Package: SimKid (via r-universe)

June 6, 2026

Title Simulate Virtual Pediatrics using Anthropometric Growth Charts

Version 1.0.0.9000

Description Simulate a virtual population of subjects that has demographic distributions (height, weight, and BMI) and correlations (height and weight), by sex and age, which mimic those reported in real-world anthropometric growth charts (CDC, WHO, or Fenton).

License GPL (>= 3)

Encoding UTF-8

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BugReports https://github.com/Andy00000000000/SimKid/issues

URL https://github.com/Andy00000000000/SimKid

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Repository https://andy00000000000.r-universe.dev

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Contents

`calc_bmi_bsa` *Calculate BMI and BSA*

Description

BMI and BSA are calculated for a data frame that minimally has columns of HTCM and WTKG. Output columns match the definitions given by `sim_kid()`.

Usage

```
calc_bmi_bsa(data = NULL)
```

Arguments

`data`	A data frame with columns of `HTCM` and `WTKG`.

Details

Equations and methods involved during the creation of virtual subjects.

Value

A data frame with columns of `BMI`, `BSA1`, `BSA2`, and `BSA3` added to `data`:

- `BMI`: Body mass index in kilograms per meter squared, rounded to 1 decimal place.
- `BSA1`: Body surface area in meters squared, rounded to 2 decimal places; calculated using the Mosteller equation.
- `BSA2`: Body surface area in meters squared, rounded to 2 decimal places; calculated using the Gehan and George equation.
- `BSA3`: Body surface area in meters squared, rounded to 2 decimal places; calculated using the DuBois equation.

Calculation of body mass index

The equation for body mass index in kilograms per meter squared is `BMI = WTKG/((HTCM/100)^2)`.

Calculation of body surface area

The Mosteller equation (1) for body surface area in meters squared is `BSA1 = sqrt(WTKG*HTCM/3600)`.

The Gehan and George equation (2) for body surface area in meters squared is `BSA2 = 0.0235*(WTKG^0.51456)*(HTCM^0.42`

The DuBois equation (3) for body surface area in meters squared is `BSA3 = 0.007184*(WTKG^0.425)*(HTCM^0.725)`.

(1) Mosteller RD. Simplified calculation of body-surface area. N Engl J Med. 1987 Oct 22;317(17):1098. <doi: 10.1056/NEJM198710223171717.> PMID: 3657876. (2) Gehan EA, George SL. Estimation of human body surface area from height and weight. Cancer Chemother Rep. 1970 Aug;54(4):225-35. PMID: 5527019. (3) Du Bois D, Du Bois EF. A formula to estimate the approximate surface area if height and weight be known. 1916. Nutrition. 1989 Sep-Oct;5(5):303-11; discussion 312-3. PMID: 2520314.

Examples

```
demo0 <- sim_kid()
demo <- calc_bmi_bsa(data = demo0)
```

---

cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_allreplicates

Optimized Correlations between Z-scores of Weight and Height for Ages 2 to 20 years using U.S. Centers for Disease Control and Prevention (CDC) Growth Charts

---

Description

Methods of dataset creation:

1. Virtual subject age is created: 1000 males and 1000 females per each month of age ranging from 25 to 239 months.
2. Virtual subject height and weight are created using the CDC growth charts (i.e., LMS parameters) and BMI is calculated.
3. The height and weight distributions by age are constrained between the 0.1 and 99.9 percentiles (i.e., z-scores from -3 to 3).
4. The correlations between z-score of height and z-score of weight are optimized separately by sex and age using a 1-year age bucket (ex. correlation for ages 2-3 yr, 3-4 yr, etc.).
5. Percentiles of BMI (3rd, 10th, 25th, 50th, 75th, 90th, 97th) for the virtual population is compared to matching percentiles of observed BMI (i.e. the CDC growth chart of BMI vs age using the lower end of the 1-year age bucket) to calculate sum of squares.
6. R optimize function is used to minimize the sum of squares, providing the optimal correlation between z-scores of height and weight per sex and year of age.
7. This process is repeated 10x.

