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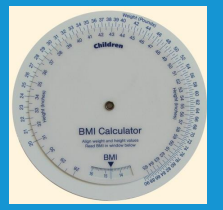
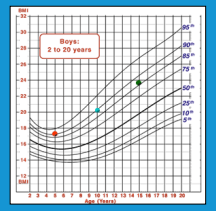
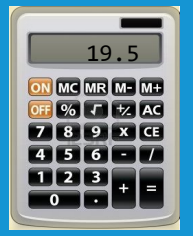
Assessing Child Growth Using Body Mass Index (BMI)-for-Age Growth Charts







DHCS
HealthCareServices

Adapted by the State of California CHDP Nutrition Subcommittee from materials developed by
California Department of Health Care Services – Children's Medical Services Branch
Centers for Disease Control and Prevention
Maternal and Child Health Bureau

Training Objectives

By the end of this presentation, you will be able to:

- Select appropriate ***growth chart*** for age group
- Identify the ***age range*** for which Body Mass Index (BMI) screening is used
- Calculate or determine ***BMI value***
- ***Plot BMI value*** on the appropriate growth chart
- Determine ***BMI-for-age percentile***
- Identify ***weight category***
- ***Record results*** on PM 160

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Which Growth Chart Should I Use?

Birth to 2:
- Use WHO

2 to 20:
- Use CDC

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Which Growth Chart Should I Use?

Background Information:
In September 2010, the Centers for Disease Control (CDC), the National Institutes of Health (NIH), and the American Academy of Pediatrics (AAP) recommended that health care providers use World Health Organization growth standards for assessment of growth of infants from birth to 24 months. The 2009 WHO Growth Charts describe a **standard** for how healthy children should grow under optimal environmental and health conditions. The charts were developed from a multicenter research study of infants in six countries. These infants were predominantly breastfed for at least four months and continued to breastfeed during the introduction of complementary foods between four and twelve months of age.

The familiar CDC Growth Charts (2000) are growth **references** describing how certain children grew in a particular place and time, not necessarily in environments for optimal growth. The CDC growth charts published in 2000 continue to be recommended for use with children ages 2 to 20.

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What is Body Mass Index?

- A number calculated using weight and height measurements:
  - **Body Mass Index (BMI) = Weight (kg) / Height (m)^2**
- It compares a person's weight to height
- It is an indirect *screening test f*or body fatness

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What is Body Mass Index?

Background Information:

Although BMI is a fairly accurate indicator of body fat, it may overestimate or underestimate actual body fat. BMI does not take into account the difference between lean mass (muscle, bone and organs) and fat mass. Athletes, for example, may have high BMIs even though the percentage of body fat is low. In children with BMIs ≥ 85th percentile, the BMI is a good indicator of excess fat. However, the differences in the BMIs of relatively thin children (that is, BMI for age < 85th percentile) can be largely due to differences in lean mass. BMI-for-age is a less reliable indicator for body fat in children classified as underweight.

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Why Use BMI-for-Age?

- **Lifetime tracking tool**
  - *From age 2 through adult*
- **Relates weight, stature *and* age**
- **Screening for health and nutrition status required by CHDP and health plans**
- **Early indicator of other health risk factors**
  - *Hyperlipidemia*
  - *Elevated insulin*
  - *High blood pressure*

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Body Mass Index Cutoff Values for Adults

- Standard weight categories
- Same for all ages 18 +
- Same for men and women

Weight Status	BMI
Obese	30.0 and above
Overweight	25.0 - 29.9
Normal	18.5 - 24.9
Underweight	Below 18.5

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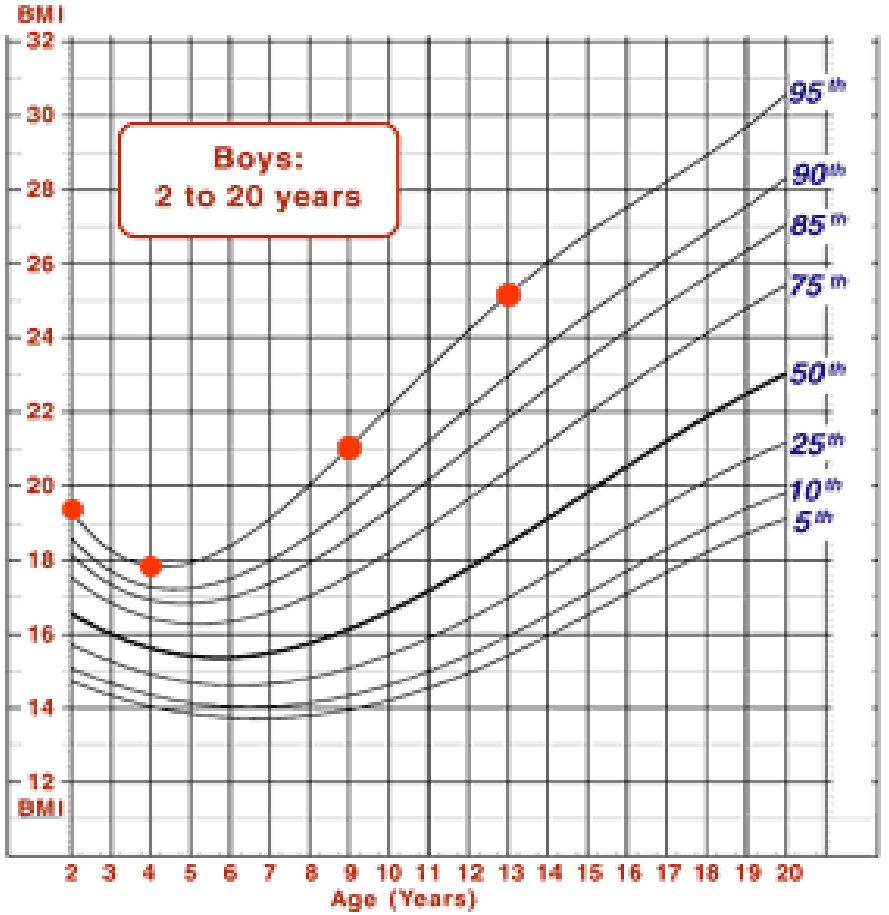
For Children, BMI Changes with Age

Example: Child's growth tracking along 95th percentile

Age	2	4	9	13
BMI Value	19.3	17.8	21.0	25.1



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BMI for Children & Teens

- Age-and sex-specific
- Plot BMI to find percentile
- Determine weight status

Weight Status Category	Percentile Range
Obese	≥ 95th percentile
Overweight	85th to < 95th percentile
Normal	5th to < 85th percentile
Underweight	< 5th percentile

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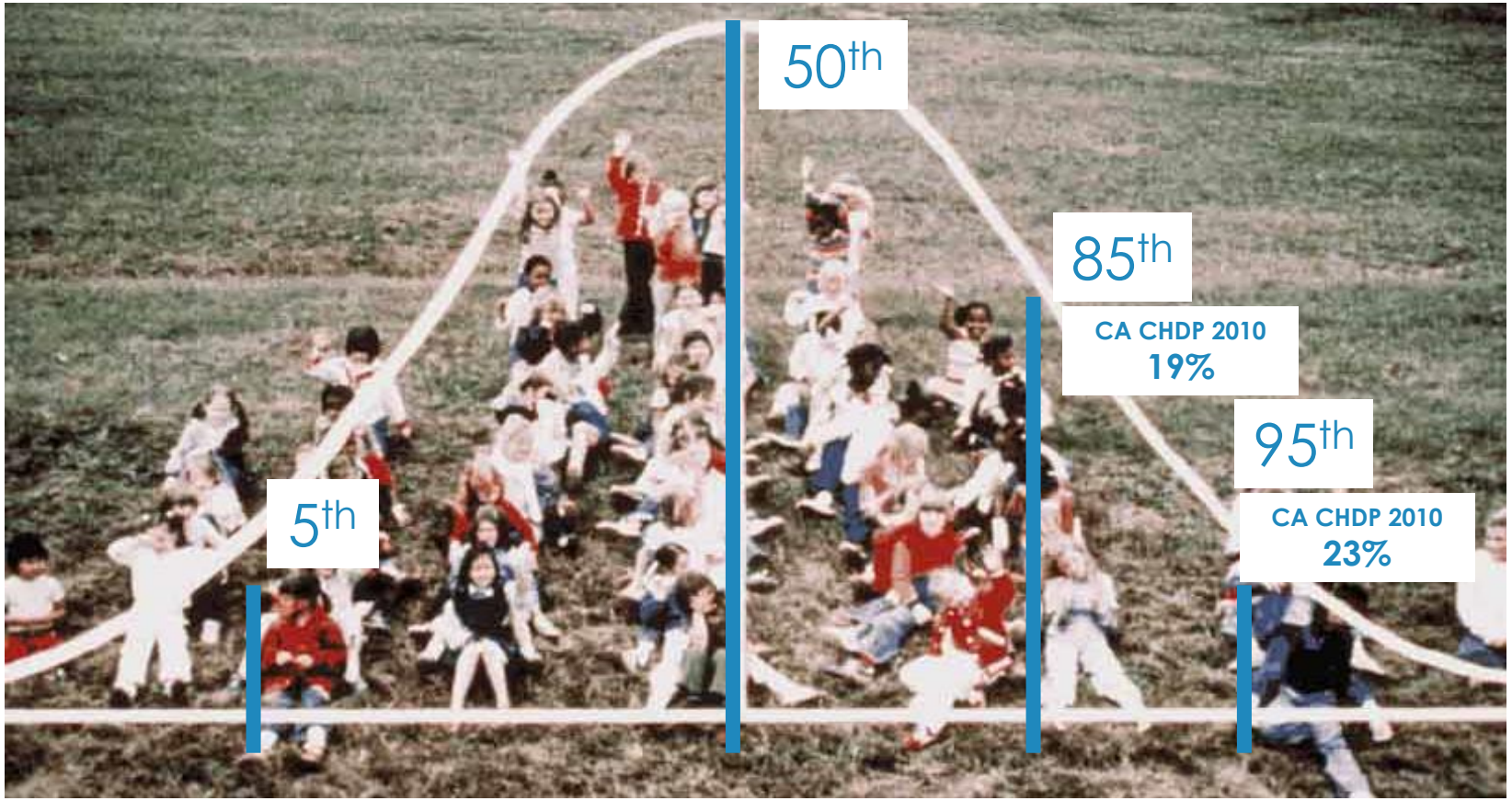
What is a Percentile?

