Explanation of Body Composition Assessment Results

Get Measured

Track Progress

Manage Performance
Disclaimer

The information provided is for informational purposes.

You should not use this to diagnose a medical condition or disease and diagnosis of any medical condition or disease should be made by a health professional. Whilst all reasonable care has been taken in the preparation of this report no liability is assumed for any errors or omissions.
Our **vision** is to make **Body DEXA fit** the first choice for

Accurate, reliable and affordable **Body Composition analysis**

Our **mission** is to help our customers:

1) improve their health and athletic **performance**
2) reduce their **risk** for various diseases by:

providing them with **cutting edge** technology and support
Dual-Energy X-ray Absorptiometry (DEXA) scans provide a state-of-the-art way to assess your body composition.

This gold standard test allows us to accurately determine your overall body fat mass and fat–free mass including specific body segments being your arms, trunk, waist, hips and legs.
DEXA makes use of X-ray energy, but this is at extremely low and safe levels.

The amount of radiation exposure is very low (1-4 MicroSievert), compared to radiation exposure of approximately 10 MicroSievert on an airline flight from Melbourne to Sydney or 20 MicroSievert during chest xray (front view only).
# Effective Radiation Dose Comparison

<table>
<thead>
<tr>
<th>Diagnostic procedure</th>
<th>Typical effective dose (mSv)</th>
<th>Equivalent No. of DEXA Body Scans</th>
<th>Approximate equivalent period of natural background radiation (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEXA Body composition</strong></td>
<td>&lt;0.004</td>
<td>1</td>
<td>&lt;16 hours</td>
</tr>
</tbody>
</table>

* X-ray examinations:*

- Limbs and joints (except hip) <0.01 2.5 <1.5 days
- Chest (single PA film) 0.02 5 3 days
- Skull 0.07 17.5 11 days
- Thoracic spine 0.7 175 4 months
- Lumbar spine 1.3 325 7 months
- Hip 0.3 75 7 weeks
- Pelvis 0.7 175 4 months
- Abdomen 1.0 250 6 months
- IVU 2.5 625 14 months
- Barium swallow 1.5 375 8 months
- Barium meal 3 750 16 months
- Barium follow through 3 750 16 months
- Barium enema 7 1,750 3.2 years

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</tbody>
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* Radionuclide studies:*

- Lung ventilation (Xe-133) 0.3 75 7 weeks
- Lung perfusion (Tc-99m) 1 250 6 months
- Kidney (Tc-99m) 1 250 6 months
- Thyroid (Tc-99m) 1 250 6 months
- Bone (Tc-99m) 4 1,000 1.8 years
- Dynamic cardiac (Tc-99m) 6 1,500 2.7 years
- PET head (F-18 FDG) 5 1,250 2.3 years

(1) UK average background radiation = 2.2 mSv per year: regional averages range from 1.5 to 7.5 mSv per year.

With advice from Wall, B. National Radiological Protection Board.

*This table has been adapted to include DEXA Body composition scan using Hologic Discovery A as used at Body DEXA fit.

The radiation dose is very low, 1 to 4 MicroSieverts or 0.001 to 0.004 MilliSieverts (1 milliSievert = 1000 MicroSievert)
What is Body composition?

**Body composition** refers primarily to the distribution of fat and lean mass in the body, and its measurement plays an important role in both sports and health.

**Scales** weigh total body mass. What the scale does not tell you is whether that weight is fat mass, bone mineral content or lean soft tissue mass.
What is Body composition?

Your body weight

\[ \text{Your body weight} = \text{fat mass} + \text{fat free mass} \]
Body Mass Index

Body Mass Index = \frac{\text{Body Weight (kg)}}{\text{Height (m)}^2} = \text{kg/m}^2

= \frac{\text{Fat Mass + Fat Free mass (kg)}}{\text{Height (m)}^2}

= \text{Fat Mass Index} + \text{Fat Free Mass Index}
The colour image map displays fat, lean (muscle) and bone using the graduated scale of colours to represent each area.

