

# **WIC Anthropometrics Modules 1 & 2**

February 2012

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This text is intended to be used in conjunction with the online portion of these modules.

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# Module 1

## Introduction – Anthropometric Measurement

Anthropometrics – now there's a big fancy word. So what exactly does it mean? Anthropometrics simply means to take measurements of the body. In the WIC program, it means taking the heights, weights and lengths of women, infants and children so we can assess development. These measurements are an important step in helping WIC staff members determine if there's chance of health risk. Since these measurements are used by the WIC computer system to help identify risks, accuracy and precision are extremely important.





In this lesson, you'll learn how to:

- Define the term Anthropometrics.
- Describe the 4 factors that affect growth.
- Understand how to accurately measure heights, weights and lengths.
- Define Body Mass Index (BMI).
- Interpret growth charts for clients.

## Growth and Development Factors

It's no surprise the kids and adults come in many different shapes and sizes. If you look at kids in the same grade at any school, you'll see a dramatic difference in heights, weights and body sizes between girls and boys.

So what contributes to these growth and developmental difference? Refer to the following table for the four factors that influence growth and development.

|   |   |
|---|---|
| <b>Environment</b><br> | <ul style="list-style-type: none"><li>• Environmental factors include sunshine, quality and quantity of the food, water, and exposure to disease, illness and pollution.</li></ul>  |
| <b>Behavioral</b><br>  | <ul style="list-style-type: none"><li>• Behavioral factors include physical activity, exercise patterns and eating habits. Habits of the mother during pregnancy, such as smoking or drug use, are behavioral in nature, as well.</li></ul> |
| <b>Genetic</b><br>     | <ul style="list-style-type: none"><li>• Genetic factors include inherited family characteristics.</li></ul>   |
| <b>Hormonal</b><br>    | <ul style="list-style-type: none"><li>• Hormonal factors include such things as "morning sickness," commonly experienced by women during pregnancy, may affect early pregnancy weight gain.</li></ul>                                       |

## Measuring Weights of Infants

The first anthropometric measurement you'll be learning about is how to take the weight of an infant.

- Two types of scales used for infants: **digital** and **balance beam** (both equally accurate).
- Balance beam scale – manually adjust to determine weight.
- The infant scale is used for infants and children up to 24 months in age.
- Can be used for babies up to 36 months, if child cannot stand on his or her own

## Accuracy and Precision Measuring

The measurements you'll be making will be used to determine if a child is growing normally or if a woman is gaining the recommended amount of weight during her pregnancy. So if you make errors in your measurements, then the growth assessment provided to your clients will be in error too. This is why accuracy and precision play an important role.

Example:

Accuracy and precision. These two terms sound similar, but let's see how they differ when it comes to taking anthropomorphic measurements.

Let's say you took the weight of a child to be 12 pounds 3 ounces, and you reweighed and got 12 pounds 3 ounces again. Would you be accurate or precise? Precise - precision has to do with your ability to get the same result over and over. So what about accuracy? Do you think that 12 pounds 3 ounces would be accurate?

Let's say you forgot to ask the mother to check her child's diaper, and it was full. So even though you were very precise getting the same measurement, this measurement would actually be inaccurate because a full diaper could weigh up to two pounds.

## How to Measure Weights of Infants

Weighing an infant may sound easy, however mistakes can be easily made when not paying careful attention to detail. Use the following steps to weight infants.

1. Put clean paper cloth on scale
2. Balance the scale at zero (with paper sheet on tray)
  - Balance beam – place the main and fractional sliding beam weight directly over their zero positions.
  - Electronic scale – zero the scale. Make sure its set to measure pounds and not kilograms.
3. Have the caregiver undress the child, removing all outer clothing. It is recommended to **undress the child to only a dry diaper for accurate weighing** (a wet diaper can weight as much as 2 lbs.)
4. Place the infant/child lying in the center of the scale. Older children up to 24 months do better if places sitting in the center of the scale. Have the caregiver

help by keeping the infant stable and protected from harm (falling, etc.), but they should not touch or hold the infant while being weighed.

