Package 'bodycompref'

July 21, 2024

Type Package

Title Reference Values for CT-Assessed Body Composition

Version 2.0.1

Maintainer J. Peter Marquardt <peter@kmarquardt.de>

Description Get z-scores, percentiles, absolute values, and percent of predicted of a reference cohort. Functionality requires installing the data packages 'adiposerefdata' and 'musclerefdata'. For more information on the underlying research, please visit our website which also includes a graphical interface. The models and underlying data are described in Marquardt JP et al.(planned publication 2025; reserved doi 10.1097/RLI.0000000000001104), ``Subcutaneous and Visceral adipose tissue Reference Values from Framingham Heart Study Thoracic and Abdominal CT", *Investigative Radiology* and Tonnesen PE et al. (2023), ``Muscle Reference Values from Thoracic and Abdominal CT for Sarcopenia Assessment [column] The Framingham Heart Study", *Investigative Radiology*, <doi:10.1097/RLI.0000000000001012>.

URL https://bodycomp-metrics.mgh.harvard.edu, https://github.com/p-mq/bodycompref

Depends R (>= 4.0.0)

Imports assertthat, gamlss, stats, sae

License GPL (>= 3)

Encoding UTF-8

RoxygenNote 7.3.1

Suggests testthat (>= 3.0.0), usethis, adiposerefdata, musclerefdata, knitr, rmarkdown

Config/testthat/edition 3

Additional_repositories https://p-mq.github.io/drat

VignetteBuilder knitr

NeedsCompilation no

Author J. Peter Marquardt [aut, cre] (<https://orcid.org/0000-0002-5596-1357>)

Repository CRAN

Date/Publication 2024-07-21 10:20:01 UTC

Contents

`.Get_lambda` *Get the lambda used to build a model*

Description

For each reference LMSP model, get the lambdas used before fitting

Usage

```
.Get_lambda(metric, sex, level = NA)
```

Arguments

`metric`	character, body composition metric
`sex`	character, "Female" or "Male"
`level`	character, used vertebral level

Value

lambda (numeric, range [-2, 2], increments of 0.1)

Author(s)

J Peter Marquardt

`.Get_percent_predicted` *Get % of expected value*

Description

For a given constellation of metric, sex, vertebral level, and age returns the ratio of actual and expected value (percentile 50) in percent

Usage

```
.Get_percent_predicted(
  metric,
  sex,
  level,
  age,
  measurement,
  verbose = FALSE,
  digits = 0
)
```

Arguments

`metric`	character, body composition metric
`sex`	character, "Female" or "Male"
`level`	character, used vertebral level
`age`	integer, age
`measurement`	numeric, raw value of measurement
`verbose`	logical, should messages be discplayed
`digits`	integer, digits to round return value

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

.Get_reference_model *Get reference models*

Description

For a given combination of metric, sex, and level return the appropriate LMSP model. Imports the non-CRAN packages musclerefdata and adiposerefdata

Usage

```
.Get_reference_model(fitted_metric, sex, level)
```

Arguments

fitted_metric	string, name of fitted metric (abbreviation, includes a lowercase b prefix for metrics with box-cox-transformation)
sex	character, "Male" or "Female"
level	string, vertebral level, T5, T8, T10, or L3

Value

LMSP model

Author(s)

J.Peter Marquardt

.Get_reference_percentile *Get percentile for a given combination of model and measurement*

Description

For a given constellation of metric, sex, vertebral level, and age returns the corresponding percentile for a given measurement

Usage

```
.Get_reference_percentile(
  metric,
  sex,
  level,
  age,
  measurement,
  verbose = FALSE,
  digits = 0
)
```

Arguments

metric	character, body composition metric
sex	character, "Female" or "Male"
level	character, used vertebral level
age	integer, age
measurement	numeric, raw value of measurement
verbose	logical, should messages be displayed
digits	integer, digits to round percentile to

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

.Get_reference_value *Get reference for a given combination of model and percentile/z-score*

Description

For a given constellation of metric, sex, vertebral level, and age returns the corresponding measurement for a given percentile/z-score

Usage

```
.Get_reference_value(
  metric,
  sex,
  level,
  age,
  percentile = NULL,
  z_score = NULL,
  verbose = FALSE,
  digits = 0
)
```

