Package 'childsds'

January 28, 2025

Title Data and Methods Around Reference Values in Pediatrics

Version 0.9.8

Description Calculation of standard deviation scores and percentiles adduced from different standards (WHO, UK, Germany, Italy, China, etc). Also, references for laboratory values in children and adults are available, e.g., serum lipids, iron-related blood parameters, IGF, liver enzymes. See package documentation for full list.

Depends R (>= 4.2.0)

Imports gamlss, gamlss.dist, dplyr, magrittr, methods, tidyr, tidyselect, boot, class, tibble, reshape2, purrr, purrrlyr, utils, VGAM, interp, lubridate

Suggests ggplot2

BugReports https://git.sc.uni-leipzig.de/my221hepi/childsds/-/issues

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.3.2

NeedsCompilation no

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Repository CRAN

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Contents

aga_15.ref — *Parameters from recommendations of the German Adiposity Association (2015, AGA)*

Description

Parameters from recommendations of the German Adiposity Association (2015, AGA)

Usage

```
aga_15.ref
```

Source

"Kromeyer-Hauschild K, Moss A, Wabitsch M. Referenzwerte fuer den Body-Mass-Index fuer Kinder, Jugendliche und Erwachsene in Deutschland. Adipositas - Ursachen, Folgeerkrankungen, Therapie. 2015;09(3):123-7."

aggregate_lms — *aggregate lms parameters*

Description

aggregate lms parameters

Usage

```
aggregate_lms(lms.list)
```

Arguments

lms.list	list of parameter tables as returned by do_iterations()

Details

function takes the lms part of the result from the do_iterations() function and returns the mean parameters

Value

list of dataframes containing the aggregated parameters, each for every level of sex

Author(s)

Mandy Vogel

belgium.ref *Parameters derived from Flandern population*

Description

Parameters derived from Flandern population

Usage

```
belgium.ref
```

Source

Roelants M, Hauspie R, Hoppenbrouwers K. References for growth and pubertal development from birth to 21 years in Flanders, Belgium. Annals of Human Biology. 2009 Dezember;36(6):680-94.

bone.ref *Parameters for different bone parameters*

Description

Parameters for different bone parameters

Usage

```
bone.ref
```

Source

Geserick M, Vogel M, Eckelt F, et al. Children and adolescents with obesity have reduced serum bone turnover markers and 25-hydroxyvitamin D but increased parathyroid hormone concentrations – Results derived from new pediatric reference ranges. Bone 2020;132:115124 and Eberle et al. unpublishedfor VitD binding protein

---

`bp_wuehl_age.ref` *Parameters from Wuehl et al. blood pressure reference values Germany according to age, from version 0.7.3 unplausible values are replaced by interpolated ones. For the original values check out earlier versions*

Description

Parameters from Wuehl et al. blood pressure reference values Germany according to age, from version 0.7.3 unplausible values are replaced by interpolated ones. For the original values check out earlier versions

Usage

```
bp_wuehl_age.ref
```

Source

"Wuehl E, Witte K, Soergel M, Mehls O, Schaefer F, Hypertension for the GWG on P. Distribution of 24-h ambulatory blood pressure in children: normalized reference values and role of body dimensions. Journal of Hypertension. 2002 Oct;20(10):1995.", implausible values were replaced by interpolated ones from package version 0.7.4

`bp_wuehl_height.ref` *Parameters from Wuehl et al. blood pressure reference values Germany according to height from version 0.7.3 unplausible values are replaced by interpolated ones. For the original values check out earlier versions*

Description

Parameters from Wuehl et al. blood pressure reference values Germany according to height from version 0.7.3 unplausible values are replaced by interpolated ones. For the original values check out earlier versions

Usage

```
bp_wuehl_height.ref
```

Source

"Wuehl E, Witte K, Soergel M, Mehls O, Schaefer F, Hypertension for the GWG on P. Distribution of 24-h ambulatory blood pressure in children: normalized reference values and role of body dimensions. Journal of Hypertension. 2002 Oct;20(10):1995.", implausible values were replaced by interpolated ones from package version 0.7.4

`calc_confints` *Calculate confidence intervals*

Description

Calculate confidence intervals

Usage

```
calc_confints(
  lms.list,
  perc = c(2.5, 5, 50, 95, 97.5),
  level = 0.95,
  type = c("point")
)
```

Arguments

`lms.list`	lms part of the returned list of `do_iterations`
`perc`	percentiles for which the confidence bands are calculated
`level`	confidence level
`type`	for now only point is a valid value

Details

The function takes a lms list as returned by `do_iterations` and calculates the confidence bands for a given set of percentiles using `envelope` from the boot package

Value

list containing the respective confidence envelopes

Author(s)

mandy

`calc_percent_excess` *Calculate percentage relative to a given base percentile*

Description

Calculate percentage relative to a given base percentile

Usage

```
calc_percent_excess(
  bmi = NULL,
  age = NULL,
  sex = NULL,
  ref.perc = 50,
  ref,
  item = "bmi",
  rownr = NULL
)
```

Arguments

`bmi`	vector of bmi
`age`	vector of age
`sex`	vector of sex (coding "male" and "female") is assumend
`ref.perc`	single value: reference percentile (0,100)
`ref`	RefGroup object
`item`	item within ref
`rownr`	indicator of order

Details

The function calculates the percentage of a given bmi value relative to a specific percentile

Value

vector containing values between 0 and 1

Author(s)

Mandy Vogel

`cdc.ref` *LMS Parameters for the Centers for Disease Control and Prevention 2000 Growth Charts, contains bmi, height, head cirumference, weight, weight for length,*

Description

LMS Parameters for the Centers for Disease Control and Prevention 2000 Growth Charts, contains bmi, height, head cirumference, weight, weight for length,

Usage

```
cdc.ref
```

Source

National health statitics reports 63.

`cn.ref` *Parameters for height of normal weight and obese children from the CrescNet database dependent on height*

Description

Parameters for height of normal weight and obese children from the CrescNet database dependent on height

Usage

```
cn.ref
```

Source

"Kempf et al. In progress"

cole_lobstein.ref *Parameters for bmi from Cole and Lobstein, 2012*

Description

Parameters for bmi from Cole and Lobstein, 2012

Usage

```
cole_lobstein.ref
```

Source

Cole TJ, Lobstein T. Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. Pediatric Obesity 2012;7(4):284–94.

colombia_sf.ref *Parameters of skinfold measures derived from Colombian population*

Description

Parameters of skinfold measures derived from Colombian population

Usage

```
colombia_sf.ref
```

Source

Ramirez-Velez, R. et al. Triceps and Subscapular Skinfold Thickness Percentiles and Cut-Offs for Overweight and Obesity in a Population-Based Sample of Schoolchildren and Adolescents in Bogota, Colombia. Nutrients 8, (2016).

doyon_age.ref *Parameters for different carotid artery intima-media thickness and distensibility dependent on age*

Description

Parameters for different carotid artery intima-media thickness and distensibility dependent on age

Usage

```
doyon_age.ref
```

Source

"Doyon A, Kracht D, Bayazit AK, et al. Carotid artery intima-media thickness and distensibility in children and adolescents: reference values and role of body dimensions. Hypertension 2013;62(3):550-6"

doyon_height.ref *Parameters for different carotid artery intima-media thickness and distensibility dependent on height*

Description

Parameters for different carotid artery intima-media thickness and distensibility dependent on height

Usage

```
doyon_height.ref
```

Source

"Doyon A, Kracht D, Bayazit AK, et al. Carotid artery intima-media thickness and distensibility in children and adolescents: reference values and role of body dimensions. Hypertension 2013;62(3):550-6"

