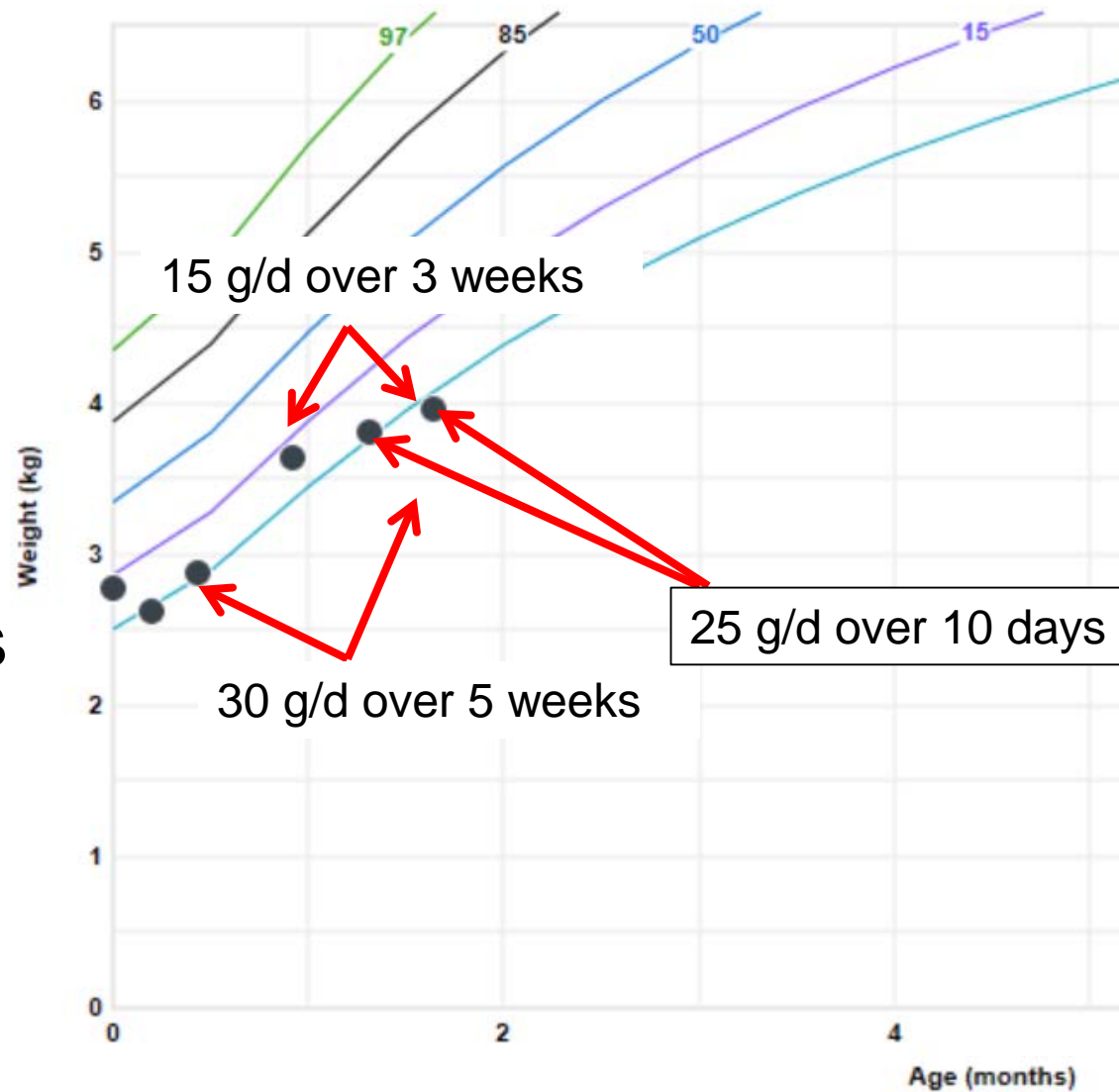
- Calculate wt gain
- 2 month old
- Consider
 - Different scales
 - Clothing





Step 2

- Calculate wt gain
- 2 month old
- Consider
 - Different scales
 - Clothing





Expected Growth & Gain

Correct for Prematurity: Everything (wt, ht, HC, formula) except imms, until 24 mo of age; if SGA or IUGR consider correcting until 3yo.

BMI-Pediatrics

Underweight = < 5thile

Healthy weight = 5thile to < 85thile

Overweight = 85thile to < 95thile

Obese = equal to or > 95thile

Adult

Underweight: BMI < 18.5

Normal weight: BMI 18.5 – 24.9

Overweight: BMI 25 – 29.9

Obese: BMI > 30



Weight and length gain recommendations...for HEALTHY children

	Weight (g/day)	Length (cm/mo)
< 3 mo	25-35	2.6-3.5
3-6 mo	15-21	1.6-2.5
6-12 mo	10-13	1.2-1.7
1-3 yo	4-10	0.7-1.1
4-6 yo	5-8	0.5-0.8
7-10 yo	5-12	0.4-0.6

Adopted from Fomon SJ, Haschke F. et al.: Body Composition of reference children from birth to age 10 years. Am J Clin Nutr 1982;35:1169.

Mayo Clinic Children's Center





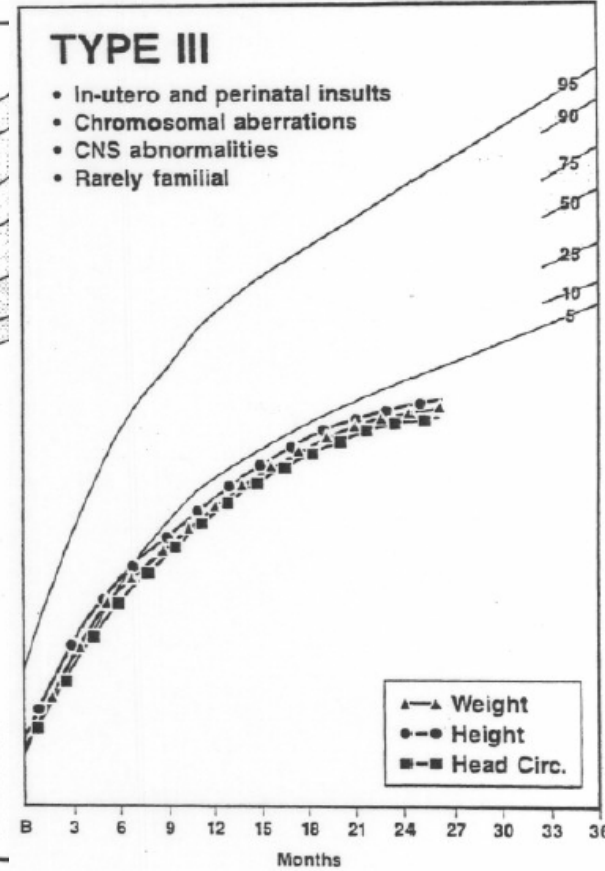
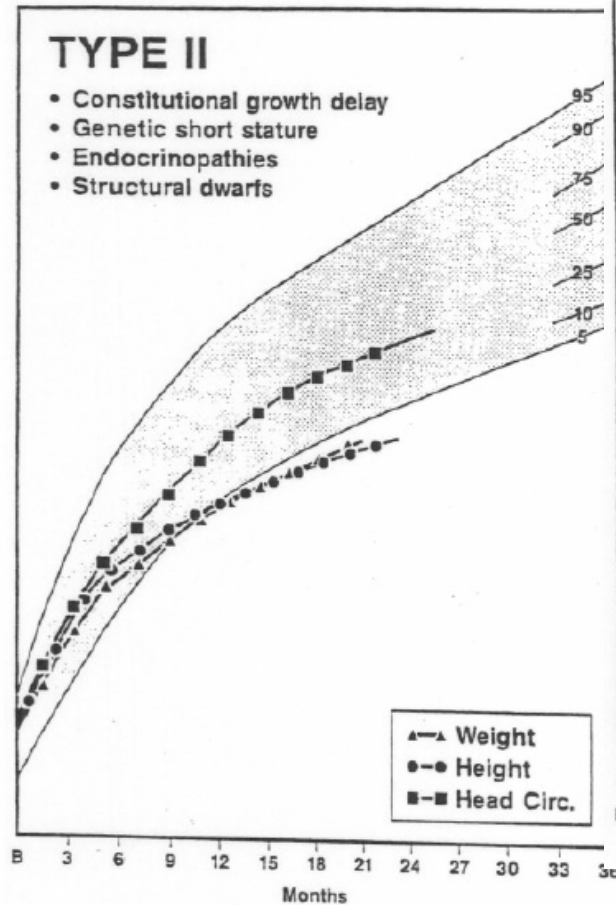
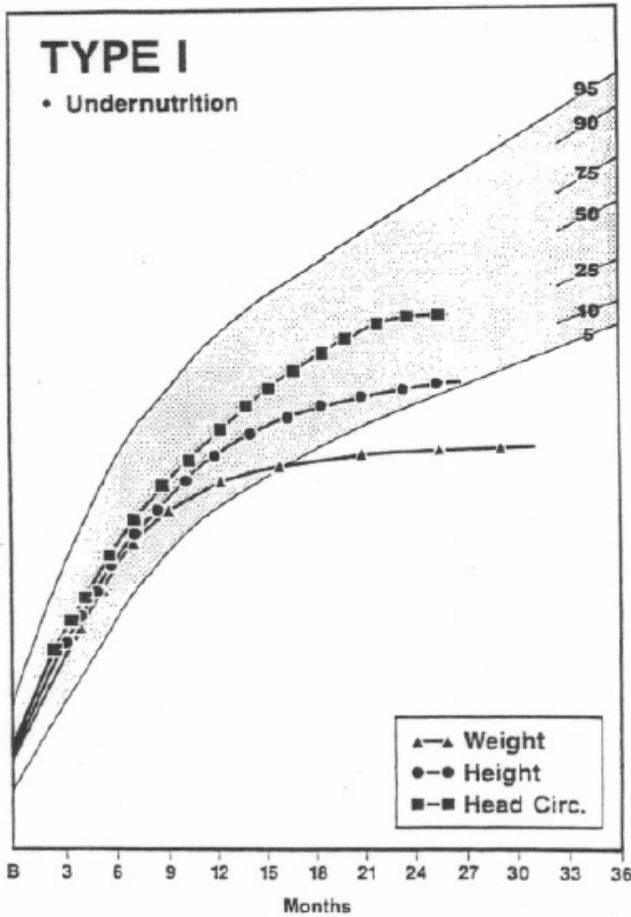
Step 3

