

Anthropometric Manual Minnesota WIC Program

Minnesota Department of Health

Revised October 2012



Division of Community and Family Health
Supplemental Nutrition Programs
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Module Guidance

1. Read the knowledge and the performance objectives (pages 4 -5) of this module.
2. As you read the module, STOP when you come to a “Self-Check” section.
3. When you come to a “Self-Check” section, complete it right away.
4. Check your answer with the “Self-Checks” against the ANSWER KEY at the end of the manual.
5. For any incorrect answers, or for questions that you find difficult, re-read the appropriate section of text to clear up any confusion. Then move to the next section. If still confused, consult your WIC Coordinator (or designated trainer), or if necessary, your nutrition consultant.
6. Review any supplemental materials that are recommended.
7. After you have successfully completed a section, arrange with your agency WIC Coordinator (or designated trainer) to observe experienced staff demonstrating the procedure, and then demonstrate the knowledge and skills you have learned.
8. After successfully demonstrating the skills, move on to the next section.

Good Luck!

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Introduction

Anthropometry refers to measurements of the body, such as for example, length or height, weight and head circumference. Length refers to the measurement of infants and young children while lying down (referred to as recumbent measurement). Height refers to a standing measurement, which is the method used for children over two years of age and women. Height is sometimes referred to as stature. In WIC, weight and length (for infants and children up to age two) or standing height (for children over two years and women) are measured at specific times depending on age and WIC type as part of the nutrition assessment process. Children's measurements are compared to a comparison population using a growth chart. Women's measurements are compared to weight standards and during pregnancy weight gain or loss is plotted on a pregnancy weight gain grid.

At specified intervals (every six months for children), a nutrition assessment is conducted as part of the certification process for all WIC participants. Much can be learned about the nutritional status and general health of WIC applicants and participants when these measurements are used along with hematologic data and diet and health information that are gathered during the certification process. The certification process determines eligibility to participate in the WIC program and thus each aspect of the nutrition assessment must be done during the certification. The nutrition assessment is at the heart of WIC, it is through the assessment that staff identifies any health issues that should be addressed through education, referrals or the food package.

You have an important role in helping parents and caregivers determine whether their children are growing normally. Information you are expected to know is listed on the next page entitled, "Objectives of the Anthropometric Assessment Module." The skills that you will need to appropriately demonstrate and document are listed on the page entitled "Performance Objectives".

Objectives of the anthropometric assessment module

Knowledge Objectives

The CPA will be able to:

1. List four reasons for assessing the weight and length/height of WIC applicants/participants.
2. List three factors that influence the growth of infants and children.
3. List three factors that influence weight gain patterns during pregnancy.
4. Describe appropriate weighing techniques for women, infants, and children.
5. Describe appropriate techniques for measuring length and height.
6. Describe (or find reference that describes) features of equipment that may be used in WIC.
7. Describe how to designate that a measurement was done on a date different than the certification date.
8. List two common errors made when measuring length and height.
9. List two common errors made when measuring weight.
10. Identify at what ages it is appropriate to measure children's length (in a recumbent position) vs. height (in a standing position).
11. Identify how to record height, length and weight.
12. Describe what the various WHO and CDC growth grids tell us.
13. Describe what the pregnancy weight gain grids tell us.
14. List WIC criteria used to define normal versus abnormal growth patterns of children.

Performance Objectives

The CPA will be able to:

1. Observe other staff members weigh and measure four (4) children and two (2) pregnant women.
2. Explain the purpose and procedure for measuring weight and length/height of infants/children of different ages.
3. Explain the purpose and procedures for measuring women.
4. Measure weight and length/height of two (2) children, two (2) infants and two (2) women using appropriate procedures
5. Record weight and length/height measures in the data processing system.
6. Designate in the data processing system that a measurement was done as recumbent, and the actual date of collection of referral data.
7. Reviewing the growth grids, determine if the growth patterns of the two (2) children, two (2) infants are normal or if the patterns indicate short stature, underweight, or overweight.
8. Evaluate a pregnant women's pre-pregnancy weight status, and make appropriate recommendations for weight gain during her pregnancy.
9. Using the pregnancy weight gain grids, determine if the two pregnant women are gaining weight at an appropriate rate.
10. Explain appropriately and adequately to the parents/caregivers of the four (4) children, the results of their anthropometric assessment, and to the two pregnant women, the results of their weight gain assessment.

Glossary

Anthropometry	Anthropometry is the science of weighing and measuring the body. The anthropometric measurements used in WIC are standing height, recumbent length, and weight.								
BMI	<p>Body Mass Index (BMI) is a measure that adjusts bodyweight for height. For children, BMI is age and gender-specific. It is calculated as weight in kilograms divided by height in meters squared. The resulting value is compared to reference cut-off points that designate weight status.</p> <p>The weight classifications of BMIs for adults are:</p> <table><tr><td>< 18.5</td><td>underweight</td></tr><tr><td>≥ 18.5 to 24.9</td><td>healthy weight</td></tr><tr><td>≥ 25 to 29.9</td><td>overweight</td></tr><tr><td>≥ 30</td><td>obese</td></tr></table> <p>The cut-off points for children's BMI vary by age, so that a particular BMI value may fall in a different category at different ages. The BMI Growth Chart is used to evaluate a child's BMI value.</p>	< 18.5	underweight	≥ 18.5 to 24.9	healthy weight	≥ 25 to 29.9	overweight	≥ 30	obese
< 18.5	underweight								
≥ 18.5 to 24.9	healthy weight								
≥ 25 to 29.9	overweight								
≥ 30	obese								
BMI Growth Chart	<p>In 2000 the Centers for Disease Control and Prevention developed BMI charts for children, 2 to 20 years of age. These charts represent a large reference population and show how a child's BMI compares to the BMI of other children, the same gender and age. The charts show the percentile distribution of BMI by age.</p> <p>Weight classifications by BMI percentile for children:</p> <table><tr><td>≤ 10th percentile.....</td><td>underweight or at-risk of underweight</td></tr><tr><td>11th to 84th</td><td>normal weight</td></tr><tr><td>85th to 94th</td><td>at-risk for overweight</td></tr><tr><td>≥ 95th percentile.....</td><td>overweight</td></tr></table>	≤ 10 th percentile.....	underweight or at-risk of underweight	11 th to 84 th	normal weight	85 th to 94 th	at-risk for overweight	≥ 95 th percentile.....	overweight
≤ 10 th percentile.....	underweight or at-risk of underweight								
11 th to 84 th	normal weight								
85 th to 94 th	at-risk for overweight								
≥ 95 th percentile.....	overweight								
Frankfort Plane	An imaginary line used to correctly position an individual's head for measuring both recumbent length and standing height. Visualize a straight line along the side of the head from the opening in the ear to the lower bone of the eye socket. For measuring in the recumbent position, this line should be perpendicular (i.e., at a right angle) to the surface of the measuring board under the child's head. For standing height, this line should be parallel to the floor (i.e., at a right angle to the surface of the measuring board behind the child's head).								
Growth Charts	A tool (also referred to as a growth grid) for comparing an individual child's growth with a reference population. The charts are specific for measurement position, age and gender. See BMI Growth Chart.								

Percentiles	A number, on a scale from 0 to 100, reflecting the relative position a measurement lies in a range of values. Percentiles are commonly used to compare an individual's anthropometric measurements to a reference population. For example, if a child has a weight-for-height value that is plotted at the third percentile, then 97% of the population of the same age, gender and height, weigh more than that child.
Recumbent Length	The distance from the crown of the head to the bottom of the heels when the subject is measured lying down.
Standing Height	The distance from the crown of the head to the bottom of the heels when the subject is measured standing upright, also referred to as stature.
Weight Gain Charts	Charts developed by the Institute of Medicine used to assess weight gain during pregnancy. Weight gain is assessed and monitored during pregnancy because better pregnancy outcomes are associated with differing weight gain amounts that vary based on the woman's weight status prior to pregnancy. Women who were <i>underweight</i> prior to pregnancy are encouraged to <i>gain more</i> weight than women who were normal weight prior to becoming pregnant and <i>overweight</i> women are encouraged to <i>gain less</i> than normal weight women.
Weeks Gestation	The number of weeks that have passed since the first day of the woman's last menstrual period; the duration of the pregnancy thus far.

Part I: Anthropometric measurements done in WIC clinics and factors affecting health, growth and pregnancy

Anthropometric measurements done in WIC clinics

The length/standing height and weight is measured for all WIC applicants and participants during the assessment phase of the certification process. The information gathered during the assessment is used to determine program eligibility and to determine what education and referrals should be provided to the participant/parent/caretaker. If the anthropometric measurements indicate a potential or overt problem, WIC staff will address this by providing education, nutritious foods and referrals at the time of the certification. A plan for follow-up to monitor progress with the issue will be created.

High quality measurements are essential to provide accurate information so that beneficial education and referrals can be made. If measurements are done poorly, incorrect assessments may be made, leading to incorrect education and counseling. A parent may worry unnecessarily about poor growth or overweight when the child is actually growing appropriately, or a true growth problem may not be identified. Multiple measurements done over time at WIC clinic visits will provide a more complete and more accurate picture of individual children's or women's growth and health.

Quality accurate measurements are also important because individual WIC participants' anthropometric measurements that are done in WIC clinics are combined to create reports. These reports describe the WIC population for the WIC community, and these reports are used by decision makers to inform future policy and priorities.

Factors affecting growth, development and pregnancy outcomes

Children's health, growth and development, and the health of women and their pregnancies including weight status and weight gain during pregnancy are influenced by several interacting factors including:

- Environmental factors – for example:
 - quality of dietary intake (excess juice or sugary beverages, inadequate protein)
 - quantity of dietary intake (excess or inadequate calories)
 - presence of disease (frequent colds &/or frequent use of antibiotics may cause diminished appetite or poor absorption secondary to diarrhea)
 - exposure to environmental toxins (lead, second hand smoke and other pollution)
- Behavioral factors – for example:
 - active vs. sedentary lifestyle (imbalance of calories)
 - smoking (appetite suppression, organ damage and poor oxygen circulation)
 - drug and/or alcohol use (appetite suppression, direct effects of the drugs and diminished ability to care for themselves and their children)
 - timing of weaning (dental damage, appetite suppression and excess calories)
 - dental hygiene (dental damage and impact on ability and desire to eat and chew)
 - taking or not taking prenatal vitamins
- Genetic factors (i.e., inherited family characteristics)

- Hormonal factors (e.g., hormonal changes that are partly responsible for the "morning sickness" that many women experience early in pregnancy)

Among preschoolers, environmental and behavioral factors are most likely to cause differences in growth among children of similar age and gender. On the positive side, there is greater ability to influence these factors and thus improve health outcomes.

In Summary:

It is important that WIC staff use good quality, well maintained equipment and follow correct procedures when measuring weight, length or height in WIC clinics because:

- Measurement of weight and length or height is a required component of WIC certifications
- The anthropometric measurements are part of the information used to assess health and nutrition status of WIC participants (e.g.: identify participants who are or who may be at-risk for overweight or underweight).
- The assessment process (including evaluation of height/length, weight and growth) provides a basis for nutrition education and counseling.
- Measurements done in WIC clinics are used to create reports that describe the WIC population for the WIC community.
- These reports are used in assessing the health status of WIC participants and in setting public health priorities.

WIC can impact the health, growth and development of children and the health of women and their pregnancies through identifying health problems and factors that may contribute to diminished health. This information can then be used to identify education, counseling and referrals that will improve health and nutrition status.



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

Questions

Mark the following statements either true (T) or false (F) or answer the question:

1. List a reason for measuring length/height and weight as part of the WIC certification process:
2. List a second reason for measuring length/height and weight as part of the WIC certification process:
3. True or False If the height and weight measures at previous certifications indicated good growth, repeat measurements may be skipped at the next WIC re-certification.
4. True or False An individual's growth (or pattern of weight gain) is influenced by a combination of genetic, hormonal, environmental, and behavioral factors.
5. True or False Environmental factors are more likely to influence the growth of preschool-age children, compared to genetic factors.
6. Name one behavioral factor that can influence the health of a pregnancy.



Now, check your answers against the Answer Key at the end of this module.

Part II: Procedures and equipment for weighing, measuring and recording anthropometric data

In order to accurately reflect health status, measurements must be taken carefully using standardized techniques. The results must be recorded accurately and compared with the appropriate references. Measurements do not need to be done twice, if the one measurement is done correctly, using proper equipment and technique. If there is any doubt about the accuracy of a measurement, it should be repeated.

Measuring Recumbent Length of Infants and Young Children

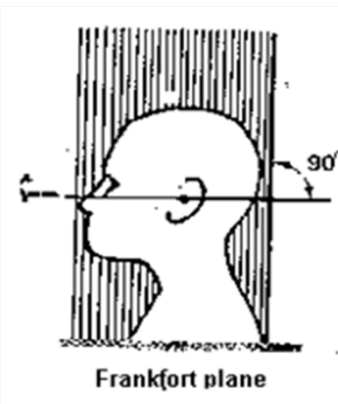
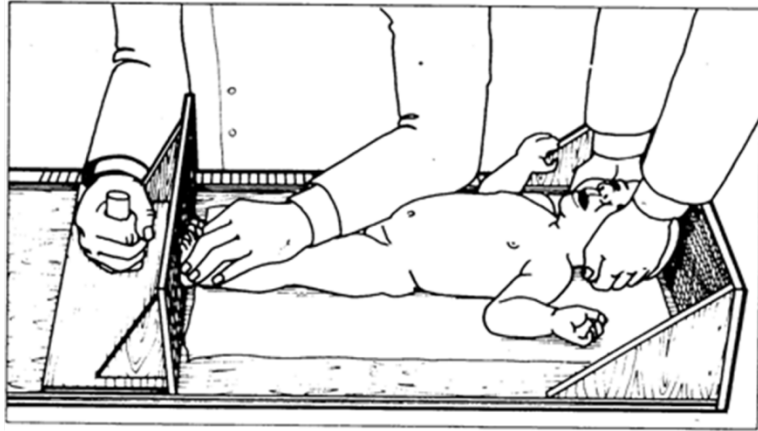
Until age 2, children must be measured in the *recumbent position*. After age 3 all children must be measured standing. After age 2 years, the CPA should make every effort to measure the child in the standing position. If it is not possible to obtain an accurate standing measure for children between 2 and 3 years, the child may be measured in the recumbent position. However, **no anthropometric risk codes** will be assigned for a child over two years measured in the recumbent position.

A. Equipment:

Use a recumbent measuring board with a fixed headpiece and sliding foot piece that are both perpendicular/upright (form a 90-degree angle) to the measurement surface. Measurements should be readable to the nearest eighth of an inch.



Measuring board



B. Technique:

Two people, the measurer and an assistant (usually a parent), are needed to measure recumbent length. To measure recumbent length, follow these steps:

1. Put a clean cloth or paper on measuring board.
2. Remove shoes and hats, and flatten interfering hairstyles (if possible).
3. With the help of an assistant, lay the child flat on his/her back on the measuring board with their head located at the end with the fixed headpiece. (See illustration above)
4. Assistant should stand directly behind headboard and cup her hands over the child's ears while holding the child's head firmly against the headboard. Child's eyes should be facing upward, with the line of sight and Frankfort Plane perpendicular to the measuring surface. The top of her/his head should be touching the headboard. See glossary in introduction for complete description of Frankfort Plane.
5. While the assistant holds the infant's head in the proper position, the measurer aligns the infant's trunk and legs, and extends both legs, placing one hand on the infant's knees to maintain full extension. Bring the footpiece firmly against the infant's heels. The infant's toes should point upward.

Infants often bend or curl their toes and push them against the movable footpiece, which may result in an inaccurate value. Try gently massaging the infant's feet to relax their toes.

It is important that both legs be fully extended for an accurate measurement. If only one leg is extended, the measurement will likely be inaccurate. Correctly positioning the infant for a length measurement requires two people.

6. Read the measured length to the nearest eighth of an inch.
7. Recording the length immediately.

Checklist for Recumbent Length

Did you....

- Have the parent or assistant help by holding the child's head (cupping her hands over the child's ears) in the correct position according to the Frankfort Plane?

NOTE: To determine the Frankfort Plane, look at the side of the child's head and draw an imaginary line from the bottom of the eye socket to the hole in the child's ear (beginning of the auditory canal). This line should be perpendicular (at a right angle) to the surface of the measuring board under the child's back (see diagram on previous page)

- Ensure that the child was straight and centered on the board from head to feet?
- Extend both legs and ensure that the toes were pointing up?
- Slide the foot piece firmly against the child's heels?
- Carefully read and record the measure?

C. Reading the measurements:

Proper technique is essential when measuring the recumbent length of a child. Equally important is a correct reading of the measurement. This can be difficult, since the increments on the measuring board "tape" are quite small. It is important for you to understand fractions of an inch to accurately read the measurement. Below is an enlarged portion of a tape.



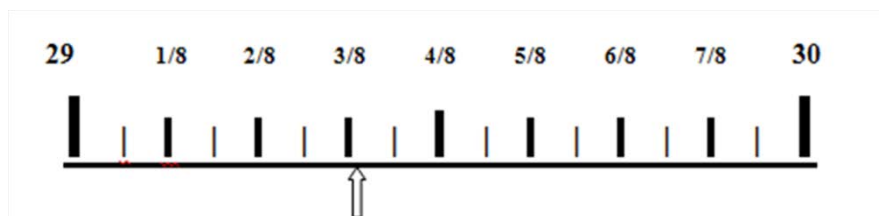
If you look between the longer lines that mark each inch (example above shows 29 to 30 inches), you see there are smaller lines between them. Beginning at 29, move to the right to the next smaller line, counting each of the *spaces* between the lines. There are seven lines between the inch marks, and eight spaces. Each space, lying between two of the small lines, represents one-eighth ($1/8$) of an inch. (Remember that the total number of spaces between inch 29 and inch 30 pictured above is *eight*.)

