SUPPLEMENTAL DIGITAL CONTENT 5 Mean signed differences in PBF estimated from published equations using anthropometrics and from DXA in males and females aged ≥ 20 years by overall age, obesity status and race/ethnicity: NHANES 1999 - 2004 *1, 2*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sex/Anthropometric(s) used in equations  /Equations evaluated | Overall |  | By age | | |  | By obesity status*3* | | |  | By race/ethnicity*4* | | |
|  | 20-39  years | 40-59  years | ≥ 60  years |  | Normal  weight | Over-  weight | Obese |  | Mexican  Americans | Non-  Hispanic  whites | Non-  Hispanic  blacks |
| *Males* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Unweighted sample size* | 5,268 |  | 1,824 | 1,587 | 1,857 |  | 1,862 | 2,373 | 949 |  | 1,225 | 2,703 | 931 |
| *Triceps and subscapular skinfold thickness* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Durnin and Womersley age-specific (5) | -1.3 |  | -3.3 | 0.7 | -0.9 |  | -1.7 | -0.9 | -1.4 |  | -2.8\*\*\* | -1.3 | 0.2\*\*\* |
| Durnin and Womersley all-age (5) | -2.9 |  | -2.1 | -2.8 | -5.1 |  | -3.4 | -2.5 | -2.8 |  | -3.0 | -3.2 | -1.2\*\*\* |
| Hassager et al. (11) | -5.2 |  | -5.9 | -4.7 | -4.4 |  | -5.2 | -4.8 | -5.9 |  | -6.1\*\*\* | -5.3 | -3.6\*\*\* |
| Slaughter et al. (30) | -1.1 |  | -0.7 | -0.7 | -3.0 |  | -4.4 | -0.4 | 3.9 |  | -1.2 | -1.2 | -0.7 |
| *Height and weight, and/or body mass index (BMI)* | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Deurenberg et al., 1989 (2) | 5.6 |  | 7.0 | 5.4 | 2.9 |  | 6.4 | 5.1 | 5.1 |  | 5.5 | 5.3 | 8.3\*\*\* |
| Deurenberg et al. 1991 (3) | -0.9 |  | -3.2 | 0.0 | 2.5 |  | -2.2 | -0.7 | 1.3 |  | -2.6\*\*\* | -0.8 | 0.8\*\*\* |
| Deurenberg et al. 1998 (4) | -2.9 |  | -4.9 | -2.1 | -0.3 |  | -4.5 | -2.7 | -0.2 |  | -4.4\*\*\* | -2.9 | -1.2\*\*\* |
| Gallagher et al. 1996 (9) | -4.3 |  | -5.2 | -3.7 | -3.6 |  | -6.3 | -4.1 | -0.6 |  | -5.1\*\* | -4.3 | -2.4\*\*\* |
| Gallagher et al. 2000 full(8) | -3.3 |  | -4.1 | -2.7 | -2.7 |  | -4.6 | -2.6 | -2.0 |  | -3.9\*\* | -3.3 | -2.6\* |
| Gallagher et al. 2000 simplified(8) | -4.2 |  | -5.1 | -3.6 | -3.3 |  | -5.2 | -3.6 | -3.3 |  | -5.0\*\*\* | -4.2 | -2.3\*\*\* |
| Gomez-Ambrosi et al. (10) | -0.9 |  | -1.8 | -0.2 | -0.2 |  | -2.7 | -0.4 | 1.9 |  | -1.7\*\* | -0.9 | 0.9\*\*\* |
| Heitmann (12) | -3.1 |  | -3.9 | -2.5 | -2.5 |  | -4.3 | -2.4 | -2.0 |  | -3.9\*\* | -3.2 | -1.2\*\*\* |
| Jackson et al. (16) | -2.7 |  | -3.7 | -2.0 | -1.9 |  | -4.1 | -2.2 | -0.9 |  | -3.6\*\* | -2.8 | -0.8\*\*\* |
| Noppa et al. (23) | - |  | - | - | - |  | - | - | - |  | - | - | - |
| Pasco et al. (25) | -3.2 |  | -3.2 | -2.8 | -4.0 |  | -4.9 | -2.7 | -0.7 |  | -3.5 | -3.3 | -1.2\*\*\* |
| Rush et al. (28) | - |  | - | - | - |  | - | - | - |  | - | - | - |
| Smith et al.(31) | - |  | - | - | - |  | - | - | - |  | - | - | - |