- Physical Exam-Nutrition Focused





Infant Growth Curve Patterns



Mayo Clinic Children's Center



Infant Type 1 Curves

Majority of patients failing to thrive will reflect Type I pattern with undernutrition being the main underlying cause.

Undernutrition may result from:

- (1) caloric intake inadequate for patients' needs, the most common problem;
- (2) excessive caloric losses from GI abnormalities
- (3) impaired peripheral utilization
- 4) excessive peripheral utilization.

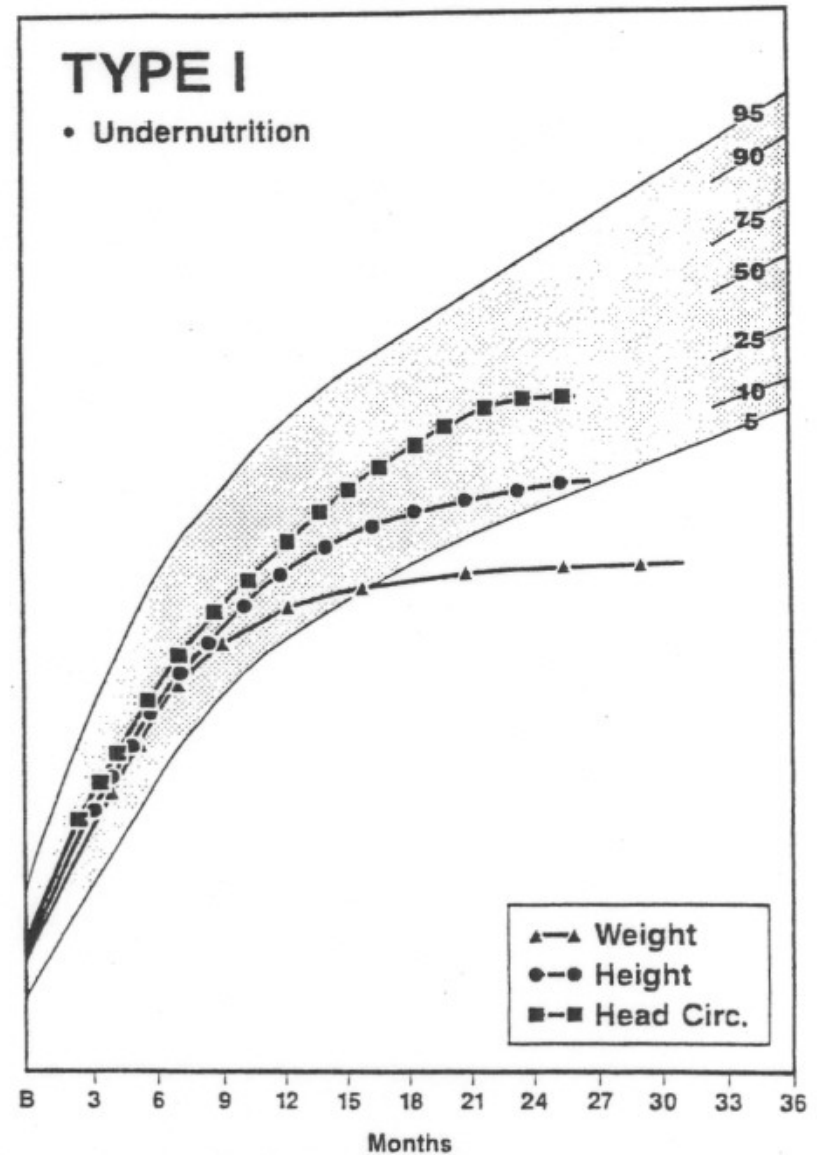


Fig. 1-1. Retardation of weight with near normal or slowly decelerating height and head growth.