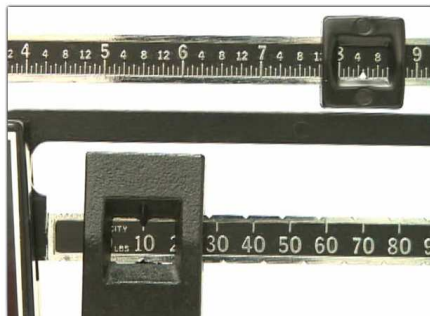
5. To take the reading on a balance beam scale, move the large counter balance on the main beam away from the zero position until the indicator drops showing that little to much weight has been added.
6. Read the weight to the nearest ounce.
7. Record the weight immediately in the participant's record. Today's date will default as the date the measurement was performed.
8. Return the weights to the zero position at the left-hand side of the scale to help maintain scale accuracy. Remove the disposable paper cloth.

Note: The scale should rest on a firm, flat, stable table and care must be taken protect the child from accidents throughout the procedure.

Sometimes a child may be unmanageable. Make every effort to obtain as accurate a measurement as possible. Inappropriate counseling and education may result from inaccurate measurements. As parent may worry unnecessary about poor growth or overweight in their child when the child's actually growing appropriately, or a true growth problem may not identified with incorrect measurements.

### **Reading a Balance Beam Scale**

Below is a close-up measurement take on a balance beam scale. The lower weight, which increases in ten pound units, was moved over one notch to the ten pound position. The top weight, which increases in pounds and ounces, was moved to the 8 pound, 5 ounce position. This child weighs 18 pounds, 5 ounces. The indicator arm is in the center and balanced.



### **Reading an Electronic Scale**

Electronic scales are a bit easier to read because they display the measurement for you; however, not all infant electronic scales display the same units of measurement. Electronic scales all display pounds, but they differ in how they display the smaller units, such as tenths of an ounce, tenths of a pound and quarter pound units. These smaller units can make a big difference in determining risk.

The image below shows an infant weight of 9 pounds, 5 and 5 tenths ounces.



### **Rounding Tenths of an Ounce**

If you use an electronic scale that displays units in tenths of an ounce, you will often need to round the tenths up or down, as many of the WIC computer systems only take pounds and ounces.

- Anything 5 or greater gets rounded up to the next highest number.
- Anything 4 or less gets rounded down.

### **Measuring Weights of Children and Adults**

Just like with infants, balance beam and electronic scales are used to weight women and children in the WIC program. Most balance beam scales will display units in pounds and ounces. Electronic scales could display in pounds and ounces, pounds and tenths of a pound and pounds and quarter pounds. Once again, make sure you check with your supervisor or another WIC staff member as to the units your scale displays.

### **Measuring Units on Electronic Scales (Adults/Children)**

When weighing adults and children using electronic scales, you will often have to convert measurements. To meet your WIC computer system requirements, you may need to convert tenths of a pound to ounces or quarter pounds to ounces. To help, we've supplied the following conversion tables.

| <b>Converting Tenths of a Pound to Ounces</b> |                         |
|---|-------------------------|
| <b>Tenths of a Pound</b>                      | <b>Ounce Equivalent</b> |
| .1  | 2                       |
| .2  | 3                       |
| .3  | 5                       |
| .4  | 6                       |
| .5  | 8                       |
| .6  | 10                      |
| .7  | 11                      |
| .8  | 13                      |
| .9  | 14                      |

| <b>Converting Quarter Pounds into Ounces</b> |                         |
|--|-------------------------|
| <b>Quarter Pound Displayed</b>               | <b>Ounce Conversion</b> |
| ¼ pound                                      | 4 ounces                |
| ½ pound                                      | 8 ounces                |
| ¾ pound                                      | 12 ounces               |

### **State Requirements**

Requirements for anthropometric measurement may vary from state to state. Oregon WIC requires only one measurement. Obtain a second measurement if there is a concern about the accuracy of the initial measurement. .

### **Common Errors in Weighing**

Weighing women, infants and children may sound simple, but mistakes can be made. Avoiding common errors will help make the most accurate health assessment possible. Most common errors in weighing:

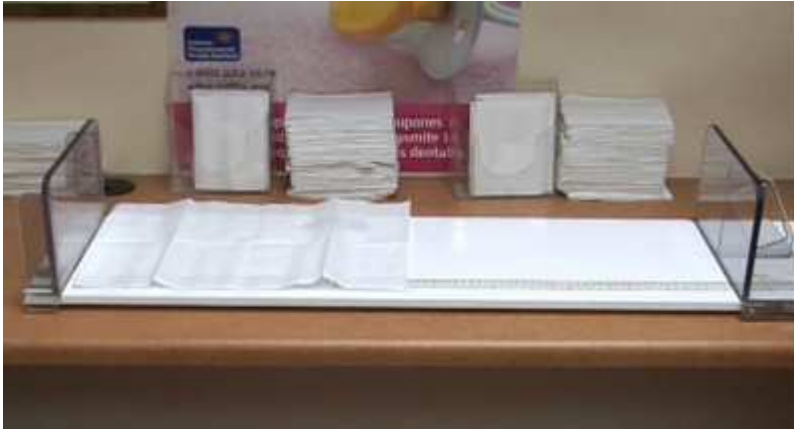
- Outer clothing not removed.
- Shoes not removed.
- Child weighed with wet or soiled diaper.
- Electronic scale not set to zero before weighing.
- Units switched to kilogram, not pound.
- Quarter pound or tenth of a pound measurements not properly converted.
- Child or adult not in center of scale or moving around or holding onto an object or a person.
- Using the wrong equipment, such as a bathroom scale.
- Poorly maintained equipment.
- Equipment not properly calibrated.
- Reading & recording measurements incorrectly.

### **Measuring Recumbent Lengths of Infants**

The recumbent length board has a fixed headpiece and sliding footboard that rests against the infant's feet. The foot area is where you'll read the measurement. Units for this measurement are entered into the computer system as inches and eighths of an inch, such as 20 and 3/8 inches.

- Recumbent length is the "lying down" measurement.
- Used for infants and children up to 24 months (because they can't stand on their own).
- Infants over 24 months that can stand obtain height, not length.
- Can be used with older children if that have trouble standing on their own (developmental disability).





To measure recumbent length accurately -

1. Two people should help with the measuring.
2. Put a clean paper liner on measuring board.
3. Have the caregiver undress the child, removing outer clothes and shoes. At a minimum, remove outer clothing such as jackets, hats, etc. Have the mother/caregiver make sure the diaper is dry; change it if needed.
4. Have the caregiver lay the child's back flat against the measuring board.
5. Have the caregiver hold the child's head against the headboard. The child's eyes should be looking up at the ceiling..
6. The WIC staff member can then bring the child's knees together and gently push them down, so that both legs are extended; one of their hands should rest on the child's knees or shins to prevent the child's legs from spreading apart or bending, while the other hand brings the movable footboard to rest firmly against both heels. The toes should point upward and feet need to be flat against the footboard.

Note:

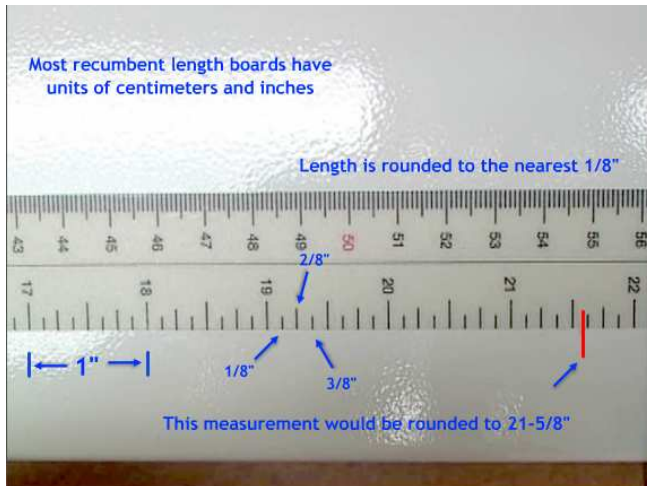
Babies' legs are difficult to straighten – DO NOT FORCE THE LEGS FLAT, AS THE LEGS CAN BE INJURED. You can “pedal” the baby's legs in a circular motion to loosen them up. You can also stroke the bottom of the baby's feet to get the toes to point upward

7. Read the measurement to the nearest 1/8” of an inch. (Check your state's requirement.)
8. Immediately record the measurement in the baby's record. Additionally, record anything that could affect the measuring process, such as a child that won't keep still

### **Reading Measurement on a Recumbent Length Board**

Each 1 inch increment on the recumbent length board is broken down into 1/8ths of an inch. You'll need to round up or down if the measurement is in between eighths.

- Each measurement is taken to the nearest 1/8 of an inch.
- Anything beyond the halfway point gets rounded up to the next highest eighth, anything below gets rounded down.