| Visser et al. (33) | 6.3 |  | 7.6 | 6.3 | 3.7 |  | 6.3 | 6.0 | 7.2 |  | 6.3 | 6.1 | 8.9\*\*\* |
| *Waist circumference (WC) or waist-to-height ratio(WHtR)* | | | |  |  |  |  |  |  |  |  |  |  |
| Kagawa et al. (17) | 0.9 |  | 1.6 | 1.0 | -0.5 |  | -0.2 | 1.0 | 3.4 |  | 2.1\*\*\* | 0.8 | 1.3\* |
| Lean et al. WC (19) | 0.4 |  | -1.7 | 1.4 | 3.0 |  | -1.7 | 0.7 | 3.9 |  | -1.6\*\*\* | 0.9 | 0.2\* |
| *Multiple anthropometric variables 5* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chapman et al. (1) | -3.4 |  | -2.4 | -3.7 | -5.1 |  | -3.8 | -3.0 | -3.1 |  | -1.8\*\*\* | -3.9 | -1.7\*\*\* |
| Lean et al. WC-triceps (19) | 1.4 |  | -2.1 | 2.6 | 6.8 |  | -1.5 | 2.0 | 6.0 |  | -1.7\*\*\* | 2.1 | 0.9\*\*\* |
| Ramirez-Zea et al. (27) | -1.5 |  | -3.5 | -0.5 | 1.1 |  | -4.6 | -0.9 | 3.5 |  | -2.2\*\*\* | -0.9 | -3.3\*\*\* |
| Svendsen et al. (32) | -5.9 |  | -5.2 | -6.0 | -7.6 |  | -7.6 | -5.1 | -4.0 |  | -4.7\*\*\* | -6.3 | -4.6\*\*\* |
| Wilmore and Behnke body density (35) | -3.7 |  | -5.2 | -3.0 | -1.4 |  | -5.3 | -3.4 | -0.9 |  | -3.9\* | -3.3 | -4.9\*\*\* |
| Wilmore and Behnke lean body weight (35) | -3.7 |  | -5.3 | -3.1 | -1.2 |  | -4.5 | -3.0 | -3.5 |  | -3.4 | -3.4 | -5.0\*\*\* |
| *Females* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Unweighted sample size* | 4,666 |  | 1,506 | 1,341 | 1,819 |  | 1,910 | 1,613 | 1,023 |  | 1,034 | 2,485 | 762 |
| *Triceps and subscapular skinfold thickness* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Durnin and Womersley age-specific (5) | -3.3 |  | -4.4 | -1.8 | -3.8 |  | -2.8 | -3.2 | -4.7 |  | -4.5\*\*\* | -3.4 | -2.1\*\*\* |
| Durnin and Womersley all-age (5) | -4.9 |  | -3.3 | -4.5 | -8.1 |  | -4.3 | -4.9 | -6.4 |  | -5.0 | -5.2 | -3.1\*\*\* |
| Hassager et al. (11) | -4.6 |  | -4.2 | -4.1 | -6.1 |  | -4.0 | -4.5 | -6.2 |  | -5.3 | -4.8 | -3.1\*\*\* |
| Slaughter et al. (30) | -5.3 |  | -3.9 | -4.4 | -8.7 |  | -6.2 | -4.4 | -3.9 |  | -5.0\* | -5.7 | -2.8\*\*\* |
| *Height and weight, and/or body mass index (BMI)* | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Deurenberg et al., 1989 (2) | 5.9 |  | 7.5 | 5.7 | 3.5 |  | 7.2 | 4.2 | 4.4 |  | 5.2 | 5.8 | 7.5\*\*\* |
| Deurenberg et al. 1991 (3) | -1.7 |  | -4.6 | -1.3 | 2.2 |  | -2.9 | -2.1 | 1.8 |  | -3.6\*\*\* | -1.6 | -0.2\*\*\* |
| Deurenberg et al. 1998 (4) | -3.3 |  | -5.7 | -2.9 | 0.0 |  | -4.8 | -3.6 | 0.9 |  | -4.9\*\*\* | -3.2 | -1.5\*\*\* |
| Gallagher et al. 1996 (9) | -4.7 |  | -6.0 | -4.4 | -3.3 |  | -6.6 | -5.0 | 0.5 |  | -5.6\* | -4.8 | -2.5\*\*\* |
| Gallagher et al. 2000 full(8) | -3.5 |  | -4.6 | -3.3 | -2.2 |  | -4.5 | -3.0 | -1.2 |  | -4.3\*\* | -3.5 | -2.7\*\* |
| Gallagher et al. 2000 simplified(8) | -3.9 |  | -4.3 | -3.7 | -3.6 |  | -4.7 | -3.5 | -1.8 |  | -4.5\* | -4.0 | -1.7\*\*\* |
| Gomez-Ambrosi et al. (10) | -1.2 |  | -2.5 | -0.8 | 0.3 |  | -2.4 | -1.1 | 1.8 |  | -2.2\*\* | -1.2 | 0.8\*\*\* |