**Yellow** regions representing regions with higher %Fat

**Orange** and **Red** regions indicating progressively lower %Fat

**Bone** containing regions are indicated in **blue**

Crystal Image Map

The crystal map displays shows the Android/Gynoid areas, Visceral Fat (VAT) slice and cut lines to distinguish the trunk from the extremities.

The trunk is outlined in green on this image and is referenced in parts of the Adipose and Lean Indices in the report.

The Android (waist) and Gynoid (hips) areas are listed as “A” and “G” and defined by the cut lines of the iliac crest and chin.

This determines if the patient is an “apple” or a “pear” which is important for assessing where the fat is primarily stored. Apple people have more cardiovascular issues, high blood pressure, diabetes, metabolic syndrome than pear people.
NHANES performs a health survey of the United States population, collecting data on about 5000 persons/year.

In 2008 NHANES released a body composition database containing more than 23,000 subjects 8-85 years old measured on Hologic DXA scanners.

**Body Composition Results can be compared to values from** NHANES DEXA Whole Body database released in 2008 both graphically and quantitatively.

The graphical plot displays the reference values along with the subject’s measured DEXA value. In adults, the quantitative comparison provides a Z-score or an Age-matched (AM) Percentile value and a T-score or a Young Normal Percentile value (YN).
T-Score or “young normal” / YN

The T-score or “young normal” indicates how your result compares to healthy normal 20-29 year old population database (2008 NHANES DEXA Whole Body database).

Z-Score or “aged-matched” / am

The Z-score or “aged-matched” indicates how your result compares to same gender and population database (2008 NHANES DEXA Whole Body database).


http://www.plosone.org/article/info:doi/10.1371/journal.pone.0007038
Interpretation of Results

Example 1: Total % Fat = 30.6
Percent body fat reflects the proportion of body weight that is fat mass

YN = 22% Fat Percentile
(meaning 22% of 20-29 yr old population database have less fat than you or 78% have more fat than you)

AM = 13% Fat Percentile
(meaning 13% of (gender specific) people your age have less fat than you)

Example 2: Lean Mass Index = 18.2 kg/m^2
YN = 89 Percentile
(meaning 89% of 20-29 yr old population database have less muscle than you or 11% have more muscle than you)

AM = 84 Percentile
(meaning 16% of (gender specific) people your age have less muscle than you)
Learn the exact percentage of fat, lean, and bone mass in your arms, legs, and trunk. Includes all areas defined by cut lines & % fat per segment.

This is the total body fat mass in grams or 25.8kg.

Identify muscle imbalance & symmetry.

This represents your fat free mass or everything in your body except fat (58.5kg). It includes lean mass and bone mineral content. This number is used to determine resting metabolic expenditure, a very useful indicator of the number of calories required to sustain life at rest.

This is the total body fat percentage, 30.6%.

YN = 22% Fat Percentile
AM = 13% Fat Percentile

Android % Fat can show how close you are for a six-pack abdomen.
Body Mass index (BMI) vs. Fat Mass Index (FMI)

Currently, BMI is the standard measure for clinical obesity

Problems with BMI (Weight/Height\(^2\)):
   i) Measure of excess weight, not excess fat
   ii) Not gender specific

Advantages of FMI (Fat Mass/height\(^2\)):
   i) Measure of excess fat not confounded by lean mass
   ii) Gender specific reference values (using NHANES calibration)
       5 – 9 kg/m\(^2\) in women
       3 - 6 kg/m\(^2\) in men

www.bodydexafit.com.au
Fat Mass Index (kg/m$^2$) classification ranges$^1$.