Major Percentile Divisions



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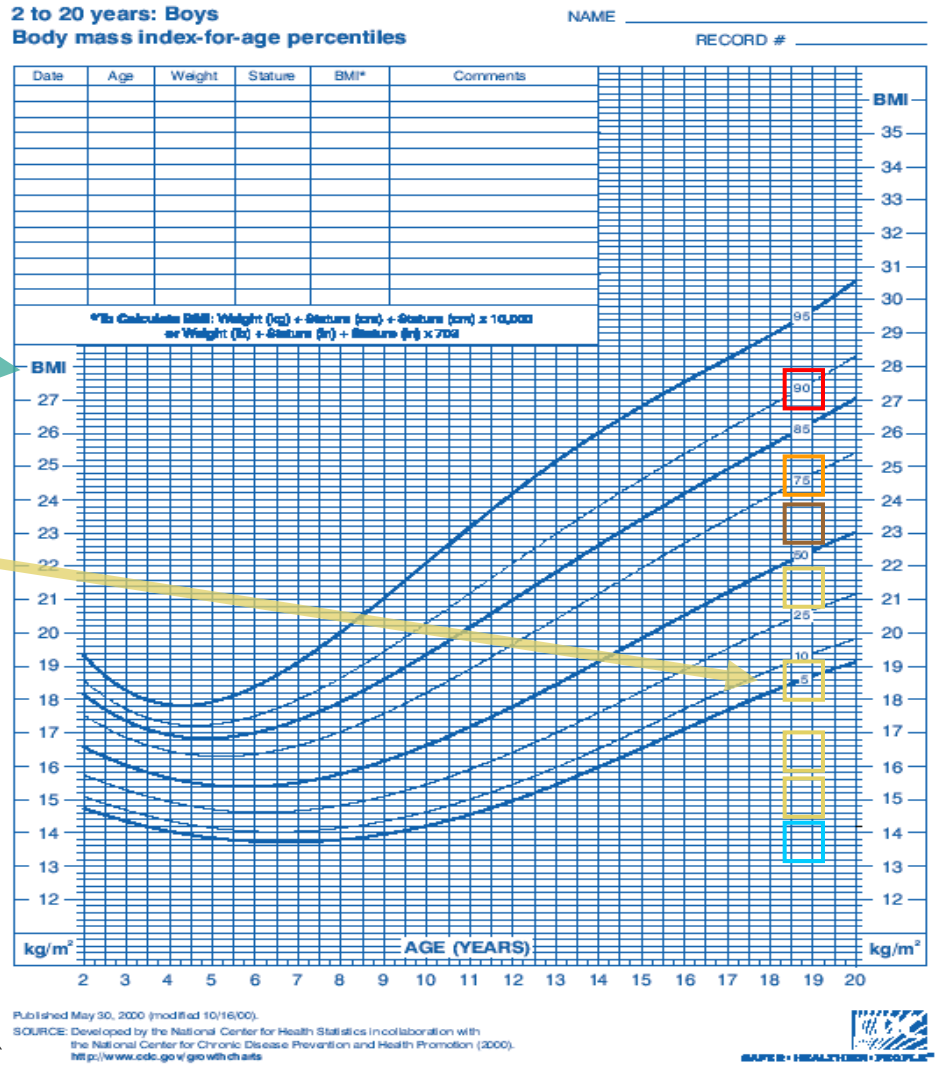
CDC Growth Chart

Tip: **Download and print from**
www.cdc.gov/growthcharts/

Formula to calculate BMI

Percentile lines
5th - 10th - 25th - 50th
75th - 85th - 90th - 95th

Published May 30, 2000
(Modified 2000-2001)



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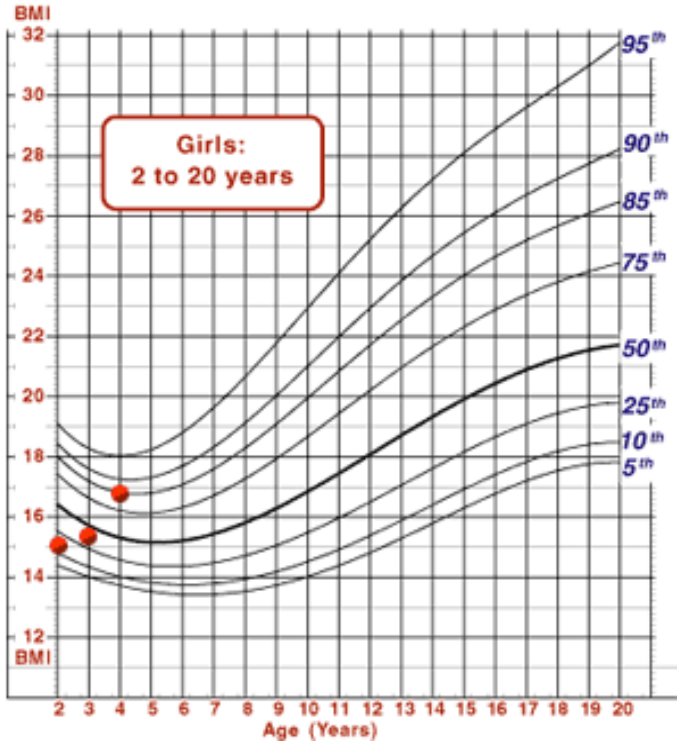
How to Read & Interpret the Growth Chart



- A single point on the curve indicates current status
- A series of BMI plots are needed to determine the growth trend
- If growth deviates from the expected growth pattern, further assessment may be needed

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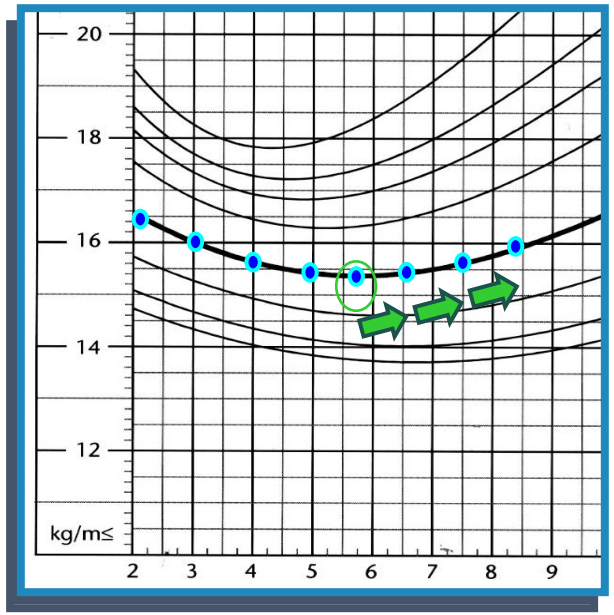
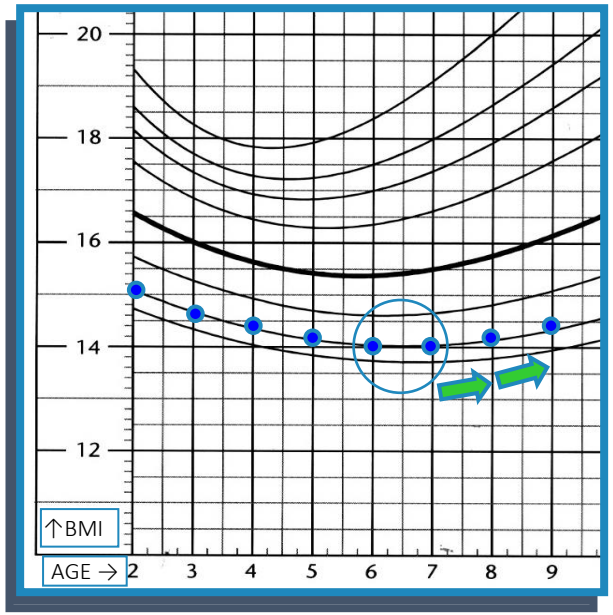
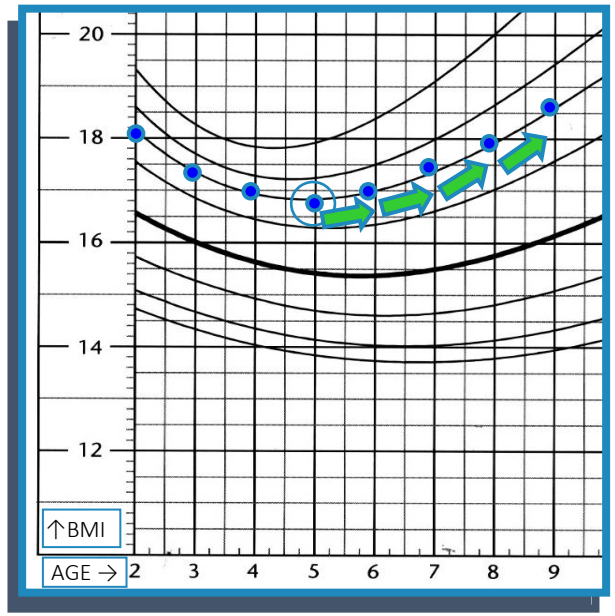
Adiposity Rebound



Child following 50th percentile curve



Child following 10th percentile curve



Child following 85th percentile curve

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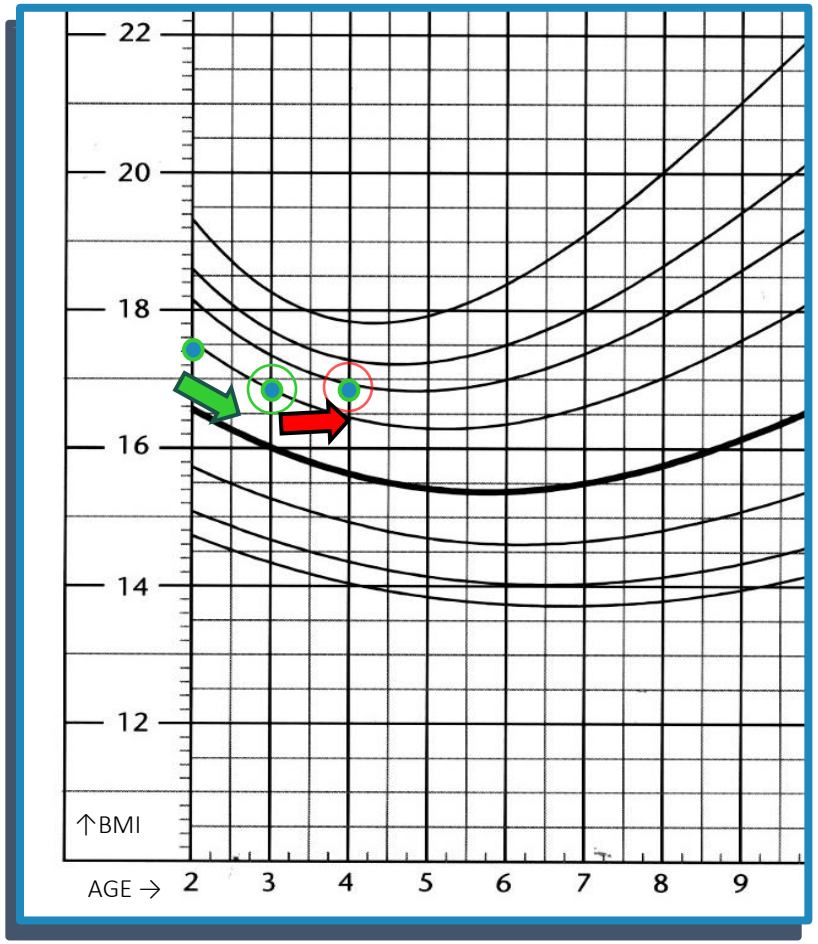
A normal increase in BMI after it reaches its lowest point, usually between ages 4 and 6

Early Adiposity Rebound

- An increase in BMI before age 5 is called *early adiposity rebound*
- An upward BMI trend before age 5 is related to higher BMI in adulthood
- This is a red flag indicating need for further nutrition and physical activity assessment



