

MeasureUp – Fact Sheet

Total Bone Density

The whole body bone density scan measurement can help identify persons who may be at greater risk for fracture because they have weaker bones. **Total bone mass** represents the weight of all the bones in your body measured in grams. It is shown on your report as bone mineral content (BMC). This is not to be confused with bone mineral density (BMD), which is BMC divided by the area from which the measure was taken. BMD is usually measured in specific clinical areas of the body such as the lower back (lumbar spine region) and the top of the leg bone (femoral neck). These sites are clinically important, as it's where the majority of fractures occur, particularly in women, as a result of low BMD or osteoporosis.

As we get older, **bone mass** usually decreases. Regular participation in weight-bearing activity and resistance exercise (e.g. weight training) can delay the start of bone loss, reduce bone loss and may even increase bone mass in older people and postmenopausal women. Unlike other body composition assessment methods, the **DEXA** is able to assess **bone mass** and takes **bone mass** into account when calculating your **fat mass** and **fat-free mass**. Although you may have regular **DEXA** assessment for the purpose of assessing changes in **fat mass** and **fat-free mass**, it is also advisable that you track changes observed in your bone mass.

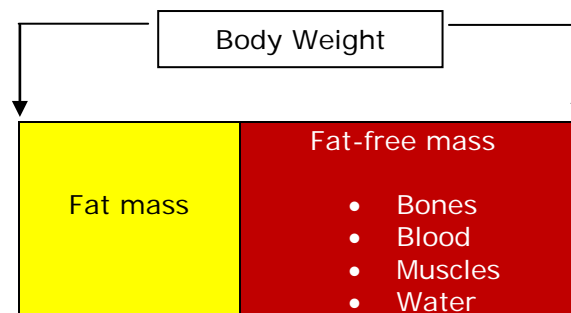
Please keep in mind that it is unlikely you will see changes in your bone mass over a period of months. A suitable time to observe change is a minimum of one year.

How Do You Compare:

- In your report, I am referring here to the BMC (g) column.
- The skeleton of most males weighs between 2.5kg and 3.5kg.
- The skeleton of most females weighs between 1.5kg and 2.5kg.
- Your bone marrow can weigh up to 2-3kg on top of the weight of your bones.

Body Composition Explained

Your body **weight** = **fat mass** + **fat-free mass**



Fat mass or your total body fat includes your essential fat as well as your storage fat.

Essential fat is the fat required for normal functioning and is stored in the marrow of bones as well as in the heart, lungs, liver, spleen, kidneys, intestines, muscles and the central nervous system. As a consequence of childbearing and other hormone-related functions, females require about 3 times (12-14% of body mass) as much essential fat when compared with males (3% of body mass). Any encroachment into this reserve may impair normal body function. Storage fat consists of the excess fat that accumulates in adipose (fatty) tissue, predominantly beneath the surface of the skin. An excess of body fat (storage fat) is undesirable for good health and fitness.

How Do You Compare:

- In your report, I am referring here to the Fat (g) column.
- Total fat of most males should weigh between 10kg and 15kg and up to 20kg in very tall individuals.
- Total fat of most females should weigh between 20kg and 25kg. You are doing very well if you fall between 15kg to 20kg. Professional female athletes normally sit between 10kg and 15kg of total fat mass.

Fat-free mass refers to the body mass with no extractable fat. This is essentially your muscles, tendons, ligaments, body fluids and bone.

Lean Mass refers to muscle tissue in the arms and legs and the muscle and organ tissue in your trunk. Cadaver studies have shown us that the weight of our organ tissue is approximately 5% of our total body weight.

How Do You Compare:

- In your report, I am referring here to the Lean (g) column.
- Total lean mass of most males should weigh over 60kg and over 55kg in shorter individuals.
- Total lean mass of most females should weigh 40kg and over 35kg in shorter individuals.

Percent body fat reflects the proportion of your body weight that is **fat mass** and includes both *essential* and *storage fat*. Males ideally should have a **percent body fat** of less than 15% (certainly less than 25%), while women should strive for less than 25% (certainly less than 30%).