### **Common Errors in Measuring Recumbent Lengths**

As with weighing, common errors can be avoided by planning ahead. Most common errors in measuring recumbent length:

- Incorrect equipment for the age of the child.
- Shoes, hats and hair accessories not removed.
- Board not firmly against both heels.
- Feet not parallel to movable board.
- Head not firmly against headboard; remove braids barrettes, ponytails or anything that prevents board from resting against the head. If unable to do so, record in your WIC computer system.
- Body not straight.
- Eyes not looking forward.
- Body or knees arched or bent.
- Only one leg extended.
- Board not on flat surface.

### **Taking Heights of Children 24 Months or Older**

- Children can grow quickly.
- Take heights of children 24 months and older using stadiometer, if child can stand.
- Height is used to calculate Body Mass Index (BMI).
- BMI important number to determine if child is at risk for nutrition-related concerns.

### **Measuring Heights of Adults and Children**

To measure the heights of adults and children, you'll use a device called a stadiometer.

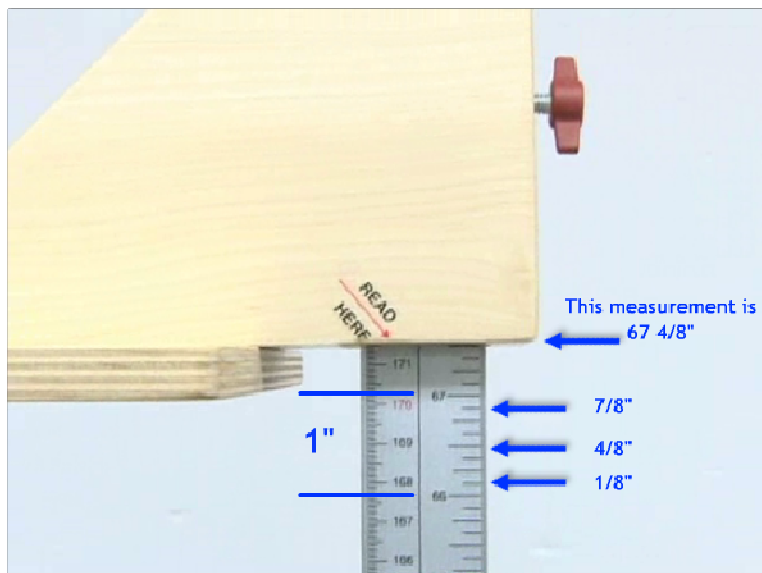
Use the following steps for taking measurement using a stadiometer:

1. Remove shoes, hats and hair accessories and flatten large hairstyles when possible.
2. The child or adult should stand tall and straight, with shoulders level, hands at sides, knees or thighs together (whichever touches first), and feet flat on the floor or foot piece. The position of the body should follow the mid-axillary line where the ear lines up with the middle of the shoulder and the middle of the arch in the foot.
3. To take the measurement, stand directly to the side of the child or adult. Place your hand firmly on the participant's chin.
4. Look at the middle of the participant's ear (the hole) and line it up with the bone of the eye socket (just below the eye). This may cause the participant to be looking slightly downward. It will allow you to appropriately measure the crown of the head.
5. Lower the headboard (or measuring device) until it firmly touches the crown of the head and creates a right angle with the measurement surface. Ensure that the lower body stays in position by firmly pressing hands on knees and thighs.
6. Read the stature to the nearest 1/8 of an inch and record in the participant's record.

### **Reading the Manual Stadiometer**

Each increment on the manual stadiometer is broken down into 1/8ths of an inch, just as in the recumbent length boards – so you will need to round up or down in your measurement that fall between 1/8ths.

Each stadiometer has a “read here” or designated line to mark the measurement.



## **Reading the Digital Stadiometer**

Digital stadiometers make taking heights pretty easy. Just move the headboard up and down and the measurement adjusts on the display. However, since it is a digital display, you'll need to convert the decimal values into 1/8ths of an inch. Use the following table to help with conversion.

| <b>Decimal</b> | <b>1/8<sup>th</sup></b> |
|----------------|-------------------------|
| .125           | 1/8                     |
| .25            | 2/8                     |
| .375           | 3/8                     |
| .5             | 4/8                     |
| .625           | 5/8                     |
| .75            | 6/8                     |
| .875           | 7/8                     |

## **Common Errors in Height Measurements**

As in measuring for weight, common errors occur, but with planning ahead, many can be avoided.