`do_iterations` *do lms iterations*

Description

Do lms iterations

Usage

```
do_iterations(
  data.list,
  n = 10,
  max.it = 1000,
  method = "gamlss",
  prop.fam = 0.75,
  prop.subject = 1,
  age.min = 0,
  age.max = 18,
  age.int = 1/12,
  x2.min = 25,
  x2.max = 42,
  x2.int = 1/12,
  keep.models = F,
  dist = "BCCGo",
  mu.df = 4,
  sigma.df = 3,
  nu.df = 2,
  tau.df = 2,
  verbose = F,
  formula = NULL,
  sigma.formula = ~1,
  nu.formula = ~1,
  tau.formula = ~1,
  method.pb = "ML",
  trans.x = F,
  lim.trans = c(0, 1.5)
)
```

Arguments

`data.list`	list of dataframes as returned by prepare_data
`n`	number of desired fits
`max.it`	maximum number of iterations that will be run
`method`	use vgam or gamlss
`prop.fam`	proportion of families to be sampled
`prop.subject`	proportion of subject to be sampled

age.min	lower bound of age
age.max	upper bound of age
age.int	stepwidth of the age variable
x2.min	minimum limit for the second predictor
x2.max	maximum limit for the second predictor
x2.int	interval length between knots saved
keep.models	indicator whether or not models in each iteration should be kept
dist	distribution used for the fitting process, has to be one of BCCGo, BCPEo, BCTo as they are accepted by lms()
mu.df	degree of freedem location parameter
sigma.df	degree of freedem spread parameter
nu.df	degree of freedem skewness parameter
tau.df	degree of freedem kurtosis parameter
verbose	whether or not information about sampling will be printed during while iterate
formula	formula for the location parameter
sigma.formula	formula for the sigma parameter
nu.formula	formula for the nu parameter
tau.formula	formula for the tau parameter
method.pb	GAIC or ML
trans.x	indicator wether age should be transformed or not
lim.trans	limits for the exponent of transformation of age

Details

function samples families, samples measurements (and subjects), fits the model for a given number of iterations

Value

list of lists for models and fitted parameters

Author(s)

Mandy Vogel

dummy.refs *dummy*

Description

dummy function to call a function of the gamlss.dist package

Usage

```
dummy.refs(ref, item)
```

Arguments

ref	reference object
item	item name specifiying the reference

Details

dummy function to call a function of the gamlss.dist package

Value

dummy output

Author(s)

Mandy Vogel

duran_bf.ref *Parameters for bodyfat (for Whites, Blacks, and Mexican-Americans*

Description

Parameters for bodyfat (for Whites, Blacks, and Mexican-Americans

Usage

```
duran_bf.ref
```

Source

"Duran I, Martakis K, Rehberg M, Stark C, Schafmeyer L, Schoenau E. Reference Centiles for the Evaluation of Nutritional Status in Children using Body Fat Percentage, Fat Mass and Lean Body Mass Index. Journal of Clinical Densitometry [Internet] 2019 [cited 2019 Mar 19];Available from: https://linkinghub.elsevier.com/retrieve/pii/S1094695018302622"

ethiop.ref *Parameters derived Ethiopian children*

Description

Parameters derived Ethiopian children

Usage

```
ethiop.ref
```

Source

Amare, E. B. et al. Reference Ranges for Head Circumference in Ethiopian Children 0–2 Years of Age. World Neurosurgery 84, 1566–1571.e2 (2015).

fit_gamlss *fit lms*

Description

fit gamlss

Usage

```
fit_gamlss(
  data,
  age.min = 0.25,
  age.max = 18,
  age.int = 1/12,
  keep.models = F,
  dist = "BCCGo",
  mu.df = 4,
  sigma.df = 3,
  nu.df = 2,
  tau.df = 2,
  trans.x = F,
  lim.trans = c(0, 1.5),
  value,
  tmpdata
)
```

Arguments

data	dataframe as return by select_meas()
age.min	lower bound of age
age.max	upper bound of age
age.int	stepwidth of the age variable
keep.models	indicator whether or not models in each iteration should be kept
dist	distribution used for the fitting process, has to be one of BCCGo, BCPEo, BCTo as they are accepted by lms()
mu.df	degree of freedem location parameter
sigma.df	degree of freedem spread parameter
nu.df	degree of freedem skewness parameter
tau.df	degree of freedem kurtosis parameter
trans.x	indicator wether age should be transformed or not
lim.trans	limits for the exponent of transformation of age
value	names of the value variable (character) if different from value, ignored
tmpdata	ignored

Details

wrapper around the lms function in the gamlss package returns the fitted lms-parameter at given age points the function is called inside do_iterations and may not called directly

Value

list containing a dataframe of the fitted lms parameter at the given age points and the fitted model

Author(s)

Mandy Vogel

---

fit_gamlss1 *fit_gamlss1*

Description

fit_gamlss1

Usage

```
fit_gamlss1(
  data,
  age.min = 0,
  age.max = 80,
  age.int = 1/12,
  keep.models = F,
  dist = "BCCGo",
  formula = NULL,
  sigma.formula = ~1,
  nu.formula = ~1,
  tau.formula = ~1,
  method.pb = "ML"
)
```

Arguments

data	dataframe as return by select_meas()
age.min	lower bound of age
age.max	upper bound of age
age.int	stepwidth of the age variable
keep.models	indicator whether or not models in each iteration should be kept
dist	distribution used for the fitting process, has to be one of BCCGo, BCPEo, BCTo as they are accepted by lms()
formula	formula for the location parameter
sigma.formula	formula for the sigma parameter
nu.formula	formula for the nu parameter
tau.formula	formula for the tau parameter
method.pb	GAIC or ML

Details

wrapper around the gamlss function from the gamlss package returns the fitted lms-parameter at given age points the function is called inside do_iterations and may not be called directly

Value

list containing a dataframe of the fitted lms parameter at the given age points and the fitted model

Author(s)

Mandy Vogel

`fit_gamlss_2d` *fit_gamlss_2d*

Description

fit_gamlss 2dim

Usage

```
fit_gamlss_2d(
  data,
  age.min = 0,
  age.max = 80,
  age.int = 1/12,
  x2.min = 25,
  x2.max = 42,
  x2.int = 1,
  keep.models = F,
  dist = "BCCGo",
  formula = NULL,
  sigma.formula = ~1,
  nu.formula = ~1,
  tau.formula = ~1,
  method.pb = "ML"
)
```

Arguments

`data`	dataframe as return by select_meas()
`age.min`	lower bound of age
`age.max`	upper bound of age
`age.int`	stepwidth of the age variable
`x2.min`	minimum limit for the second predictor
`x2.max`	maximum limit for the second predictor
`x2.int`	interval length between knots saved
`keep.models`	indicator whether or not models in each iteration should be kept
`dist`	distribution used for the fitting process, has to be one of BCCGo, BCPEo, BCTo as they are accepted by lms()
`formula`	formula for the location parameter
`sigma.formula`	formula for the sigma parameter
`nu.formula`	formula for the nu parameter
`tau.formula`	formula for the tau parameter
`method.pb`	GAIC or ML

Details

wrapper around the gamlss function from the gamlss package returns the fitted lms-parameter at given age points the function is called inside do_iterations and may not be called directly

Value

list containing a dataframe of the fitted lms parameter at the given age points and the fitted model

Author(s)

Mandy Vogel

`fit_vgam` *fit lms parameters via VGAM*

Description

fit vgam

Usage

```
fit_vgam(
  data,
  age.min = 0.25,
  age.max = 18,
  age.int = 1/12,
  keep.models = F,
  dist = "BCN",
  mu.df = 4,
  sigma.df = 3,
  nu.df = 2,
  value
)
```

Arguments

`data`	dataframe as return by select_meas()
`age.min`	lower bound of age
`age.max`	upper bound of age
`age.int`	stepwidth of the age variable
`keep.models`	indicator whether or not models in each iteration should be kept
`dist`	distribution used for the fitting process, has to be one of BCCGo, BCPEo, BCTo as they are accepted by lms()
`mu.df`	degree of freedem location parameter
`sigma.df`	degree of freedem spread parameter
`nu.df`	degree of freedem skewness parameter
`value`	names of the value variable (character) if different from value, ignored

