

# Package ‘bodycomp’

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**Type** Package

**Title** Percent Body Fat Values Using Anthropometric Prediction Equations

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**Description** Skinfold measurements is one of the most popular and practical methods for estimating percent body fat. Body composition is a term that describes the relative proportions of fat, bone, and muscle mass in the human body. Following the collection of skinfold measurements, regression analysis (a statistical procedure used to predict a dependent variable based on one or more independent or predictor variables) is used to estimate total percent body fat in humans. <doi:10.4324/9780203868744>.

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Durnin.4sites	<i>Percent Body Fat Estimates Using Durnin and Womersley (1974).</i>
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## Description

This function calculates the percent body mass estimates based on 4 sites skinfold measurements using the equations of Durnin and Womersley (1974). Population Specifications: Adults (both sexes) non athletes from UK; Male (aged 17 - 72) and Female (aged 16 - 68).

## Usage

Durnin.4sites(Sex, TR, BI, SB, SI, Age, Equation, Output.format)

## Arguments

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
BI	a value a vector representing Biceps Skinfold. Direction of Fold measurements: Vertical (midline). Anatomical Reference: Biceps brachii. Measurement: Fold is lifted over belly of the biceps brachii at the level marked for the triceps and on line with anterior border of the acromial process and the antecubital fossa. Caliper is applied 1 cm below fingers.
SB	a value or a vector representing Subscapular Skinfold measurements. Direction of Fold: Diagonal. Anatomical Reference: Inferior angle of scapula. Measurement: Fold is along natural cleavage line of skin just inferior to inferior angle of scapula, with caliper applied 1 cm below fingers.
SI	a value a vector representing Suprailiac Skinfold measurements. Direction of Fold: Oblique. Anatomical Reference: Iliac crest. Measurement: Fold is grasped posteriorly to midaxillary line and superiorly to iliac crest along natural cleavage of skin with caliper applied 1 cm below fingers.
Age	a value or a vector representing the age (in years) from subject assessed.
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Tree possible choices: 0, 1 or 2.

## Details

Sex: Use 0 for Male and 1 for Female. Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

## Value

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements.

## References

Durnin, J.V.G.A., and J. Womersley. 1974. Body fat assessed from total body density and its estimation from skinfold thickness: Measurements on 481 men and women aged from 16 to 72 years. *British Journal of Nutrition* 32: 77-97.

International Society for the Advancement of Kinanthropometry (ISAK), 2001. *International Standards for Anthropometric Assessment*. (Underdale, SA, Australia.)

Eston, R. (Ed.). (2008). *Kinanthropometry and Exercise Physiology Laboratory Manual: Tests, Procedures and Data: Volume One: Anthropometry (3rd ed.)*. Routledge. <https://doi.org/10.4324/9780203868744>

Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHERL, A. (Eds.). *Techniques for measuring body composition*. Washing, D.C.:National Academy of Science, 1961. p. 223-224.

Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. *Annals of the New York Academy of Sciences* 110: 113-140.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. *Anthropometric standardizing reference manual*. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80.

## Examples

```
#Predicting % body fat
```

```
df <- Durnin.4sites(Sex = 1, TR = 14, BI = 12, SB = 18, SI = 18,
                  Age = 28, Equation = 2, Output.format = 2)
```

**Description**

This function calculates the percent body mass estimates based on 3 sites skinfold measurements using the equations of Guedes (1965). Population Specifications: Both sexes; Brazilian university students; Male and Female (aged 18-30).

**Usage**

```
Guedes.3sites(Sex, TR, AB, SI, TH, SB, Equation, Output.format)
```

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TR	a value or a vector representing Triceps Skinfold measurement. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
AB	a value or a vector representing Abdominal Skinfold. Direction of Fold measurement: Horizontal. Anatomical Reference: Umbilicus. Measurement: Fold is taken 3 cm lateral and 1 cm inferior to center of the umbilicus.
SI	a value or a vector representing Suprailiac Skinfold measurement. Direction of Fold: Oblique. Anatomical Reference: Iliac crest. Measurement: Fold is grasped posteriorly to midaxillary line and superiorly to iliac crest along natural cleavage of skin with caliper applied 1 cm below fingers.
TH	a value or a vector representing Thigh Skinfold measurement. Direction of Fold: Vertical (midlin). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.
SB	a value or a vector representing Subscapular Skinfold measurement. Direction of Fold: Diagonal. Anatomical Reference: Inferior angle of scapula. Measurement: Fold is along natural cleavage line of skin just inferior to inferior angle of scapula, with caliper applied 1 cm below fingers.
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Tree possible choices: 0, 1 or 2.