Most common errors in measuring height:

- Incorrect equipment for the age of the child.
- Shoes and hats not removed.
- Feet not straight or flat on floor.
- Shoulder, buttocks, head, and heels not firmly against backboard.
- Head not held straight or eyes not looking forward.
- Head not firmly against headboard; remove braids, barrettes, pony tails or anything that prevents board from resting against the head. If unable to do so, record in WIC computer system.
- Knees bent.

## **A Client's Previous Documentation**

If a mother or caregiver comes in with previous weight, height and/or length documentation from a previous health care provider, you can use the information using the following guidelines:

- The documentation must have been taken within the last 60 days, and must reflect current health status (i.e., was the woman pregnant then?).
- The documentation must be official paperwork from a health care provider, like a physician's prescription pad, letterhead or a computer printout with the doctor's name/address on it.
- Make sure to enter these measurements into the WIC computer system using the date on which they were taken; this contributes to the overall health assessment.
- You can still take anthropometric measurements that day, if possible; however, this is not mandatory, but suggested. The more measurements we have on our clients, the better we can assess their growth.

## **Summary**

In this lesson you learned:

- Four factors that affect growth.
- How to take anthropometric measurements.
- Check with supervisor and/or agency's policy manual.
- When to use previous client documentation.

## Module 2

### **Introduction - Understanding Body Mass Index & Growth Charts**

Now that you've learned how to take anthropometric measurements, it's time to learn how to interpret data using growth charts that illustrate growth patterns for children and adults.

Growth charts:

- Are used to assess physical growth using national standards.
- Are used to assess physical growth across age and gender.

### **Growth Charts**

For purposes of interpreting growth charts in WIC, we'll use two types of growth charts.

Growth charts:

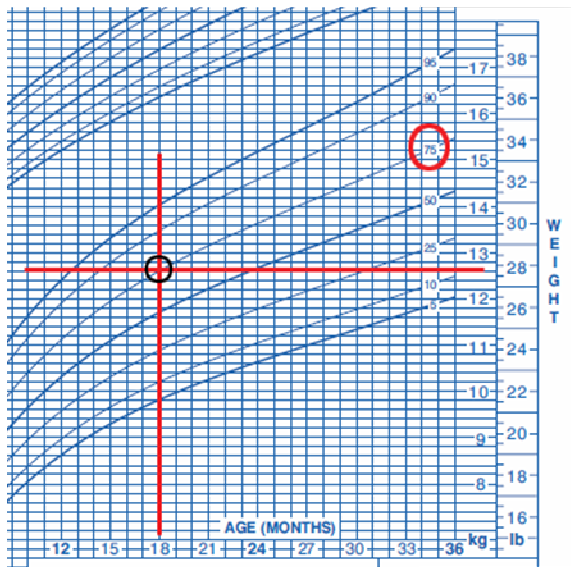
- Children under 24 months: percentiles on the World Health Organization (WHO) charts are used to show how a child is growing compared to other children their age.
- Children 24 months or older: percentiles and Body Mass Index (BMI) on the Center for Disease Control (CDC) charts are used to show how a child is growing compared to other children the same age.
- In Oregon, the WIC computer system selects the appropriate growth charts to display based on the child's age

### **Understanding Growth Charts**

To interpret growth charts for children less than 24 months of age, it's important to understand what a percentile is, so let's plot a point for an 18-month-old boy weighing 28 pounds (using the chart pictured below). It's important to note that only a percentile, not Body Mass Index or BMI for short, is used for children less than 24 months.

To determine the child's percentile, find the boy's age on the chart (18 months). Second, find the boy's weight (28 pounds). The intersection of these two points shows the percentile. In this case, the intersection of the lines falls directly on the line marked 75. So what does this 75 mean?

It means that the child is heavier than 75 percent of boys his age. Only 25 percent of boys his age weigh more. Is this normal? Yes. Anything between the 2<sup>nd</sup> and 98<sup>th</sup> percentiles is considered normal for a child between birth to 24 months of age, and between the 10<sup>th</sup> and 90<sup>th</sup> percentiles is considered normal for children over 24 months of age. It is also normal for children to remain on or near the same percentile curve as they age. Yes, there is some variation to this, as each individual child's growth pattern is unique, but a few percentiles up or down isn't uncommon; however, if a child has a dramatic change, such as a 25% change or more, it may require more assessment.