Usage

```
cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_allreplicates
```

Format

`cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_allreplicates`**:**

A data frame with 360 rows and 4 columns:

ITER Iteration of the repeated optimization procedure

SEXF Female sex indicator (0 is male; 1 is female)

AGEGRP Age group in months

HTWT_COR Optimized correlation between z-score of weight and z-score of height

Source

data-raw/cdc0.csv (data-raw/kid0.csv subset) and data-raw/htwt0.csv

---

`cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_summarized`

Mean Correlations across the Ten Replicates of Optimization between Z-scores of Weight and Height for Ages 2 to 20 years using U.S. Centers for Disease Control and Prevention (CDC) Growth Charts

---

Description

The mean correlations over the 10x replicates of optimization is calculated for use in the 'SimKid' package. In the 'SimKid' package the optimized correlations are validated by simulating virtual populations, calculating BMI statistics, and overlaying with the respective CDC BMI vs. age growth charts.

Usage

```
cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_summarized
```

Format

`cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_summarized`**:**

A data frame with 36 rows and 5 columns:

SEXF Female sex indicator (0 is male; 1 is female)

AGEGRP Age group in months

NITER Number of iterations (i.e., replicates) that contributes to the MEAN_HTWT_COR calculation

NSUBJ_AGEMO_SEXF Number of virtual subjects, in each replicate of the optimization procedure, per month of age and per sex that contributes to the MEAN_HTWT_COR calculation

MEAN_HTWT_COR Mean across the replicates of optimized correlation between z-score of weight and z-score of height

Source

data-raw/cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_allreplicates.csv

---

`cdc0` *U.S. Centers for Disease Control and Prevention (CDC) Growth Charts of Weight, Height, and BMI for Age*

Description

Original CSV data files were manipulated into a more usable format.

Usage

```
cdc0
```

Format

`cdc0`**:**

A data frame with 1,398 rows and 16 columns:

CHART Growth chart label

VAR Demographic variable (WTKG is weight in kg, HTCM is height in cm, BMI is body mass index in kg/m^2)

SEXF Female sex indicator (0 is male; 1 is female)

AGEGRP Age group bucket in months

L Power in the Box-Cox transformation (calculation of VAR using age)

M Median (calculation of VAR using age)

S Generalized coefficient of variation (calculation of VAR using age)

P3 3rd percentile of the given VAR

P5 5th percentile of the given VAR

P10 10th percentile of the given VAR

P25 25th percentile of the given VAR

P50 50th percentile of the given VAR

P75 75th percentile of the given VAR

P90 90th percentile of the given VAR

P95 95th percentile of the given VAR

P97 97th percentile of the given VAR

Source

https://www.cdc.gov/growthcharts/cdc-data-files.htm

`fent0` *Fenton Growth Charts of Weight for Age in Preterm Infants*

Description

Fenton growth charts for male and female weight vs. age were digitized up to 40 weeks (for full-term) from the literature (1-3) using 'PinPoint Digitizer' (4). Fitting of weight LMS parameters by age and sex was done in R using the optimize function (5) and the sum of squares statistic between digitized and predicted weight percentiles. (1) https://ucalgary.ca/resource/preterm-growth-chart/preterm-growth-chart (2) Fenton, T.R., Kim, J.H. A systematic review and meta-analysis to revise the Fenton growth chart for preterm infants. BMC Pediatr 13, 59 (2013). doi:10.1186/1471-2431-13-59 (3) Fenton, T.R., Nasser, R., Eliasziw, M. et al. Validating the weight gain of preterm infants between the reference growth curve of the fetus and the term infant. BMC Pediatr 13, 92 (2013). doi:10.1186/1471-2431-13-92 (4) https://mhismail.github.io/PinPoint-Landing/ (5) <https://www.rdocumentation.org/packages/stats/versions/3.6.2/topics/optimize>

Usage

```
fent0
```

Format

`fent0`**:**

A data frame with 38 rows and 16 columns:

CHART Growth chart label

VAR Demographic variable (WTKG is weight in kg)

