Package 'childsds'

February 10, 2022

Title Data and Methods Around Reference Values in Pediatrics

Version 0.8.0

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 (>= 3.5.0)

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

Suggests ggplot2

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

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.1.2

NeedsCompilation no

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Repository CRAN

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R topics documented:

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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 Weber 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

| 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"

| 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,
  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
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

---

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_gamlss

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_vgam   *fit lms parameters via VGAM*

Description

fit gamlss

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)

---

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.

| kro.ref | *LMS Parameters for German reference data (Kromeyer Hauschild, 2001) for height, weight, bmi, and waist circumference, including preterm correction (Voigt)* |

Description

LMS Parameters for German reference data (Kromeyer Hauschild, 2001) for height, weight, bmi, and waist circumference, including preterm correction (Voigt)

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

---

| 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_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

"preliminary reference values cap med and e med from fibroscan in the life child study. Publication (Puasa et al) in preparation."

---

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

Usage

```
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. Accepted"

---

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_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_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."

---

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).

---

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)
```

---

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/

---

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,
  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
`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",
  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
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)
```

---

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

---

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")
```

---

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

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

---

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)

`who.ref`	*LMS Parameters for UK-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 UK-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 skinfold measures derived from Colombian population*

Description

Parameters of skinfold measures derived from Colombian population

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.

---

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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