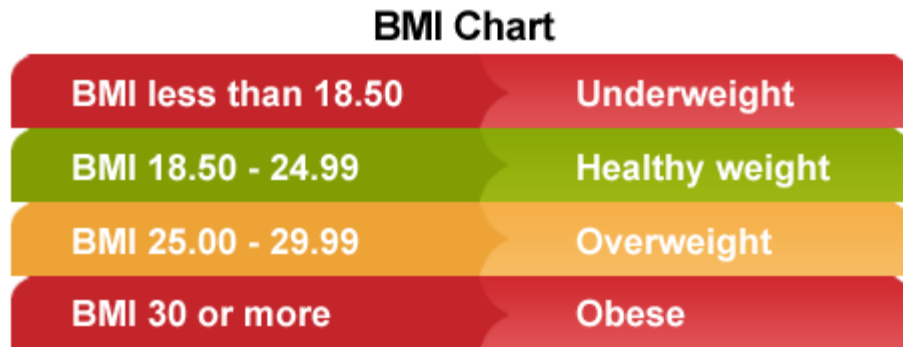


Body Mass Index

Body Mass Index (BMI) is used as a screening tool to identify possible weight problems, however, BMI is not a diagnostic tool. To determine if excess weight is a health risk further assessments are needed such as:

- skinfold thickness measurements
- evaluations of diet
- physical activity
- and family history

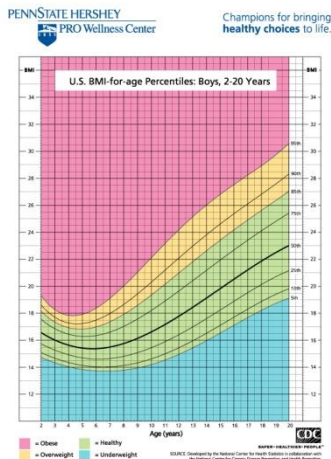
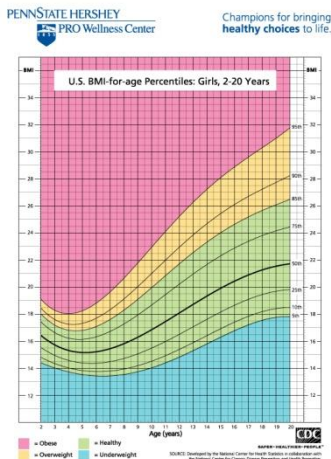
The table below can be used to assess an adult's status BMI Status.



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

In some parts of the world food supplies are insufficient or are unevenly distributed and many people as a result are underweight. In other parts of the world a likelier cause of being underweight is anorexia nervosa. This is a psychological condition that involves voluntary starvation and loss of body mass. Obesity is an increasing problem in some countries. Obesity increases the risk of conditions such as coronary heart disease and type II diabetes. It reduces life expectancy significantly and is increasing the overall costs of health care in countries where rates of obesity are rising.

Charts such as the ones below can also be used to assess BMI.



Weight	lbs																												
	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215					
	Kgs																												
Height	in/cm																												
	5'00"	5'01"	5'02"	5'03"	5'04"	5'05"	5'06"	5'07"	5'08"	5'09"	5'10"	5'11"	6'00"	6'01"	6'02"	6'03"	6'04"												
	152.4	154.9	157.4	160.0	162.5	165.1	167.6	170.1	172.7	175.2	177.8	180.3	182.8	185.4	187.9	190.5	193.0	Underweight	Healthy	Overweight	Obese	Extremely Obese							
5'00"	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42					
5'01"	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41					
5'02"	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41					
5'03"	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40					
5'04"	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40					
5'05"	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39					
5'06"	16	17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38					
5'07"	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38					
5'08"	15	16	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
5'09"	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
5'10"	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
5'11"	14	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36					
6'00"	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36					
6'01"	13	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35					
6'02"	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35					
6'03"	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35					
6'04"	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34					

Body Mass Index

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

1. Metric: $BMI = \frac{\text{weight (kg)}}{(\text{height (m)})^2}$

formula:

2. English: $BMI = \frac{\text{weight (lb)}}{(\text{height (in)})^2} \times 703$

Example:

Mass = 68 kg, Height = 165 cm (1.65 m)