SEXF Female sex indicator (0 is male; 1 is female)

AGEGRP Newborn age group bucket in weeks (PNA is postnatal age; GA is gestational age)

L Power in the Box-Cox transformation (calculation of VAR using age)

M Median (calculation of VAR using age)

S Generalized coefficient of variation (calculation of VAR using age)

P3 3rd percentile of the given VAR

P5 5th percentile of the given VAR

P10 10th percentile of the given VAR

P25 25th percentile of the given VAR

P50 50th percentile of the given VAR

P75 75th percentile of the given VAR

P90 90th percentile of the given VAR

P95 95th percentile of the given VAR

P97 97th percentile of the given VAR

Source

https://ucalgary.ca/resource/preterm-growth-chart/preterm-growth-chart

get_seeds *Generate a reproducible vector of random seeds*

Description

Use the user-specified masterseed to generate a vector of randomly sampled seeds that is reproducible by calling the same masterseed at a future time.

Usage

```
get_seeds(masterseed = NULL, nseed = 1000)
```

Arguments

masterseed	An integer ranging from 1 to .Machine$integer.max that sets an overall seed for the simulation to ensure reproducibility of the results. Defaults to no seed.
nseed	A positive integer that specifies the number of subjects to simulate. Defaults to 1000.

Value

A vector of numeric integers of length nseed

Examples

```
get_seeds(masterseed = 513, nseed = 10)
```

grow_kid *Grow the simulated virtual subjects using anthropometric growth chart data*

Description

Following creation of a virtual population using sim_kid(), each virtual subject grows from their baseline age. It is assumed that each virtual subject remains at the same respective percentiles of height- and weight-for-age-and-sex as they were at baseline.For example, if sim_kid() created a male 2 year old at the 25th percentile of height and the 30th percentile of weight, then if allowed to grow to 3 years old, this subject would be at the 25th percentile of height and 30th percentile of weight for 3 year old males according to the given anthropometric growth chart. Note that this function will not work for virtual preterm newborns created using the Fenton growth chart data. Note that this function will not allow virtual subjects ages 0 to 2 yr to grow past 2 years.

Usage

```
grow_kid(data = NULL, grow_time = 0, tstep = 1, age0isbirth = FALSE)
```

Arguments

data	A data frame created by sim_kid().
grow_time	A non-negative numeric specifying the duration of time in months the virtual subjects are allowed to grow for. Will be rounded to the nearest month.
tstep	A positive numeric specifying the time step for growth in months. Default of 1. Will be rounded to the nearest month.
age0isbirth	Logical TRUE or FALSE matching the sim_kid() input option used. Default of FALSE.

Value

A data frame with columns matching those of data and the number of rows equal to nrow(data)*(1+grow_time/tstep)-ns
Where nsubtract is the number of records with age greater than 240 months.

Examples

```
# growth for 1 year at monthly time step
demo0 <- sim_kid()
demo <- grow_kid(data = demo0, grow_time = 12)
```

---

htwt0 *U.S. Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) Growth Charts of Weight for Height*

Description

Original CSV data files were manipulated into a more usable format.

Usage

```
htwt0
```

Format

htwt0:

A data frame with 474 rows and 16 columns:

CHART Growth chart label

VAR Demographic variable (HTWT denotes weight (kg) calculated using height (cm))

SEXF Female sex indicator (0 is male; 1 is female)

HTCMGRP Height group

L Power in the Box-Cox transformation (calculation of weight using height)

M Median (calculation of weight using height)

S Generalized coefficient of variation (calculation of weight using height)

P3 3rd percentile of weight

P5 5th percentile of weight

P10 10th percentile of weight
P25 25th percentile of weight
P50 50th percentile of weight
P75 75th percentile of weight
P90 90th percentile of weight
P95 95th percentile of weight
P97 97th percentile of weight

Source

https://www.cdc.gov/growthcharts/cdc-data-files.htm and https://www.cdc.gov/growthcharts/who-data-files.htm

---

`kid0` *Master Combined Dataset of Growth Charts of Weight, Height, and BMI for Age*

Description

cdc0, who0, and fent0 were combined into a single dataset.

