

Body Fat Formulas

Department of Human Nutrition, Agricultural University Wageningen, The Netherlands
Deurenberg, Weststrate, Seidell
1991

Key:

- Sex
 - o Male – use 1
 - o Female – use 0
- BMI – Body Mass Index
- Age – Age in Years

Note – In obese people the formula slightly overestimates

Children's Formula:

$$\text{Body Fat Percentage} = 1.51(\text{BMI}) - 0.7(\text{Age}) - 3.6(\text{Sex}) + 1.4$$

Adult Formula:

$$\text{Body Fat Percentage} = 1.2(\text{BMI}) + 0.23(\text{Age}) - 10.8(\text{Sex}) - 5.4$$

Source: <https://www.ncbi.nlm.nih.gov/pubmed/2043597>

Sheba Medical Center, Heller Institute of Medical Research, Tel Hashomer, Ramat Gan, Israel
Lahav, Epstein, Kedem, Schermann
2018

Key:

- H – Height in cm
- N – Neck in cm
- A – Abdomen in cm
- Sex
 - o Male – use 10.1
 - o Female – use 19.2

Note – Estimate is usually within $\pm 5\%$ of DEXA value

Formula:

$$\text{Body Fat Percentage} = (\text{Sex}) - 0.239(\text{H}) + 0.8(\text{A}) - 0.5(\text{N})$$

Source: <https://www.ncbi.nlm.nih.gov/pubmed/29553036>

Division of Nutrition, Physical Activity, and Obesity, Centers for Disease Control and Prevention,
New York Obesity Nutrition Research Center, St Luke's – Roosevelt Hospital, Columbia University,
Pennington Biomedical Research Center
Institute of Human Nutrition, Columbia University
David S. Freedman, John Thornton, F. Xavier Pi-Sunyer, Steven B. Heymsfield, Jack Wang, Richard N.
Pierson, Jr. Heidi M Blanck, Dympna Gallagher
2012

Key:

- C – Hip Circumference in centimeters
- H – Height in meters

BAI Formula:

$$\text{Body Fat Percentage} \approx \text{BAI} = \left[\frac{(C)}{(H)^{1.5}} \right] - 18$$

Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3477292/>

U. S. Navy Method #1 (Imperial)

Key:

- A – Abdomen in inches
- H – Height in inches
- N – Neck in inches
- W – Waist in inches
- C – Hip Circumference in inches

Male Body Fat Formula:

$$\text{Body Fat Percentage} = 86.01[\log_{10}(A - N)] - 70.041[\log_{10}(H)] + 36.76$$

Female Body Fat Formula:

$$\text{Body Fat Percentage} = 163.205[\log_{10}(W + C - N)] - 97.684[\log_{10}(H)] - 78.387$$

Source: <https://www.wikihow.com/Measure-Body-Fat-Using-the-US-Navy-Method>

U. S. Navy Method #2 (Metric)

Key:

- A – Abdomen in cm
- H – Height in cm
- N – Neck in cm
- W – Waist in cm
- C – Hip Circumference in cm

Male Body Fat Formula:

$$\text{Body Fat Percentage} = \left(\frac{495}{1.0324 - 0.19077[\log_{10}(W - N)] + 0.15456[\log_{10}(H)]} \right) - 450$$

Female Body Fat Formula:

$$\text{Body Fat Percentage} = \left(\frac{495}{1.29579 - 0.35004[\log_{10}(W + C - N)] + 0.221[\log_{10}(H)]} \right) - 450$$

Source: <http://www.calculator.net/body-fat-calculator.html>

British Journal of Nutrition

Faculty of Education and Health Sciences, University of Limerick, Limerick, Republic of Ireland
Siobhan Leahy, Cian O'Neill, Rhoda Sohun, Clodagh Toomey and Philip Jakeman
2012

Key:

- A – Abdomen Skinfold Thickness in mm
- B – Bicep Skinfold Thickness in mm
- C - Medial Calf Skinfold Thickness in mm
- T – Tricep Skinfold Thickness in mm
- M – Midaxilla Skinfold Thickness in mm
- S – Supraspinale Skinfold Thickness in mm
- Y – Age in years

Note – Estimates have $\pm 3\%$ error

Male Body Fat Formula:

$$\text{Body Fat Percentage} = 0.1(\text{Age}) + 7.6[\log_{10}(T)] + 8.8[\log_{10}(M)] + 11.9[\log_{10}(S)] - 11.3$$

Female Body Fat Formula:

$$\text{Body Fat Percentage} = 0.1(\text{Age}) + 39.4[\log_{10}(A)] + 4.9[\log_{10}(M)] + 11[\log_{10}(B)] - 73.5$$

Source: <https://goo.gl/KgiciD>

Key:

- T – Total Body Weight in lb.’s
- R – Wrist Measurement in inches
- W – Waist Measurement in inches
- H – Hip Measurement in inches
- F – Forearm Measurement in inches

Male Body Fat Formula:

$$\text{Body Fat Percentage} = \left(\frac{9442 - 415(W)}{T} \right) - 8.2$$

Female Body Fat Formula:

$$\text{Body Fat Percentage} = \left(\frac{15.7(W) + 24.9(H) - 43.4(F) - \left[\frac{100(R)}{\pi} \right] - 898.7}{T} \right) + 26.8$$

Source: <http://www.bmi-calculator.net/body-fat-calculator/body-fat-formula.php>

BMI Formula:

Key:

- H - Height in inches or meters
- W – Weight in lb.’s or kg

Imperial Formula:

$$BMI = \frac{703(W)}{(H)^2}$$

Metric Formula:

$$BMI = \frac{W}{(H)^2}$$

Source: https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

Useful Conversions:

1 inch = 2.54 cm

1 lb. = 0.45359237 kg