Package ‘pedbp’

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Title  Pediatric Blood Pressure

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Depends  R (>= 3.5.0)

License  GPL-2

Encoding  UTF-8

URL  https://github.com/dewittpe/pedbp/

Language  en-us

LazyData  true

Imports  ggplot2, scales

Suggests  covr, data.table, DT, gridExtra, knitr, rmarkdown, shiny, shinydashboard

VignetteBuilder  knitr

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NeedsCompilation  no

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Description

A collection of data sets from multiple sources used to inform blood pressure percentiles for pediatrics patients by sex, age, and height (if known).

Usage

lo2013
gemelli1990
nhlbi_bp_norms
bp_parameters

Details

Data sets are named to reflect the source.

For all the data sets provided units are uniform:

age: Patient age; months
height: length/height/stature; cm
weight: kilograms
**male**: integer value; 1 = male, 0 = female

**sbp**: systolic blood pressure; mmHg

**dbp**: diastolic blood pressure; mmHg

Columns with a name such as sbp is a point observations. Summary statistics are appended to the variable as needed, e.g., sbp_mean and sbp_sd for the reported mean and standard deviation of systolic blood pressure.

CDC ages represent whole month but reported at the half month. That is, age = 12.5 is short-hand for 12 <= age < 13. The exception is birth; age = 0 is birth and not a range.

bp_parameters has the estimated mean and standard deviations for estimating percentiles using a Gaussian distribution for a given sex, age (in months), and height (if known/applicable).

**References**


**See Also**

vignette("bp-distributions", package = "pedbp")

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**bp_cdf**

*Plot the CDF for Blood Pressure*

**Description**

Plot the CDF for blood pressure given age, sex, and height.

**Usage**

bp_cdf(
  age,
  male,
  height = NA,
  height_percentile = 0.5,
  sbp = NA,
  dbp = NA,
  ...
)

Arguments

- **age**: numeric age, in months
- **male**: integer value, 1 = male, 0 = female, indicating sex of the patient
- **height**: numeric, in centimeters, can be missing. This is the length for patients under three years of age
- **height_percentile**: default height percentile to use if height is missing.
- **sbp, dbp**: observed values to plot on the CDF
- **...**: not currently used

Value

A ggplot2 graphic showing the CDF for diastolic and systolic blood pressures with vertical and horizontal lines highlight the percentile for the given inputs.

Examples

```r
bp_cdf(age = 96, male = 1, sbp = 103, dbp = 55)
```

Description

Percentile and quantile functions for pediatric blood pressure.

Usage

```r
p_bp(q_sbp, q_dbp, age, male, height = NA, height_percentile = 0.5, ...)
q_bp(p_sbp, p_dbp, age, male, height = NA, height_percentile = 0.5, ...)
```

Arguments

- **q_sbp**: a vector of systolic blood pressures
- **q_dbp**: a vector of diastolic blood pressures
- **age**: numeric age, in months
- **male**: integer value, 1 = male, 0 = female
- **height**: numeric, in centimeters, can be missing.
- **height_percentile**: default height percentile to use if height is missing.
- **...**: not currently used
- **p_sbp**: a vector of systolic blood percentiles
- **p_dbp**: a vector of diastolic blood percentiles
Value

A `pedbp_bp` object. This is a list of two numeric vectors: `sbp_percentile` (systolic blood pressure) and `dbp_percentile` (diastolic blood pressure). Additionally, the `bp_params` attribute provides details on the data source and parameters used in the percentile estimates.

See Also

`vignette("bp-distribution", package = "pedbp")`

Examples

```r
x <- p_bp(q_sbp = 100, q_dbp = 60, age = 8, male = 0)
x x
str(x)

x <- p_bp(q_sbp = c(NA, 82), q_dbp = c(60, 72), age = 9.2, male = 0)
x x
str(x)

x <- p_bp(q_sbp = c(NA, 82), q_dbp = c(60, 72), age = 29.2, male = 0, height = 82.8)
x x
str(x)

x <- q_bp(p_sbp = 0.78, p_dbp = 0.65, age = 8, male = 0)
x x
str(x)
```

# compare results when height is known or unknown
```r
p_bp(q_sbp = rep(100, 2),
    q_dbp = rep(60, 2),
    age = rep(35.75, 2),
    male = c(0, 0),
    height = c(NA, 100))
```

