Package ‘zscorer’

October 19, 2019

Type Package

Title Child Anthropometry z-Score Calculator

Version 0.3.1

Description A tool for calculating z-scores and centiles for weight-for-age, length/height-for-age, weight-for-length/height, BMI-for-age, head circumference-for-age, age circumference-for-age, subscapular skinfold-for-age, triceps skinfold-for-age based on the WHO Child Growth Standards.

Depends R (>= 2.10)

Imports shiny

Suggests testthat, knitr, rmarkdown, shinythemes, covr

License AGPL-3

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

URL https://github.com/nutriverse/zscorer

BugReports https://github.com/nutriverse/zscorer/issues

VignetteBuilder knitr

NeedsCompilation no

Author Mark Myatt [aut, cph] (https://orcid.org/0000-0003-1119-1474), Ernest Guevarra [aut, cre] (https://orcid.org/0000-0002-4887-4415)

Maintainer Ernest Guevarra <ernestgmd@gmail.com>

Repository CRAN

Date/Publication 2019-10-19 06:20:02 UTC

R topics documented:

addWGSR ......................................................... 2
anthro .............................................................. 4
addWGSR

Add the WHO Growth Reference z-scores to a data frame of anthropometric data for weight, height or length, MUAC, head circumference, sub-scapular skinfold and triceps skinfold.

Description

Add the WHO Growth Reference z-scores to a data frame of anthropometric data for weight, height or length, MUAC, head circumference, sub-scapular skinfold and triceps skinfold.

Usage

addWGSR(data, sex, firstPart, secondPart, thirdPart = NA, index = NA, standing = NULL, output = paste(index, "z", sep = ""), digits = 2)

Arguments

data A survey dataset as a data.frame object

sex Name of variable specifying the sex of the subject. This must be coded as 1 = male and 2 = female. Give a quoted variable name as in (e.g.) "sex".

firstPart Name of variable specifying:

• Weight (kg) for BMI/A, W/A, W/H, or W/L
• Head circumference (cm) for HC/A
• Height (cm) for BMI/A for H/A
• Length (cm) for L/A
• MUAC (cm) for MUAC/A
• Sub-scapular skinfold (mm) for SSF/A
• Triceps skinfold (mm) for TSF/A

Give a quoted variable name as in (e.g.) "weight". Be careful with units (weight in kg; height, length, head circumference, and MUAC in cm, skinfolds in mm).

secondPart Name of variable specifying:

• Age (days) for H/A, HC/A, L/A, MUAC/A, SSF/A, or TSF/A
• Height (cm) BMI/A or W/H
• Length (cm) for W/L

Give a quoted variable name as in (e.g.) "age". Be careful with units (age in days; height and length in cm).

**thirdPart**

Name of variable specifying age (in days) for BMI/A. Give a quoted variable name as in (e.g.) "age". Be careful with units (age in days).

**index**

The index to be calculated and added to data. One of:

- bfa  BMI for age
- hca  Head circumference for age
- hfa  Height for age
- lfa  Length for age
- mfa  MUAC for age
- ssa  Sub-scapular skinfold for age
- tsa  Triceps skinfold for age
- wfa  Weight for age
- wfh  Weight for height
- wfl  Weight for length

Give a quoted index name as in (e.g.) "wfh".

**standing**

Variable specifying how stature was measured. If NULL then age (for "hfa" or "lfa") or height rules (for "wfh" or "wfl") will be applied. This must be coded as 1 = Standing; 2 = Supine; 3 = Unknown. All other values will be recoded to 3 = Unknown. Give a quoted variable name as in (e.g.) "measured" or a single value (e.g. "measured = 1"). If no value (or NULL) is specified then height and age rules will be applied.

**output**

The name of the column containing the specified index to be added to the dataset. This is an optional parameter. If you do not specify a value for output then the added column will take the name of the specified index with a "z" appended.

**digits**

The number of decimal places for output. Defaults to 2 d.p.

**Value**

A data.frame of the survey dataset with the calculated z-scores added.

**Examples**

# Calculate weight-for-height (wfh) for the anthro3 dataset
addWGSR(data = anthro3,
        sex = "sex",
        firstPart = "weight",
        secondPart = "height",
        index = "wfh")

# Calculate weight-for-age (wfa) for the anthro3 dataset
addWGSR(data = anthro3,
        sex = "sex",
        firstPart = "weight",
        secondPart = "age",
        index = "wfa")
```r
index = "wfa")

# Calculate height-for-age (hfa) for the anthro3 dataset
addWGSR(data = anthro3,
        sex = "sex",
        firstPart = "height",
        secondPart = "age",
        index = "hfa")

# Calculate MUAC-for-age (mfa) for the anthro4 dataset

## Convert age in anthro4 from months to days
testData <- anthro4
testData$age <- testData$agemons * (365.25 / 12)

addWGSR(data = testData,
        sex = "sex",
        firstPart = "muac",
        secondPart = "age",
        index = "mfa")
```

### anthro1

*Anthropometric data from a SMART survey in Kabul, Afghanistan.*

---

**Description**

Anthropometric data from a SMART survey in Kabul, Afghanistan.