Infant Type 2 Curves

Primarily represented by children with

1. Constitutionally delayed growth
2. Familial short stature
3. Endocrinopathy
4. Genetic abnormality

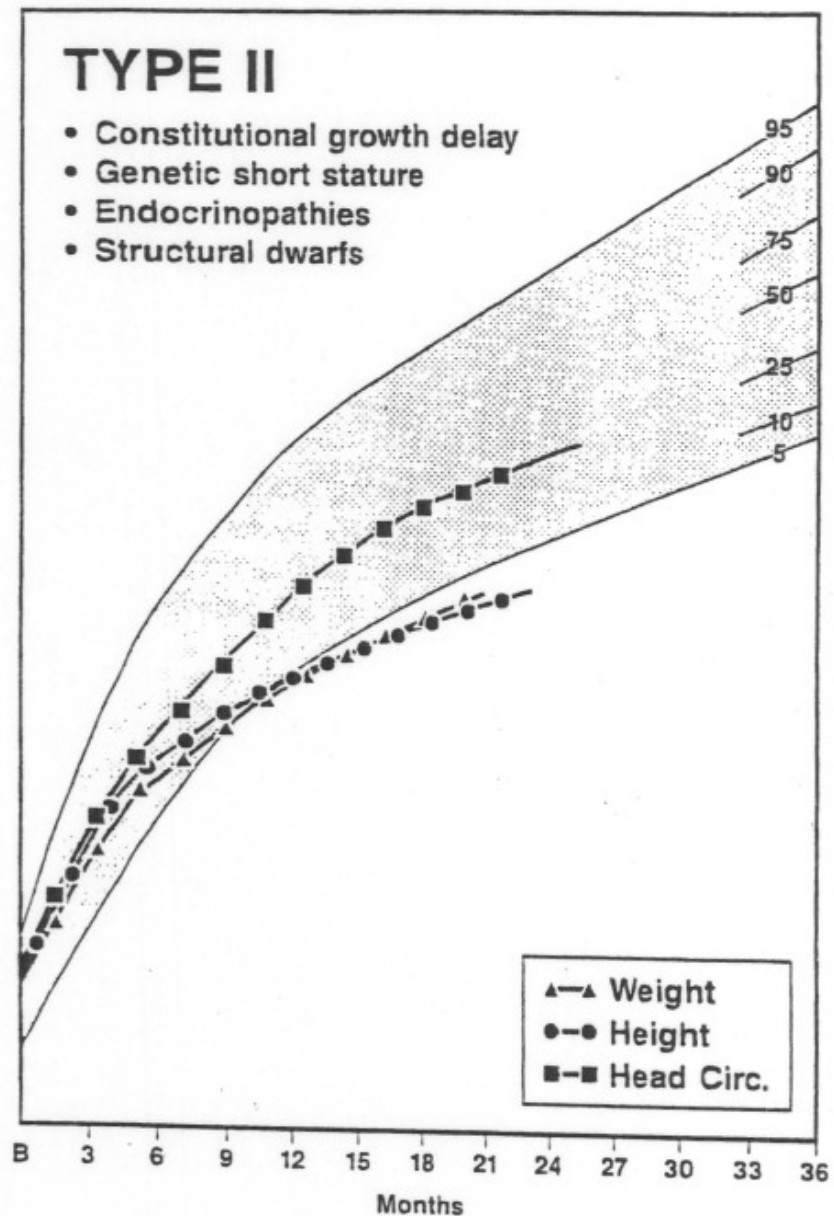


Fig. 1-3. Near proportional retardation of height and weight and normal head growth.

Infant Type 3 Curves

Includes fairly large group of children who “fail to thrive”

1. Genetic causes
2. In-utero and perinatal insults (stroke/hypoxic/ischemic insult)
3. Sometimes with:
 - microcephaly
 - developmental delays,
 - seizures as part of the complex

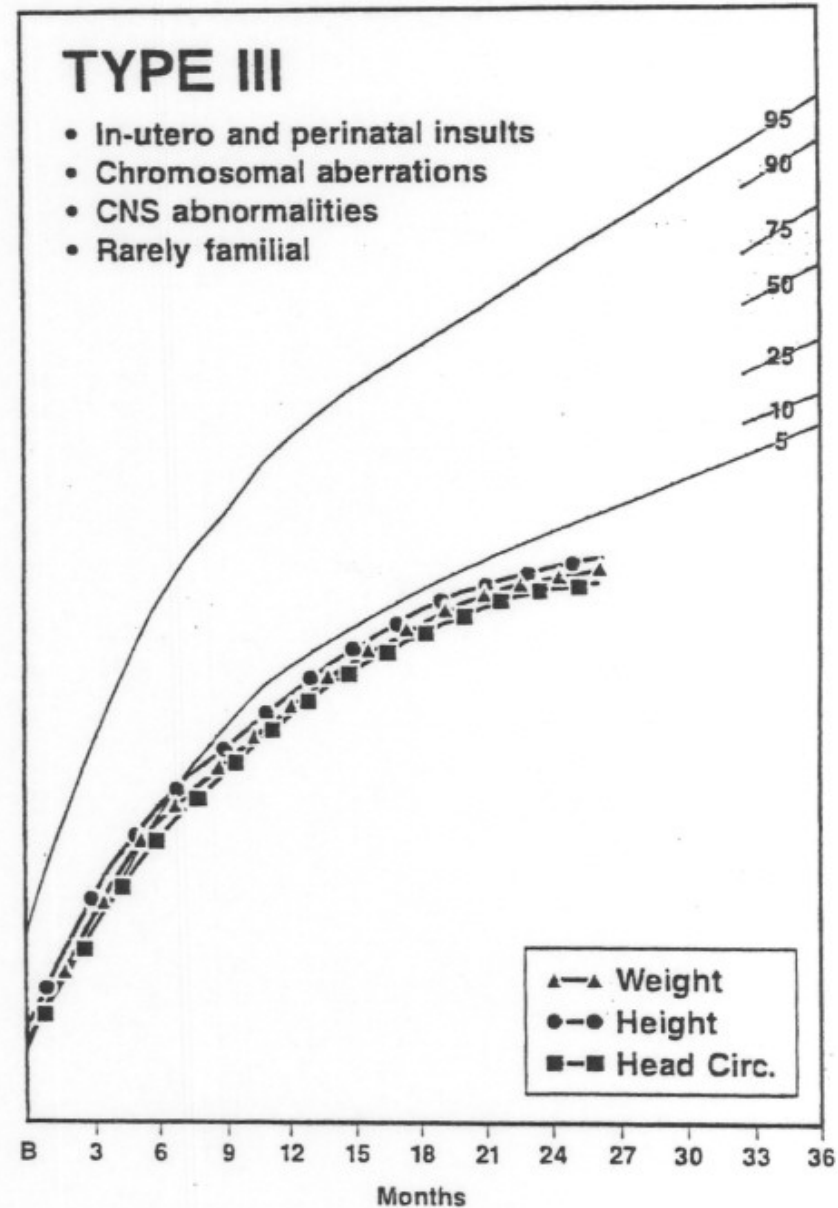
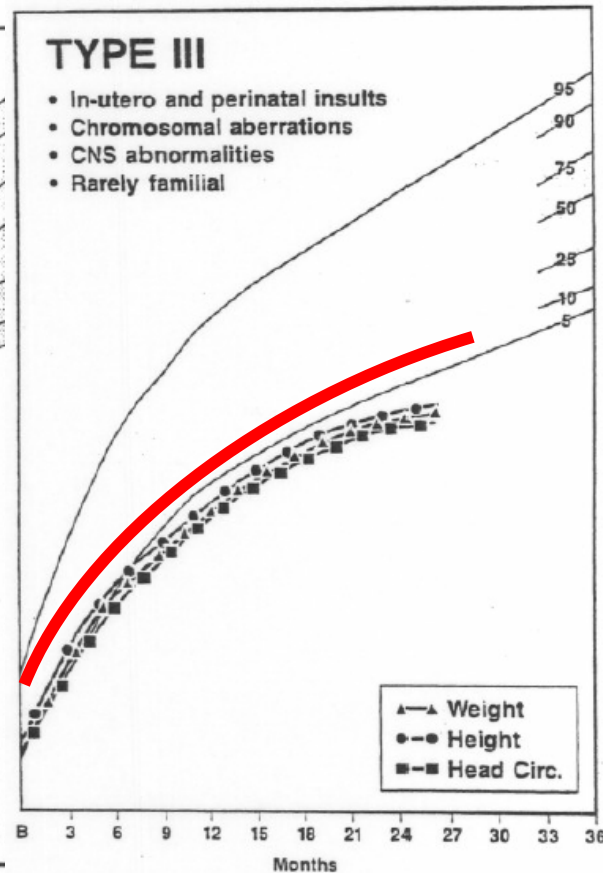
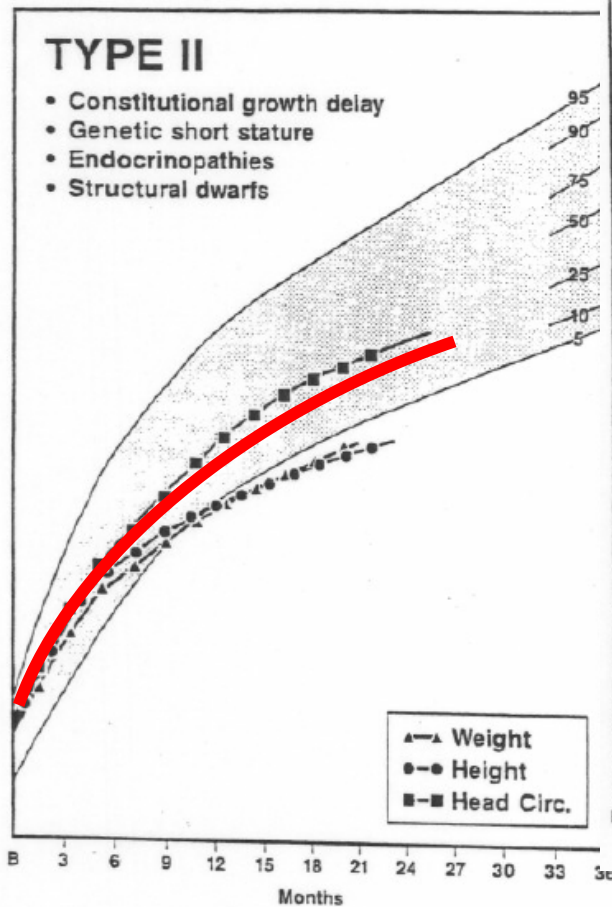
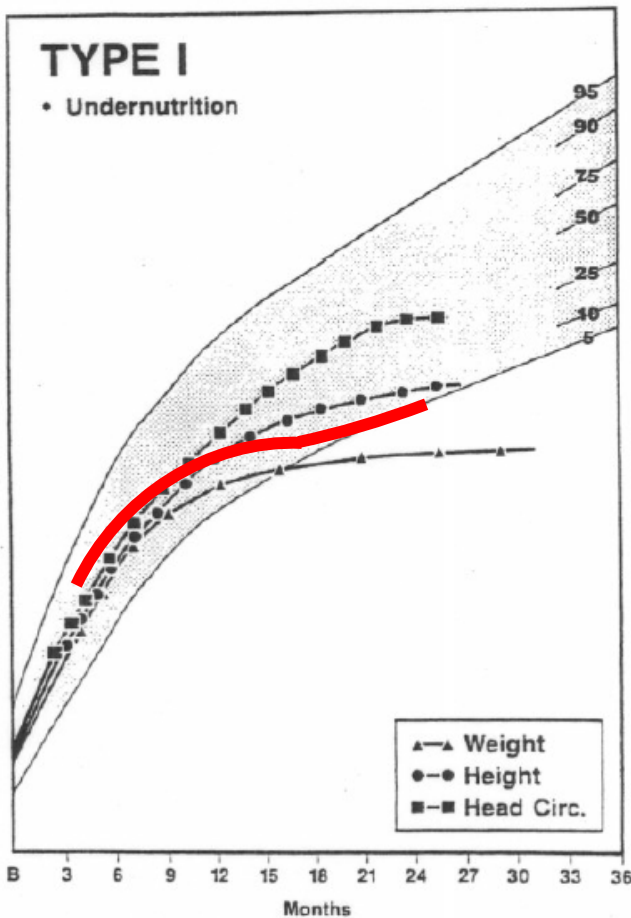