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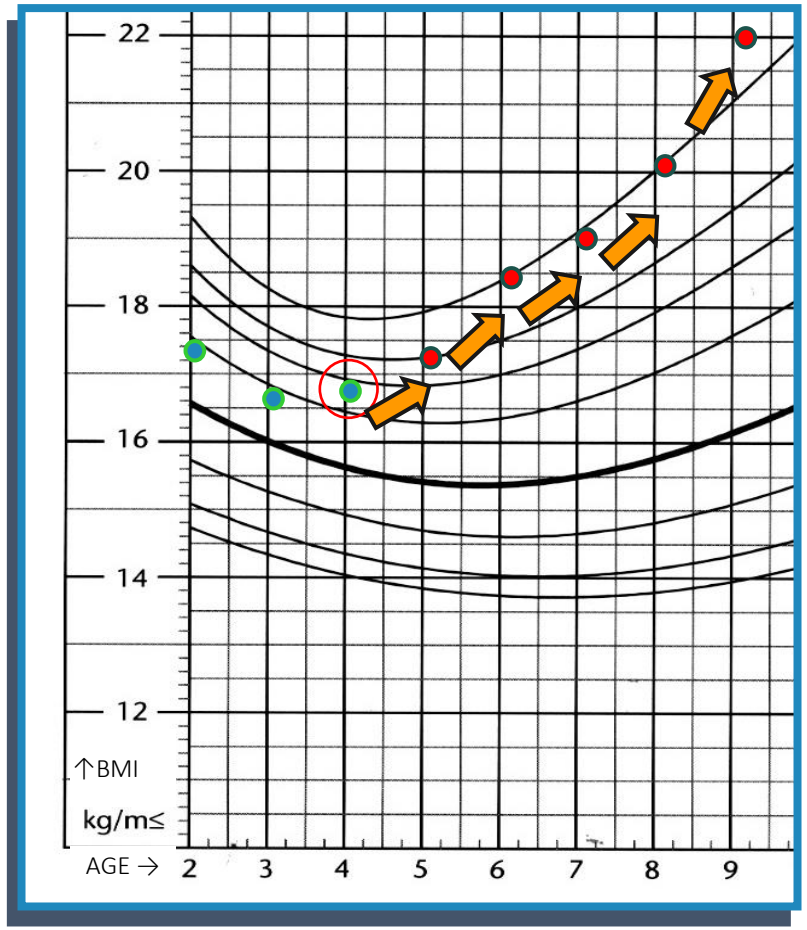
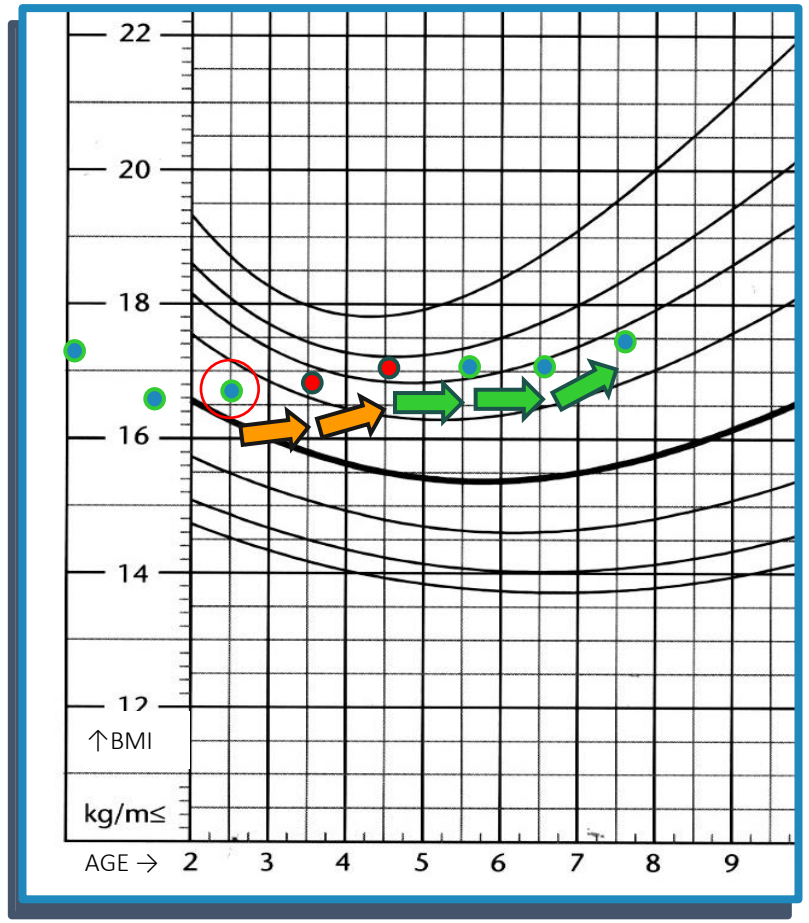
Early Adiposity Rebound

Without Intervention



With Intervention



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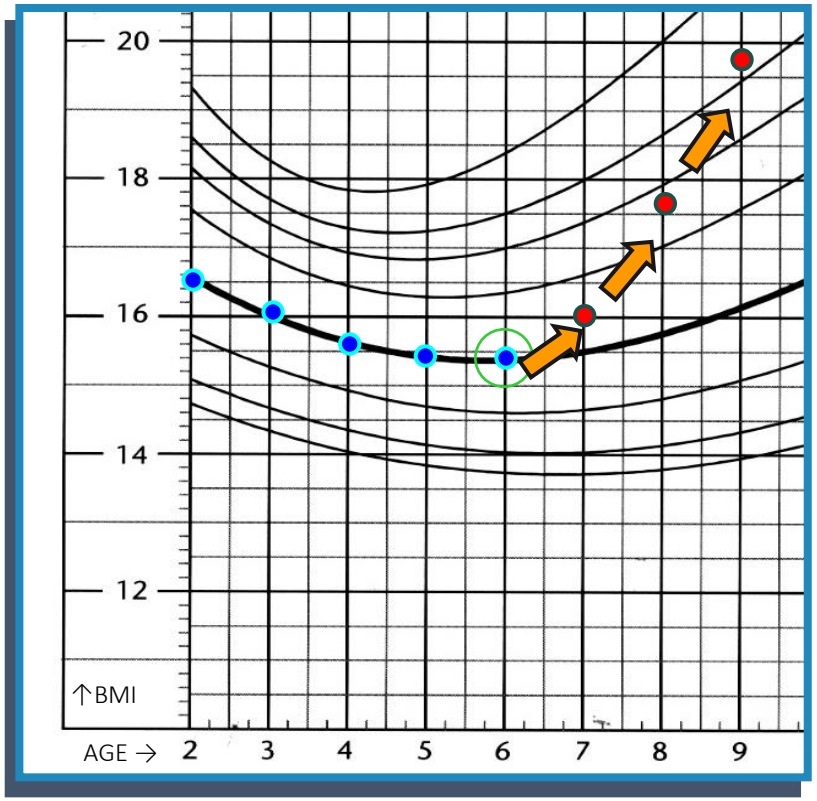
Excessive Adiposity Rebound



- Excessive adiposity rebound is also related to higher BMI in adulthood
- Increasing BMI percentiles that cross major percentile lines are red flags indicating need for further nutrition and physical activity assessment

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Steps to Plot BMI for Age

1. **Select** appropriate growth chart
2. **Measure** standing height accurately
3. **Measure** weight accurately
4. **Determine** BMI value
5. **Determine** BMI-for-age percentile
6. **Record** BMI percentile on PM 160
7. **Determine** weight category

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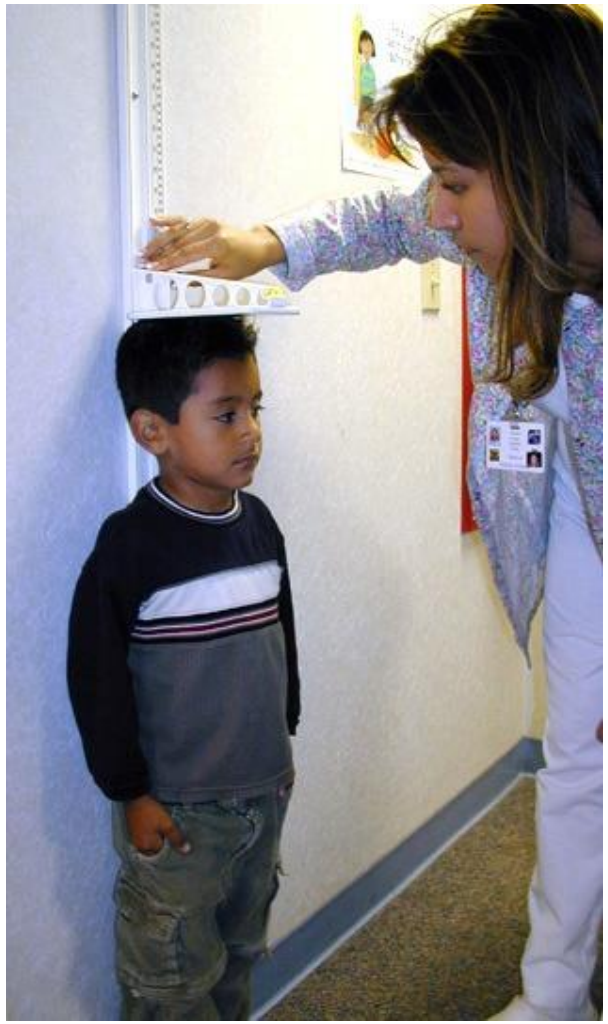
Step 1: Chart Carlos Correctly

- **Select** Appropriate Growth Chart

- **Boys:** CDC 2 to 20 years
  - Stature-for-age
  - Weight-for-age
  - BMI-for-age



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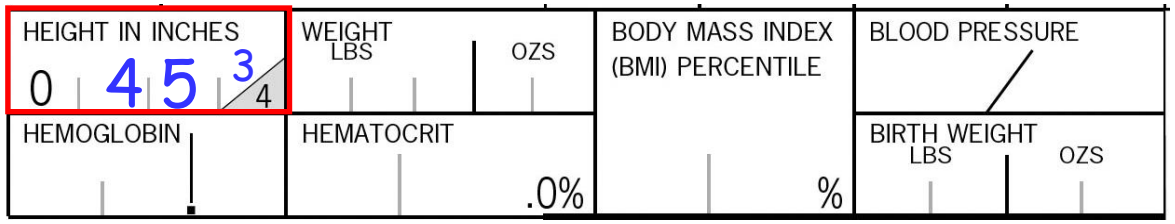
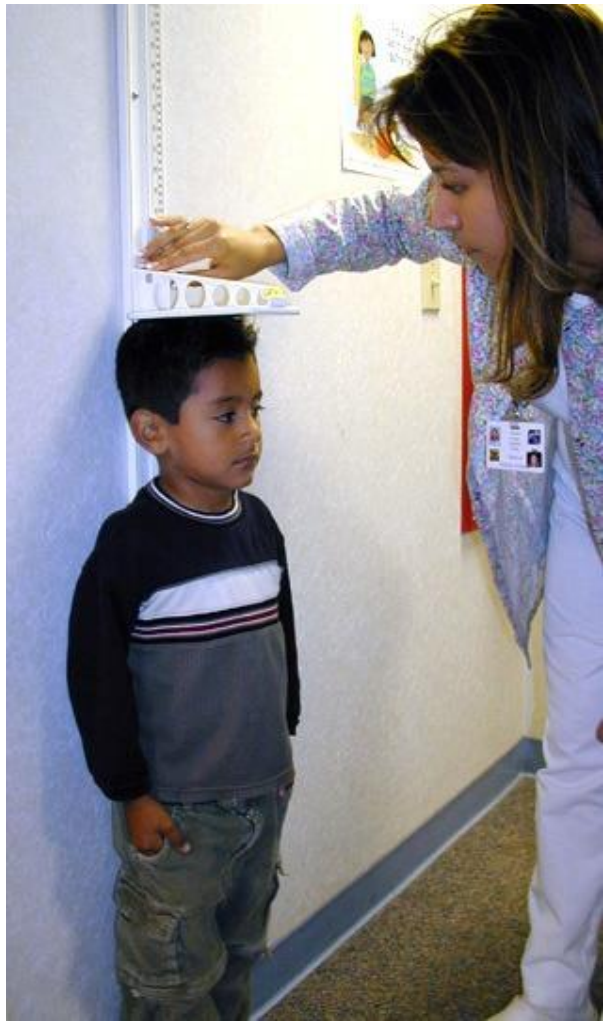
Step 2: Measure Standing Height