When measuring an infant's or a child's recumbent length, you need to measure to the nearest eighth (1/8) of an inch. You will need to count the number of lines (or eighths) that are to the right of the whole inch mark.

Looking at where the arrow is pointing in the example below, you would count three lines from the 29 inch mark, which would make it 29 and three-eighths inches (29 $\frac{3}{8}$).



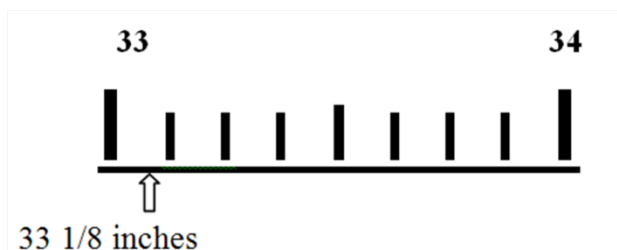
Some measuring tapes have additional lines between eighth inch (1/8) marks. These are sixteenth inch (1/16) marks. (See example below.) Do not let this confuse you! Ignore the smaller (sixteenth) lines and *read to the nearest eighth mark*. Looking at where the arrow is pointing in the example below, you would count three of the more prominent lines from the 29-inch mark, which would make it 29 and three-eighths inches (29 $\frac{3}{8}$).



D. Rounding the measurements:

Many recumbent length and height measurements will not fall directly on an eighth inch (1/8) increment. Therefore you will need to **round** your reading. Round as follows:

- If the measurement *lies closer* to one of the eighth (1/8) marks, round to the **nearest** eighth mark. In the example below, the measurement lies closer to 33 $\frac{1}{8}$ than to 33 inches; therefore, round to 33 $\frac{1}{8}$ inches.



- If the measurement falls exactly between two eighth marks, **round down** to the lower eighth mark.

E. Recording the measurements:

Length and height measurements are recorded in the clinic software in Inches and Eighths of inches. In the example above, 33 1/8 inches will be recorded in the clinic software as:

All fractions for height measures are recorded as eighths of inches.

Fraction	Record as
1/8 inch	1/8"
1/4 inch	2/8"
3/8 inch	3/8"
1/2 inch	4/8"
5/8 inch	5/8"
3/4 inch	6/8"
7/8 inch	7/8"



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

Questions:

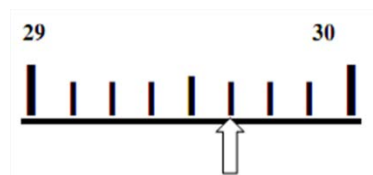
Fill in the blank with the correct letter.

7. Until what age at a minimum, should a child be measured lying down (recumbent)?
- (a) 6 months
 - (b) 1 year
 - (c) 2 years

Mark the following true ("T") or false ("F"):

8. It is very difficult for one person alone to obtain an accurate recumbent length measurement of a child.
9. Recumbent length measures for children should be read to the nearest $\frac{1}{4}$ ".
10. For the following situation in clinic – select the correct answer for each statement that follows: Situation in Clinic: Even though several attempts have been made, it is not possible to obtain a standing measure for a 25 month old child.
- a. True or False, it is acceptable to measure this child in the recumbent position.
 - b. Which of the following risk codes will be assigned?
 - _____ Risk Code 103 - Underweight
 - _____ Risk Code 114 – At risk of Overweight
 - _____ Risk Code 113 – Overweight
 - _____ Risk Code 115 – High Weight for Length
 - _____ Risk Code 121 - Short stature

For the following questions – look at the enlarged portion of a ruler below:

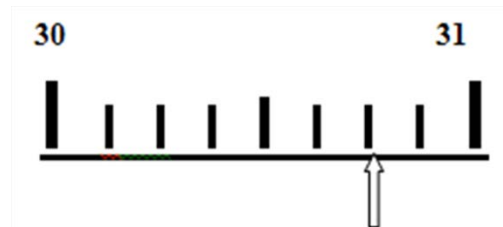


11. The arrow is pointing at:
- a. $\frac{5}{8}$
 - b. $\frac{3}{8}$
 - c. $\frac{4}{16}$
 - d. $\frac{6}{8}$

12. The actual measurement is:

- a. $30 \frac{2}{8}$ "
- b. $30 \frac{3}{8}$ "
- c. $29 \frac{3}{8}$ "
- d. $29 \frac{5}{8}$ "

For the following questions - look at the enlarged portion of a ruler below:



13. The arrow is pointing at:

- a. $\frac{6}{8}$
- b. $\frac{6}{16}$
- c. Exactly between $\frac{6}{8}$ and $\frac{7}{8}$
- d. $\frac{7}{8}$

14. The measurement you record for the picture above is:

a. Height Inches Eighths

b. Height Inches Eighths

c. Height Inches Eighths

15. How should the following length values be recorded in the clinic software?

a. $29 \frac{3}{8}$ " enter as:

Height Inches Eighths

b. $29 \frac{3}{4}$ " enter as:

Height Inches Eighths

c. $29 \frac{1}{2}$ " enter as:

Height Inches Eighths



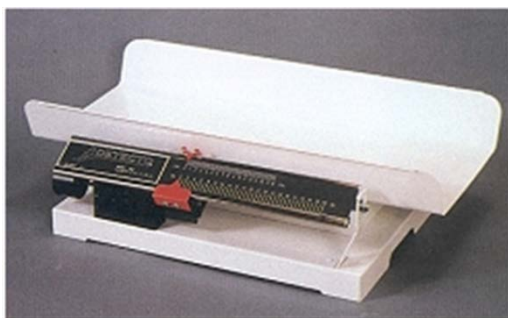
Now, check your answers against the Answer Key at the end of this module.

Measuring weight for children younger than 24 months – 2 years of age

A. Equipment

Use either a medical grade digital or beam balance scale. The scale must be capable of weighing **up to 40 pounds** and weigh in **½ ounce or smaller increments**. The tray should be large enough to fully support the infant. The scale should be easily zeroed. Further it must have features that allow calibration. The balance scale should have a non-detachable balance weight, a zero adjustment weight, and free-sliding weights (non-detachable) on both main and fractional beams. The scale should be clearly marked in increments of at least one-half (½) ounce.

All scales must be placed on a hard, level, flat surface. Scales should not be placed on a rug!



Digital and balance beam scales can usually be read in either pounds or kilograms. Make sure the digital scale is set to measure pounds and that the weights on the balance beam scale are properly placed so that they settle into the pound increment slots.

Testing scales for accuracy

Digital and balance beam scales must be checked for accuracy using standard weights at least two times per year approximately every six months. Clinics with high volumes should test scales more often. Recommend testing quarterly for scales used in locations with monthly caseloads of 1,000 participants.

Zero the scale. Test three different amounts of weight, beginning with a small standard weight, then testing weight at a midrange and then near capacity of the scale.

Zero the scale and then add standard weights, for example:

- Place a standardized 5# weight on the scale read and record the result.
- Remove the 5# weight and allow to zero. Then place the 10# and the 5# weight on the scale at the same time. Read and record the result.
- Remove these weights and then place a combination of weights to test at 30 to 35#. Read and record the result.

A form that can be used to document the accuracy checks is available in the [Minnesota WIC Program Operations Manual \(MOM\)](#) as an exhibit. Local agencies may use their own form as long as the pertinent information is collected (date, scale tested, weight tested and results of tests)

The scale should weigh the test weights within ½ ounce. For example, if the test weight is 15# it is acceptable if the scale measures anything between 14 pounds 15 ½ ounces, up to 15 pounds and ½ ounce.

If the scale measures the test weight differently than the test weight's value plus or minus the allowed tolerance (in this case ½ ounce), the scale must be calibrated. Check the scale's "User's Manual" for directions for calibrating the scale or consult with the scale's manufacturer.

Local agencies may have a different combination of standard weights and in this case, the procedure for testing the scale will be the same except that the available test weights will be used. If you have questions you should contact the Nutrition Consultant assigned to your grantee.

B. Technique

Balance the scales at zero. If a paper drape or pad is used, zero the scale with the drape or pad on the tray. Check the instructions manual for how to do this. Prior to weighing, check that the scale balance indicator is centered, assuring that the scale is 'balanced' at zero. For most digital scales, place drape on scale before turning the scale "on", check the instructions manual for information specific to that model scale. Turn digital scales "on".

Have the parent/caregiver undress the child, removing the child's outer clothing, undressing the child to a single layer undergarment and dry diaper. (A wet diaper can weigh as much as 2 ½ pounds!)

NOTE: if it is cold in the clinic light clothing may be worn, but document this in the participant record.

Lay the very young child/infant in the center of the scale. Older toddlers may sit in the center of the scale.

For the digital scale simply read the result.

For a balance beam scale, move the weight on the main beam away from the zero position until the indicator drops below center, showing that a little too much weight has been added. Then move the weight back towards the zero position until the indicator rises slightly, showing that just a little too much weight has been removed. Move the weight on the fractional beam away from its zero position until the indicator is at center, indicating that the child and the weights are in balance with each other. You may have to go back and forth with the fractional weight a few times to reach the balance point. Return the weights to zero when finished.

NOTE: the scale should be placed on a firm, stable and level surface and care should be taken to protect the child from accidents throughout the procedure. An adult should be able to reach the infant at all times.

Children who do not want to be weighed:

Sometimes a child may be difficult to measure. However, make every effort to obtain as accurate a measurement as possible by asking for assistance and using toys or mobiles to distract the child. If necessary, a child may be weighed in an adult's arms. First, the adult is weighed alone and that weight is recorded. Next, the adult is weighed with the child and this second weight is recorded. The adult's

weight is then subtracted from the second reading (adult and child together). Staff should record "weight obtained in adult's arms" in the participant record.

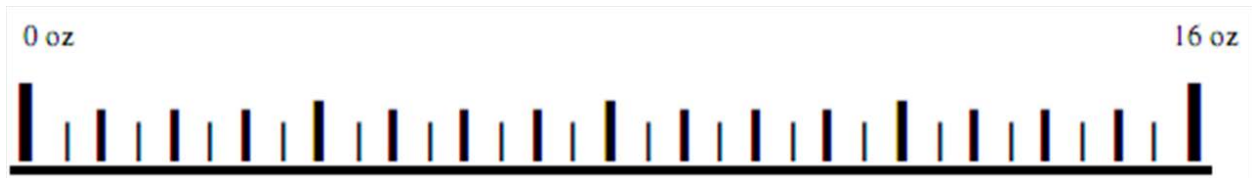
NOTE: Most digital/electronic scales have a tare feature, which allows you to zero the scale while the adult is on it, before handing the infant or child to the adult. With this feature, only the weight of the infant will appear in the scale display after the adult's weight is tared. Check the instruction manual. Staff should document that the weight was obtained in an adult's arms.

C. Reading the Measurements

Using proper techniques when measuring the weight of an infant/child is very important and equally critical is properly reading the measurement. Pediatric scales are read to the nearest $\frac{1}{2}$ ounce and there are sixteen ounces in one pound.

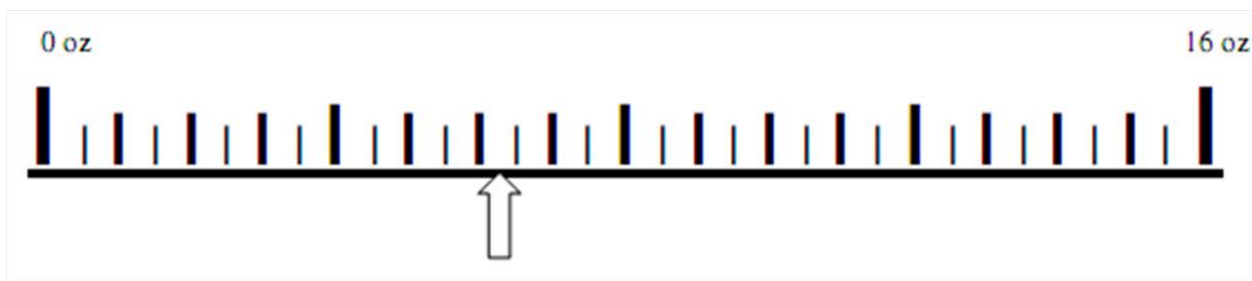
Reading Measurements from Balance Beam Scales:

Below is an enlarged portion of the fractional beam balance on a baby scale.



This is an enlarged view of the ounce portion of the infant balance beam scale. The scale is marked in one-half ounce increments, allowing the measurement to be done to the one-half ounce. The infant weight is recorded in ounce measures and so the staff person must round the measure to the nearest ounce. If the scale measures as exactly one-half ounce, the measure should be rounded down.

To what ounce is the arrow pointing to in the diagram below?



The arrow is pointing between 6 and 7 ounces but it is closer to six ounces, therefore it should be read as **6 ounces**.

Reading measurements from Digital Scales:

Infant digital scales read in pounds, ounces and one-half or smaller increments of ounces. **We will record to the nearest ounce.** For example, if the measurement result is 18 pounds 2 and a half ounces, record 18 pounds and 3 ounces (round to the next full ounce).

Infant digital scales have a read-out panel that looks similar to this:

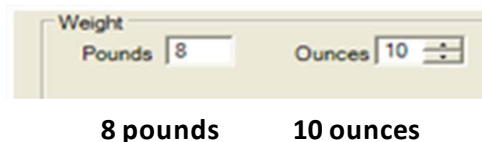
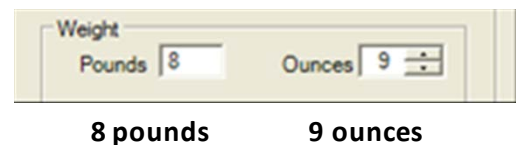


First two digits indicate pounds, the next two digits indicate ounces and the last digit indicates fractions of ounces.

A reading of .1 up to .4 ounces must be recorded as the last full ounce (round down), and .5 to .9 ounces must be recorded as the next full ounce (round up).

These weight measures should be recorded as

08.09.0	Round down	8 pounds 9 ounces
08.09.1	↑	8 pounds 9 ounces
08.09.2	↑	8 pounds 9 ounces
08.09.3	↑	8 pounds 9 ounces
08.09.4	↑	8 pounds 9 ounces
08.09.5	↓	8 pounds 10 ounces
08.09.6	↓	8 pounds 10 ounces
08.09.7	↓	8 pounds 10 ounces
08.09.8	↓	8 pounds 10 ounces
08.09.9	Round up	8 pounds 10 ounces



If your scale measures in one half-ounce increments, the last digit will read .0 or .5. In the case of a scale that reads in ½ ounce increments, record .0 as the last full ounce, and .5 as the next full ounce.

Review the following examples. Each of these examples pertain to scales that measure in $1/10^{\text{th}}$ ounces (0.10 ounces).

Digital scale example 1:

22.10.5

This is twenty-two pounds and ten and one half ounces. It should be recorded as 22 pounds 11 ounces (round up for .5 to .9 ounces)

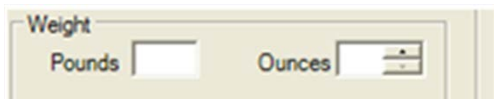
Digital scale example 2:

24.11.7

This is twenty-four pounds and eleven and seven-tenths ounces. It should be recorded as 24 pounds 12 ounces (round up for .5 to .9 ounces)

D. Recording weight measurements in WIC clinic software

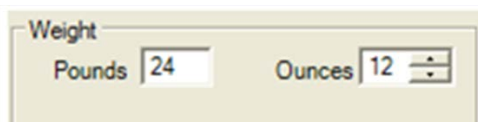
Weights are measured in pounds and one-half ounces and entered in the clinic software as pounds and ounces.



Weight
Pounds Ounces

To record the example above (24 pounds 11 and 7/10ths pounds):

Eleven and seven tenths ounces should be rounded to 12 ounces.



Weight
Pounds Ounces



SELF CHECK



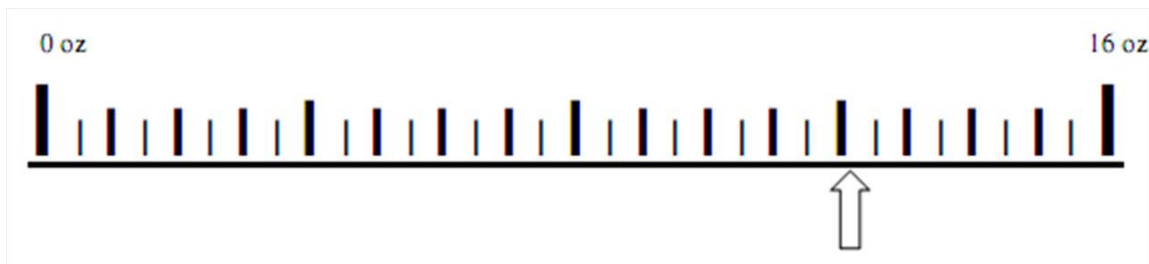
ANTHROPOMETRIC ASSESSMENT

Questions:

Mark the following statements “T” for true and “F” for false.

16. ____ Children younger than age 24 months may be weighed wearing a wet diaper.
17. ____ Weight of children younger than 24 months should be read to the nearest one-half ounce.