Details

wrapper around the vgam function in the VGAM package returns the fitted lms-parameter at given age points the function is called inside do_iterations and may not called directly

Value

list containing a dataframe of the fitted lms parameter at the given age points and the fitted model

Author(s)

mandy

---

fredriks05.ref *Parameters derived from Dutch children (additional to nl4.ref)*

Description

Parameters derived from Dutch children (additional to nl4.ref)

Usage

```
fredriks05.ref
```

Source

Fredriks, A. M. et al. Nationwide age references for sitting height, leg length, and sitting height/height ratio, and their diagnostic value for disproportionate growth disorders. Archives of Disease in Childhood 90, 807–812 (2005)

---

ghouili_anthro.ref *Parameters for height, weight, sitting height, etc from Ghouili, 2021*

Description

Parameters for height, weight, sitting height, etc from Ghouili, 2021

Usage

```
ghouili_anthro.ref
```

Source

Ghouili H, Ouerghi N, Boughalmi A, Dridi A, Rhibi F, Bouassida A. First growth reference curves for Tunisian children and adolescents. Archives de Pediatrie 2021;28(5):381–91

gomez_bmitmi.ref *Parameters for BMI and TMI from Gomez, 2021*

Description

Parameters for BMI and TMI from Gomez, 2021

Usage

```
gomez_bmitmi.ref
```

Source

Gomez-Campos R, Vidal-Espinoza R, Marques de Moraes A, et al. Comparison of Anthropometric Indicators That Assess Nutritional Status From Infancy to Old Age and Proposal of Percentiles for a Regional Sample of Chile. Frontiers in Nutrition 2021 [cited 2022 May 28];8. Available from: https://www.frontiersin.org/article/10.3389/fnut.2021.657491

international_lab.ref *International Laboratory Parameters Tables*

Description

International Laboratory Parameters Tables

Usage

```
international_lab.ref
```

Source

Bidlingmaier, M., Friedrich, N., Emeny, R.T., Spranger, J., Wolthers, O.D., Roswall, J., Koerner, A., Obermayer-Pietsch, B., Huebener, C., Dahlgren, J., others, 2014. Reference intervals for insulin-like growth factor-1 (IGF-I) from birth to senescence: results from a multicenter study using a new automated chemiluminescence IGF-I immunoassay conforming to recent international recommendations. The Journal of Clinical Endocrinology & Metabolism 99, 1712-1721.

Friedrich, N., Wolthers, O.D., Arafat, A.M., Emeny, R.T., Spranger, J., Roswall, J., Kratzsch, J., Grabe, H.J., Huebener, C., Pfeiffer, A.F.H., Doering, A., Bielohuby, M., Dahlgren, J., Frystyk, J., Wallaschofski, H., Bidlingmaier, M., 2014. Age- and Sex-Specific Reference Intervals Across Life Span for Insulin-Like Growth Factor Binding Protein 3 (IGFBP-3) and the IGF-I to IGFBP-3 Ratio Measured by New Automated Chemiluminescence Assays. The Journal of Clinical Endocrinology & Metabolism 99, 1675-1686. doi:10.1210/jc.2013-3060

iron.ref *Parameters for iron-related blood parameters in children*

Description

Parameters for iron-related blood parameters in children

Usage

```
iron.ref
```

Source

Rieger, K. et al. Reference intervals for iron-related blood parameters: results from a population-based cohort study (LIFE Child). LaboratoriumsMedizin 40, (2016).

italian.ref *Parameters derived from Italian children*

Description

Parameters derived from Italian children

Usage

```
italian.ref
```

Source

Cacciari E, Milani S, Balsamo A, Spada E, Bona G, Cavallo L, et al. Italian cross-sectional growth charts for height, weight and BMI (2 to 20 yr). J Endocrinol Invest. 2006 Jul 1;29(7):581–93.

japanese.ref *Parameters derived from Japanese children*

Description

Parameters derived from Japanese children

Usage

```
japanese.ref
```

Source

Inokuchi, M., Matsuo, N., Anzo, M., Takayama, J. I. & Hasegawa, T. Age-dependent percentile for waist circumference for Japanese children based on the 1992–1994 cross-sectional national survey data. Eur J Pediatr 166, 655–661 (2007)

japan_lab.ref *Parameters of serum insulin-like growth factor-I (IGF-I)*

Description

Parameters of serum insulin-like growth factor-I (IGF-I)

Usage

```
japan_lab.ref
```

Source

Isojima, T., Shimatsu, A., Yokoya, S., Chihara, K., Tanaka, T., Hizuka, N., Teramoto, A., Tatsumi, K., Tachibana, K., Katsumata, N., Horikawa, R., 2012. Standardized centile curves and reference intervals of serum insulin-like growth factor-I (IGF-I) levels in a normal Japanese population using the LMS method. Endocrine Journal 59, 771-780. doi:10.1507/endocrj.EJ12-0110

kawel_boehm.ref — *Parameters for Cardiovascular Magnetic Resonance*

Description

Parameters for Cardiovascular Magnetic Resonance

Usage

```
kawel_boehm.ref
```

Source

Kawel-Boehm N, Hetzel SJ, Ambale-Venkatesh B, et al. Reference ranges (normal values) for cardiovascular magnetic resonance (CMR) in adults and children: 2020 update. Journal of Cardiovascular Magnetic Resonance 2020;22(1):87.

kiggs.ref — *LMS Parameters for German reference data (KiGGS, 2003-2006) for height, weight, bmi, hip, whr, whtr, bodyfat, skinfold sum, triceps skinfold, subscapular skinfold, and waist circumference*

Description

LMS Parameters for German reference data (KiGGS, 2003-2006) for height, weight, bmi, hip, whr, whtr, bodyfat, skinfold sum, triceps skinfold, subscapular skinfold, and waist circumference

Usage

```
kiggs.ref
```

Source

Referenzperzentile fuer anthropometrische Masszahlen und Blutdruck aus KiGGS 2003-2006, Robert Koch Institut, Germany

kiggs_bp.ref *Parameters derived from the German KiGGS cohort*

Description

Parameters derived from the German KiGGS cohort

Usage

```
kiggs_bp.ref
```

Details

contains 2-dimensional reference grid. Do not use with sds but sds_2d

Source

Neuhauser, H. K., Thamm, M., Ellert, U., Hense, H. W. & Rosario, A. S. Blood Pressure Percentiles by Age and Height from Nonoverweight Children and Adolescents in Germany. Pediatrics peds.2010-1290 (2011). doi:10.1542/peds.2010-1290.

kiggs_lightness.ref *Parameters regarding lightness and height-to-mass ratio*

Description

Parameters regarding lightness and height-to-mass ratio

Usage

```
kiggs_lightness.ref
```

Source

Kliegl et al. in preparation

kirk_bf.ref *Parameters for fat and lean mass from Kirk, 2021*

Description

Parameters for fat and lean mass from Kirk, 2021

Usage

```
kirk_bf.ref
```

Source

Kirk B, Bani Hassan E, Brennan-Olsen S, et al. Body composition reference ranges in community-dwelling adults using dual-energy X-ray absorptiometry: the Australian Body Composition (ABC) Study. Journal of Cachexia, Sarcopenia and Muscle 2021;12(4):880–90.

kro.ref *LMS Parameters for German reference data (Kromeyer Hauschild, 2001) for height, weight, bmi, and waist circumference, including preterm correction (Voigt) and census data for ages 18+ to 92 years*

Description

LMS Parameters for German reference data (Kromeyer Hauschild, 2001) for height, weight, bmi, and waist circumference, including preterm correction (Voigt) and census data for ages 18+ to 92 years