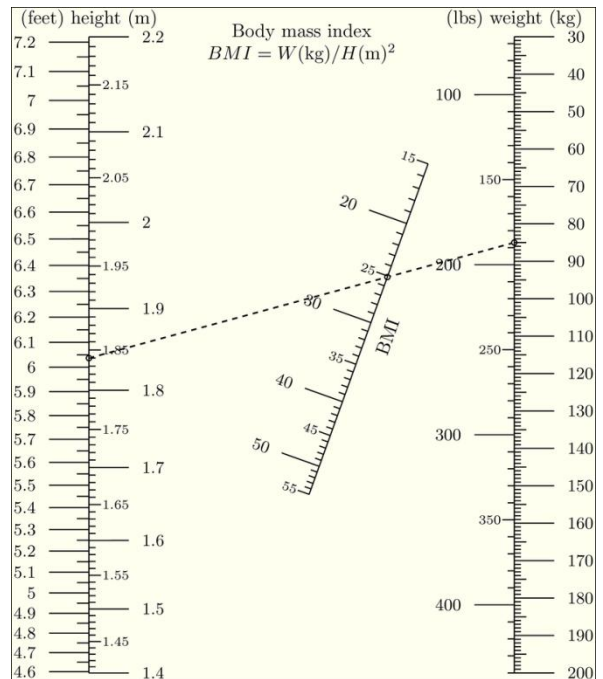
$BMI = 68 \div (1.65)^2 = 24.98 \text{ kg m}^{-2}$ In this example the adult would be (borderline) overweight - see the adult table above.

Nomograms

An alternative to calculating the BMI is a nomogram.

Simply use a ruler to draw a line from the body mass (weight) to the height of a person. Where it intersects the W/H^2 line the person's BMI can be determined. Now use the table to assess their BMI status.

Look at the example: At 1.84 m and 85Kg this person's BMI is 25 and is marginally obese.



BMI Chart

BMI less than 18.50	Underweight
BMI 18.50 - 24.99	Healthy weight
BMI 25.00 - 29.99	Overweight
BMI 30 or more	Obese

Body Mass Index

Estimating Body Fat Percent

The skin fold caliper is a device which measures the thickness of a fold of your skin with its underlying layer of fat. By doing this at the key locations can be a quite accurate representative of the total amount of fat that is on your body, it is also possible to estimate the total percent of body fat on your body.

The jaws of the calipers should be about 1/4" (7.5mm) from the fingers of your left hand which continues to hold the fold of skin. Release the trigger of the calipers so the entire force of the jaws is on the skin fold. Do not release the fingers of the left hand while taking the readings.

Measure all four locations shown in the diagrams below and write down the readings on the calipers scale. It doesn't matter what order you do the readings in.



Back of the arm (Triceps):

The fold is taken in a vertical direction directly on the centre of the back of the arm.



Front of the arm (Biceps):

This is taken exactly the same as the Triceps, except it is taken on the centre of the front of the upper arm.



Shoulder blade:

This is located just below the shoulder blade. Note that the skin fold is taken at 45 degrees angle as shown on the diagram.



Waist:

a little towards the front from the side of the waist. The fold is taken approximately horizontally as shown on the diagram.

Add up the four readings. The % body fat can then be determined from the charts below. You will notice one set of figures for males and one for females, make sure you use the right one!

Body Mass Index

← % Body Fat For Men Reading in Millimeters →

	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-36
18-20	2.0	3.9	6.2	8.5	10.5	12.5	14.3	16.0	17.5	18.9	20.2	21.3	22.3	23.1	23.8	24.3	24.9
21-25	2.5	4.9	7.3	9.5	11.6	13.6	15.4	17.0	18.6	20.0	21.2	22.3	23.3	24.2	24.9	25.4	25.8
26-30	3.5	6.0	8.4	10.6	12.7	14.6	16.4	18.1	19.6	21.0	22.3	23.4	24.4	25.2	25.9	26.5	26.9
31-35	4.5	7.1	9.4	11.7	13.7	15.7	17.5	19.2	20.7	22.1	23.4	24.5	25.5	26.3	27.0	27.5	28.0
36-40	5.6	8.1	10.5	12.7	14.8	16.8	18.6	20.2	21.8	23.2	24.4	25.6	26.5	27.4	28.1	28.6	29.0
41-45	6.7	9.2	11.5	13.8	15.9	17.8	19.6	21.3	22.8	24.7	25.5	26.6	27.6	28.4	29.1	29.7	30.1
46-50	7.7	10.2	12.6	14.8	16.9	18.9	20.7	22.4	23.9	25.3	26.6	27.7	28.7	29.5	30.2	30.7	31.2
51-55	8.8	11.3	13.7	15.9	18.0	20.0	21.8	23.4	25.0	26.4	27.6	28.7	29.7	30.6	31.2	31.8	32.2
56 & UP	9.9	12.4	14.7	17.0	19.1	21.0	22.8	24.5	26.0	27.4	28.7	29.8	30.8	31.6	32.3	32.9	33.3
	LEAN				IDEAL				AVERAGE				ABOVE AVERAGE				