Use the enlarged portion of the beam balance of the baby scale pictured below to answer question 18. Circle the correct answer.



18. What measurement (in ounces) is the arrow pointing to?
- 12 4 10 11 6
19. What fraction of a pound is four ounces? $\frac{1}{4}$ $\frac{3}{4}$ $\frac{6}{8}$ $\frac{5}{8}$ $\frac{11}{16}$
- What fraction of a pound is 12 ounces? $\frac{1}{4}$ $\frac{3}{4}$ $\frac{7}{8}$ $1\frac{1}{2}$
20. Assuming you are using a scale that measures to 1/10th ounce increments, how should 10.4 ounces be recorded in the clinic software?
- 11 ounces 10 ounces 10.4 ounces



Now, check your answers against the Answer Key at the end of this module.

Measuring standing height of children and adults



A. Equipment

A measuring board with a moveable headboard, called a stadiometer, is the preferred equipment. The board should be marked in eighth-inch ($1/8''$) increments. The headboard should be wide enough to measure the participant's crown (top of head) and create a right angle to the measurement surface. The stadiometer may be mounted on a wall in a fixed position, or it may be portable

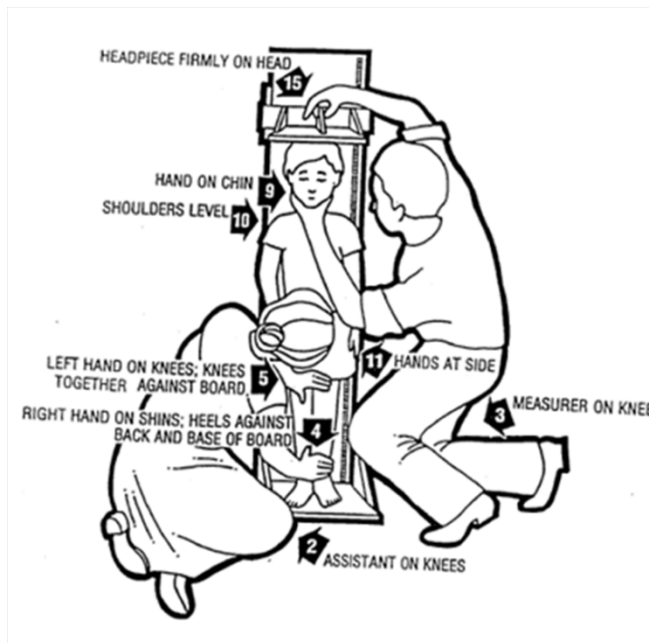
A measuring rule made of a flat, metal material that can be attached to a wall (or any vertical, flat surface) may be used. The rule must be marked in eighth-inch increments. A headboard or right angle block at least 6 inches wide must be used with this technique. **This is the least preferred approach to measuring standing height. If a manufactured stadiometer cannot be used, it is recommended that a portable stadiometer be purchased.**

A step stool or short stepladder for the staff to stand on to accurately read the height of an adult is necessary.

NOTE: Do not use the movable measuring rod on platform scales for measuring height. It is not accurate because it is too narrow, unsteady, and the headpiece is easily bent. Also, they are difficult to read, contributing to error when reading the measurement.

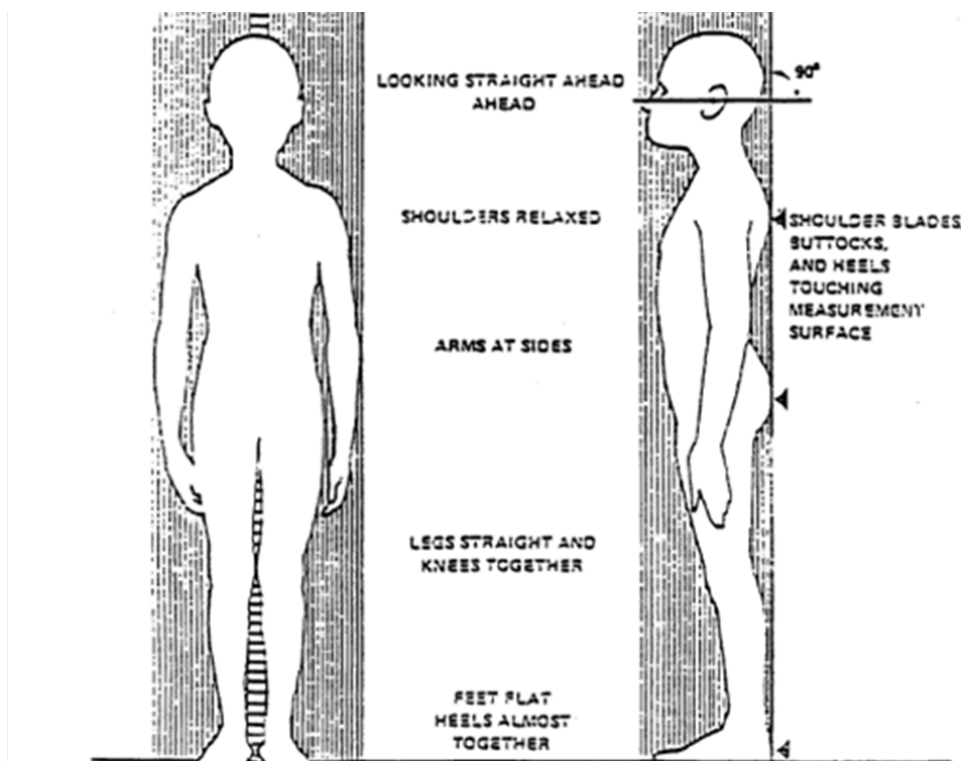
B. Technique

1. Remove shoes, hats, and hair accessories. Flatten interfering hairstyles, if possible.
2. The child or adult should stand tall and straight, with heels close together, shoulders level and relaxed, hands at sides, facing away from the measuring board. Heels touch the base of the vertical board, the buttocks, and the participant's back (at the shoulder blades) should touch the measuring board. If making all these points touch is impossible or uncomfortable, have the participant stand with buttocks touching and heels touching or as close to the board as possible. Ask the participant to inhale deeply and to stand fully erect without altering the position of the heels. Make sure that the heels do not rise off the foot plate.
3. For measuring a younger child, the assistant, who could be a parent, presses the knees and feet firmly so they are straight.
4. The person taking the measurement should be positioned in the best place to read the measurement tape; this is usually directly to the side of the child or adult.



5. Determine the position of the head by locating the Frankfort plane, which is the imaginary line drawn from the hole in the ear to the bottom of the orbit of the eye (the eye socket). The Frankfort Plane should be perpendicular to the measuring board that is located behind the child's head. The participant may appear to be looking slightly downward, but do not be concerned about this, as this will ensure that the crown of the participant's head is in the proper position to measure standing height. Older children's and many adults' heads will not touch the vertical board. See diagram on next page for illustration of Frankfort plane.

6. Lower the headboard until it firmly touches the crown of the head and creates a right angle with the measurement surface. Ensure that the body stays in position by having the assistant firmly pressing their hands on the child's knees and ankles.
7. Read the stature to the nearest eighth of an inch.
8. Record the measure immediately.
9. Use a step stool whenever the person being measured is taller than the person doing the measuring.



Pictures From: "How to Weigh and Measure Children", Irwin J. Shorr, U.N., N.Y. 1986.

NOTES:

1) It is helpful to have two people taking the height of a child: one to hold the lower body (i.e., knees and feet) in position and one take the measurement. This will not be necessary for adults or older children, but be sure to check positioning before taking the measurement.

2) If a child or adult has an elaborate hairstyle that affects measurement and cannot be altered, note this in the record.

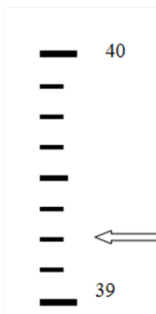
3) With preschool age children, the heels will likely touch the back of the board or wall. For older or overweight children, the heels will probably be away from the wall.

4) Women must be measured. Self-reported height is NOT acceptable.

C. Reading the measurements

Reading the measurement for a standing height is very similar to reading the recumbent length (see pages 13-14). You will read to the nearest $1/8^{\text{th}}$ inch.

See if you know to which eighth of an inch the arrow is pointing on this enlarged view of an inch.



If you said $2/8^{\text{ths}}$ you are correct ($2/8^{\text{ths}}$ is equivalent to $1/4^{\text{th}}$).

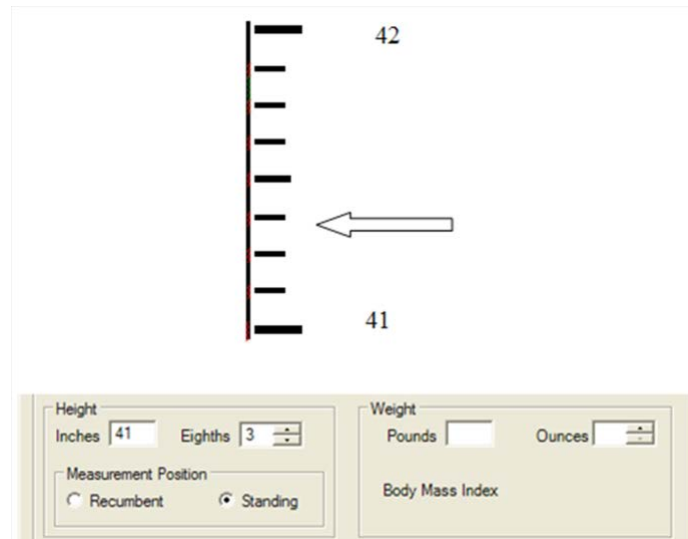
Note: when you are taking a standing height, it is important that your eyes are at the same level as where you are reading the measurement. Therefore, you may have to crouch or bend down when measuring a child, or use a step stool when measuring adults.

Rounding the measurement

If the measure appears to be exactly between two of the eighth marks, round down to the last full $1/8^{\text{th}}$ measure otherwise round to the closest mark.

D. Recording the measurement

Height measurements are recorded in the WIC clinic software as inches and eighth inches. In the example below, the child's height should be entered as 41 and $\frac{3}{8}$ th inches.



The diagram illustrates a height measurement scale and the corresponding software input fields. The scale shows a vertical line with horizontal markings. The number 42 is at the top, and 41 is at the bottom. An arrow points to the third eighth-inch mark above 41. Below the scale is a software form with two main sections: Height and Weight. The Height section has fields for Inches (41) and Eighths (3). The Measurement Position section has radio buttons for Recumbent and Standing (selected). The Weight section has fields for Pounds and Ounces. The Body Mass Index section is also present.

Height		Weight	
Inches	41	Pounds	
Eighths	3	Ounces	
Measurement Position		Body Mass Index	
<input type="radio"/> Recumbent <input checked="" type="radio"/> Standing			

Standing must be indicated in the "Measurement Position" field

All measures are recorded in inches. For adults, height in feet will need to be converted to inches. For example, the measure for a woman who was measured at 5'7 $\frac{3}{4}$ " will be recorded as 67 inches and 6 eighth inches. (Convert five feet to 60 inches and add the 7 inches to get 67 inches; then convert $\frac{3}{4}$ inch into $\frac{6}{8}$ th inch – always record in eighth inches.)

Self-reported height is NOT ACCEPTABLE – women's height must be measured. For women ≥ 20 years of age, height must be measured at the first certification and at subsequent certifications the previous measure may be used. For women who are less than twenty, height should be measured at each certification.



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

Questions

Select the correct answer

21. Height should be taken:

- (a) with shoes on (b) without shoes (c) doesn't matter

22. Which of the following are correct statements about measuring children and women's height?
(select as many as apply)

- (a) Ideally, the participant's heels, buttocks and shoulder blades will touch the vertical board of the stature board.
(b) The back of the participant's head will always touch the vertical board.
(c) Usually only one person is needed to measure young children.

23. The Frankfort plane is: *(check one)*

- (a) A747 airplane that takes you to Frankfurt, Germany.
(b) A position for weighing a child 2 years and older, and adults.
(c) A German type of hotdog eaten with sauerkraut.
(d) An imaginary line drawn from the opening of the ear canal to the bottom of the eye socket that is used to determine the proper head position to measure height or length.

24. True or False: When measuring height of children and adults, the WIC staff person should look for the participant's Frankfort plan



Now, check your answers against the Answer Key at the end of this module.

Measuring weight of children and adults

A. Equipment

Medical quality balance beam or digital scales are used in WIC clinics. The balance beam scale must have non-detachable free-sliding weights. Both types of scales must measure in $\frac{1}{4}$ # (or less) increments and must be capable of being “zeroed”.



Testing scales for accuracy

Digital and balance beam scales must be checked for accuracy using standard weights at least two times per year. Clinics with high volumes should test scales more often.

To test adult/older children's scales:

Zero the scale.

Add standardized 5 and 10 # weights. Record the result. Remove the weights.

Add standardized 5, 10, 20 and 25# weights on the scale. Record the result. Remove the weights.

Have a staff person step on the scale and note the weight. Have them step off of the scale allow the scale to zero and return to the scale while holding a standardized 20 or 25 # weight. Record the result.

Compare the scale's reading with the value of the combined weights that were measured.

Electronic scales measure the fractional pounds in one-tenths (0.1) or two-tenths (.02) of a pound. Thus the scale must measure within $1/10^{\text{th}}$ or $2/10^{\text{th}}$ pound of the value of the standardized weight. For example, if the staff person (weighed 135.8 pounds) plus the 25# weight test weight, a measurement of 160.7 up to 160.9 it is acceptable if using a scale that measures in one-tenth increments (if the scale measured in $2/10^{\text{th}}$ pound increments 160.6 up to 161.0 is acceptable).

The results should measure within $\frac{1}{4}$ pound (4 ounces) for balance beam scales. So the scale must measure within $\frac{1}{4}$ pound of the value of the standardized weight. In this example, the staff person weighed 135 $\frac{3}{4}$ pounds and held a 25# weight. The scale must read between 160 $\frac{1}{2}$ up to 161 pounds.

If the scale measures outside of this range, the scale must be calibrated. Check the scale's "User's Manual" for directions for calibrating the scale or consult with the scale's manufacturer.

A form that can be used to document the accuracy checks is available in the [Minnesota WIC Program Operations Manual \(MOM\)](#) as an exhibit. Local agencies may use their own form as long as the pertinent information is collected (date, scale tested, weight tested and results of tests).

Local agencies may have a different combination of standard weights and in this case, the procedure for testing the scale will be the same except that the available test weights will be used. If you have questions you should contact the Nutrition Consultant assigned to your grantee.

B. Technique

Balance Beam scales

1. Confirm that the weights are set at zero and that the scale balances at zero.
2. Have subject remove coats, heavy clothing (including sweatshirts and sweaters) and shoes. Have the subject set aside purses, toys or any other items they may be holding.
3. Have the subject stand in the middle of the platform with body upright and hands/arms hanging naturally at their sides.
4. Move the heaviest weight to the right until the scale tips – indicating that too much test weight has been added, return the weight to the highest position that indicates that more weight is needed. Add smaller weights until the beams tips over indicating that too much weight has been added – move to the highest position that indicates that more weight is needed. Finally move the smallest weight until the scale balances within $\frac{1}{4}$ pound (four ounces).
5. Immediately record the result.
6. Return the weights to the zero position.

Digital scales

1. Turn on scale and confirm that zero is indicated.
2. Have subject remove coats, heavy clothing (including sweatshirts and sweaters) and shoes. Have the subject set aside purses, toys or any other items they may be holding.
3. Have the subject stand in the middle of the platform with body upright and hands/arms hanging naturally at their sides.
4. Immediately record the reading.

C. Reading/rounding the measurement

Correctly reading/rounding and recording the weight measurements is important. If the value is incorrectly read, rounded or recorded, incorrect assessments may be made, leading to inappropriate nutrition education. Additionally, incorrect risk codes might be assigned or risk codes might not be assigned.

Beam Balance Scale

Balance beam scales usually measure to $\frac{1}{4}$ pound and thus adults and children weighed on these scales will have results that must be converted to ounces. Read the result to the nearest quarter pound, if the result is exactly between two quarter pound increments, round down to the last full quarter pound. Then convert to ounces.

Record quarter pounds as the following ounce values:

Record $\frac{1}{4}$ pound as 4 ounces
Record $\frac{1}{2}$ pound as 8 ounces
Record $\frac{3}{4}$ pound as 12 ounces

Digital Scale

The digital scale reads the weight result quickly. The value will be displayed as pounds and 1/10th pounds. For example, 125 and 2 tenths of pounds will read like this: 125.2.

In Minnesota WIC, tenths of pounds will be converted to ounces according to the following chart:

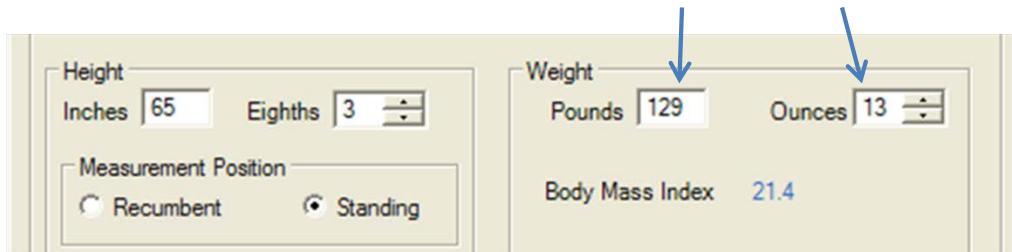
Recording ounces from digital scales	
Digital read out:	Record as:
.0	0 Ounces
.1	2 Ounces
.2	3 Ounces
.3	5 Ounces
.4	6 Ounces
.5	8 Ounces
.6	10 Ounces
.7	11 Ounces
.8	13 Ounces
.9	14 Ounces

Local Agencies should post a copy of this chart on the digital scales so staff won't need to think about the conversion from 1/10 pounds to ounces.

