Package 'cmpproviders'

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Version 0.31

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Title Compare Providers

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Depends R (>= 4.0.4), ggplot2, ggrepel, grid, lattice

Suggests COUNT,
medpar,
dplyr,
knitr,
rmarkdown

Description
A program that compares provider rate data using funnel plots or control charts. The implementations are based on Bonert et al. (2017) <https://doi.org/10.4103/jpi.jpi_50_17> and on Bonert et al. (2023) <https://doi.org/10.1038/s41598-022-26962-w>

License GPL (>= 3)

URL https://github.com/mbonert/cmpproviders

BugReports michael@librepathology.org

RoxygenNote 7.1.1

VignetteBuilder knitr

R topics documented:

`controlchart2cmpproviders` *Creates a control chart with an arbitrary number of control lines*

Description

Control charts to compare (healthcare) providers or institutions

Usage

```
controlchart2cmpproviders(
  x_var,
  y_var,
  labels = NULL,
  limits = c(95, 99.9),
  control_chart_centre_line = NULL,
  addlabels = "NONE",
  labels_to_display = NULL,
  x_label = NULL,
  y_label = NULL,
  plot_title = NULL,
  show_legend = TRUE,
  y_percent = FALSE,
  sort_by_y_norm = TRUE,
  showoutlier_arr = FALSE
)
```

Arguments

`x_var`	x values on funnel plot, e.g. number of specimens
`y_var`	y values on funnel plot, e.g. diagnostic rate (0-1)
`labels`	labels that describe the (x,y) data points, e.g. name of institution or provider identification; default: the data points are numbered (if undefined)
`limits`	limits (confidence intervals); default: 95%, 99.9%
`control_chart_centre_line`	defines the control chart centre line; default: median of y_var
`addlabels`	whether to display labels on the funnel plot; accepted values are: • `"none"` : do not add labels (default) • `"all"` : add labels to all points • `"outliers"` : label only outliers outside of the inner funnels • `"outliers2"` : label only outliers outside of second innermost funnel • `"only_oaf"` : label only outliers outside of all funnels • `"list"` : display the list of labels given by argument `labels_to_display`
`labels_to_display`	selected labels to display (see argument *addlabels*)

x_label	x axis label
y_label	y axis label
plot_title	title of the (funnel) plot
show_legend	TRUE shows legend at bottom of plot
y_percent	y axis in percent (multiplies y_var_normed by 100)
sort_by_y_norm	sort by the normed y value
showoutlier_arr	show the outlier array

Details

A function to compare provider rate data. The implementation is based on Bonert et al. (2023) https://doi.org/10.1038/s41598-022-26962-w

Value

funnel plot object

Examples

```
library(COUNT)
library(dplyr)
data(medpar)

print("Number of cases by provider ...")
provider_count=as.data.frame(table(medpar$provnum))
colnames(provider_count) = c('PROVIDER', 'COUNT')
provider_count

print("Purging providers with less than 20 cases ...")
requiredcases=20
medpar_trunc <- medpar[medpar$provnum %in% provider_count[provider_count$COUNT>=requiredcases,]$PROVIDER,]

print("Number of cases by provider in purged data set ...")
provider_count_trunc=as.data.frame(table(medpar_trunc$provnum))
colnames(provider_count_trunc) = c('PROVIDER', 'COUNT')
provider_count_trunc

medpar_trunc_died <- medpar_trunc[medpar_trunc$died==1,]

print("Number of died by provider in purged data set ...")
provider_count_trunc_died=as.data.frame(table(medpar_trunc_died$provnum))
colnames(provider_count_trunc_died) = c('PROVIDER', 'COUNT')
provider_count_trunc_died

print("Death rate by provider ...")
y_var = provider_count_trunc_died[,2]/ provider_count_trunc[,2]
y_var

x_var = provider_count_trunc[,2]
```

```
provider_labels = provider_count_trunc[,1]

print("Creating control charts ...")
cc1=controlchart2cmpproviders(x_var, y_var, limits=c(95,99.9,99.9999), addlabels = 1,
  x_label = "Provider", y_label = "Normalized Death Rate by Provider",
  plot_title = "Normalized Death Rate by Provider")
cc2=controlchart2cmpproviders(x_var, y_var, limits=c(95,99.9,99.9999), labels=provider_labels,
 addlabels = "OUTLIERS", x_label = "Provider", y_label = "Normalized Provider Death Rate",
 plot_title = "Normalized Death Rate by Provider with Outliers Labelled", do_not_sort_by_y_norm=1)
cc3=controlchart2cmpproviders(x_var, y_var, limits=c(95,99.9,99.9999), labels=provider_labels,
 addlabels = "OUTLIERS", x_label = "Provider", y_label = "Normalized Provider Death Rate",
  plot_title = "Normalized Death Rate by Provider with Outliers Labelled")
```

`funnel2cmpproviders` *Creates a funnel plot with an arbitrary number of funnels*