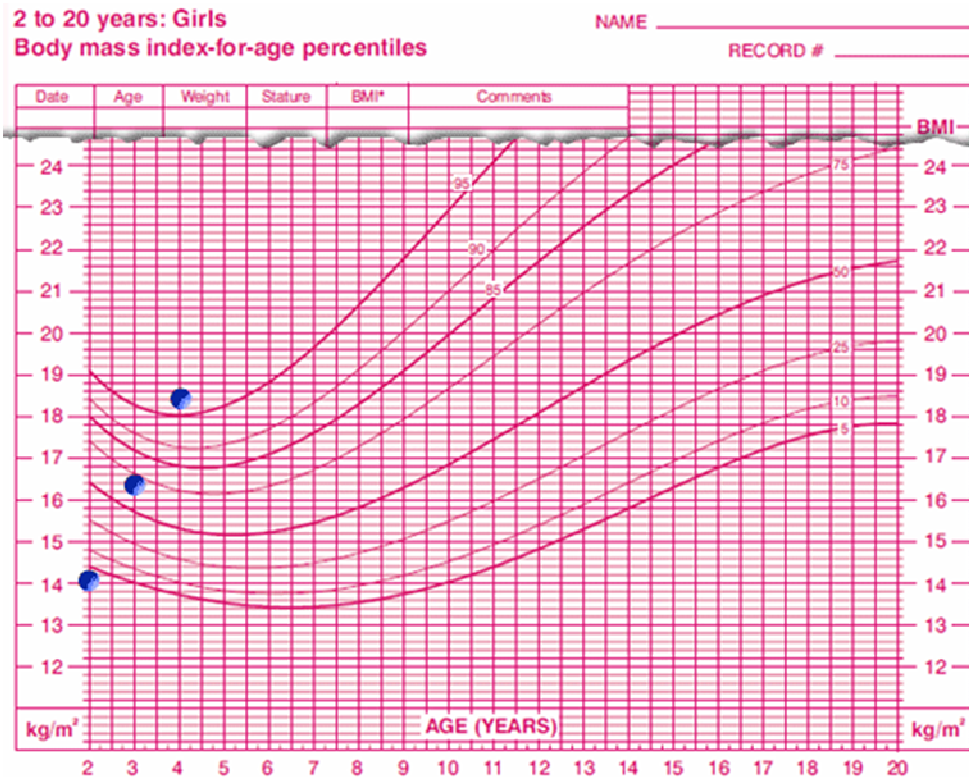
### Understanding Growth Charts using BMI

For children 2 years (24 months) or older who can stand on their own, Body Mass Index (BMI) for age is used to determine percentile on growth charts.

Body Mass Index is a calculation using heights and weights. It is used to compare kids as they grow. Body Mass Index is also used for adults to assign them to categories like Obese, Overweight, Normal and Underweight. Similar categories are used for children; ask your supervisor for the most current guidelines.

$$\text{Body Mass Index (BMI)} = \frac{\text{Weight (lbs)} \times 703 \div \text{Height (in)}}{\text{Height (in)}}$$

Examples:



**Example 1:** This point shows a 3-year-old girl with a BMI-for-age at the 40th percentile. Because this falls between the 10th and 90th percentiles, this is considered a normal BMI-for-age for a 3-year-old girl. This means that she has a higher BMI-for-age than 40% of other 3-year-old girls and a lower BMI-for-age than the other 60%.

**Example 2:** This point shows a 4-year-old girl with a BMI-for-age at the 98th percentile. Because it is above the 95th percentile, this 4-year-old girl is categorized as overweight. This means she has a higher BMI-for-age than 97% of other girls that age and a lower BMI-for-age than the other 3%.

**Example 3:** point shows a 2-year-old girl with a BMI-for-age at the 3rd percentile. Because it is below the 5th percentile, this 2-year-old girl is categorized as underweight. This means she has a lower BMI-for-age than 97% of other girls that age and a higher BMI-for-age than the other 3%.

### Accuracy of Taking Measurement

- Accuracy is important to calculate BMI.
- Inaccurate BMI leads to an incorrect health assessment.
- BMI is NEVER calculated for children less than 24 months.
- Weight loss is NEVER recommended for children less than 24 months.



## **Children with Special Needs/Considerations**

Every now and then, you'll come across a child that has special needs. Those children with birth defects or congenital disorders, such as Downs Syndrome, fall into this category. Also, you may also come across a child that has been diagnosed as Failure to Thrive or FTT.