D. Recording the measurement in the WIC clinic software (balance and digital scales)

Weight measurements for women and children are recorded in the WIC clinic software in the ht/wt tab.

Weight is recorded in pounds and ounces.



The screenshot shows the WIC clinic software interface. On the left, the 'Height' section has 'Inches' set to 65 and 'Eighths' set to 3. Below it, 'Measurement Position' has 'Recumbent' selected and 'Standing' unselected. On the right, the 'Weight' section has 'Pounds' set to 129 and 'Ounces' set to 13. Below that, 'Body Mass Index' is 21.4. Two blue arrows point to the 'Pounds' and 'Ounces' fields.

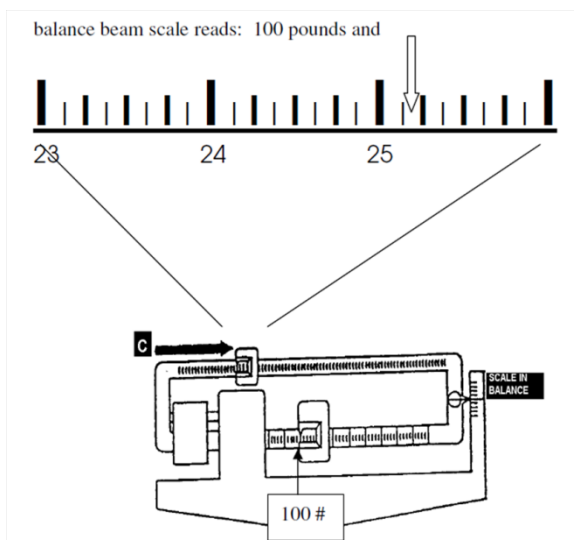
Example 1: a woman is measured on a digital scale that reads: 125.2 (One hundred twenty five and two-tenths) pounds

Record in the clinic software: 125 in the “pounds” field and convert 2/10 pounds to ounces using the table on page 31. This converts to 3 ounces and will be entered into the software as: 125# 3 Ounces



The screenshot shows the WIC clinic software interface. On the left, the 'Height' section has 'Inches' set to 65 and 'Eighths' set to 3. Below it, 'Measurement Position' has 'Recumbent' selected and 'Standing' unselected. On the right, the 'Weight' section has 'Pounds' set to 125 and 'Ounces' set to 3. Below that, 'Body Mass Index' is 20.6. Two blue arrows point to the 'Pounds' and 'Ounces' fields.

Example 1 Continued: The same woman is measured on a balance beam scale



On the balance beam scale, read to the nearest $\frac{1}{4}$ pound; in this case

100 pounds from the lower arm
plus
25 $\frac{1}{4}$ pounds from the upper arm
(the arrow is pointing closest to $\frac{1}{4}$ #)

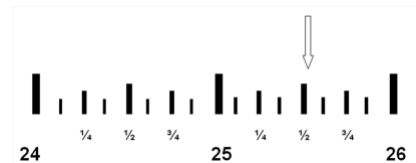
for a total weight of 125 $\frac{1}{4}$ pounds

Record in the clinic software as 125 pounds 4 ounces

The screenshot shows a software interface for recording patient measurements. On the left, under 'Height', 'Inches' is set to 65 and 'Eighths' is set to 3. Below this, 'Measurement Position' has 'Recumbent' selected and 'Standing' unselected. On the right, under 'Weight', 'Pounds' is set to 125 and 'Ounces' is set to 4. Below this, 'Body Mass Index' is calculated as 20.6. Two blue arrows point from the text above to the 'Pounds' and 'Ounces' fields.

Example 2: A woman is measured on a digital scale that reads: 125.5 (One hundred twentyfive and five-tenths).

The same woman is measured on a balance scale and it reads:



100# on the lower arm and the upper arm looks like this:

$$100 \text{ (lower arm)} + 25 \frac{1}{2} \text{ (upper arm)} = 125 \frac{1}{2} \text{ pounds}$$

These values would be entered into the clinic software as 125# 8 ounces (digital scale .5 converts to 8 ounces – see chart on page 31 and on the balance scale 1/2 converts to 8 ounces see chart on page 31).

The screenshot shows the same software interface as before. Under 'Height', 'Inches' is 65 and 'Eighths' is 3. 'Measurement Position' has 'Recumbent' selected and 'Standing' unselected. Under 'Weight', 'Pounds' is set to 125 and 'Ounces' is set to 8. 'Body Mass Index' is calculated as 20.7.



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

Questions:

25. What value should be entered into the clinic software for the following weight values?

- a. 145.7 Pounds _____ Ounces _____
- b. 128.8 Pounds _____ Ounces _____
- c. 116.0 Pounds _____ Ounces _____

Mark each as True or False:

- 26. ____ The scale should be balanced at zero prior to each weighing
- 27. ____ Children can wear their boots and coats while being weighed because the digital scale can “tare” for these items
- 28. ____ It is important that a child stand on both feet on the scale’s platform to get an accurate weight
- 29. ____ Weight of children over age two is recorded to the nearest ounce

Choose the correct answer (a, b, c, or d below)

30. 1 pound = _____ ounces $\frac{1}{4}$ pound = _____ ounces 2 ounces = _____ pound
- a. 12, 4 and $\frac{1}{4}$
 - b. 16, 4 and $\frac{1}{2}$
 - c. 8, 2 and 8
 - d. 16, 4 and $\frac{1}{8}$



Now, check your answers against the Answer Key at the end of this module.

COMMON MEASUREMENT ERRORS

The accuracy of anthropometric data is dependent upon having accurate equipment that is working correctly and carefully following the appropriate procedures. It is also necessary to correctly read the results and to correctly record the information. The goal is to minimize the number of errors that can occur. The lists below identify some of the more common errors that staff should take care to avoid.

All Measurements:

1. Inadequate equipment (e.g.: bathroom scales, stretchable tapes)
2. Shoes and or heavy clothes not removed
3. Poorly maintained equipment (e.g.: worn, broken, loose sliding headboards)
4. Scale not "zeroed"
5. Reading result incorrectly (e.g.: $3/8^{\text{th}}$ inch read as $1/2$ inch, staff not wearing reading glasses so can't see detail)
6. Recording result incorrectly (e.g.: $3/4$ inch recorded as $3/8^{\text{th}}$ when should be $6/8^{\text{th}}$ inch)
7. Active struggling child

Recumbent length:

1. Head not aligned with body
2. Top of head not against the head board
3. Body arched
4. Frankfort plane not at 90 degree angle to measuring board
5. Knees bent
6. Only measured one leg
7. Feet not flat against footboard
8. Did not use recumbent board

Height:

1. Incorrect age for instrument (child less than two years measured standing)
2. Hat or elaborate hairstyle not removed
3. Knees bent
4. Frankfort plane not at 90 degree angle to measuring board
5. Feet not flat (standing on tip toes)
6. Body and head not aligned correctly
7. Stool not used when person being measured is taller than the measurer
8. Headboard not parallel to the floor

Weight:

1. Child measured in wet diaper
2. Scale not at zero before weighing
3. Equipment out of calibration
4. Scale set to measure or sliding weights placed in metric units



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

Questions:

31. State two common sources of errors in height measurements.

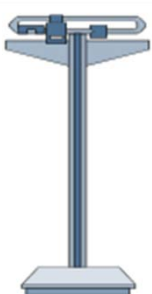
- a. _____
- b. _____

32. State two common sources of errors in weight measurements.

- a. _____
- b. _____



Now, check your answers against the Answer Key at the end of this module.



Locate the anthropometric equipment used in your clinic. Does it meet the criteria noted in this section? Is it in good working condition? Take notice of the increments on each measuring and weighing tool. Also see page 65 “Equipment Checklists” for detailed lists of required features of equipment.

Part III: Using and interpreting growth charts and Pregnancy weight gain charts

The following background was taken from the Centers for Disease Control and Prevention website discussion of Growth Charts [CDC Growth Charts](#) and the document [2000 CDC Growth Charts for the United States: Methods and Development](#) page 25 General Growth Chart Principles – Growth References and Standards.

What is a growth chart?

Growth charts consist of a series of percentile curves that illustrate the distribution of selected body measurements in children. Growth charts are tools used to track the growth of infants and children that help to identify children who may be at risk for overweight, underweight, or short stature, and those who fall within the average range of weight, length or height for their age and gender. Measurements of individual children are plotted on the growth charts. This information, along with accurate dietary, health, and hematological information, can help you assess a child's health and nutritional status.

In developing the growth charts, the WHO working groups defined **a reference** as a tool for providing a common basis for purposes of comparison and **a standard** as embodying a concept of a norm or target, that is, a value judgment. In simple terms, a reference describes “what is” whereas a standard describes “what should be”. In practice, however, reference values are often used as a standard. Growth references are intended to be used to screen and monitor growth in individuals and populations. They are not intended to be used as a sole diagnostic instrument. Instead, growth charts are tools that contribute to forming an overall clinical impression for the child being measured.

The American Academy of Pediatrics (AAP), National Institutes of Health (NIH) and CDC recommend that the WHO 2006 charts be used for children under age two years and the 2000 CDC charts for children over age two years. USDA has accepted these recommendations for the WIC program.

In WIC clinics, the **CDC 2000 growth charts for children 2 to 18 years** are used as part of the nutrition assessment process for children over two years of age. These charts illustrate how a child's growth in weight and height compare with that of other children of the same age and gender in the United States. The 2000 CDC charts are a **reference**— meaning they compare growth of individual children to the growth of children in a reference population. For children over age two and measured standing, the clinic software will create the appropriate growth charts and height for age, weight for age and BMI for age will be displayed.

*The plots on the CDC 2000 growth charts for children 2 to 18 years are used to assign **anthropometric risk codes** for children over age two years measured in the standing position. For children older than two years measured in the recumbent position, anthropometric risk codes do not apply. Children over age two measured in the recumbent position will not have risk codes related to length or weight.*

For children over age two years but measured in the recumbent position, the **CDC 2000 growth charts for birth to 36 months** length for age, weight for age and weight for length charts will be created and the plots displayed. WIC staff will use the information in these charts along with the hematologic, health

and dietary information to assess the child's growth. But no anthropometric risk codes will be assigned based on these charts. WIC staff is encouraged to obtain measures for children older than two years in the standing position.

The **WHO (World Health Organization) 2006 Growth Charts for children 0 to 59** months are used in WIC as part of the nutrition assessment process for all children less than two years old. The WHO Charts represent a **Standard** for growth in young children – meaning they compare an individual's growth to the growth of children the same age and gender raised in ideal environments. Ideal environments were characterized by:

- fully or mainly breastfeeding for the child's first six months
- continued breastfeeding for the first full year
- introduction of appropriate solid foods at six months
- non-smoking households
- receipt of appropriate routine medical care
- adequate resources to assure proper growth

The 2006 WHO charts illustrate how an individual infant or child is "supposed" to grow. The clinic software will create the 2006 WHO charts and the individual infant or child's weight and length measures will be displayed. The system software will assign risk codes based on how the child's measures plot on the 2006 WHO charts.

What do the growth charts tell us?

Growth charts show you how each child's measurements compare with children of the same gender and age. Each chart has smoothed curves or lines that represent growth percentiles. For children over age two years, the curves (percentiles) serve as a reference for comparison. The height or weight of a child will be plotted on the grid and then compared to these percentiles. Deviation from the curves for a child over age two signal that further investigation should be done, but because the curves represent a reference, not a standard, WIC staff must be cautious in how the charts are interpreted. For children under age two years, the 2006 WHO charts can be used as a standard to assess a child's growth. Deviations from the curves for children under age two should be given serious consideration when evaluating the child's nutrition status.

Regardless of which chart is used for the assessment, the charts cannot be used in isolation. Additional information about the child and the situation (e.g.: hematology, dietary, home environment and health information) must be part of the evaluation.

Likewise; single measurements of height and weight in isolation only begin to provide clues about a child's growth. Measurements from two or more WIC visits begin to show the child's growth pattern. This pattern can then be compared to the expected pattern of growth. In other words, you can evaluate whether the child is growing at a rate similar to that of their peers, and unexpected increases or decreases in height-for-age, or weight-for-age, weight-for-length, or BMI should be assessed. Growth charts are valuable tools that are part of the nutrition assessment process.

For example, if a 26-month-old girl is below the 5th percentile weight-for-age, less than 5% of girls her age weigh less. However, the only context for this child's weight is her age – other factors such as her

height must be considered. If she is also on the low end of the stature continuum her weight might be appropriate for her. Growth charts can be used to identify children who potentially have growth issues, but they are only part of the overall assessment.

Using growth charts for assessing infants and children’s anthropometric measurements

As you assess children’s length, height or weight as part of a certification for the Minnesota WIC program, you will use the automated growth charts that are part of the clinic software. Based on the information entered into the height/weight tab, the software generates the relevant growth charts. For children over age two, the 2000 CDC growth charts are generated and the child’s measurements are plotted on these charts. For infants and children less than 2 years, the 2006 CDC/WHO charts are generated and the measurements are plotted on these charts. The automated system eliminates the need for “hand-plotting” length or height and weight. The instructions for entering length or height and weight data into the WIC clinic software are described below.

Procedures for plotting infants’ and children’s height, length and weight during certifications

Using equipment and procedures described in Part II of this manual, height or length and weight for infants and children will be measured and entered into the Height and Weight tab in the WIC clinic software. Measurement data is entered in the Height/Weight subtab of the Ht/Wt/Blood tab in the clinic software.

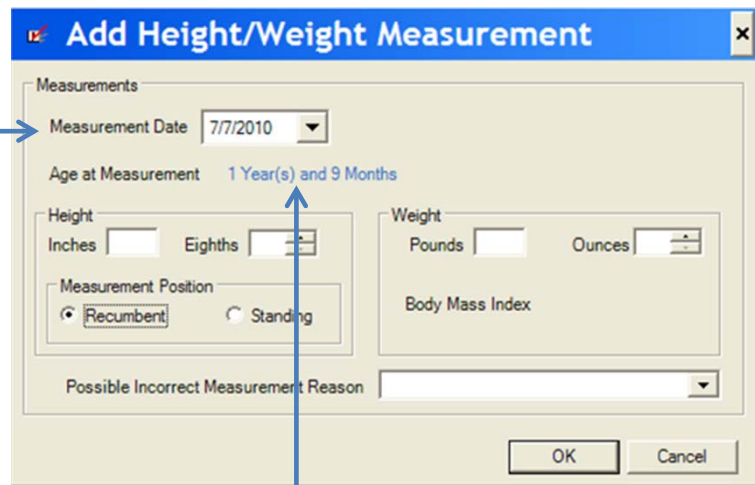
Measurement Date	Age at Measurement	Inches	Eighths	Measurement Position	Pounds	Ounces	Body Mass Index
02/10/2012	0 Months 3 Days	20	4	Recumbent	8	8	N/A

To enter height or length and weight data, click on the “Add” button of the Height/Weight/Blood tab

Step # 1 -- Enter date of collection.

The first step is to enter the date on which the measurements were taken. Most often, this will be the date of the certification.

Enter the date the data was collected. If the data is collected on a date other than the current date (as happens with referral data), the actual date of collection must be entered.

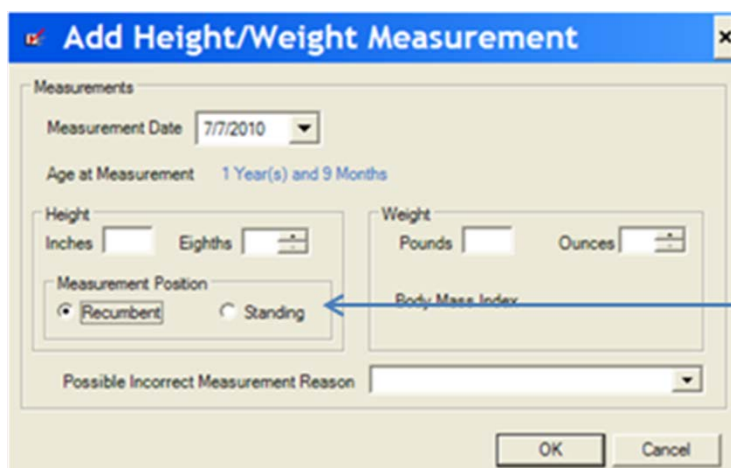


Child's age at time of data collection calculated by clinic software

The clinic software will calculate the child's age based on the indicated date of collection and displays this on the Height and Weight screen. The system defaults in today's date because most often height and weight are measured during the certification appointment. However, WIC may use anthropometric measures collected by other medical providers at an earlier date. If such information is used, the actual date of the measurements must be entered so that the data will be plotted based on the child's actual age at the time of measurement. See [Minnesota Operations Manual chapter five](#) for specific information regarding requirements for using referral data.

Step # 2 – Indicate whether the child was measured standing or recumbent.

It is essential to correctly indicate whether the child was measured standing or recumbent. The child's length or height is assessed using the grid that matches the child's measurement position.