Description

Funnel plots to compare (healthcare) providers or institutions

Usage

```
funnel2cmpproviders(
  x_var,
  y_var,
  labels = NULL,
  limits = c(95, 99.9),
  funnel_centre_line = NULL,
  addlabels = "NONE",
  labels_to_display = NULL,
  x_label = NULL,
  y_label = NULL,
  plot_title = NULL,
  x_lower_limit = NULL,
  x_upper_limit = NULL,
  y_lower_limit = NULL,
  y_upper_limit = NULL,
  x_fpad_upper = 0.1,
  x_fpad_lower = 0.03,
  y_fsd = 0.5,
  funnel_curve_calculation_parameter = 3,
  fc_min_dx = 0.5,
  fc_max_y_err = 0.001,
  x2plot = NULL,
  show_legend = TRUE,
  y_percent = FALSE,
  showoutlier_arr = FALSE
)
```

Arguments

x_var	x values on funnel plot, e.g. number of specimens
y_var	y values on funnel plot, e.g. diagnostic rate (0-1)
labels	labels that describe the (x,y) data points, e.g. name of institution or provider identification; default: the data points are numbered (if undefined)
limits	limits (confidence intervals); default: 95%, 99.9%
funnel_centre_line	defines the funnel centre line; default: median of y_var
addlabels	whether to display labels on the funnel plot; accepted values are: • "none" : do not add labels (default) • "all" : add labels to all points • "outliers" : label only outliers outside of the inner funnels • "outliers2" : label only outliers outside of second innermost funnel • "only_oaf" : label only outliers outside of all funnels • "list" : display the list of labels given by argument labels_to_display
labels_to_display	selected labels to display (see argument *addlabels*)
x_label	x axis label
y_label	y axis label
plot_title	title of the (funnel) plot
x_lower_limit	lower x limit (min x value on plot)
x_upper_limit	upper x limit (max x value on plot)
y_lower_limit	lower y limit (min y value on plot)
y_upper_limit	upper y limit (max y value on plot)
x_fpad_upper	upper padding as fraction of x axis range
x_fpad_lower	lower padding as fraction of x axis range
y_fsd	padding as fraction of standard deviation of y values
funnel_curve_calculation_parameter	method used to calculate the funnel curves / determine the x values used to calculate the funnel curves; 1: uses geom_function to calculate/plot funnel curves, 2 = uses geom_line to plot funnel curves, 3: uses geom_line to plot funnel curves, calculates ideal x using *get_ideal_x.r* (default)
fc_min_dx	funnel curve parameter, minimum delta x
fc_max_y_err	funnel curve parameter, maximum y error
x2plot	vector defines extra x values used to calculate the funnel curves
show_legend	TRUE shows legend at bottom of plot
y_percent	y axis in percent (multiplies y_var by 100)
showoutlier_arr	show the outlier array

Details

A function to compare provider rate data. The implementation is based on Bonert et al. (2017) https://doi.org/10.4103/jpi.jpi_50_17

Value

funnel plot object

Examples

```
library(COUNT)
library(dplyr)
data(medpar)

print("Number of cases by provider ...")
provider_count=as.data.frame(table(medpar$provnum))
colnames(provider_count) = c('PROVIDER', 'COUNT')
provider_count

print("Purging providers with less than 20 cases ...")
requiredcases=20
medpar_trunc <- medpar[medpar$provnum %in% provider_count[provider_count$COUNT>=requiredcases,]$PROVIDER,]

print("Number of cases by provider in purged data set ...")
provider_count_trunc=as.data.frame(table(medpar_trunc$provnum))
colnames(provider_count_trunc) = c('PROVIDER', 'COUNT')
provider_count_trunc

medpar_trunc_died <- medpar_trunc[medpar_trunc$died==1,]

print("Number of died by provider in purged data set ...")
provider_count_trunc_died=as.data.frame(table(medpar_trunc_died$provnum))
colnames(provider_count_trunc_died) = c('PROVIDER', 'COUNT')
provider_count_trunc_died

print("Death rate by provider ...")
y_var = provider_count_trunc_died[,2]/ provider_count_trunc[,2]
y_var

x_var = provider_count_trunc[,2]
provider_labels = provider_count_trunc[,1]

print("Creating funnel plots ...")
fp1=funnel2cmpproviders(x_var, y_var, limits=c(95,99.9,99.9999), addlabels = 1,
 x_label = "Provider \crVolume (Patients Cared for by Provider)", y_label = "Death Rate (Deaths by
 Provider/Patients Cared for by Provider)", plot_title = "Death Rate by Provider and Volume")
fp2=funnel2cmpproviders(x_var, y_var, limits=c(95,99.9,99.9999), labels=provider_labels,
  addlabels = "OUTLIERS", x_label = "Provider Volume (Patients Cared for by Provider)",
  y_label = "Provider Death Rate (Deaths by Provider/Patients Cared for by Provider)",
  plot_title = "Death Rate by Provider and Volume with Outliers Labelled")
```

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