Arguments

metric	character, body composition metric
sex	character, "Female" or "Male"
level	character, used vertebral level
age	integer, age

percentile	numeric, percentile to return value for. If both percentile and z_score are given, only percentile is evaluated
z_score	numeric, z score to return value for. If both percentile and z_score are given, only percentile is evaluated
verbose	logical, should messages be discplayed
digits	integer, digits to round reference value

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

.Get_reference_z_score

Get z-score for a given combination of model and measurement

Description

For a given constellation of metric, sex, vertebral level, and age returns the corresponding z-score for a given measurement

Usage

```
.Get_reference_z_score(
  metric,
  sex,
  level,
  age,
  measurement,
  verbose = FALSE,
  digits = 2
)
```

Arguments

metric	character, body composition metric
sex	character, "Female" or "Male"
level	character, used vertebral level
age	integer, age
measurement	numeric, raw value of measurement
verbose	logical, should messages be displayed
digits	integer, digits to round percentile to

Value

numeric, corresponding z-score

Author(s)

J. Peter Marquardt

`bodycomp_reference` *Get body composition reference values*

Description

For a given constellation of metric, sex, vertebral level, and age returns either - the reference percentile - the reference z-score - the reference value - the percent of predicted value

Usage

```
bodycomp_reference(
  metric,
  sex,
  level,
  age,
  type,
  measurement = NULL,
  percentile = NULL,
  z_score = NULL,
  verbose = FALSE,
  digits = 2
)
```

Arguments

`metric`	character (vector), body composition metric.
`sex`	character (vector), ""Female" or "Male"
`level`	character (vector), used vertebral level
`age`	integer (vector), age
`type`	character, type of value to return, either of "percentile", "z_score", "reference_value", "percent_predicted"
`measurement`	numeric (vector), raw value of measurement
`percentile`	numeric (vector), percentile to return value for. If both percentile and z_score are given, only percentile is evaluated
`z_score`	numeric (vector), z score to return value for. If both percentile and z_score are given, only percentile is evaluated
`verbose`	logical, should messages be displayed
`digits`	integer, digits to round return value to

Details

Reference models are available for the following metrics: - CSMA: Cross-sectional muscle area [cm²] - SMI: Skeletal Muscle Index [cm²/m²] - SMRA: Skeletal Muscle Radioattenuation [Hounsfield Units (HU)] - SMG: Skeletal Muscle Gauge [cm² * HU/ m²] - CSFA: Cross-sectional (subcutaneous) fat area [cm²] - SATI: Subcutaneous Adipose Tissue Index [cm²/m²] - SATRA: Subcutaneous Adipose Tissue Radioattenuation [HU] - SATG: Subcutaneous Adipose Tissue Gauge [cm² * HU/ m²] - CSVFA: Cross-sectional Visceral Fat Area [cm²] - VATI: Visceral Adipose Tissue Index [cm²/m²] - VATRA: Visceral Adipose Tissue Radioattenuation [HU] - VATG: Visceral Adipose Tissue Gauge [cm² * HU/ m²] - TAT: Cross-sectional Total Adipose Tissue Area [cm²] (SATA + VATA) - TATI: Total Adipose Tissue Index [cm²/m²] (SATI + VATI) - VAT_SAT_ratio: VAT/SAT ratio []

Measurement values must be >= -124 for SATRA and VATRA, <= -1 for SATG and VATG, and >= 1 for all other metrics.

The reference values are based on LMSP models constructed from the Framingham Heart Study published in the following publications: - Marquardt JP, Tonnesen PE, Mercaldo ND, Graur A, Allaire B, Bouxsein ML, Samelson EJ, Kiel DP, Fintelmann FJ. Subcutaneous and Visceral adipose tissue Reference Values from Framingham Heart Study Thoracic and Abdominal CT. Investigative Radiology, 2024. - Tonnesen PE, Mercaldo ND, Tahir I, Dietrich ASW, Amari W, Graur A, Allaire B, Bouxsein ML, Samelson EJ, Kiel DP, Fintelmann FJ. Muscle Reference Values from Thoracic and Abdominal CT for Sarcopenia Assessment: The Framingham Heart Study. Investigative Radiology, 2023.