Record on growth chart and PM 160

Date	Age	Weight	Stature	BMI*
	3	32 #	38 ½ ”	15.2
	4	36 #	41 ”	15.0
	6		45 ¾ ”	





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Step 3: Measure Weight

Record on growth chart and PM 160

Date	Age	Weight	Stature	BMI*
	3	32 #	38 ½ ”	15.2
	4	36 #	41 ”	15.0
	6	43 ½ #	45 ¾ ”	

HEIGHT IN INCHES	WEIGHT	BODY MASS INDEX (BMI) PERCENTILE	BLOOD PRESSURE
0 45 3/4	LBS 043 OZS 08		
HEMOGLOBIN	HEMATOCRIT		BIRTH WEIGHT
!	.0%	%	LBS OZS

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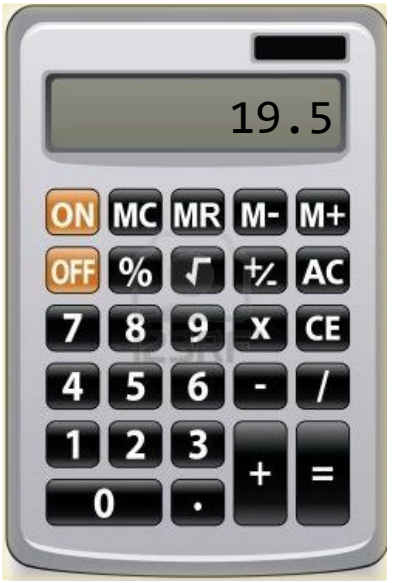
Step 4A: Determine BMI Value

Method 1: Using a calculator

- **English measurements**
  Wt (pounds) ÷ Ht (inches) ÷ Ht (inches) x 703
- **Metric measurements**
  Wt (kg) ÷ Ht (cm) ÷ Ht (cm) x 10,000



TIP: Formulas are listed on the BMI-for-age chart

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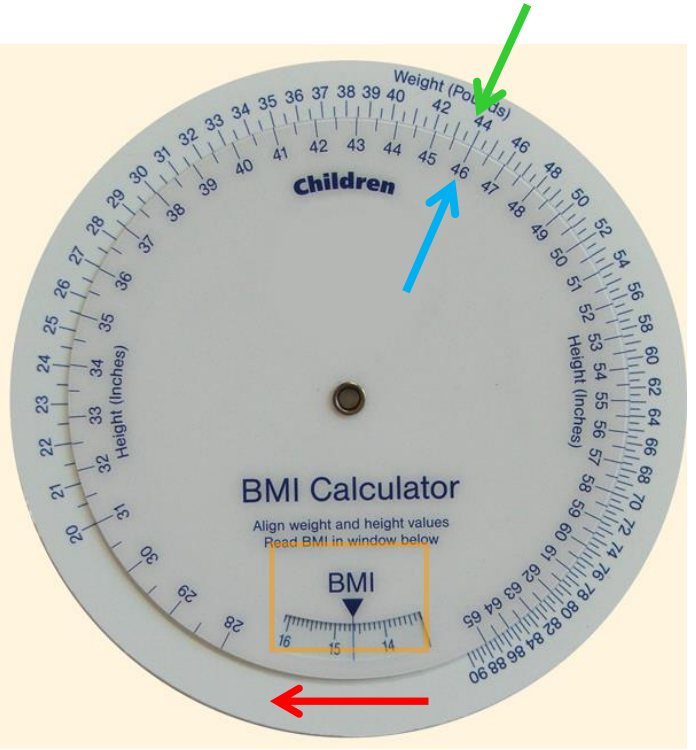
Step 4A: Determine BMI Value

Method 2: Using a BMI calculation wheel

- Line up the **height** on inner wheel with the **weight** on outer wheel
- Read BMI value in the window on the inner wheel
  Read number and decimal points from right to left!



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Step 4A: Determine BMI Value

Method 3: Using an online calculator or electronic health record

- CDC BMI Calculator for Child and Teen
  http://apps.nccd.cdc.gov/dnpabmi/Calculator.aspx
- Children's Hospital of Philadelphia Body Mass Index and Z-Score Calculator in Children
  http://stokes.chop.edu/web/zscore
- Your clinic's electronic health record system

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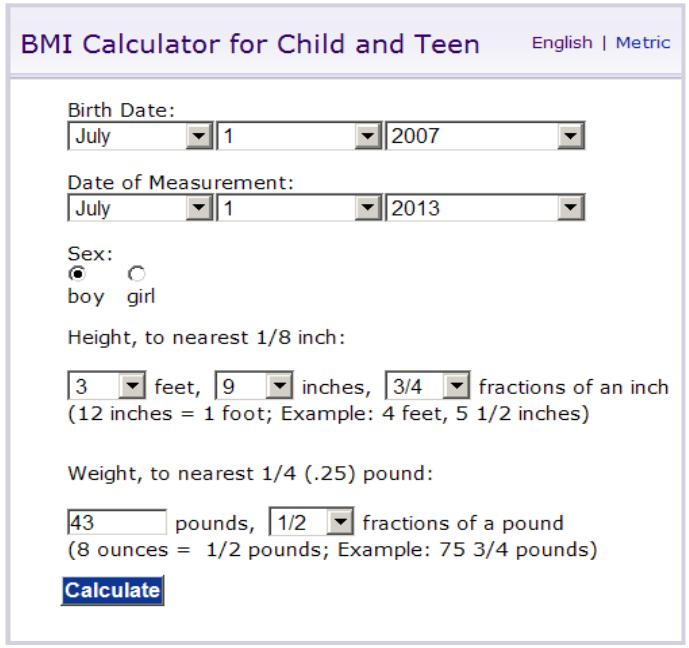
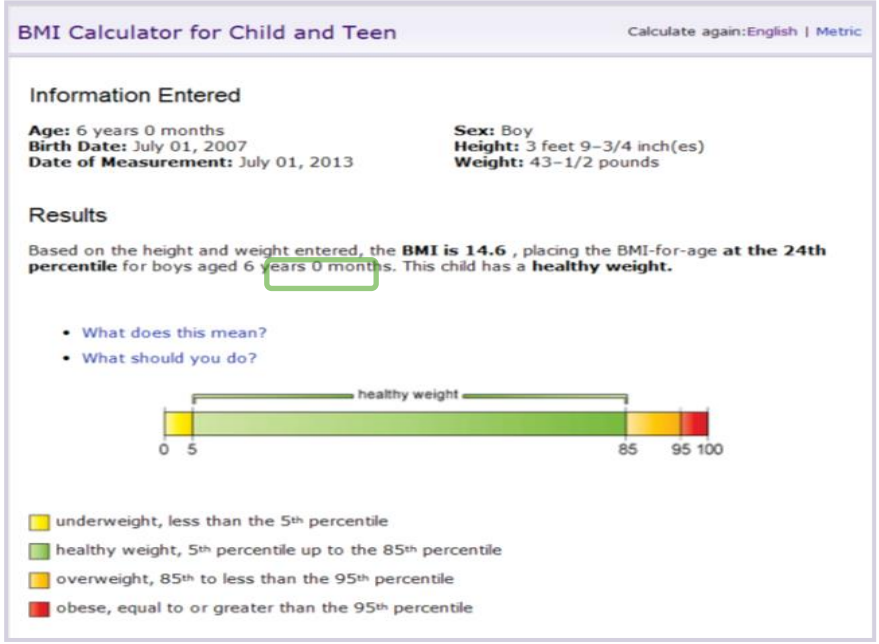
Step 4A: Determine BMI Value

Method 3: Using an online calculator or electronic health record

Enter Data



View Results



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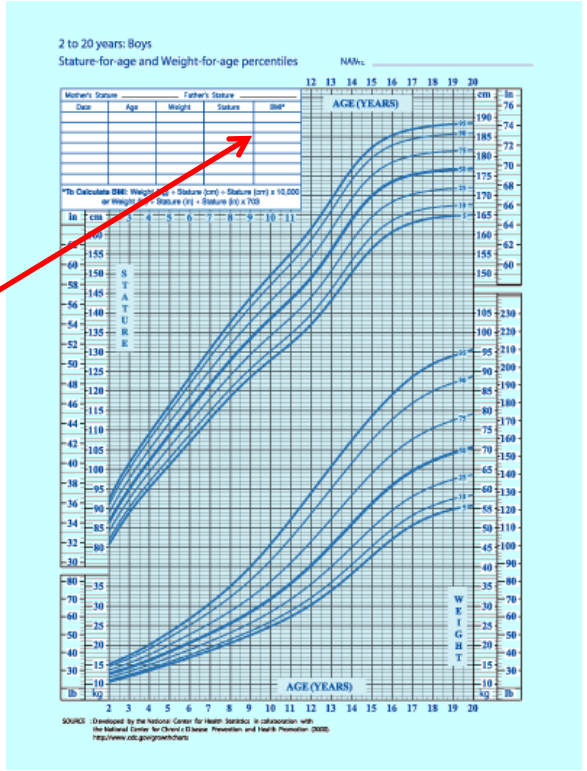
Step 4B: Determine BMI Value

Record on growth chart

Date	Age	Weight	Stature	BMI*
	3	32 #	38 ½ ”	15.2
	4	36 #	41 ”	15.0
	6	43 ½ #	45 ¾ ”	14.6