**Details**

Sex: Use 0 for Male and 1 for Female. Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

#'

**Value**

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

**References**

Guedes, D.P. Estudo da gordura corporal através da mensuração dos valores de densidade corporal e espessura de dobras cutâneas em universitários.(Dissertação de Mestrado). Santa Maria (RS), Universidade Federal de Santa Maria, 1985.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. Anthropometric standardizing reference manual. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80.

International Society for the Advancement of Kinanthropometry (ISAK), 2001. International Standards for Anthropometric Assessment. (Underdale, SA, Australia.)

Jackson, A.S., and M.L. Pollock. 1978. Generalized equations for predicting body density of men. British Journal of Nutrition 40: 497-504.

Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHER, A. (Eds.). Techniques for measuring body composition. Washing, D.C.:National Academy of Science, 1961. p. 223-224.

Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. Annals of the New York Academy of Sciences 110: 113-140.

**Examples**

```
# Predicting % body fat

df <- Guedes.3sites(Sex = 1, TR = 34, AB = 24, SI = 33, TH = 24, SB = 19,
                    Equation = 1, Output.format = 0)
```

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Jackson.3sites	<i>Percent Body Fat Estimates Using Jackson and Pollock (1978) and Jackson et al. (1980).</i>
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**Description**

This function calculates the percent body mass estimates based on 3 sites skinfold measurements using the equations of Pollock (1978) and Jackson et al. (1980). Population Specifications: Both sexes; Male (aged 18-61) and Female (aged 18-55).

**Usage**

Jackson.3sites(Sex, CH, AB, TH, TR, SI, Age, Equation, Output.format)

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
CH	a value or a vector representing Chest Skinfold measurement. Direction of Fold: Diagonal. Anatomical Reference: Axilla and nipple. Measurement: Fold is taken between axilla and nipple as high as possible on anterior axillary fold, with measurement taken 1 cm below fingers.
AB	a value or a vector representing Abdominal Skinfold measurement. Direction of Fold: Horizontal. Anatomical Reference: Umbilicus. Measurement: Fold is taken 3 cm lateral and 1 cm inferior to center of the umbilicus.
TH	a value or a vector representing Thigh Skinfold measurement. Direction of Fold: Vertical (midlin). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.
TR	a value or a vector representing Triceps Skinfold measurement. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
SI	a value or a vector representing Suprailiac Skinfold measurement. Direction of Fold: Oblique. Anatomical Reference: Iliac crest. Measurement: Fold is grasped posteriorly to midaxillary line and superiorly to iliac crest along natural cleavage of skin with caliper applied 1 cm below fingers.
Age	a value or a vector representing the age (in years) from subject assessed.
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Three possible choices: 0, 1 or 2.

**Details**

Sex: Use 0 for Male (Jackson and Pollock. 1978) or 1 for Female (Jackson et al. 1980). Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

**Value**

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

## References

- Jackson, A.S., and M.L. Pollock. 1978. Generalized equations for predicting body density of men. *British Journal of Nutrition* 40: 497-504.
- Jackson, A.S., M.L. Pollock, and A. Ward. 1980. Generalized equations for predicting body density of women. *Medicine & Science in Sports & Exercise* 12: 175-181.
- International Society for the Advancement of Kinanthropometry (ISAK), 2001. *International Standards for Anthropometric Assessment*. (Underdale, SA, Australia.)
- Eston, R. (Ed.). (2008). *Kinanthropometry and Exercise Physiology Laboratory Manual: Tests, Procedures and Data: Volume One: Anthropometry (3rd ed.)*. Routledge. <https://doi.org/10.4324/9780203868744>
- Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHERL, A. (Eds.). *Techniques for measuring body composition*. Washing, D.C.:National Academy of Science, 1961. p. 223-224.
- Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. *Annals of the New York Academy of Sciences* 110: 113-140.