Usage

```
kro.ref
```

Source

Perzentile fuer den Body-mass-Index fuer das Kindes- und Jugendalter unter Heranziehung verschiedener deutscher Stichproben, Monatsschrift Kinderheilkunde August 2001, Volume 149, Issue 8, pp 807-818; Fruehgeborenenkorrektur nach Voigt

kro.ref15 — *LMS Parameters for German reference data (Kromeyer Hauschild, 2015) for height, weight, bmi, and waist circumference, including preterm correction (Voigt) and Kromyer-Hausschild 2015*

Description

LMS Parameters for German reference data (Kromeyer Hauschild, 2015) for height, weight, bmi, and waist circumference, including preterm correction (Voigt) and Kromyer-Hausschild 2015

Usage

```
kro.ref15
```

Source

Perzentile fuer den Body-mass-Index fuer das Kindes- und Jugendalter unter Heranziehung verschiedener deutscher Stichproben, Monatsschrift Kinderheilkunde August 2001, Volume 149, Issue 8, pp 807-818; preterm adjustment Voigt; Adults: Kromeyer-Hauschild K, Moss A, Wabitsch M. Referenzwerte für den Body-Mass-Index für Kinder, Jugendliche und Erwachsene in Deutschland. Adipositas - Ursachen, Folgeerkrankungen, Therapie. 2015;09(3):123-127. doi:10.1055/s-0037-1618928

leptin.ref — *Parameters for leptin dependent on age/puberty and bmi*

Description

Parameters for leptin dependent on age/puberty and bmi

Usage

```
leptin.ref
```

Source

Brandt-Hedunemann et al. In preparation

liao_igf1.ref *Parameters for IGF-1 from Liao, 2016*

Description

Parameters for IGF-1 from Liao, 2016

Usage

```
liao_igf1.ref
```

Source

Liao ZH, Yin QQ, Wan JX, He W, Ji W, Zhang LY, et al. Serum Insulin-like growth factor-1 levels of healthy adults in southern China. Endocr J. 2016 Dec 30;63(12):1081–6.

life_ap.ref *Parameters for alkaline phosphatase*

Description

Parameters for alkaline phosphatase

Usage

```
life_ap.ref
```

Source

Strauch, J.-M., Vogel, M., Meigen, C., Ceglarek, U., Kratzsch, J., Willenberg, A., Kiess, W., 2023. Pediatric reference values of alkaline phosphatase: Analysis from a German population-based cohort and influence of anthropometric and blood parameters. Bone 174, 116809. https://doi.org/10.1016/j.bone.2023.116809

life_cbc.ref *Parameters for complete blood count*

Description

Parameters for complete blood count

Usage

```
life_cbc.ref
```

Source

Sommer et al. In preparation

life_circ.ref *Parameters for different circumferences and whr and whtr*

Description

Parameters for different circumferences and whr and whtr

Usage

```
life_circ.ref
```

Source

"Roennecke E, Vogel M, Bussler S, Grafe N, Jurkutat A, Schlingmann M, Koerner A, Kiess W. Age- and sex-related percentiles of skinfold thickness, waist and hip circumference, Waist-to- Hip Ratio and Waist-to-Height Ratio: Results from a population-based paediatric cohort in Germany (LIFE Child). Obesity Facts. 2019."

life_ck.ref *Parameters for creatine kinase*

Description

Parameters for creatine kinase

Usage

```
life_ck.ref
```

Source

Publication in Preparation

life_cysc.ref — *Parameters for different metabolom parameters from the LIFE Child cohort*

Description

Parameters for different metabolom parameters from the LIFE Child cohort

Usage

```
life_cysc.ref
```

Source

"Ziegelasch N, Vogel M, Müller E, et al. Cystatin C Serum Levels in Healthy Children Are Related to Age, Gender, and Pubertal Stage. Pediatr Nephrol 2019; 34: 449–57."

life_fibroscan.ref — *Parameters for fibroscan from the LIFE Child cohort*

Description

Parameters for fibroscan from the LIFE Child cohort

Usage

```
life_fibroscan.ref
```

Source

Brunnert, L., Puasa, I.D., Garten, A., Penke, M., Gaul, S., Grafe, N., Karlas, T., Kiess, W., Flemming, G., Vogel, M., 2022. Pediatric percentiles for transient elastography measurements - effects of age, sex, weight status and pubertal stage. Front Endocrinol (Lausanne) 13, 1030809. https://doi.org/10.3389/fendo.2022.1030809

life_folb12.ref *Parameters regarding folate and cobalamine*

Description

Parameters regarding folate and cobalamine

Usage

```
life_folb12.ref
```

Source

Kreusler, P., Vogel, M., Willenberg, A., Baber, R., Dietz, Y., Körner, A., Ceglarek, U., Kiess, W., 2021. Folate and Cobalamin Serum Levels in Healthy Children and Adolescents and Their Association with Age, Sex, Bmi and Socioeconomic Status. Nutrients 13. https://doi.org/10.3390/nu13020546

life_hba1c.ref *Parameters for hba1c based on a child cohort a) including overweight and b) excluding overweight children*

Description

Parameters for hba1c based on a child cohort a) including overweight and b) excluding overweight children

Parameters regarding HbA1c

Usage

```
life_hba1c.ref

life_hba1c.ref
```

Source

"Hovestadt, I., Kiess, W., Lewien, C., Willenberg, A., Poulain, T., Meigen, C., Körner, A., Vogel, M., 2022. HbA1c Percentiles and the Association between BMI, Age, Gender, Puberty and HbA1c Levels in Healthy German Children and Adolescents. Pediatr Diabetes 23, 194–202. https://doi.org/10.1111/pedi.13297"

Hovestadt, I., Kiess, W., Lewien, C., Willenberg, A., Poulain, T., Meigen, C., Körner, A., Vogel, M., 2022. HbA1c Percentiles and the Association between BMI, Age, Gender, Puberty and HbA1c Levels in Healthy German Children and Adolescents. Pediatr Diabetes 23, 194–202. https://doi.org/10.1111/pedi.13297

life_heart.ref *hs-Troponin T and NT-proBNP from the LIFE Child cohort*

Description

hs-Troponin T and NT-proBNP from the LIFE Child cohort

Parameters for heart markers

Usage

```
life_heart.ref

life_heart.ref
```

Source

Kiess A, Green J, Willenberg A, et al. Age-dependent reference values for hs-Troponin T and NT-proBNP and determining factors in a cohort of healthy children (The LIFE child study). Pediatric Cardiology 2022.

Kiess, A., Green, J., Willenberg, A., Ceglarek, U., Dähnert, I., Jurkutat, A., Körner, A., Hiemisch, A., Kiess, W., Vogel, M., 2022. Age-Dependent Reference Values for Hs-Troponin T and Nt-Probnp and Determining Factors in a Cohort of Healthy Children (the Life Child Study). Pediatr Cardiol 43, 1071–1083. https://doi.org/10.1007/s00246-022-02827-x

life_igf.ref *IGF-I and IGF-BP3 from the LIFE Child cohort*

Description

IGF-I and IGF-BP3 from the LIFE Child cohort

Usage

```
life_igf.ref
```

Source

Hoerenz C, Vogel M, Wirkner K. BMI and contraceptives affect new age-, sex-, and puberty-adjusted IGF-I and IGFBP-3 reference ranges across life span. JCEM 2022 (in (minor) revision).

life_liver.ref *Parameters for serum liver enzymes*

Description

Parameters for serum liver enzymes

Usage

```
life_liver.ref
```

Source

Bussler et al, New pediatric percentiles of liver enzyme serum levels (ALT, AST, GGT): effects of age, sex, BMI and pubertal stage, Hepatology 2017

life_oxyandrogene.ref *Parameters for oxyandrogenes*

Description

Parameters for oxyandrogenes

Usage

```
life_oxyandrogene.ref
```

Source

Zeidler R, Wagner F, et al. in preparation

life_shbg.ref *Parameters for shbg*

Description

Parameters for shbg

Usage

```
life_shbg.ref
```

Source

Duergen P. et al. in preparation

life_skinfold.ref *Parameters for different skinfolds*

Description

Parameters for different skinfolds

Usage

```
life_skinfold.ref
```

Source

"Roennecke E, Vogel M, Bussler S, Grafe N, Jurkutat A, Schlingmann M, Koerner A, Kiess W. Age- and sex-related percentiles of skinfold thickness, waist and hip circumference, Waist-to- Hip Ratio and Waist-to-Height Ratio: Results from a population-based paediatric cohort in Germany (LIFE Child). Obesity Facts. 2019."