# Working with multiple patients records
```r
d <- read.csv(system.file("example_data", "for_batch.csv", package = "pedbp"))
d
bp_percentiles <-
p_bp(
    q_sbp = d$sbp..mmHg.,
    q_dbp = d$dbp..mmHg.,
    age = d$age_months,
    male = d$male
)
bp_percentiles
q_bp(
    p_sbp = bp_percentiles$sbp_percentile
)
est_norm

Estimate Normal Distribution Given Set of Quantile Values

Description

With at least two quantile values find the mean and standard deviation of a normal distribution to match up with empirical values provided.

Usage

est_norm(q, p, weights = rep(1, length(p)), ...)

Arguments

q     quantile values.
p     probabilities corresponding to the q quantiles.
weights relative weight of each quantile. The higher the weight the better the approximated distribution will be at fitting that quantile.
...    passed to optim.

Details

For X ~ N(mu, sigma), Pr[X <= q] = p

Given the set of quantiles and probabilities, est_norm uses optim to find the preferable mean and standard deviation of a normal distribution to fit the provided quantiles.

Use the weight argument to emphasize which, if any, of the provided quantiles needs to be approximated closer than others. By default all the quantiles are weighted equally.

Value

a pedbp_est_norm object. This is a list with elements:

- para named numeric vector with the mean and standard deviation for a Gaussian distribution
- qpa numeric matrix with two columns built from the input values of q and p
- weightsthe weights used
- callThe call made
- optimresult from calling optim
Examples

# Example 1
q <- c(-1.92, 0.1, 1.89) * 1.8 + 3.14
p <- c(0.025, 0.50, 0.975)

x <- est_norm(q, p)
str(x)
x

plot(x)

# Example 2 -- build with quantiles that are easy to see unlikely to be from
# a Normal distribution
q <- c(-1.92, 0.05, 0.1, 1.89) * 1.8 + 3.14
p <- c(0.025, 0.40, 0.50, 0.975)

# with equal weights
x <- est_norm(q, p)
x
plot(x)

# weight to ignore one of the middle value and make sure to hit the other
x <- est_norm(q, p, weights = c(1, 2, 0, 1))
x
plot(x)

# equal weight the middle, more than the tails
x <- est_norm(q, p, weights = c(1, 2, 2, 1))
x
plot(x)

---

pediatric_vital_sign_distributions

Pediatric Vital Sign Distributions

Description

Based on the data provided by the CDC, provide the distribution function, quantile function, and a z-score function for one of eight vital signs by another vital sign, e.g., weight for age. Values are based on an LMS approach.

Usage

p_bmi_for_age(q, age, male)

q_bmi_for_age(p, age, male)
z_bmi_for_age(q, age, male)
p_head_circ_for_age(q, age, male)
q_head_circ_for_age(p, age, male)
z_head_circ_for_age(q, age, male)
p_length_for_age_inf(q, age, male)
q_length_for_age_inf(p, age, male)
z_length_for_age_inf(q, age, male)
p_stature_for_age(q, age, male)
q_stature_for_age(p, age, male)
z_stature_for_age(q, age, male)
p_weight_for_age_inf(q, age, male)
q_weight_for_age_inf(p, age, male)
z_weight_for_age_inf(q, age, male)
p_weight_for_age(q, age, male)
q_weight_for_age(p, age, male)
z_weight_for_age(q, age, male)
p_weight_for_length_inf(q, length, male)
q_weight_for_length_inf(p, length, male)
z_weight_for_length_inf(q, length, male)
p_weight_for_stature(q, height, male)
q_weight_for_stature(p, height, male)
z_weight_for_stature(q, height, male)

Arguments

q a vector of quantities
age numeric age, in months
pediatric_vital_sign_distributions

male
integer value, 1 = male, 0 = female

p
a vector of probabilities

length
length, in cm, of the patient (age under 3 years)

height
height, in cm, of the patient (age 2 - 20 years)

Value
The p_ method return values from the estimated distribution function. q_ methods return values from the estimated quantile function. z_ methods return standard scores, equivalent to qnorm.

References
https://www.cdc.gov/growthcharts/percentile_data_files.htm

Examples

#########################################################################
# BMI for Age
# A BMI of 18.2 for a 18.1 year old female is in the
# p_bmi_for_age(q = 18.2, age = 18.1 * 12, male = 0)
# percentile.
# The z-score is the same as qnorm(p)
qnorm(p_bmi_for_age(q = 18.2, age = 18.1 * 12, male = 0))
z_bmi_for_age(q = 18.2, age = 18.1 * 12, male = 0)
# The 70th percentile of BMI for 15.4 year old males is
q_bmi_for_age(p = 0.70, age = 15.4 * 12, male = 1)
#########################################################################
# Stature/Lenght/Height for Age
# length_for_age_inf is for Infants are from 0 to 3 years (36 months)
# stature_for_age is for pediatrics from 2 years (24 months) to 20 years
# (240 months)
# The overlap between these functions will produce slightly different values
# the kids between 24 and 36 months of age.
# p_length_for_age_inf(87, age = 28, male = 0)
# p_stature_for_age(87, age = 28, male = 0)
p_length_for_age_inf(q = 87, age = 28, male = 0)
# Multiple patients, the age and male, length, height arguments can also be
# vectors
p_length_for_age_inf(q = 87, age = 28, male = 0)
p_length_for_age_inf(q = 90, age = 30, male = 1)
p_length_for_age_inf(q = c(87,90), age = c(28, 30), male = c(0,1))
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