Package 'precisely'

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Type Package

Title Estimate Sample Size Based on Precision Rather than Power

Version 0.1.0

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Description Estimate sample size based on precision rather than power. 'precisely' is a study planning tool to calculate sample size based on precision. Power calculations are focused on whether or not an estimate will be statistically significant; calculations of precision are based on the same principles as power calculation but turn the focus to the width of the confidence interval. 'precisely' is based on the work of Rothman and Greenland (2018) <doi: 10.1097/EDE.0000000000000876>.

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URL https://github.com/malcolmbarrett/precisely

BugReports https://github.com/malcolmbarrett/precisely/issues

Depends R (>= 3.2.0)

Imports dplyr, ggplot2, magrittr, purrr, rlang, shiny, shinycssloaders, shinythemes, tidyr

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R topics documented:

`launch_precisely_app` *Launch precisely Shiny app*

Description

`launch_precisely_app()` launches a Shiny app to calculate and plot precision, sample size, and upper limit calculations.

Usage

```
launch_precisely_app()
```

`map_precisely` *Calculate with precisely functions across values*

Description

`map_precisely()` is a wrapper around `tidyr::crossing()` and `purrr::pmap_dfr()` to give a set of values to any of the calculation functions in precisely. All possible combinations of the values are passed to the function, returning a tibble where each row is the result for each combination.

Usage

```
map_precisely(.f, ...)
```

Arguments

`.f`	a function in precisely
`...`	arguments passed to `.f`. All possible combinations of argument values are given to the function.

Value

a tibble

Examples

```
map_precisely(
  n_risk_difference,
  precision = seq(from = .02, to = .20, by = .005),
  exposed = c(.2, .4),
  unexposed = c(.1, .3),
  group_ratio = 1
)
```

`n_risk_difference` *Estimate sample size based on precision of a measure*

Description

These functions calculate the sample size needed to estimate a measure with a certain precision. For ratio measures, like the risk ratio, rate ratio, and odds ratio, this is the ratio of the upper to lower limit of the confidence interval. For difference measures, like the risk difference or rate difference, this is the absolute width of the confidence interval.

Usage

```
n_risk_difference(precision, exposed, unexposed, group_ratio, ci = 0.95)

n_risk_ratio(precision, exposed, unexposed, group_ratio, ci = 0.95)

n_rate_difference(precision, exposed, unexposed, group_ratio, ci = 0.95)

n_rate_ratio(precision, exposed, unexposed, group_ratio, ci = 0.95)

n_odds_ratio(
  precision,
  exposed_cases,
  exposed_controls,
  group_ratio,
  ci = 0.95
)
```

Arguments

`precision`	For differences, the width of the CI. For ratios, the ratio of the upper to lower CI.
`exposed`	The risk or rate among the exposed cohort.
`unexposed`	The risk or rate among the unexposed cohort.
`group_ratio`	In cohort studies, the ratio of the unexposed to the exposed. In case-control studies, the ratio of the controls to the cases.

`ci` The confidence interval as a probability or percent. Default is .95.

`exposed_cases` The proportion of exposed cases.

`exposed_controls` The proportion of exposed controls.

Value

a tibble with sample size, effect measure, and precision

References

Rothman, K.J. and Greenland, S. 2018. Planning Study Size Based on Precision Rather Than Power. 29(5):599-603.

Examples

```
# From Rothman and Greenland 2018

n_risk_difference(
  precision = .08,
  exposed = .4,
  unexposed = .3,
  group_ratio = 3,
  ci = .90
)

n_risk_ratio(
  precision = 2,
  exposed = .4,
  unexposed = .3,
  group_ratio = 3
)
```

`plot_sample_size` *Plot precisely*

Description

Simple line plots for the output of `map_precisely()`. Use `dplyr::group_by()` to create multiple lines on the plot.

Usage

```
plot_sample_size(.df, xlab = "Sample Size", ylab = "Precision", line_size = 1)

plot_precision(.df, xlab = "Precision", ylab = "Sample Size", line_size = 1)

plot_upper_limit(
  .df,
  xlab = "Sample Size",
  ylab = "Upper Limit",
  line_size = 1
)
```

Arguments

.df	a data frame with values to plot, possibly from map_precisely().
xlab	Label for the x-axis.
ylab	Label for the y-axis.
line_size	The width of the line. Default is 1.