life_steroide.ref *Parameters for steroid hormones*

Description

Parameters for steroid hormones

Usage

```
life_steroide.ref
```

Source

Bae, Y.J., Zeidler, R., Baber, R., Vogel, M., Wirkner, K., Loeffler, M., Ceglarek, U., Kiess, W., Koerner, A., Thiery, J., Kratzsch, J., 2019. Reference intervals of nine steroid hormones over the life-span analyzed by LC-MS/MS: Effect of age, gender, puberty, and oral contraceptives. J. Steroid Biochem. Mol. Biol. 193, 105409. https://doi.org/10.1016/j.jsbmb.2019.105409

life_stfr.ref *Parameters regarding soluble transferrin receptor*

Description

Parameters regarding soluble transferrin receptor

Usage

```
life_stfr.ref
```

Source

Prenzel et al. In Preparation.

life_thyr.ref *Parameters for TSH, FT3, FT4 from the LIFE Child cohort*

Description

Parameters for TSH, FT3, FT4 from the LIFE Child cohort

Usage

```
life_thyr.ref
```

Source

"Surup H., Vogel M., Koerner A., Hiemisch A., Oelkers L., Willenberg A., Kiess W., Kratzsch J. (2021). BMI and puberty have to be included into the interpretation of TSH, FT3 and FT4 measurements by new pediatric reference intervals. THYROID."

life_vegf.ref *Parameters for vegf-d*

Description

Parameters for vegf-d

Usage

```
life_vegf.ref
```

Source

Arelin M. et al. in preparation

life_vit.ref *Parameters for cobalamin and folate (awkward)*

Description

Parameters for cobalamin and folate (awkward)

Usage

```
life_vit.ref
```

Source

Kreusler, P., Vogel, M., Willenberg, A., Baber, R., Dietz, Y., Körner, A., Ceglarek, U., Kiess, W., 2021. Folate and Cobalamin Serum Levels in Healthy Children and Adolescents and Their Association with Age, Sex, Bmi and Socioeconomic Status. Nutrients 13. https://doi.org/10.3390/nu13020546

linden_heart.ref *Parameters for left artrial volumne Linden et al,*

Description

Parameters for left artrial volumne Linden et al,

Usage

```
linden_heart.ref
```

Source

Linden, K. et al. (2019) Left Atrial Volumes and Phasic Function in Healthy Children: Reference Values Using Real-Time Three-Dimensional Echocardiography, Journal of the American Society of Echocardiography, 32(8), pp. 1036-1045.e9. doi:10.1016/j.echo.2019.03.018.

lipids.ref *Parameters for serum lipids in children*

Description

Parameters for serum lipids in children

Usage

```
lipids.ref
```

Source

Dathan-Stumpf, A. et al. Pediatric reference data of serum lipids and prevalence of dyslipidemia: Results from a population-based cohort in Germany. Clinical Biochemistry 49, 740–749 (2016). In addition non-hdl references are provided. Publication in progress (Maidowski et al).

make_percentile_tab *calculate raw values*

Description

Calculate raw values for percentile curve

Usage

```
make_percentile_tab(
  ref,
  item,
  perc = c(2.5, 5, 50, 95, 97.5),
  stack = F,
  age = NULL,
  include.pars = T,
  digits = 4,
  sex
)
```

Arguments

ref	Refgroup object
item	name of the measurement item
perc	vector of percentiles to be calculated
stack	wether or not the data should be stacked, stacked data would most possibly be used in ggplot2

age	desired values of age
include.pars	indicator whether or not parameters should be included
digits	specification of number of decimal places
sex	name of the sex variable (character) if different from sex, not functional in this version and therefore ignored

Details

calculates quantile values for given RefGroup and given percentiles

Value

data frame either with the different percentiles as columns or, if stacked, as data frame with four columns: age, sex, variable, value

Author(s)

Mandy Vogel

Examples

```
ptab <- make_percentile_tab(ref = kro.ref,
                            item = "height",
                           perc = c(2.5,10,50,90,97.5),
                           stack = TRUE)

ggplot2::ggplot(ptab, ggplot2::aes(x = age, y = value, colour = variable)) +
   ggplot2::geom_line() +
   ggplot2::facet_wrap(~ sex, nrow = 2)
```

---

make_percentile_tab2d *calculate raw values*

Description

Calculate raw values for percentile curve

Usage

```
make_percentile_tab2d(
  ref,
  item,
  perc = c(2.5, 5, 50, 95, 97.5),
  stack = F,
  age = NULL,
  x2 = NULL,
  include.pars = T,
  digits = 4,
  sex
)
```

Arguments

ref	Refgroup object
item	name of the measurement item
perc	vector of percentiles to be calculated
stack	wether or not the data should be stacked, stacked data would most possibly be used in ggplot2
age	desired values of age
x2	desired values of second covariate
include.pars	indicator whether or not parameters should be included
digits	specification of number of decimal places
sex	name of the sex variable (character) if different from sex, not functional in this version and therefore ignored

Details

calculates quantile values for given RefGroup and given percentiles

Value

data frame either with the different percentiles as columns or, if stacked, as data frame with four columns: age, sex, variable, value

Author(s)

Mandy Vogel

Examples

```
ptab <- make_percentile_tab(ref = kro.ref,
                            item = "height",
                           perc = c(2.5,10,50,90,97.5),
                           stack = TRUE)

ggplot2::ggplot(ptab, ggplot2::aes(x = age, y = value, colour = variable)) +
   ggplot2::geom_line() +
   ggplot2::facet_wrap(~ sex, nrow = 2)
```

---

metabolom.ref — *Parameters for different metabolom parameters from the LIFE Child cohort*

Description

Parameters for different metabolom parameters from the LIFE Child cohort

Usage

```
metabolom.ref
```

Source

"Hirschel, J., Vogel, M., Baber, R., Garten, A., Beuchel, C., Dietz, Y., Dittrich, J., Körner, A., Kiess, W., & Ceglarek, U. (2020). Relation of Whole Blood Amino Acid and Acylcarnitine Metabolome to Age, Sex, BMI, Puberty, and Metabolic Markers in Children and Adolescents. Metabolites, 10(4), 149. https://doi.org/10.3390/metabo10040149"

---

mock_df *Mock a data frame*

Description

mock values for a given reference

Usage

```
mock_df(ref, item, n = 1000)
```

Arguments

ref	a valid RefGroup object
item	a valid imte present in ref
n	how many values should be created

Details

mock values for a given reference

Value

data frame containing a age, sex, and value column

Author(s)

mandy

mock_value *Mock Value*

Description

mock a value for a given reference

Usage

```
mock_value(ref, item, sex = c("male", "female"), age)
```

Arguments

ref	a valid RefGroup object
item	a valid item present in ref
sex	character male or female
age	numeric age value

Details

the function creates a random value for a given age and sex value and a given reference

Value

a random value from the conditional distribution (conditionally on age and sex)

Author(s)

mandy

mock_values *Mock Values*

Description

mock values for a given reference, given age and given sex

Usage

```
mock_values(df, sex, age, ref, item)
```

Arguments

df	data frame containing the age and sex
sex	name of the sex variable
age	name of the age variable
ref	a valid RefGroup object
item	a valid imte present in ref

Details

the function creates random values for given age and sex values and a given reference

Value

data frame containing the additional column with random numbers

Author(s)

mandy

---

momo.ref *Parameters for the German MoMo study (sports test)*

Description

Parameters for the German MoMo study (sports test)

Usage

```
momo.ref
```

Source

"Niessner C, Utesch T, Oriwol D, et al. Representative Percentile Curves of Physical Fitness From Early Childhood to Early Adulthood: The MoMo Study. Front Public Health 2020;8. Available from: https://www.frontiersin.org/articles/10.3389/fpubh.2020.00458/full?report=reader"

motor.ref *Parameters for 5 subtests of the KiGGS Motorik Module*

Description

Parameters for 5 subtests of the KiGGS Motorik Module

Usage

```
motor.ref
```

Source

"Sobek et al. In progress"

nl3.ref *Parameters of skinfold measures derived from Colombian population*

Description

Parameters of skinfold measures derived from Colombian population

Usage

```
nl3.ref
```

Source

Fredriks, A. M. et al. Continuing positive secular growth change in The Netherlands 1955-1997. Pediatric research 47, 316-323 (2000).