## Examples

```
# Predicting % body fat

df <- Jackson.3sites(Sex = 1, CH = 34, AB = 24, TH = 24, TR = 17, SI = 33,
                    Age = 28, Equation = 1, Output.format = 0)
```

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Jackson.7sites	<i>Percent Body Fat Estimates Using Jackson, Pollock (1978) and Jackson et al. (1980).</i>
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## Description

This function calculates the percent body mass estimates based on 7 sites skinfold measurements using the equations of Jackson, Pollock (1978) and Jackson et al. (1980). Population Specifications: Both sexes, Non Athletes: Males (aged 18-61) and Females (aged 18 - 55).

## Usage

```
Jackson.7sites(Sex, TH, SB, SI, TR, CH, AB, MA, Age, Equation, Output.format)
```

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TH	a value or a vector representing Thigh Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.
SB	a value representing Subscapular Skinfold. Direction of Fold: Oblique. Anatomical Reference: Vertebral border and inferior angle of scapula. Measurement: Fold is taken on diagonal line coming from the vertebral border, 1-2 cm below the inferior angle.
SI	a value representing Suprailiac Skinfold. Direction of Fold: Diagonal. Anatomical Reference: Iliac crest. Measurement: Fold is taken diagonally above the iliac crest along the anterior axillary line.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
CH	a value representing Chest Skinfold. Direction of Fold: Diagonal. Anatomical Reference: Axilla and nipple. Measurement: Fold is taken 1/2 the distance between the anterior axillary line and nipple for men and 1/3 of this distance for women.
AB	a value representing Abdominal Skinfold. Direction of Fold: Vertical. Anatomical Reference: Umbilicus. Measurement: Fold is taken vertically 2 cm lateral to the umbilicus.
MA	a value representing Midaxillary Skinfold. Direction of Fold: Vertical. Anatomical Reference: Xiphoid process of sternum. Measurement: Fold is taken at level of xiphoid process along the midaxillary line.
Age	a value or a vector representing the age (in years) from subject assessed.
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Three possible choices: 0, 1 or 2.

**Details**

Sex: Use 0 for Male and 1 for Female. Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

**Value**

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements



## References

- Jackson, A.S., and M.L. Pollock. 1978. Generalized equations for predicting body density of men. *British Journal of Nutrition* 40: 497-504.
- Jackson, A.S., M.L. Pollock, and A. Ward. 1980. Generalized equations for predicting body density of women. *Medicine & Science in Sports & Exercise* 12: 175-18.
- Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. *Anthropometric standardizing reference manual*. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80.
- International Society for the Advancement of Kinanthropometry (ISAK), 2001. *International Standards for Anthropometric Assessment*. (Underdale, SA, Australia.)
- Eston, R. (Ed.). (2008). *Kinanthropometry and Exercise Physiology Laboratory Manual: Tests, Procedures and Data: Volume One: Anthropometry (3rd ed.)*. Routledge. <https://doi.org/10.4324/9780203868744>
- Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHERL, A. (Eds.). *Techniques for measuring body composition*. Washing, D.C.: National Academy of Science, 1961. p. 223-224.
- Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. *Annals of the New York Academy of Sciences* 110: 113-140.

## Examples

```
# Predicting % body fat

df <- Jackson.7sites(Sex = 1, TH = 12, SB = 13, SI = 14, TR = 15, CH = 15, AB = 16,
                    MA = 14, Age = 32, Equation = 1, Output.format = 2)
```

---

Petroski.2sites      *Percent Body Fat Estimates Using Petroski (1995).*

---

## Description

This function calculates the percent body mass estimates based on 2 sites skinfold measurements using the equations of Petroski (1995). Population Specifications: Brazilian Males aged 18-66.

## Usage

```
Petroski.2sites(TR, MA, Age, Equation, Output.format)
```

## Arguments

TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
MA	Site: a value or a vector representing Midaxillary Skinfold measurements. Direction of Fold: Oblique (Adapted from Author). Anatomical Reference: Xiphisternal junction (point where costal cartilage of ribs 5-6 articulates with sternum, slightly above inferior tip of xiphoid process). Measurement: Fold is taken on midaxillary line at level of xiphisternal junction. Petroski choose modifications in the verification of the AM fold for obliques because it's most used procedures in Brazil.
Age	a value or a vector representing the age (in years) from subject assessed.
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Tree possible choices: 0, 1 or 2.