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

Examples

```
bodycomp_reference(metric=c("CSFA", "CSFA"), sex=c("Female","Male"),
                   level=c("T5","L3"), age=c(42,68), measurement=c(100,200),
                   type = "percentile")
```

`percent_predicted` *Get % of expected value*

Description

For a given constellation of metric, sex, vertebral level, and age returns the ratio of actual and expected value (percentile 50) in percent

Usage

```
percent_predicted(
  metric,
  sex,
  level,
  age,
  measurement,
  verbose = FALSE,
  digits = 0
)
```

Arguments

metric	character (vector), body composition metric
sex	character (vector), ""Female" or "Male"
level	character (vector), used vertebral level
age	integer (vector), age
measurement	numeric (vector), raw value of measurement
verbose	logical, should messages be displayed
digits	integer, digits to round return value to

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

See Also

[bodycomp_reference()]

Examples

```
percent_predicted(metric=c("CSFA", "CSFA"), sex=c("Female","Male"),
                  level=c("T5","L3"), age=c(42,68), measurement=c(100,200))
```

`reference_percentiles` *Get percentile(s) for a given combination of model and measurement*

Description

For a given constellation of metric, sex, vertebral level, and age returns the corresponding percentiles for a given measurement

Usage

```
reference_percentiles(
  metric,
  sex,
  level,
  age,
  measurement,
  verbose = FALSE,
  digits = 0
)
```

Arguments

`metric`	character (vector), body composition metric
`sex`	character (vector), "Female" or "Male"
`level`	character (vector), used vertebral level
`age`	integer (vector), age
`measurement`	numeric (vector), raw value of measurement
`verbose`	logical, should messages be discplayed
`digits`	integer, digits to round percentile to

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

See Also

[bodycomp_reference()]

Examples

```
reference_percentiles(metric=c("CSFA", "CSFA"), sex=c("Female","Male"),
                level=c("T5","L3"), age=c(42,68), measurement=c(50,50))
```

`reference_values` *Get reference values for a given combination of model and percentile/z-score*

Description

For a given constellation of metric, sex, vertebral level, and age returns the corresponding measurements to a given percentile/z-score

Usage

```
reference_values(
  metric,
  sex,
  level,
  age,
  percentile = NULL,
  z_score = NULL,
  verbose = FALSE,
  digits = 0
)
```

Arguments

`metric`	character (vector), body composition metric
`sex`	character (vector), ""Female" or "Male"
`level`	character (vector), used vertebral level
`age`	integer (vector), age
`percentile`	numeric (vector), percentile to return value for. If both percentile and z_score are given, only percentile is evaluated
`z_score`	numeric (vector), z score to return value for. If both percentile and z_score are given, only percentile is evaluated
`verbose`	logical, should messages be displayed
`digits`	integer, digits to round return value to

Value

numeric, corresponding percentile

Author(s)

J. Peter Marquardt

See Also

[bodycomp_reference()]

Examples

```
reference_values(metric=c("CSFA", "CSFA"), sex=c("Female","Male"),
                 level=c("T5","L3"), age=c(42,68), percentile=c(50,50))
```

`reference_z_scores` *Get z-scores for a given combination of model and measurement*

Description

For a given constellation of metric, sex, vertebral level, and age returns the corresponding z-scores for a given set of measurements

Usage

```
reference_z_scores(
  metric,
  sex,
  level,
  age,
  measurement,
  verbose = FALSE,
  digits = 2
)
```

Arguments

`metric`	character (vector), body composition metric
`sex`	character (vector), "Female" or "Male"
`level`	character (vector), used vertebral level
`age`	integer (vector), age
`measurement`	numeric (vector), raw value of measurement
`verbose`	logical, should messages be displayed
`digits`	integer, digits to round percentile to

Value

numeric, corresponding z-score

Author(s)

J. Peter Marquardt

See Also

[bodycomp_reference()]

Examples

```
reference_z_scores(metric=c("CSFA", "CSFA"), sex=c("Female","Male"),
                 level=c("T5","L3"), age=c(42,68), measurement=c(50,50))
```

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