**Body Fat Formulas**

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

Key:

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

Note – In obese people the formula slightly overestimates

Children’s Formula:

\[
Body\ Fat\ Percentage = 1.51(BMI) - 0.7(Age) - 3.6(Sex) + 1.4
\]

Adult Formula:

\[
Body\ Fat\ Percentage = 1.2(BMI) + 0.23(Age) - 10.8(Sex) - 5.4
\]


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
  - Male – use 10.1
  - Female – use 19.2

Note – Estimate is usually within ± 5% of DEXA value

Formula:

\[
Body\ Fat\ Percentage = (Sex) - 0.239(H) + 0.8(A) - 0.5(N)
\]

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:

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

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:

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

Female Body Fat Formula:

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

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

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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 ± 3% error

Male Body Fat Formula:

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

Female Body Fat Formula:

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

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:

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

Female Body Fat Formula:

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

Source: [http://www.bmi-calculator.net/body-fat-calculator/body-fat-formula.php](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:

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


Useful Conversions:

\[ 1 \text{ inch} = 2.54 \text{ cm} \]
\[ 1 \text{ lb.} = 0.45359237 \text{ kg} \]