## Details

Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

## Value

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

## References

- Petroski, E. L. Desenvolvimento e validação de equações generalizadas para a estimativa da densidade corporal em adultos. 1995. Tese (Doutorado) – UFSM, Santa Maria.
- Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. Anthropometric standardizing reference manual. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80
- International Society for the Advancement of Kinanthropometry (ISAK), 2001. International Standards for Anthropometric Assessment. (Underdale, SA, Australia.)
- Eston, R. (Ed.). (2008). Kinanthropometry and Exercise Physiology Laboratory Manual: Tests, Procedures and Data: Volume One: Anthropometry (3rd ed.). Routledge. <https://doi.org/10.4324/9780203868744>
- Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHERL, A. (Eds.). Techniques for measuring body composition. Washing, D.C.:National Academy of Science, 1961. p. 223-224.

Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. *Annals of the New York Academy of Sciences* 110: 113-140.

## Examples

```
# Predicting % body fat

df<- Petroski.2sites(TR = c(23,24), MA = c(34,33), Age = c(24,27), Equation = 1, Output.format = 0)
```

---

Petroski.3sites      *Percent Body Fat Estimates Using Petroski (1995).*

---

## Description

This function calculates the percent body mass estimates based on 3 sites skinfold measurements using the equations of Petroski (1995). Population Specifications: Brazilians Male (aged 18-66) and Female (aged 18-51).

## Usage

```
Petroski.3sites(
  Sex,
  TR,
  CH,
  SB,
  SI,
  TH,
  Age,
  Weight,
  Height,
  Equation,
  Output.format
)
```

## Arguments

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TR	a value or a vector representing Triceps Skinfold measurement. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.

CH	a value or a vector representing Chest Skinfold measurement. Direction of Fold: Diagonal. Anatomical Reference: Axilla and nipple. Measurement: Fold is taken between axilla and nipple as high as possible on anterior axillary fold, with measurement taken 1 cm below fingers.
SB	a value or a vector representing Subscapular Skinfold measurement. Direction of Fold: Diagonal. Anatomical Reference: Inferior angle of scapula. Measurement: Fold is along natural cleavage line of skin just inferior to inferior angle of scapula, with caliper applied 1 cm below fingers.
SI	a value or a vector representing Suprailiac Skinfold measurement. Direction of Fold: Oblique. Anatomical Reference: Iliac crest. Measurement: Fold is grasped posteriorly to midaxillary line and superiorly to iliac crest along natural cleavage of skin with caliper applied 1 cm below fingers.
TH	a value or a vector representing Thigh Skinfold measurement. Direction of Fold: Vertical (midlin). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.
Age	a value or a vector representing the age (in years) from subject assessed.
Weight	a value or a vector representing the body weight in kilograms (kg).
Height	a value or a vector representing the body stature in centimeters (cm).
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Three possible choices: 0, 1 or 2.

### Details

Sex: Use 0 for Male and 1 for Female. Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

### Value

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

### References

PETROSKI, E. L. Desenvolvimento e validação de equações generalizadas para a estimativa da densidade corporal em adultos. 1995. Tese (Doutorado) – UFSM, Santa Maria.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. Anthropometric standardizing reference manual. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80

International Society for the Advancement of Kinanthropometry (ISAK), 2001. International Standards for Anthropometric Assessment. (Underdale, SA, Australia.)

Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHER, A. (Eds.). Techniques for measuring body composition. Washing, D.C.:National Academy of Science, 1961. p. 223-224.

Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. Annals of the New York Academy of Sciences 110: 113-140.

## Examples

```
# Predicting % body fat

df <- Petroski.3sites(Sex = 1, SB = 9, SI = 9, TH = 9,
                    Age = 28, Weight = 71, Height = 170, Equation = 1, Output.format = 0)
```

---

Petroski.4sites	<i>Percent Body Fat Estimates Using Petroski (1995).</i>
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---

## Description

This function calculates the percent body mass estimates based on 4 sites skinfold measurements using the equations of Petroski (1995). Population Specifications: Brazilians Male (aged 18-66) and Female (aged 18-51).