Value

a ggplot

Examples

```
library(dplyr)
library(ggplot2)

map_precisely(
  n_risk_difference,
  precision = seq(from = .02, to = .20, by = .005),
  exposed = .4,
  unexposed = .3,
  group_ratio = 1
 ) %>%
  plot_sample_size()

map_precisely(
  precision_odds_ratio,
  n_cases = seq(from = 500, to = 1000, by = 10),
  exposed_cases = .6,
  exposed_controls = .4,
  group_ratio = 1:4
) %>%
  group_by("Control/Case Ratio" = factor(group_ratio)) %>%
  plot_precision()

map_precisely(
  upper_rate_ratio,
  upper_limit = seq(1.5, 2.5, by = .1),
```

```
  prob = seq(.50, .95, by = .05),
  exposed = .01,
  unexposed = .01,
  group_ratio = 1:4
 ) %>%
  group_by("Probability" = factor(prob)) %>%
  plot_upper_limit(line_size = 1) +
    scale_color_viridis_d() +
    theme_precisely() +
    theme(legend.position = "right",
          strip.text = element_text(margin = margin(b = 5), hjust = 0)) +
    facet_wrap(~ group_ratio,
               labeller = as_labeller(function(x) paste("Unexposed/Exposed:", x)))
```

`precision_risk_difference` *Estimate precision of a measure based on sample size*

Description

These functions calculate the precision of an estimate given a certain sample size. For ratio measures, like the risk ratio, rate ratio, and odds ratio, this is the ratio of the upper to lower limit of the confidence interval. For difference measures, like the risk difference or rate difference, this is the absolute width of the confidence interval.

Usage

```
precision_risk_difference(
  n_exposed,
  exposed,
  unexposed,
  group_ratio,
  ci = 0.95
)

precision_risk_ratio(n_exposed, exposed, unexposed, group_ratio, ci = 0.95)

precision_rate_difference(
  n_exposed,
  exposed,
  unexposed,
  group_ratio,
  ci = 0.95
)

precision_rate_ratio(n_exposed, exposed, unexposed, group_ratio, ci = 0.95)
```

```
precision_odds_ratio(
  n_cases,
  exposed_cases,
  exposed_controls,
  group_ratio,
  ci = 0.95
)
```

Arguments

`n_exposed, n_cases`	In cohort studies, the number of exposed participants. In case-control studies, the number of cases.
`exposed`	The risk or rate among the exposed cohort.
`unexposed`	The risk or rate among the unexposed cohort.
`group_ratio`	In cohort studies, the ratio of the unexposed to the exposed. In case-control studies, the ratio of the controls to the cases.
`ci`	The confidence interval as a probability or percent. Default is .95.
`exposed_cases`	The proportion of exposed cases.
`exposed_controls`	The proportion of exposed controls.

Value

a tibble with precision, effect measure, and sample size

References

Rothman, K.J. and Greenland, S. 2018. Planning Study Size Based on Precision Rather Than Power. 29(5):599-603.

Examples

```
# From Rothman and Greenland 2018

precision_odds_ratio(
  n_cases = 500,
  exposed_cases = .6,
  exposed_controls = .4,
  group_ratio = 2
)
```

theme_precisely *Minimalist themes for precision plots*

Description

Minimalist themes for precision plots

Usage

```
theme_precisely(base_size = 14, base_family = "", ...)
```

Arguments

base_size	base font size
base_family	base font family
...	additional arguments passed to ggplot2::theme()

upper_risk_difference *Estimate sample size based on probability that upper limit is below level of concern.*

Description

These functions calculate sample size based on probability that upper limit is below level of concern. The idea behind this approach is to use precision to provide support for the absence of effect. These functions calculate sample size where, when the true effect is null, the upper limit of the confidence interval of the estimate of interest has a probability of being at or under a specified level of concern.

Usage

```
upper_risk_difference(
  upper_limit,
  prob,
  exposed,
  unexposed,
  group_ratio,
  ci = 0.95
)

upper_risk_ratio(upper_limit, prob, exposed, unexposed, group_ratio, ci = 0.95)

upper_rate_difference(
  upper_limit,
  prob,
  exposed,
```

```
  unexposed,
  group_ratio,
  ci = 0.95
)

upper_rate_ratio(upper_limit, prob, exposed, unexposed, group_ratio, ci = 0.95)

upper_odds_ratio(
  upper_limit,
  prob,
  exposed_cases,
  exposed_controls,
  group_ratio,
  ci = 0.95
)
```

Arguments

upper_limit	The upper limit of the confidence interval, a level of concern.
prob	The probability of the estimated upper limit of the confidence interval being at or below the level of concern.
exposed	The risk or rate among the exposed cohort.
unexposed	The risk or rate among the unexposed cohort.
group_ratio	In cohort studies, the ratio of the unexposed to the exposed. In case-control studies, the ratio of the controls to the cases.
ci	The confidence interval as a probability or percent. Default is .95.
exposed_cases	The proportion of exposed cases.
exposed_controls	The proportion of exposed controls.

Value

a tibble with sample size, effect measure, upper limit, and probability

References

Rothman, K.J. and Greenland, S. 2018. Planning Study Size Based on Precision Rather Than Power. 29(5):599-603.

Examples

```
# From Rothman and Greenland 2018

upper_rate_ratio(
  upper_limit = 2,
  prob = .90,
  exposed = .01,
```

```
  unexposed = .01,
  group_ratio = 1
)
```

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