| Heitmann (12) | -5.4 |  | -7.1 | -5.0 | -3.2 |  | -7.1 | -4.4 | -1.7 |  | -6.4\* | -5.5 | -3.2\*\*\* |
| Jackson et al. (16) | -4.7 |  | -6.4 | -4.3 | -2.6 |  | -7.0 | -4.0 | 0.6 |  | -5.7\* | -4.9 | -1.0\*\*\* |
| Noppa et al. (23) | -7.3 |  | -6.4 | -7.6 | -8.1 |  | -7.2 | -7.6 | -6.8 |  | -5.7\*\*\* | -7.8 | -5.6\*\*\* |
| Pasco et al. (25) | -1.6 |  | -1.3 | -1.5 | -2.5 |  | -3.5 | -0.5 | 1.8 |  | -1.6 | -1.9 | 1.1\*\*\* |
| Rush et al. (28) | -0.9 |  | 0.2 | -0.9 | -2.6 |  | -1.4 | -1.3 | 1.1 |  | -1.1 | -1.1 | 1.4\*\*\* |
| Smith et al.(31) | -3.7 |  | -3.0 | -3.3 | -5.3 |  | -6.4 | -3.9 | 3.8 |  | -4.3 | -3.9 | -0.4\*\*\* |
| Visser et al. (33) | 5.2 |  | 6.4 | 5.2 | 3.3 |  | 5.0 | 4.1 | 7.1 |  | 4.9 | 5.0 | 7.4\*\*\* |
| *Waist circumference (WC) or waist-to-height ratio(WHtR)* | | | |  |  |  |  |  |  |  |  |  |  |
| Kagawa et al. (17) | 0.4 |  | 1.3 | 0.0 | -0.5 |  | -0.7 | 0.0 | 3.4 |  | 1.7\*\*\* | 0.0 | 2.1\*\*\* |
| Lean et al. WC (19) | 1.5 |  | -1.8 | 1.8 | 6.4 |  | 1.0 | 1.2 | 3.0 |  | -0.8\*\*\* | 1.9 | 2.3 |
| *Multiple anthropometric variables 5* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chapman et al. (1) | -5.1 |  | -4.2 | -5.2 | -6.5 |  | -4.8 | -4.8 | -6.0 |  | -3.4\*\*\* | -5.7 | -4.3\*\*\* |
| Lean et al. WC-triceps (19) | 2.0 |  | -0.9 | 2.7 | 5.5 |  | 0.7 | 2.7 | 4.1 |  | -0.3\*\*\* | 2.2 | 2.6 |
| Ramirez-Zea et al. (27) | -3.9 |  | -3.7 | -3.7 | -4.7 |  | -6.1 | -4.0 | 1.7 |  | -4.6 | -4.0 | -1.3\*\*\* |
| Svendsen et al. (32) | -8.0 |  | -7.6 | -7.6 | -9.1 |  | -10.0 | -6.1 | -4.4 |  | -6.2\*\*\* | -8.5 | -6.4\*\*\* |
| Wilmore and Behnke body density (35) | - |  | - | - | - |  | - | - | - |  | - | - | - |
| Wilmore and Behnke lean body weight (35) | - |  | - | - | - |  | - | - | - |  | - | - | - |

*1* Values of mean signed differences were adjusted for complex sample design and expressed as the average of the five estimatesrespectively from the five imputation DXA datasets.

*2* Abbreviations: DXA for dual-energy X-ray absorptiometry and PBF for percentage body fat.

*3*Participants who were underweight (n = 84 for males and n = 120 for females) were excluded from the analysis.

*4* Participants from other race/ethnicities (n = 409 for males and n = 385 for females) were excluded from the analysis.

*5*Anthropometrics used in equations were waist circumference and triceps skinfold for Lean et al. WC-triceps equation, BMI and triceps skinfold for Svendsen et al. equation, weight, height and triceps skinfold for Chapman et al. equation, weight and waist circumference for Wilmore and Behnke body density and lean body weight equations, and weight, height and waist circumference for Ramirez-Zea et al. equation.

Mexican Americans and African Americans were compared to Non-Hispanic whites: \* P < 0.05, \*\* P < 0.001, \*\*\* P < 0.0001.