## Usage

```
Petroski.4sites(
  Sex,
  TR,
  SB,
  SI,
  CA,
  MA,
  TH,
  Age,
  Weight,
  Height,
  Equation,
  Output.format
)
```

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
SB	a value or a vector representing Subscapular Skinfold measurements. Direction of Fold: Diagonal. Anatomical Reference: Inferior angle of scapula. Measurement: Fold is along natural cleavage line of skin just inferior to inferior angle of scapula, with caliper applied 1 cm below fingers.
SI	a value a vector representing Suprailiac Skinfold measurements. Direction of Fold: Oblique. Anatomical Reference: Iliac crest. Measurement: Fold is grasped posteriorly to midaxillary line and superiorly to iliac crest along natural cleavage of skin with caliper applied 1 cm below fingers.
CA	a value or a vector representing Calf Skinfold measurements. Direction of Fold: Vertical (medial aspect). Anatomical Reference: Maximal calf circumference. Measurement: Fold is lifted at level of maximal calf circumference on medial aspect of calf with knee and hip flexed to 90°.
MA	a value or a vector representing Midaxillary Skinfold measurements. Direction of Fold: Horizontal. Anatomical Reference: Xiphisternal junction (point where costal cartilage of ribs 5-6 articulates with sternum, slightly above inferior tip of xiphoid process). Measurement: Fold is taken on midaxillary line at level of xiphisternal junction.
TH	a value or a vector representing Thigh Skinfold measurements. Direction of Fold: Vertical (midlin). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.
Age	a value or a vector representing the age (in years) from subject assessed.
Weight	a value a vector representing the body weight in kilograms (kg).
Height	a value a vector representing the body stature in centimeters (cm).
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Tree possible choices: 0, 1 or 2.

**Details**

Sex: Use 0 for Male and 1 for Female. Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

**Value**

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

**References**

PETROSKI, E. L. Desenvolvimento e validação de equações generalizadas para a estimativa da densidade corporal em adultos. 1995. Tese (Doutorado) – UFSM, Santa Maria.

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**Examples**

```
#Predicting % body fat

df <- Petroski.4sites(Sex = 1, SI = 9, CA = 17, MA = 33, TH = 12, Age = 27,
                    Weight = 70, Height = 180, Equation = 1, Output.format = 0)
```

---

Slaughter.2sites      *Percent Body Fat Estimates Using Slaughter et al. (1988).*

---

**Description**

This function calculates the percent body mass estimates based on 2 sites skinfold measurements using the equations of Slaughter et al. (1988). Population Specifications: Both sexes. Boys (aged 8 - 18) and Girls (aged 8 - 18)

**Usage**

```
Slaughter.2sites(Sex, TR, CA)
```

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
CA	a value or a vector representing Calf Skinfold measurements. Direction of Fold: Vertical (medial aspect). Anatomical Reference: Maximal calf circumference. Measurement: Fold is lifted at level of maximal calf circumference on medial aspect of calf with knee and hip flexed to 90°.

**Details**

Sex: Use 0 for Male and 1 for Female.

**Value**

Returns a data frame with the values of the % body fat from a subject assessed by skinfold measurements

**References**

Slaughter, M. H. et al. Skinfold equations for estimation of body fatness in children and youth. *Human Biology*, n. 60, p. 709-23, 1988.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. *Anthropometric standardizing reference manual*. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80.

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Lohman TG. *Advances in Body Composition Assessment: Current Issues in Exercise Science*, Monograph Number 3. Champaign, IL: Human Kinetics, 1992.

**Examples**

```
#Predicting % body fat
```

```
df <- Slaughter.2sites(Sex = 1, TR = 17.1, CA = 24.3)
```



---

 Slaughter.2sites.Matur

*Percent Body Fat Estimates Using Slaughter et al. (1988) According to Maturational Level.*

---

## Description

This function calculates the percent body mass estimates based on 2 sites skinfold measurements using the equations of Slaughter et al. (1988). Population Specifications: American black and white boys (aged 8 - 18) around maturation groups (Tanner Scale, 1962). American girls (aged 8 - 18).

## Usage

```
Slaughter.2sites.Matur(Sex, Matur_lv, Race, TR, SB)
```

## Arguments

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
Matur_lv	a value or a vector representing a maturational level of the subjects assessed by the Tanner Scale (1962). Three possible choices: 1, 2 or 3.
Race	a value or a vector representing the race from boys assessed. Two possible choices: 0 or 1.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
SB	a value or a vector representing Subscapular Skinfold measurements. Direction of Fold: Diagonal. Anatomical Reference: Inferior angle of scapula. Measurement: Fold is along natural cleavage line of skin just inferior to inferior angle of scapula, with caliper applied 1 cm below fingers.