<table>
<thead>
<tr>
<th>FMI Class</th>
<th>Severe Fat Deficit</th>
<th>Moderate Fat Deficit</th>
<th>Mild Fat Deficit</th>
<th>Normal</th>
<th>Excess Fat</th>
<th>Obese Class I</th>
<th>Obese Class II</th>
<th>Obese Class III</th>
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<tbody>
<tr>
<td>Male</td>
<td>&lt; 2</td>
<td>2 to &lt; 2.3</td>
<td>2.3 to &lt; 3</td>
<td>3 – 6</td>
<td>&gt; 6 to 9</td>
<td>&gt; 9 to 12</td>
<td>&gt; 12 to 15</td>
<td>&gt; 15</td>
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<tr>
<td>Female</td>
<td>&lt; 3.5</td>
<td>3.5 to &lt; 4</td>
<td>4 to &lt; 5</td>
<td>5 – 9</td>
<td>&gt; 9 to 13</td>
<td>&gt; 13 to 17</td>
<td>&gt; 17 to 21</td>
<td>&gt; 21</td>
</tr>
</tbody>
</table>

Classification ranges for FMI that match the prevalence of the WHO BMI classifications. Unlike BMI, FMI is a gender specific measure of fat not confounded by lean tissue.

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Males</th>
<th>Females</th>
<th>Height (cm)</th>
<th>Males</th>
<th>Females</th>
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<td>150</td>
<td>6.8 kg to 13.5 kg</td>
<td>11.3 kg to 20.3 kg</td>
<td>176</td>
<td>9.3 kg to 18.6 kg</td>
<td>15.5 kg to 27.9 kg</td>
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<tr>
<td>152</td>
<td>6.9 kg to 13.9 kg</td>
<td>11.6 kg to 20.8 kg</td>
<td>178</td>
<td>9.5 kg to 19.0 kg</td>
<td>15.8 kg to 28.5 kg</td>
</tr>
<tr>
<td>154</td>
<td>7.1 kg to 14.2 kg</td>
<td>11.9 kg to 21.3 kg</td>
<td>180</td>
<td>9.7 kg to 19.4 kg</td>
<td>16.2 kg to 29.2 kg</td>
</tr>
<tr>
<td>156</td>
<td>7.3 kg to 14.6 kg</td>
<td>12.2 kg to 21.9 kg</td>
<td>182</td>
<td>9.9 kg to 19.9 kg</td>
<td>16.6 kg to 29.8 kg</td>
</tr>
<tr>
<td>158</td>
<td>7.5 kg to 15.0 kg</td>
<td>12.5 kg to 22.5 kg</td>
<td>184</td>
<td>10.2 kg to 20.3 kg</td>
<td>16.9 kg to 30.5 kg</td>
</tr>
<tr>
<td>160</td>
<td>7.7 kg to 15.4 kg</td>
<td>12.8 kg to 23.0 kg</td>
<td>186</td>
<td>10.4 kg to 20.8 kg</td>
<td>17.3 kg to 31.1 kg</td>
</tr>
<tr>
<td>162</td>
<td>7.9 kg to 15.7 kg</td>
<td>13.1 kg to 23.6 kg</td>
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<td>10.6 kg to 21.2 kg</td>
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<tr>
<td>164</td>
<td>8.1 kg to 16.1 kg</td>
<td>13.4 kg to 24.2 kg</td>
<td>190</td>
<td>10.8 kg to 21.7 kg</td>
<td>18.1 kg to 32.5 kg</td>
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<tr>
<td>166</td>
<td>8.3 kg to 16.5 kg</td>
<td>13.8 kg to 24.8 kg</td>
<td>192</td>
<td>11.1 kg to 22.1 kg</td>
<td>18.4 kg to 33.2 kg</td>
</tr>
<tr>
<td>168</td>
<td>8.5 kg to 16.9 kg</td>
<td>14.1 kg to 25.4 kg</td>
<td>194</td>
<td>11.3 kg to 22.6 kg</td>
<td>18.8 kg to 33.9 kg</td>
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<tr>
<td>170</td>
<td>8.7 kg to 17.3 kg</td>
<td>14.5 kg to 26.0 kg</td>
<td>196</td>
<td>11.5 kg to 23.0 kg</td>
<td>19.2 kg to 34.6 kg</td>
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<tr>
<td>172</td>
<td>8.9 kg to 17.8 kg</td>
<td>14.8 kg to 26.6 kg</td>
<td>198</td>
<td>11.8 kg to 23.5 kg</td>
<td>19.6 kg to 35.3 kg</td>
</tr>
<tr>
<td>174</td>
<td>9.1 kg to 18.2 kg</td>
<td>15.1 kg to 27.2 kg</td>
<td>200</td>
<td>12.0 kg to 24.0 kg</td>
<td>20.0 kg to 36.0 kg</td>
</tr>
</tbody>
</table>
### Body Composition Regions