**Usage**

`anthro1`

**Format**

A data frame with 873 observations and 11 variables

- `psu` Primary sampling unit
- `age` Age of child (months)
- `sex` Gender of child
- `weight` Weight of child (kgs)
- `height` Height of child (cm)
- `muac` Mid-upper arm circumference (mm)
- `oedema` Presence or absence of oedema
- `haz` Height-for-age z-score
- `waz` Weight-for-age z-score
- `whz` Weight-for-height z-score
- `flag` Data quality flag
**anthro2**

*Anthropometric data from a single state from a Demographic and Health Survey (DHS) of a West African country.*

**Description**

Anthropometric data from a single state from a Demographic and Health Survey (DHS) of a West African country.

**Usage**

anthro2

**Format**

A data frame with 796 observations and 6 variables

- **psu** Primary sampling unit
- **age** Age (months)
- **sex** Gender
- **wt** Weight (kg)
- **ht** height (cm)
- **oedema** Presence or absence of oedema

---

**anthro3**

*Anthropometric data from a Rapid Assessment Method (RAM) survey from Burundi.*

**Description**

Anthropometric data from a Rapid Assessment Method (RAM) survey from Burundi.

**Usage**

anthro3

**Format**

A data frame with 221 observations and 7 variables

- **psu** Primary sampling unit
- **age** Age (months)
- **sex** Gender
- **weight** Weight (kg)
height  Height (cm)
nuac    Mid-upper arm circumference (cm)
oedema Presence or absence of oedema

---

**anthro4**  
* A subset of mid-upper arm circumference data from study conducted to create MUAC-for-age z-scores

**Description**

A subset of mid-upper arm circumference data from study conducted to create MUAC-for-age z-scores

**Usage**

```r
anthro4
```

**Format**

A data.frame with 257 observations and 4 variables

- `pk_serial` Unique identifier
- `muac` Mid-upper arm circumference in centimetres
- `agemons` Age in months
- `sex` Sex; 1 = Male; 2 = Female

**Source**

Mramba Lazarus, Ngari Moses, Mwangome Martha, Muchai Lilian, Bauni Evasius, Walker A Sarah et al. A growth reference for mid upper arm circumference for age among school age children and adolescents, and validation for mortality: growth curve construction and longitudinal cohort study BMJ 2017; 358 :j3423 [https://doi.org/10.1136/bmj.j3423](https://doi.org/10.1136/bmj.j3423)

---

**getAllWGS**  
* Calculate z-scores for WHZ, HAZ, WAZ using the WHO Growth Reference (2006) for a single child data.

**Description**

Calculate z-scores for WHZ, HAZ, WAZ using the WHO Growth Reference (2006) for a single child data.

**Usage**

```r
getAllWGS(data = NULL, sex, weight, height, age, index)
```
getAllWGS

Arguments

data Data frame containing corresponding data on sex, weight, height, and age of children. Default is NULL. If specified, parameters for sex, weight, height and age should be provided as character values of the names of variables in data corresponding to the parameters required.

sex Either numeric values (1 = male; 2 = female) indicating sex of child (default) or character value (if data is specified) indicating variable name in data containing information on sex of child/children (1 = male; 2 = female).

weight Either numeric values for weight in kg with at least 1 decimal place (default) or character value (if data is specified) indicating variable name in data containing information on weight of child/children.

height Either numeric values for height in cm with at least 1 decimal place (default) or character value (if data is specified) indicating variable name in data containing information on height of child/children.

age Either numeric values for age in whole months (default) or character value (if data is specified) indicating variable name in data containing information on age of child/children.

index One of "wfh", "hfa", "wfa" (specifies the required index) or "all" to calculate all three indices

Value

Either a single numeric value for z-score of the anthropometric index selected if data is for single child or a data frame of numeric values for z-scores of each anthropometric index if data is for multiple children and more than one anthropometric index selected.

The function fails messily when secondPart is outside of the range given in the WGS reference (i.e. 45 to 120 cm for height and 0 to 60 months for age). It is up to you to check the ranges of your data.

The reference data for W/H assumes supine length is used for children with a standing height below 85cm.