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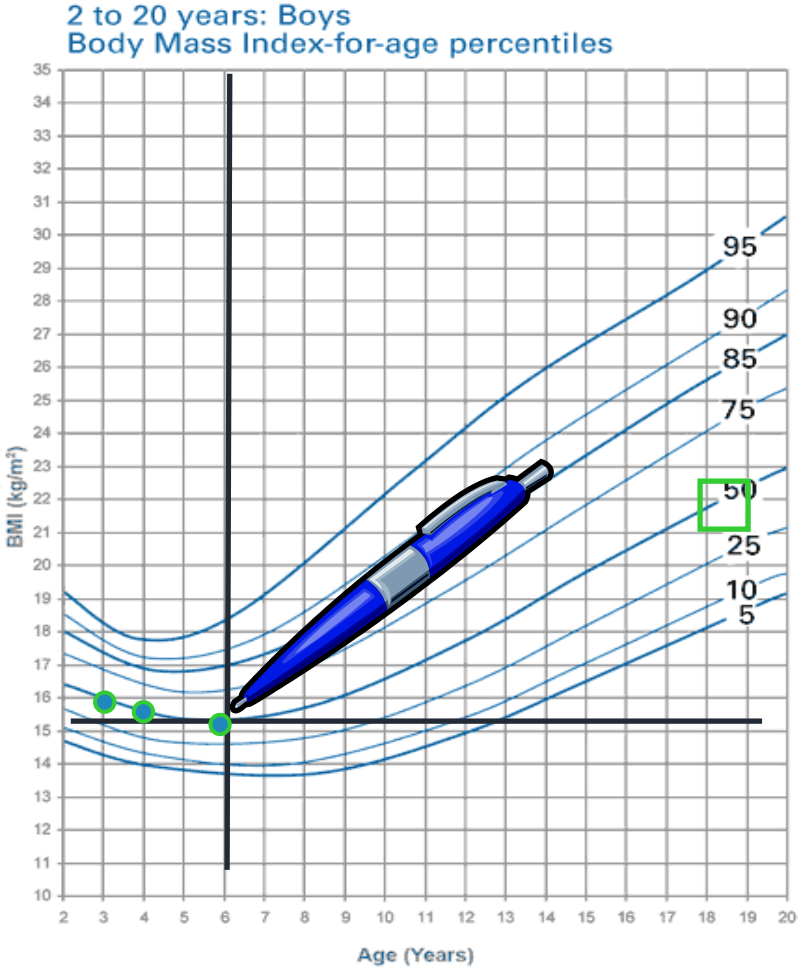
Step 5: Determine BMI-for-Age %ile

TIP: Use a transparent growth chart plotting aid

- Find age on horizontal axis
- Find BMI value on vertical axis
- Mark point of intersection
- Estimate BMI percentile



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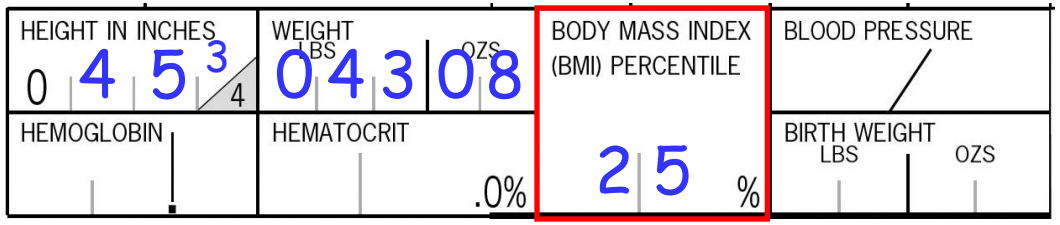
Step 6: Record BMI Percentile on PM 160

- Estimate a whole number between 1 and 99 that best represents the percentile point plotted on the growth chart



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Step 7A: Determine Weight Category

Determined by certified CHDP health are provider (MD, NP, or PA)

Weight Status Category	Percentile Range
Obese	≥ 95th percentile
Overweight	85th to < 95th percentile
Normal	5th to < 85th percentile
Underweight	< 5th percentile

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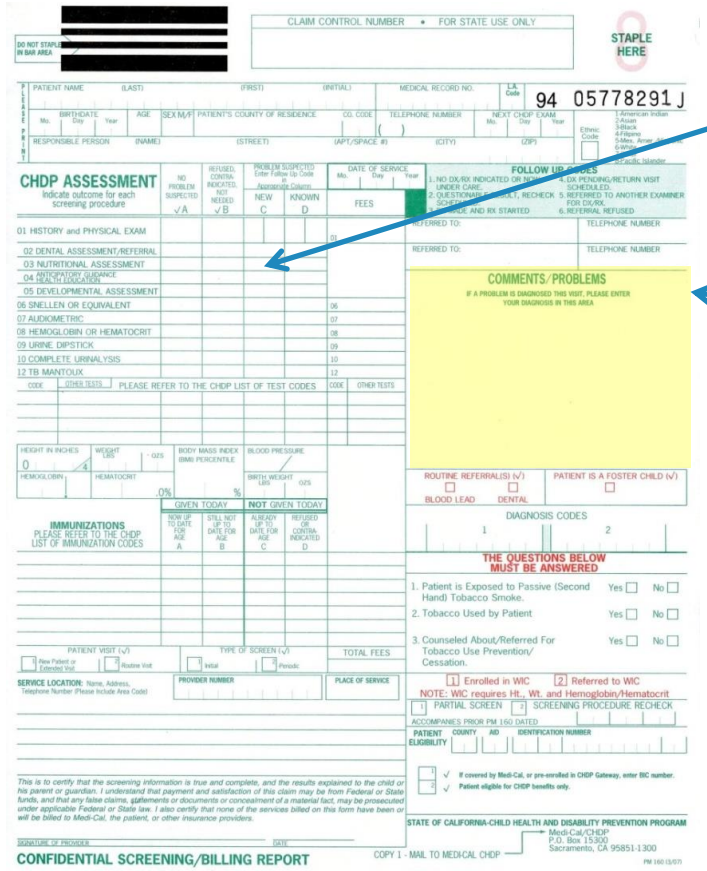
Step 7B: Record Abnormal Results



- On PM 160, enter follow up code in appropriate column under **PROBLEM SUSPECTED**
- Enter diagnosis under **COMMENTS/PROBLEMS**
  - *Underweight*
  - *Overweight*
  - *Obese*
- Carlos' weight status is normal so there is nothing to record in the comments

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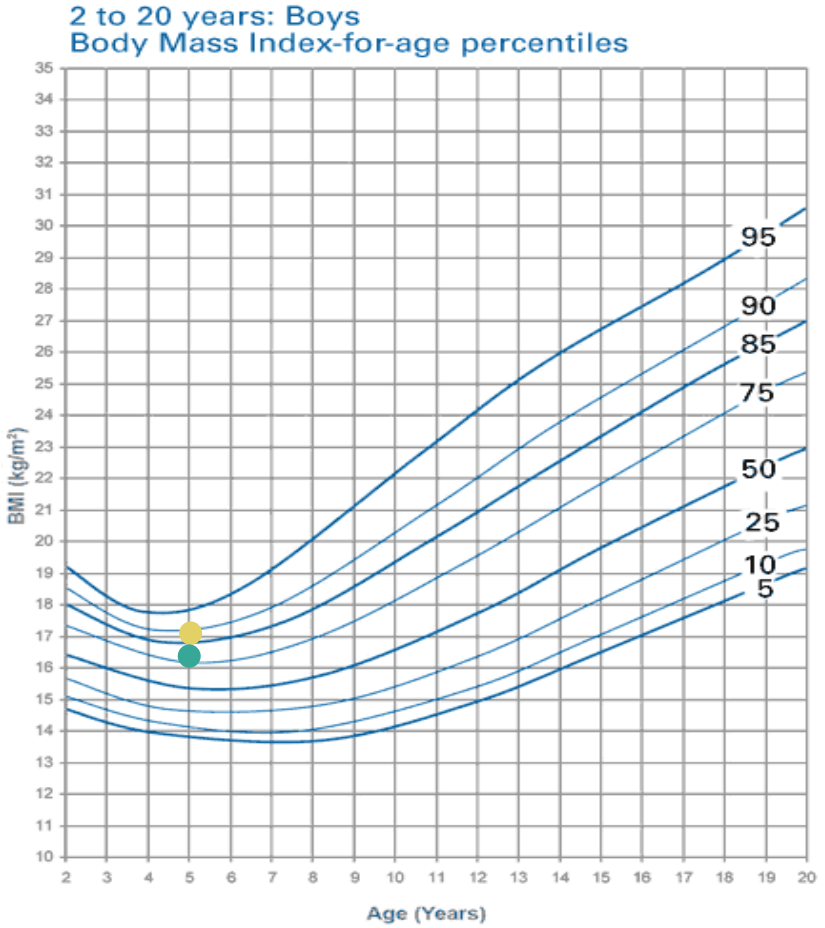
Accurate Measurements are Critical

BMI for 5-year-old boy

- Weight: 43.5 lb
- Height: 43.0 in
- BMI= 16.5



- BMI-for-age = 75-84th percentile
- *Normal range*

If height is inaccurate:

- Weight: 43.5 lb
- Height: 42.5 in
- BMI = 17.0

- BMI-for-age = 85-94th percentile
- *Overweight range*

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Practice Using BMI-for-Age Growth Charts

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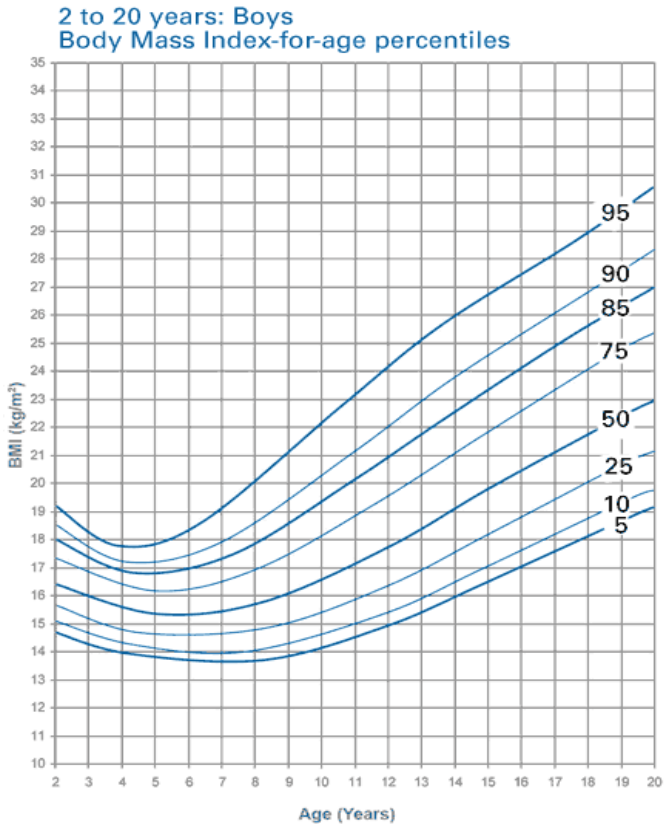
Plot Pete Precisely

FIRST STEPS

1. Select appropriate growth chart
2. Measure standing height
3. Measure weight

Date	Age	Weight	Stature	BMI*
	2	30 #	34 ½ ”	17.7
	3	36 ½ #	38 ”	17.8
	4	43 #	41 ”	



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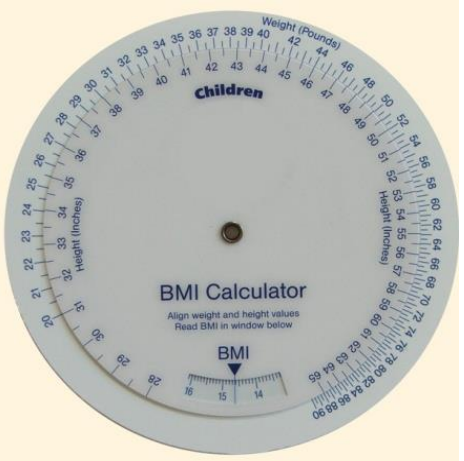
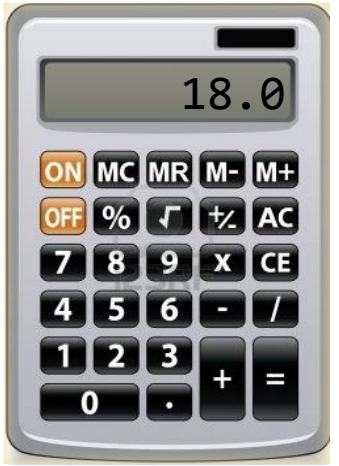
Plot Pete Precisely