Usage

```
kid0
```

Format

`kid0`**:**
A data frame with 1,536 rows and 16 columns:
CHART Growth chart label
VAR Demographic variable (WTKG is weight in kg, HTCM is height in cm, BMI is body mass index in kg/m^2)
SEXF Female sex indicator (0 is male; 1 is female)
AGEGRP Age group
L Power in the Box-Cox transformation (calculation of VAR using age)
M Median (calculation of VAR using age)
S Generalized coefficient of variation (calculation of VAR using age)
P3 3rd percentile of the given VAR
P5 5th percentile of the given VAR
P10 10th percentile of the given VAR
P25 25th percentile of the given VAR
P50 50th percentile of the given VAR
P75 75th percentile of the given VAR
P90 90th percentile of the given VAR
P95 95th percentile of the given VAR
P97 97th percentile of the given VAR

Source

data-raw/cdc0.csv, data-raw/who0.csv, data-raw/fent0.csv

`lms_calc` *Calculate the dependent variable (height or weight) using LMS parameters from anthropometric growth charts at a given Z score*

Description

Calculate the dependent variable (height or weight) using LMS parameters from anthropometric growth charts at a given Z score

Usage

```
lms_calc(z = 0, l = NA, m = NA, s = NA)
```

Arguments

`z`	Numeric or numerical vector of Z score(s) associated with a given percentile of the dependent variable. Default of 0 (i.e., 50th percentile).
`l`	Numeric or numerical vector of L parameter(s) from an anthropometric growth chart.
`m`	Numeric or numerical vector of M parameter(s) from an anthropometric growth chart.
`s`	Numeric or numerical vector of S parameter(s) from an anthropometric growth chart.

Value

Numeric or vector of numeric dependent variable value(s). Value is calculated according to: if `l` (rounded to 6 decimal places) is equal to 0, then = `l*exp(s*z)`; otherwise = `m*(1+l*s*z)^(1/l))`.

Examples

```
# calculate weight (kg) for a male 2 year old at the 50th percentile of
# weight for age and sex using CDC Growth Chart LMS parameters.
wtkg <- lms_calc(
z = qnorm(50/100),
l = -0.2165012,
m = 12.74154,
s = 0.1081660
)

# calculate weight (kg) for male 2 year old at the 25th and 50th percentiles
# of weight.
wtkg <- lms_calc(
z = c(qnorm(25/100),
```

```
qnorm(50/100)),
l = -0.2165012,
m = 12.74154,
s = 0.1081660
)

# calculate weight (kg) for male at 50th percentile and female at 25th
# percentile of weight.
wtkg <- lms_calc(
  z = c(0, qnorm(0.25)),
  l = c(-0.6213197, -1.0244713),
  m = c(14.40263, 13.94108),
  s = c(0.1118745, 0.1194917)
)
```

`sim_kid` *Create body size metrics for virtual subjects using anthropometric growth chart data and a distribution of age*

Description

Body size metrics (height, weight, BMI, and BSA) are created for a population of virtual subjects.The body size metrics reflect the anthropometric growth chart distribution(s) and correlations (ex. height vs weight) according to virtual subject age and sex. The assumed distribution of age (uniform or truncated normal) and probability that a given subject is female are specified by the user. For ages greater than 2 years, CDC growth charts are used. For ages birth to 2 years, either CDC (the default) or WHO growth charts can be used. Note that while CDC growth charts are used to prevent a jump discontinuity at 2 years, WHO growth charts are recommended for ages 0 to 2 years. For birth only (postnatal age of zero), Fenton growth charts for preterm can be used according to a distribution of gestational age. Note: when using Fenton growth charts, only body weight will be simulated.