Fig. 1-4. Concomitant retardation of weight, height, and head growth.

Step 1. Review ALL the growth curves trends

< 2yo: Wt, L, HC, W-for-L

> 2yo: Wt, Ht, BMI



Mayo Clinic Children's Center

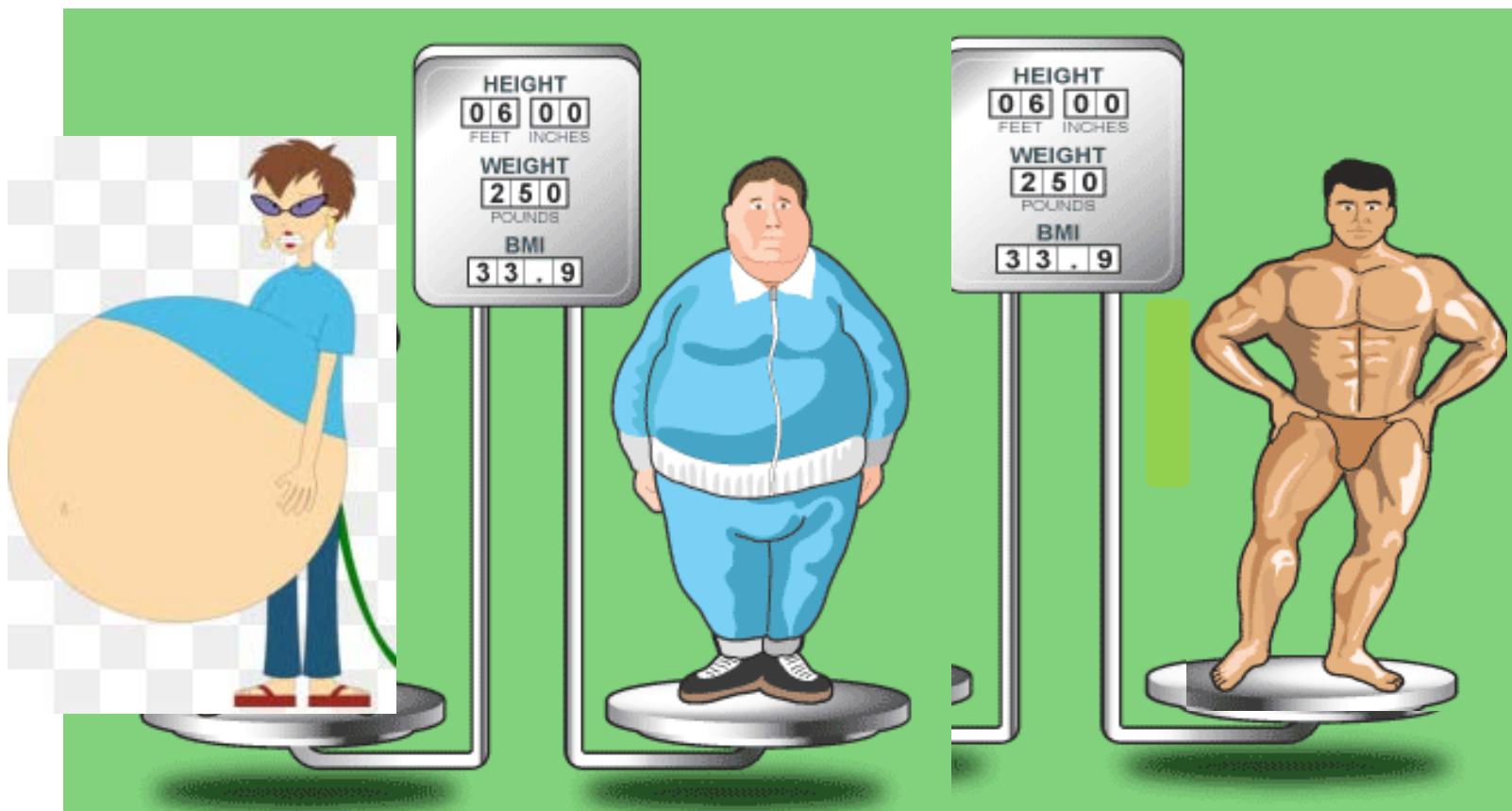
Growth Chart Interpretation

- Weight scales often vary in calibration
- Children < 2yo may not have been measured nude
 - Diapers and clothes add a lot of weight
- Include the history in interpretation when concerned

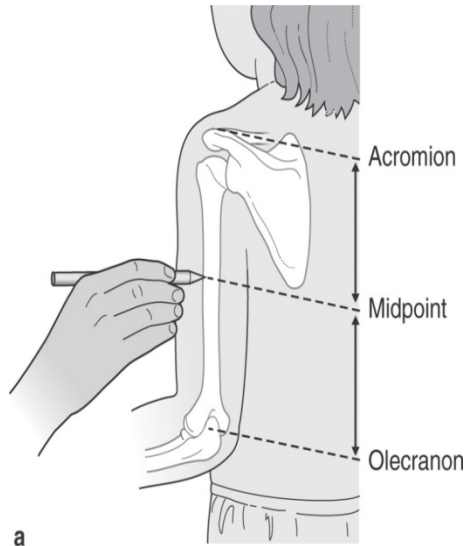
Other Anthropometrics

- Mean Upper Arm Circumference
- Triceps Skin Fold
- Height surrogates
 - Knee-Ht Caliper
 - Arm Span
 - Segmental Height