AGE ↑

← % Body Fat For Women Reading in Millimeters →

	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-36
18-20	11.3	13.5	15.7	17.7	19.7	21.5	23.2	24.8	26.3	27.7	29.0	30.2	31.3	32.3	33.1	33.9	34.6
21-25	11.9	14.2	16.3	18.4	20.3	22.1	23.8	25.5	27.0	28.4	29.6	30.8	31.9	32.9	33.8	34.5	35.2
26-30	12.5	14.8	16.9	19.0	20.9	22.7	24.5	26.1	27.6	29.0	30.3	31.5	32.5	33.5	34.4	35.2	35.8
31-35	13.2	15.4	17.6	19.6	21.5	23.4	25.1	26.7	28.2	29.6	30.9	32.1	33.2	34.1	35.0	35.8	36.4
36-40	13.8	16.0	18.2	20.2	22.2	24.0	25.7	27.3	28.8	30.2	31.5	32.7	33.8	34.8	35.6	36.4	37.0
41-45	14.4	16.7	18.8	20.8	22.8	24.6	26.3	27.9	29.4	30.8	32.1	33.3	34.4	35.4	36.3	37.0	37.7
46-50	15.0	17.3	19.4	21.5	23.4	25.2	26.9	28.6	30.1	31.5	32.8	34.0	35.0	36.0	36.9	37.6	38.3
51-55	15.6	17.9	20.0	22.1	24.0	25.9	27.6	29.2	30.7	32.1	33.4	34.6	35.6	36.6	37.5	38.3	38.9
56 & UP	16.3	18.5	20.7	22.7	24.6	26.5	28.2	29.8	31.3	32.7	34.0	35.2	36.3	37.2	38.1	38.9	39.5
	LEAN				IDEAL				AVERAGE				ABOVE AVERAGE				

AGE ↑

Body Mass Index

Problems

1. A man has a mass of 75 kg and a height of 1.45 meters.
 - a. Calculate his body mass index. (1)
 - b. Deduce the body mass status of this man using the table. (1)

2. A woman has a height of 150 cm and a BMI of 40.

- a. Calculate the minimum amount of body mass she must lose to reach normal body mass status. Show all of your work. (3)