Usage

```
sim_kid(
  num = 1,
  agedistr = "unif",
  agemean = NULL,
  agesd = NULL,
  agemin = NULL,
  agemax = NULL,
  prob_female = 0.5,
  age0isbirth = FALSE,
  age0to2yr_growthchart = "CDC",
  age2to20yr_correlate_htwt = TRUE,
  htwt_percentile_min = NULL,
  htwt_percentile_max = NULL,
  masterseed = NULL
)
```

Arguments

num	A positive integer that specifies the number of subjects to simulate. Defaults to a single subject. For agedistr = "nperage" the number of subjects per growth chart age and sex bin.
agedistr	A string that specifies the distribution used to create virtual subject age. • unif (the default): A uniform distribution of age with a range from agemin to agemax. • norm: A truncated normal distribution of age with a mean of agemean, a standard deviation of agesd, and a range from agemin to agemax. • nperage: An equal number of subjects per growth chart age and sex bin.
agemean	A positive numeric greater than or equal to agemin and less than or equal to agemax that specifies the mean age when agedistr = "norm" is specified. • Only used for agedistr = "norm". • Units of postnatal age in months for age0to2yr_growthchart = "CDC" or age0to2yr_growthchart = "WHO". • Units of gestational age in weeks for age0to2yr_growthchart = "FENTON".
agesd	A numeric greater than or equal to 0 that specifies the standard deviation of age when agedistr = "norm" is specified. • Only used for agedistr = "norm". • Units of postnatal age in months for age0to2yr_growthchart = "CDC" or age0to2yr_growthchart = "WHO". • Units of gestational age in weeks for age0to2yr_growthchart = "FENTON".
agemin	A numeric that specifies the lower range of age. Defaults to the maximum allowable range if missing. • Must be greater than or equal to 0 months of postnatal age for age0to2yr_growthchart = "CDC" or age0to2yr_growthchart = "WHO". • Must be greater than or equal to 22 weeks of gestational age for age0to2yr_growthchart = "FENTON". • Must be less than or equal to agemax.
agemax	A numeric that specifies the upper range of age. Defaults to the maximum allowable range if missing. • Must be less than 240 months of postnatal age for age0to2yr_growthchart = "CDC" or age0to2yr_growthchart = "WHO". • Must be less than 41 weeks of gestational age for age0to2yr_growthchart = "FENTON". • Must be greater than or equal to agemin.
prob_female	A numeric value with an inclusive range of 0 to 1 that specifies the probability that a given virtual subject is female. Defaults to 0.5.
age0isbirth	A logical that specifies whether age equal to zero denotes birth. • TRUE: Age of 0 is birth. • FALSE (the default): Age of 0 is ages from birth to less than one month. • Not applicable nor used for age0to2yr_growthchart = "FENTON", for which postnatal age is always zero.

age0to2yr_growthchart
: A string that specifies which anthropometric growth charts are used for ages less than or equal to 2 years old.
  - "CDC" (the default): United States Centers for Disease Control and Prevention growth charts are used.
  - "WHO": World Health Organization growth charts are used.
  - "FENTON": Fenton growth charts for preterm newborns are used. This option is only available when simulating virtual subjects at birth (postnatal age = 0).

age2to20yr_correlate_htwt
: A logical that specifies whether correlations, by sex and year of age, are implemented between simulated height and simulated weight for ages greater than or equal to 2 years old.
  - TRUE (the default): Correlations are implemented between simulated height and simulated weight according to an identical internal-systems-data version of cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_summarized located within the data folder.
  - FALSE: Height and weight are simulated independently without any correlation(s). Note that this will likely result in unrealistic virtual subjects.

htwt_percentile_min
: A numeric value that specifies the minimum allowed percentile of simulated height and weight, expressed as a decimal.
  - Must be greater than or equal to 0.001.
  - Must be less than htwt_percentile_max when age2to20yr_correlate_htwt = TRUE. Must be less than or equal to htwt_percentile_max when age2to20yr_correlate_htwt = FALSE.
  - Defaults to 0.001 when age0to2yr_growthchart = "CDC" or age0to2yr_growthchart = "WHO".
  - Defaults to 0.01 when age0to2yr_growthchart = "FENTON" to avoid nonviable birth weights.