Physical Exam - Nutrition Focused

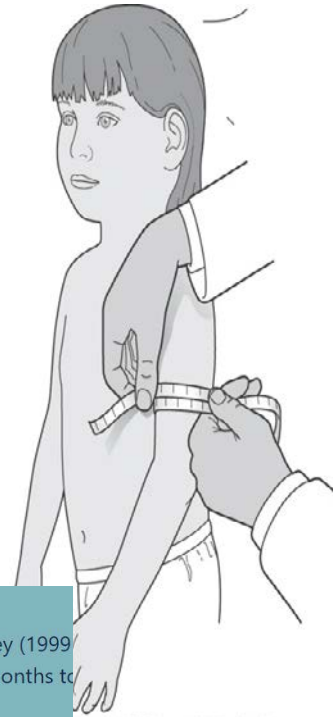


Mean Upper Arm Circumference (MUAC)

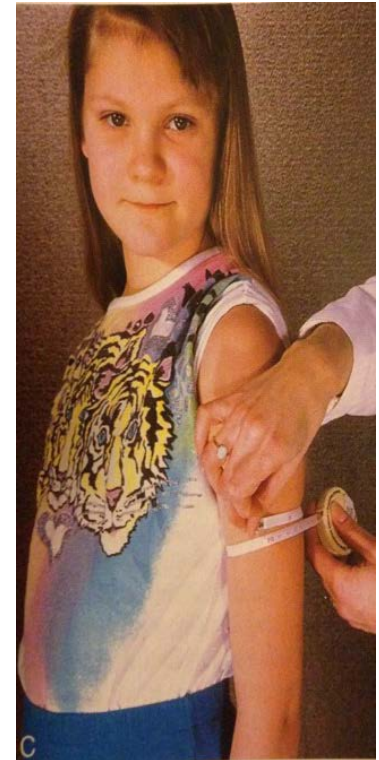


a

(Adapted from Jelliffe DS. The Assessment of the Nutritional Status of the Community. Geneva: World Health Organization; 1960. Monograph Series No. 53, with permission.)



(Adapted from Jelliffe DS. The Assessment of the Nutritional Status of the Community. Geneva: World Health Organization; 1960. Monograph Series No. 53, with permission.)



c



CDC mid-upper arm circumference

(2017) Uses data from the CDC National Health and Nutrition Examination Survey (1999) for mid-upper arm circumference percentiles and Z-scores on children from 2 months to 19 years of age.



WHO mid-upper arm circumference

(2017) Mid-upper arm circumference percentiles and Z-scores for children from 5 to 19 years of age, derived from the Health Examination Survey (HES) / NHANES US population dataset that accord with the WHO growth standards.

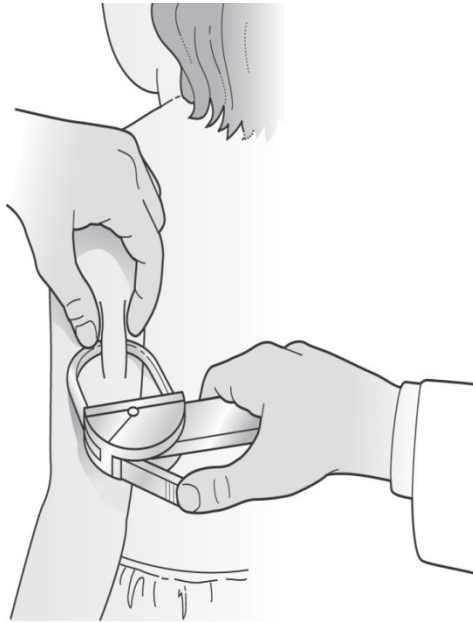
Mayo Clinic Children's Center

Triceps Skin Fold

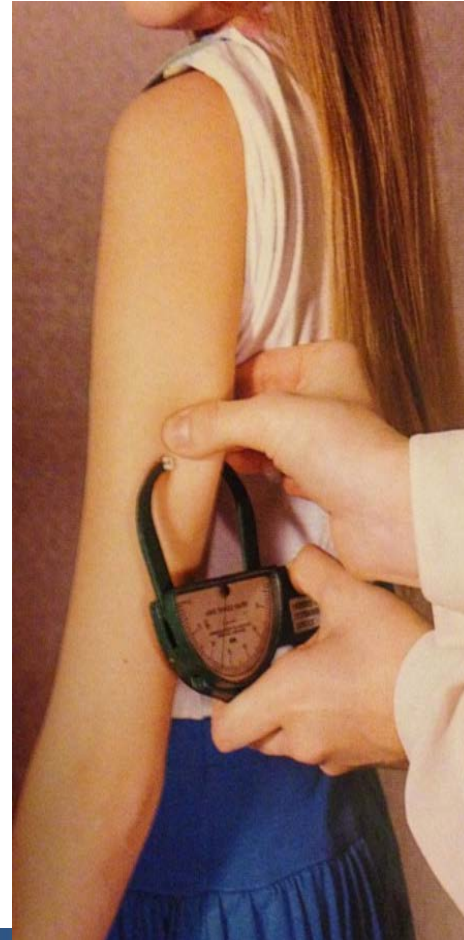


WHO arm circumference and triceps / subscapular skin fold

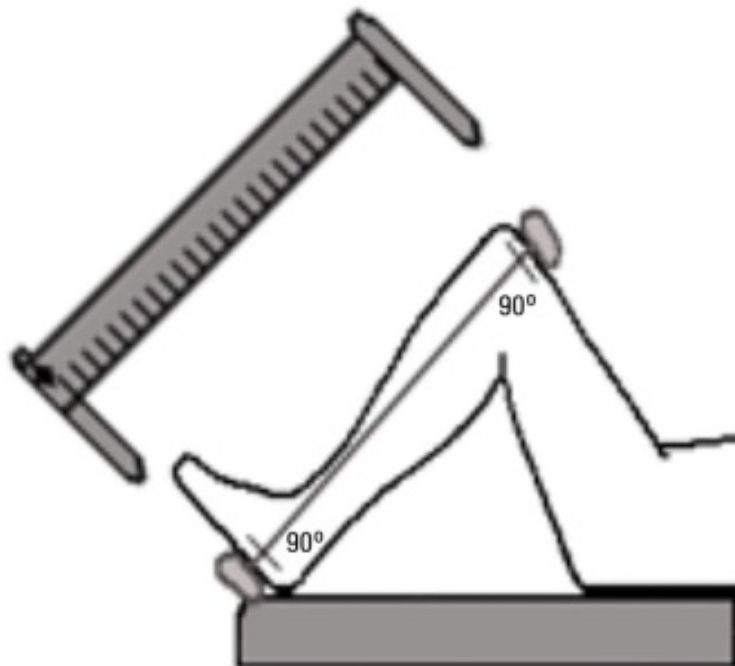
2007 WHO child growth standard to calculate arm circumference, triceps skin fold, and subscapular skin fold percentiles and Z-scores on children from 3 to 60 months of age.



(Adapted from Jelliffe CB. The Assessment of the Nutritional Status of the Community. Geneva: World Health Organization; 1968. Monograph Series No. 53, with permission.)