#### Adipose Indices

<table>
<thead>
<tr>
<th>Measure</th>
<th>Result</th>
<th>YN</th>
<th>AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Body % Fat</td>
<td>30.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat Mass/Height$^2$ (kg/m$^2$)</td>
<td>8.47</td>
<td>45</td>
<td>33</td>
</tr>
<tr>
<td>Android/Gynoid Ratio</td>
<td>0.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Fat Trunk/% Fat Legs</td>
<td>0.64</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Trunk/Limb Fat Mass Ratio</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. VAT Mass (g)</td>
<td>141</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. VAT Volume (cm$^3$)</td>
<td>153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. VAT Area (cm$^2$)</td>
<td>29.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXAMPLE**

Fat Mass Index = 8.47 kg/m$^2$

YN = 45 Percentile
(meaning 45% of 20-29 yr old population database have less fat than you or 55% have more fat than you)

AM = 33 Percentile
(meaning 33% of (gender specific) people your age have less fat than you)
**Adipose Indices (Fat)**

**Android/Gynoid Ratio**

- This determines if you are “Apple” or “Pear” but does not tell you if that mass is fat or lean
- It is strictly a ratio of the % Fat of Android & % Fat of Gynoid
- If mass is carried in the Android area, the Result would be 1.xx (Apple) or very muscular
- If mass is carried in Gynoid area, the Result would be 0.xx (Pear)
- Pear habitus has less risk for cardiovascular problems
- There is no % reference associated with this number

<table>
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<th>Percentile</th>
<th>AM</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>Est. VAT Area (cm²)</td>
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<td></td>
<td></td>
<td></td>
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Body Composition Regions

Adipose Indices (Fat)

% Fat Trunk/% Fat Legs and Trunk/Limb Fat Mass Ratio

- Primarily used for determining impact of lipodystrophy.
- As a result of treatment for AIDS/HIV, redistribution of subcutaneous fat occurs from the extremities to the trunk, usually in abdominal and upper neck/shoulder area.
- This ultimately turns into visceral fat.
- These ratios are not frequently used unless site is scanning AIDS/HIV patients.
- Again if both parts of the equation are equal, 1.00 will be Result.
- If less than 1.00, second part of the equation is where the fat occurs (legs or limb).
- Percentile YN and AM higher number not desired for lipodystrophy.
Lean Indices (Muscle)
These indices measure amount of muscle mass in the body.

Lean/Height$^2$
- Result: Higher number is desired (18.2 vs. 8.7) as this signifies more muscle mass.
- Low number may signify Sarcopenia.
- Combining Lean/Height and Fat Mass/Height approximates BMI

EXAMPLE
Lean Mass Index = 18.2 kg/m$^2$
YN = Young normal (T score)
YN = 89 Percentile
(meaning 11% of 20-29 yr old population database has more muscle than you)

AM = Aged match (Z score)
AM = 84 Percentile
(meaning 16% of (gender specific) people your age have more muscle than you)
Lean Indices (Muscle)

- **Appendicular Lean/Height\(^2\)**
  - Again a ratio to determine how much lean muscle mass is in the extremities (non-trunk) compared to height.
  - Result: Higher number is desired (7.72 vs. 3.88)
  - Low number signifies lack of adequate muscle mass which may interfere with daily living issues such as lifting themselves from a chair or unsteadiness.
  - Sports athletes will have a high number as they are using their extremities most often in their sport (football, swimming, etc)