## Details

Sex: Use 0 for Male and 1 for Female. Matur\_lv: Use 1 for prepubescent (stages 1 and 2 - Tanner Scale); 2 for pubescent (stage 3 - Tanner Scale) and 3 for postpubescent (stages 4 and 5 - Tanner Scale). Race: Use 0 for white boys and 1 for black boys.

## Value

Returns a data frame with the values of the % body fat from a subject assessed by skinfold measurements

## References

Slaughter, M. H. et al. Skinfold equations for estimation of body fatness in children and youth. *Human Biology*, n. 60, p. 709-23, 1988.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. *Anthropometric standardizing reference manual*. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80.

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Lohman TG. *Advances in Body Composition Assessment: Current Issues in Exercise Science*, Monograph Number 3. Champaign, IL: Human Kinetics, 1992.

## Examples

```
#Predicting % body fat
```

```
df <- Slaughter.2sites.Matur(Sex = 0, Matur_lv = 1, Race = 1, TR = 13, SB = 17)
```

---

Sloan.2sites

*Percent Body Fat Estimates Using Sloan and Weir (1970).*

---

## Description

This function calculates the percent body mass estimates based on 2 sites skinfold measurements using the equations of Sloan and Weir (1970). Population Specifications: Both sexes; Athletes; Male (aged 18-26) and Female (aged 17-25).

## Usage

```
Sloan.2sites(Sex, TH, SB, SI, TR, Equation, Output.format)
```

## Arguments

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
TH	a value or a vector representing Thigh Skinfold measurement. Direction of Fold: Vertical (midlin). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.

SB	a value or a vector representing Subscapular Skinfold measurement. Direction of Fold: Diagonal. Anatomical Reference: Inferior angle of scapula. Measurement: Fold is along natural cleavage line of skin just inferior to inferior angle of scapula, with caliper applied 1 cm below fingers.
SI	a value or a vector representing Suprailiac Skinfold measurement. Direction of Fold: Oblique. Anatomical Reference: Iliac crest. Measurement: Fold is grasped posteriorly to midaxillary line and superiorly to iliac crest along natural cleavage of skin with caliper applied 1 cm below fingers.
TR	a value or a vector representing Triceps Skinfold measurement. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
Equation	desired estimation equation. Two possible choices: 1 or 2.
Output.format	desired output information. Three possible choices: 0, 1 or 2

### Details

Sex: Use 0 for Male and 1 for Female. Equation: Use 1 for Siri (1961) equation or 2 for Brozek et al. (1963) equation. Output.format: Use 0 to display Percent Body Fat (%BF) and Body Density (BD) together; use 1 to display %BF only; use 2 to display BD only.

### Value

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

### References

- Sloan, A.W., and J.B. Weir. 1970. Nomograms for prediction of body density and total body fat from skinfold measurements. *Journal of Applied Physiology* 28: 221-222.
- Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. *Anthropometric standardizing reference manual*. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80.
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- Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. *Annals of the New York Academy of Sciences* 110: 113-140.

**Examples**

```
#Predicting % body fat

df <- Sloan.2sites(Sex = 1, TH = 24, SB = 33, SI = 24, TR = 19, Equation = 1, Output.format = 0)
```

---

YMCA.3sites	<i>Percent Body Fat Estimates Using Golding, Myers and Sinning (1989).</i>
-------------	--

---

**Description**

This function calculates the percent body mass estimates based on 3 sites skinfold measurements using the equations of Jackson and Pollock (1978); Jackson, Pollock and Ward (1980) adapted by Golding, Myers and Sinning (1989). Population Specifications: Both sexes (Males: aged 18-61 and Females: aged 18 - 55) from Young Men's Christian Association (YMCA).

**Usage**

```
YMCA.3sites(Sex, AB, SI, TR, Age)
```

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
AB	a value representing Abdominal Skinfold. Direction of Fold: Vertical. Anatomical Reference: Umbilicus. Measurement: Fold is taken vertically 2 cm lateral to the umbilicus.
SI	a value representing Suprailiac Skinfold. Direction of Fold: Diagonal. Anatomical Reference: Iliac crest. Measurement: Fold is taken diagonally above the iliac crest along the anterior axillary line.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
Age	a value or a vector representing the age (in years) from subject assessed.

**Details**

Sex: Use 0 for Male and 1 for Female.