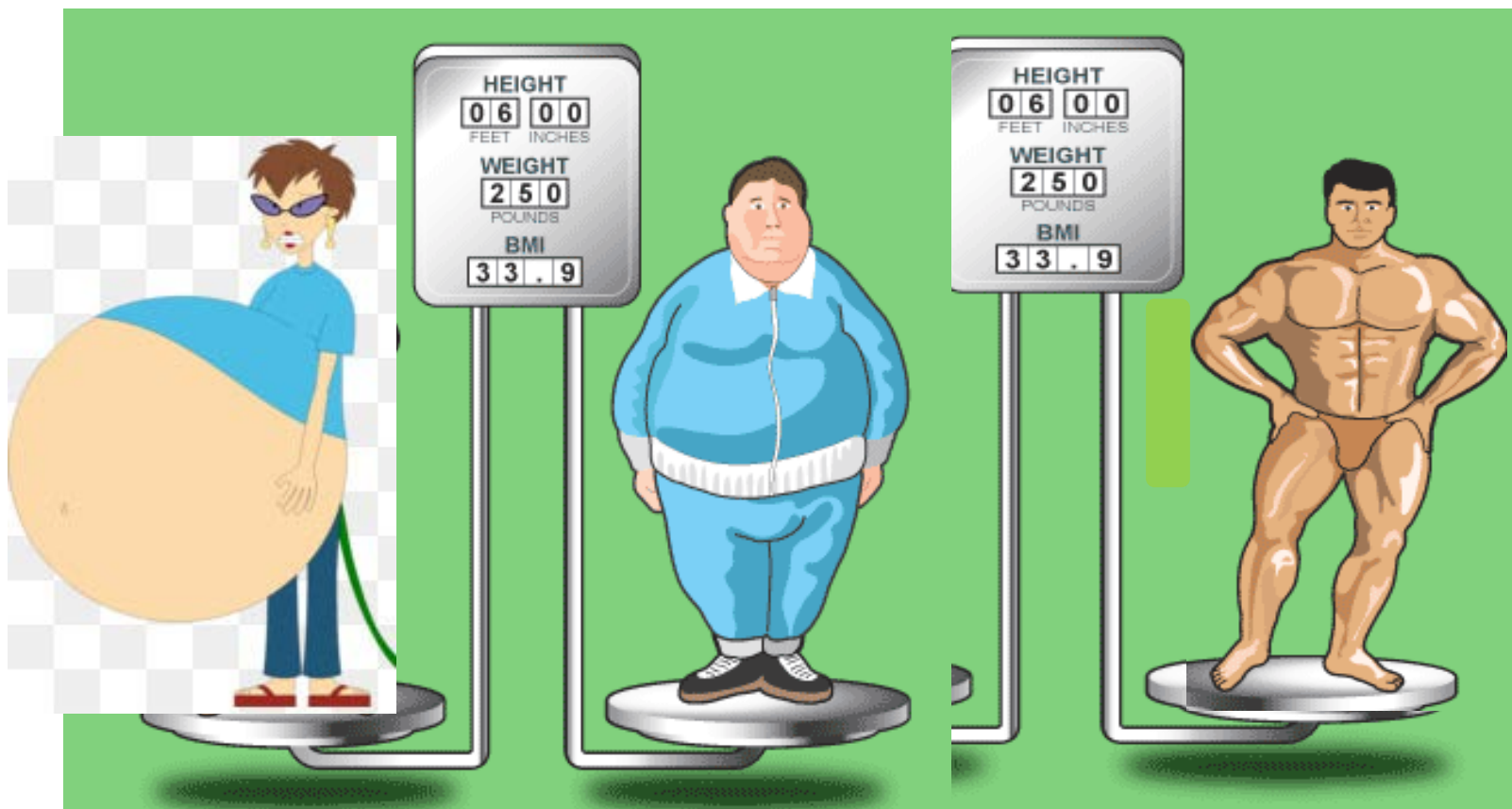


Knee-Height



Step 3 Physical Exam

Physical Exam - Nutrition Focused



Visualization

Infants' subcutaneous fat pads

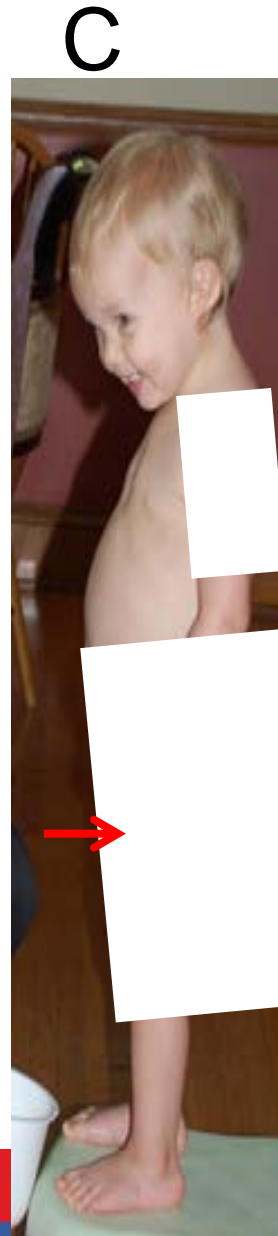
1. Periorbital region
2. Cheeks
3. Upper arm-triceps
4. Thighs



QUIZ 2

Both children are malnourished.

When
more
about
How
tell





“At Risk” or Normal

<10 Years old

- Height
 - <10th percentile
- Weight
 - <10th percentile
- Wt-for-Ht (2<yo)
 - <10th percentile
- BMI (>2 yo)
 - <10th percentile
- History of weight loss

>10 Years old

- Weight
 - <10th percentile
- BMI
 - <10th percentile
- History of weight loss
- Weight
 - > 90th percentile
- BMI
 - > 85th percentile

“Failure to Thrive”

Percentile of Median

1. Weight < 75% of median weight for chronologic age (Gomez criterion)
2. Weight < 80% of median weight for length (Waterlow criterion)

Percentiles

3. Body mass index (if > 2yo) for chronological age < 5th %ile
4. Wt-for-Length (if < 2yo) for chronological age < 3rd or 5th %ile
5. Weight for chronological age < 5th %ile
6. Length for chronological age < 5th %ile

Weight deceleration

7. Crossing more than 2 major centile lines from birth until weight

Standard deviation or Z-scores

8. Z-score ≤ -2 : wt-for-age, ht-for-age, or wt-for-ht

Malnutrition

Coding and Screening for Pediatric Malnutrition (undernutrition)

- In children ages 1 month to 18 years
- Use clinical judgment and history when applying these as diagnostic criteria
- When a child meets more than one malnutrition acuity level, the provider should document the severity of the malnutrition at the highest acuity level to ensure that an appropriate treatment plan and intervention, monitoring and evaluation are provided.
- For undernourished former preemies—use a corrected age until 36 months chronological age

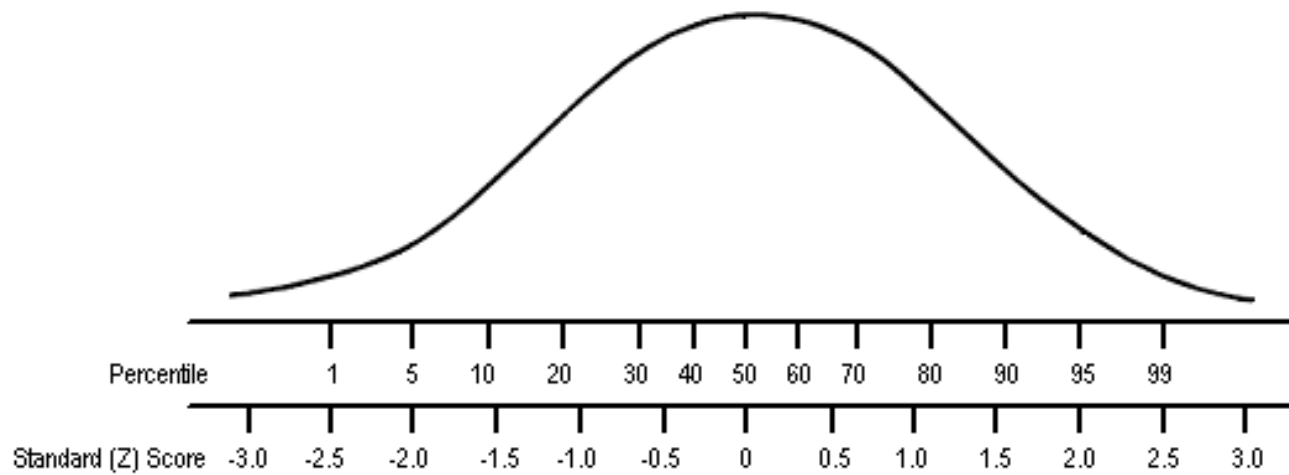
		Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
		E44.1	E44.0	E43.0
Single data point available	BMI for age Wt-for-Length	-1 to -1.99 Z score Requires supporting documentation, eg: <ul style="list-style-type: none"> • Weight loss • Lower than expected wt-gain velocity • Declining Z score • Inadequate energy/protein intake 	-2 to 2.9 Z score	≥ -3 Z score
	MUAC (Mid Upper Arm Circumference) < 5 years old	-1 to -1.99 Z score	-2 to 2.9 Z score	≥ -3 Z score
	Length, Height for age	No data	No data	≥ -3 Z score
Trending 2 or more data points	Weight gain velocity < 2 years old	< 75% of norm ^N for expected weight gain	< 50% of norm ^N for expected weight gain	< 25% of norm ^N for expected weight gain
	Weight Loss * 2-20 years old	5% of usual body weight	7.5% of usual body weight	10% of usual body weight
	Deceleration in BMI or weight-for-length *	Decline of 1 Z score	Decline of 2 Z scores	Decline of 3 Z scores
	Inadequate nutrient intake *	51-75% of estimated energy/protein need	26-50% of estimated energy/protein need	≤ 25% estimated energy/protein need