NEXT STEP

4. Determine BMI Value

Date	Age	Weight	Stature	BMI*
	2	30 #	34 ½ ”	17.7
	3	36 ½ #	38 ”	17.8
	4	43 #	41 ”	18.0





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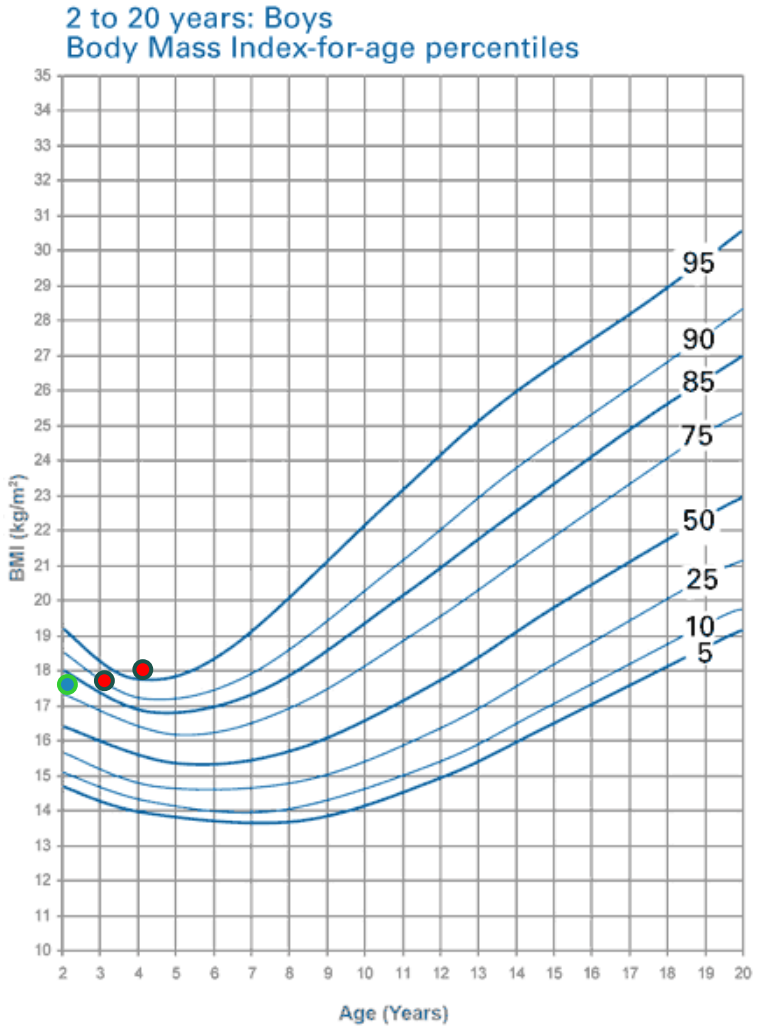
Plot Pete Precisely

NEXT STEP

5. Determine BMI-for-age percentile



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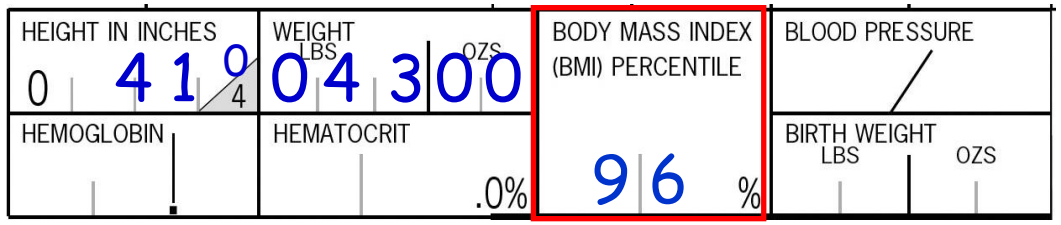
Plot Pete Precisely

NEXT STEP

6. Record BMI Percentile on PM 160
   - *Estimate a whole number between 1 and 99 that best represents the percentile point plotted on the growth chart*



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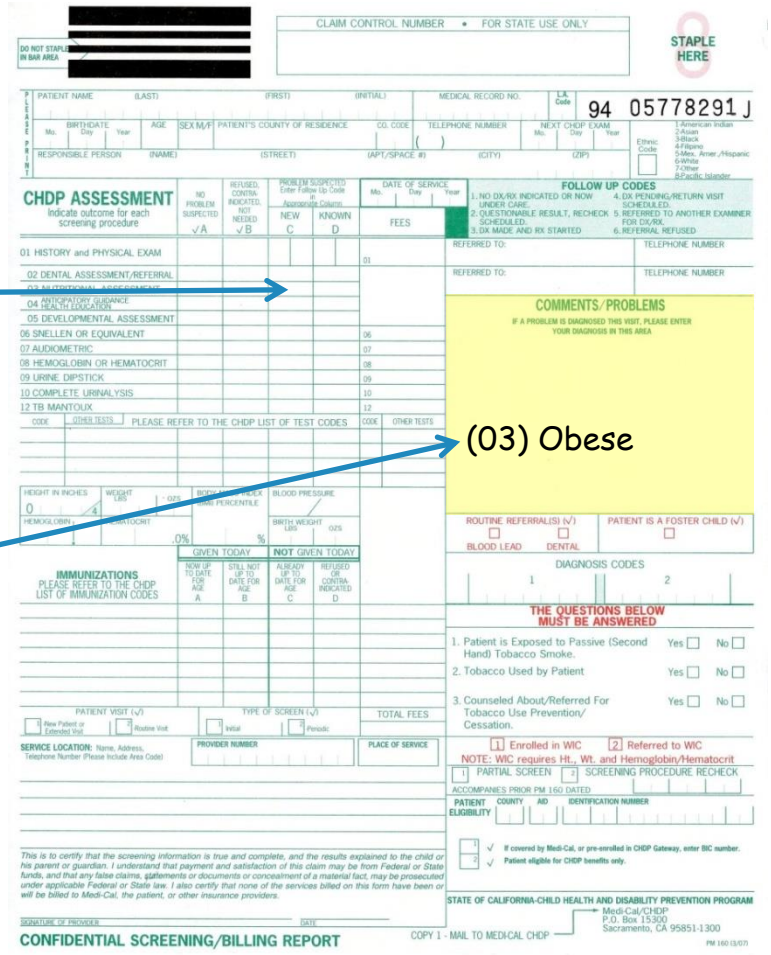
Plot Pete Precisely

FINAL STEP

7. Determine category and record on PM 160 if needed
   - Enter follow up code in appropriate column under **PROBLEM SUSPECTED**
   - Enter diagnosis under **COMMENTS / PROBLEMS**
     - *Underweight*
     - *Overweight*
     - *Obese*



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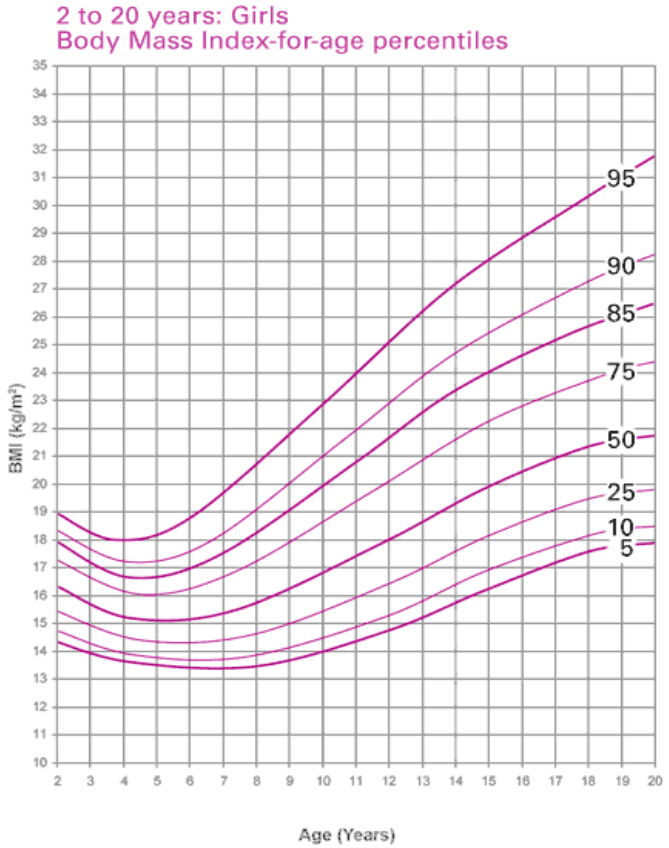
Let's Look at Liz

FIRST STEPS

1. Select appropriate growth chart
2. Measure standing height
3. Measure weight

Date	Age	Weight	Stature	BMI*
	2	28 ¾ #	33 ½ "	18.0
	3	33 #	36 ½ "	17.4
	4	37 #	39 ¼ "	



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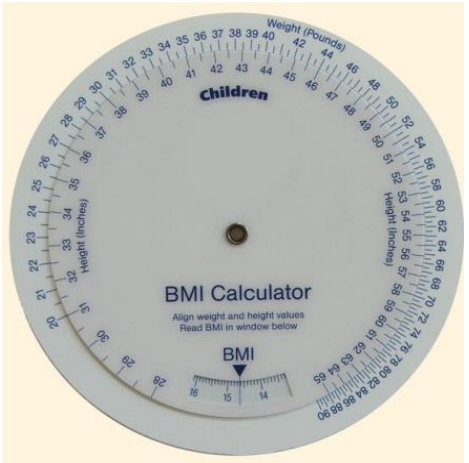
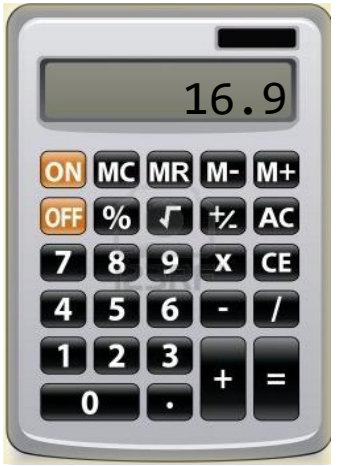
Let's Look at Liz

NEXT STEP

4. Determine BMI Value

Date	Age	Weight	Stature	BMI*
	2	28 ¾ #	33 ½ "	18.0
	3	33 #	36 ½ "	17.4
	4	37 #	39 ¼ "	16.9