Indicate if the infant or child's measurement was done in the standing or recumbent position

Measuring length or height of children

- All children <2 years of age must be measured in the recumbent position. If the child is <2 years old, “recumbent” will be defaulted into the “measurement position” box.
- Children older than 3 years of age must be measured standing, “standing” is defaulted into the “measurement position” box.
- Children between 2 and 3 years may be measured either standing or recumbent (see page 10 for guidance on deciding the appropriate position). Standing will be defaulted and this must be changed to recumbent if the child was measured in the recumbent position.

Step # 3 -- Enter height/length and weight into the Height and Weight tab in the clinic software

Enter the value of the measured length or height in inches and 1/8th inches.

Indicate if the measure was done in the recumbent or standing position.

Enter the value of the weight in pounds and ounces.

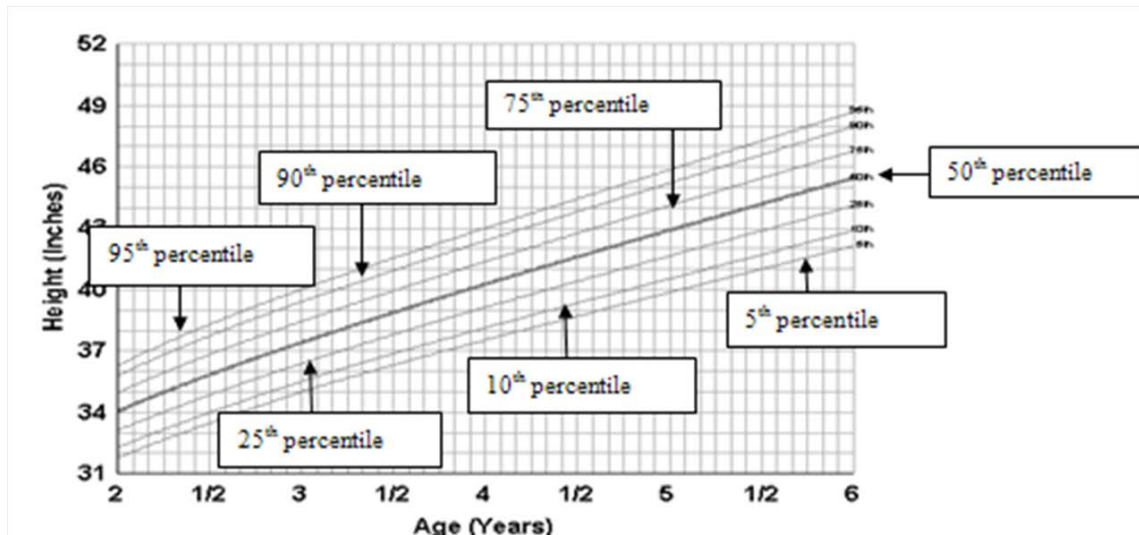
The screenshot shows a software window titled "Add Height/Weight Measurement". It contains several input fields: "Measurement Date" with a dropdown menu showing "7/7/2010"; "Age at Measurement" with a text field showing "1 Year(s) and 9 Months"; "Height" with "Inches" and "Eighths" input fields; "Weight" with "Pounds" and "Ounces" input fields; "Measurement Position" with radio buttons for "Recumbent" (selected) and "Standing"; and "Body Mass Index" with a text field. At the bottom, there is a "Possible Incorrect Measurement Reason" dropdown menu and "OK" and "Cancel" buttons.

Click the “OK” button to save. This returns you to the Height/Weight Subtab of the Ht/Wt/Blood tab. Once back at the Ht/Wt/Blood tab, the *growth charts* can be viewed by clicking on the Growth Grids button. This prompts the system to generate the appropriate growth chart so that the CPA can assess the child’s growth.

When a child’s measurements are plotted on the growth charts, the results are displayed as “percentiles”. For children over age two, the data is plotted on the 2000 CDC growth charts and the percentiles represent the normal distribution of weight, height, weight for height, or BMI for a nationally representative reference group of healthy children the same age and gender. Percentiles are represented by curved lines on the growth chart.

Interpreting growth charts

On each chart, the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles are indicated by lines. On the BMI/age chart, the 85th percentile is also shown. The 50th percentile is the mean; the top percentile shown is the 95th, and the lowest percentile displayed is the 5th percentile.



Children with measurements that are about average will “plot” near the mean (or 50th percentile). For children who are larger than average, their measurements will be plotted above the mean, and smaller children’s measurements will be below the mean. As a child’s measurements deviate further above the mean, the percentile representing that measure will be larger. As measurements deviate further below the mean, the percentile will be smaller.

For example:

- For a child whose weight plots on the 50th percentile of the weight-for-age chart, we expect that half (50%) of all healthy children of the same gender and age weigh less than the measured child, and half weigh more.
- For a child whose height plots on the 25th percentile of the height-for-age chart, we expect that 25% of all healthy children of the same age are shorter than the child, and 75% are taller.
- For a child whose BMI plots on at the 95th percentile on the BMI-for-age chart, we expect that 95% (or “most”) healthy children of the same height, age and gender will weigh less, and only 5% (or “not very many”) will weigh more than this child.

Whenever a measurement doesn’t make sense or seems incorrect, the staff must investigate the situation, often the first step will be to re-measure the child. For example, if a child is shorter, weighs less than previous measures, or it appears that very little growth or weight gain has occurred, clinic staff should re-measure the child to determine if the measurement done today is correct.

If the second measure matches the day's earlier measure, staff should begin to assess the situation to determine the source of this unexpected situation. For example, was the participant measured incorrectly the last time measurements were done? Is it possible that the measurement at the previous clinic visit was entered incorrectly? This might happen when:

- Two children from the same family are measured and the values are entered into the incorrect child's file
- The digits in a value were transposed (23 was entered when the value was 32)
- A field was not used correctly, for example in the ounce field, "6" was entered when the scale read ".6" or "six-tenths pounds" which should be converted to 11 ounces
- The value for the weight measure was entered into the height field or vice versa
- There is a note indicating that the child was very anxious and struggled significantly against the last measure

If nothing can be found to explain the situation, WIC staff will need to determine if it appears that the situation on the growth chart reflects the actual situation. Has the child lost weight or not grown since the previous measure? The clinic staff will need to evaluate other information to understand the situation to determine the correct actions. Staff will need to consider any additional physical information (e.g.: hemoglobin measures, physical aspects of the child that can be seen) and ask the parents the nutrition and health assessment questions and probe all aspects to determine if a source of the problem can be found. WIC staff will need to make recommendations and referrals that make sense to the situation.



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

33. What do you need to mark on the height and weight screen when you use referral data?
- A. Enter the date the measurement was actually collected
 - B. Select a reason from the “Possible Incorrect Measurement Position” drop-down list
 - C. Enter an exception reason
 - D. A and B
 - E. All of the above
34. If a child is between two and three years what is the appropriate method of measuring?
- A. Always standing
 - B. Always recumbent
 - C. Depends on what parent prefers
 - D. None of the above
35. If a child is greater than three years old, what is the appropriate method of measuring?
- A. Always standing
 - B. Always recumbent
 - C. Depends on if child is able to cooperate so that a good standing measure can be obtained, otherwise should be done recumbent
 - D. None of the above
36. What are the first steps to take if it appears that a child’s weight or height has changed drastically compared to previous plots on the growth charts?
- A. Make an immediate referral to the child’s health care provider.
 - B. Begin further assessment by asking the parent assessment questions (*e.g., does the parent think the child’s weight or height status has changed? VENA questions*).
 - C. Look at the measures entered in the record to assure that the information was entered correctly (*e.g., entered “42” when should have been “24”; or entered the decimal value when should have entered it’s ounce equivalent – e.g.: entered “6” in the ounce field because the read out was “.6” which should have been converted to “11 ounces”*).
 - D. Re-measure the child.
 - E. First, C and if errors found, D and if it appears that measures were correct, then B and if appropriate A.
37. Which of the following statements are false?
- A. Multiple (vs. single) plots of weight/height give a better picture of a child’s growth.
 - B. It doesn’t matter if the length or height was measured (recumbent or standing).
 - C. It is important to indicate the actual date measurements were taken so height and weight plots will be based on the child’s age at time of measurement

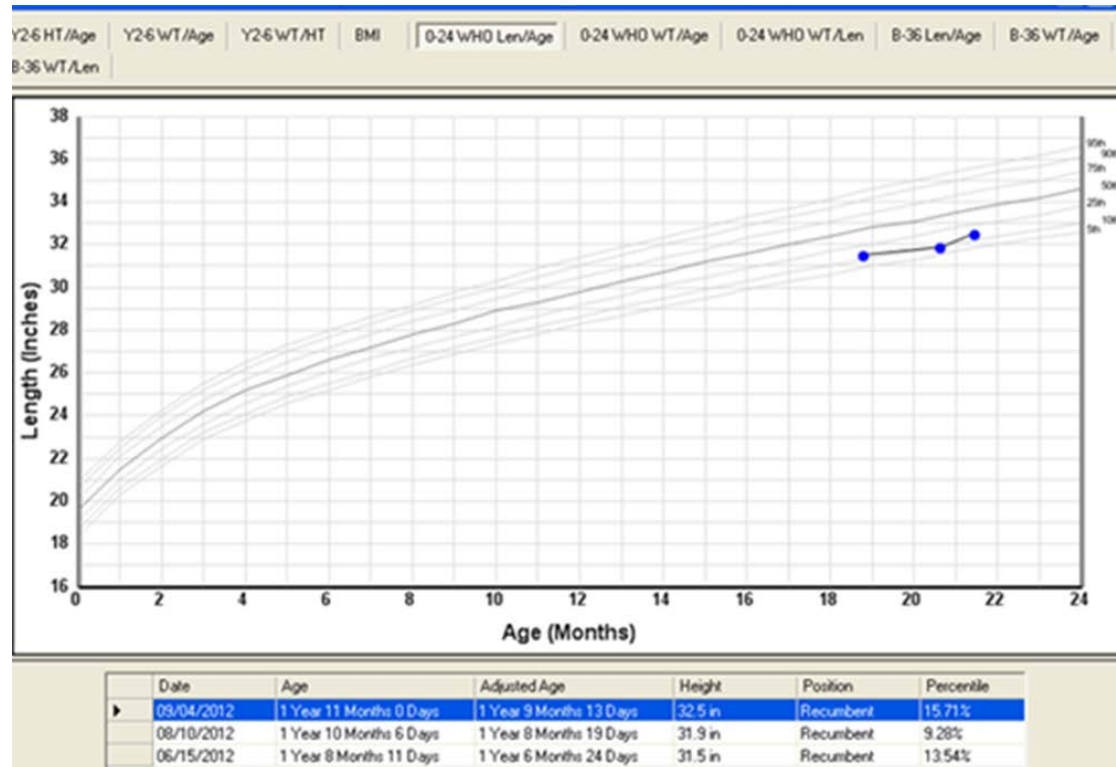


Now, check your answers against the Answer Key at the end of this module.

Assessing Growth and Weight Status

The following charts are used by the Minnesota WIC Program to assess growth.

WHO 0 to 24 Length-for-Age and Gender



The WHO 0-24 month length-for-age charts represent the normal distribution of length at specified ages for boys or girls in the WHO Standard population. These charts compare how long a child is to other children the same age and gender raised in an ideal environment.

Based on this chart the following risk code could be assigned:

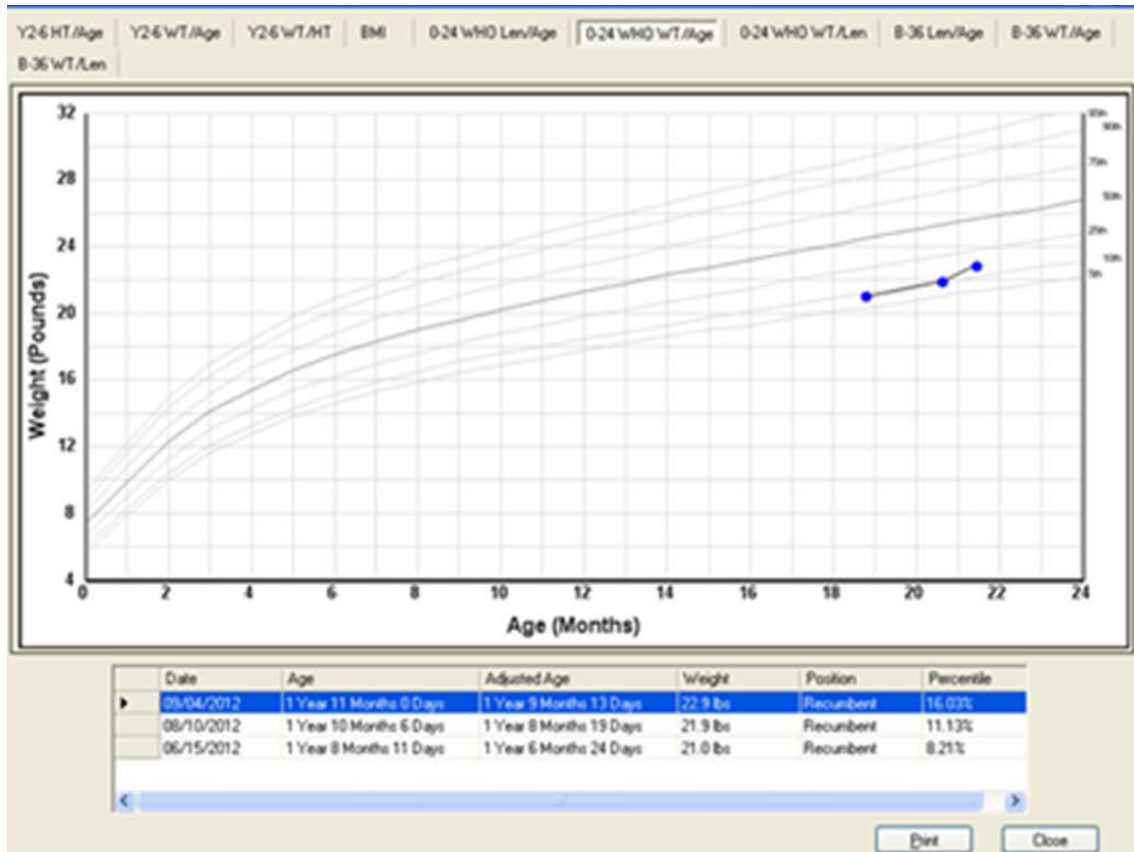
WIC Risk Code 121, Short Stature or At Risk of Short Stature

Length for Age \leq the fifth percentile (5%) is the criteria for assigning Risk Code 121, Short Stature or At Risk of Short Stature.

- Length-for-Age \leq the 2.3% is criteria for Short Stature
- Length-for-Age \leq the 5% but above the 2.3%, is criteria for At-Risk of Short Stature

NOTE: because the 2006 CDC/WHO charts are a Standard (not a reference) narrower ranges are used to indicate possible concerns. For example, for children less than two years, the risk code 121 - Short Stature or At Risk of Short Stature, is not assigned until the child's length/age is \leq 5%. While for children older than two years measured standing, is assigned when height/age is \leq 10%.

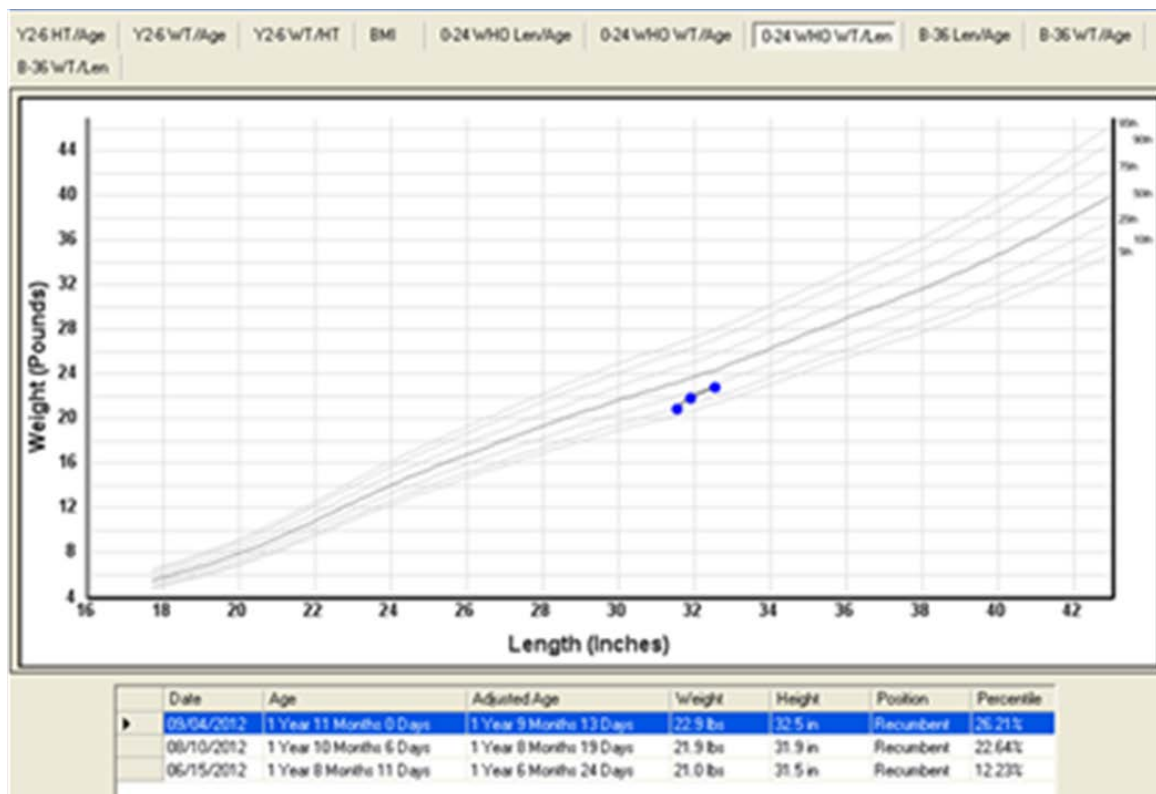
WHO 0 to 24 Weight-for-Age and Gender



The 0 to 24 month weight-for-age charts represent the normal distribution of weight at specified ages for boys or girls in the WHO standard population. These charts compare how heavy a child is compared to other children the same age and gender.