Heights should be specified in cm to the nearest mm (i.e. to 1 d.p.)

Ages should be specified in whole months

Weights should be specified in kg to available precision

The function requires reference data wgsData included in this package

Examples

# apply \code{getAllWGS()} to a make believe 52 month old male child with weight of
# 14.6 kg and height of 98.0 cm
waz <- getAllWGS(sex = 1, # 1 = Male / 2 = Female
    weight = 14.6, # Weight in kilograms
    height = 98, # Height in centimetres
    age = 52, # Age in whole months
    index = "wfa") # Anthropometric index (weight-for-age)

waz
**getCohortWGS**

Calculate z-scores for WHZ, HAZ, WAZ using the WHO Growth Reference (2006) for a cohort or sample of children.

**Description**

Calculate z-scores for WHZ, HAZ, WAZ using the WHO Growth Reference (2006) for a cohort or sample of children.
**Usage**

```
getCohortWGS(data, FUN = getWGS, sexObserved, firstPart, secondPart, index)
```

**Arguments**

- `data` : Data frame containing the variables needed for calculation
- `FUN` : Function to apply; default to `getWGS`
- `sexObserved` : Sex of child (1 = Male; 2 = Female)
- `firstPart` : Weight (kg; for WHZ and WAZ) or height (cm; for HAZ)
- `secondPart` : Age (months; for HAZ and WAZ) or height (cm; for WHZ)
- `index` : One of "wfh", "hfa", "wfa" (specifies the required index)

**Value**

Numeric vector of z-scores of the anthropometric index selected

The function fails messily when `secondPart` is outside of the range given in the WGS reference (i.e. 45 to 120 cm for height and 0 to 60 months for age). It is up to you to check the ranges of your data.

The reference data for W/H assumes supine length is used for children with a standing height below 85cm

Heights should be specified in cm to the nearest mm (i.e. to 1 d.p.)

Ages should be specified in whole months

Weights should be specified in kg to available precision

The function requires reference data `wgsData` included in this package

**Examples**

```
# apply getWGS to first child in sample data anthro1
wazAll <- getCohortWGS(data = anthro1, 
                        sexObserved = "sex", 
                        firstPart = "weight", 
                        secondPart = "age", 
                        index = "wfa")

wazAll

hazAll <- getCohortWGS(data = anthro1, 
                        sexObserved = "sex", 
                        firstPart = "height", 
                        secondPart = "age", 
                        index = "hfa")

hazAll

whzAll <- getCohortWGS(data = anthro1, 
                        sexObserved = "sex", 
                        firstPart = "weight", 
                        secondPart = "height", 
```


Calculate z-scores for WHZ, HAZ, WAZ using the WHO Growth Reference (2006) for a single child data.

**Description**

Calculate z-scores for WHZ, HAZ, WAZ using the WHO Growth Reference (2006) for a single child data.

**Usage**

```
getWGS(sexObserved, firstPart, secondPart, index)
```

**Arguments**

- `sexObserved`  
  Sex of child (1 = Male; 2 = Female)
- `firstPart`  
  Weight (in kg for WHZ and WAZ) or height (in cm for HAZ)
- `secondPart`  
  Age (in months for HAZ and WAZ) or height (in cm for WHZ)
- `index`  
  One of "wfh", "hfa", "wfa" (specifies the required index)

**Value**

z-score of the anthropometric index selected

**Warning**

The function fails messily when `secondPart` is outside of the range given in the WGS reference (i.e. 45 to 120 cm for height and 0 to 60 months for age). It is up to you to check the ranges of your data.

**Reminders**

- The reference data for W/H assumes supine length is used for children with a standing height below 85cm
- Heights should be specified in cm to the nearest mm (i.e. to 1 d.p.)
- Ages should be specified in whole months
- Weights should be specified in kg to available precision
- The function requires reference data `wgsData` included in this package
getWGSR

Note

This is a legacy function from the first CRAN release of zscorer which focused mainly on the calculation of z-scores for weight-for-age, weight-for-height and height-for-age. This function has been kept in the package to ensure that existing analysis workflows implemented using the function continue to work.

Examples

```r
# apply \code{getWGS()} to a make believe 52 month old male child with weight of
# 14.6 kg and height of 98.0 cm
waz <- getWGS(sexObserved = 1,  # 1 = Male / 2 = Female
             firstPart = 14.6,  # Weight in kilograms
             secondPart = 52,  # Age in whole months
             index = "wfa")  # Anthropometric index (weight-for-age)
waz

haz <- getWGS(sexObserved = 1,
             firstPart = 98,    # Height in centimetres
             secondPart = 52,
             index = "hfa")    # Anthropometric index (height-for-age)
haz

whz <- getWGS(sexObserved = 1,
             firstPart = 14.6,
             secondPart = 98,
             index = "wfh")    # Anthropometric index (weight-for-height)
whz
```

getWGSR


calculate WHO Growth Reference z-score for a given anthropometric measurement.