Table 1: Recommended % Body Fat Ranges

	Age	Low	Recommended	High	Very High
Female	20-39	5-20	21-33	34-38	>38
	40-59	5-22	23-34	35-40	>40
	60-79	5-23	24-36	37-41	>41
Male	20-39	5-7	8-20	21-25	>24
	40-59	5-10	11-21	22-27	>27
	60-79	5-12	13-25	26-30	>30

Based on Gallagher et al., American Journal of Clinical Nutrition, Vol.72, Sept. 2000

Regional fat distribution

Visceral Adipose Fat (VAT)

Where you deposit your fat mass influences your health and this is independent of total **fat mass** and **% body fat**. Fat deposited centrally (i.e., around the trunk region) is associated with an increased risk of heart disease, Type 2 diabetes and high blood pressure. Unfortunately, genetics often controls fat distribution, which in turn highlights the importance of participating in healthy lifestyle behaviours (participating in regular physical activity and eating a nutritious diet) to control overall **fat mass**. The estimated VAT area will provide you with a useful measure to follow over the course of your training or treatment program. Use this information, in conjunction with your fat mass (kg) to develop a greater understanding of your changing body composition.

How Do You Compare:

Est. VAT Area (cm²):



Resting Metabolic Rate (RMR)

Many dieters assume that they have slow metabolisms and must starve themselves to lose any weight at all. In fact, the opposite is true in many cases: Dieters can have fairly hefty caloric needs, and undercutting themselves by more than 500 calories per day will cause undue hunger and drastically decrease diet adherence. RMR represents about 60% to 70% of daily caloric needs and as such dieting without an individualised caloric goal is like driving a car without a steering wheel. Maybe this is part of the reason why we have so many "nutritional casualties?" RMR is an estimate of how many calories you would burn if you were to do nothing but rest for 24 hours. For each individual, there is a minimum energy requirement to sustain normal body functions. Your **RMR** reflects the amount of **fat-free mass** you have. Higher amounts of **fat-free mass** coincide with higher **RMR**. Your resting metabolic rate has been estimated by the Cunningham equation, which can only be used accurately with DEXA. To determine your total daily calorie needs, RMR is multiplied by an activity weighting factor to determine the Total Daily Energy Intake to maintain your current weight.

Glossary

Body Composition

The ratio of lean body mass (structural and functional elements in cells, body water, muscle, bone, heart, liver, kidneys, etc.) to body fat (essential and storage) mass.

Dual energy x-ray absorptiometry (DEXA)

The gold standard test for measuring bone density and body composition. It can accurately and precisely monitor changes in muscle, bone and fat in those who are undergoing clinical management of a condition, weight loss treatments and health and fitness programs. It is painless and non-invasive, requiring no special preparations. For this exam, you lie on a padded table while the x-ray scanning machine moves over your entire body. The exam takes about 6 minutes to complete, and the radiation dosage from the x-ray is less than 10% of that used for a chest x-ray or less than the exposure from an airline flight from Sydney to Brisbane.

Bone mineral content (BMC)

The total amount of bone tissue in the skeleton that is expressed in grams (g).

Bone mineral density (BMD)

The amount of calcium and minerals in the bone. BMD is measured in grams per square centimetre (g/cm^2) using dual energy x-ray absorptiometry or BMC divided by Area.

Fat mass – Fat (g)

The amount of fat, in grams (g), in the body. Fat contains nine calories per gram; it has the most calories of the macronutrients.

Lean mass – Lean (g)

Everything in the body except fat, including organs, skin and all body tissue including muscle tissue. Approximately 50-60% of lean body mass is water. The same as **FFM**.

Fat free mass (FFM) – Lean + BMC (g)

Another term for lean body mass, FFM refers to muscle, bones, organs, and connective tissue. The three compartments of the body are fat free mass, fat mass, and water.

Osteopenia

A condition in which there is a decrease in bone mineral density but not necessarily an increase in the risk or incidence of fracture.

Osteoporosis

A condition in which there is a decrease in bone mineral content and bone mineral density and an increased risk and/or incidence of fracture.

Visceral Adipose Fat (VAT)

VAT area is a specific assessment of your abdominal region (Central Adipose Tissue). The research literature suggests that if your Est. VAT Area (cm^2) measurement is over $100\text{g}/\text{cm}^2$ you have an increased risk of cardiovascular disease and/or type 2 diabetes.

T-score - a measuring system used to detect standard deviations for a specific group - on a DEXA, compares a person to a group of young adults of the same sex.