Weight for age is not used alone to classify infants and children as under or overweight. However, it is important in early infancy for monitoring weight, and weight gain. Further, because weight for age is influenced by recent changes in health or nutritional status, it can be helpful in explaining changes in weight-for-length or BMI-for-age.

WHO 0 to 24 Weight-for-length and Gender



The WHO 0 to 24 month weight-for-length charts represent a normal distribution of weight compared to length for boys or girls in the age range from birth to 24 months. These charts compare the weight measures of all same gender children of a given length. Compared to other children the same gender, how does the child's weight compare to other children this length? These charts can be an indicator of overweight or underweight.

Based on this chart the following risk codes could be assigned:

WIC Risk Code 103, Underweight or At Risk of Becoming Underweight

Weight-for-Length \leq the fifth percentile (5%) is the criteria for assigning WIC Risk Code 103.

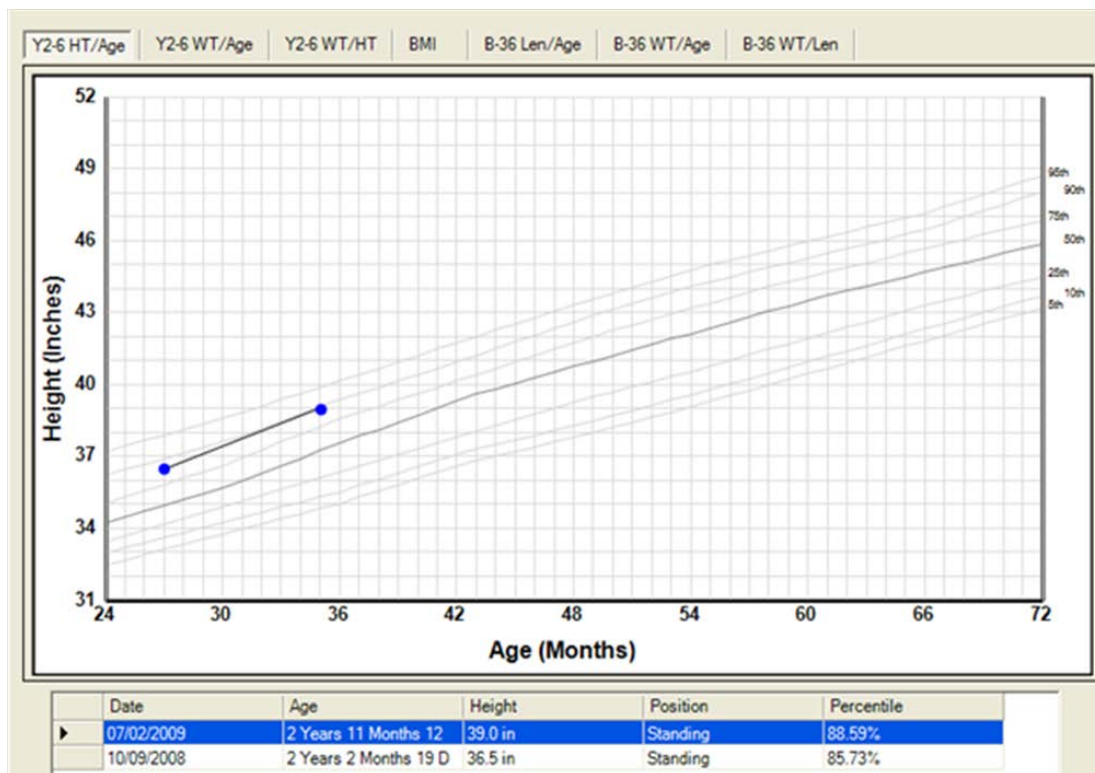
- Weight-for-length \leq the **2.3 percentile** (2.3%) is criteria for **Underweight**
- Weight-for-length \leq the fifth percentile (5%) but above the 2.3percentile is the criteria for **At-Risk** of Becoming Underweight

WIC Risk Code 115, High weight for length

Weight for length \geq 97.7% for infants and children less than two years old is the criteria for assigning WIC Risk Code 115. Children 12 months and older with this risk code are considered high risk and an INCP will need to be written.

NOTE: There will be no anthropometric risk codes assigned to children greater than two years measured in the recumbent position.

Two-to-six year Height-for-Age and Gender



The height-for-age charts represent a normal distribution of heights at specified ages for boys or girls in the nationally representative reference. These charts compare how tall a child is to the height of other children the same sex and age. These charts can be an indicator of short stature or growth faltering.

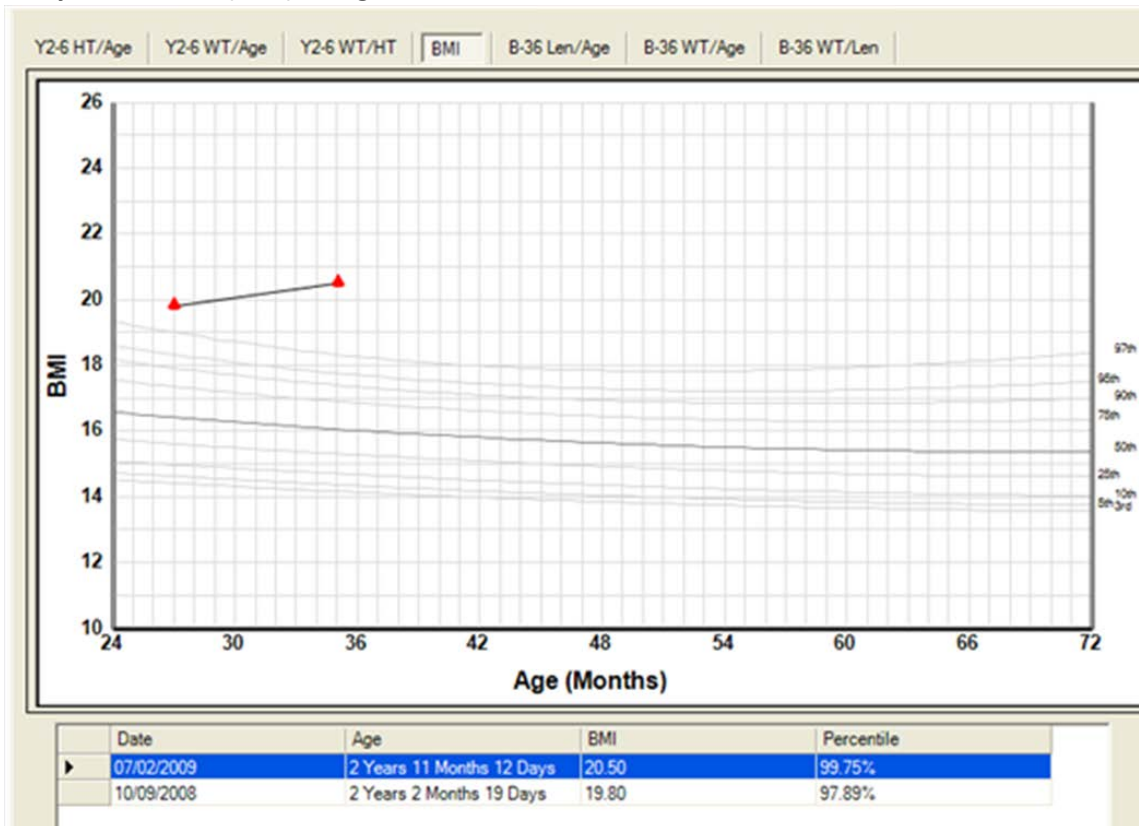
Based on this chart the following risk codes could be assigned:

WIC Risk Code 121, Short Stature or At Risk of Short Stature

Height for Age \leq the tenth percentile (10%) is the criteria for assigning

- Height-for-Age \leq the fifth percentile (5%) is used to screen for Short Stature
- Height-for-Age \leq the tenth (10%) but above the fifth is used to screen for At Risk of Short Stature

Body-Mass-Index (BMI) for Age and Gender



The BMI-for-age charts represent a normal distribution of weight and height together, and compare BMI - for boys and girls of the same age in the nationally representative reference. These charts compare the combined weight and height to other same age and gender children. BMI is used to classify children as underweight, overweight or obese.

Based on this chart the following risk codes could be assigned:

WIC Risk Code 103, Underweight or At-Risk-of-Becoming Underweight

BMI for Age \leq the tenth percentile (10%) is the criteria for assigning Risk Code 103, Underweight or At Risk of Becoming Underweight.

- BMI-for-Age \leq the fifth percentile (5%) is used to screen for Underweight
- BMI-for-Age \leq the tenth (10%) but above the fifth is used to screen for At Risk of Becoming Underweight

WIC Risk Code 113, Obese (Children 2 years and older)

BMI for Age \geq 95th percentile is the criteria for assigning Risk Code 113, Obese.

WIC Risk Code 114, Overweight (Children 2 years and older):

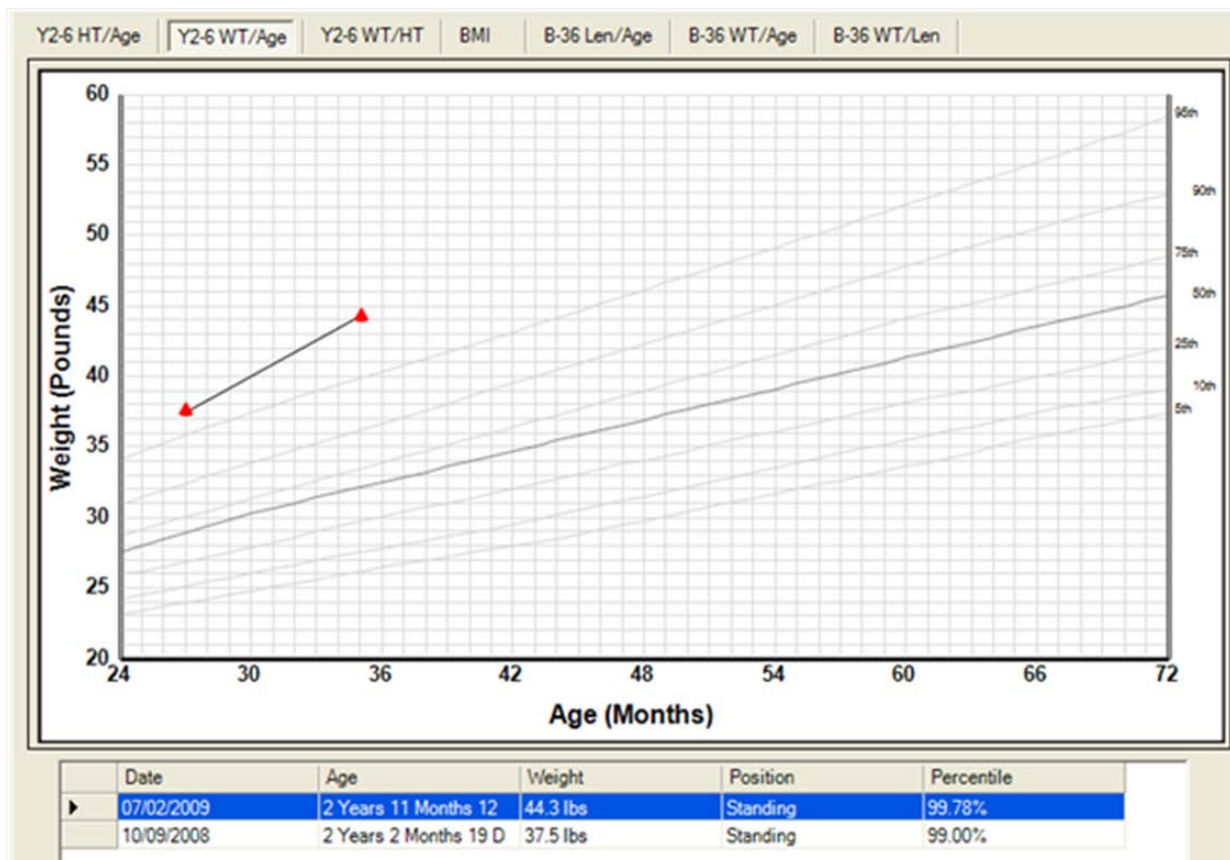
BMI for Age \geq 85th percentile up to the 95th percentile is the criteria for assigning Risk Code 114.

Note: In 2000, the CDC introduced BMI charts for children. The BMI for age charts are used to evaluate weight status compared to height **and** age. BMI for age charts is superior for evaluating weight status, and BMI for age is the measure WIC staff should use to assess weight status. The CDC has created a [BMI/age training module](#) that all staff should review.

- On the BMI for age chart, the child's age is included in the assessment of the child's weight status. Including age in the assessment is important because children's adiposity varies by their stage of development, which is reflected by the child's age.
- BMI can be used to evaluate weight status through adolescence and into adulthood. This allows for tracking a child's weight over time.

BMI for age is the appropriate method for evaluating children's weight status. Weight for height should not be used to assess weight status in WIC clinics.

Two-to-six year Weight-for-Age and gender:



The two to six year weight for age charts represent a normal distribution of weights at specified ages for boys or girls in the nationally representative reference. These charts compare how heavy a child is to the weight of other children the same sex and age. Weight-for-Age alone is not used to classify children as over or underweight, but it often reflects recent changes in health or nutritional status and can be important in assessing changes in BMI status.

Please do the [WHO Growth Chart Training Case Examples](#) following the links below:

[Case Example 1: Low Weight for Length](#)

[Case Example 2: Inadequate Growth or Just Small](#)

[Case Example 3: Excess Weight Gain](#)

[Case Example 4: Transitioning from the WHO Weight-for-Length Chart to the CDC BMI-for-Age Chart at Age 2 years](#)

[Case Example 5: Early Lactation Difficulties](#)

Complete the quizzes as you work through the examples. Complete the following self-check using the information gleaned from this document and the case studies. You may wish to print the certificate of completion at the end of the case examples.



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

38. Choose “T” (for True) or “F” (for False) for each of the following statements

- a. The pattern of growth reveals more about a child’s nutritional status than a measurement at one point in time.
- b. Height or weight plotted at a certain age tells you how a child compares in size with other children of the same age and gender.
- c. Percentiles are curved lines on the growth chart that are used to show how a child’s measurements compare with other children.
- d. Short stature (low length or height for age) might indicate a growth problem, but it may simply reflect normal growth for that child.
- e. To see if a 3 year-old child has an appropriate weight for his height; plot the measurement on the weight-for-height chart.

39. Fill in the blanks with the appropriate percentiles:

- a. BMI for age less than or equal to (\leq) the _____ percentile may indicate underweight.
- b. BMI for age greater than or equal to (\geq) the _____ percentile may indicate overweight.
- c. BMI for age greater ($>$) than the _____ percentile and less than or equal to (\leq) the _____ percentile may indicate the child is “at-risk-of-underweight”.
- d. BMI for age greater than or equal to (\geq) the _____ percentile may indicate the child is obese.

40. Choose “T” (for True) or “F” (for False) for each of the following statements

- a. Weight and length (or height) should be measured at every certification for all children.
- b. The growth chart should be reviewed at every certification for all children.



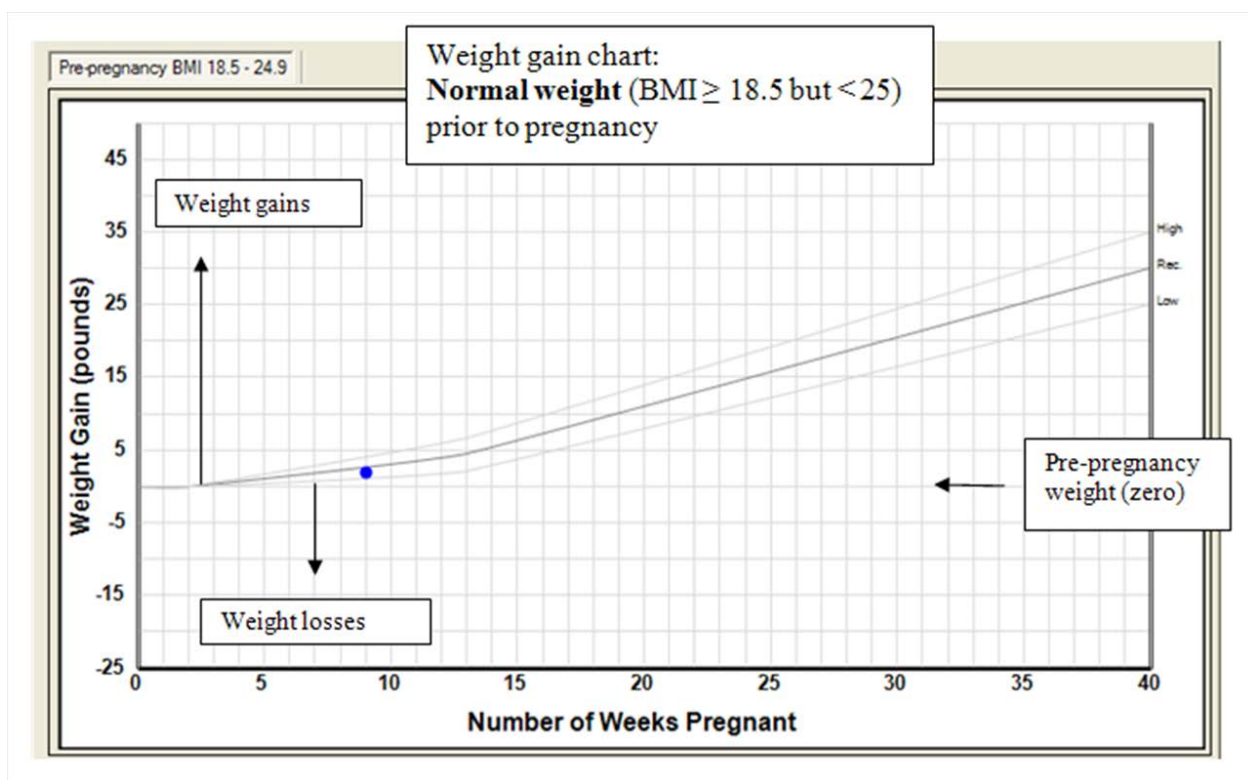
Now, check your answers against the Answer Key at the end of this module.