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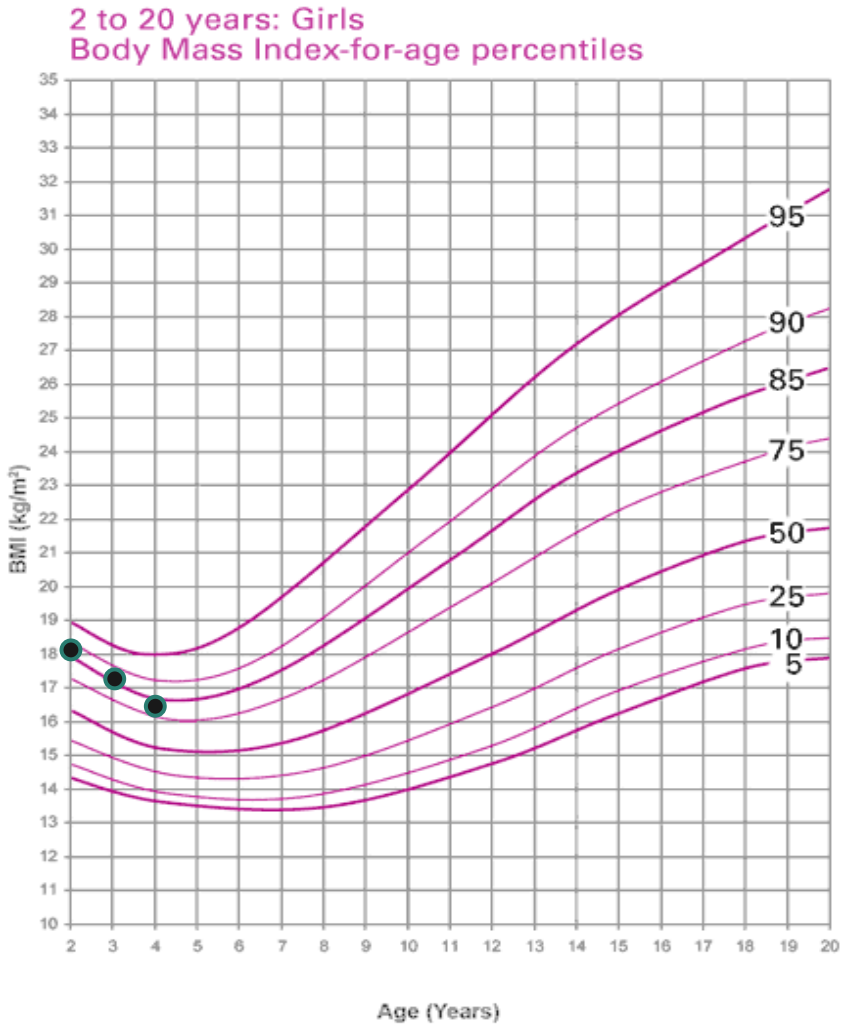
Let's Look at Liz

NEXT STEP

5. Determine BMI-for-age percentile



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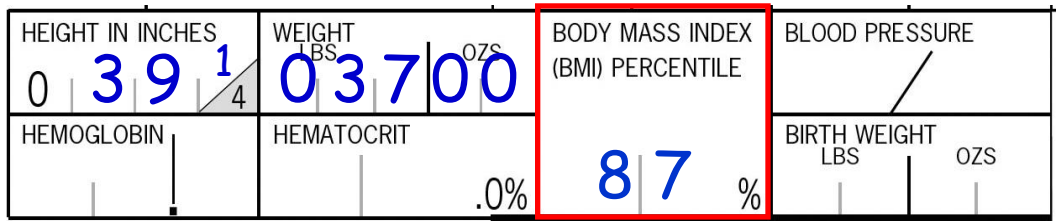
Let's Look at Liz

NEXT STEP

6. Record BMI Percentile on PM 160
   - *Estimate a whole number between 1 and 99 that best represents the percentile point plotted on the growth chart*



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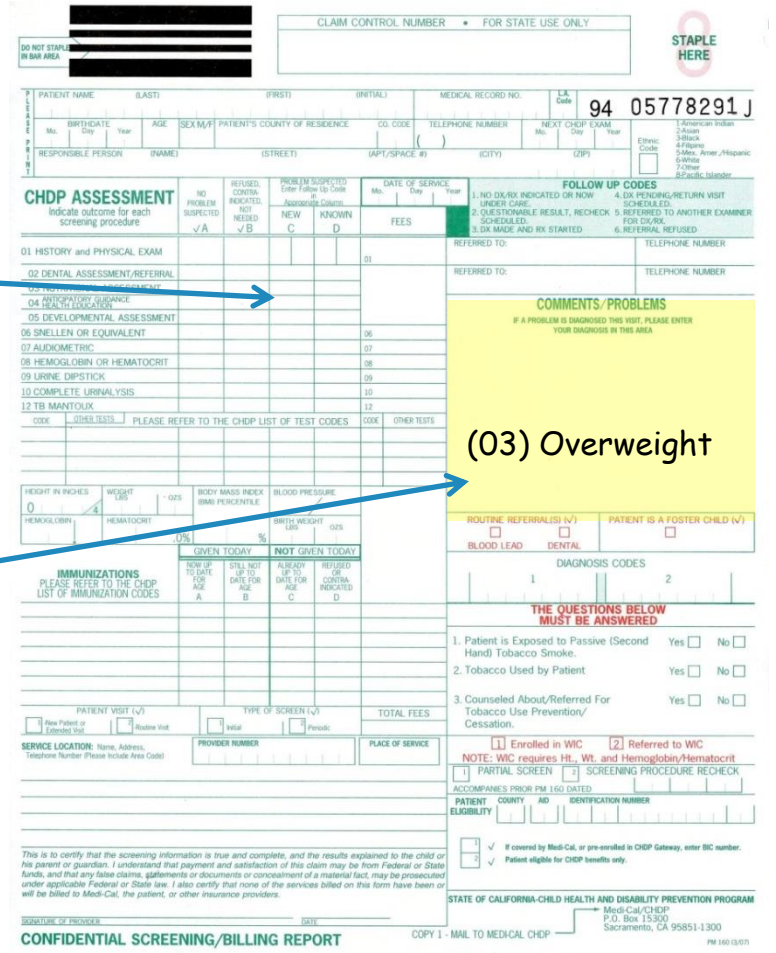
Let's Look at Liz

FINAL STEP

7. Determine category and record on PM 160 if needed
   - Enter follow up code in appropriate column under PROBLEM SUSPECTED
   - **Enter diagnosis under** COMMENTS/PROBLEMS
     - *Underweight*
     - ***Overweight***
     - *Obese*



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Graph Gabriela's Growth

FIRST STEPS

1. Select appropriate growth chart
2. Measure standing height
3. Measure weight

Date	Age	Weight	Stature	BMI*
	2	25 #	34 ½ "	14.8
	3	29 ½ #	38 ½ "	14.0
	4	32 ½#	41 "	

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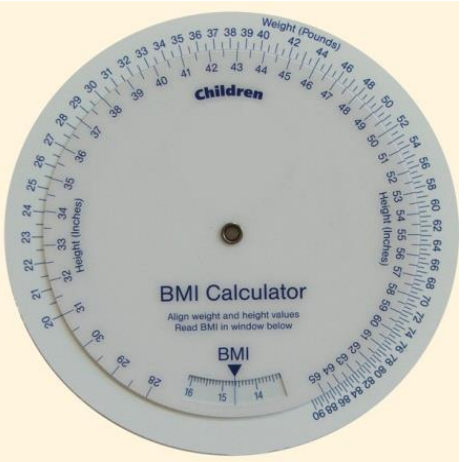
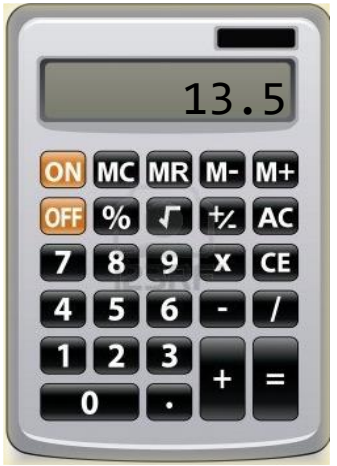
Graph Gabriela's Growth

NEXT STEP

4. Determine BMI Value

Date	Age	Weight	Stature	BMI*
	2	25 #	34 ½ ”	14.8
	3	29 ½ #	38 ½ “	14.0
	4	32 ½ #	41 ”	13.6





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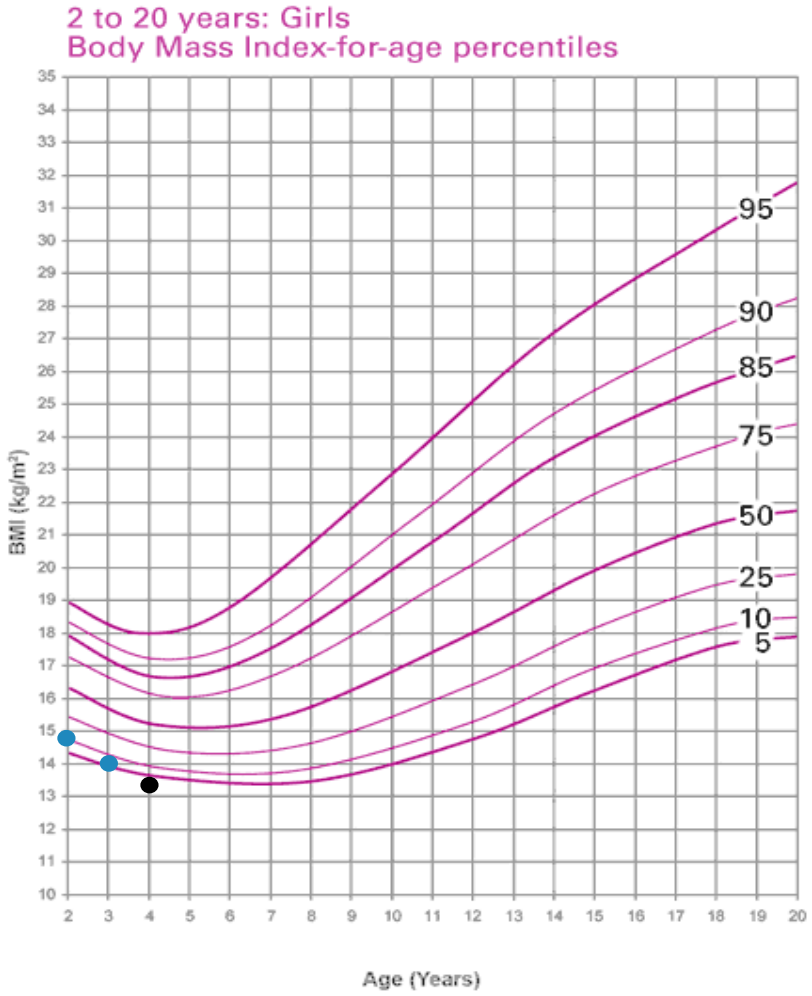
Graph Gabriela's Growth

NEXT STEP

5. Determine BMI-for-age percentile



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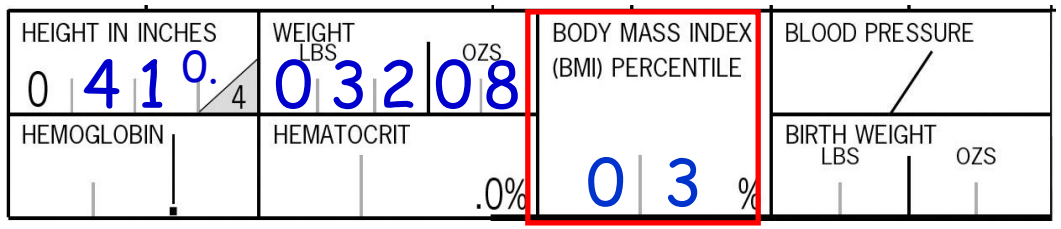
Graph Gabriela's Growth

