



## OVERVIEW

### BIG IDEA

Body mass index (BMI) is an easy, efficient, and practical way to measure individual and population overweight and obesity levels.

### OBJECTIVE

2.8 Calculate and interpret a person's body mass index.

### AGENDA

1. BMI Chart Analysis
2. Discussion
3. Reading
4. Calculating BMI

### HOMEWORK

Do you think it should be mandatory for schools to report student's BMI to students and parents on an annual basis (assuming it is done in a confidential manner)? Write 1-3 paragraph defending your position.

# LESSON 2.8

## Body Mass Index

### SUMMARY:

This lesson teaches students to calculate and interpret Body Mass Index (BMI) the most widely used indicator of overweight and obesity status. Students will begin by analyzing a BMI Chart. They will then learn what BMI means, how it is used, how to calculate it, and why it is useful. Next they will practice calculating BMI with some examples and complete an open ended assessment of their understanding.



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## Body Mass Index

PH2.8: Calculate and interpret a person's body mass index.

**DO NOW**

The graph below is a Body Mass Index (BMI) Chart. Use it to answer the questions below:

- What four categories for BMI are represented on this chart?
- If a person is 5'7" and weighs 190 lbs, what category would he or she be in for BMI?
- What is the weight range a person who is 5'11" can be in to fall within the Normal Range (BMI 18.5-25)?
- If a person is Overweight and weighs 170, what height range must he or she be in?

**DISCUSS:**

With a partner, discuss what you already know about Body Mass Index (BMI). Where have you heard that term before? If you have never heard of BMI before, who do you think uses it and what is it used for?

### DO NOW Answers:

- Underweight, Normal, Overweight, Obese
- Obese
- Approx 133-172 lbs
- Approx 5'4"-5'11"

### DISCUSS:

Answers will vary. Some students will have (or currently do) attend a school which collects and reports this information. Others may have learned about it in a PE class before. Most students may not be familiar but can use information from the Do Now to make some inferences.



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#### BODY MASS INDEX

(Source: cdc.gov)

##### What are the health consequences of overweight and obesity for adults?

The BMI ranges are based on the relationship between body weight and disease and death. Overweight and obese individuals are at increased risk for many diseases and health conditions, including the following:

- Hypertension (high blood pressure)
- Dyslipidemia (for example, high LDL cholesterol, low HDL cholesterol, or high levels of triglycerides)
- Type 2 diabetes
- Coronary heart disease
- Stroke
- Gallbladder disease
- Osteoarthritis
- Sleep apnea and respiratory problems
- Some cancers (endometrial, breast, and colon)

##### What is BMI?

Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI is a fairly reliable indicator of body fatness for most people. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry (DXA). BMI can be considered an alternative for direct measures of body fat. Additionally, BMI is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems.

##### How is BMI used?

BMI is used as a screening tool to identify possible weight problems for adults. However, BMI is not a diagnostic tool. For example, a person may have a high BMI. However, to determine if excess weight is a health risk, a healthcare provider would need to perform further assessments. These assessments might include skinfold thickness measurements, evaluations of diet, physical activity, family history, and other appropriate health screenings.

##### Why do we use BMI?

Calculating BMI is one of the best methods for population assessment of overweight and obesity. Because calculation requires only height and weight, it is inexpensive and easy to use for clinicians and for the general public. The use of BMI allows people to compare their own weight status to that of the general population.

##### What are other ways to measure BMI?

Other methods to measure body fatness include skinfold thickness measurements (with calipers), underwater weighing, bioelectrical impedance, dual-energy x-ray absorptiometry (DXA), and isotope dilution. However, these methods are not always readily available, and they are either expensive or need highly trained personnel. Furthermore, many of these methods can be difficult to standardize across observers or machines, complicating comparisons across studies and time periods.

#### READ: Health Consequences

Explain disease terms that students do not know. This is a good opportunity to demonstrate a quick google search to get a basic description of a medical term.