Weight Gain in Pregnancy

Appropriate weight gain is important to achieving a healthy pregnancy. WIC can have a critical role in facilitating appropriate weight gain among WIC participants by accurately assessing the rate of weight gain and by providing appropriate advice regarding the individual's unique situation. Weight gain recommendations are based on a woman's pre-pregnancy weight status (i.e., underweight, normal, overweight or obese). For example, women who were underweight prior to the pregnancy should gain more weight than normal- or over-weight women. By monitoring a woman's weight gain over the course of the pregnancy, WIC can provide individualized nutrition information and support to improve the likelihood that she will gain a healthy amount of weight.

What is a pregnancy weight gain chart?

The pregnancy weight gain chart is a tool used to plot a woman's weight gain (or loss) over the course of her pregnancy to monitor the amount and rate of weight gain throughout the pregnancy. Weeks gestation -- from 0 to 40 -- are shown on a horizontal axis moving left to right. Each grid line represents one week of gestation.

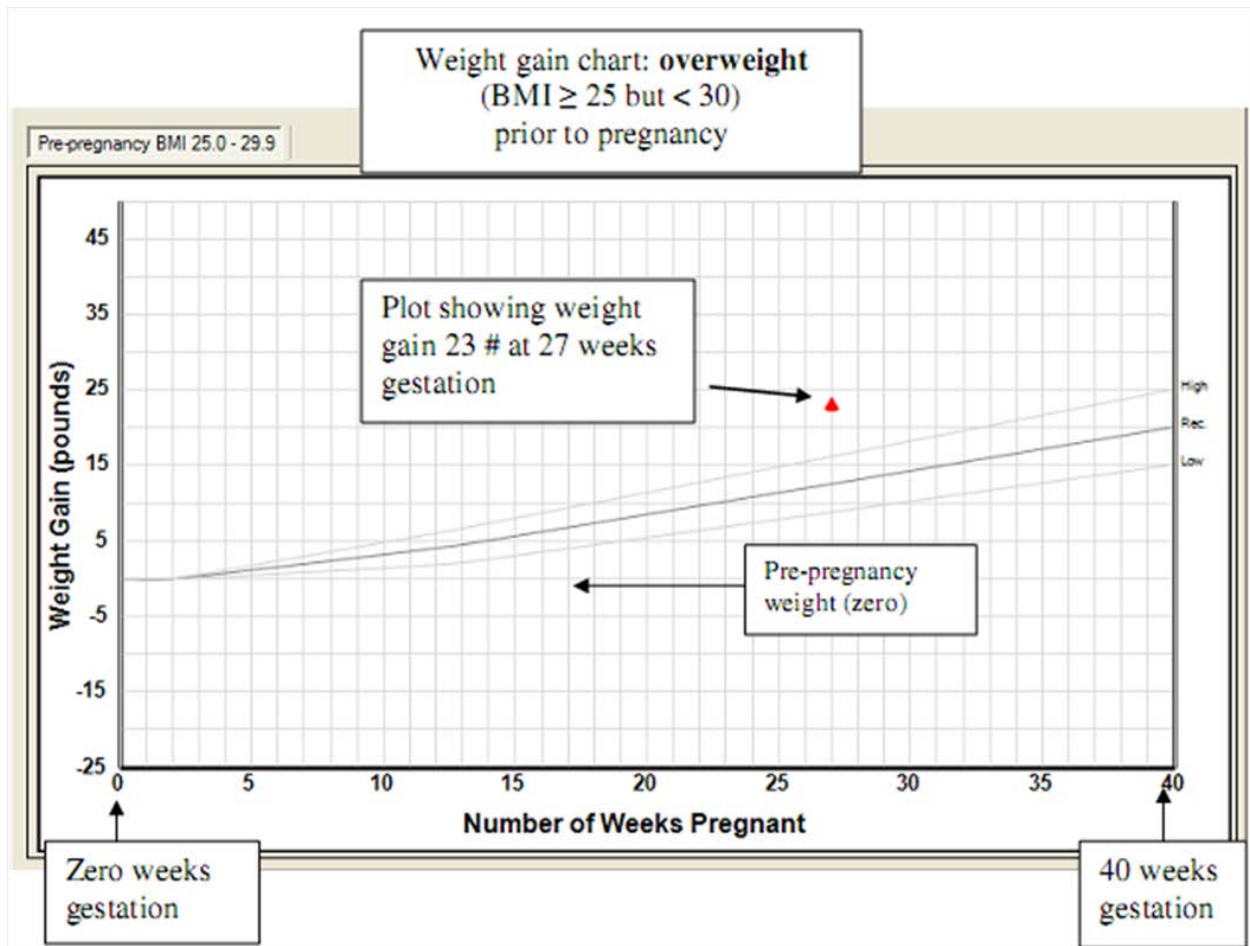


Weight gain or loss from the pre-pregnancy weight is depicted on the vertical axis along the left hand side of the chart. The pre-pregnancy weight is plotted at "zero" (the starting point on the graph). Weight gain is depicted by grid lines above zero; and weight loss is shown by increments below zero. Each grid line represents five pounds.

The chart displays a recommended range of weight gain for each week of gestation. The actual weight change (today's weight less the pre-pregnancy weight) is plotted against the weeks gestation. Tracking

the weight gain or loss and comparing it to the recommended weight gain, helps identify deviations from the expected rate of change. This information, along with accurate dietary and health information can help you assess a woman's health and nutritional status.

In the example below, the woman was assessed to be "overweight" prior to the pregnancy. On the date of the measurement, it was estimated that she was at twenty seven weeks gestation, and she had gained approximately 23 pounds.



The pregnancy weight gain charts used in the Minnesota WIC Program were developed based on the recommendations from the Institute of Medicine ([Nutrition During Pregnancy, Institute of Medicine, National Academy of Sciences, National Academy Press, 2009](#)). IOM published recommended amounts of weight gain based on pre-pregnancy weight status -- underweight, normal weight, overweight, and obese -- reflecting the different recommended amounts of weight gain based on pre-pregnancy weight status.

A woman's pre-pregnancy weight status is assessed using Body-Mass-Index (BMI), and determined to be either underweight, normal weight, overweight or obese.

Procedures for determining recommended weight gain

Step #1: Determine the woman's pre-pregnancy BMI.

You can use the system calculated BMI, a BMI chart or a calculator.

BMI Chart

Height in inches	Weight pounds								
58"	88	89	91	100	118	119	129	143	144
59"	91	92	94	104	123	124	133	148	149
60"	94	95	97	107	127	129	138	153	154
61"	97	98	100	111	131	133	143	158	159
62"	100	101	104	115	135	137	147	163	164
63"	104	105	107	118	140	141	152	169	170
64"	107	108	110	122	144	146	157	174	175
65"	110	111	114	126	149	150	162	179	180
66"	114	115	118	130	154	155	167	185	186
67"	117	118	121	134	158	159	172	191	192
68"	121	122	125	138	164	165	177	196	197
69"	124	125	128	142	168	169	182	202	203
70"	128	129	132	146	173	174	188	208	209
71"	132	133	136	150	178	179	193	214	215
72"	136	137	140	154	183	184	199	220	221
BMI	< 18.5	≥ 18.5	19	21	24.9	25	27	29.9	≥30
	Under Weight	Normal Weight			Over Weight			Obese	

In establishing an estimated pre-pregnancy weight, the CPA must use professional judgment, along with assessment and interviewing skills. The CPA may begin by asking the woman what she estimates her pre-pregnancy weight to have been. Some women will know but many will not. Many women will not have had access to a reliable medical quality scale. The CPA must keep these things in mind when determining what weight to use as her pre-pregnancy weight estimate.

The CPA may need to help the woman estimate the pre-pregnancy weight by asking her if she thinks she has gained or lost weight, consider asking her things such as: if and how her clothes fit differently? does she sense a physical change? have there been measurements done at her clinic visits?

If for example, she states that her pre-pregnancy weight was 125 pounds, she is currently at 8 weeks gestation, and she states that her clothes mostly still fit – with minor changes in the snugness of the waist band of her jeans, and you measure her weight at the clinic as 135 pounds, you may wish to change the estimate of pre-pregnancy weight to a number closer to 135 pounds.

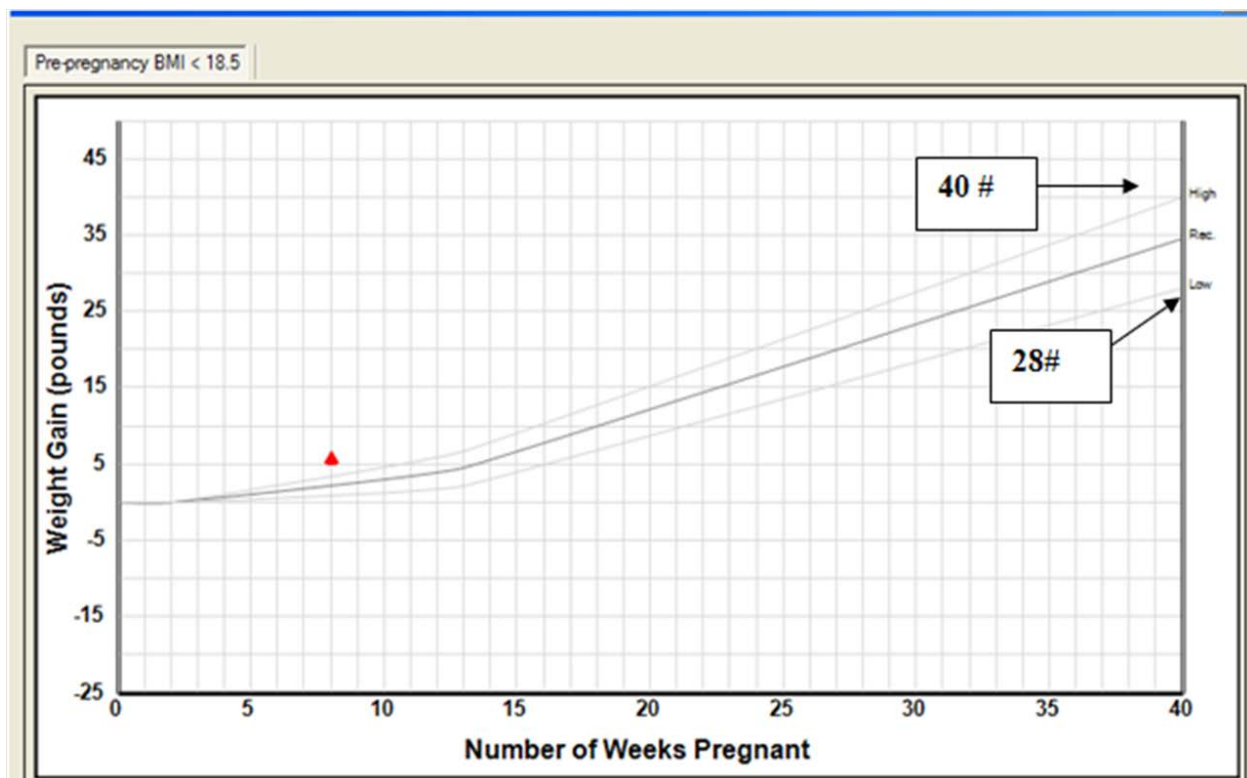
Step #2: Determine the woman's recommended weight gain amount and pattern.

The following table lists pre-pregnancy BMI values, and the corresponding weight gain recommendations. The clinic software will display the appropriate chart based on information entered into the health information and height/weight/blood tabs.

BMI prior to pregnancy	Pre-pregnancy weight status	Recommended total weight gain	Weight Gain Chart used to plot weight in pregnancy
< 18.5	Underweight	28 to 40 pounds	Underweight chart
18.5 to 24.9	Normal weight	25 to 35 pounds	Normal weight chart
25 to 29.9	Overweight	15 to 25 pounds	Overweight
≥ 30.0	Obese	11 to 20 pounds	Obese chart

Weight Gain in Pregnancy – Underweight Women - pre-pregnancy BMI is less than 18.5

This chart is used for women who were underweight prior to the pregnancy. The total amount of recommended weight gain is greater for women who began their pregnancy underweight. In order to achieve a greater total weight gain, the weight gain pattern will be slightly different. By plotting the changes in her weight by the week's gestation, it is possible to see if her current rate and amount of weight gain is on target to achieve the total recommended amount of weight gain. For women who were underweight prior to the pregnancy, the recommended range of weight gain is 28 to 40 pounds.

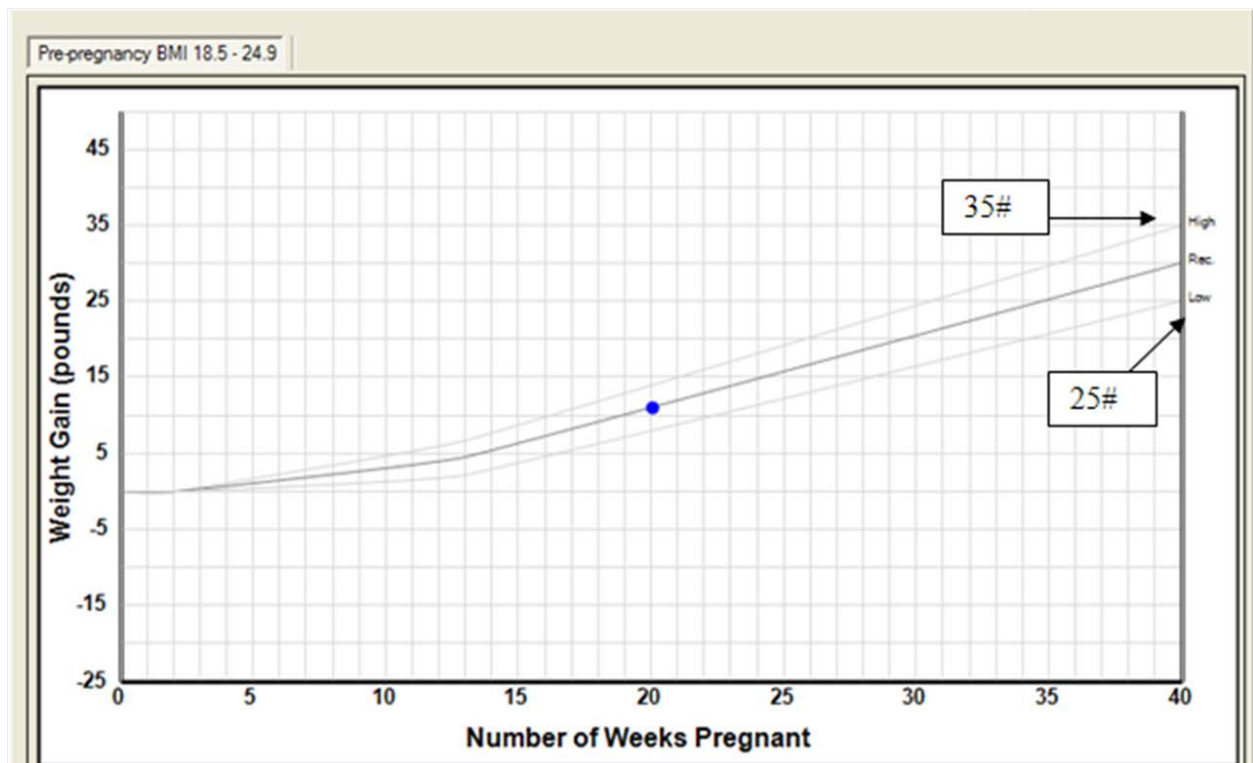


This woman was underweight prior to pregnancy. She is currently at 8 weeks gestation and has gained five and a half pounds. It is recommended that she gain is at least 28 pounds but less than 40 pounds. Strictly speaking, her current weight gain is high (it falls above the range), but your counseling would not

focus on the slight discrepancy between her current weight gain and the range. More important will be weight changes going forward measured on reliable consistent scales.

Weight Gain in Pregnancy – Normal Weight Women – pre-pregnancy BMI is ≥ 18.5 and < 25

This chart is used for women who were classified as “normal” weight prior to pregnancy, (i.e., the BMI was between 18.5 and 24.9). As with underweight women, by plotting the changes in weight by weeks gestation, it is possible to see if the current rate and amount of weight gain is on target to achieve the total recommended amount of weight gain. For women who were normal weight prior to the pregnancy, the recommended range of weight gain is 25 to 35 pounds.