- May be difficult to assess child's growth using standard growth charts.
- Consult with the nutritionist at your clinic or your supervisor as to how you should take heights and weights.

## **Pregnancy and Prenatal Weight Gain**

The official medical term for weight gain during pregnancy is gestational or prenatal weight gain. As a WIC staff member, you'll be monitoring this weight gain throughout your client's pregnancy.

With pregnant women, the pattern of weight gain, such as two pounds in one month and three pounds the next, is just as important as the total amount of weight gained, as both the pre-pregnancy weight and the total weight gained during pregnancy affect fetal growth and the infant's birth weight. It's also important to note that a woman increases her chance of having a healthy pregnancy and delivery by gaining a healthy amount of weight.

- Recommended weight gain based upon pre-pregnancy BMI (calculated by height and pre-pregnancy weight).
- Ask her pre-pregnancy weight to determine pre-pregnancy BMI.
- Enter pre-pregnancy weight and height into WIC computer system to get pre-pregnancy BMI – you can then determine target weight gain range using the table below.

| <b>Pre-Pregnancy Weight Status</b> | <b>BMI</b>      | <b>Weight Gain* (pounds)</b> | <b>Weight Gain For Twins</b> |
|------------------------------------|-----------------|------------------------------|------------------------------|
| Underweight                        | BMI < 18.5      | 28-40                        | Undetermined                 |
| Normal Weight                      | BMI 18.5-24.9   | 25-35                        | 37-54                        |
| Overweight                         | BMI 25.0-29.9   | 15-25                        | 31-50                        |
| Obese                              | BMI $\geq$ 30.0 | 11-20                        | 25-42                        |

\*Not every woman's weight gain is going to fall within these ranges.

## **Special Considerations: Pregnancy and Prenatal Weight Gain**

The following are some special considerations when it comes to pregnancy and weight gain:

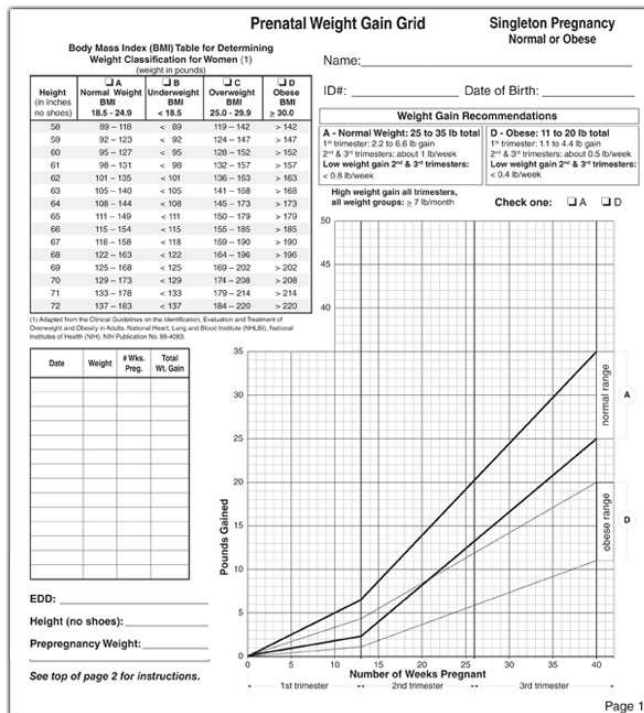
- Weight gain goals for underweight women are higher than those for normal weight or overweight women.
- Women who are underweight before pregnancy tend to have smaller babies than heavier women, even when both women gain the same amount of weight during pregnancy.

- Overweight women do not need to gain as much weight to deliver a normal weight baby.
- A slightly lower or higher rate of weight gain than recommended is not cause for alarm, as long as there is a progression toward the recommended goal.

## Understanding Prenatal Weight Gain Charts

### Gestational/Prenatal Weight Gain

- Prenatal weight gain grids are helpful visual tools to determine if your client's weight gain is within the recommended range (shown below).
- In Oregon, the WIC computer system will display the appropriate prenatal weight gain chart based on the participant's pre-pregnancy weight.

