Estimating segmental fat and lean mass of human limbs

# Abstract

# Introduction

# Methods

|  | **Male (N = 13205)** | **Female (N = 11735)** |
| --- | --- | --- |
| **Exam Age (year)** | 28.8 +- 17.61 [8.0 - 70.0] | 28.3 +- 17.90 [8.0 - 70.0] |
| **Weight (kg)** | 71.2 +- 21.79 [20.0 - 180.2] | 60.7 +- 17.42 [20.0 - 173.5] |
| **Standing Height (cm)** | 169.0 +- 14.52 [112.0 - 200.7] | 158.2 +- 10.50 [119.2 - 184.3] |
| **Waist Circumference (cm)** | 86.4 +- 16.42 [49.2 - 145.1] | 81.9 +- 14.25 [48.0 - 149.5] |

# Results

|  | **(Intercept)** | **RIAGENDR** | **RIDAGEEX** | **BMXWT** | **BMXHT** | **BMXARMC** | **BMXARML** | **BMXCALF** | **BMXLEG** | **BMXSUB** | **BMXTHICR** | **BMXTRI** | **BMXWAIST** | **Adj. R2** | **RMSE** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DXXHEFAT** | 774.183 | -75.573 | -1.070 | 5.504 | 0.505 | 2.266 |  |  |  | 2.413 | -1.110 | -2.259 |  | 0.74 | 82.1 |
| **DXDHETOT** | 2,697.651 | -252.814 | -2.291 | 21.152 | 7.515 | 14.741 | -3.289 | -2.012 | -2.486 | 10.235 | 2.295 | -11.273 | -6.312 | 0.73 | 336.5 |
| **DXDHEPF** | 26.423 | -0.348 | -0.011 | 0.007 | -0.024 | -0.021 | 0.008 | 0.008 | 0.010 |  | -0.030 | 0.008 | 0.032 | 0.40 | 0.4 |
| **DXXLAFAT** | 636.884 | 162.553 | 0.389 | 21.124 | -12.652 | 3.826 | 9.380 |  | -2.942 | -0.790 | -7.561 | 29.530 | 6.174 | 0.89 | 200.2 |
| **DXDLATOT** | 1,043.241 | -202.205 | -1.168 | 65.599 | -11.421 | 96.922 | 24.022 | -19.564 | 12.477 | 2.555 | -28.260 | -12.702 | -15.407 | 0.97 | 243.2 |
| **DXDLAPF** | 9.204 | 6.014 | 0.014 | -0.239 | -0.111 | -0.189 |  | 0.155 | -0.071 | 0.031 | 0.105 | 0.762 | 0.366 | 0.83 | 4.5 |
| **DXDLLTOT** | -3,257.330 | 62.573 | -8.378 | 156.809 | -6.035 | -119.248 | 42.186 | 98.452 | 43.917 | -12.444 | 113.933 | 39.965 | -47.712 | 0.96 | 651.8 |
| **DXXLLFAT** | -990.164 | 686.673 | -0.624 | 51.713 | -28.376 | -139.292 | 30.475 | 54.822 | 9.816 | -16.344 | 79.662 | 99.853 | 4.156 | 0.85 | 662.8 |
| **DXDLLPF** | 21.598 | 6.082 |  | -0.129 | -0.146 | -0.542 | 0.076 | 0.116 |  | -0.071 | 0.287 | 0.683 | 0.238 | 0.76 | 4.6 |
| **DXXRAFAT** | 645.476 | 158.930 | 0.162 | 21.602 | -12.179 | 7.031 | 10.029 | -3.037 | -4.065 | -0.647 | -8.575 | 29.714 | 5.993 | 0.89 | 198.3 |
| **DXDRATOT** | 665.381 | -217.909 | -1.668 | 63.978 | -8.779 | 109.819 | 26.251 | -19.558 | 9.367 | 3.074 | -29.699 | -14.404 | -15.564 | 0.97 | 235.5 |
| **DXDRAPF** | 9.065 | 5.727 | 0.009 | -0.223 | -0.102 | -0.158 |  | 0.110 | -0.083 | 0.036 | 0.088 | 0.751 | 0.359 | 0.83 | 4.3 |
| **DXXRLFAT** | -1,113.436 | 705.409 |  | 52.504 | -29.668 | -143.378 | 35.038 | 57.930 | 9.659 | -15.850 | 84.010 | 101.821 | 2.871 | 0.85 | 676.2 |
| **DXDRLTOT** | -3,953.549 | 69.104 | -8.149 | 154.192 | -4.611 | -123.107 | 46.977 | 107.639 | 39.642 | -11.525 | 126.754 | 38.881 | -47.929 | 0.97 | 648.5 |
| **DXDRLPF** | 20.636 | 6.144 |  | -0.124 | -0.147 | -0.534 | 0.103 | 0.115 |  | -0.065 | 0.281 | 0.687 | 0.231 | 0.77 | 4.6 |
| **DXXTRFAT** | 9,089.898 | 1,306.748 | 11.431 | 245.547 | -95.286 | -192.650 | -44.492 | -103.574 | -60.387 | 34.677 | -95.518 | 118.948 | 151.629 | 0.94 | 1349.6 |
| **DXDTRTOT** | 1,799.287 | 550.876 | 21.217 | 538.563 | 31.948 | 41.939 | -152.531 | -166.100 | -97.097 | 14.314 | -177.724 | -46.461 | 128.671 | 0.99 | 1335.3 |
| **DXDTRPF** | 6.608 | 3.751 | 0.018 | -0.138 | -0.133 | -0.127 | 0.048 | -0.033 | -0.074 | 0.187 | 0.084 | 0.348 | 0.465 | 0.86 | 3.5 |
| **DXDTOBMC** | -1,740.570 | 68.256 | 2.602 | 20.737 | 19.690 | 25.272 |  | -9.124 |  | 3.171 | 9.213 | -16.585 | -17.823 | 0.85 | 247.2 |
| **DXDTOBMD** | -0.032 | 0.046 | 0.001 | 0.002 | 0.005 | 0.011 | -0.001 | -0.002 |  | 0.002 | 0.006 | -0.006 | -0.004 | 0.65 | 0.1 |
| **DXDTOFAT** | 9,095.854 | 2,952.861 | 10.050 | 399.088 | -177.376 | -460.425 | 39.766 |  | -49.187 |  | 52.006 | 379.034 | 171.380 | 0.94 | 2357.1 |
| **DXDTOPF** | 15.053 | 4.506 | 0.010 | -0.117 | -0.140 | -0.307 | 0.061 | 0.063 | -0.034 | 0.064 | 0.141 | 0.494 | 0.336 | 0.85 | 3.2 |

# Discussion

Notes

# Raw Data

## 2003 - 2004

<https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Examination&Cycle=2003-2004>

## 2005 - 2006

<https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Examination&Cycle=2005-2006>

Total mass + Segmental mass = f(body measure:, circumference + BH + age + sex):

Mass: mass + fat mass + lean mass