#### READ: How is BMI Used?

Ask: What is meant by the term "screening tool"? What are other examples of health screening tools that medical professionals may use? (ex: Pap smear, mammogram, cholesterol test, blood pressure checks, etc.)

#### READ: Why do we use BMI?

Students may be interested in learning more about alternative ways to measure body fat. Doing a quick Google image search or finding a short youtube video that demonstrates methods can be done if time permits.



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#### Calculation of BMI

BMI is calculated the same way for both adults and children. The calculation is based on the following formulas:

Measurement Units	Formula and Calculation
<b>Kilograms and meters (or centimeters)</b>	<p>Formula: <math>\text{weight (kg)} / [\text{height (m)}]^2</math></p> <p>With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. Since height is commonly measured in centimeters, divide height in centimeters by 100 to obtain height in meters.</p> <p>Example: Weight = 68 kg, Height = 165 cm (1.65 m)            Calculation: <math>68 \div (1.65)^2 = 24.98</math></p>
<b>Pounds and inches</b>	<p>Formula: <math>\text{weight (lb)} / [\text{height (in)}]^2 \times 703</math></p> <p>Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.</p> <p>Example: Weight = 150 lbs, Height = 5'5" (65")            Calculation: <math>[150 \div (65)^2] \times 703 = 24.96</math></p>

#### Is BMI interpreted the same way for children and teens as it is for adults?

Although the BMI number is calculated the same way for children and adults, the criteria used to interpret the meaning of the BMI number for children and teens are different from those used for adults. For children and teens, BMI age- and sex-specific percentiles are used for two reasons:

- The amount of body fat changes with age.
- The amount of body fat differs between girls and boys.

Because of these factors, the interpretation of BMI is both age- and sex-specific for children and teens. The CDC BMI-for-age growth charts take into account these differences and allow translation of a BMI number into a percentile for a child's sex and age. For adults, on the other hand, BMI is interpreted through categories that are not dependent on sex or age.

**Interpretation of BMI for adults:** For adults 20 years old and older, BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women, listed in the table below. For children and teens, on the other hand, the interpretation of BMI is both age- and sex-specific.

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

#### NEW INFO:

Students should be able to quickly apply this equation to examples. However, for students who struggle with basic math skills, practicing a few examples together will help.



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Calculate the Body Mass Index and Weight Status for the following people:

1. A 32-year-old female who is 1.75 meters tall and 96 kilograms
2. A 66-year-old male who is 1.87 meters tall and 92 kilograms
3. A 21-year-old male who is 170 lbs and 6'3"
4. A 45-year-old female who is 110 lbs and 5'8"



Answer the following open-ended questions:

1. Name two health consequences of obesity: \_\_\_\_\_ and \_\_\_\_\_
2. What two numbers are needed to calculate BMI? \_\_\_\_\_ and \_\_\_\_\_
3. What is one reason a physician may calculate a patient's BMI?
4. Why is BMI one of the best assessments of a population's overweight and obesity status?
5. What is the BMI of a massive adult who is only 1.5 meters tall but weighs 150 kilograms?



Do you think it should be mandatory for schools to report student's BMI to students and parents on an annual basis (assuming it is done in a confidential manner)? Write 1-3 paragraph defending your position.

#### THINK Answers:

1. 31.4 (Obese)
2. 26.3 (Overweight)
3. 21.2 (Normal)
4. 16.7 (Underweight)

(Note: Age is irrelevant here, but students should recall that this basic BMI equation applies to adults).

#### ASSESS Answers:

Answers 1-4 correspond to paragraphs in text reading. #5 = 66.6 (extremely big BMI number! – morbidly obese)

#### HOMEWORK:

The purpose of this homework assignment is for students to connect the concepts of BMI they just learned about with real world issues relating to childhood obesity, in preparation for their case study. There are many possible interventions that can be used to try to reduce obesity among children, but much is unknown about which are most effective and appropriate.