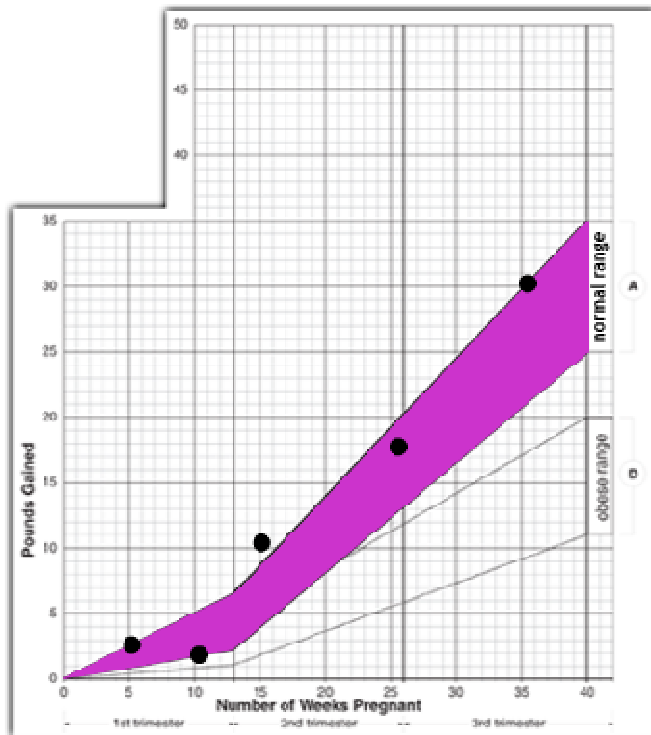


## Understanding Prenatal Weight Gain Charts (example)

A client come in whose pre-pregnancy BMI showed she was of a normal weight. The recommended amount of weight gain for this client would be about 25-35 pounds, which corresponds to the shaded pink region.

On her first visit to the office, right around week five, her weight gain was about five pounds, slightly above the recommended amount. On her next visit, it was five pounds again, a pound or so under what's recommended for that visit. On the next three visits, she pretty much stayed on track for her target amount. Can you do this for underweight or overweight women? You bet. The only difference would be the shaded region, and where their weight falls on it.

As you can see, prenatal weight gain grids are a useful tool allowing you to quickly assess if your client's weight gain puts her at risk or if it is within the recommended range.



## Trimesters

From a prenatal weight gain grid, you can see that weight is slowly gained – only a few pounds in the first trimester - but then a steady 1/2 pound to 1 pound per week in the second and third trimesters. The recommended amount of weight gain per trimester depends upon pre-pregnancy BMI.

- Three trimesters or 40 weeks is a full-term pregnancy
- Trimester: a period of about 13 weeks

## Premature Births

Babies born at or before 37 weeks of gestation are or 21 or more days before the expected due date are considered premature.

- In Oregon, completing the information in the gestational age area of the medical data screen will allow the computer system to create adjusted age graphs for preterm infants..
- For infants and children up to 2 years of age who were born prematurely, the **Short Stature** risk assignment is based on adjusted gestational age.

## **Adjusted Gestational Age**

In most cases, when a pregnant woman comes in for certification, she will most likely have seen her doctor and have a given due date.

- Due date also called Expected Date of Delivery or Expected Date of Confinement – typically 40 weeks from her last period.
- For premature babies, we calculate Adjusted Gestational Age – because these babies were born early, they've had less time to develop. Adjust growth measurements including size and developmental milestones to match adjusted gestational age.
- For more information, check with your supervisor.

Examples:

Let's say Sara was born at week 30, and her mother brings her in 2 weeks after her due date (considered week 42). Now, you might think Sara is 12 weeks old, which is true in a way; this is her chronological age. But since a full-term pregnancy is 40 weeks long, and it's now two weeks beyond that date, her adjusted gestational age is 2 weeks.

## **Recap: The Importance of Anthropometric Measurement**

Here's a recap as to why taking accurate height and weight measurements are so important. Taking accurate measurements will allow you and others to:

- Identify women, infants, and children at risk for health problems.
- Provide counseling to prevent and correct nutrition-related health problems.
- Discuss growth and development of infants and children with their parent/caretaker.
- Counsel pregnant women on their weight gain.
- Evaluate the effectiveness of the nutritional counseling being offered.

## **Summary**

In this lesson you learned:

- .
- Different growth charts are used for children at different ages.
- Prenatal growth charts are used for pregnant woman.
- Pre-pregnancy BMI determines pregnancy weight gain.
- Adjusted gestational age is used for premature births.

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