		Weight in Kilograms																		
		45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	82.5	85	87.5	90
145.0	Height in Centimeters	21.4	22.6	23.8	25.0	26.2	27.3	28.5	29.7	30.9	32.1	33.3	34.5	35.7	36.9	38.0	39.2	40.4	41.6	42.8
147.5	Height in Centimeters	20.7	21.8	23.0	24.1	25.3	26.4	27.6	28.7	29.9	31.0	32.2	33.3	34.5	35.6	36.8	37.9	39.1	40.2	41.4
150.0	Height in Centimeters	20.0	21.1	22.2	23.3	24.4	25.6	26.7	27.8	28.9	30.0	31.1	32.2	33.3	34.4	35.6	36.7	37.8	38.9	40.0
152.5	Height in Centimeters	19.3	20.4	21.5	22.6	23.6	24.7	25.8	26.9	27.9	29.0	30.1	31.2	32.2	33.3	34.4	35.5	36.5	37.6	38.7
155.0	Height in Centimeters	18.7	19.8	20.8	21.9	22.9	23.9	25.0	26.0	27.1	28.1	29.1	30.2	31.2	32.3	33.3	34.3	35.4	36.4	37.5
157.5	Height in Centimeters	18.1	19.1	20.2	21.2	22.2	23.2	24.2	25.2	26.2	27.2	28.2	29.2	30.2	31.2	32.2	33.3	34.3	35.3	36.3
160.0	Height in Centimeters	17.6	18.6	19.5	20.5	21.5	22.5	23.4	24.4	25.4	26.4	27.3	28.3	29.3	30.3	31.3	32.2	33.2	34.2	35.2
162.5	Height in Centimeters	17.0	18.0	18.9	19.9	20.8	21.8	22.7	23.7	24.6	25.6	26.5	27.5	28.4	29.3	30.3	31.2	32.2	33.1	34.1
165.0	Height in Centimeters	16.5	17.4	18.4	19.3	20.2	21.1	22.0	23.0	23.9	24.8	25.7	26.6	27.5	28.5	29.4	30.3	31.2	32.1	33.1
167.5	Height in Centimeters	16.0	16.9	17.8	18.7	19.6	20.5	21.4	22.3	23.2	24.1	24.9	25.8	26.7	27.6	28.5	29.4	30.3	31.2	32.1
170.0	Height in Centimeters	15.6	16.4	17.3	18.2	19.0	19.9	20.8	21.6	22.5	23.4	24.2	25.1	26.0	26.8	27.7	28.5	29.4	30.3	31.1
172.5	Height in Centimeters	15.1	16.0	16.8	17.6	18.5	19.3	20.2	21.0	21.8	22.7	23.5	24.4	25.2	26.0	26.9	27.7	28.6	29.4	30.2
175.0	Height in Centimeters	14.7	15.5	16.3	17.1	18.0	18.8	19.6	20.4	21.2	22.0	22.9	23.7	24.5	25.3	26.1	26.9	27.8	28.6	29.4
177.5	Height in Centimeters	14.3	15.1	15.9	16.7	17.5	18.3	19.0	19.8	20.6	21.4	22.2	23.0	23.8	24.6	25.4	26.2	27.0	27.8	28.6
180.0	Height in Centimeters	13.9	14.7	15.4	16.2	17.0	17.7	18.5	19.3	20.1	20.8	21.6	22.4	23.1	23.9	24.7	25.5	26.2	27.0	27.8
182.5	Height in Centimeters	13.5	14.3	15.0	15.8	16.5	17.3	18.0	18.8	19.5	20.3	21.0	21.8	22.5	23.3	24.0	24.8	25.5	26.3	27.0
185.0	Height in Centimeters	13.1	13.9	14.6	15.3	16.1	16.8	17.5	18.3	19.0	19.7	20.5	21.2	21.9	22.6	23.4	24.1	24.8	25.6	26.3
187.5	Height in Centimeters	12.8	13.5	14.2	14.9	15.6	16.4	17.1	17.8	18.5	19.2	19.9	20.6	21.3	22.0	22.8	23.5	24.2	24.9	25.6
190.0	Height in Centimeters	12.5	13.2	13.9	14.5	15.2	15.9	16.6	17.3	18.0	18.7	19.4	20.1	20.8	21.5	22.2	22.9	23.5	24.2	24.9

http://www.freebmicalculator.net

■ Underweight
 ■ Normal
 ■ Overweight
 ■ Obesity

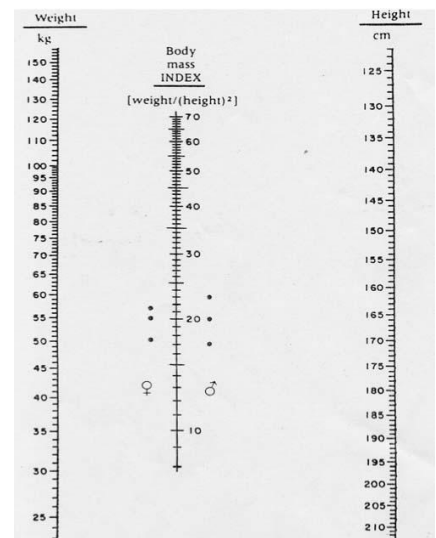
- b. Suggest two ways in which the woman could reduce her body mass. (2)

3. Outline the relationship between height and BMI for a fixed body mass (1) and tell what type of correlation exists(1).

4. Show your BMI using the nomogram. (1)

Check your findings with the CDC's online calculator:

<http://www.cdc.gov/healthyweight/assessing/bmi/index.html>



Body Mass Index

5. Use the skin caliper to estimate your body fat percentage. (2)

Body Part	Caliper Reading (mm)
Tricep	
Bicep	
Shoulder Blade	
Waist	
	Total:

6. A 45 year old man has the following skin fold measurements :

Body Part	Caliper Reading (mm)
Tricep	5.6
Bicep	4.2
Shoulder Blade	8.3
Waist	10.8
	Total:

a. What is his % body fat? (1)

b. What category does he fall into?(1)