* no time frame specified
^N weight gain increments at the median of the WHO growth velocity standards for the time span between the 2 data points
 Gray: Needs additional positive diagnostic criteria to make malnutrition diagnosis

Considerations during diagnosis:

- Acute typically < 3 months
- Chronic typically > 3 months

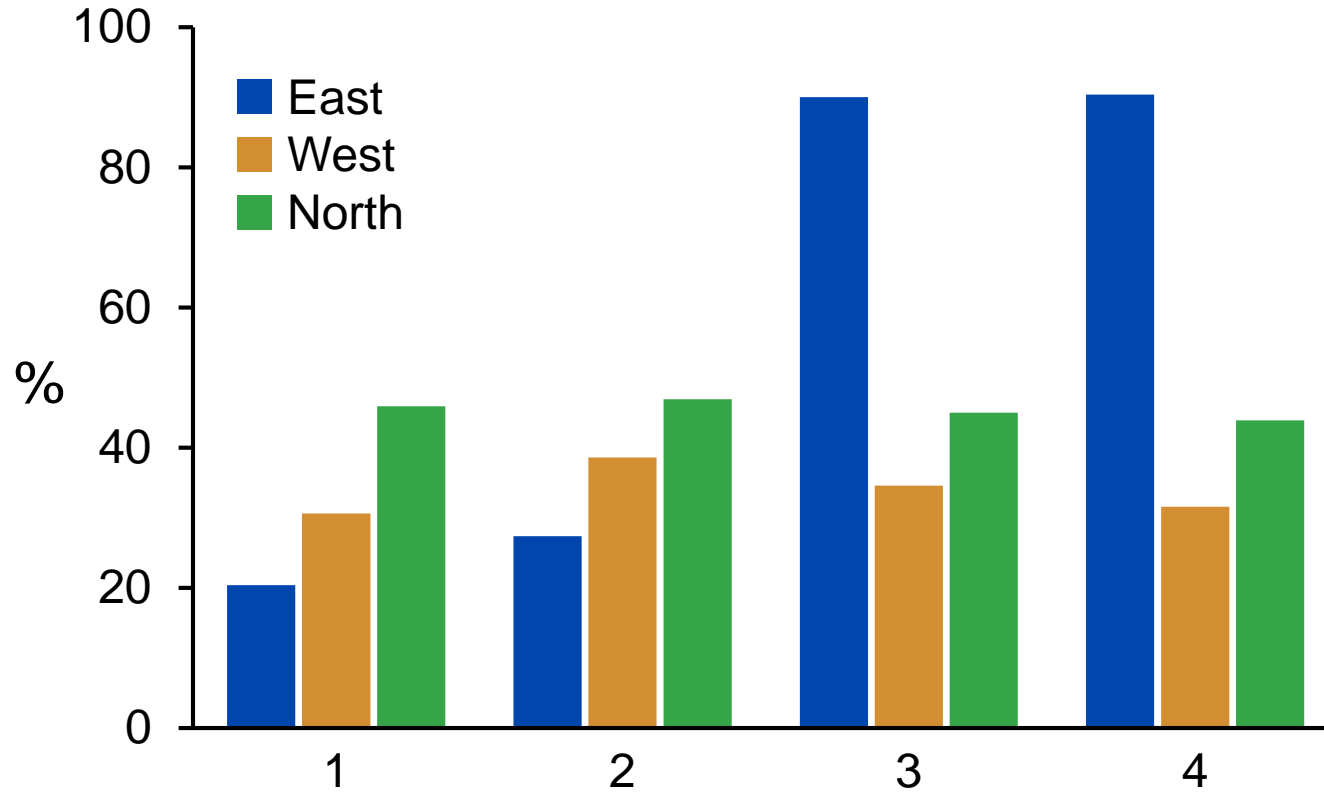
Step 3: Physical Exam



Mayo Clinic Children's Center

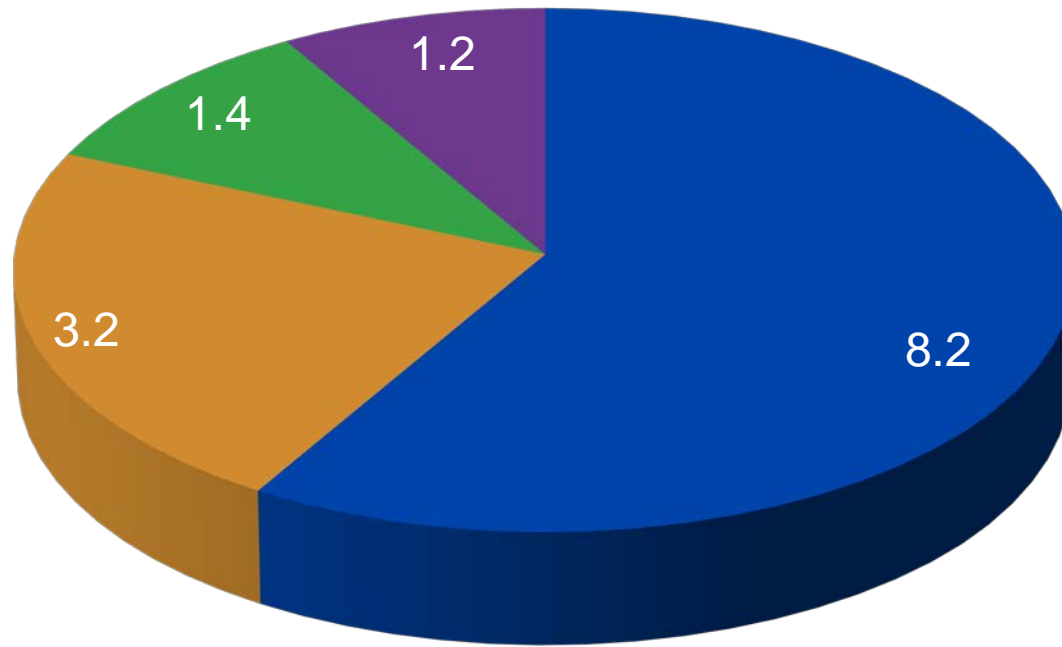
Title for Chart

Subtitle for Chart



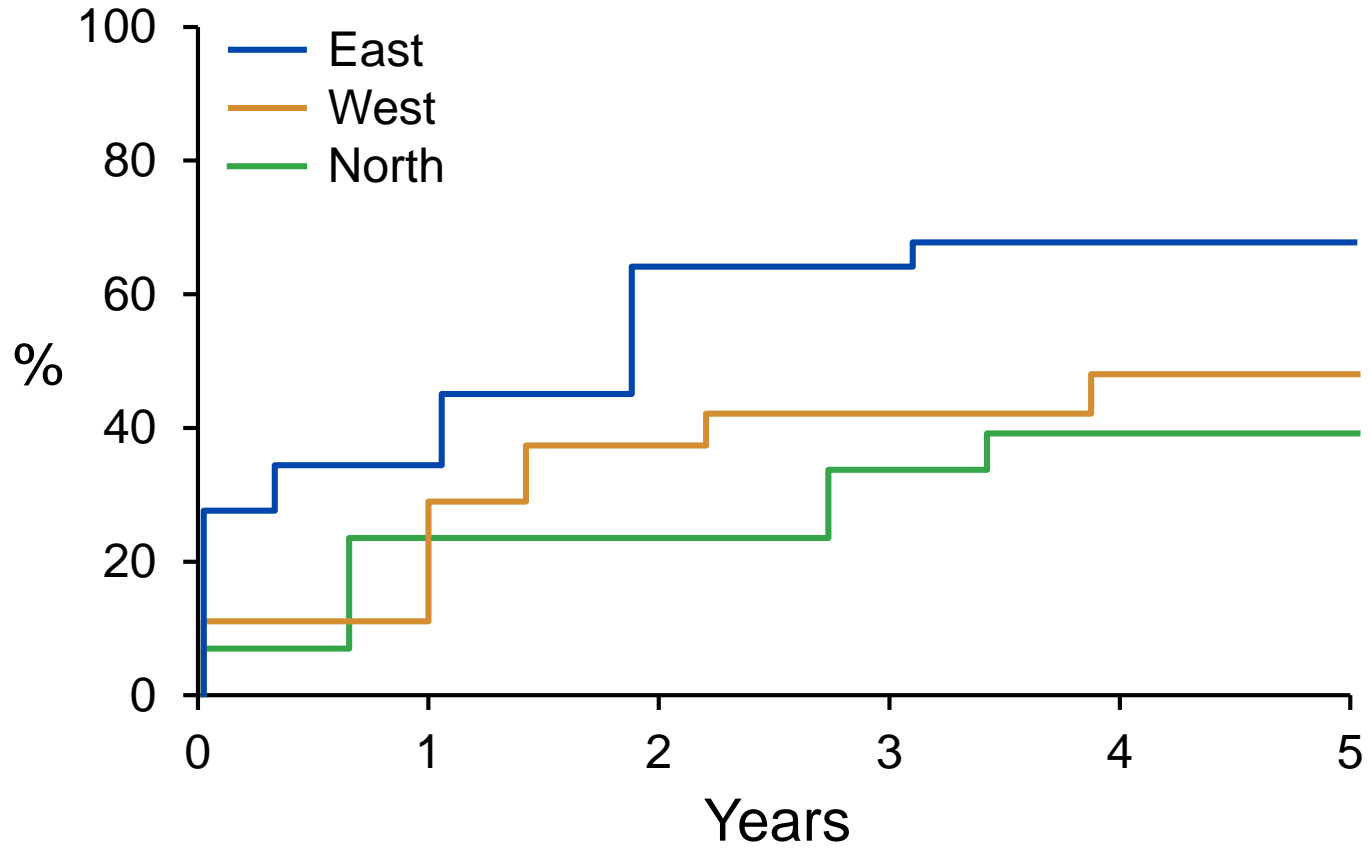
Title for Chart

Subtitle for Chart



Title for Chart

Subtitle for Chart



Microsoft Table

Subtitle for Table

Row	Color	No.	%	P
1	Red	12.3	47	<0.001
2	Yellow	459.2	26	0.05
3	Green	56.7	98	NS
4	Blue	1.0	2	>0.01
5	Pink	56.9	14	<0.0001
6	Violet	25.4	35	0.01

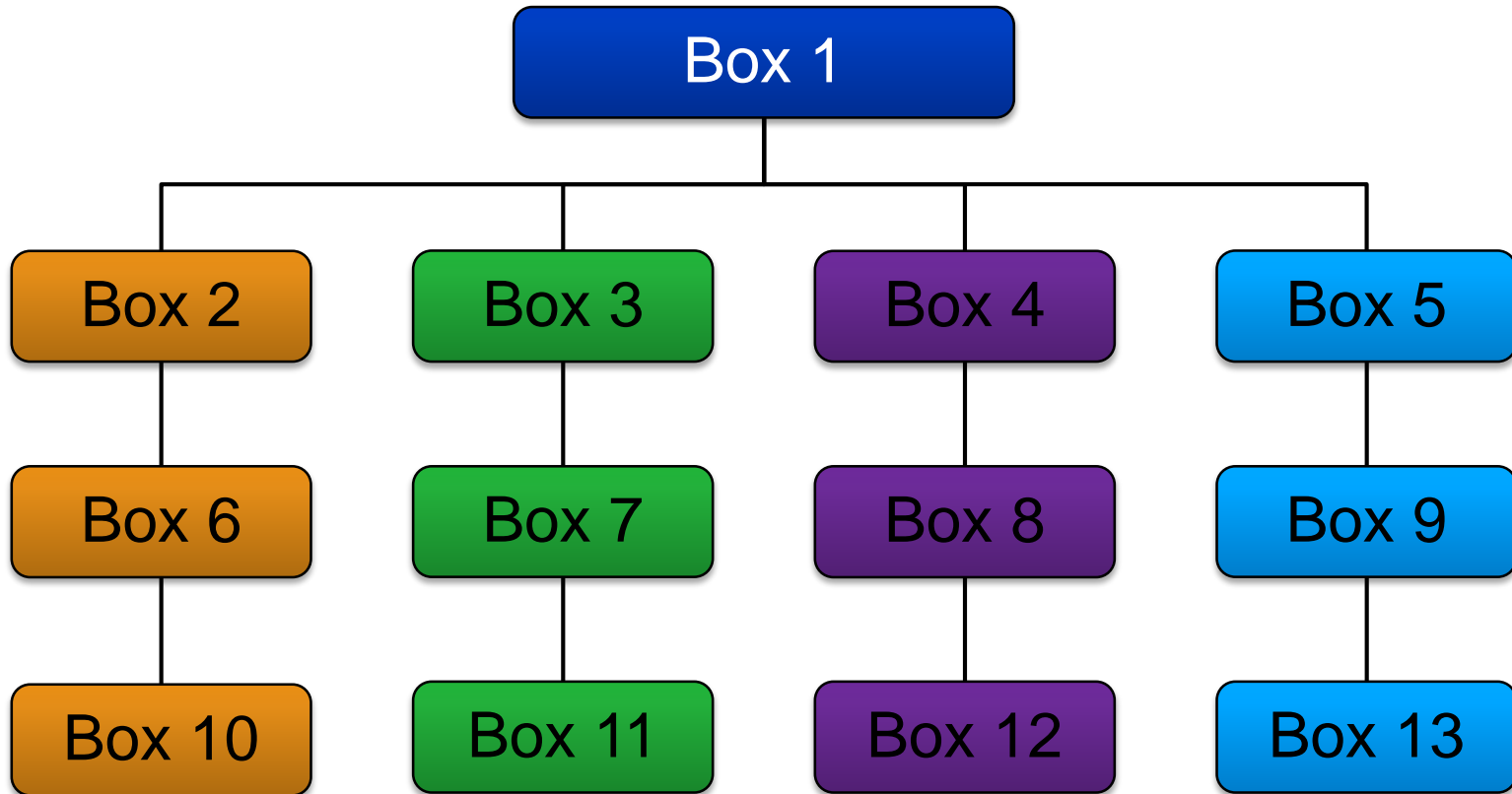
Tabbed Table

Subtitle for Table

Row	Color	No.	%	P
1	Red	12.3	47	<0.001
2	Yellow	459.2	26	0.05
3	Green	56.7	98	NS
4	Blue	1.0	2	0.01
5	Pink	56.9	14	0.0001
6	Violet	25.4	35	0.01

Organization Chart

Text boxes and Connectors





Questions & Discussion



References

- Brooks J, Day SM, Shavelle RM, Strauss DJ (2011). Low weight, morbidity, and mortality in children with cerebral palsy: New clinical growth charts. *Pediatrics*, 128; e299;
- Holliday MA and Segar WE. p. 823-8232, *Pediatrics* 1957
- Wright DR, Glanz K, Colburn T, Robson SM, Saelens BE. The accuracy of parent-reported height and weight for 6-12 year old U.S. children. *BMC Pediatr.* 2018;18(1):52. Published 2018 Feb 12. doi:10.1186/s12887-018-1042-x

	Juice	Water +	Fruit
Calories	More	0	Less
Sugar	More	0	Less
Fiber	Less	0	More
Natural Vitamins	Less	0	More
Natural Minerals			