Fredriks, A.M., van Buuren, S., Wit, J.M., Verloove-Vanhorick, S.P., 2000. Body index measurements in 1996-7 compared with 1980. Archives of disease in childhood 82, 107-112.

https://cran.r-project.org/package=AGD

nl4.ref *Parameters derived from the 4th Dutch growth study*

Description

Parameters derived from the 4th Dutch growth study

Usage

```
nl4.ref
```

Source

Fredriks, A. M. et al. Nationwide age references for sitting height, leg length, and sitting height/height ratio, and their diagnostic value for disproportionate growth disorders. Archives of Disease in Childhood 90, 807–812 (2005); Fredriks, A. M. et al. Height, weight, body mass index and pubertal development references for children of Moroccan origin in The Netherlands. Acta Paediatr. 93, 817–824 (2004); Fredriks, A. M. et al. Continuing positive secular growth change in The Netherlands 1955–1997. Pediatric research 47, 316–323 (2000); Fredriks, A. M. et al. Height, weight, body mass index and pubertal development reference values for children of Turkish origin in the Netherlands. Eur. J. Pediatr. 162, 788–793 (2003); Fredriks, A. M., van Buuren, S., Wit, J. M. & Verloove-Vanhorick, S. P. Body index measurements in 1996–7 compared with 1980. Archives of disease in childhood 82, 107–112 (2000); R package: AGD, Stef van Buuren, http://www.stefvanbuuren.nl/

ofenheimer_bf.ref *Parameters for fat and lean mass from Ofenheimer et al., 2020*

Description

Parameters for fat and lean mass from Ofenheimer et al., 2020

Usage

```
ofenheimer_bf.ref
```

Source

Ofenheimer A, Breyer-Kohansal R, Hartl S, et al. Reference values of body composition parameters and visceral adipose tissue (VAT) by DXA in adults aged 18–81 years—results from the LEAD cohort. European Journal of Clinical Nutrition 2020;74(8):1181–91.

one_iteration *one iteration*

Description

one iteration

Usage

```
one_iteration(
  data.list,
  method,
  prop.fam = 0.75,
  prop.subject = 1,
  age.min = 0,
  age.max = 18,
  age.int = 1/12,
  x2.min = 25,
  x2.max = 42,
  x2.int = 1/12,
  keep.models = F,
  dist = "BCCGo",
  formula = NULL,
  sigma.df = 3,
  nu.df = 2,
  mu.df = 4,
  tau.df = 2,
  sigma.formula = ~1,
  nu.formula = ~1,
  tau.formula = ~1,
  verbose = F,
  trans.x = F,
  lim.trans = c(0, 1.5),
  method.pb = "ML"
)
```

Arguments

data.list	list of dataframes as returned by prepare_data
method	use vgam or gamlss
prop.fam	proportion of families to be sampled
prop.subject	proportion of subject to be sampled
age.min	lower bound of age
age.max	upper bound of age
age.int	stepwidth of the age variable

x2.min	minimum limit for the second predictor
x2.max	maximum limit for the second predictor
x2.int	interval length between knots saved
keep.models	indicator whether or not models in each iteration should be kept
dist	distribution used for the fitting process, has to be one of BCCGo, BCPEo, BCTo as they are accepted by lms()
formula	formula for the location parameter
sigma.df	degree of freedem spread parameter
nu.df	degree of freedem skewness parameter
mu.df	degree of freedem location parameter
tau.df	degree of freedem kurtosis parameter
sigma.formula	formula for the sigma parameter
nu.formula	formula for the nu parameter
tau.formula	formula for the tau parameter
verbose	whether or not information about sampling will be printed during while iterate
trans.x	indicator wether age should be transformed or not
lim.trans	limits for the exponent of transformation of age
method.pb	GAIC or ML

Details

function samples families then measurements and fits the model the function is called inside do_iterations and may not called directly

Value

list of lists each containing a dataframe of the fitted lms parameter at the given age points and the fitted model

Author(s)

Mandy Vogel

ParTab-class *Table of references*

Description

Reference tables

Slots

item identifier of the item

dist named list which contains the distribution which was used in fitting the references. One entry for male and one for female

portug.ref *Parameters derived from Portuguese children*

Description

Parameters derived from Portuguese children

Usage

```
portug.ref
```

Source

Chaves, R., Baxter-Jones, A., Souza, M., Santos, D. & Maia, J. Height, weight, body composition, and waist circumference references for 7-to 17-year-old children from rural Portugal. HOMO-Journal of Comparative Human Biology 66, 264–277 (2015).

prepare_data *prepare data for iteration process*

Description

prepare data for repeated iteration process

Usage

```
prepare_data(
  data,
  group = NULL,
  subject = "SIC",
  sex = NULL,
  value = "value",
  age = "age",
  x2 = "x2",
  lb = -Inf,
  ub = Inf
)
```

Arguments

data	dataframe containing measurement values, age, sex, and subject identifier
group	optional variable indicating groups of subjects within the data frame in most cases (families)
subject	subject identifier

sex	column containing the sex (or any other stratum), ideally of type character, iteration process will run on each of the levels separately
value	numeric column containing the measurement values
age	numeric column containing the age
x2	numeric column containing a second covariate
lb	optional - lower bound for age
ub	optional - upper bound for age

Details

given a dataframe, the column name of the subject identifier, sex, age, value and group colums, the function creates a dataframe containing only these five columns with the standard column names group, subject, sex, age, value. lines containing missing values are removed.

Value

list of dataframes containing the columns group, subject, sex, age, value; one dataframe for every level of sex

Author(s)

Mandy Vogel

---

preterm.ref *Parameters Preterm and Intrauterine*

Description

Parameters Preterm and Intrauterine

Usage

```
preterm.ref
```

Source

Olsen, I.E., Lawson, M.L., Ferguson, A.N., Cantrell, R., Grabich, S.C., Zemel, B.S., Clark, R.H., 2015. BMI Curves for Preterm Infants. PEDIATRICS 135, e572-e581. doi:10.1542/peds.2014-2777

Olsen, I.E., Groveman, S.A., Lawson, M.L., Clark, R.H., Zemel, B.S., 2010. New intrauterine growth curves based on United States data. Pediatrics 125, e214-224. doi:10.1542/peds.2009-0913

RefGroup-class *Class of references*

Description

Container for reference tables

Slots

`name` name of the reference group

`refs` List of references, each reference refers to one item and contains independent variable age, and the parameter values for both genders

`citations` information about the sources of the references

`info` additional infos regarding the references

Author(s)

Mandy Vogel

Examples

```
data(kiggs.ref)
print(kiggs.ref)
data(ukwho.ref)
print(ukwho.ref)
data(who.ref)
print(who.ref)
```

ripka_bf.ref *Parameters for fat and lean mass from Ripka et al, 2020*

Description

Parameters for fat and lean mass from Ripka et al, 2020

Usage

```
ripka_bf.ref
```

Source

Ripka, W.L. et al. (2020) Lean mass reference curves in adolescents using dual-energy x-ray absorptiometry (DXA), PLOS ONE, 15(2), p. e0228646. doi:10.1371/journal.pone.0228646.