Description

This function is usually called by the addWGSR() function but could be used as a stand-alone calculator for getting z-score for a given anthropometric measurement.

Usage

```r
getWGSR(sex, firstPart, secondPart, index = NA, standing = NA,
         thirdPart = NA)
```

Arguments

```r
sex  Sex of the subject. This must be coded as 1 = male and 2 = female.
firstPart Name of variable specifying:
  • Weight (kg) for BMI/A, W/A, W/H, or W/L
```
• Head circumference (cm) for HC/A
• Height (cm) for BMI/A for H/A
• Length (cm) for L/A
• MUAC (cm) for MUAC/A
• Sub-scapular skinfold (mm) for SSF/A
• Triceps skinfold (mm) for TSF/A

Give a quoted variable name as in (e.g.) "weight". Be careful with units (weight in kg; height, length, head circumference, and MUAC in cm, skinfolds in mm).

secondPart
Name of variable specifying:
• Age (days) for H/A, HC/A, L/A, MUAC/A, SSF/A, or TSF/A
• Height (cm) BMI/A or W/H
• Length (cm) for W/L

Give a quoted variable name as in (e.g.) "age". Be careful with units (age in days; height and length in cm).

index
The index to be calculated and added to data. One of:
bfa BMI for age
hca Head circumference for age
hfa Height for age
lfa Length for age
mfa MUAC for age
ssa Sub-scapular skinfold for age
tsa Triceps skinfold for age
wfa Weight for age
wfh Weight for height
wfl Weight for length

Give a quoted index name as in (e.g.) "wfh".

standing
Variable specifying how stature was measured. If NULL then age (for "hfa" or "lfa") or height rules (for "wfh" or "wfl") will be applied. This must be coded as 1 = Standing; 2 = Supine; 3 = Unknown. All other values will be recoded to 3 = Unknown. Give a quoted variable name as in (e.g.) "measured" or a single value (e.g."measured = 1"). If no value (or NULL) is specified then height and age rules will be applied. zz

thirdPart
Name of variable specifying age (in days) for BMI/A. Give a quoted variable name as in (e.g.) "age". Be careful with units (age in days).

Value
A numeric value or vector of z-scores for the specified index.

Examples
# Given a male child 10 months old with a weight of 5.7 kgs, height of 64.2
# cms, and MUAC of 125 mm:
# Calculate weight-for-height
getWGSR(sex = 1,
       firstPart = 5.7,
       secondPart = 64.2,
       index = "wfh",
       standing = 3)

# calculate weight-for-age
getWGSR(sex = 1,
       firstPart = 5.7,
       secondPart = 10,
       index = "wfa",
       standing = 3)

# calculate height-for-age
getWGSR(sex = 1,
       firstPart = 64.2,
       secondPart = 10,
       index = "hfa",
       standing = 3)

# Calculate MUAC-for-age z-score for a girl
getWGSR(sex = 1,
       firstPart = 20,
       secondPart = 62 * (365.25 / 12),
       index = "mfa")

---

**run_zscorer**

*Initialise built-in Shiny application*

**Description**

Initialise built-in Shiny application

**Usage**

`run_zscorer()`

**Examples**

```r
if(interactive()) run_zscorer()
```
wgsData

World Health Organization (WHO) Growth Reference (2006) data

Description

World Health Organization (WHO) Growth Reference (2006) data

Usage

wgsData

Format

A data frame with 6 columns and 2338 rows.

 indicator One of weight-for-age (waz), height-for-age (haz), or weight-for-height (whz) anthropometric indicators
 sex Sex of child (1 = Male; 2 = Female)
 given Variable to which standardisation is to be made. For waz and haz, given is age in months. For whz, given is height in cm
 L L component of the LMS method for normalising growth centile standards. L is the trend in the optimal power to obtain normality
 M M component of the LMS method for normalising growth centile standards. M is the trend in the mean
 S S component of the LMS method for normalising growth centile standards. S is the trend in the coefficient of variation

Source

Index

*Topic datasets
  anthro1, 4
  anthro2, 5
  anthro3, 5
  anthro4, 6
  wgsData, 14

addWGSR, 2
anthro1, 4
anthro2, 5
anthro3, 5
anthro4, 6

getAllWGS, 6
getCohortWGS, 8
getWGS, 10
getWGSR, 11

run_zscorer, 13

wgsData, 14