htwt_percentile_max
: A numeric value that specifies the maximum allowed percentile of simulated height and weight, expressed as a decimal.
  - Must be less than or equal to 0.999.
  - Must be greater than htwt_percentile_min when age2to20yr_correlate_htwt = TRUE. Must be greater than or equal to htwt_percentile_min when age2to20yr_correlate_htw = FALSE..
  - Defaults to 0.999 when age0to2yr_growthchart = "CDC" or age0to2yr_growthchart = "WHO".
  - Defaults to 0.99 when age0to2yr_growthchart = "FENTON" to avoid nonviable birth weights.

masterseed
: An integer ranging from 1 to .Machine$integer.max that sets an overall seed for the simulation to ensure reproducibility of the results. Defaults to no seed.

Details

Equations and methods involved during the creation of virtual subjects.

Value

A data frame with the number of rows equal to num (except for agedistr = "nperage") and columns of:

- ID: An integer ranging from 1 to num that serves as a virtual subject identifier.
- SEXF: An integer of value 0 for male or 1 for female.
- AGEMO: Postnatal age in months.
- AGE: Postnatal age in years.
- GAWK: Gestational age in weeks.
- WTKG: Body weight in kilograms, rounded to 2 decimal places.
- HTCM: Body height in centimeters, rounded to the nearest centimeter.
- BMI: Body mass index in kilograms per meter squared, rounded to 1 decimal place.
- BSA1: Body surface area in meters squared, rounded to 2 decimal places; calculated using the Mosteller equation.
- BSA2: Body surface area in meters squared, rounded to 2 decimal places; calculated using the Gehan and George equation.
- BSA3: Body surface area in meters squared, rounded to 2 decimal places; calculated using the DuBois equation.
- ZWTKG: The z-score of weight-for-height for ages 0 to 2 years, weight-for-age for ages greater than 2 years, and weight-for-gestational-age for newborns when using Fenton growth charts.
- ZHTCM: The z-score of height-for-age.
- PWTKG: The percentile of weight corresponding to the respective z-score.
- PHTCM: The percentile of height corresponding to the respective z-score.
- CHART: The anthropometric growth chart used. An error will be returned if the simulation fails.

Calculation of simulated body height and weight

The equation for simulated body height in cm (HTCM) or weight in kg (WTKG) is: if L (rounded to 6 decimal places) is equal to 0, then = M*exp(S*Z); otherwise = M*(1+L*S*Z)^(1/L)) (1).

Where L, M, and S are obtained, using the independent variables of sex (SEXF) and age bucket (AGEGRP), from identical internal-systems-data versions of the combined anthropometric growth chart datasets (kid0 and htwt0 located within the data folder). And where Z, the z-score respective to either the height or weight distribution, is randomly sampled for each virtual subject.

(1) https://www.cdc.gov/growthcharts/cdc-data-files.htm

Simulation of z-scores for variability in height and weight

For ages 0 to 2 years, correlations between height and weight are always implemented. This is done by simulating height using length-for-age growth charts (see kid0 located within the data folder) and then simulating weight using weight-for-height growth charts (see htwt0 located within the data folder). For ages greater than 2 years, correlations between height and weight were repeatedly optimized (see cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_allreplicates located within the

data folder) and then summarized to the mean (see cdc_ages2to20yr_correlations_by_sex_htcm_wtkg_summarized located within the data folder). For ages greater than 2 years, the user can override the default behavior that includes correlations (as per an identical internal-systems-data version of cdc_ages2to20yr_correlations_by_sex_h between simulated height and weight using the age2to20yr_correlate_htwt input.

For ages 0 to 2 years and for ages greater than 2 years when simulating without correlations between height and weight: The z-scores are obtained independently for height and weight and for each virtual subject via random sampling from a truncated standard normal distribution using msm::rtnorm().

For ages greater than 2 years when simulating with correlations between height and weight: The z-scores are obtained simultaneously for height and weight and for each virtual subject via random sampling from a truncated multivariate standard normal distribution using tmvtnorm::rtmvnorm().

Calculation of body mass index

The equation for body mass index in kilograms per meter squared is BMI = WTKG/((HTCM/100)^2).