NEXT STEP

6. Record BMI Percentile on PM 160
   - *Estimate a whole number between 1 and 99 that best represents the percentile point plotted on the growth chart*



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Graph Gabriela's Growth

FINAL STEP

7. Determine category and record on PM 160 if needed
   - Enter follow up code in appropriate column under PROBLEM SUSPECTED
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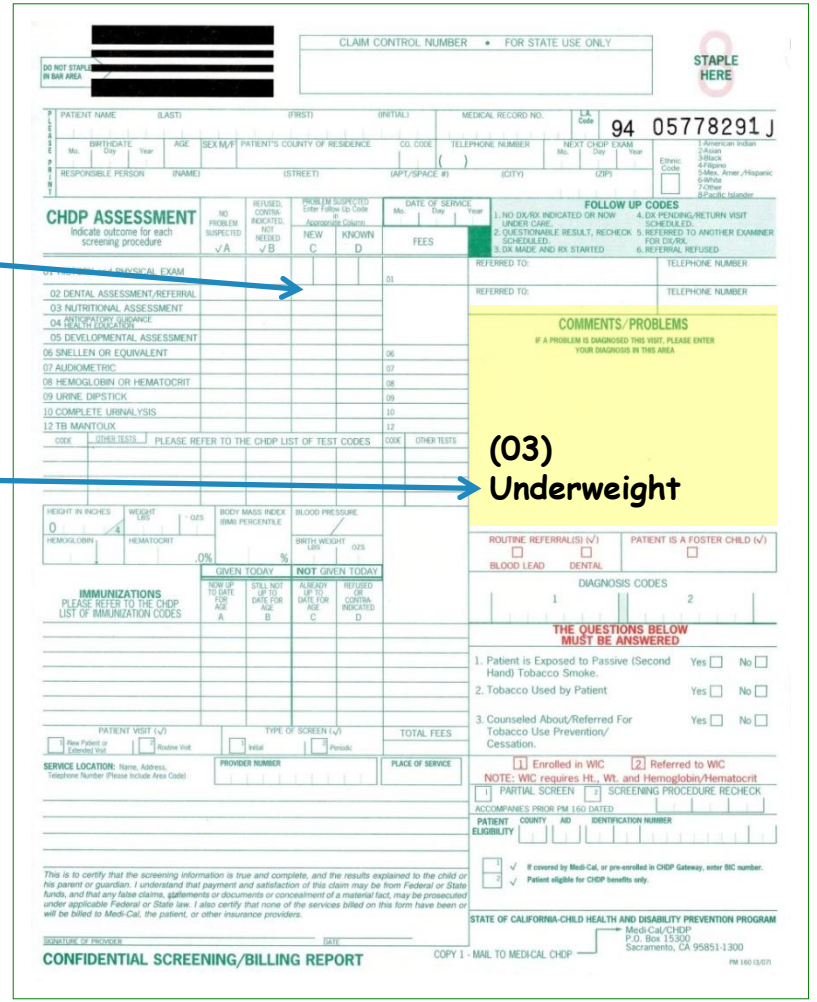
     - ***Underweight***
     - *Overweight*
     - *Obese*



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Resources & Clinical Tools

- Select appropriate ***growth chart*** for age group
- Identify the ***age range*** for which Body Mass Index (BMI) screening is used
- Calculate or determine ***BMI value***
- Plot ***BMI value*** on the appropriate growth chart
- Determine ***BMI-for-age percentile***
- Identify ***weight category***
- ***Record results*** on PM 160

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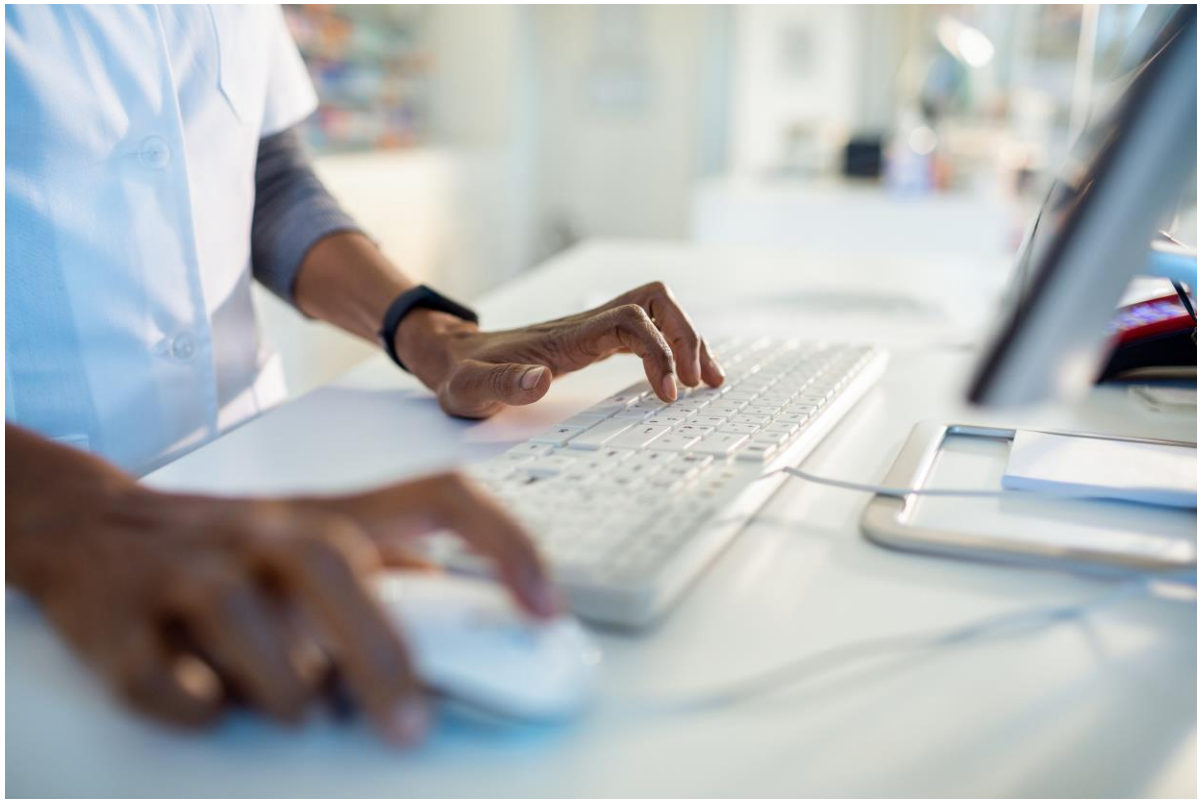
Resources & Clinical Tools

- Online tutorials
- Online resources
- Growth charts
- BMI wheels
- BMI calculators
- Plotting aids



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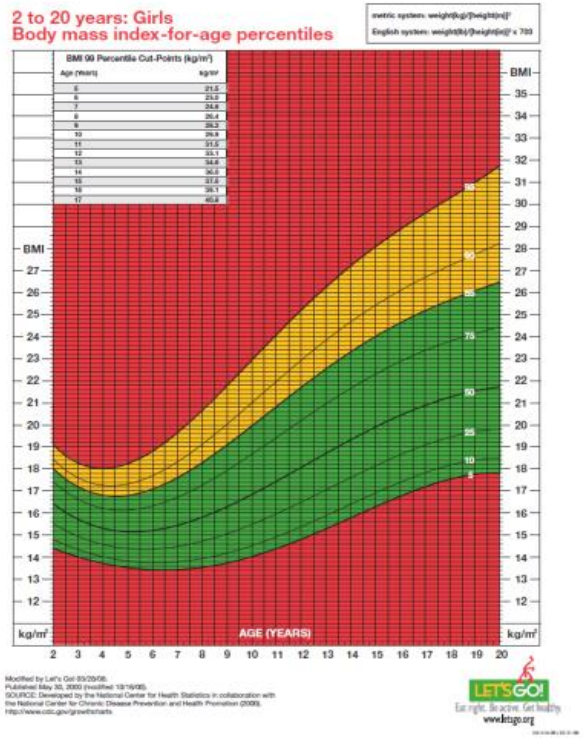
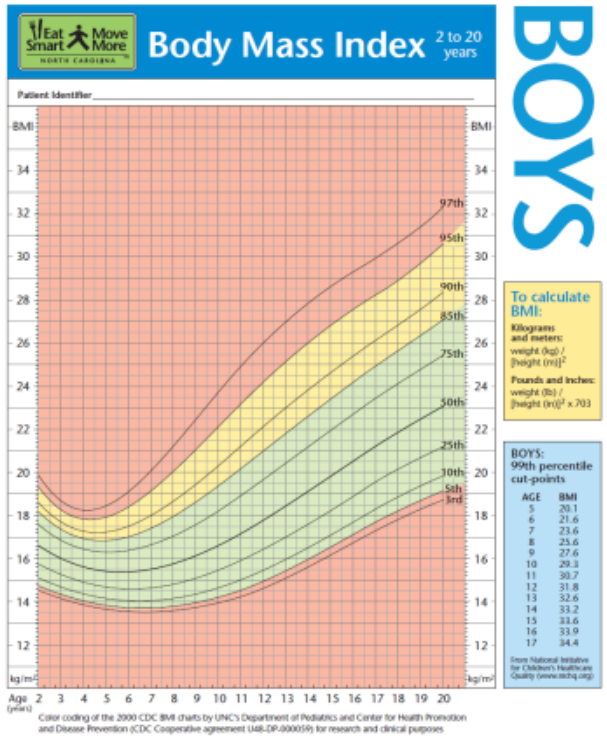
Color-Coded BMI Charts



[5210 Let's Go!]



[Eat Smart, Move More North Carolina]

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BMI Quiz

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TRUE or FALSE

When calculating BMI, the units must always be in imperial units only (pounds and inches).

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TRUE or FALSE

When calculating BMI, the units must always be in imperial units only (pounds and inches).

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What is not a cause of obesity?

A. Laughing
B. Genetics
C. Poor diet
D. Lack of exercise

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What is not a cause of obesity?

A. Laughing
B. Genetics
C. Poor diet
D. Lack of exercise

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Which four data points are needed to determine a weight status in a child?

A. Age, height, weight, gender
B. Height, weight, gender, body mass index
C. Age, weight, body mass index, gender
D. Height, weight, body mass index, age

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Which four data points are needed to determine a weight status in a child?

A. Age, height, weight, gender
B. Height, weight, gender, body mass index
C. Age, weight, body mass index, gender
D. Height, weight, body mass index, age

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Important Next Steps:

cencalhealth.org/providers/care-guidelines/medi-cal-for-kids-teens-services/

1. Please take a moment to work with your Clinical Trainer and walk through a BMI calculation process practice session.

2. Once complete, please submit the CenCal Health Training Acknowledgement Form to receive your BMI Training Certificate of Completion for your records.

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- Slide 19. US Department of Health and Human Services. Health Resources and Services Administration. Maternal and Child Health Bureau.
  Accurately Weighing and Measuring Infants, Children and Adolescents: Technique.

- Slide 28. UC Berkeley Longitudinal Study, 1973. Adapted from the
  CDC Growth Charts 2000 Slide Set. Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease and Prevention. 2002.

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