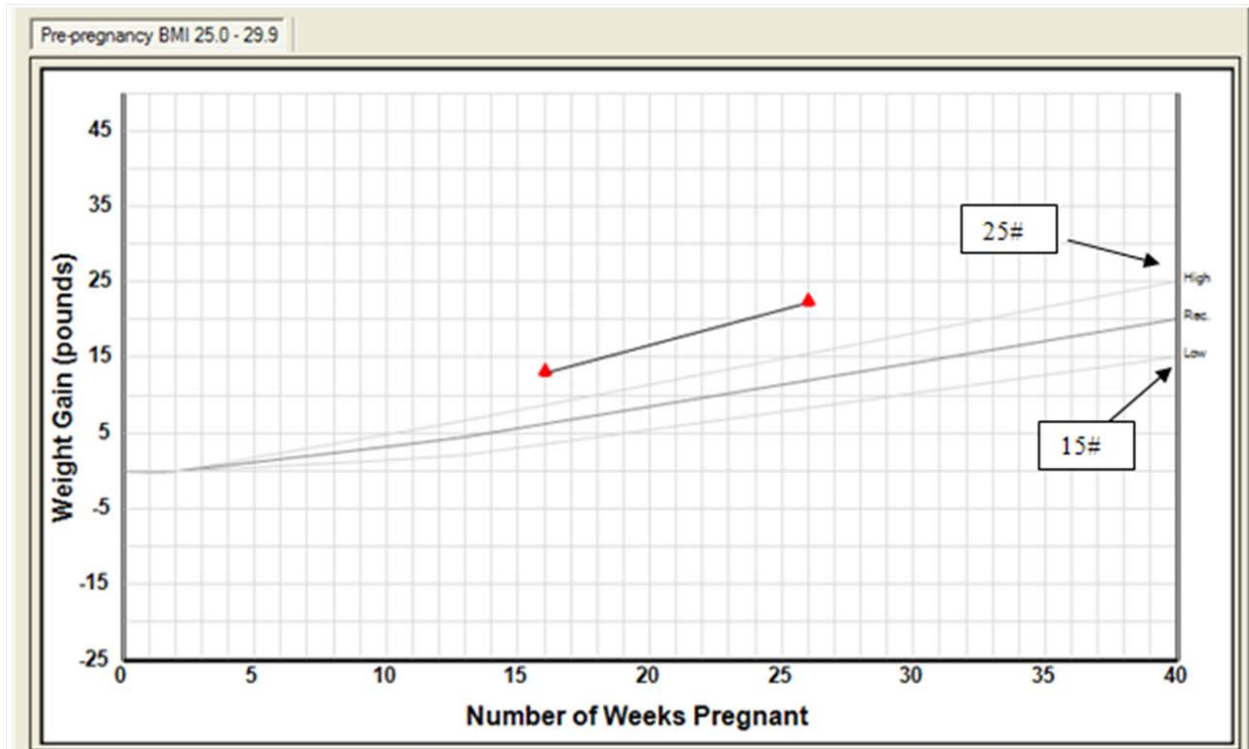
This woman’s weight status was “normal” prior to her pregnancy. She is currently at 20 weeks gestation and has gained about eleven pounds.

Her current weight gain, assuming the pre-pregnancy weight estimate is correct, is within the recommended range of weight gain and she is on track to gain an appropriate amount of weight during the pregnancy.

Weight Gain in Pregnancy – Overweight Women – pre-pregnancy BMI is ≥ 25 and < 30

This chart is used for women who were classified as overweight prior to pregnancy. As with underweight and normal weight women, by plotting the change in weight by weeks gestation, it is possible to see if the current rate and amount of weight gain is on target to achieve the total recommended amount of weight gain. For women who were overweight prior to the pregnancy, the recommended range of weight gain is 15 to 25 pounds.

This chart is used for women whose pre-pregnancy BMI is greater than or equal to 25, but less than 30.



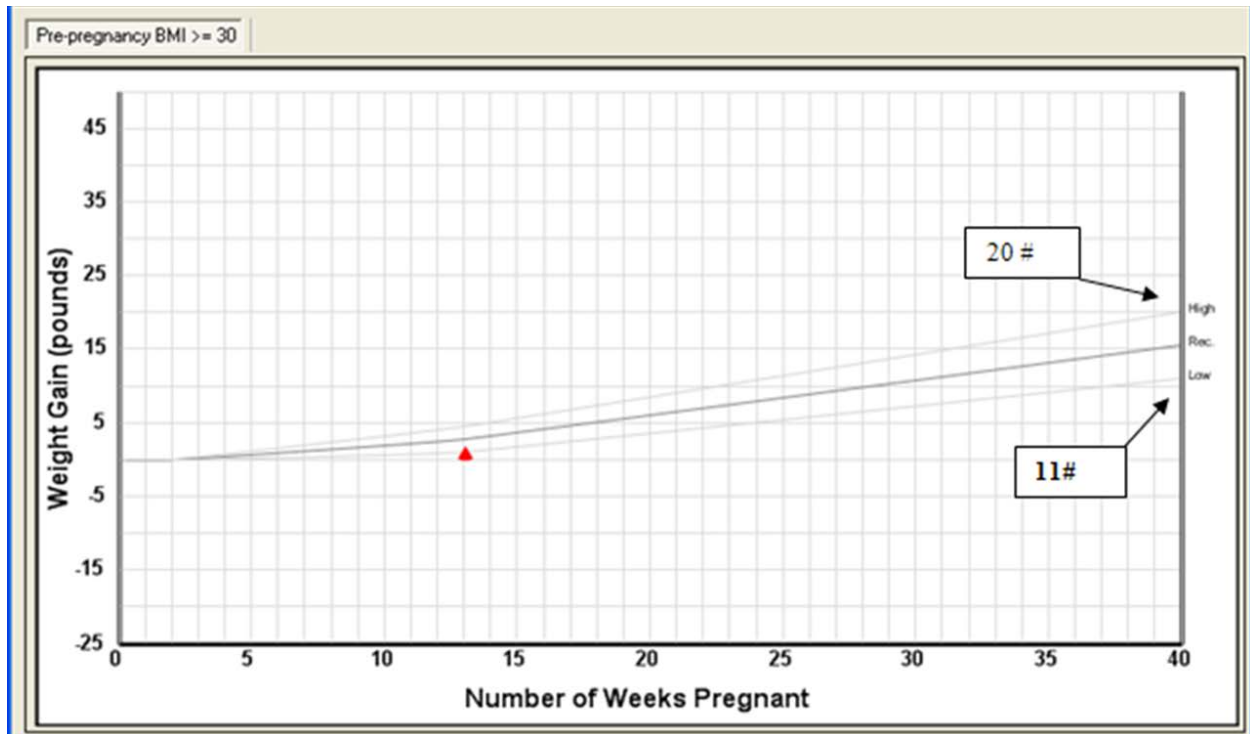
This woman's weight status was "overweight" prior to her pregnancy. She is currently at 26 weeks gestation and has gained about 23 pounds. This woman's total amount of weight gain is greater than recommended and the pattern is slightly faster than recommended, but in clinic you would need to consider her situation.

If there had been a concern that excess weight gain was likely to be a problem for this woman, this total and rate of gain may be an excellent clinical outcome. Also keep in mind that the initial weight measurement was within approximately 5 pounds of the recommended range and the estimated pre-pregnancy weight could easily be off by five pounds. So even though the system will assign a risk code for high weight gain in pregnancy, the focus would be on continued small gradual weight gains through the remainder of the pregnancy and not the risk code per se.

Weight Gain in Pregnancy – Obese Women – pre-pregnancy BMI is ≥ 30

This chart is used for women who were classified as obese prior to pregnancy. As with overweight, underweight and normal weight women, by plotting the change in weight by weeks gestation, it is possible to see if the current rate and amount of weight gain is on target to achieve the total recommended amount of weight gain. For women who were obese prior to the pregnancy, the recommended range of weight gain is 11 to 20 pounds.

This chart is used for women whose pre-pregnancy BMI is greater than or equal to 30.



This woman's weight status was "obese" prior to her pregnancy. She is currently at 13 weeks gestation and has gained very little weight. Her weight gain will be assessed by the system as being too low. However, counseling should not focus on this. The current weight gain is very near to the recommended amount and the pre-pregnancy weight is an estimate. Further, there is only one weight measurement and the pattern of weight gain throughout the pregnancy will be more important to monitor using consistent accurate scales. Further, especially for obese women, advice about the amount and rate of weight gain should be from her doctor.

What do the Weight Gain in Pregnancy Charts Tell Us?

The weight-gain-in-pregnancy-chart allows comparison of a woman's weight gain to a recommended range of weight gain, based on the pre-pregnancy weight status. The recommended standards provide a range of weight gain for given pre-pregnancy weight status. The standards are developed by an expert panel for the Institute of Medicine (IOM), and are based on the best available scientific evidence.

Low maternal weight gain is associated with an increased risk of small for gestational age (SGA) infants, especially in underweight and normal weight women. (IOM. *Weight gain during pregnancy: reexamining the guidelines*. National Academy Press Washington, D.C.; 2009)

Likewise, women with excessive gestational weight gains are at increased risk for cesarean delivery and delivering large for gestational age infants. This can secondarily lead to complications during labor and delivery. There is a strong association between higher maternal weight gain and both postpartum weight retention and subsequent maternal obesity. High maternal weight gain may be associated with glucose abnormalities and gestational hypertension disorders, but the evidence is inconclusive. Obesity is one of the most important long-term child outcomes related to high maternal weight gain. A small number of relatively large and recent epidemiologic studies show that higher maternal weight gain is associated with childhood obesity as measured by BMI. (IOM. *WIC nutrition risk criteria: a scientific assessment*. National Academy Press, Washington D.C.; 1996)

If a woman's weight gain falls within the recommended range, it is assumed that her weight gain is appropriate and healthy. If the weight gain is greater than the recommended range, she may be gaining too much weight or gaining too quickly. If the weight gain is less than the recommended range, she may not be gaining enough for the best pregnancy outcome. A pregnant woman's rate of weight gain, reviewed together with information obtained from a diet and health assessment, can help focus the nutrition education and counseling.

It is very important to keep in mind that a single plot can be deceiving. Staff should avoid drawing conclusions from a single weight measurement. Serial measurements during pregnancy illustrate the pattern (rate and amount) of the weight gain. Wherever on the grid the weight plots, continued gradual weight gain should be encouraged. For women who have gained more than the recommended amount, the goal should be to slow the rate of gain, but **not** to stop gaining. For women who have gained less than the recommended amount, a faster rate of weight gain is recommended.

NOTE: Estimating Pre-pregnancy weight - Many pregnant women won't know what they weighed before they were pregnant, so it is often only an estimate and prone to error. If the estimate of pre-pregnancy weight is incorrect, the chart used to plot her weight change during the pregnancy might be inappropriate, and assessed weight gained or lost could be incorrect. Staff must always remember when using the charts that they may have incomplete information. However, even though the information is not perfect, it is important to assess weight change during pregnancy.

Excessive weight gains and serious weight losses should be evaluated, first to verify that the weight change is accurate (i.e., that no measurement errors occurred). Whenever large deviations from the expected rate of change are identified, it is essential to determine whether it reflects measurement error or actual weight changes.

If the weight changes seem to be accurate, the CPA should explore possible explanations for the weight gain or loss. The CPA should review recent dietary intake, exercise habits, as well as other aspects of the woman's health and home situation. Significant unexplained weight shifts may signal a problem with the pregnancy and the woman should consult with her doctor.



SELF CHECK



ANTHROPOMETRIC ASSESSMENT

41. Obese women should be encouraged to:

- a. Lose weight early in the pregnancy to avoid excess total amount of weight gain
- b. Gain approximately 8 to 15 pounds during the entire pregnancy
- c. all of the above
- d. none of the above

42. Which of the following is true?

- a. It is easy to assess women's weight gain at their first visit because you can compare her weight gain at this visit compared to their pre-pregnancy weight.
- b. If a woman is gaining too slowly, she should be encouraged to stop doing any exercise or activity that burns extra calories.
- c. If a woman is gaining too slowly, the WIC CPA should assess why this might be the case. For example: does she have nausea or heartburn that might inhibit her desire to eat, what was her usual meal pattern before the pregnancy what is it now, what does she usually eat, is she eating a balanced diet?

43. Mark the following statements "T" (for True) and "F" (for False).

- a. Even obese women are encouraged to gain small amounts of weight each week with a goal of 11 to 20# total weight gain.
- b. Weight gains far above or far below the amount and rates suggested on the weight gain charts are associated with less favorable pregnancy outcomes.
- c. A woman who is currently at 28 weeks gestation, had a pre-pregnancy BMI in the normal range, and who has already gained 40 pounds should be encouraged to stop gaining weight, and to try to stay at her current weight until the recommended weight gain range "catches" up with her current weight gain.
- d. The recommended weight gain depends on what the woman gained in her last pregnancy. If she gained 25# and the baby was healthy that is what she should gain with this pregnancy.
- e. Women almost always know their pre-pregnancy weight within a couple of pounds.

44. Fill in the blanks for the following statement: A 5'2" woman who weighed 100 # prior to the pregnancy has a pre-pregnancy BMI that falls in which range? Select one: underweight, normal weight, overweight or obese. She should be encouraged to gain a total of ____ to ____ pounds.



Now, check your answers against the Answer Key at the end of this module.

Part IV Answer Key for Self-Checks

1. Any of the following responses are correct:
2. Any of the following responses are correct:
 - Measuring length/height and weight is a required component of certifications in WIC
 - Results of the measures may identify possible or overt problems (e.g.: under or overweight)
 - Results of the measures are used in determining/planning education and counseling
 - Results of the measures are compiled to create reports that describe the WIC population
 - Results of the measures are compiled to create reports that are used by policy makers
3. F
4. T
5. T
6. Any of the following are correct (many other responses would also be correct)
 - Smoking
 - Drug or alcohol use
 - Good or poor dental hygiene
 - Active or sedentary lifestyle
 - Taking or not taking prenatal vitamins
7. C
8. T
9. F
10. a True
b None of the risk codes will be assigned
11. A
12. D
13. A
14. A

15. a 29 3/8 enter as

Height	
Inches	29
Eighths	3

b 29 ¾ enter as

Height	
Inches	29
Eighths	6

c 29 ½ enter as

Height	
Inches	29
Eighths	4

16. F
17. T
18. 12
19. ¼ ¾
20. 10 ounces
21. B
22. A
23. D
24. T

25. a 145 pounds 11 ounces
b 128 pounds 13 ounces
c 116 pounds 0 ounces
26. T
27. F
28. T
29. T
30. D
31. Possible answers (any two of the following others also may be correct)
- shoes not removed
 - hat not removed
 - elaborate hairdo on crown of head
 - knees bent
 - Frankfort plane is not parallel to the floor
 - feet, legs not properly positioned (i.e. feet not flat on floor)
 - body not properly positioned (straight mid-axillary line not achieved)
 - child < 2 years measured standing
 - child > 3 years measured recumbent
 - measurer did not crouch to read measure at eye level or did not use step stool when shorter than the person being measured
32. Possible answers (any two of the following others also may be correct)
- shoes not removed
 - outer, heavy clothing not removed
 - wet diaper present
 - body not centered on scale
 - child jumping or moving around on scale
 - person is weighed while holding some object such as toy or purse
 - nutrition staff is distracted from recording a measurement immediately following procedure and records an incorrect measurement later
 - scale not balanced at zero setting before weighing the participant
 - person being measured leaning on the wall or holding the stem of the scale
 - scale set to Kg
33. A
34. D (none of the above, depends on child's ability to stand correctly and cooperate)
35. A
36. E
37. B
38. a T
b T
c T
d T
e F
39. a 5th (BMI/age ≤ 5th % = underweight; BMI/age > and ≤ 10th % = at risk of underweight)
b 85th
c 5th and 10th
d 95th
40. a T
b T

41. D
42. C
43. a T
b T
c F
d F
e F
44. Her BMI = 18.3 which falls in the < 18.5 (underweight) category
She should gain 28 to 40 pounds

Equipment checklists

Infant Scale Checklist

- ✓ High quality beam balance or electronic digital
- ✓ Weighs to 40 lb.
- ✓ Weighs in 1/2 oz. (or smaller) increments
- ✓ Tray large enough to support the infant
- ✓ Can be easily 'zeroed' and checked
- ✓ Can be calibrated

Infant Length-board Checklist

- ✓ A firm, inflexible, flat horizontal surface with a measuring tape in 1/8 inch increments
- ✓ Tape is stable and easily read
- ✓ An immovable headboard at a right angle to the tape
- ✓ A smoothly moveable footboard, perpendicular to the tape

Child and Women Scale Checklist

- ✓ High quality beam balance or electronic digital
- ✓ Weighs in 1/4 lb. (or smaller) increments
- ✓ Stable weighing platform
- ✓ Can be easily 'zeroed'
- ✓ Can be calibrated
- ✓ **No stature device attached**

Child and Women Stadiometer Checklist

- ✓ A vertical board with an attached metal tape, or metal tape firmly mounted on a stable wall
- ✓ An easily moveable horizontal headboard that can be brought into contact with the most superior part of the head
- ✓ If not attached, the head board must be a right angle that is 6" wide
- ✓ A wide and stable platform or firm uncarpeted floor as the base
- ✓ Easily read, stable tape readout in 1/8 inch increments

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