Calculation of body surface area

The Mosteller equation (1) for body surface area in meters squared is BSA1 = sqrt(WTKG*HTCM/3600).

The Gehan and George equation (2) for body surface area in meters squared is BSA2 = 0.0235*(WTKG^0.51456)*(HTCM^0.42

The DuBois equation (3) for body surface area in meters squared is BSA3 = 0.007184*(WTKG^0.425)*(HTCM^0.725).

(1) Mosteller RD. Simplified calculation of body-surface area. N Engl J Med. 1987 Oct 22;317(17):1098. <doi: 10.1056/NEJM198710223171717.> PMID: 3657876. (2) Gehan EA, George SL. Estimation of human body surface area from height and weight. Cancer Chemother Rep. 1970 Aug;54(4):225-35. PMID: 5527019. (3) Du Bois D, Du Bois EF. A formula to estimate the approximate surface area if height and weight be known. 1916. Nutrition. 1989 Sep-Oct;5(5):303-11; discussion 312-3. PMID: 2520314.

Examples

```
# Simulate 1 subject with an age randomly sampled from a uniform
# distribution of ages ranging
#    from 0 to 20 years using CDC growth charts.
df_kids <- sim_kid()

# Simulate 10 female 3 year old subjects with a seed set for reproducibility.
df_kids <- sim_kid(
  num = 10,
  agedistr = "norm", agemean = 36, agesd = 0,
  prob_female = 1, masterseed = 513
)

# Simulate 10 subjects (approximately 50% female) with ages ranging from
# 1 year to 2 years
# according to a uniform distribution of age using WHO growth charts.
df_kids <- sim_kid(
  num = 10,
  agedistr = "unif", agemin = 12, agemax = 24,
  age0to2yr_growthchart = "WHO"
```

```
)

# Simulate 1 subject per age bin and per sex using CDC growth charts
df_kids <- sim_kid(agedistr = "nperage")
```

`validate_kid` *Validate the simulated virtual subjects to anthropometric growth chart data*

Description

Following creation of a virtual population using `sim_kid()`, overlay scatter plots are used to validate that the virtual population is reflective of the respective anthropometric growth chart data.

Usage

```
validate_kid(
  data = NULL,
  age0isbirth = FALSE,
  overlay_percentile = NA,
  alpha = 0.4
)
```

Arguments

`data`	A data frame created by `sim_kid()`.
`age0isbirth`	Logical `TRUE` or `FALSE` matching the `sim_kid()` input option used. Default of `FALSE`.
`overlay_percentile`	`NA` (default) for no ribbon overlay of simulated percentiles. Or a numeric greater than `0` and less than `1` specifying the simulated percentile interval to overlay. For example, input of `0.90` would overlay the 5th and 95th percentiles of simulated data.
`alpha`	Numeric between `0` and `1` specifying the simulated data transparency in validation plots. Default of `0.4`.

Value

A list of 5 'ggplot2' plot objects.

Examples

```
demo0 <- sim_kid() # single subject
validation_plots <- validate_kid(data = demo0)
```

who0 *World Health Organization (WHO) Growth Charts of Weight and Height for Age*

Description

Original CSV data files were manipulated into a more usable format.

Usage

```
who0
```

Format

who0**:**

A data frame with 100 rows and 16 columns:

CHART Growth chart label

VAR Demographic variable (WTKG is weight in kg, HTCM is height in cm)

SEXF Female sex indicator (0 is male; 1 is female)

AGEGRP Age group bucket in months

L Power in the Box-Cox transformation (calculation of VAR using age)

M Median (calculation of VAR using age)

S Generalized coefficient of variation (calculation of VAR using age)

P3 3rd percentile of the given VAR

P5 5th percentile of the given VAR

P10 10th percentile of the given VAR

P25 25th percentile of the given VAR

P50 50th percentile of the given VAR

P75 75th percentile of the given VAR

P90 90th percentile of the given VAR

P95 95th percentile of the given VAR

P97 97th percentile of the given VAR

Source

https://www.cdc.gov/growthcharts/who-data-files.htm

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