**Value**

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

**References**

Golding, L., C. Myers, and W. Sinning. 1989. Y's way to physical fitness. Champaign, IL: Human Kinetics.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. Anthropometric standardizing reference manual. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80

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Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHERL, A. (Eds.). Techniques for measuring body composition. Washing, D.C.:National Academy of Science, 1961. p. 223-224.

Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. Annals of the New York Academy of Sciences 110: 113-140.

Jackson, A.S., and M.L. Pollock. 1978. Generalized equations for predicting body density of men. British Journal of Nutrition 40: 497-504.

Jackson, A.S., M.L. Pollock, and A. Ward. 1980. Generalized equations for predicting body density of women. Medicine & Science in Sports & Exercise 12: 175-18.

**Examples**

```
#Predicting % body fat

df <- YMCA.3sites(Sex = 1, AB = 19, SI = 17, TR = 13, Age = 27)
```

---

 YMCA.4sites

*Percent Body Fat Estimates Using Golding, Myers and Sinning (1989).*

---

**Description**

This function calculates the percent body mass estimates based on 4 sites skinfold measurements using the equations of Jackson and Pollock (1978); Jackson, Pollock and Ward (1980) adapted by Golding, Myers and Sinning (1989). Population Specifications: Both sexes (Males: aged 18-61 and Females: aged 18 - 55) from Young Men's Christian Association (YMCA).

**Usage**

YMCA.4sites(Sex, AB, SI, TR, TH, Age)

**Arguments**

Sex	a value or a vector representing the sex declared by the subject. Two possible choices: 0 or 1.
AB	a value representing Abdominal Skinfold. Direction of Fold: Vertical. Anatomical Reference: Umbilicus. Measurement: Fold is taken vertically 2 cm lateral to the umbilicus.
SI	a value representing Suprailiac Skinfold. Direction of Fold: Diagonal. Anatomical Reference: Iliac crest. Measurement: Fold is taken diagonally above the iliac crest along the anterior axillary line.
TR	a value or a vector representing Triceps Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Acromial process of scapula and olecranon process of ulna. Measurement: Using a tape measure, distance between lateral projection of acromial process and inferior margin of olecranon process is measured on lateral aspect of arm with elbow flexed 90°. Midpoint is marked on lateral side of arm. Fold is lifted 1 cm above marked line on posterior aspect of arm. Caliper is applied at marked level.
TH	a value or a vector representing Thigh Skinfold measurements. Direction of Fold: Vertical (midline). Anatomical Reference: Inguinal crease and patella. Measurement: Fold is lifted on anterior aspect of thigh midway between inguinal crease and proximal border of patella. Body weight is shifted to left foot and caliper is applied 1 cm below fingers.
Age	a value or a vector representing the age (in years) from subject assessed.

**Details**

Sex: Use 0 for Male and 1 for Female.

**Value**

Returns a data frame with the values of the % body fat and body density from a subject assessed by skinfold measurements

**References**

Golding, L., C. Myers, and W. Sinning. 1989. Y's way to physical fitness. Champaign, IL: Human Kinetics.

Harrison GG, Buskirk ER, Carter JEL, Johnston FE, Lohman TG, Pollock ML, et al. Skinfold thicknesses and measurements technique. In: Lohman TG, Roche AF, Martorell R, editors. Anthropometric standardizing reference manual. Champaign (Illinois): Human Kinetics Books; 1991. p.55-80

International Society for the Advancement of Kinanthropometry (ISAK), 2001. International Standards for Anthropometric Assessment. (Underdale, SA, Australia.)

Siri, W. E. Body composition from fluid space and density. In: BROZEK, J.; HANSCHER, A. (Eds.). Techniques for measuring body composition. Washing, D.C.:National Academy of Science, 1961. p. 223-224.

Brozek J., F. Grande, J. Anderson, et al. 1963. Densitometric analysis of body composition: Revision of some quantitative assumptions. Annals of the New York Academy of Sciences 110: 113-140.

Jackson, A.S., and M.L. Pollock. 1978. Generalized equations for predicting body density of men. British Journal of Nutrition 40: 497-504.

Jackson, A.S., M.L. Pollock, and A. Ward. 1980. Generalized equations for predicting body density of women. Medicine & Science in Sports & Exercise 12: 175-18.

### Examples

```
#Predicting % body fat
```

```
df <- YMCA.4sites(Sex = 1, AB = 19, SI = 17, TR = 13, TH = 22,  
                  Age = 27)
```

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