saudi.ref *Parameters derived from Saudi children*

Description

Parameters derived from Saudi children

Usage

```
saudi.ref
```

Source

Mouzan, M. I. E., Salloum, A. A. A., Alqurashi, M. M., Herbish, A. S. A. & Omar, A. A. The LMS and Z scale growth reference for Saudi school-age children and adolescents. Saudi Journal of Gastroenterology 22, 331 (2016)

Shaik, S.A., El Mouzan, M.I., AlSalloum, A.A., AlHerbish, A.S., 2016. Growth reference for Saudi preschool children: LMS parameters and percentiles. Ann Saudi Med 36, 2-6. doi:10.5144/0256-4947.2016.2

schafmeyer_leg.ref *Parameters for bone mineral content/density, fm, lm (lower limbs) from Schafmeyer, 2022*

Description

Parameters for bone mineral content/density, fm, lm (lower limbs) from Schafmeyer, 2022

Usage

```
schafmeyer_leg.ref
```

Source

Schafmeyer L, Linden T, Sill H, Rehberg M, Schoenau E, Duran I. Pediatric Reference Centiles of Bone Mineral Density and Body Composition of Lower Limbs. Journal of Clinical Densitometry. 2022 Jan;25(1):73–80.

sds *Calculate SDS Values*

Description

Calculate SDS values

Usage

```
sds(value, age, sex, item, ref, type = "SDS", male = "male", female = "female")
```

Arguments

value	vector of measurement values
age	vector of age values
sex	vector of sex
item	name of the item e.g. "height"
ref	RefGroup object
type	"SDS" or "perc"
male	coding of sex for male
female	coding of sex for female

Details

The function takes a vector of measurement values, and of age and of sex and a RefGroup object as arguments. It calculates the sds or percentile values.

Value

vector containing SDS or percentile values

Author(s)

Mandy Vogel

Examples

```
anthro <- data.frame(age = c(11.61,12.49,9.5,10.42,8.42,10.75,9.57,10.48),
                     height = c(148.2,154.4,141.6,145.3,146,140.9,145.5,150),
                     sex = sample(c("male","female"), size = 8, replace = TRUE),
                     weight = c(69.5,72.65,47.3,51.6,45.6,48.9,53.5,58.5))
anthro$height_sds <- sds(anthro$height,
                         age = anthro$age,
                         sex = anthro$sex, male = "male", female = "female",
                         ref = kro.ref,
                         item = "height",
                         type = "SDS")
```

```
anthro$bmi <- anthro$weight/(anthro$height**2) * 10000
anthro$bmi_perc <- sds(anthro$bmi,
                       age = anthro$age,
                       sex = anthro$sex, male = "male", female = "female",
                       ref = kro.ref,
                       item = "bmi",
                       type = "perc")
data(who.ref)
x <- data.frame(height=c(50,100,60,54),
                sex=c("m","f","f","m"),
                age=c(0,2.9,0.6,0.2))
sds(value = x$height, age = x$age, sex = x$sex, male = "m", female = "f",
    ref = who.ref, item = "height")
```

---

sds2d *Calculate SDS Values for 2-dimensional matrix of covariates*

Description

Calculate SDS values for 2-dimensional matrix of covariates

Usage

```
sds2d(
  value,
  age,
  x2,
  sex,
  item,
  ref,
  type = "SDS",
  male = "male",
  female = "female"
)
```

Arguments

value	vector of measurement values
age	vector of age values
x2	second vector of covariates
sex	vector of sex
item	name of the item e.g. "height"
ref	RefGroup object
type	"SDS" or "perc"
male	coding of sex for male
female	coding of sex for male

Details

The function takes a vector of measurement values, and of age and a second covariate (like age and height for blood pressure) of sex and a RefGroup object as arguments. It calculates the sds or percentile values. This function is beta.

the function searches for the nearest given point in the reference grid. From there, the SDS/percentile value will be calculated. Different from sds, no interpolation will be applied. The procedure is according to Neuhauser et al. Blood Pressure Percentiles by Age and Height from Nonoverweight Children and Adolescents in Germany. 2011.

Value

vector containing SDS or percentile values

Author(s)

Mandy Vogel

`sdsold` *Calculate SDS Values*

Description

Calculate SDS values - old version for comparison

Usage

```
sdsold(
  value,
  age,
  sex,
  item,
  ref,
  type = "SDS",
  male = "male",
  female = "female"
)
```

Arguments

`value`	vector of measurement values
`age`	vector of age values
`sex`	vector of sex
`item`	name of the item e.g. "height"
`ref`	RefGroup object
`type`	"SDS" or "perc"
`male`	coding of sex for male
`female`	coding of sex for female

Details

The function takes a vector of measurement values, and of age and of sex and a RefGroup object as arguments. It calculates the sds or percentile values.

Value

vector containing SDS or percentile values

Author(s)

Mandy Vogel

Examples

```
anthro <- data.frame(age = c(11.61,12.49,9.5,10.42,8.42,10.75,9.57,10.48),
                     height = c(148.2,154.4,141.6,145.3,146,140.9,145.5,150),
                     sex = sample(c("male","female"), size = 8, replace = TRUE),
                     weight = c(69.5,72.65,47.3,51.6,45.6,48.9,53.5,58.5))
anthro$height_sds <- sds(anthro$height,
                         age = anthro$age,
                         sex = anthro$sex, male = "male", female = "female",
                         ref = kro.ref,
                         item = "height",
                         type = "SDS")

anthro$bmi <- anthro$weight/(anthro$height**2) * 10000
anthro$bmi_perc <- sds(anthro$bmi,
                       age = anthro$age,
                       sex = anthro$sex, male = "male", female = "female",
                       ref = kro.ref,
                       item = "bmi",
                       type = "perc")
data(who.ref)
x <- data.frame(height=c(50,100,60,54),
                sex=c("m","f","f","m"),
                age=c(0,2.9,0.6,0.2))
sds(value = x$height, age = x$age, sex = x$sex, male = "m", female = "f",
    ref = who.ref, item = "height")
```

---

sds_2d *Calculate SDS Values for 2-dimensional matrix of covariates*

Description

Calculate SDS values for 2-dimensional matrix of covariates – old version

Usage

```
sds_2d(
  value,
  age,
  x2,
  sex,
  item,
  ref,
  type = "SDS",
  male = "male",
  female = "female"
)
```

Arguments

value	vector of measurement values
age	vector of age values
x2	second vector of covariates
sex	vector of sex
item	name of the item e.g. "height"
ref	RefGroup object
type	"SDS" or "perc"
male	coding of sex for male
female	coding of sex for male

Details

The function takes a vector of measurement values, and of age and a second covariate (like age and height for blood pressure) of sex and a RefGroup object as arguments. It calculates the sds or percentile values. This function is beta.

the function searches for the nearest given point in the reference grid. From there, the SDS/percentile value will be calculated. Different from sds, no interpolation will be applied. The procedure is according to Neuhauser et al. Blood Pressure Percentiles by Age and Height from Nonoverweight Children and Adolescents in Germany. 2011.

Value

vector containing SDS or percentile values

Author(s)

Mandy Vogel

sds_pub *Calculate SDS Values*

Description

Calculate SDS values depending on the Tanner stage

Usage

```
sds_pub(
  value,
  pubstatus,
  sex,
  item,
  ref,
  type = "SDS",
  male = "male",
  female = "female"
)
```

Arguments

value	vector of measurement values
pubstatus	vector of Tanner stages coded 1 to 5
sex	vector of sex
item	name of the item e.g. "height"
ref	RefGroup object
type	"SDS" or "perc"
male	coding of sex for male
female	coding of sex for female

Details

The function takes a vector of measurement values, and of tanner stage and of sex and a RefGroup object as arguments. It calculates the sds or percentile values.