**EXAMPLE**

Appendicular Lean Mass Index = 7.72 kg/m\(^2\)

- YN = Young normal (T score)
- YN = 85 Percentile
  - (meaning 15% of 20-29 yr old population database has more muscle than you)

- AM = Aged match (Z score)
- AM = 82 Percentile
  - (meaning 18% of (gender specific) people your age have more muscle than you)
Visceral Adipose Tissue (VAT) is the fat that is deep inside the abdominal wall only (not extremities) and usually surrounds the organs.

It is placed about L4-L5 across the abdominal cavity and between the pelvis and the rib cage.

It is calibrated and correlated with VAT CT slices.
Visceral Adipose Tissue (VAT) Assessment

Visceral Fat score (cm$^2$) and relative risk of heart disease and diabetes

The report shows the VAT information in 3 categories:

- Mass (grams)
- Volume (cm$^3$)
- Area (cm$^2$)

Area is the most important because this is the number that is correlated with disease risk

EXAMPLE:
Est VAT Area (cm$^2$) = 29.3
Classification = Normal Range
• Total bone mass represents the weight of all the bones in your body measured in grams. It is shown in the report as bone mineral content (BMC).
• Bone Mineral density (BMD) is the BMC divided by the area (g/cm²)
A whole body bone density provides you with the total bone mass and Bone Mineral Density but cannot provide a diagnosis of osteoporosis.

This test is not consistent with World Health Organization guidelines of osteoporosis being indicated by a T score for bone density that is 2.5 SD or more below the young adult mean, which applies, most commonly in the hip, lumbar spine and less often the forearm but does not apply to total body BMD.

Applying the criterion of T score $\leq -2.5$ SD to the whole body BMD, as provided by body composition scans, will underestimate the prevalence of osteoporosis.
DEXA bone densitometry is used to measure bone loss, most commonly in the hip, lumbar spine and less often the forearm.

It measures the density (strength) of your bones and can help in predicting your future risk of fracture.

It is most often used to diagnose osteoporosis which involves a gradual loss of calcium, causing bones to become thinner and more prone to break.

This test is separate to a body composition scan.
Having body composition monitored periodically with DEXA will provide valuable feedback on how successful your diet and training have been towards achieving your goals.

Additional scans can be performed to monitor rehabilitation from injury.
Tracking your changes in Body Composition – sample 1
### Total Fat Mass Results

<table>
<thead>
<tr>
<th>Scan Date</th>
<th>Age</th>
<th>Fat Mass (g)</th>
<th>Change/Month vs Baseline</th>
<th>Change vs Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>05.03.2014</td>
<td>27</td>
<td>8017</td>
<td>-1260</td>
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<td>09.02.2014</td>
<td>27</td>
<td>10201</td>
<td>-1135</td>
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<td>21.12.2013</td>
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<td>-1018</td>
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<td>04.10.2013</td>
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<td>03.06.2013</td>
<td>26</td>
<td>19355</td>
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### Total Body % Fat Results

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<tr>
<th>Scan Date</th>
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<th>% Fat</th>
<th>Percentile</th>
<th>Change vs Baseline</th>
<th>Change vs Previous</th>
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<tr>
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<td>04.10.2013</td>
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<td>03.06.2013</td>
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<td>32.4</td>
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<td>-3.8</td>
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### Total Mass Results

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<thead>
<tr>
<th>Scan Date</th>
<th>Age</th>
<th>Mass (g)</th>
<th>Change/Month vs Baseline</th>
<th>Change vs Previous</th>
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### Total Lean Mass Results

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<th>Lean (g)</th>
<th>Change/Month vs Baseline</th>
<th>Change vs Previous</th>
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<td>38576.1</td>
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YN = Young Normal  
AM = Age Matched

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Tracking your changes in Body Composition – sample 2