Value

vector containing SDS or percentile values

Author(s)

Mandy Vogel

sds_pub2d *Calculate SDS Values*

Description

Calculate SDS values depending on the Tanner stage and a second variable

Usage

```
sds_pub2d(
  value,
  pubstat,
  x2,
  sex,
  item,
  ref,
  type = "SDS",
  male = "male",
  female = "female",
  age = NULL,
  id = 1:length(value)
)
```

Arguments

value	vector of measurement values
pubstat	vector of Tanner stages coded 1 to 5
x2	2nd predictor (vector), e.g. bmisds must be contained in reference
sex	vector of sex
item	name of the item e.g. "height"
ref	RefGroup object
type	"SDS" or "perc"
male	coding of sex for male
female	coding of sex for female
age	not used yet
id	order of values

Details

The function takes a vector of measurement values, and of tanner stage of a second variable (x2) and of sex and a RefGroup object as arguments. It calculates the sds or percentile values.

Value

vector containing SDS or percentile values

Author(s)

Mandy Vogel

`select_fams` *select families*

Description

Select groups (families)

Usage

```
select_fams(data, prop = 0.75, group, verbose = F)
```

Arguments

`data`	dataframe as returned by prepare data
`prop`	proportion of families to be sampled
`group`	name of the group variable (character) if not "group", ignored
`verbose`	if TRUE information about sample size is printed out

Details

function selects a given proportion of groups/families from the data if no grouping variable is given the original data set is returned function is called inside `do_iterations` and may not called directly

Value

dataframe containing only prop.fam percent the families in data

Author(s)

Mandy Vogel

select_meas *choose one measurement per subject*

Description

Choose one measurement per subject

Usage

```
select_meas(data, subject = "subject", prop = 1, verbose = F)
```

Arguments

data	dataframe as returned by prepare data
subject	name of the column containing the subject identifier
prop	optional - proportion of measurements to sample
verbose	if TRUE information about sample size is printed out

Details

function samples one measurement per subject, if prop < 1 additional a prop*100 percent will be sampled from the measurements the function is called inside do_iterations and may not called directly

Value

dataframe containing the sampled rows

Author(s)

Mandy Vogel

show,ParTab-method *class ParTab*

Description

show method for ParTab

Usage

```
## S4 method for signature 'ParTab'
show(object)
```

Arguments

object	object of calss ParTab

Details

show method for ParTab

Value

print information about the respective reference table

Author(s)

Mandy Vogel

---

show,RefGroup-method *class RefGroup*

Description

show method for RefGroup

Usage

```
## S4 method for signature 'RefGroup'
show(object)
```

Arguments

object	object of class RefGroup

Details

show method for RefGroup

Value

prints information about age range, citations, etc.

Author(s)

Mandy Vogel

turkish.ref *Parameters derived from Turkish children*

Description

Parameters derived from Turkish children

Usage

```
turkish.ref
```

Source

Hatipoglu, N. et al. Waist circumference percentiles for 7- to 17-year-old Turkish children and adolescents. Eur J Pediatr 167, 383–389 (2008);Bundak, R. et al. Body mass index references for Turkish children. Acta Paediatrica 95, 194–198 (2006).

Neyzi, O., Furman, A., Bundak, R., Gunoz, H., Darendeliler, F., Bas, F., 2006. Growth references for Turkish children aged 6 to 18 years. Acta Paediatrica 95, 1635-1641. doi:10.1080/08035250600652013

Bundak, R. et al. Body mass index references for Turkish children. Acta Paediatrica 95, 194-198 (2006).

uk1990.ref *Parameters from the 1990 UK growth study*

Description

Parameters from the 1990 UK growth study

Usage

```
uk1990.ref
```

Source

Cole, T.J., Freeman, J.V., Preece, M.A., 1998. British 1990 growth reference centiles for weight, height, body mass index and head circumference fitted by maximum penalized likelihood. Statistics in medicine 17, 407-429.

Cole, T.J., Freeman, J.V., Preece, M.A., 1995. Body mass index reference curves for the UK, 1990. Archives of disease in childhood 73, 25-29.

ukwho.ref — *LMS Parameters for UK-WHO growth charts for height, weight, bmi, head circumference*

Description

LMS Parameters for UK-WHO growth charts for height, weight, bmi, head circumference

Usage

```
ukwho.ref
```

Source

Wright, Charlotte M., et a,Practice pointer: Using the new UK-WHO growth charts. British Medical Journal 340.c1140 (2010): 647-650.Preterm British 1990, 0-4 WHO2006, 4-18 British1990

us.ref — *Parameters derived from US children (additional to the cdc.ref)*

Description

Parameters derived from US children (additional to the cdc.ref)

Usage

```
us.ref
```

Source

Sharma, A. K., Metzger, D. L., Daymont, C., Hadjiyannakis, S. & Rodd, C. J. LMS tables for waist-circumference and waist-height ratio Z-scores in children aged 5-19 y in NHANES III: association with cardio-metabolic risks. Pediatric research (2015)

valencia_nc.ref *Parameters for neck circumference from Valencia-Sosa, 2021*

Description

Parameters for neck circumference from Valencia-Sosa, 2021

Usage

```
valencia_nc.ref
```

Source

Valencia-Sosa E, Chavez-Palencia C, Vallarta-Robledo JR, et al. Percentile Reference Values for the Neck Circumference of Mexican Children. Children 2021;8(5):407.

who.ref *LMS Parameters for WHO growth charts for height, weight, bmi, head circumference,arm mid upper arm circumference, subscapular and triceps skinfold, weight for height*

Description

LMS Parameters for WHO growth charts for height, weight, bmi, head circumference,arm mid upper arm circumference, subscapular and triceps skinfold, weight for height

Usage

```
who.ref
```

Source

de Onis, M., Onyango, A., Borghi, E., Siyam, A., Blossner, M., & Lutter, C. (2012). Worldwide implementation of the WHO child growth standards. Public Health Nutr, 12, 1-8.

who2007.ref *Parameters of bmi, height, and weight; WHO 2007*

Description

Parameters of bmi, height, and weight; WHO 2007

Usage

```
who2007.ref
```

Source

Onis, M. de, Onyango, A.W., Borghi, E., Siyam, A., Nishida, C., Siekmann, J., 2007. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World health Organization 85, 660-667.

wormplot2d_gg *Worm Plot ggplot version*

Description

Worm plot ggplot version, 2 covariates

Usage

```
wormplot2d_gg(
  m = NULL,
  residuals = NULL,
  age = NA,
  x2 = NA,
  name.x2,
  n.inter.age = 1,
  n.inter.x2 = 1,
  y.limits = c(-1, 1)
)
```

Arguments

m	a gamlss model
residuals	nlormalized quantile residuals
age	numeric vector of ages
x2	numeric vector of second covariate
name.x2	name of x2 for use in graphics

n.inter.age	number of age intervals or cut points
n.inter.x2	number of x2 intervals or cut points
y.limits	limits of the y-axis

Details

creates a wormplot for a gamlss model or a given vector of normalized quantile residuals, either for all residuals or grouped by age intervals

Value

ggplot object

---

wormplot_gg *Worm Plot ggplot version*

Description

Worm plot ggplot version

Usage

```
wormplot_gg(
  m = NULL,
  residuals = NULL,
  age = NA,
  n.inter = 1,
  y.limits = c(-1, 1)
)
```

Arguments

m	a gamlss model
residuals	nlormalized quantile residuals
age	numeric vector of ages
n.inter	number of age intervals or cut points
y.limits	limits of the y-axis

Details

creates a wormplot for a gamlss model or a given vector of normalized quantile residuals, either for all residuals or grouped by age intervals

Value

ggplot object

zong13.ref *Parameters derived from Chinese children (additional to nl4.ref)*

Description

Parameters derived from Chinese children (additional to nl4.ref)

Usage

```
zong13.ref
```

Source

Zong, X.-N., Li, H. Construction of a New Growth References for China Based on Urban Chinese Children: Comparison with the WHO Growth Standards. PLOS ONE 8, e59569 (2013).

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